Esso Australia Resources Pty Ltd

BASS STRAIT ENVIRONMENT PLAN

CURRENT VERSION

Vol	Rev	Title	Doc Number	Status	Date
	2	Preface	AUGO-EV-EMM-012	Response to NOPSEMA RFFWI #2	26/03/21
1	2	Description of Environment	AUGO-EV-EMM-001	NOPSEMA Bass Strait EP RFFWI #1	10/06/20
2	3	Impacts and Risks	AUGO-EV-EMM-005	Response to NOPSEMA RFFWI #2	26/03/21
3	6	ER Impacts and Risks	AUGO-EV-EMM-003	NOPSEMA Bass Strait Operations EP OMR	09/12/20
	8.1	OPEP	AUGO-EV-ELI-001	Minor change SSDI /State Control Agency/updates to scope	09/12/20
	5	OSMP	AUGO-EV-EPL-001	NOPSEMA OMR for Bass Strait EP	09/12/20
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	3	OPEP	AUGO-EV-ELI-001	NOPSEMA JUR Drilling EP OMR	02-12-19
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	3	OSMP	AUGO-EV-EPL-001	NOPSEMA JUR Drilling EP RFFWI(2)	30-12-19
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	3	Environmental Performance & Implementation Strategy	AUGO-EV-EMM-006	Response to NOPSEMA RFFWI #2	25-03-21

Esso Australia Resources Pty Ltd

BASS STRAIT ENVIRONMENT PLAN

Preface

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1 Preface

1.1 Purpose of this document

This preface document provides an overview of the Bass Strait Environment Plan (EP) and incorporates the summary table required by regulation 11(4). It is designed to assist the reader to navigate the four volumes which make up the Bass Strait EP.

1.2 Overview of the Environment Plan Structure

1.2.1 Structure of the Environment Plan

Esso Australia Resources Pty Ltd (Esso), a wholly owned subsidiary of ExxonMobil Australia Pty Ltd, is the operator for the Gippsland Basin Joint Venture (Esso and BHP Billiton Petroleum (Bass Strait) Pty Ltd (BHP)) and the Kipper Unit Joint Venture (Esso, BHP, and MEPAU A Pty Ltd). In connection with these joint ventures, Esso operates 23 offshore platforms and installations in the Bass Strait and 600 km of subsea pipelines. Esso receives services, including personnel, from Esso Australia Pty Ltd (EAPL), which is also a wholly owned subsidiary of ExxonMobil Australia Pty Ltd.

Esso also undertakes project work across its offshore assets and permit areas, including those owned jointly by the Gippsland Basin Joint Venture participants and the Kipper Unit Joint Venture participants. Exploration and development drilling or other project activities are also planned or may be undertaken in the future.

All offshore activities as defined by the Offshore Petroleum and Greenhouse Gas Storage Act, 2006 (OPGGS Act) and the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations, 2009 (OPGGS(E)R), require an accepted Environment Plan to enable them to proceed. All of these activities take place in the Bass Strait and are operated by Esso using the same management systems and processes. Therefore there is direct replication of processes, information and systems across facilities and within facility specific Environment Plans. In an effort to minimse replication and streamline the administrative process, Esso has standardised the sections of the Environment Plans that are identical between activities. The Environment Plan is now presented in four separate volumes which should be read as one volume however can be maintained individually as nessecary.

Esso Bass Strait Offshore Environment Plan Structure

VOLUME 1 - DESCRIPTION OF THE ENVIRONMENT

APPLIES TO All Esso ACTIVITIES

Describes the total combined geographic area which may be affected by all and any of the activities undertaken by Esso

Section 1	Introduction
Section 2	Description of the Environment (Reg 13(2) and Reg 13(3))
Section 3	Legislative and other requirements (Reg 13(4))
Appendix A	Environmental Policy (Reg 16(a))
Appendix B	References
Appendix C	EPBC Act Search Reports
Appendix D	Current Roses

VOLUME 2 - DESCRIPTION OF THE ACTIVITY, IMPACTS AND RISKS

ACTIVITY SPECIFIC

- Provides activity specific scope
- Describes activity specific impacts and risks and measures taken to manage the impacts and risks

Section 1	Details of Titleholder (Reg 15)
Section 2	Description of Activity (Reg 13(1))
Section 3	Future Planning (OPGGSA Section 572)
Section 4	Impact and Risk Assessment Methodology
Section 5	Activity Specific Description of Environment (Reg 13(2) and Reg 13(3))
Section 6	Impact Assessment (Reg 13(5), Reg 6(a) & Reg 6(b))
Section 7	Risk Assessment (Reg 13(5), Reg 6(a) & Reg 6(b))
Appendix A	Bass Strait Operations Inventory
Appendix B	Inventory Maintenance and Planning End State
Appendix C	EPBC Act Listed Species PEA
Appendix D	EPBC Act Listed Species by OA and EPBC Reports
Appendix E	Bass Strait Facilities Survey Data
Appendix F	PFW Data File
Appendix G	PFW Breakout Boxes

VOLUME 3 - EMERGENCY PREPAREDNESS AND RESPONSE

APPLIES TO ALL ESSO ACTIVITIES

Describes Esso's Emergency Preparedness and Response activities and arrangements as they apply to all activities

Section 1-9	Description of Emergency Response Activities (Reg 13(1)) Potential Impact Assessment of Response Activities (Reg 13(5b), Reg 13(6)) Arrangements for responding to and monitoring oil pollution (Reg 14(8AA)) Arrangements and capability for monitoring oil pollution and inform response activities (Reg 14(8AAd), Reg 14(8D))
Appendix A	Oil Pollution Emergency Plan
Appendix B	Oil Spill Monitoring Plan

VOLUME 4-IMPLEMENTATION STRATEGY

ACTIVITY SPECIFIC

Describes activity specific implementation plan including performance monitoring, consultation and reporting

Section 1	Environmental Performance - Operations and Emergency Response Preparedness (Reg 13(7))
Section 2	Operations Integrity Management System (Reg 14(1), Reg 14(8A, 88 & 8C), Reg 10A(e) Reg 14(3))
Section 3	Platform Surveillance and Optimisation (Reg 14(3))
Section 4	Roles and Responsibilities (Reg 14(5))
Section 5	Training (Reg 14(5))
Section 6	Monitoring of performance outcomes and standards (Reg 14(3))
Section 7	Monitoring of emissions and discharges
Section 8	Reporting (Reg 14(2), Reg 26C)
Section 9	Emergency Response (Reg 14(4))
Section 10	Stakeholder Consultation and Community Engagement (Reg 11, Reg 16(b)) Environmental legislative compliance
Appendix A	Relevant Stakeholders
Appendix B	Stakeholder Consultation Reports

Figure 1-1 Environment Plan Structure for Esso activity submissions under OPGGS(E)R

1.2.2 Standardised information across all activities

The standardised sections of the Environment Plans that are identical between activities are described below:

Volume 1 - Description of the Environment

Volume 1 describes the environment within a geographic area (henceforth called the Described Area (DA)) which encompasses the combined breadth of all credibly conceivable worst case discharge scenarios (WCDS) that could arise from any activity undertaken by Esso.

Each project will have a different WCDS. Project specific stochastic oil spill modelling will be used to determine the geographic area potentially impacted by that particular project.

Volume 1 uses the combined geographic area from all the conceivable individual activities and is then used to determine the total DA.

Note that by definition, no single credible spill scenario could potentially impact the whole of the DA. Information contained in Volume 1 includes:

- Description of the Environment (Reg 13(2) and Reg 13(3))
- Legislative and other requirements (Reg 13(4))
- Describes the total combined geographic area which may be affected by all and any of the activities undertaken by Esso
- Esso's Corporate environmental policy (Reg 16(a))

Volume 3 - Emergency Preparedness and Response

Esso prepares for and manages emergency situations, including oil spills, under its safety management system, OIMS System 10-2 (refer Implementation Strategy). The purpose of OIMS System 10-2 is to ensure that Esso establishes effective response to emergencies and business disruptions that threaten the safety, security and health of the public, contractors and employees, the environment, asset integrity, and critical business operations. The system and its processes address all sites for which Esso has responsibility and are designed to respond to all emergency situations, regardless of the specific activity and is therefore applied consistently across all activities.

Information contained in Volume 3 includes:

- Description of the activities that may be undertaken in response to an oil spill, should one occur (Reg 13(1));
- Impact and Risk Assessment of the oil spill response activities (Reg 13(5) & Reg 13(6));
- A description of Esso's capability to respond to an oil spill, including arrangements with other organisations that can provide additional resources (Reg 14(8AA);
- An assessment of the adequacy of Esso's capability to respond in a timely manner to any oil spill arising from any and all of Esso's offshore petroleum activities (Reg 14(8AA).

The Oil Pollution Emergency Plan (OPEP) is included in Appendix A of Volume 3 and includes:

- Description of the specific arrangements in place for responding to and monitoring oil pollution arising from any of Esso's offshore petroleum activities (Reg 14(8AA).
- The Oil Spill Monitoring Plan (OSMP) is included in Appendix B of Volume 3 and includes:
- Description of the specific arrangements for monitoring oil pollution which also informs response activities (Reg 14(8AAd) & Reg 14(8D).

1.2.3 Activity specific information

The information which will vary between activities is the specific scope of work that will be undertaken, defined by the OPGGS(E)R as the description of the Activity (R13(1)), and its associated impacts and potential risks (R13(5), R13(6) and R13(7)). For each work scope, all activity specific information relating to these regulations will be provided in Volume 2, Description of the Activity, Impacts and Risks.

Volume 2 - Description of the Activity, Impacts and Risks

Information contained in Volume 2 includes:

- Details of Titleholder (Reg 15)
- Description of Activity (Reg 13(1))
- Description of the activity specific environment that may be affected (R13(2)a)
- Impact and Risk Assessment (Reg 13(5), Reg 6(a) & Reg 6(b))

Volume 4 - Implementation Strategy

Esso operates in accordance with the proprietary ExxonMobil Operations Integrity Management System (OIMS). OIMS consists of 11 Elements, each of which has globally defined corporate expectations. These are implemented through formally documented Management Systems. This provides for all the standard recognised requirements of safety management systems, beginning with Management Leadership, Commitment and Accountability (Element 1) and incorporating a continuous cycle of assessment and improvement (Element 11). Regardless of the specific activity, Esso will consistently use OIMS to implement all activities. However the activity specific organisation structure and roles and responsibilities of personnel in relation to the implementation, management and review of the environment plan defined by the OPGGS(E)R as the Implementation Strategy for the environment plan (R14), will vary for each project. This information will be provided in Volume 4, Implementaton Strategy.

Information contained in Volume 4 includes:

- Environmental Performance (Reg 13(7))
- Monitoring of performance outcomes and standards (Reg 14(3))
- Implementation Plan (Reg 14(1), Reg 10A(e) and Reg 14(8A, 8B & 8C)
- Environmental Management System (Reg 14(3))
- Roles and Responsibilities & Training (Reg 14(5))
- Incident reporting and recording requirements (Reg 26, 26A, 26AA & 26B) and Reporting (Reg 14(2) & 26C)
- Consultation (Reg 11 & Reg 16b)

1.3 EP Summary Requirement

This Bass Strait EP summary has been prepared from material provided in the EP. The summary consists of the following as required by regulation 11(4):

EP Summary material requirement	Relevant section of EP containing EP Summary material
The location of the activity	Volume 2 Section 2
A description of the receiving environment	Volume 1 Volume 2 Section 5
A description of the activity	Volume 2 Section 2 Volume 2 Section 3
Details of the environmental impacts and risks	Volume 2 Section 6 Volume 2 Section 7
The control measures for the activity	Volume 2 Section 6 Volume 2 Section 7 Volume 4 Section 1
The arrangements for ongoing monitoring of the titleholders environmental performance	Volume 4
Response arrangements in the oil pollution emergency plan	Volume 3, including appendices
Consultation already undertaken and plans for ongoing consultation	Volume 4 Section 10 Volume 4 Appendix B
Details of the titleholders nominated liaison person for the activity	Volume 2 Section 1

1.4 Summary of the Table of Contents of each Volume of the EP

This Bass Strait EP is comprised of four volumes. The table of contents of each volume is summarised here for convenience.

Table of Contents Volume 1 – Description of the Environment

Table of Contents Volume 2 – Impacts and Risks

Table of Contents Volume 3 – Emergency Response Impacts and Risks

Table of Contents Volume 4 – Environmental Performance and Implementation Strategy

Esso Australia Resources Pty Ltd

DESCRIPTION OF THE ENVIRONMENT
BASS STRAIT ENVIRONMENT PLAN

Volume 1

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Abbreviations

Abbreviation	Description
ABWMIS	Australian Ballast Water Management Information System
AFFF	Aqueous Film-Forming Foam
AFMA	Australian Fisheries Management Authority
ALARP	As Low As Reasonably Practicable
AMOSC	Australian Marine Oil Spill Centre
AMP	Australian Marine Parks
AMSA	Australian Maritime Safety Authority
ANZECC	Australian and New Zealand Environment and Conservation Council
APASA	Asia Pacific Applied Science Association
APPEA	Australian Petroleum Production and Exploration Association
AQIS	Australian Quarantine Inspection Service
BIA	Biologically Important Area
AS/NZS	Australian Standards / New Zealand Standards
ANZECC	Australian and New Zealand Environment and Conservation Council
ATBA	Area To Be Avoided
BIA	Biologically Important Area
BBMT	Barry Beach Marine Terminal
BHPB	BHP Billiton Petroleum (Bass Strait) Pty Ltd
BOM	Bureau of Meteorology
Bonn Convention	Convention on the Migratory Species of Wild Animals 1979
BSCZSF	Bass Strait Central Zone Scallop Fishery
BSOA	Bass Strait Operating Area
CAMBA	Chinese Australia Migratory Bird Agreement
CASA	Civil Aviation Safety Authority
CITES	Convention on International Trade in Endangered Species of Wildlife and Flora 1973
CMR	Commonwealth Marine Reserve
CVIT	Commonwealth Victoria Inshore Trawl
DA	Described Area
DAWE	Department of Agriculture, Water and the Environment
DEH	Department of Environment and Heritage
DEPI	Department of Environment and Primary Industries (previously Department of Sustainability and the Environment or DSE and Department of Primary Industries or DPI)
DoE	Department of the Environment (formerly Department of Sustainability, Environment, Water, Population & Communities or SEWPaC)
DoEE	Department of the Environment and Energy
DoI	Department of Industry (previously Department of Resources, Energy and Tourism or DRET)
DoIRD	Department of Infrastructure and Regional Development (formerly Department of Infrastructure and Transport)

Abbreviation	Description
DSDBI	Department of State Development, Business and Innovation (Energy and Resources portfolio formerly located with Department of Primary Industries or DPI)
DTPLI	Department of Transport, Planning and Local Infrastructure (formerly Department of Transport or DoT)
EAC	East Australian Current
EAPL	Esso Australia Pty Ltd
EARPL	Esso Australia Resources Pty Ltd
ECD	Ecological Character Description
ECDTS	East Coast Deepwater Trawl Sector
EGBPA	Esso Gippsland Basin Permit Area
EMM	Environment Management Manual
EMBA	Environment that may be Affected
EPA	Environment Protection Authority
EPBC	Environment Protection and Biodiversity Conservation Act, 1999
GABTS	Great Australian Bight Trawl Sector
GBJV	Gippsland Basin Joint Venture
GHTS	Gillnet, Hook and Trap Sector
GVP	Gross Value Production
HLA	Halibut
IMCRA	Integrated Marine and Coastal Regionalisation of Australia
IUCN	International Union for Conservation of Nature
JAMBA	Japan Australia Migratory Bird Agreement
KFA	Kingfish A
KEF	Key Ecological Feature
KFB	Kingfish B
km	kilometres
KPA	Kipper Subsea Facility
KTT	Kipper, Tuna, Turrum
LAC	Limits of Acceptable Change
LEFCOL	Lakes Entrance Fishing Co-operative Limited
MARPOL 73/78	International Convention for the Prevention of Pollution from Ships
MEPAU	Mitsui E&P Australia Pty Ltd
MEPC	Marine Environment Protection Committee
MKA	Mackerel
MNES	Matters of National Environmental Significance
MLA	Marlin A
MLB	Marlin B
MMboe	million barrels of oil equivalent
m	metres
mm	millimetres

Abbreviation	Description
m/s	metres per second
MPA	Marine Protected Area
MSL	Mean Sea Level
MT	Metric Ton
NEPM	National Environment Pollution Measures
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NOPTA	National Offshore Petroleum Titles Authority
NSW	New South Wales
OIMS	Operations Integrity Management System
OPEP	Oil Pollution Emergency Plan
OPGGS Act	Offshore Petroleum and Greenhouse Gas Storage Act, 2006
OPGGS(E)R	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations, 2009
PEA	Potentially Exposed Area
psu	Practical Salinity Units
PSZ	Petroleum Safety Zone
RAMSAR	Convention on Wetlands of International Importance
ROKAMBA	Republic of Korea Migratory Birds Agreement
SESSF	Southern and Eastern Scalefish and Shark Fishery
SETF	South Eastern Trawl Fishery
SSHE	Safety, Security, Health & Environment
SNA	Snapper
TAS	Tasmania
TEC	Threatened Ecological Communities
TSPA	Tasmanian Threatened Species Protection Act 1995
TNA	Tuna
UNESCO	United Nations Educational, Scientific and Cultural Organization
VIC	Victoria
WCDS	Worst Credible Discharge Scenario
WKF	West Kingfish
WTN	West Tuna

1 Introduction

1.1 Overview

This Description of the Environment has been prepared in accordance with the requirements of the Commonwealth Offshore Petroleum and Greenhouse Gas Storage Act 2006 and the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations, 2009 (OPGGS(E)R) per the amended Act and Regulations as at 01 January 2015. The Environment Plan development has been guided by N04750-GN1344 Environment Plan Content Requirements (NOPSEMA 2016).

1.2 Regulatory Context

The OPGGS(E)R have prescribed requirements for the description of the environment. Table 1-1 lists the requirements of the regulations and identifies the sections in this description of the environment where the requirements are addressed.

Table 1-1 OPGGS(E)R requirements for the description of the activity with references to where these items are addressed

Regulation	Requirement	Relevant section where this is addressed
13(2)	The Environment plan must:	
13(2)(a)	Describe the existing environment that may be affected by the activity	1.4 Definition of Described Area 2 Description of the Environment
13(2)(b)	Include details of the particular relevant values and sensitivities (if any) of that environment’	2.2 Values and Sensitivities
13(3)	Particular relevant values and sensitivities may include	
13(3)(a)	the world heritage values of a declared World Heritage property within the meaning of the EPBC Act	2.2.1 World Heritage
13(2)(b)	the national heritage values of a National Heritage place within the meaning of that Act	2.2.2 National Heritage
13(2)(c)	the ecological character of a declared Ramsar wetland within the meaning of that Act	2.2.3 Wetlands of International Importance
13(2)(d)	the presence of a listed threatened species or listed threatened ecological community within the meaning of that Act	2.3.1 Fauna 2.2.4 Threatened Ecological Communities
13(2)(e)	the presence of a listed migratory species within the meaning of that Act	2.3.1 Fauna
13(2)(f)	any values and sensitivities that exist in, or in relation to, part or all of:	
13(2)(f)(i)	a Commonwealth marine area within the meaning of that Act; or	2.2.5 Commonwealth Marine Areas 2.2.6 Australian Marine Parks
13(2)(f)(ii)	(ii) Commonwealth land within the meaning of that Act	2.2.8 National Parks and Reserves

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 Regulation 13(2) of the OPGGS(E)R, this document describes the physical setting, ecological receptors, and social receptors, of the receiving environment.

A greater level of detail is provided for those particular receptors as defined by Regulation 13(3) of 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:

(g) a Commonwealth marine area within the meaning of that Act; or

(h) Commonwealth land within the meaning of that Act.

1.3 Environmental Policy

It is Esso's policy to conduct its business in a manner that is compatible with the balanced environmental and economic needs of the communities in which it operates. Esso is committed to continuous efforts to improve environmental performance throughout its operations.

Accordingly, Esso's policy is to:

- Comply with all applicable environmental laws and regulations and apply responsible standards where laws and regulations do not exist;
- Encourage concern and respect for the environment, emphasize every employee's responsibility in environmental performance, and ensure appropriate operating practices and training;
- Work with government and industry groups to foster timely development of effective environmental laws and regulations based on sound science and considering risks, costs and benefits, including effects on energy and product supply;
- Manage its business with the goal of preventing incidents and of controlling emissions and wastes to below harmful levels and design, operate, and maintain facilities to this end;
- Respond quickly and effectively to incidents resulting from its operations, cooperating with industry organizations and authorized government agencies;
- Conduct and support research to improve understanding of the impact of its business on the environment, to improve methods of environmental protection, and to enhance its capability to make operations and products compatible with the environment;
- Communicate with the public on environmental matters and share its experience with others to facilitate improvements in industry performance; and
- Undertake appropriate reviews and evaluations of its operations to measure progress and to ensure compliance with this environmental policy.

A copy of Esso's Environmental Policy is provided in Appendix A.

1.4 Definition of Described Area

In accordance with Regulation 13(2)a of the OPGGS(E)R and NOPSEMA A652993 (NOPSEMA, 2019), the Potentially Exposed Area (PEA) is defined as the outer edge of all simulations in stochastic modelling, using the worst case discharge scenario (WCDS) and the lowest relevant threshold for the furthest reaching fate of hydrocarbons. While modelling carries some inherent uncertainty, the Potentially Exposed Area (PEA) as defined:

- Represents the area that could be affected by any oil spill; and
- Is conservative, as the lowest threshold relevant to any receptor is used.

Each specific activity will define its own PEA in Volume 2 of the Environment Plan. The Described Area (DA) is the *combined* breadth of *all* credibly conceivable PEAs for specific operational activities and project activities to be undertaken by Esso. By definition:

- the limits of each specific PEA is expected to fall within the DA and therefore, all information required to describe the environment will be contained in this Volume 1; and
- no single activity is expected to potentially impact the entire DA.

In the event that the PEA for a future activity is found to reach beyond the edge of the DA, the DA will be expanded and the Description of Environment (this Volume 1) will be revised.

Using the criteria described above, the DA is shown in Figure 1-1. The DA encompasses the Southeast Marine Bioregion, the Temperate East Marine Bioregion and the Coral Sea Marine Bioregion. The IMCRA provincial bioregions encompassed by the DA are also shown in Figure 1-1.

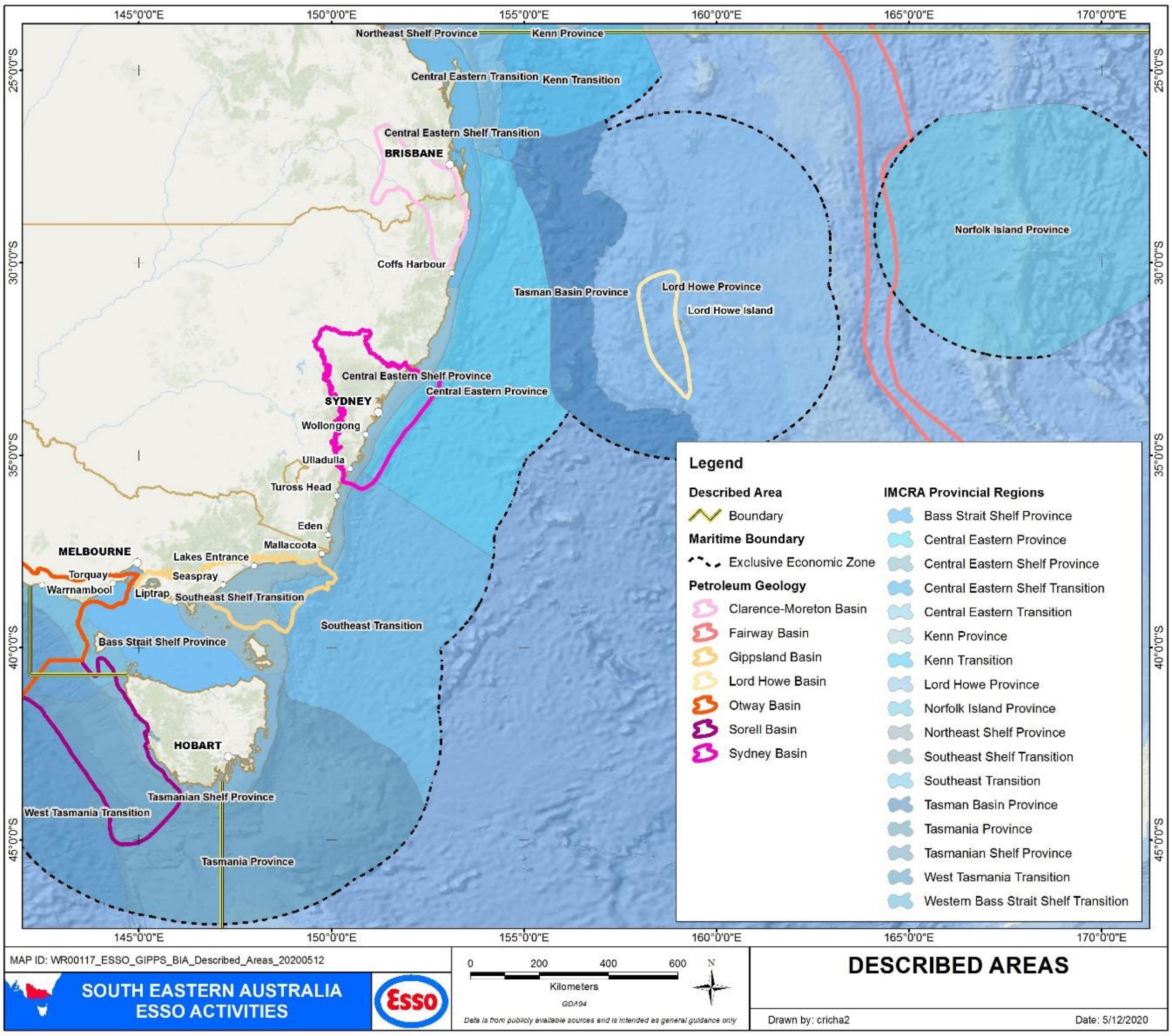


Figure 1-1 Described Area (DA)

1.5 Esso Bass Strait Permit Area

Esso's operations and project activities are undertaken within its permit areas in the Gippsland Basin in Bass Strait. Figure 1-2 shows the Esso Gippsland Basin Permit Areas (EGBPA) and Table 1-2 lists the location of the existing facilities and pipelines.

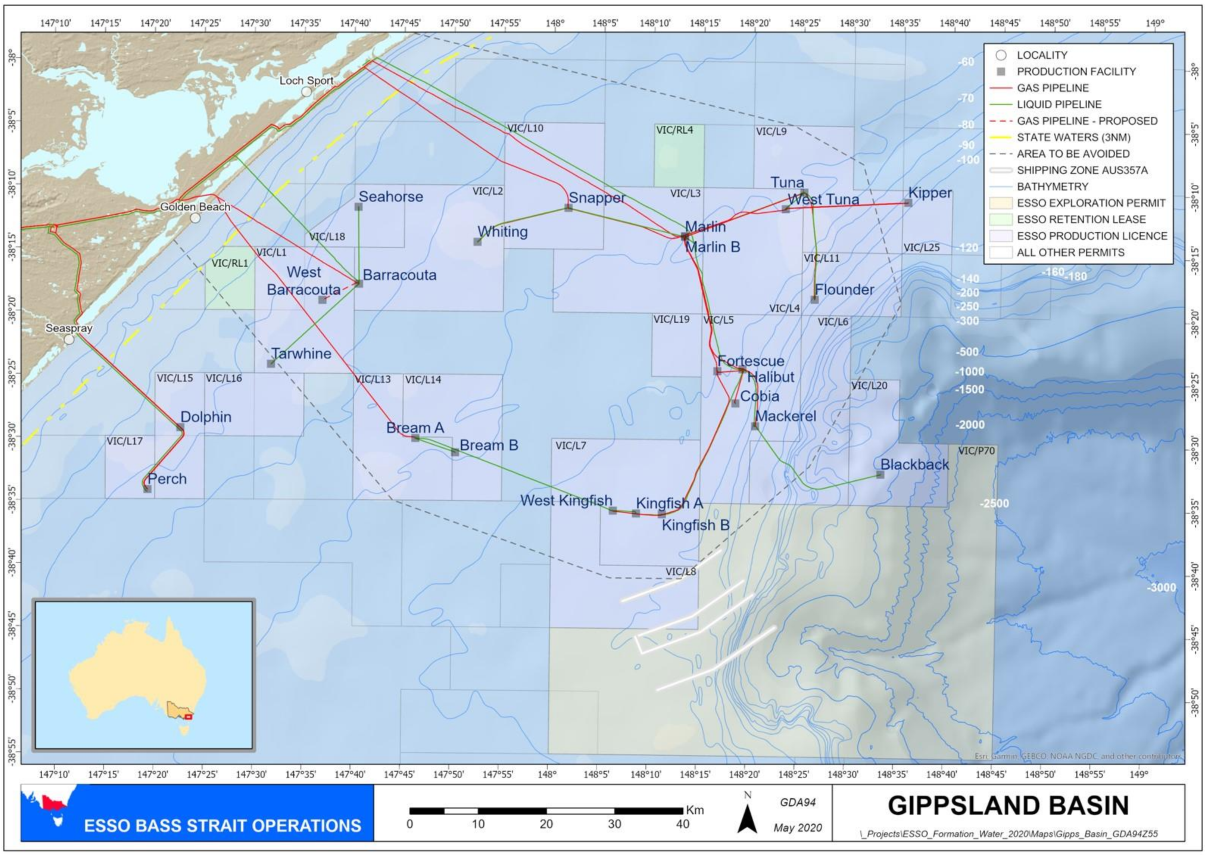


Figure 1-2 Esso Gippsland Basin Permit Area

Table 1-2 Esso's Bass Strait Facility locations (GDA94)

Production License No.	Facility Name	Code	Distance from coast (km)	Water depth (m)	Latitude	Longitude
VIC/L01	Tarwhine subsea facility	TWA[1]	22	~43	38° 24' 11" S	147° 31' 46" E
VIC/L02	West Barracouta subsea facility	BTW[7]	22	46	38° 19' 05" S	147° 36' 57" E
VIC/L02	Barracouta platform	BTA	~23	~46	38° 17' 48" S	147° 40' 33" E
VIC/L02	Whiting platform	WTA	~34	~54	38° 14' 24" S	147° 52' 25" E
VIC/L03	Marlin A platform	MLA	~42	~59	38° 13' 50" S	148° 13' 14" E
VIC/L03	Marlin B platform	MLB			38° 13' 46" S	148° 13' 16" E
VIC/L04	West Tuna platform	WTN	~45	~61	38° 11' 31" S	148° 23' 20" E
VIC/L04	Riser Access Tower	WTN-RAT			38° 11' 29" S	148° 23' 23" E
VIC/L05	Halibut platform	HLA	~62-68	~69-93	38° 24' 15" S	148° 19' 12" E

Production License No.	Facility Name	Code	Distance from coast (km)	Water depth (m)	Latitude	Longitude
VIC/L05	Fortescue platform	FTA			38° 24' 26" S	148° 16' 41" E
VIC/L05	Cobia platform	CBA			38° 26' 58" S	148° 18' 33" E
VIC/L05	Mackerel platform	MKA			38° 28' 45" S	148° 20' 33" E
VIC/L07	Kingfish A platform	KFA[2]	~77	~77	38° 35' 46" S	148° 08' 40" E
VIC/L07	Kingfish B platform	KFB	~77	~78	38° 35' 49" S	148° 11' 17" E
VIC/L07	West Kingfish platform	WKF	~72	~76	38° 35' 35" S	148° 06' 20" E
VIC/L09	Tuna platform	TNA	~43	~59	38° 10' 10" S	148° 25' 10" E
VIC/L10	Snapper platform	SNA	~32	~55	38° 11' 37. " S	148° 01' 31" E
VIC/L11	Flounder platform	FLA	~58	~93	38° 18' 40" S	148° 26' 22" E
VIC/L13	Bream A platform	BMA	~46	~59	38° 29' 59" S	147° 46' 20" E
VIC/L14	Bream B platform	BMB[3]	~51	~61	38° 31' 06" S	147° 50' 21" E
VIC/L15	Dolphin platform	DPA[6]	~21	~38	38° 29' 14" S	147° 22' 39" E
VIC/L17	Perch platform	PCA[6]	~24	~42	38° 34' 09" S	147° 19' 21" E
VIC/L18	Seahorse subsea facility	SHA[4]	12	~42	38° 11' 42" S	147° 40' 27" E
VIC/L20	Blackback subsea facility	BKA	~87	~402	38° 32' 21" S	148° 33' 20" E
VIC/L25	Kipper subsea facility	KPA[5]	-	95	38° 10' 52" S	148° 35' 37" E

1 TWA subsea facility is located approximately 17 km to the south west of the BTA platform
2 The KFA platform is located approximately 3.5 km from the WKF platform and 4 km from the KFB platform.
3 The BMB platform is located approximately 7 km east of BMA
4 The SHA subsea facility is located approximately 11 km to the north of the BTA platform
5 KPA subsea facility is located approximately 18 km to the east of the WTN platform
6 The PCA and DPA platforms are 9 km apart, and approximately 40 km and 33 km west of BMA respectively
7 The BTW subsea facility is located approximately 6 km to the west of BTA platform

2 Description of the Environment

2.1 Physical Environment

Esso's operations are located in Bass Strait, the region of the continental shelf that separates mainland Australia from Tasmania. The physical environment of the Described Area (DA) is described in this section.

2.1.1 Climate and Meteorology

Average summer air temperatures in coastal Victoria (Yarram Airport) range from early morning lows of 11 to 13°C, to afternoon highs of 23 to 26°C (BOM, 2017). Average winter temperatures range from minimums of 5°C to maximums of 15°C in the afternoons. Offshore (on Deal Island in central Bass Strait), milder conditions occur with an average summer range of 13 to 21°C and an average winter range of 9 to 14°C (BOM, 2017).

Average monthly rainfall along the Gippsland coast (Yarram Airport) ranges from 36 mm in January (highest 112 mm) to 60 mm in June (highest 174 mm). Offshore (on Deal Island in central Bass Strait) monthly rainfall ranges from 41 mm in January (highest 162 mm) to 78 mm in June (highest 247 mm) and shows a similar pattern to the coastal region (Lakes Entrance) with slightly higher winter rainfall: 38 mm in January (highest 90 mm) to 101 mm in June (highest 298 mm) (BOM, 2017).

Wind speeds are in the range of 10 to 30 km per hour, with maximum gusts reaching 100 km per hour. The wind direction is predominately westerly during winter, westerly and easterly during spring and autumn (when wind speeds are highest) and easterly during summer. Strong south-easterly winds can be generated by low pressure systems known as 'east coast lows'. Although these occur relatively infrequently (once or twice per year), the longer fetch of these winds increases their potential for generating extreme wave conditions (BOM, 2017).

There are three main and one minor types of storm which can generate severe wave conditions in the study area of Bass Strait. These are (Esso, 1989 and Cardno, 2017):

South-east storms: are generally associated with what has become known as an "east-coast low". East-coast lows are generally associated with very strong east to south-east winds (speeds in excess of 80 knots have been measured off the New South Wales coastline) and high rainfall. South-east storms resulting from east-coast lows occur relatively infrequently (on average 1 to 2 per year), and not all travel far enough south to cause concern in Bass Strait. The waves they generate are however, unrestricted by fetch or water depth. As such they have the greatest potential for generating extreme wave conditions in eastern Bass Strait.

South-west storms: occur relatively frequently (typically several severe storms per year). Due to fetch and depth limitation, it is unlikely that extreme design-wave conditions will occur during a south-west storm.

South storms: are generally associated with low-pressure systems in the western part of the Tasman Sea. During the peak of the storm the Tasman Sea lows generate very strong south south-east through to south south-west winds in Bass Strait. During storm development however, the wind can have a significant south-east or south-west component, depending on the origin of the low. Southerly storms occur at about the same frequency as south-east storms. Southerly storms are considered to have a greater potential than the south-west storms for generating extreme wave conditions.

Small-scale Bass Strait Lows: can generate south east, south or south west waves, depending on their origin and location. These storms can be quite severe (e.g., the January 1986 storm), but due to fetch limitations are unlikely to be the cause of extreme design-wave conditions.

2.1.2 Oceanography

2.1.2.1 Currents and Tides

Currents in the Gippsland Basin are tide and wind driven. Tidal movements predominantly have a northeast–southwest orientation. Tidal flows come from the east and west during a rising (flood) tide, and flow out to the east and west during a falling (ebb) tide. Tidal streams are dominated by the lunar tidal constituent, which has a period of 12.4 hours. The main tidal components vary in phase by about three to four hours from east to west. Most of this phase change occurs between Lakes Entrance and Wilsons Promontory. Timing of the high tide, for example, can vary by up to three hours across this region. Tides in the area from Lakes Entrance to Gabo Island are, however, relatively weak in comparison to other areas of Bass Strait (GEMS, 2005).

Bass Strait is characterised by shallow water and tidal currents. While there is a slow easterly flow of waters in Bass Strait, there is also a large anticlockwise circulation. The shallowness of the water means that these waters more rapidly warm in summer and cool in winter than other waters of the Region.

Wind driven currents in Gippsland Basin can be caused by the direct influence of weather systems passing over Bass Strait (wind and pressure driven currents) and the indirect effects of weather systems passing over the Great Australian Bight (GEMS, 2005). Appendix D provides the current roses from six platforms in Bass Strait (SNA, TNA, FTA, HLA, CBA and MKA) (RPS, 2016). They show the monthly average ocean current rose plot derived from five-year current dataset at each location.

The colour keys shows the current speeds (m/s), the compass direction provides the current direction flowing *towards* and the length of the wedge gives the percentage of the record for a particular speed and direction combination.

The eastern parts of the Region are strongly influenced by the East Australian Current (EAC) that flows southward adjacent to the east coast of New South Wales, Victoria and Tasmania, carrying warm equatorial waters (Refer Figure 2-1 and Figure 2-2). The EAC is up to 500 m deep and 100 km wide, and is strongest in summer when it can flow at up to 5 knots. In winter it flows at 2–3 knots as the oceanographic and climatic drivers in the Coral Sea diminish. The EAC tends to form ocean eddies that rotate around warm, central cores that can be up to 200 km across, and may persist for months. Eddies form more frequently off the south coast of New South Wales than other areas, but are also common along the east coast of Tasmania. The eddies can cross the continental shelf, and when mixing with shelf break waters, create upwellings that form isolated areas of enhanced productivity 200–300 km in diameter. Seasonal and transient upwellings are important ecological features of the Region. The closest to the Bass Strait operations is the Upwelling East of Eden, a key ecological feature for the high productivity and aggregations of marine life (refer Section 4.6.2 for further details). The EAC also affects sea surface temperatures on the eastern Tasmanian shelf, which can vary substantially among years depending on the relative influence of subtropical waters.

At the shelf break east of Bass Strait, nutrient-rich waters rise to the surface in winter as part of the processes of the Bass Strait Water Cascade, where the eastward flushing of the shallow waters that are more saline and slightly warmer than surrounding Tasman Sea waters form an undercurrent that cascades down the continental slope (refer Section 4.6.4 for further details). The cascading water has a displacing effect causing nutrient rich waters to rise which in turn leads to increased primary productivity in those areas. The cascading water also concentrates nutrients and some fish and whales are known to aggregate along its leading edge.

Further offshore, in the south east part of the operational area, currents are driven by two parameters, the Sub-Antarctic Water movement, coming from the south, and the Bass Strait Water movement from the west (Tomczak, 1985; Rochford, 1975; in Gibbs et al, 1991). The presence of deepwater currents is documented in the Blackback Oceanographic Study (Lawson & Treloar 1996), Kingfish B Wave, Current and Wind data (Lawson & Treloar 1987 1990) and Metocean Design Criteria for Bass Strait Fixed Platforms (Esso 1990).

Esso undertook a comprehensive current measurement program in the Blackback study area using seven current meters moored three metres above the seabed over a 12 month period (Lawson & Treloar 1996) to provide an understanding of the regional oceanography of the Bass Strait shelf and continental slope, particularly the relative importance of tidal, wind-driven and density-generated currents and the influence of regional topography on currents in the study area.

Tidal current analysis indicated general seabed current alignment normal to the bathymetry, at speeds of around 0.2 to 0.3 m/s. The dominance of the bathymetry was most evident at the current meter sites located within a clearly defined valley.

Analysis of residual, non-tidal current vectors during significant storm periods has confirmed that wind driven currents are the strongest currents in the continental shelf areas but are of progressively lesser significance lower down the continental slope. The study has also provided evidence of flow of water from the continental shelf down the continental slope, conforming to the Bass Strait Cascade, as evidenced by high easterly currents and minimum vertical variation in temperature from the shelf to depths of 500 m (Refer to Section 2.2.7.4 for detail on the Bass Cascade). Currents during these cascade flows were stronger than background tidal currents and were the strongest currents recorded lower down the continental slope.

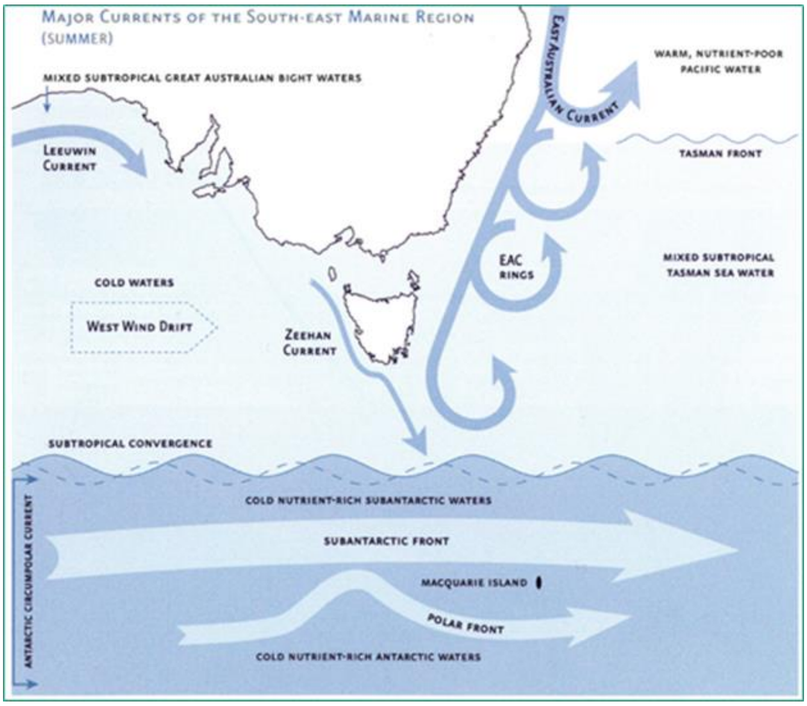


Figure 2-1 Major ocean currents in south-eastern Australian waters summer

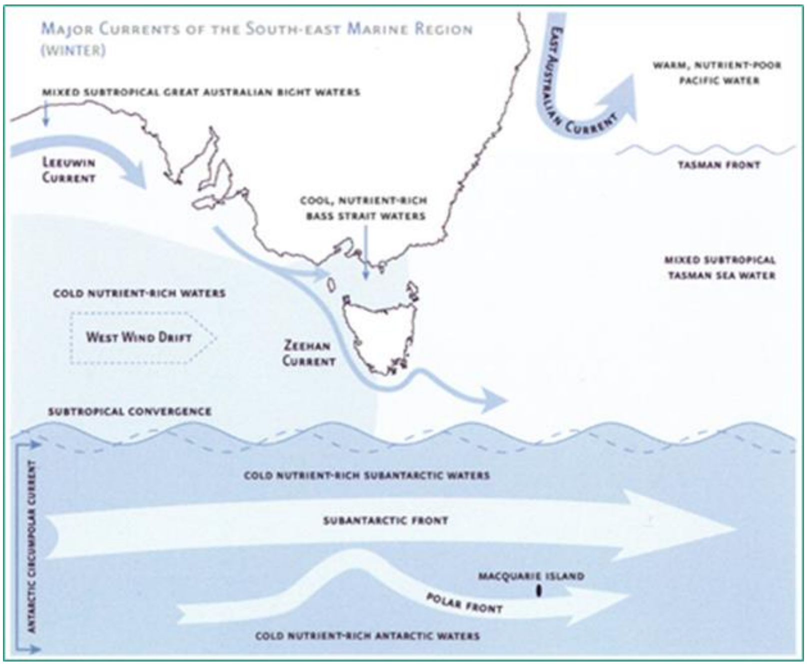


Figure 2-2 Major ocean currents in south-eastern Australian waters winter

2.1.2.2 Water Temperatures and Density Stratification

Temperatures in the subsurface waters of Bass Strait range from about 13°C in August/September to 16°C in February/March. Surface temperatures can exceed 20°C at times in late summer due to the warmer waters of the East Australia Current entering the strait. Water temperatures in the operational area are expected to follow this pattern (Jones 1980). Table 2-1 shows the monthly average sea surface temperatures and salinity as obtained from the World Ocean Atlas 2013 database which shows the same range of temperatures as those previously recorded. Monthly average sea surface temperatures were shown to range from 14°C (August, September) and 20°C (March). Salinity remained consistent throughout the year ranging from 35 to 36 psu (RPS, 2018a).

Table 2-1 Average monthly sea surface temperature and salinity nearby Blackback well location within the 0-5m water depth.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature (°C)	19	20	20	19	18	16	15	15	14	15	16	18
Salinity (psu)	35	35	36	36	35	36	36	36	35	36	36	36

Waters are generally well mixed, but surface warming sometimes causes weak stratification in calm summer conditions. During these times, mixing and interaction between varying water masses leads to variations in horizontal water temperature and a thermocline (temperature profile) develops. The thermocline acts as a low friction layer separating the wind driven motions of the upper well mixed layer from the bottom well mixed layer. As a result, upwelling of cold water on the northern shores of Bass Strait can occur (Jones 1980).

Information on density and temperature profiles of the deeper area of the Blackback field has been obtained by Lawson and Treloar (1996a). Temperatures measured at the seabed confirmed a decrease in temperature with depth of measurement. The survey also showed a period (July to September) of uniformity of temperature at all measured depths, indicating flow down the continental slope (Bass Strait Cascade). The range of water temperatures observed at the seabed is from a maximum of 17°C at 93 m to a minimum of 7°C at 480 m. The minimum temperatures at depth were recorded in summer, possibly because of stronger stabilising stratification and absence of the cascade of relatively warmer water during winter.

2.1.2.3 Waves

Bass Strait is a high energy environment exposed to frequent storms and significant wave heights. High wave conditions are generally associated with strong west to southwest winds caused by the eastward passage of low pressure systems across Bass Strait. Storms may occur several times a month resulting in wave heights of 3 to 4 m or more. In severe cases, southwest storms can result in significant wave heights of greater than 6 m (Jones 1980).

Wave data have been analysed for the ten year period from 1977 to 1987 (Lawson & Treloar 1987). Wave conditions at Blackback exhibit an increased wave climate, in excess of those experienced at further inshore facilities due to the increased fetch length of waves approaching from the south west. Higher wave conditions are generally associated with strong west to south west winds caused by the eastward passage of low pressure systems across Bass Strait. These may occur several times per month and can result in significant wave heights of three to four metres or more. In severe cases, south west storms can result in significant wave heights of up to six to seven metres.

Extreme design wave conditions are associated with east coast low pressure systems. These can result in very strong east to south east winds in eastern Bass Strait. The 1989 Metocean Design Criteria Report (Esso 1990) gives a design significant wave height of 9.0 m and a corresponding maximum wave height of 17.5 m.

2.1.2.4 Bathymetry

The EGBPA is located in Bass Strait, the region of the continental shelf that separates mainland Australia from Tasmania. The bathymetry in the EGBPA is concave shaped, with a shallower rim on the eastern and western end of the EGBPA and a deeper centre. The seabed bathymetry across the region is highly variable. A steep nearshore profile (0 to 20 m water depth) extends to a less steep inner (20 to 60 m water depth) and moderate profile (60 to 120 m water depth), concluding with a flat outer shelf plain (greater than 120 m water depth) in the western part (central Bass Strait) and a steep slope into the Bass Canyon in the east. The Esso Bass Strait Operations are distributed across this area from the Dolphin platform located closest to the coast at approximately 21 km and in approximately 38 m water depth out to the VIC/P70 permit area that extends out to 90-100 km offshore in water depths of approximately 2,300m. Refer to Figure 1-2 which shows the bathymetry in the EGBPA.

2.2 Values and Sensitivities in the DA

This sections summarises the relevant values and sensitivities in the DA as required by regulation 13(2)(b) of the OPGGS(E)R.

The OPGGS(E)R require petroleum activities to be carried out in a manner; consistent with the principles of ecologically sustainable development as set out in section 3A of the Environment Protection and Biodiversity Conservation Act (EPBC Act). Protected matters, or matters of national environmental significance (MNES) must be described and considered.

Table 2-2 provides a summary of the relevant MNES that have been identified as existing in the DA, or in the case of floral and faunal species, may exist within the DA. Additional detail of each MNES is provided in other parts of this volume as indicated in the table. Table 2-3 summarises the values and sensitivities of other protected matters within the DA.

Table 2-2 Relevant Matters of National Environmental Significance in the DA

Matters of National Environmental Significance Value/sensitivity	Receptor Type	Features present within the Described Area
World Heritage	Cultural feature - Historic site	Tasmania Darlington Probation Station (2.2.1.1.1) Port Arthur Historic (2.2.1.1.1) Norfolk Island Kingston and Arthurs Vale Historic Area (2.2.1.1.1)
	Natural place	New South Wales Lord Howe Island Group (2.2.1.2) Gondwana Rainforests of Australia (2.2.1.3) Queensland Fraser Island (2.2.1.4)
National Heritage	National Heritage place or site	Victoria The Great Ocean Road and Scenic Environs (2.2.2.1) Tasmania Port Arthur Historic Site (as above) (2.2.1.1.1) New South Wales Ku-ring-gai Chase (2.2.2.2) North Head (2.2.2.3) Bondi Beach (2.2.2.4) Kurnell Peninsula (2.2.2.5) Kamay-Botany Bay: botanical collection sites (2.2.2.6) Royal National Park and Garawarra State Conservation Area (2.2.2.7) Lord Howe Island Group (as above) (2.2.1.2) External Territories Nepean Island Reserve and Phillip Island (2.2.2.8) HMAS Sirius Shipwreck (2.2.2.9)
Wetlands of International Importance (Ramsar)	Wetlands	Victoria Gippsland Lakes (2.2.3.1) Corner Inlet (2.2.3.2) Western Port (2.2.3.8) Tasmania Logan Lagoons (2.2.3.3) East Cape Barren Islands Lagoon (2.2.3.4)

		Flood Plain Lower Ringarooma (2.2.3.5) Lavinia (2.2.3.10) Little Waterhouse Lakes (2.2.3.9) Apsley Marshes (2.2.3.7) Moulting Lagoon (2.2.3.6) New South Wales Myall Lakes (2.2.3.11) Hunter Estuary Wetlands (2.2.3.12) Towra Point (2.2.3.13) Elizabeth and Middleton Reefs (2.2.3.14) Queensland Moreton Bay (2.2.3.15) Great Sandy (2.2.3.16)
Listed Threatened Species and, Listed Migratory Species	Sea Birds and Shorebirds	Refer Section 2.3.1.4
	Fish	Refer Section 2.3.1.1
	Sharks and Rays	Refer Section 2.3.1.3
	Marine Mammals	Refer Section 2.3.1.5
	Marine Reptiles	Refer Section 2.3.1.9 and 2.3.1.10
Listed Threatened Ecological Communities	Giant Kelp Marine Forests	Giant Kelp Marine Forests of South East Australia Refer Section 2.2.4.1
	Littoral Rainforest	Coastal Vine Thicket and Littoral Rainforests Refer Section 2.2.4.2
	Saltmarsh	Subtropical and Temperate Coastal Saltmarsh Refer Section 2.2.4.3
Commonwealth Marine Areas	Australian Marine Parks	Southeast Marine Region East Gippsland Marine Park (2.2.6.1) Beagle Marine Park (2.2.6.2) Apollo Marine Park (2.2.6.6) Boags Marine Park (2.2.6.5) Flinders Marine Park (2.2.6.3) Freycinet Marine Park (2.2.6.4) Franklin Marine Park (2.2.6.8) Huon Marine Park (2.2.6.9) Zeehan Marine Park (2.2.6.7) South Tasman Marine Park (2.2.6.16) Temperate East Marine Region Jervis Bay Marine Park (2.2.6.14) Hunter Marine Park (2.2.6.13) Cod Grounds Marine Park (2.2.6.14) Central Eastern Marine Park (2.2.6.12) Lord Howe Marine Park (2.2.6.11) Solitary Islands Marine Park (2.2.6.10) Gifford Marine Park (2.2.6.17) Norfolk Marine Park (2.2.6.18) Coral Sea Marine Region Coral Sea Marine Park (2.2.6.19)

	Key Ecological Feature	Big Horseshoe Canyon (2.2.7.1) Upwelling East of Eden (2.2.7.2) East Tasmania subtropical convergence zone (2.2.7.3) Bass Cascade (2.2.7.4) Seamounts of South and East of Tasmania (2.2.7.5) Shelf Rocky Reefs Southeast Marine Region (2.2.7.6) West Tasmania Canyons (2.2.7.7) Tasmantid Seamount Chain (2.2.7.8) Lord Howe Seamount Chain (2.2.7.9) Tasman Front and eddy field (2.2.7.10) Shelf Rocky Reefs Temperate East Marine Region (2.2.7.11) Canyons on the Eastern Continental Slope (2.2.7.3) Upwelling off Fraser Island (2.2.7.13) Norfolk Ridge (2.2.7.14)

Table 2-3 Values and Sensitivities of Other Protected Areas or Places in the DA

Other Protected Areas Value/sensitivity	Receptor Type	Relevant features present within the Described Area
Social/Cultural/ Conservation	National Parks and Reserves	Victoria • Cape Howe Marine Park National (2.2.8.1) • Gabo Island Lighthouse Reserve (2.2.8.2) • Croajingolong National Park (2.2.8.5) • Point Hicks Marine Park National Park (2.2.8.6) • Beware Reef Marine Sanctuary (2.2.8.7) • Cape Conran Coastal Park (2.2.8.8) • The Lakes National Park & Gippsland Lakes Coastal Park (2.2.8.9) • Ninety Mile Beach Marine National Park (2.2.8.10) • Corner Inlet and Nooramunga Marine and Coastal Parks (2.2.8.11) • Corner Inlet Marine National Park (2.2.8.12) • Wilsons Promontory Marine Park and Wilsons Promontory National Park (2.2.8.13) • Cape Liptrap Coastal Park (2.2.8.14) • Bunurong Marine and Coastal Park and Bunurong Marine National Park (2.2.8.15) • French Island Marine National Park (2.2.8.17) • Phillip Island Nature Park (2.2.8.16) • Churchill Island Marine National Park (2.2.8.18) • Yaringa Marine National Park (2.2.8.19) • Mornington Peninsula National Park (2.2.8.20) • Great Otway National Park (2.2.8.21) • Port Campbell National Park and Bay of Islands Coastal Park (2.2.8.22) **Tasmania** • Hogan Group National Park (2.2.8.23) • West Moncoeur Island & East Moncoeur Island (2.2.8.24)

		• Curtis Island Nature Reserve and Devils Tower Nature Reserve (2.2.8.25) • Kent Group National Park (2.2.8.26) • Logan Lagoon Conservation Area (2.2.8.27) • Strzelecki National Park (2.2.8.28) • Rocky Cape National Park (2.2.8.31) • Narawntapu National Park (2.2.8.32) • Mount William National Park (2.2.8.33) • Freycinet National Park & Wye River State Reserve (2.2.8.34) • Ile des Phoques Nature Reserve (2.2.8.35) • Maria Island National Park (2.2.8.35) • Tasman National Park & Reserves (2.2.8.36) • Lavinia State Reserve (2.2.8.29) • Hunter Island Group (2.2.8.30) New South Wales • Lord Howe Island Permanent Park Preserve (2.2.8.37) • Cudgen, Wooyung and Billinudgel Nature Reserves (2.2.8.40) • Cape Byron Marine Park (2.2.8.41) • Byron Coast Group of Nature Reserves (2.2.8.42) • Arakwal National Park and Cape Byron Conservation Area (2.2.8.43) • Broadwater National Park, Bundjalung National Park and Iluka Nature Reserve (2.2.8.44) • Yuraygir National Park (2.2.8.45) • Solitary Islands Marine Park (2.2.8.46) • Coffs Coast Regional Park and Moonee Beach Nature Reserve (2.2.8.47) • Muttonbird Island Nature Reserve (2.2.8.48) • Bongil National Park (2.2.8.49) • Jagun Nature Reserve (2.2.8.50) • Gaagal Wanggaan (South Beach) National Park (2.2.8.51) • Hat Head National Park (2.2.8.52) • Limeburners Creek National Park (2.2.8.53) • Sea Acres National Park (2.2.8.54) • Crowdy Bay National Park and Watson Taylors Lake (2.2.8.55) • Darawank, Khappinghat and Kattang Nature Reserves (2.2.8.56) • Booti National Park and Wallis Lake (2.2.8.57) • Myall Lakes National Park Little Broughton Island and Stormpetrel Nature Reserves (2.2.8.58) • Tomaree National Park (2.2.8.59) • Worimi Conservation Lands (2.2.8.60) • Glenrock State Conservation Area and Awabakal Nature Reserve (2.2.8.61) • Munmorah State Conservation Area and Bird Island Nature Reserve and Wallarah National Park (2.2.8.62) • Wyrrabalong National Park (2.2.8.63)

		• Bouddi National Park, Brisbane Water National Park & Ku-ring-gai Chase National Park (2.2.8.64) • Sydney Harbour National Park (2.2.8.65) • Malabar Headland National Park (2.2.8.66) • Towra Point Nature Reserve (2.2.8.67) • Kamay Botany Bay National Park (2.2.8.68) • Royal National Park (2.2.8.69) • Five Islands Nature (2.2.8.70) • Seven Mile Beach National Park (2.2.8.71) • Jervis Bay Marine Park National Park (2.2.8.72) • Booderee National Park (2.2.8.73) • Conjola National Park (2.2.8.74) • Narrawallee Creek Nature Reserve (2.2.8.75) • South Pacific Heathland Reserve (2.2.8.76) • Meroo National Park (2.2.8.77) • Murramurrang National Park (2.2.8.78) • Batemans Marine Park (2.2.8.79) • Eurobodalla National Park (2.2.8.80) • Montague Island Nature Reserve (2.2.8.79) • Mimosa Rocks National Park (2.2.8.81) • Bournda National Park (2.2.8.82) • Ben Boyd National Park (2.2.8.83) Queensland • K'gari, Great Sandy National Park (2.2.8.84) • Noosa National Park (2.2.8.85) • Bribie Island National Park (2.2.8.86) • Moreton Island, Southern Moreton Bay Islands, South Stradbroke Island National Parks (2.2.8.87) • Naree Budjong Djara National Park (2.2.8.88)
Cultural - Indigenous Heritage (2.5.1)	Indigenous Protected Place	Babel Island Mount Chappell Island Big Dog Island Badger Island Iungatalanana
	Native Title	Determination Area for Gunai-Kurnai People
Commonwealth Heritage Listed Natural place (2.5.2)	Wetland	Point Wilson
	National Park	The Beecroft Peninsula
	Headland	Malabar Headland
	Key Ecological Feature	Tasman Sea Mount Area
Commonwealth Heritage Listed Historic place	-	
Historic Maritime (2.5.3.1)	Historic Shipwrecks	Victoria 417 Tasmania 415 New South Wales 328 QLD 72
	Protected Shipwrecks	VIC • SS Alert (1893) • Clonmel (1841) • SS Glenelg (1900)

		NSW • Bega • Lady Darling (1880) • M24 (Japanese Midget Submarine) (1942) QLD • AHS Centaur (1943) • Aarhus (1894)

2.2.1 World Heritage

There are three relevant World Heritage listings which occur in or near the DA. Darlington Probation Station and Port Arthur Historic Site are also on the Australian Convict Sites World Heritage list.

2.2.1.1 Australian Convict Sites

2.2.1.1.1 Darlington Probation Station

Darlington Probation Station, located on Maria Island National Park (Section 2.2.8.35) off the east coast of Tasmania is the only declared World Heritage place in the DA. It offers a glimpse into our convict past and the probation system that was unique to Tasmania. The precinct has 13 intact structures that remain and are set amongst a relatively unchanged landscape along the cove, uniquely demonstrating the philosophy behind the probation system (DoEE, 2019d).

2.2.1.1.1 Port Arthur Historic Site

Located in the south-west on the Tasman Peninsula is the Port Arthur Historic Site. Port Arthur was inscribed on the Australian Convict Sites World Heritage serial listing on 31 July 2010. Port Arthur was established in the 1830s as a penal settlement. It remains a physical chronicle of a dramatic part of Australia's history and together with its 60 or so buildings and picturesque landscape has become Tasmania's most popular tourist destination (DoEE, 2019c).

2.2.1.1.1 Kingston and Arthur's Vale Historic Area

The Kingston and Arthur’s Vale Historic Area (KAVHA), on Norfolk Island, is of outstanding significance to the nation as a convict settlement spanning the era of transportation to eastern Australia from 1788 to 1855. The punishment, living and working conditions for the convicts were extremely harsh and brutal making it infamous as a 'hell on earth' with 'no hope of return'. KAVHA includes more than 40 buildings, groups of buildings, ruins and archaeological remains within 225 hectares of relatively undisturbed land. All structures were built by convicts from limestone quarried on the island or with local timber. There was an exceptional phase of penal reform to rehabilitate convicts under Commandant Maconochie between 1840 and 1844. His penal regime had an impact and was partly adopted in Fremantle Prison, Britain and America (DAWE, 2020g).

2.2.1.2 Lord Howe Island Group

Located 700 kilometres north-east of Sydney and covering an area of 1,463 km^2, the Lord Howe Island Group comprises Lord Howe Island, Admiralty Islands, Mutton Bird Islands, Ball's Pyramid, and associated coral reefs and marine environments. The justification criteria for its World Heritage listing are its exceptional diversity of spectacular and scenic landscapes within a small area, including sheer mountain slopes, a broad arc of hills enclosing the lagoon and Balls Pyramid rising abruptly from the ocean. It is considered to be an outstanding example of an island system developed from submarine volcanic activity and demonstrates the nearly complete stage in the destruction of a large shield volcano. Having the most southerly coral reef in the world, it demonstrates a rare example of a zone of transition between algal and coral reefs. Many species are at their ecological limits, endemism is high, and unique assemblages of temperate and tropical forms cohabit. The second criteria is it’s an outstanding example of the development of a characteristic insular biota that has adapted to the island environment through speciation. A significant number of endemic species or subspecies of plants and animals have evolved in a very limited area. The diversity of landscapes and biota and the high number of threatened and endemic species make these islands an outstanding example of independent evolutionary processes (DoEE, 2019s). Endemic species occur in the flora and invertebrate fauna; 60% of invertebrate fauna are endemic with discovery of new species still occurring. Of the endemic flora, more is known about the vascular plants of which 113 of the 239 species are endemic. Whilst less is known about the non-vascular plants, they are also thought to be highly diverse and include endemic species (DECCW, 2007). Lord Howe Island Group is within the Lord Howe Marine Park, refer Section 2.2.6.11 for information on this park.

2.2.1.3 Gondwana Rainforests of Australia

Gondwana Rainforests of Australia, comprising eight blocks of protected areas (366,703 ha), is situated predominantly along the Great Escarpment on Australia's east coast. The outstanding geological features displayed around shield volcanic craters and the high number of rare and threatened rainforest species are of international significance for science and conservation. One of the protected areas (136 ha) is within the Iluka Nature Reserve (refer Section 2.2.8.38). The reserve is located on the north coast of NSW, approximately 750 km north of Sydney and 150 km south of the NSW/QLD border. The coastal reserve contains the largest single stand in New South Wales of littoral rainforest, a distinctive coastal variant of sub-tropical rainforest, and the least extensive of all New South Wales rainforest types (DoEE, 2019an).

2.2.1.4 Fraser Island

Fraser Island World Heritage site covers 181,851 hectares and includes all of Fraser Island and several small islands off the island's west coast. It is the world's largest sand island, with long sweeps of ocean beach, 40 kms of sand cliffs and inland remnants of tall rainforest growing on sand dunes, a phenomenon believed to be unique in the world because it requires significant biological adaptation. Fraser Island also represents significant biological evolution (such as the development of rare and biogeographically significant species of plants and animals). Vegetation associations and succession display an unusual level of complexity, with major changes in floristic and structural composition occurring over very short distances. Evolution and specialised adaptation to low fertility, fire, waterlogging and aridity is continuing in the ancient angiosperm flora of the heathlands and the associated vertebrate and invertebrate fauna. The site also represents an outstanding example of significant ongoing geological processes including longshore drift. Fraser Island also has a variety of freshwater dune lakes which are exceptional in terms of number (half of the all the world's perched lakes), diversity and age (DAWE, 2020d).

2.2.2 National Heritage

The National Heritage List is Australia's list of natural, historic and Indigenous places which are classified to have outstanding heritage value to the nation. There are three classes for National Heritage listings; natural, historic and indigenous. The declared World Heritage properties noted in Section 2.2.1 above are also listed on Australia's National Heritage list. Other relevant National Heritage places occurring in the DA are described below.

2.2.2.1 The Great Ocean Road and Scenic Environs – Historic Heritage

The Great Ocean Road and Scenic Environs is a 242 km road located on the west coast of Victoria, commencing at Torquay and ending in Allansford, just east of Warrnambool which as well as following the spectacular coast, passes inland through the forests of the Great Otway National Park and the rural landscape west of the Otway Ranges. The site includes all the coastline between the two towns where coastline abuts the dynamic ocean swells of Bass Strait, and the hinterland displays a diverse natural environment including temperate rainforest, heathlands, wetlands, sheer cliffs, ancient rock stacks and stunning beaches, which combined, provide a magnificent aesthetic landscape and seascape which support a diverse range of flora and fauna, including threatened coastal and migratory birds.

The project to build the road was created to provide work and continuing welfare for First World War returned servicemen over the 13 years it took to build, and also to provide a utilitarian memorial to all Australian First World War servicemen. This accounts for its listing under the historic classification on the database. It also provided the residents and tourists a means of accessing the spectacular coastal landscape, for which it is most well-known now. The limestone at Port Campbell is significant for the diversity of geomorphical features found in a single lithological unit giving rise to the distinctive rock formations of the twelve Apostles, Bay of Island and Bay of Martyrs. The Otway Ranges Coastal Cretaceous site is one of only two places in Australia where polar dinosaur fossils are found and illustrates the environment prior to the separation of Australia from Antarctica. These features contribute to the scientific and educational values of the place. The place includes a large part of the Great Otway

National Park (refer Section 2.2.8.21) where a diverse range of ecosystems including wet and dry sclerophyll forests, cool temperate rainforest and near the coast, shrublands and coastal heaths (DoEE, 2019p).

2.2.2.2 Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves – Natural Heritage

Located at the entry to Broken Bay and the mouth of the Hawksbury River, Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves span 15,000 ha, approximately 20 km north of Sydney. The park and reserves contain an outstanding representation of the species that contribute to the high endemism value of the Sydney region with high species richness across many groups and a representative range of ecosystems. The complex pattern of 24 plant communities contribute species richness with over 1000 native plant species present and an outstanding array of birds and other plant species. Rock art can be seen cross the entire sandstone landscape and a small number of engravings found on vertical boulders in close proximity to major waterways. Section 2.2.8.52 provides additional information on the National Park (DoEE, 2019).

2.2.2.3 North Head – Historic Heritage

The northern, seaward entrance to Port Jackson, more commonly known as Sydney Harbour, is important as it played a major role in the cultural and military life of the colony of New South Wales, following the arrival of the First Fleet in 1788. The 'Heads', have signified arrival and departure at Port Jackson since 1788 and are recognised as important, iconic, national landmarks. The North Head Quarantine Station is important for its association with the establishment of the colony of NSW and with Australia's development as an island-nation, susceptible to ship-borne disease. The quarantine station has the longest history (1828-1977) of quarantine use in Australia. Existing structures at the North Head Quarantine Station include hospital and isolation ward, cemeteries and memorials, wharf area, separation facilities for first, second and third class passengers and an administration area. The area comprises the entire headland of approximately 277 ha at Manly DoEE, 2019i).

2.2.2.4 Bondi Beach – Historic Heritage

Bondi Beach is significant in the course of Australia's cultural history as the site of the foundation of Australia's first recognised surf lifesaving club in 1907. It is also has significant social value for being having a central place in the development of Australia's beach culture and it's way of life and leisure (DoEE, 2019j).

2.2.2.5 Kurnell Peninsula Headland – Historic Heritage

The site of first recorded contact between Indigenous people and Britain in eastern Australia (The Meeting Place) representing the birthplace of a nation and the dispossession of Indigenous people is on Kurnell Peninsula. The first landfall on continental Australia made by Captain James Cook, Commander of the Endeavour at Kurnell Peninsula was a precursor of the colonisation of Australia by Britain. On this voyage in 1770, Cook mapped Australia's eastern coastline. The listed place occupies approximately 325 hectares on the southern headland at the entrance to Botany Bay. It includes the Meeting Place Precinct, including Captain Cook's Landing Place, the coastal, landmark, sandstone, areas of Kurnell Headland between Sutherland Point in the north and Doughboy Head in the south, Endeavour Heights and sand dunes, including Botany Cone, in the south-west. The boundaries are defined by Botany Bay National Park (Kurnell Section) and a small Sydney Water inholding at Potter Point (DoEE, 2019f).

2.2.2.6 Kamay Botany Bay: botanical collection sites – Historic Heritage

Accompanying Captain James Cook on the 1770 voyage to Australia (refer 2.2.2.5 above) were botanist Sir Joseph Banks and naturalist Dr Daniel Solander. Upon the first landing plants collected by Banks and Solander included a large number of iconic Australian plant species, including some that later became type-specimens which have important scientific and research value. The plant collection sites at Kamay Botany Bay, together with the collected plant material, represent the symbolic and actual integration of Australian flora into western science. Banks and Solander used ideas from Swedish scientist Carl Linnaeus newly developed and revolutionary biological classification system (known as the Linnaean System) to collect the plants for scientific study. This plant collection made a significant contribution in revolutionising the international systematic biology discipline, shaped European perceptions of Australia and provided a benchmark for the Australian environment as well as catalysing and informing subsequent botanical studies of Australia (DoEE, 2019h). The place is broadly comprised of three areas: the Kurnell Peninsula and La Perouse Headland which are located within Kamay Botany Bay National Park (refer Section 2.2.8.68) and the Towra Point Nature Reserve (refer Section 2.2.8.67).

Figure 2-3 shows the location of the National Heritage places and Ramsar Wetland in Botany Bay.

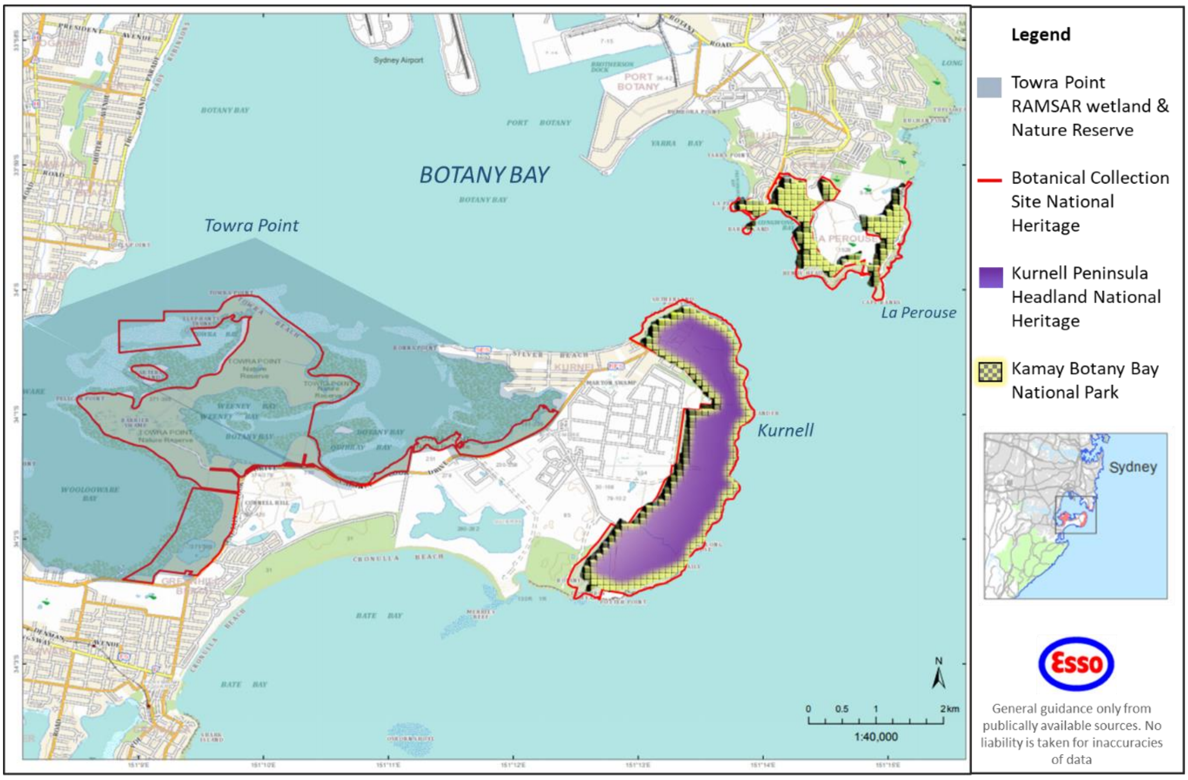


Figure 2-3 National Heritage Places, RAMSAR wetland, National Parks and Reserves in Botany Bay

2.2.2.7 Royal National Park and Garawarra State Conservation Area – Natural Heritage

Bounded by the Pacific Ocean to the east, Port Hacking to the north, the 15,968 ha area of the Royal National Park (15068 ha) and Garawarra State Conservation Area (900 ha) in NSW (south of Cronulla) was the second National Park to be established in the world after Yellowstone. Its declaration in 1879 marked the beginning of the development of Australia's National Park system of protected areas. With greater access to and use of natural areas for recreation, the public's concern for the natural environment and its conservation grew. The establishment of Royal NP is considered to be the beginning of the Australian conservation movement (DoEE, 2019e).

Royal National Park (Royal NP) and Garawarra State Conservation Area (Garawarra SCA) constitute a major centre of temperate plant species richness in Australia, with more than 1000 species recorded. The place is also extremely rich in perching birds, reptiles and butterflies and can be regarded as exemplifying the biodiverse Hawkesbury Sandstone environment.

The park's historical significance and species richness account for the official values of its National Heritage listing. However this area has many other values which are described in the National Parks and Reserves, Section 2.2.8.69.

2.2.2.8 Nepean Island Reserve and Phillip Island

Nepean Island Reserve and Phillip Island are part of the Norfolk Island group protected area system located in the External Territories of Australia. Nepean Island Reserve is listed for its natural values and is the main breeding site within the Norfolk Island Group for the masked booby Sula dactylatra. The masked booby is one of eight seabird species known to breed on the island. Seven of these are protected under Commonwealth legislation, and three are also protected under International treaties.

The reserve supports populations of the nationally vulnerable nocturnal marbled gecko, Christinus guentheri. This species is no longer found on Norfolk Island but remains on Nepean Island mainly due to the absence of predation pressure from black rats. Nepean Island is historically significant for its association with quarrying and timber-getting during the Second Settlement period (1825-55) (refer Section 2.2.6.18) (DAWE, 2020h).

Phillip Island is important as several vascular plant species have survived there and are re-establishing what were thought to be extinct including the endemic Norfolk Island abutilon Abutilon julianae, Phillip Island wheat grass Elymus multiflorus var. kingianus and the endemic Phillip Island hibiscus Hibiscus insularis. Phillip Island is the northern most breeding habitat for the Australasian gannet Morus serrator and also supports one of the largest breeding populations of the red-tailed tropicbird Phaethon rubricauda roseotincta (DAWE, 2020i).

2.2.2.9 HMAS Sirius Shipwreck

The shipwreck site of HMS Sirius has outstanding heritage value to the nation because of its importance in defining events in Australia's cultural history and for its part in development of the processes of Australian migration and defence. It also possesses rare and uncommon aspects of Australia's cultural history relating to early European settlement. The archaeological remains of HMS Sirius are the only known remains of a vessel of the first fleet that sailed to Australia. The primary shipwreck site of HMS Sirius is located east of Kingston Pier in Slaughter Bay, Norfolk Island (COA, 2011).

2.2.3 Wetlands of International Importance

Under the Ramsar Convention, wetland types have been defined to identify the main wetland habitats represented at each site. The classification system uses three categories (with a number of wetland types within each): (i) Marine/Coastal Wetlands; (ii) Inland Wetlands; and (iii) Human-made Wetlands. The wetlands are selected on account of their international significance in terms of the biodiversity and uniqueness of their ecology, botany, zoology or other natural process. A set of nine criteria have been developed to identify and classify wetlands, these are shown in Table 2-4 below. Two Ramsar wetlands are located inshore of Esso's permit areas and several others occur in the DA (Figure 2-4).

Table 2-4 Criteria for identifying Wetlands of International Importance (DoEE, 2019u)

Group	Ramsar Criteria
A Sites containing representative, rare or unique wetland types	**Criterion 1:** A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.
B Sites of international importance for conserving biological diversity	Criteria based on species and ecological communities **Criterion 2:** A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities. **Criterion 3:** A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region. **Criterion 4**: A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.
	Specific criteria based on waterbirds **Criterion 5:** A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds. **Criterion 6:** A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.
	Specific criteria based on fish

	Criterion 7: A wetland should be considered internationally important if it supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity. **Criterion 8:** A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.
	Specific criteria based on other taxa **Criterion 9:** A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of wetland-dependent non-avian animal species.

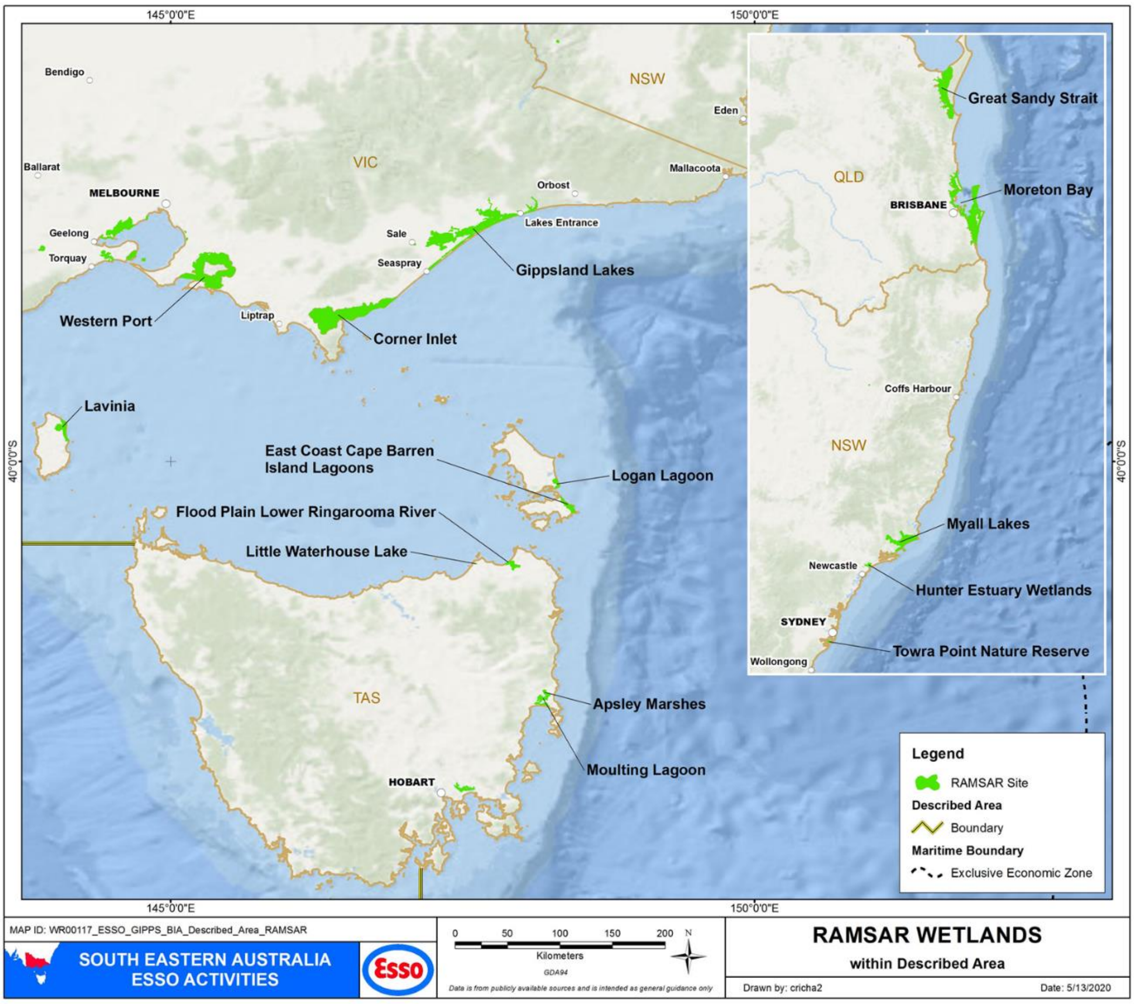


Figure 2-4 Wetlands of International Importance within the DA

2.2.3.1 Gippsland Lakes Ramsar Site

The Gippsland Lakes Ramsar Site is located in Victoria, south of the Eastern Highlands and to the east of the La Trobe Valley. Covering a vast area, the lakes are a series of large, shallow, coastal lagoons approximately 70 km in length and 10 km wide, separated from the sea by sand dunes. The surface area of the lakes is approximately 364 km2 and the three main water bodies are Lakes Wellington, Victoria and King.

The Gippsland Lakes Ramsar Site meets six of the Ramsar criteria:1, 2, 4, 6 & 8 (DoEE 2017s).

The Gippsland Lakes is a particularly good representative example of a natural or near-natural wetland, characteristic of the biogeographical region. It forms one of the largest coastal lagoon systems in the Drainage Division and contains a distinctive landscape of wetlands and flat coastal plains. The site supports a broad range of wetland types in close proximity to each other, including periodically inundated palustrine marshes, permanently inundated palustrine marshes, shallow lacustrine (lake) features, deep lacustrine features, lagoons with narrow inlets, and broad embayments.

The site supports several nationally threatened wetland fauna species at various stages of their life-cycle including two nationally threatened frog species (green and golden bell frogs and growling grass frogs), the vulnerable Australian painted snipe, a vulnerable fish species (the Australian grayling) and three nationally vulnerable and endangered wetland-associated flora species (dwarf kerrawang, swamp everlasting and metallic sun-orchid).

The site supports habitat and conditions that are important for critical life cycle stages of a variety of wetland-dependent fauna species. The permanence of the main lakes and the relatively regular flooding of the adjacent wetlands mean that this wetland is an important drought refuge for many water birds and other aquatic species, including as permanent refuges and breeding sites for two threatened frog species.

The Gippsland Lakes have been identified as being of outstanding importance for waterbirds, regularly supporting more than 20,000 waterfowl. Waterbird species which are considered to have met the one per cent population threshold are: Red-necked stint, Black swan, Sharp-tailed sandpiper, Chestnut teal, Musk duck, Fairy tern and Little tern.

Gippsland Lakes provides important habitats, feeding areas, dispersal and migratory pathways, and spawning sites for numerous fish species of direct and indirect fisheries significance. These fish have important fisheries resource values both within and external to the site.

Currently, parts of the Lakes system are heavily used for commercial and recreational fisheries and boating activities, while the immediate hinterland has been developed for agricultural use, and limited residential and tourism purposes (DoEE, 2017q).

The Lakes are protected as a Ramsar site by the Lakes National Park and the Gippsland Lakes Coastal Park (Refer Section 2.2.8.9). The locality of the Ramsar site is shown in Figure 2-5.

The ecological character description (ECD) of the Gippsland Lakes Ramsar Site as developed under the requirements of the National Framework and Guidance for Describing the Ecological Character of Australia's Ramsar Wetlands (DEWHA, 2008), is summarised in Table 2-5. The information on the limits of acceptable change, also required by the National Framework for describing the wetlands, are summarised in Table 2-6 (DSEWPAC 2010).

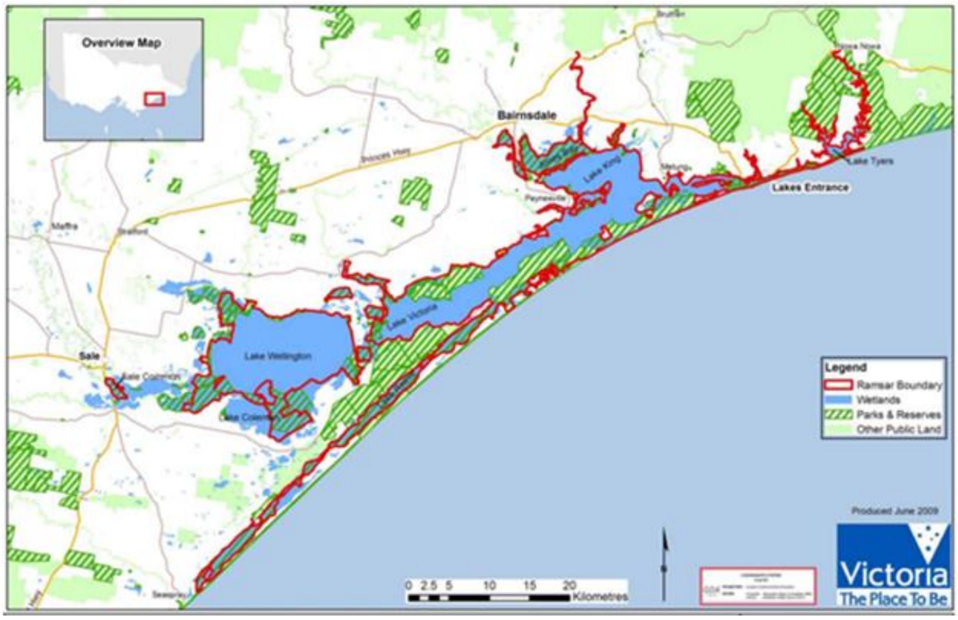


Figure 2-5 Locality of Gippsland lakes Ramsar Site (DSEWPAC, 2010)

Table 2-5 Summary of critical components, processes and services/benefits for the Gippsland Lakes Ramsar site (DSEWPAC 2010)

Critical components	Critical processes	Critical services/benefits
Wetland habitats: grouped as follows • (C1) marine subtidal aquatic beds (seagrass/aquatic plants). • (C2) coastal brackish or saline lagoons (open water phytoplankton-dominated habitats). • fringing wetlands that can occur within the site as– • (C3) predominantly freshwater wetlands • (C4) brackish wetlands • (C5) saltmarsh/ hypersaline wetlands. **Wetland flora and fauna:** • (C6) abundance and diversity of waterbirds. • (C7) presence of threatened frog species (green and golden bell frog; growling grass frog). • (C8) presence of threatened wetland flora species.	Hydrological regime: (P1) patterns of inundation and freshwater flows into the wetland system, groundwater influences and marine inflows that affect habitat structure and condition. Waterbird breeding functions: (P2) critical breeding habitats for a variety of waterbird species.	Threatened species: (S1) the site supports an assemblage of vulnerable or endangered wetland flora and fauna that contribute to biodiversity. Fisheries resource values: (S2) the site supports key fisheries habitats and stocks of commercial and recreational significance.
Supporting Components	**Supporting Processes**	**Supporting services/benefits**
Other wetland habitats: supported by the site (sand/pebble shores, estuarine waters, etc.). Other wetland fauna: supported by the site (for example, fish, aquatic invertebrates).	Climate: patterns of temperature, rainfall and evaporation. Geomorphology: key geomorphologic/ topographic features of the site. Coastal and shoreline processes: hydrodynamic controls on coasts and shorelines through tides, currents, wind, erosion and accretion. Water quality: water quality influences aquatic ecosystem values, noting the key water quality variables for Gippsland Lakes are salinity, dissolved oxygen, nutrients and sediments. Nutrient cycling, sediment processes and algal blooms: primary productivity and the natural functioning of nutrient cycling/flux processes in waterbodies. Biological processes: important biological processes such as primary productivity.	Tourism and recreation: the site provides and supports a range of tourism and recreational activities that are significant to the regional economy. Scientific research: the site supports and contains features important for scientific research.

Table 2-6 Limits of acceptable change (LAC) – Gippsland Lakes Ramsar site (DSEWPAC 2010)

Number	Indicator for Critical Component / Process/Service for the LAC	Relevant timescale[1]	Limit(s) of Acceptable Change	Spatial scale/temporal scale of measurements	Underpinning baseline data	Secondary critical C,P,S addressed through LAC
Critical components						
C1	Marine sub-tidal aquatic beds (for example, within Lake King, Lake Victoria, Lake Tyers, Bunga Arm and Lake Bunga)	Long Term	Total seagrass extent will not decline by greater than 50 per cent of the baseline value of Roob and Ball 1997 (that is, 50 per cent of 4330 hectares = 2165 hectares) in two successive decades at a whole of site scale. Total mapped extent of dense and moderate *Zostera* will not decline by greater than 80 per cent of the baseline values determined by Roob and Ball (1997) in two successive decades at any of the following locations: Fraser Island Point Fullerton, Lake King Point King, Raymond Island, Lake King Gorcrow Point – Steel Bay, Lake Victoria Waddy Island, Lake Victoria	Sampling to occur at least twice within the decade under consideration. Baseline mapping against which this LAC can be tested is within Roob and Ball 1997. Note that the seagrass assessment by Hindell (2008) did not produce mapping but did use similar sampling sites to Roob and Ball.	Level B – Recent quantitative data describes seagrass condition at various sites but over a limited timeframe. There is no available seagrass condition data prior to listing.	P1
C2	Coastal brackish or saline lagoons (for example, Lake King, Lake Victoria, Lake Wellington, Lake Tyers)	Long Term	No change in wetland typology from the 1980 classification of Corrick and Norman (1980), as presented in Figure 2-3.	To be determined based on expert review.	Level B – VMCS mapping data describes wetland extent. This is coarse scale mapping and should be considered as indicative only.	P1, S2
		Long Term	A long-term change in ecosystem state at Lake King, Lake Victoria or Lake Tyers from relatively clear, seagrass- dominated estuarine lagoons to turbid, algae dominated system (characteristic of Lake Wellington) will represent a change in ecological character.	To be determined based on expert review.		

		Short Term	No single cyanobacteria algal bloom event will cover greater than 10 per cent of the combined area of coastal brackish/saline lagoons (that is, Lake King, Victoria, Wellington and Tyers) in two successive years.	Algal bloom extent (per cent lakes area and location) and number should be reported annually, but assessed on an ongoing basis.	Level A – The occurrence of cyanobacteria algal blooms are well documented. The extent of algal blooms historically has not been assessed, including at the time of site declaration.	
C3	Fringing wetlands – predominantly freshwater marsh at Macleod Morass and Sale Common	Long Term	No change in wetland typology from the 1980 classification (Corrick and Norman 1980; See Figure 2-3). In this regard, the conversion of vegetation communities at Sale Common and Macleod Morass from a predominantly freshwater character (for example, giant rush, common reed, cumbungi) to those of a brackish water character (brackish or swamp scrub/saltmarsh species) will represent a change in ecological character.	To be determined based on expert review.	Level B – VMCS mapping data describes wetland extent during 1980. This is coarse scale mapping and should be considered as indicative only. There is no available community data prior to listing.	P1, P2, C6, C7, C8
			The total mapped area of freshwater marshes (shrubs and reed wetland types) at Sale Common and Macleod Morass will not decline by greater than 50 per cent of the baseline value outlined in VMCS for 1980 (that is, 50 per cent of 402 hectares = 201 hectares) in two successive decades.	Sampling to occur at least twice within the decade under consideration.		
		Short Term	In existing freshwater wetland areas, the annual median salinity should not be greater than one grams per litre in two successive years. Note that where ambient water quality characteristics fall outside the range of these baseline levels, and ecosystem health indicators shows no signs of impairment, the LAC may need to be adjusted accordingly.	Annual median based on at least eight sampling periods per year, encompassing wet and dry periods.	Level C – No available baseline data. Value based on species salinity tolerances.	
C4	Fringing wetlands – brackish marsh (for example, Dowd	Long Term	For all fringing brackish wetlands: No change in wetland typology from the 1980 classification (Corrick and Norman 1980).	To be determined based on expert review.	As for C3.	P1, P2, C6, C7, C8

	Morass; The Heart Morass; Clydebank Morass, Lake Coleman {Tucker Swamp})	Medium Term	For Dowd Morass and the Heart Morass: The annual median salinity will be less than four grams per litre in five successive years. Note that where ambient water quality characteristics fall outside the range of these baseline levels, and ecosystem health indicators shows no signs of impairment, LAC may need to be adjusted accordingly.	Annual median based on at least eight sampling periods per year, encompassing wet and dry periods.	Level C – No available baseline data. This value is based on species tolerances and requirement for salinity to be less than four grams per litre to allow reproduction (refer Tilleard and Ladson 2010).	
		Long Term	The total area of common reed at Dowd Morass will not decline by greater than 50 per cent of the 1982 baseline value (that is, 50 per cent of 480 hectares = 245 hectares) outlined in Boon et al. (2007) in two successive decades.	Sampling to occur at least twice within the decade under consideration.	Level A – Boon et al. (2007) provides good quality mapping data relevant to time of listing.	
C5	Fringing wetlands – saltmarsh/hypersaline marsh (for example, Lake Reeve)	Medium Term	No change in wetland typology from the 1980 classification (Corrick and Norman 1980). The total mapped area of salt flat, saltpan and salt meadow habitat at Lake Reeve Reserve will not decline by greater than 50 per cent of the baseline value outlined in VMCS for 1980 (that is, 50 per cent of 5035 hectares = 2517 hectares) in two successive decades.	To be determined based on expert review. Sampling to occur at least twice within the decade under consideration.	As for C3.	P1, C6

C6	Abundance and diversity of waterbirds	Medium Term	The number of standard 20 minute searches (within any ten year period) where waterbird abundance is less than 50 individuals will not fall below 50 per cent of the 'baseline' value (based on Birds Australia count data – 1987-2010), for the following species: black swan = 15 per cent of surveys chestnut teal = 10 per cent of surveys Eurasian coot = 11 per cent of surveys. The absence of records in any of the following species in five successive years will represent a change in character: red- necked stint, sharp-tailed sandpiper, black swan, chestnut teal, fairy tern, little tern, musk duck, Australasian grebe, grey teal, Eurasian coot, great cormorant, red knot, curlew sandpiper. Median abundance (derived from at least three annual surveys {summer counts} over a 10-year period) falls below the 20th percentile baseline value. *Note: An adequate baseline will need to be established to assess this LAC (for example, at least three annual surveys (summer counts) over a 10-year period).*	Sampling to be undertaken at least twice a year over any 10 year period at stations containing favourable habitat for these species (see Table E8 for locations). Surveys should consist of standardised 20 minute counts. Sampling to be undertaken at least twice a year (during summer) at stations containing favourable habitat for these species (see section 3.4.1 for important locations). Recommended baseline monitoring program should include: A combination of aerial and ground surveys. Representative coverage of primary habitats within the site.	Level A – Birds Australia data, while standardised in terms of sampling effort per site, is not standardised in terms of frequency of sampling events at any given sampling location. Data should be considered indicative only. Level A – Records for these species are reliable. Birds Australia and DSE data can be used to assess this qualitative LAC. There are no baseline data available for this LAC.	P1, P2

C7	Presence of threatened frogs	Medium Term	The site will continue to support suitable habitat for growling grass frog and green and golden bell frog. In this regard, the LAC for Component 3 applies. There is insufficient data to develop a LAC relating directly to site usage by these species, which represents a critical information gap. Should baseline data become available in the future, the following LAC will apply: a significant reduction (greater than 25 per cent over a period of 5 years) in the local adult population within the site, especially for important local populations (for example, within Macleod Morass, Sale Common, Ewings Marsh, Roseneath wetlands (Morley Swamp and Victoria Lagoon), the Heart Morass and freshwater pools on Rotamah Island).	Refer to C3. Recommended baseline monitoring program should comprise a minimum two annual sampling periods separated by at least one year (and within a 5 year period).	Level C – Surveys for these species have been opportunistic. The most recent record for growling grass frog is 2007, whereas the green and golden bell frog was recorded at the site in 1998. There are no empirical data describing abundances at the site.	P1
C8	Presence of threatened wetland flora species	Long Term	The three threatened flora species (*Rulingia prostrata*, *Thelymitra epipactoides* and *Xerochrysum palustre*) continue to be supported within the boundaries of the Gippsland Lakes Ramsar site.	Based on opportunistic searches.	Level C – Setting of empirical limits of acceptable change is not possible at present, given the absence of quantitative estimates of population size of threatened species within the site, and more importantly the viability of populations (and their key controls) within the site.	P1

<table>
<tr><th colspan="7">Critical processes</th></tr>
<tr>
<td>P1</td>
<td>Hydrological regime</td>
<td>Short Term – Medium Term</td>
<td>Wetland wetting frequency, flushing frequency and flushing volume are maintained as follows:
<table>
<tr><th>Wetland</th><th>Wetting Frequency</th><th>Flushing Frequency</th><th>Required Flushing Volume</th></tr>
<tr><td>Sale Common</td><td>Annual with 100 per cent reliability</td><td>2-3 times/decade</td><td>4 GL</td></tr>
<tr><td>Dowd Morass</td><td>5-7 times/decade</td><td>2-3 times/decade</td><td>15GL</td></tr>
<tr><td>The Heart Morass</td><td>5-7 times/decade</td><td>2-3 times/decade</td><td>15GL</td></tr>
</table>
From Tilleard and Ladson (2010); note that larger flushing volumes (~20GL) are identified as being needed for Dowd and the Heart Morasses following saline flood events in the Lake Wellington system (for example, when the wetlands are filled with saline water from Lake Wellington and this corresponds with low flows in the Latrobe River).</td>
<td>Refer to LAC for details. Values measured at existing gauging stations in the lower reaches of the Rivers or otherwise in the wetlands themselves.</td>
<td>LAC have been identified for these wetlands on the basis that they are the best indicators of freshwater flows into the broader Gippsland Lakes system.

Level C – LAC based on Tilleard and Ladson (2010) 'Hydrological Analyses to Support Determination of Environmental Water Requirements in the Gippsland Lakes'. This is a threshold-based LAC that is based on modelling and ecological assessments.

Note that these values should be considered as indicative only at this stage, and should be constantly reviewed.

Tilleard and Ladson (2010) indicate no work has been done for wetlands on the Mitchell (Macleod Morass); McLennan Straits (Morley Swamp, Lake Betsy); or Jones Bay.</td>
<td>C1 – C8
S1, S2</td>
</tr>
</table>

P2	Waterbird breeding	Short Term	Abandonment or significant decline (greater than 50 per cent) in the productivity of two or more representative breeding sites (based on two sampling episodes over a five year period) within any of the following site groupings: Lake Coleman, Tucker Swamp and Albifrons Island – Australian pelican. Bunga Arm and Lake Tyers – little tern and fairy tern. Macleod Morass, Sale Common and Dowd Morass – black swan, Australian white ibis, straw-necked ibis, and little black cormorant.	Recommended baseline monitoring program should comprise a minimum two annual sampling periods separated by at least one year (and within a 5 year period).	Level C – The use of the site by these species is well documented. However, there are no empirical data describing breeding rates. Baseline data will need to be collected to assess this LAC.	C6
Critical services/benefits						
S1	Threatened species	N/A	No LAC are proposed for painted snipe and Australasian bittern at the current time until greater information is available about patterns of usage and populations in the Ramsar site. Other threatened species are dealt with in the critical components above.	N/A	Level C – Site records are not recent, uncommon and the location within the Ramsar boundary not known.	P1, C3
		Long Term	Australian grayling continues to be supported in one or more of the catchments draining into the Gippsland Lakes.	Setting of more empirical limits of acceptable change not possible at present, given the absence of quantitative population data for this species for any of the rivers and creeks that drain into the site.	Level C – This species has been recorded in the major drainages that drain into the site. Juveniles have an apparent obligate estuarine phase, and therefore must use the site in order for this species to persist in these drainages. There are no data describing the population status of this species in these drainages.	P1, C1, C2
S2	Fisheries resource values	Medium Term	Total annual black bream commercial fishing catch per unit effort will not fall below the 10th percentile historical baseline value of 6.1 (see Section 3.8.2) in a five successive year period.	Median measured over five years.	Level B – While some commercial fish data has been accessed and	C1, C2, C3, C4, C5

			Sub-optimal black bream spawning conditions should not occur in any successive five year period within key spawning grounds (that is, mid-lower estuaries and adjacent waters of main lakes) during the peak spawning period (October to December). Based on Tilleard (2009), optimal conditions are as follows:	Annual median value for the period October to December.	reviewed as part of the current study, the abundance and usage of the Gippsland Lakes by key fish species of commercial and recreational significance is not well quantified. The baseline data used in this LAC has limited duration (five years), and is unlikely to be representative of patterns in abundance over longer timeframes. This LAC will need to reviewed and refined.	
			Water column salinity is maintained in brackish condition (for example, between 17-21 grams per litre median value) in the middle of the water column in the mid-lower estuaries and adjacent waters of the main lakes	As above.		
			The salt wedge is located within the mid-lower section of the estuarine river reaches or just out into the main lakes as opposed to far upstream or well-out into the Lakes.		Level C – based on conditions outlined in Tilleard (2009).	

C – component, P – process , S/B – service/benefit

2.2.3.2 Corner Inlet Ramsar Site

The Corner Inlet Ramsar Site is located on the south-east coast of Victoria. It is bounded to the west and north by the South Gippsland coastline, in the south-east by a series of barrier islands and sandy spits lying end to end and separated by narrow entrances, and to the south by the hills of Wilsons Promontory.

The Corner Inlet Ramsar Site also meets six of the Ramsar criteria (DoEE 2017o): 1, 2, 4, 5, 6 and 8 (as described above).

Corner Inlet is a very good example of a wetland enclosed by barrier islands in Victoria and contains the most extensive intertidal mudflats in Victoria. The area contains the only extensive bed of the Broad-leafed seagrass in Victoria. The islands of Corner Inlet, although not rich in plant diversity, are of high biogeographical significance as a result of their geological history and connectivity to the mainland during ice ages. The islands also contain significant areas of saltmarsh and mangroves, both of which are communities of very limited distribution. These communities filter pollutants, stabilize sediments and protect the shoreline from erosion.

Corner Inlet provides breeding habitat for a variety of waterbirds, including several species listed as threatened at the State level and/or occurring in significant numbers and habitat for significant aggregations of waterbirds during post-breeding, and as a refuge during adverse environmental conditions. Corner Inlet regularly supports well over 20,000 waterbirds including species such as the Eastern curlew, Curlew sandpiper, Bar-tailed godwit, and Double-banded plover.

The Corner Inlet Ramsar Site has regularly supported more than one per cent of the population of the Pied oystercatcher, Sooty oystercatcher, Pacific gull, Fairy tern, Red knot, Red necked stint and Chestnut teal.

Corner Inlet supports the nationally critically endangered Orange bellied parrot as well as several other vulnerable and endangered species, including the growling grass frog and Australian grayling. The Southern right whale, Leathery turtle, Swift parrot and Shy albatross have all also been recorded at the site.

Corner Inlet provides important habitats, feeding areas, dispersal and migratory pathways, and spawning sites for numerous fish species. Some of these include King George whiting, Australian salmon, greenback flounder, southern garfish, leatherjackets (several species), short-finned eel and gummy shark.

Corner Inlet was used traditionally by Indigenous people and many archaeological sites including scarred trees, burial sites, artefact scatters, shell middens and camps have been found. Currently, the Ramsar site is used for biological conservation, ports with servicing facilities for off-shore oil and natural gas exploration, commercial fishing, recreational fishing, and other recreational activities. Diving is popular around the numerous shipwreck sites in Corner Inlet and around the barrier islands (DoEE, 2017o).

The site is protected as a Ramsar site by the Nooramunga and Corner Inlet Marine and Coastal Parks, and by part of it lying within the Corner Inlet Marine National Park (Section 2.2.8.11). The locality of the Ramsar site is shown in Figure 2-6.

The ecological character description (ECD) of the Corner Inlet Ramsar Site is summarised in Table 2-7 with limits of acceptable change summarised in Table 2-8 (DSEWPAC, 2011b).

In the context of the Bass Strait Operations and predicted extent of the DA, critical components that may be affected by a major spill event include Seagrass, mangroves, saltmarshes and intertidal and subtidal waters (C1), Waterbird breeding (P1), Threatened species (S1) and Fish abundance (S2).

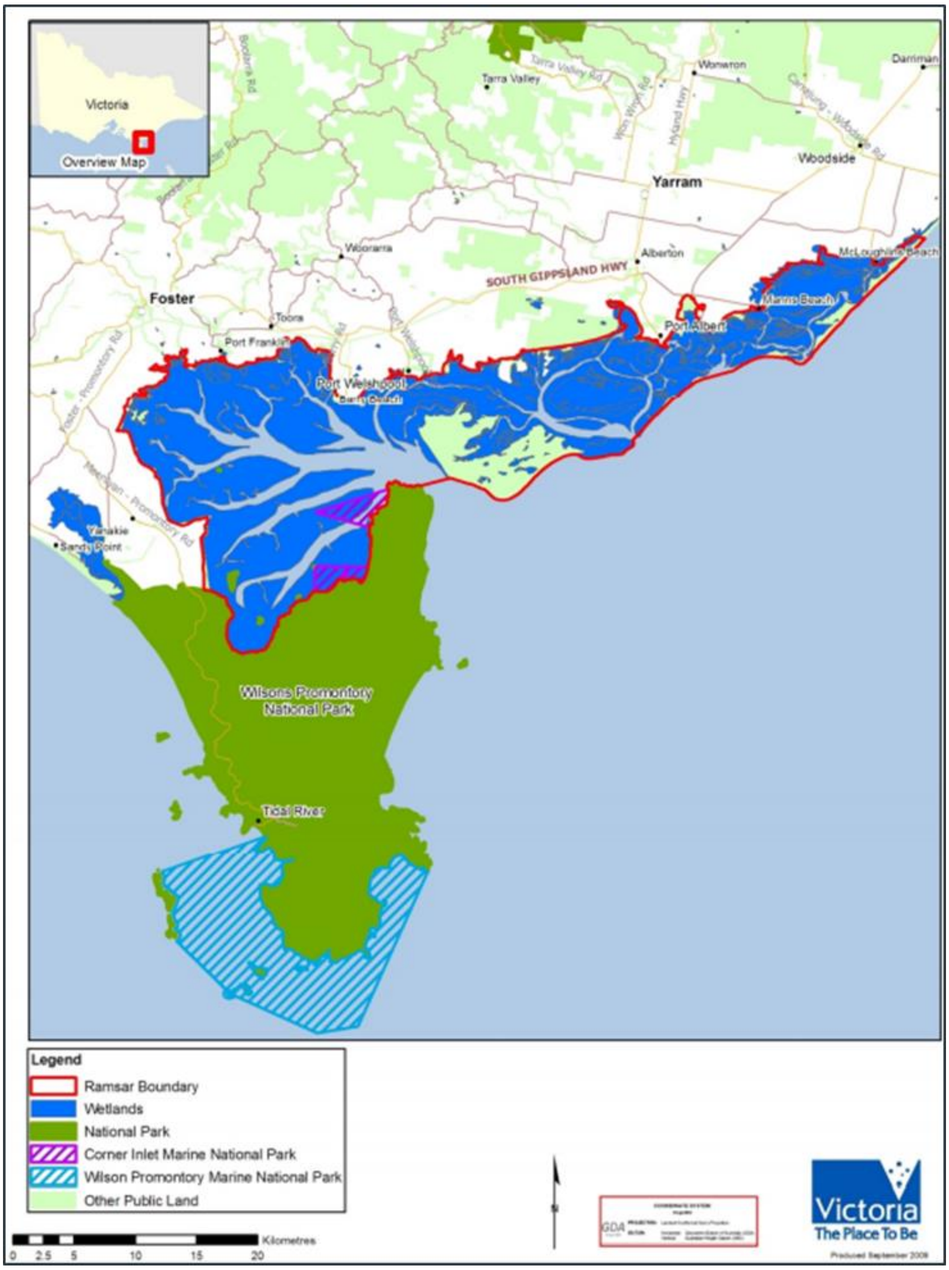


Figure 2-6 Locality of Corner Inlet Ramsar Site (DSEWPAC, 2011b)

Table 2-7 Summary of critical components, processes and services/benefits for the Corner Inlet Ramsar site (DSEWPAC, 2011b)

Critical Components	Critical Processes	Critical Services/Benefits
C1. Several key wetland mega-habitat types are present: • seagrass • intertidal sand or mud flats • mangroves • saltmarshes • permanent shallow marine water **C2.** Abundance and diversity of **waterbirds**	**P1. Waterbird breeding** is a key life history function in the context of maintaining the ecological character of the site, with important sites present on the sand barrier islands	S1. The site supports nationally threatened fauna species including: • orange-bellied parrot • growling grass frog • fairy tern • Australian grayling **S2.** The site supports **outstanding fish habitat values** that contribute to the health and sustainability of the bioregion
Supporting Components	**Supporting Processes**	**Supporting Services/Benefits**
Important **geomorphological features** that control habitat extent and types include: • sand barrier island and associated tidal delta system • the extensive tidal channel network • mudflats and sandflats. **Invertebrate megafauna** in seagrass beds and subtidal channels are important elements of biodiversity and control a range of ecosystem functions. The **diverse fish communities** underpin the biodiversity values of the site	**Climate**, particularly patterns in temperature and rainfall, control a range of physical processes and ecosystem functions Important **hydraulic and hydrological processes** that support the ecological character of the site includes**:** • Fluvial hydrology. Patterns of inundation and freshwater flows to wetland systems • Physical coastal processes. • Hydrodynamic controls and marine inflows that affect habitats through tides, currents, wind, erosion and accretion. • Groundwater. For those wetlands influenced by groundwater interaction, the level of the groundwater table and groundwater quality. **Water quality** underpins aquatic ecosystem values within wetland habitats. The key water quality parameters for the site are salinity, turbidity, dissolved oxygen and nutrients. Important **biological processes** include nutrient cycling and food webs.	The site supports **recreation and tourism values** (scenic values, boating, recreational fishing, camping, etc.) that have important flow-on economic effects for the region. The site provides a range of values important for **scientific research**, including a valuable reference site for future monitoring.

Table 2-8 Limits of acceptable change (LAC) – Corner Inlet Ramsar site (DSEWPAC, 2011b)

Number	Indicator for Critical Component / Process/Service for the LAC	Relevant timescale[1]	Limit(s) of Acceptable Change	Spatial scale/temporal scale of measurements	Underpinning baseline data	Secondary critical C,P,S addressed through LAC
Critical Components						
C1	Seagrass extent	Long Term	• Total mapped extent of dense *Posidonia* will not decline by greater than 10 percent of the baseline value outlined by Roob *et al.* (1998) at a whole of site scale (baseline = 3050 hectares; LAC = mapped area less than 2745 hectares) on any occasion. (Note: the small degree of allowable change recognises that this seagrass species is a critical habitat resource and generally shows low natural variability.) • Total mapped extent of the dense and medium density Zosteraceae will not decline by greater than 25 percent of the baseline values outlined by Roob *et al.* (1998) at a whole of site scale on two sampling occasions within any decade. • Dense *Zostera* - Baseline = 5743 hectares (LAC = mapped area less than 4307 hectares) • Medium *Zostera* - Baseline = 1077 hectares (LAC = mapped area less than 807 hectares) (Note: the moderate degree of allowable change recognises that these seagrass species generally show moderate degrees of natural variability)	Sampling to occur at least twice within the decade under consideration. Note that the seagrass assessment by Hindell (2008) did not produce mapping but did use similar sampling sites to Roob *et al*.	Recent quantitative data describes seagrass condition at various sites but over a limited timeframe. It is thought that the Roob *et al*. (1998) study under-estimated the total available seagrass habitat (J. Stevenson, Parks Victoria, pers. comm. February 2011), hence a 10 per cent change from this baseline value would represent a larger actual change from the true baseline. ***Note***: Prior to declaration, *Posidonia* covered approximately 44 per cent (11,900 hectares) of the site (Poore 1978). Morgan (1986) estimated that *Posidonia* meadows covered 11,900 hectares in 1965 and 9,000 to 9,500 square kilometres in 1983–84. There is uncertainty regarding these mapping data and therefore empirical LACs	S2

[1] *Short Term – measured in years; Medium Term – five to 10 year intervals; Long term – 10+ year intervals.*

Number	Indicator for Critical Component / Process/Service for the LAC	Relevant timescale[1]	Limit(s) of Acceptable Change	Spatial scale/temporal scale of measurements	Underpinning baseline data	Secondary critical C,P,S addressed through LAC
					have not been developed from these data.	
	Mangrove forest extent	Long term	• Based on EVC mapping, it is estimated that mangroves presently cover an area of 2137 hectares within the site (see Section 3.3.1). A 10 percent reduction in the total mapped mangrove area, observed on two sampling occasions within any decade, is an unacceptable change. (LAC – mapped area less than 1924 hectares). (Note: the small degree of allowable change recognises that mangroves are a critical habitat resource and generally shows low natural variability)	Sampling to occur at least twice within the decade under consideration.	No available data to determine changes in extent over time. It is unlikely that this has changed markedly since Ramsar listing. Note that there are uncertainties regarding the quality of existing mapping, and therefore the baseline value should be considered as indicative only.	S2
	Saltmarsh extent	Long term	• Based on EVC mapping, it is estimated that intertidal saltmarsh presently covers an area of 6500 hectares within the site (see Section 3.3.1). A 10 percent reduction in the total mapped saltmarsh area, observed on two sampling occasions within any decade, is an unacceptable change (LAC – mapped area less than 5850 hectares). (Note: the small degree of allowable change recognises that saltmarsh is a critical habitat resource and generally show low natural variability)	Sampling to occur at least twice within the decade under consideration.	No available data to determine changes in extent over time. It is unlikely that this has changed markedly since Ramsar listing. The note regarding data quality for mangroves applies also to saltmarsh.	S2
	Shallow subtidal waters	Long term	• A greater than 20 percent reduction in the extent of subtidal channel (areas mapped by NLWRA = 16 349 hectares), observed on two sampling occasions within any decade, will represent a change in ecological character (LAC – mapped area less than 13 079 hectares). (Note: the moderate degree of allowable change recognises that shallow subtidal waters represent a critical	Sampling to occur at least twice within the decade under consideration.	NLWRA mapping data describes wetland extent. This is coarse scale mapping and should be considered as indicative only. ***Note***: there is a need to develop a condition-based LAC for this critical component. While some water quality data	S2

Number	Indicator for Critical Component / Process/Service for the LAC	Relevant timescale[1]	Limit(s) of Acceptable Change	Spatial scale/temporal scale of measurements	Underpinning baseline data	Secondary critical C,P,S addressed through LAC
			habitat resource, generally show low natural variability, but data reliability is low)		exists, this is presently insufficient to derive a LAC (i.e. whether a change in water quality represents a true change in ecological character of the wetland)	
	Inlet waters (intertidal flats)	Long term	• A greater than 20 percent reduction in the extent of permanent saline wetland – intertidal flats (areas mapped by DSE = 40 479 hectares, see Figure 3-1), observed on two sampling occasions within any decade, will represent a change in ecological character (LAC – mapped area less than 36 431 hectares). (Note: the moderate degree of allowable change recognises that intertidal flats represent a critical habitat resource and generally show low natural variability. A loss of intertidal flat would also result in changes in seagrass)	Sampling to occur at least twice within the decade under consideration.	VMCS mapping data describes wetland extent. This is coarse scale mapping and should be considered as indicative only. ***Note***: there is a need to develop a condition-based LAC for this critical component. While some water quality data exists, this is presently insufficient to derive a LAC (i.e. whether a change in water quality represents a true change in ecological character of the wetland)	S2
C2	Abundance and of waterbirds	Short term (All species)	• Mean annual abundance of migratory bird species - Birds Australia (2009c) notes that there is a maximum annual abundance of migratory species of 42 811 birds, with a mean annual abundance of migratory species being 31 487 birds (deriving from 28 years of data collection to September 2008). The annual abundance of migratory shorebirds will not decline by 50 per cent of the long-term annual mean value (that is, must not fall below 15 743 individuals) in three consecutive years. (Note: the large degree of allowable change recognises that these species can show high	At least four annual surveys (summer counts) within the decade under consideration.	Bird count data are available from a variety of programs, most notably Birds Australia monitoring programs	P2

Number	Indicator for Critical Component / Process/Service for the LAC	Relevant timescale[1]	Limit(s) of Acceptable Change	Spatial scale/temporal scale of measurements	Underpinning baseline data	Secondary critical C,P,S addressed through LAC
			levels of natural variability, and that limitations of existing baseline data)change recognises that these species can show high levels of natural variability, and that limitations of existing baseline data)			
		Short term (individual species)	• Mean annual abundance of migratory species that meet the one per cent criterion will not be less than 50 per cent of the long-term annual mean value in five years of any ten year period. These values are follows: • curlew sandpiper – baseline = 2588 birds, LAC = 1294 birds • bar tailed godwit – baseline = 9727 birds, LAC = 4863 birds • eastern curlew – baseline = 1971 birds, LAC = 985 birds • pied oystercatcher – baseline = 893 birds, LAC = 446 birds • sooty oystercatcher – baseline = 285 birds, LAC = 142 birds • double-banded plover– baseline = 523 birds, LAC = 261 birds There are insufficient baseline data to determine long-term average abundance of fairy tern and Pacific gull. (Note: the large degree of allowable change recognises that these species can show high levels of natural variability, and that limitations of existing baseline data)	At least five annual surveys (summer counts) within the decade under consideration.	Bird count data are available from a variety of programs, most notably Birds Australia monitoring programs	P2
Critical Processes						
P1	Waterbird breeding	Short Term	A greater than 50 per cent decrease in nest production at two or more monitoring stations (based on two sampling	Recommended baseline monitoring	The use of the site by these species is well documented.	C2

Number	Indicator for Critical Component / Process/Service for the LAC	Relevant timescale[1]	Limit(s) of Acceptable Change	Spatial scale/temporal scale of measurements	Underpinning baseline data	Secondary critical C,P,S addressed through LAC
			episodes over a five year period) within any of the following locations and species: • Clomel Island - fairy tern, hooded plover, Caspian tern, crested tern • Dream Island - fairy tern, hooded plover, crested tern • Snake Island and Little Snake Island - pied oystercatcher	program should comprise a minimum two annual sampling periods separated by at least one year (and within a five year period).	However, there are no empirical data describing nest or egg production rates. Baseline data will need to be collected to assess this LAC.	
Critical Services/Benefits						
S1	Threatened Species	N/A	For orange-bellied parrot and growling grass frog, an unacceptable change will have occurred should the site no longer support these species.	Based on multiple targeted surveys at appropriate levels of spatial and temporal replication (at least four annual surveys in preferred habitats) over a 10 year period.	Most site records are based on opportunistic surveys	P1, C3
		Short Term	For Australian grayling, an unacceptable change will have occurred should all of the drainages that drain into Corner Inlet no longer support this species.	Based on four annual surveys in a 10 year period at multiple sites located in all major catchments.	This species has been recorded in the major drainages that drain into the site. There are no data describing the population status of this species in the site. Abundance data are available for drainages that discharge into the site (Ecowise 2007; O'Connor *et al*. 2009). O'Connor *et al*. (2009) notes that collection of this species is difficult and requires targeted survey techniques. Few targeted empirical surveys have	P1, C1, C2

Number	Indicator for Critical Component / Process/Service for the LAC	Relevant timescale[1]	Limit(s) of Acceptable Change	Spatial scale/temporal scale of measurements	Underpinning baseline data	Secondary critical C,P,S addressed through LAC
					been undertaken in the site's drainages to date	
S2	Fish abundance (using fish catch of key species as a surrogate)	Medium term	An unacceptable change will have occurred if the long term (greater than five years) median catch falls below the 20th percentile historical baseline values in standardised abundance or catch-per unit effort of five or more commercially significant species (relative to baseline) due to altered habitat conditions within the site. The 25th percentile pre-listing baseline commercial catch per unit effort values for the site are as follows (units are tonnes per annum per number of boats): Australian salmon 379 rock flathead 316 southern sand flathead 373 greenback flounder 514 southern garfish 1452 yelloweye mullet 740 gummy shark 167 King George whiting 1347	Annual fish catch measured over a greater than five year period.	Commercial fish catch data. Note that there are presently no fisheries-independent baseline data (collected using empirical, systematic methods) describing patterns in the distribution and abundance of key species. Therefore, the limits of acceptable change should be treated with caution, noting socio-economic factors should be taken into account when assessing catch data underpinning this LAC.	S2

2.2.3.3 Logan Lagoon Ramsar Site

The site is an excellent, regionally representative example of a coastal estuarine wetland system and includes Logan, Syndicate and Wilsons Lagoons, Pot Boil Point and part of Planters Beach.

The Logan Lagoon Ramsar site is enclosed within the Logan Lagoon Conservation Area and is located on the south-east corner of Flinders Island in Bass Strait, Tasmania.

Logan Lagoon meets five of the Ramsar Criteria: 1, 2, 3, 4 and 6.

The Logan Lagoon Ramsar site is in the Tasmanian Australian Drainage Division. It contains two sites listed on the Tasmanian Geoconservation Database; Logan Lagoon Holocene Shorelines and Planter Beach Coastal Barrier System. Logan Lagoon, with other lagoons and dunes in the area, provides a representative and outstanding example of the development of Holocene shorelines for the local region. Planter Beach Coastal Barrier System, partly within the site, is a representative and outstanding example of how offshore bars formed with Holocene sea level rise and barrier growth has enclosed the coast, forming large lagoons. Logan Lagoon is recognised as a wetland in near pristine condition.

The nationally threatened Northern leek orchid occurs within the Logan Lagoon Ramsar site (DoEE, 2017v). The nationally threatened subspecies of the Common wombat (Bass Strait) also occurs on the site and is restricted to Flinders Island.

Logan Lagoon supports species and communities threatened in the Tasmania Drainage Division, particularly Callitris rhomboidea forest and the rayless starwort. The site provides breeding habitat for two beach nesting shorebirds that are threatened in the region, the Fairy tern and Little tern.

The Logan Lagoon Ramsar site is an important area for birds migrating between south-eastern Australia and Tasmania. The lagoon supports five migratory bird species, the Red-necked stint, Curlew sandpiper, Sharp-tailed sandpiper, Common greenshank, and Little tern. The site also regularly supports one percent of the global or regional populations of: Hooded plover, Fairy tern, Musk duck, and Chestnut teal (DoEE 2017v).

In the context of the Bass Strait Operations and predicted geographical extent of the DA, critical components that may be affected by a major spill event include water quality (should tidal exchange occur), threatened wetland-dependent plant species, threatened saline plant communities and shorebird and waterbird species.

The locality of the Ramsar site is shown in Figure 2-7. The critical components and processes of the Logan Lagoon Ramsar site and its limits of acceptable change are shown in Table 2-9.

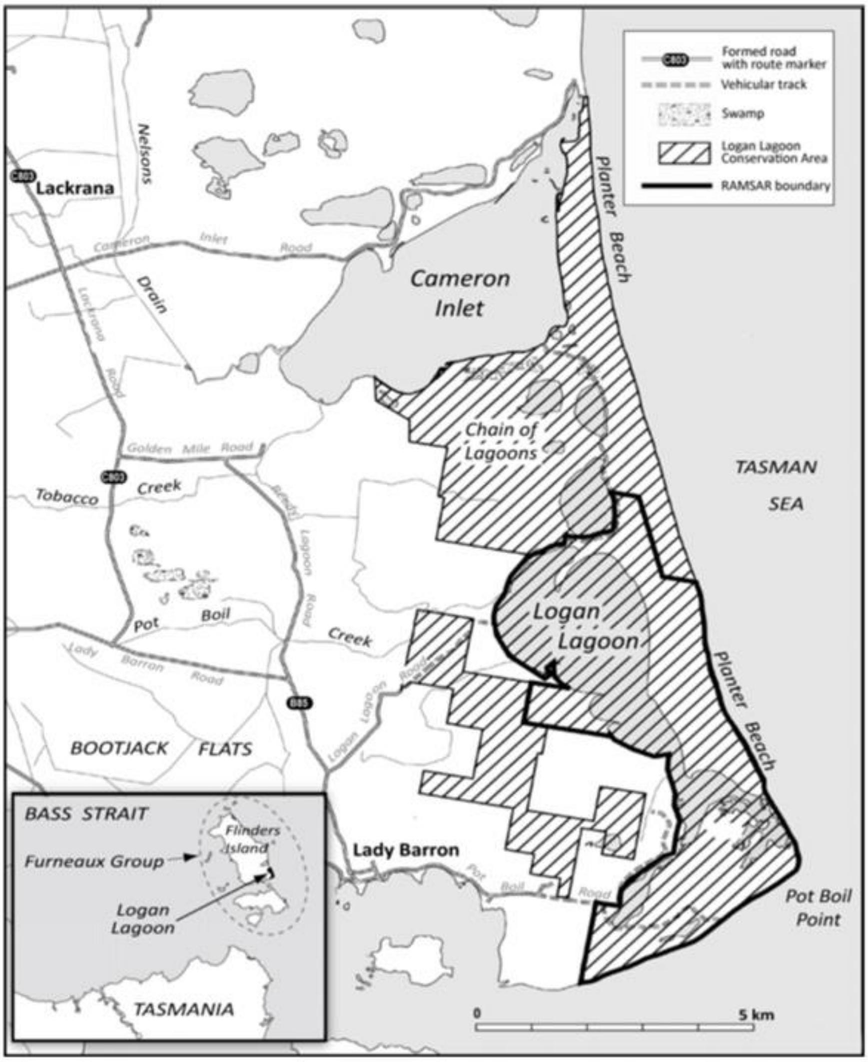


Figure 2-7 Locality Logan Lagoon Ramsar Site (Finley and Roberts, 2010)

Table 2-9 Limits of acceptable change for critical components and processes of the Logan Lagoon Ramsar site (Finley and Roberts, 2010).

Critical Component/Process / Service	Baseline / supporting evidence	Limit of acceptable change
Climate: Understanding the interactions between the physical conditions at the site and its subsequent use by flora and fauna is important. For example, waterbirds may use the site for breeding only in years when water levels are moderate and there is adequate area for nesting on the shores.		
Climate	The particular attributes of climate that are important in maintaining the ecological character of the site are rainfall, temperature, wind and evaporation. Climate predictions for north-eastern Tasmania suggest a generally warmer climate which is wetter in all seasons. Mean daily temperatures are projected to be warmer (both minimum and maximum temperatures) with increased solar radiation, relative humidity in summer, and increased evaporation (ACE CRC 2010).	The links between climatic conditions, the hydrological responses to such conditions, and their impact on the biological components are poorly understood and should be further investigated. No LAC can be determined due to a lack of understanding of the impact of climatic processes on other critical components, processes and services, such as, hydrology, geomorphology, flora and fauna.
Geomorphology: Protecting the geological features, including the integrity and structure of the dunes, is important for the purposes of geoconservation and maintaining the ecological character which contributes to the site's listing under Criterion 1.		
Holocene Shorelines and dune systems	There are approximately 54 hectares of shorelines, spits and dune systems that are important for maintaining the geoconservation value of the site under Criterion 1. The area of shorelines, spits and dunes defined in the TASVEG mapping layers require ground-truthing.	Currently there are 54 hectares of high quality shorelines, dune systems and spits mapped within the site. In the absence of studies detailing impacts from human disturbance, a common-sense approach has been adopted, setting a limit of acceptable change at not more than 3 hectares (2 percent) of the area of the Holocene shoreline and dune systems showing evidence of human disturbance through vehicle use or foot traffic. Because the wetland map was made without proper ground-truthing, verification of areas will be required.
Hydrology: The hydrological regime is a major driver in the vegetation communities at the site, particularly for wetland-dependent communities. The availability of water plays a key role in the attractiveness of the site for resting and breeding of resident and migratory fauna, especially birds.		
Surface water flow	Flow regimes are poorly understood: Historically, the lagoon mouth has been artificially breached by local landowners. Alterations to the natural hydrological regime impacts on other components such as geomorphology, water quality, vegetation and fauna. Surrounding farmland drains into the lagoon via a series of channels. High water levels in the lagoon have previously been blamed for inundated pasture on surrounding farms. The link between climate and hydrology is poorly understood. For example, the amount of rainfall required to maintain the natural hydrology.	No unnatural opening of the lagoon mouth. Site observations indicate that fluvial inflows are a significant input of surface water to the lagoon. Whilst this inflow is beneficial in maintaining water in the lagoon, poor water quality in inflow waters could offset this benefit. Site specific hydrology data and further water quality data is therefore required before LAC can be set that takes into account these factors.

Critical Component/Process / Service	Baseline / supporting evidence	Limit of acceptable change
Tidal exchange	Historical information on lagoon mouth opening is anecdotal. Future monitoring should include the status of the lagoon entrance (open/closed) because parameters such as salinity may be highly variable when the lagoon is open to the ocean.	No unnatural opening of the lagoon mouth. The lagoon is rarely open to the ocean. However, when the hydrological regime shifts to a marine system, advice on appropriate parameters should be sought.
Water Quality: provides suitable water quality to support the persistence of wetland dependent flora and fauna. The ecological character of the site currently depends on the quality of water entering and being retained within the lagoon. Baselines need to be set before LAC can be set.		
Water quality	Only two water samples recorded from the site. pH: Limited data indicates pH of 7.2-7.7 in Logan Lagoon waters. Potential for acid sulphate soils to impact on pH of lagoon waters. Salinity: Limited data indicates salinity (as Total Dissolved Solids) ranging between 2,600-35,700 mg/L: Salinity highly variable depending on seasonal climatic and hydrological processes. Dissolved Oxygen: No data available. Turbidity: Limited data indicates range between 0.5 and 4.9 NTU: Turbidity varies with freshwater inflows, wind and tidal influences. Nutrients: Limited site data indicates Total P (0.09 – 0.2 mg/L and Total N (1.4-1.5 mg/L).	Cannot determine LAC due to insufficient data.
Vegetation: the hydrology, climate, water quality and soil quality of Logan Lagoon influence the vegetation that is supported at the site. The threatened wetland-dependent vegetation communities contribute to the regional biodiversity and selection of Criterion 1 and 3.		
Holocene Shorelines and dune systems	There are currently three threatened wetland-dependent plant species mapped at the site.	In the absence of accurate mapping, a common sense approach has been adopted, setting a limit of acceptable change as the persistence of the following threatened species within the Logan Lagoon boundary: Swamp fireweed (*Senecio psilocarpus*) Large-fruit seatassel *(Ruppia megacarpa*) Northern leek orchid (*Prasophyllum secutum*) These three species are cryptic and therefore seasonally specific surveying will be required to identify them. Species should be observed during two out of every three surveys.
Threatened plant communities	Poor quality information on the current distribution and abundance of threatened plant communities because maps based on TASVEG	There are 14.22 hectares of threatened wetland-dependent vegetation communities at the site. Common sense would suggest no loss greater than 10 percent for each wetland type

Critical Component/Process / Service	Baseline / supporting evidence	Limit of acceptable change
	Mapping Layers have not been ground-truthed. The areas of threatened wetland-dependent vegetation communities are: Saline aquatic herbland = 9.23 hectares Freshwater aquatic herbland = 1.28 hectares Lacustrine herbland = 3.71 hectares.	based on TASVEG mapping layers. Because the wetland map was made without proper ground-truthing, verification of areas will be required. Based on current estimates made for this ECD, the maximum areas of threatened wetland vegetation that could be lost before causing unacceptable change to the site are: Saline aquatic herbland: 0.9 hectares Freshwater aquatic herbland: 0.5 hectares Lacustrine herbland: 4 hectares.
Fauna: Logan Lagoon supports and large number of birds, many with conservation significance locally, nationally, and internationally which justifies the selection of Ramsar criteria 3, 4 and 6.		
Number of waterbird species counted at the site annually	Annual counts of waterfowl carried out at Logan Lagoon during February 1985 - 2009, excluding 1987, 1989, 1994 and 2008. The area counted varied among years and data are not comparable, making it difficult to detect population trends.	No LAC can be determined due to insufficient data. To be defined once population trends for waterfowl are clear from systematic annual counts.
Number of shorebirds recorded in annual surveys	There has been no systematic, long term monitoring of shorebirds within the Ramsar site to enable a numerical baseline to be set, although Birds Tasmania conducted counts along the ocean coastline of the site in 2008 and 2010, and is planning future work.	No LAC can be determined due to insufficient data. To be defined once population trends for shorebirds are clear from systematic annual counts.
Threatened mammals, reptiles, amphibians	Very little systematic data. Poor information on the current distribution and abundance of threatened species.	No LAC can be determined due to insufficient data. To be defined once systematic surveys undertaken for a range of species.

2.2.3.4 East Coast Cape Barren Islands Lagoons Ramsar Site

The East Coast Cape Barren Island Lagoons Ramsar site is located on the east coast of Cape Barren Island, one of the Furneaux Group of islands which lie in Bass Strait to the north-east of Tasmania. The site extends from just north of Tar Point down to Jamieson's Bay and extends westwards from the coast for a distance varying from one to four kilometres. The site meets two of the Ramsar Criteria: 1 and 3.

The East Coast Cape Barren Island Lagoons site is significant as it forms a representative sample of coastal lagoons in the Flinders Biogeographic Region and is relatively undisturbed. The Cape Barren Dunes, within the site, are a geoconservation site in Tasmania. Thirsty Lagoon is a hypersaline lagoon and is a Tasmanian estuary of critical conservation significance. Three of the lagoons within the site, Flyover Lagoon 1, Flyover Lagoon 2 and Little Thirsty Lagoon, have been assessed as near pristine wetlands for Tasmania.

The critical components and processes for the site at the time of listing in 1982 have been determined to be geomorphology, hydrology and vegetation types. While there is some anecdotal evidence that this site is important for shorebirds, there is insufficient data to evaluate whether they are a critical component (DSEWPAC, 2008).

The Ramsar site is an important habitat for a number of plant species and vegetation communities. Thirteen threatened species listed in Tasmania occur on the site, including the Furze hakea and horny cone bush. The site represents the only known reserve in Tasmania for the threatened pink bladderwort. The White-bellied sea eagle, listed as vulnerable in Tasmania, and the Ruddy turnstone, listed under international migratory conservation agreements, also occur within the site.

This area is of cultural importance to the local Indigenous community, who manage the freehold title to part of Cape Barren Island, including the Ramsar site. Access is currently restricted, keeping the site largely undisturbed (DSEWPAC, 2008).

In the context of the Bass Strait Operations and predicted geographical extent of the DA, critical components that may be affected by a major spill event include estuarine waters, coastal brackish or saline lagoons, intertidal marshes, intertidal mud sand or salt flat and, threatened flora species.

The locality of the Ramsar site is shown in Figure 2-8. The critical components and processes of the East Coast Cape Barren Island Lagoons Ramsar and its limits of acceptable change are shown in Table 2-10.

Figure 2-8 Locality of East Coast Cape Barren Island Lagoons Ramsar site (DSEWPAC, 2008)

Table 2-10 Summary of limits of acceptable change for the East Coast Cape Barren Island Lagoons Ramsar site (DSEWPAC, 2008)

Critical ecological components, processes and services	Baseline condition and range of natural variation where known	Limit(s) of Acceptable Change* (based on baseline and natural variability)	Basis of LAC	Level of confidence
Critical component and process: Geomorphology and Hydrology *Critical service:* Natural or near-natural wetland ecosystem	There is a diversity and range of Ramsar wetland types which are defined by their geomorphology and hydrology. There is an absence of information relating to the variability in extent and types of wetland around the time of listing	The areal extent of Ramsar wetland types does not change by ±20%, i.e. • estuarine waters ± 20% from 200 hectares • intertidal marshes ± 20% from 44 hectares • coastal brackish/saline lagoons ± 20% from 375 hectares • intertidal mud sand or salt flats ± 20% from 55 hectares.	Based on aerial photograph interpretation and geomorphological mapping by Mowling (2007).	Low: Limited confidence in estimates of aerial extent. Limited data on changes to geomorphology, hydrology and vegetation types since time of listing (refer to Chapter 7 of ECD).
Critical component and process: Hydrology *Critical service:* Natural or near-natural wetland ecosystem	Hydrology as a critical component and service is linked to the geomorphology of the wetland.	As above, this LAC is linked to the geomorphology of the wetland.	As above	As above
Critical component Vegetation types *Critical service*: Natural or near-natural wetland ecosystem	Thirteen different Tasmanian wetland vegetation communities were identified within site which corresponds to six TASVEG communities. Sixteen flora species have been recorded on site that are threatened in Tasmania. Vegetation succession is an integral component of the ECCBIL wetlands such that some changes in vegetation communities are normal.	Maintenance of the extant TASVEG vegetation communities on site at time of listing i.e. • lacustrine herbland (AHL) • freshwater aquatic sedgeland and rushland (ASF) • freshwater aquatic herbland (AHF) • saline aquatic herbland (AHS) • saline sedgeland/rushland (ARS)	Based on the limited available vegetation data i.e. TASVEG mapping, the Kirkpatrick and Harwood (1981) survey and expert opinion.	Low: Not confident in the data and not confident that this will represent a change in ecological character. Limited information about the variability in extent and condition of the vegetation types since the time of listing is available. Difficult to describe baseline condition and variability (refer to Chapter 7 of ECD).

Critical ecological components, processes and services	Baseline condition and range of natural variation where known	Limit(s) of Acceptable Change* (based on baseline and natural variability)	Basis of LAC	Level of confidence
		• succulent saline herbland (ASS).		

*Exceeding or not meeting a LAC does not automatically indicate that there has been a change in ecological character

2.2.3.5 Flood Plain Lower Ringarooma

The Flood Plain Lower Ringarooma River Ramsar site is located on the far north-east coast of Tasmania, between Cape Portland and Waterhouse Point and covers an area of 3519 hectares.

The Flood Plain Lower Ringarooma River Ramsar site is rare within the Drainage Division, as it is rare for large rivers in Tasmania to be flowing through flood plains and forming the mosaic of wetlands that the Ringarooma River does. The site contains good condition, regionally representative examples of wetland systems within a flood plain, with a mosaic of permanent and seasonal marshlands and a large river estuary (Boobyalla Inlet). Boobyalla Inlet is recognised as a Tasmanian estuary with high conservation significance.

The site meets Ramsar Criteria 1, 2, 3 and 4. It supports six fauna species listed as nationally threatened including four wetland dependant species. : green and gold frog (Litoria raniformis-Vulnerable) , dwarf galaxias (Galaxiella pusilla - Vulnerable), fairy tern (Sterna nereis- Vulnerable), Australian grayling (Prototroctes maraena - Vulnerable), Australasian bittern (Botaurus poiciloptilus - Endangered) and shiny grasstree (Xanthorrhoea bracteata - Endangered) (Newall and Lloyd, 2012a). The series of shallow freshwater lagoons at the site are an important feeding and nesting place for many species of waterbirds. A number of migratory birds have been recorded from the site, including eleven listed species.

The locality of the Ramsar site is shown in Figure 2-9. The critical components and processes of the Flood Plain Lower Ringarooma River site and its limits of acceptable change are shown in Table 2-11.

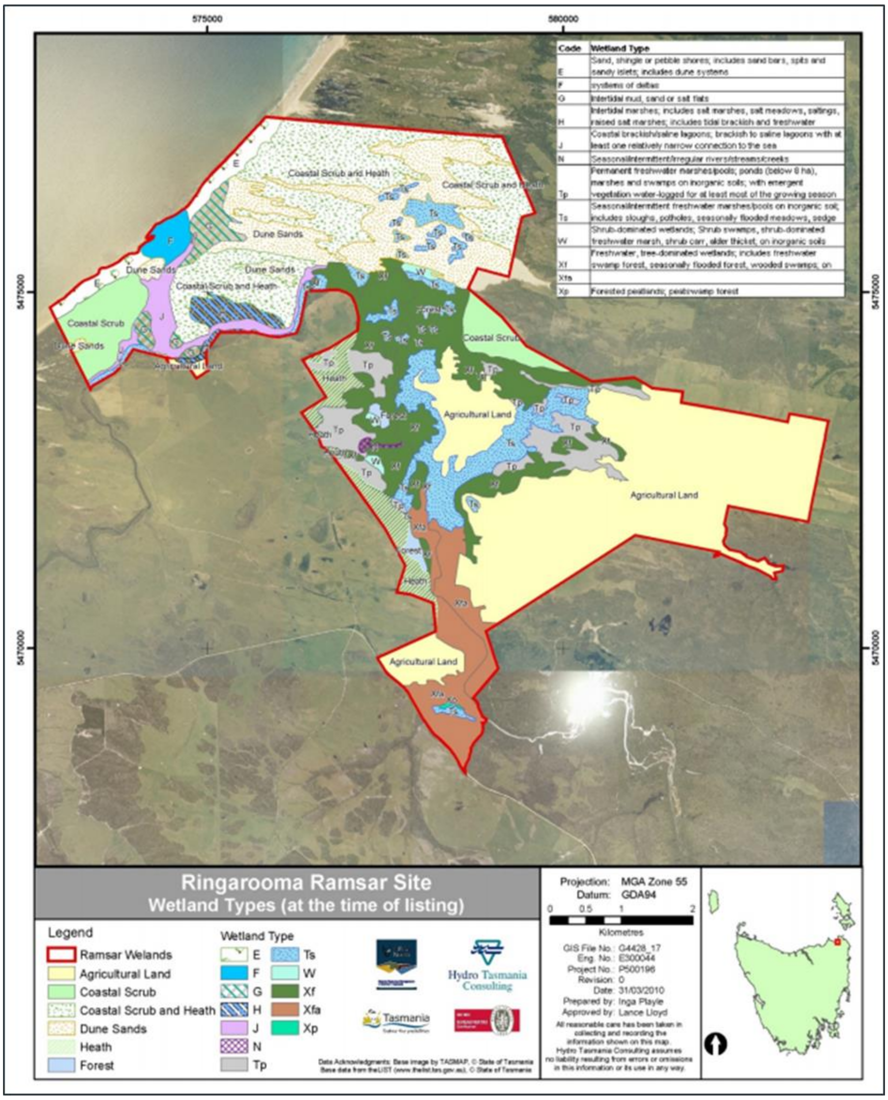


Figure 2-9 Locality and wetland type of Ringarooma Ramsar Site

Table 2-11 Critical Components and Limits of Acceptable Change for the Flood Plain Lower Ringarooma River Ramsar Site.

Critical Component, Process or Service	Baseline Information	Limits of acceptable change*	Confidence level	Justification and Comments
All Ramsar wetland types identified as being present at time of listing except Freshwater aquatic sedgeland and rushland (Ts) (service = supports Ramsar wetland types).	Using a vegetation survey (DPIW 2006), aerial photographs, and a site inspection, the following areas were identified for each wetland type (hectares): E = 74, F = 33 G = 58, H = 44 J = 74, N = 5 Tp= 169, W = 13 Xf = 614, Xp = 1	Not more than a 20 percent loss in area of any wetland type in nine out of 10 years. So that is, no more than: • 15 hectares for E • 6.5 hectares for F o 12 hectares for G • 9 hectares for H • 15 hectares for J • 1 hectare for N • 34 hectares for xp • 2.5 hectares for W • 123 hectares for Xf • 0.2 hectares for Xp	Medium – site specific measures of area are used: however, the 20 percent change is not quantitatively derived.	There are no data on the variability of the wetland habitat types and, until this ECD, there was no mapping of the wetland types. These limits have been set as a common sense approach to defining a significant change in the area of each wetland type. Monitoring into the future should incorporate changes to wetland type over time to refine this LAC.
Freshwater aquatic sedgeland and rushland (Ts) (service = supports Ramsar wetland types).	Using a vegetation survey (DPIW 2006), aerial photographs and a site inspection, an area of 257 hectares was identified as freshwater aquatic sedgeland and rushland at the time of listing.	No less than 298 hectares of freshwater aquatic sedgeland and rushland should be present at the site in nine out of 10 years. This represents 80 percent (for example a 20 percent loss) of the current area of this wetland type (373 hectares).	Medium – site specific measures of area are used: however, the 20 percent change is not quantitatively derived.	At listing, the site contained a large area of agricultural land (rough grazing) in Fosters Swamp. Grazing has subsequently ceased and the area allowed to regenerate into sedgeland and rushland, increasing the total area of this vegetation type to 373 hectares. There are no data on the variability of the wetland habitat type at the site and, until this ECD, there was no mapping of the wetland types. A limit of 20 percent has been set as a common sense approach to defining a significant change in the area of each wetland type. Monitoring into the future will refine this LAC.
Rare plant species (service = supporting populations important for regional biodiversity).	The only baseline information available is that four rare wetland dependent species were recorded as being at the site at the time of designation.	Presence in nine out of 10 years of: • native gypsywort • erect marshflower • purple loosestrife • ribbon weed	Low	There is no quantitative information on these species within the site. Therefore quantitative limits of acceptable change cannot be set and a qualitative LAC based on presence / absence of these four species is provided. Based on lack of data for the site, confidence in the LAC representing

Critical Component, Process or Service	Baseline Information	Limits of acceptable change*	Confidence level	Justification and Comments
				good indicator of change in ecological character is low.
Australian grayling and dwarf galaxias (service = support for rare or threatened species).	The only baseline information available is that these species were recorded as being at the site at the time of designation.	Presence in nine out of 10 years of: • Australian grayling • dwarf galaxias	Low	There is no quantitative information on any fish species at the site. Therefore quantitative limits of acceptable change cannot be set and a qualitative LAC based on presence / absence of the species is provided. Based on lack of data for the site, confidence in the LAC representing good indicator of change in ecological character is low.
Green and gold frog (service = support for rare or threatened species).	This species has been seen and heard at the site on different occasions. There are no quantitative data for this species.	Presence in nine out of 10 years of the green and gold frog	Low	There is no quantitative information on *Litoria raniformis* at the site. Therefore quantitative limits of acceptable change cannot be set and a qualitative LAC based on presence / absence of the species is provided. Based on lack of data for the site, confidence in the LAC representing good indicator of change in ecological character is low.
Migratory bird species (service = support for a population at a critical stage of its life cycle), and regionally rare bird species (service = supporting populations important for regional biodiversity).	The only baseline information available is that these eleven species were recorded as using the site at the time of designation.	Presence in 2 out of 3 years of: • Latham's snipe • curlew sandpiper • red-necked stint • ruddy turnstone • bar-tailed godwit • caspian tern • little tern • greenshank • cattle egret • great egret • white-bellied sea eagle	Low	There is no quantitative information on these species at the site. Therefore quantitative limits of acceptable change cannot be set and a qualitative LAC based on presence / absence of the species is provided. Based on lack of data for the site, confidence in the LAC representing good indicator of change in ecological character is low.
Nesting shorebird species (service = support for a population at a critical stage of its life cycle), and	The only baseline information available is that five species of shorebirds nest at the site, one of which (fairy	The presence of nesting populations in 2 out of 3 years for: • little tern • hooded plover	Low	There is no quantitative information on these species at the site. Therefore quantitative limits of acceptable change cannot be set and a qualitative LAC based on presence / absence of the species is provided. Based on lack of data for the site,

Critical Component, Process or Service	Baseline Information	Limits of acceptable change*	Confidence level	Justification and Comments
rare bird species (service = support for rare or threatened species).	tern) is listed on the IUCN redlist.	• fairy tern • pied oystercatcher • red-capped plover		confidence in the LAC representing good indicator of change in ecological character is low.
Migratory fish species (service = support for a population at a critical stage of its life cycle).	The only baseline information available is that three migratory fish species occur at the site, one of which is the rare Australian grayling.	Presence in 2 out of 3 years of: • Tasmanian mudfish • Tasmanian whitebait • Australian grayling	Low	Again, no quantitative information on these species at the site. Therefore quantitative limits of acceptable change cannot be set and a qualitative LAC based on presence / absence of the species is provided. Based on lack of data for the site, confidence in the LAC representing good indicator of change in ecological character is low.

2.2.3.6 Moulting Lagoon Ramsar Site

Moulting Lagoon Ramsar site comprises of an estuarine and marine waters system and is influenced by freshwater inflows from two permanent fresh water rivers which are not within the site boundary. Moulting Lagoon is located on the east coast of Tasmania, between the townships of Bicheno and Swansea and 6 kilometres north-west of Coles Bay and the Freycinet Peninsular. The site covers approximately 4507 hectares and lies within the municipality of Glamorgan-Spring Bay. The entire area of the site is Crown Land and is contiguous with the Apsley Marshes Ramsar site. The site, plus several sections of coastal reserve surrounding it and an additional area of land to the north, is located within the Moulting Lagoon Game Reserve, under the management of the Tasmanian Parks and Wildlife Service. Moulting Lagoon discharges into Great Oyster Bay via a narrow entrance at the end of a long sand spit (DoEE, 2019a).

Moulting Lagoon meets Ramsar Criteria 1, 2, 3, 4 & 8. It supports large numbers and a high diversity of waterbirds including shorebirds and waders. Twenty-two species of resident and migratory waders have been recorded onsite, with nine species regularly using the area. The site supports a number of threatened species listed under the Tasmanian Threatened Species Protection Act 1995 (TSPA) including the white-bellied sea eagle (Haliaeetus leucogaster; vulnerable); eastern curlew (Numenius madagascariensis, endangered); and great-crested grebe (Podiceps cristatus vulnerable); 13 plant species and a number of saltmarsh communities. The estuary also supports substantial populations of fish and diverse floristic communities. Wetland vegetation is dominated by two key types: saltmarsh and seagrass. These vegetation associations are critical components of the site's ecological character playing central roles in the provision of physical habitat for aquatic species as well providing key food resources, particularly for the waterbirds including migratory species. Moulting Lagoon and the Apsley Marshes provide a linkage between the inland waters of the Apsley River and the Southern Ocean. Regular migrations of short-finned eels (Anguilla australis), both on their seaward migration to breed as well as returning juveniles, are reported (Hale and Butcher 2011). In addition, black bream (Acanthopagrus butcheri) are known to travel up the drains, via Moulting Lagoon into the Apsley Marshes Ramsar site in order to spawn. Australian grayling (vulnerable, EPBC Act and TSPA) have also been recorded in the river upstream and presumably would use the site as a migratory route during breeding (DoSEWPaC, 2011).

Moulting Lagoon has indigenous cultural significance as part of the lands were occupied by the Oyster Bay Tribe, which included most of the east coast from the Derwent estuary to the Fingal Valley and west inland to the Midlands. Currently only eight sites have been registered on the Tasmanian Aboriginal Site Index.

The locality of the Ramsar site is shown in Figure 2-10. The critical components and processes of the Moulting Lagoon site and its limits of acceptable change are shown in Table 2-12.

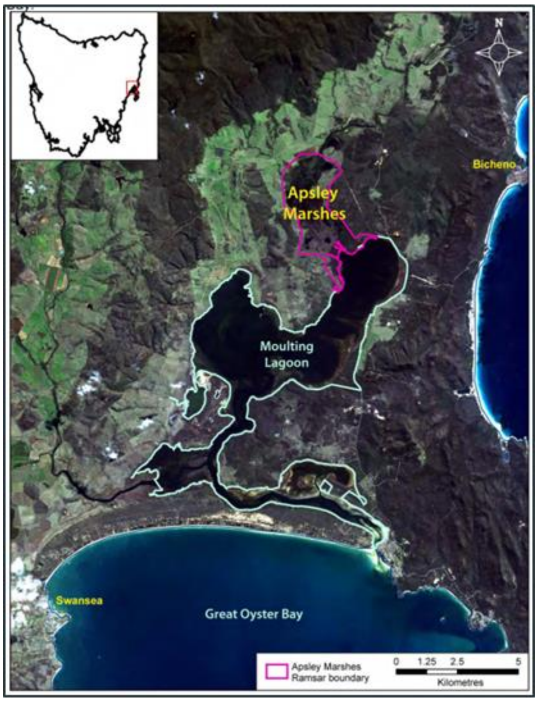


Figure 2-10 Locality of Moulting Lagoon and Apsley Marches Ramsar Sites (Hale &Butcher, 2011).

Table 2-12 Limits of Acceptable Change for the Moulting Lagoon Ramsar site

Critical Component/ Process / Service	Baseline Information and Justification	Limit of acceptable change*	Confidence level
Hydrology	Moulting Lagoon receives freshwater inflows from the Swan and Apsley Rivers. The Department of Primary Industries, Parks, Water and Environment, Tasmania monitor flow events into Moulting Lagoon at stream gauges located at Swansea Grange and Apsley upstream at Coles Bay Road. This information is stored and accessible via WIST (The Water Information System of Tasmania). There is a relatively high degree of inter annual variability in inflows. For example, from 1968 to 1992 average daily flow during winter ranged from less than 10 megalitres a day to over 5000 megalitres a day (data from State of Tasmania 2010). The tidal influence and estuarine conditions that prevail in the site are critical to the character of the site. However, there is limited information other than tide heights for this source of water. The site supports a range of estuarine wetland types including intertidal mud and sand flats, and sea grass beds. However mapping and other information is insufficient to determine extent and variability at the time of listing. In the absence of sufficient data LAC are based on no change in hydrological wetland types.	No change in wetland hydrological types present within the site. That is, the following hydrological wetland types are maintained: • • Dominance of estuarine waters; • • Presence of marine subtidal aquatic beds - seagrass beds; • • Presence of sand bars, spits, dune systems; • • Presence of intertidal mud, sand and salt flats; • • Presence of intertidal saltmarsh and salt meadows; and • • Presence of brackish to saline lagoons.	M
Wetland vegetation-saltmarsh	Some mapping of plant communities has been undertaken as part of the TASVEG program; however extent of saltmarsh vegetation within the Ramsar site is considered a knowledge gap. As such a quantitative LAC for this component cannot be set and will require revision should such information become available.	No less than 90 percent of the extent of saltmarsh communities within the Ramsar site.	L
Wetland vegetation – seagrass	Detailed mapping of seagrass was completed by Mount et al. (2005) (for the Great Swanport estuary part of the site) and Lucieer et al. (2009) for Moulting Lagoon. The combined figures from these studies indicate 2200 hectares of Ruppia; 940 hectares of seagrass (mixed Heterozostera tasmanica and Zostera muelleri) and 50 hectares of macroalgae. The mapping is a single snap shot in time and does not provide an indication in variability. The LAC has therefore been based on an arbitrary figure of 25 percent reduction from baseline mapping.	No less than 1650 hectares of Ruppia and 700 hectares of seagrass (*Heterozostera tasmanica* and *Zostera muelleri*).	H
Wetland vegetation – threatened species	The Management Plan for the Moulting Lagoon Game Reserve (PWS 2007), which covers a larger area than the Ramsar site, indicates that 13 plant species listed under the Tasmanian Threatened Species Protection Act 1995 occur “in and around” the game reserve (Appendix 2). Moulting Lagoon is recognised as being important for the conservation of some of these species such as: large fruit sea tassel Ruppia megacarpa (rare) and the spreading watermat Lepilaena patentifolia (rare) both of which are marine angiosperms; southern swampgrass Amphibromus neesii (rare), which is found at Charlie Diglers Hole; and native broom Viminaria juncea, for which Moulting Lagoon is the only known Tasmanian population.	Continued presence of the following species within the Ramsar site: *Ruppia megacarpa;* *Lepilaena patentifolia Amphibromus neesii and* *Viminaria juncea*	M

Critical Component/ Process / Service	Baseline Information and Justification	Limit of acceptable change*	Confidence level
	However, how many of the 13 species occur within the Ramsar site and are important to the ecological character of the site remains unknown. The LAC is based on continued presence of those species currently known to occur in the site and for which the site has been recognised as important for their conservation.		
Fish	Last (1993) recorded 36 fish species from Great Swanport estuary. Last also described habitat preferences for these species.	No less than 28 of recorded fish species (Last 1983) are present at least once every 10 years.	H
Waterbirds – abundance	Three waterbird species have greater than one percent of their population occurring at the site on a regular basis. These species are a major reason for the site's Ramsar listing. Further reductions in population numbers may be beyond site management control, but it is vital to the site's ecological character that it still retains the quality and quantity of habitat required by waterbirds for foraging and breeding. Long-term regional trends for these species can be used to underpin the LAC. If trends in species counts move opposite to regional trends, this may indicate issues at the site, and might be used as a management trigger for these LAC. The LAC for individual species are provided for the intrinsic value of the species but also in part as a surrogate for the waterbird community as a whole. For black swan the 20th percentile+ as a minima of the current data (1992 to 2009, S. Blackhall data) has been used to derive the LAC as the species move into and out of the site on a seasonal basis. For pied oystercatcher and Pacific gull the 80th percentile+ of the current data (1992 to 2009, S. Blackhall data) has been used to derive the LAC.	No less than 7000 black swan (*Cygnus atratus*) in eight out of 10 years.	H
		No less than 200 pied oystercatcher (*Haematopus longirostris*) in five out of 10 years.	H
		No less than 80 Pacific gull (*Larus pacificus*) in five out of 10 years	H
Waterbirds - breeding	Of the waterbirds which breed at the site, the most significant in terms of occurrence and abundance is the black swan, which breeds annually within the site.	Presence of black swan (Cygnus atratus) breeding within the site on an annual basis.	H
Supports near natural wetland types	Wetland types are maintained by hydrology and vegetation.	See LAC for hydrology and vegetation communities.	N/A
Physical habitat for waterbird (breeding, roosting and feeding).	Physical habitat for waterbirds is maintained through wetland types and can be indicated by the numbers of waterbirds supported by the site.	See LAC for hydrology, vegetation and waterbirds.	N/A
Provides drought refuge	Drought refuge is maintained by hydrology.	See LAC for hydrology.	N/A

Critical Component/ Process / Service	Baseline Information and Justification	Limit of acceptable change*	Confidence level
Supports biodiversity including threatened species	Biodiversity values of the site lie predominantly with the high diversity of wetland flora, waterbirds and fish and can be indicated by the species richness of these groups.	See LAC for vegetation, fish and waterbirds.	N/A
Ecological connectivity	Connectivity for fish migration is maintained through hydrological connections from Moulting Lagoon to inland freshwater wetlands via the Aspley River. While the LAC for hydrology partially addresses this service, it is important that physical connectivity is also retained and that obstructions to water flow are not introduced to the site	No barriers to hydrological connectivity between Moulting Lagoon and the Aspley River.	H

2.2.3.7 Apsley Marshes Ramsar Site

The Apsley Marshes Ramsar site is located on the east coast of Tasmania, within the Tasmanian Drainage Division (bioregion), 14 kilometres south west of the town of Bicheno (population in 2007; 640). The site covers approximately 880 hectares and lies within the municipality of Glamorgan-Spring Bay. The site is situated almost entirely within private (freehold) land and is contiguous with and inland of Moulting Lagoon Ramsar site (Refer Section 2.2.3.6, Figure 2-10 above). It meets Ramsar Criteria 1, 2, 3, 4 & 8. The wetland has 82 native species of wetland plant; including six species that are considered rare or threatened within the bioregion and the nationally vulnerable swamp everlasting (Xerochrysum palustre) and ten wetland vegetation associations. There are 26 species of waterbird recorded including the internationally endangered Australasian bittern (Botaurus poiciloptilus). It is also a significant breeding site for black swans (Cygnus atratus); confirmed breeding of three additional species including the white-bellied sea-eagle and potential breeding of three more waterbird species (Hale &Butcher, 2011).

2.2.3.8 Western Port Ramsar Site

The Western Port Ramsar site situated in south-eastern Australia, approximately 60 km south-east of Melbourne, Victoria, occupies approximately 59,950 ha and consists of large shallow intertidal areas dissected by deeper channels, and a narrow strip of adjacent coastal land in some areas. The Ramsar site has long been recognised for its diversity of native flora and fauna, particularly for its ability to support diverse assemblages of waterbirds and wetland vegetation, including seagrass, saltmarsh and mangroves. As such, the site as listed in 1982 satisfies criteria 1a, 1b, 2, 3a, 3b, 3c, 4 and 8.

2.2.3.9 Little Waterhouse Lake Ramsar Site

Little Waterhouse Lake, part of the Waterhouse Point wetlands complex, is located seven kilometres south-west of Waterhouse Point, and lies between the towns of Bridport and Tomahawk on the north-east coast of Tasmania.

Little Waterhouse Lake is a good example of a coastal freshwater body in good condition in the Flinders Biogeographic Region. The site forms part of the Waterhouse Dunefield Geoconservation site, a system of current, active dunes moving over the top of much older longitudinal dunes, which developed at the height of the last glacial stage when Bass Strait was dry and arid.

2.2.3.10 Lavinia Ramsar Site

Lavinia Ramsar Site (7,034 ha) is situated on the northeast coast of King Island in Bass Strait. King Island lies between the north-west tip of Tasmania and Cape Otway in Victoria. The site is listed under Ramsar criteria 1, 2, 3 and 4 (Newall and Lloyd, 2012b). The site has 4 ecosystem units and the coastal components include estuarine waters, intertidal mud and marshes, saline/brackish lagoons and rocky/sand/shingle shores. The site is important for supporting regionally rare flora and fauna and providing habitat for ten migratory bird species listed under international agreements. It provides nesting habitat for waterbirds and seabirds including the threatened fairy tern and orange-bellied parrot. The vulnerable green and gold frog are also found at the site (Newall and Lloyd, 2012b).

2.2.3.11 Myall Lakes Ramsar site

The large area of 44,612 ha making up the Myall Lakes Ramsar site is entirely within the Port Stephens Great Lakes Marine Park (NSW) just to the north of Newcastle city on the NSW central coast. It supports a rich biodiversity, containing a range of undisturbed terrestrial and wetland vegetation communities with a large number of plant and animal species. The site's vegetation is particularly diverse, with 968 species of terrestrial and aquatic plants recorded, and vegetation communities ranging from littoral rainforest to forest, heath, grassland, swamp, mangrove, seagrass, submerged aquatic vegetation and emergent freshwater vegetation. It is listed under Ramsar criterion 1a, 1c, 2a and 3b. There are 22 species of shorebirds listed under migratory bird agreements (JAMBA, CAMBA and ROKAMBA) which use the site as roosting, feeding, nesting and breeding habitat. The lakes support 5 wetland dependent threatened species including the endangered, Australasian bittern, 3 vulnerable frog species and 1 endangered frog species (NSW OEH, 2012a).

2.2.3.12 Hunter Estuary Wetlands Ramsar site

The Hunter Estuary Wetlands Ramsar site is comprised of two components, Kooragang is located in the estuary of the Hunter River, 7km north of Newcastle comprising of 3,388 ha and Hunter Wetlands Centre is a small, 42 ha complex approximately 2.5 km south west of the Kooragang (NSW OEH, 2012b). The site meets Ramsar criteria 2, 4 and 6. The site is extremely important as both a feeding and roosting site for a large seasonal population of shorebirds and as a waylay site for transient migrants. Over 250 species of birds have been recorded within the Ramsar site, including 45 species listed under international migratory conservation agreements. In addition, the Ramsar site provides habitat for the nationally threatened Green and Golden Bell Frog, Red Goshawk and Australasian Bittern (Brereton et al., 2010).

2.2.3.13 Towra Point Nature Reserve Ramsar Site

Towra Point Nature Reserve Ramsar site consists of 386.5 hectares of wetlands that lie on the southern shore of Botany Bay, approximately 16 kilometres from Sydney city centre. The entire Ramsar site lies within Towra Point Nature Reserve (Refer Section 2.2.8.67). The site meets Ramsar criteria 2, 3, 4 & 8. Towra Point is a critical roosting and feeding habitat for large numbers of migratory shorebird species and a significant nesting site for the endangered little tern (Sterna albifrons). The mangroves and seagrass provide protection and food for juvenile fish species. Studies have shown that a higher abundance and diversity of fish species are found in areas of mangrove and saltmarsh which are adjacent to seagrass than are found in isolated communities. The release of crab larvae from saltmarsh areas during spring ebb tides provides a reliable source of food for a variety of fish species and a critical link in the estuary's food web. Towra Point is important in providing ecological connectivity for itinerant species, and is important for maintaining biodiversity in the greater Sydney region. Threats to the site include its proximity to one of the largest ports in eastern Australia; alterations to the shoreline, hydrology and bathymetry of Botany Bay causing increased wave energy on the southern side of the bay; residential and industrial development within the catchment; invasive species; and the impacts of climate change including sea level rise (DECCW, 2010).

2.2.3.14 Elizabeth and Middleton Reefs Ramsar Site

Elizabeth and Middleton Reefs are located in the northern Tasman Sea, 630 km east of Coffs Harbour (NSW); 690 km east-southeast of Brisbane (Queensland); and 150 km north of Lord Howe Island. Elizabeth and Middleton Reefs are a pair of isolated oceanic platform reefs separated from one another by 45 km of deep oceanic waters and together they represent the southern-most platform reefs in the world. Elizabeth Reef measures 8.2 km by 5.5 km and Middleton Reef, slightly larger but of a similar shape, at 8.9 km by 6.3 km. The site is listed under Ramsar criteria 1, 2, 3, 4 and 8.

Critical Services provided by this site are:

- It is representative of a unique ecosystem in the bioregion: southern-most open ocean coral reef platform in the world;
- It supports threatened species: Green turtle (Chelonia mydas) (feeding habitat only, no nesting);
- It supports regionally high species diversity: fish; coral communities; molluscs; and sea cucumbers (beche-de-mer).
- It supports animal taxa at a vulnerable or critical stage of their lifecycle, particularly the Galapagos Shark (Carcharinus galapagensis)(likely nursery ground); and,
- It supports the last known large population of Black Cod (Epinephelus daemelii).

The threats to this site are the Crown of Thorns starfish which is present at the reefs however its distribution and abundance is not well known. Other threats are illegal fishing of Black Cod and other species (including for the aquarium trade), coral bleaching due to thermal changes in temperature and also water quality changes form pollution (DEWHA, 2006).

2.2.3.15 Moreton Bay Ramsar Site

The Moreton Bay Ramsar site is located in and around Moreton Bay, north-east, east and south-east of the city of Brisbane, in the state of Queensland. The site is 1,206 km^2 and includes most of Moreton Island, and parts of North and South Stradbroke Islands, Bribie Island, the southern Bay Islands, inclusive of the National Parks and Marine Parks in those areas. It is notable for its large size, diversity of wetland habitats, connectivity between wetland types, as well as diverse flora and fauna that includes threatened species and ecological communities. It contains seagrass, sandy and muddy tidal flats and subtidal areas, saltmarsh, mangroves and coral communities, freshwater wetlands, as well as ocean beaches and dunes. The site is listed under all nine of the Ramsar criteria (RSIS, 2019).

Critical Services provided by this site are:

- It includes one of the most extensive intertidal areas of seagrass, mangrove and saltmarsh communities on the eastern coast of Australia, and is valuable for supporting fisheries resources, waterbirds and marine megafauna of conservation significance.
- It regularly supports more than 50,000 waterbirds, representing at least 43 species of shorebirds and at least 28 migratory shorebird species. The site is recognised as a network site under the East Asian Australasian Flyway Partnership and supports at least nine migratory shorebird species, including the critically endangered eastern curlew (Numenius madagascariensis) and curlew sandpiper (Calidris ferruginea).
- It supports a range of internationally, nationally, state and locally significant species including the Oxleyan pygmy perch fish, four species of acid frogs, the water mouse, Illidge’s ant-blue butterfly, and several freshwater invertebrates.
- The site provides important cultural, social, economic and recreational values

Conservation measures focus on managing water quality from human, agricultural, industrial and commercial threats.

2.2.3.16 Great Sandy Strait Ramsar Site

Great Sandy Strait (including Great Sandy Strait, Tin Can Bay and Tin Can Inlet) is a sand passage estuary between the mainland and the World Heritage-listed Fraser Island. It covers an area of approximately 837 km2. The site is listed under Ramsar criteria 1, 2, 3, 5, 6 and 8 (RIS, 1999).

Critical Services provided by this site are (DAWE, 2020a):

- It is an outstanding example of a sand passage estuary and is in a relatively undisturbed state. Large, well developed expanses of sand and mud flats, salt flats, mangroves and seagrass beds are widespread along the Strait.
- It provides feeding grounds that are frequently or occasionally used by six species of threatened marine turtle, the Green Turtle, Loggerhead Turtle, Hawksbill Turtle, Flatback Turtle, Leatherback Turtle and Pacific Ridley Turtle. Other threatened species that occur in the site include the Dugong, Humpback Whale, Water Mouse, Illidge's Ant Blue Butterfly, and the Oxleyan Pygmy Perch
- It supports at least 38 species of shorebirds, 104 species of fish, 27 species of molluscs, hard & soft coral species, 11 species of mangrove, and seven species of seagrass. The mangrove communities within the Strait represent a transition between essentially temperate and tropical species
- Wetlands along Great Sandy Strait regularly support in excess of 20,000 migratory shorebirds and support more than 1% the total world population of the Eastern Curlews, Grey-tailed Tattlers, Lesser Sand Plovers, Terek Sandpipers, Whimbrels, Bar-tailed Godwits, Pied Oystercatchers, Greenshanks, and Grey Plovers
- The tidal wetlands are extremely important for protection of, and source of food for, juvenile and adult fish, prawns and other crustaceans. It is highly valued for commercial and recreational fishing.

Great Sandy Strait is located close to regional population centres (Maryborough and Hervey Bay) that are rapidly growing and causing development pressures to the site including increased water extraction, clearing of land and seagrass disturbance, landfill and dredging and pressures from expanding agriculture (RIS, 1999).

2.2.4 Threatened Ecological Communities

Ecological communities are a group of native flora, fauna and other organisms that naturally occur together and interact in a unique habitat. Their structure, composition and distribution are determined by environmental factors such as soil type, location (e.g. altitude/depth), climate, and water availability, chemistry and movement (e.g. oceanic currents) and thereby changes to any one or a combination of these factors threatens the viability of the community. Species within each ecological community interact with and depend on each other for survival. Ecological communities are important because of their unique combination of native biodiversity, distinctive landscape/seascape values, vital habitat qualities and for the ecosystem services they provide. There are three types of listed threatened ecological communities (TEC) within the DA.

2.2.4.1 Giant Kelp Marine Forests of South East Australia

The 'Giant Kelp Marine Forests of South East Australia' is listed as an endangered TEC under the EPBC Act. Kelps are very large brown algae that grow on hard sub tidal substrates in cold temperate regions. Kelps have a holdfast that attaches to the substrate, a stem-like or trunk-like stipe, and large, flattened, leaf-like blades called fronds. Because kelps require constant water motion to provide nutrients, they are located in relatively high-energy settings. Kelp forests support a diverse animal community of fish, invertebrates, and marine mammals as well as important algal communities (NOAA 2010). The ecological community is characterised by a closed to semi-closed surface or subsurface canopy of Macrocystis pyrifera, and extends between the ocean floor and ocean surface, exhibiting a 'forest-like' structure with a diverse range of organisms occupying its benthic, pelagic and upper-canopy layers (TSSC 2012). M. pyrifera is the only species of kelp to provide this three-dimensional structure from the sea floor to the sea surface (TSSC 2012). This ecological community occurs on rocky substrate along the east and south coastlines of Tasmania; some patches may also occur in the coastal waters of western and northern Tasmania, south eastern South Australia, and Victoria (TSSC 2012).

The high primary and secondary productivity of the giant kelp forests create and provide a number of ecosystem services to the local environment including settlement habitat for juvenile life stages of commercially important fisheries, improvements in local water quality conditions and coastal protection via buffering strong wave conditions from reaching the shore (TSSC 2012).

The key threats affecting the ecological community include increasing sea surface temperatures, changes in nutrient availability in warmer waters, changes in weather patterns and large scale oceanographic conditions, and associated range expansion of invasive species (TSSC 2012). Other threats include impacts on water quality from land-based activities and aquaculture and potential loss from catastrophic storm events (TSSC 2012). Figure 2-11 shows the distribution of the Giant Kelp Marine Forests of south east Australia.

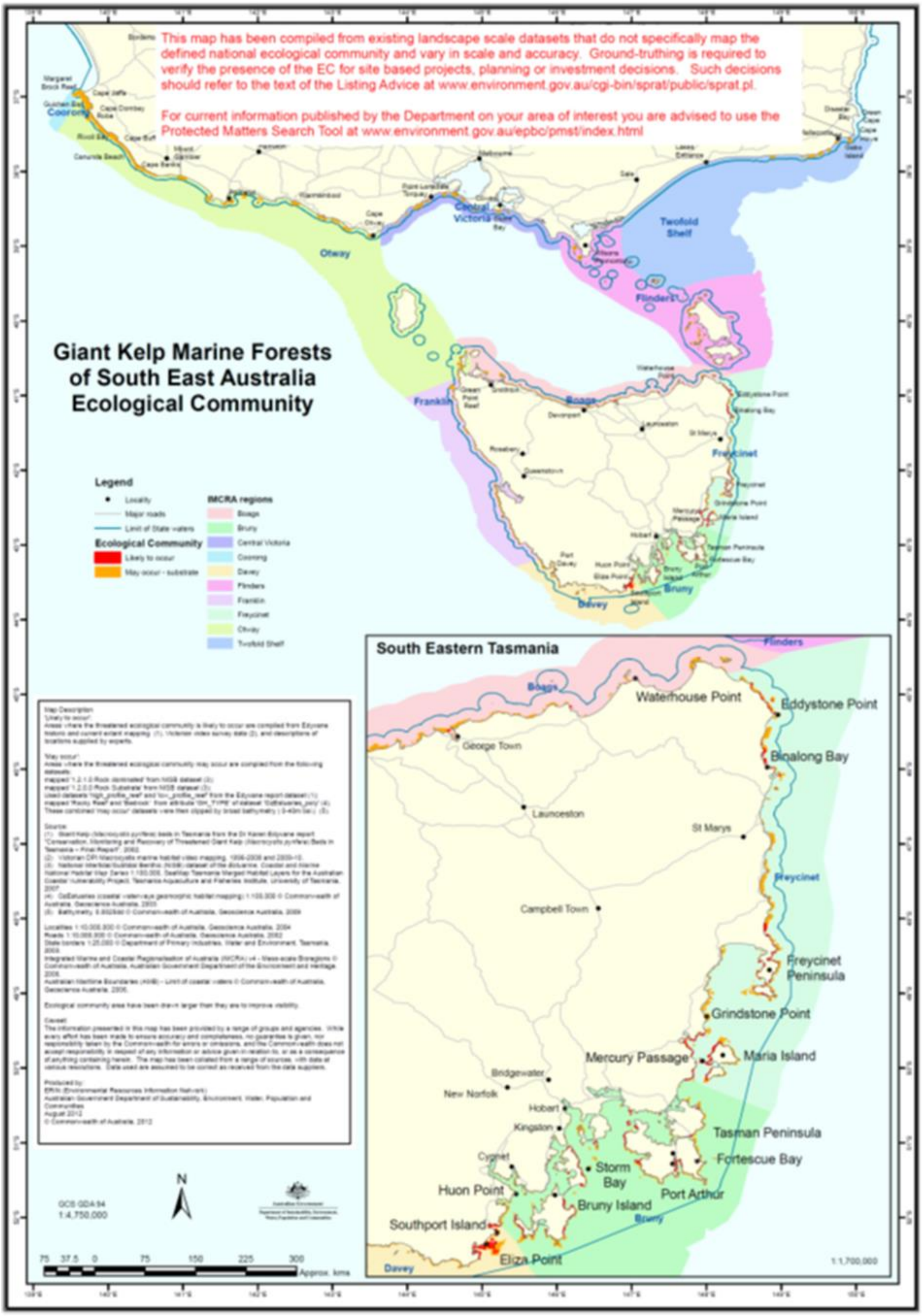


Figure 2-11 Distribution of Threatened Ecological Communities - Giant Kelp Marine Forests of South East Australia

2.2.4.2 Littoral Rainforest and Coastal Vine Thicket

The 'Littoral Rainforest and Coastal Vine Thickets of Eastern Australia' is listed as a critically endangered TEC under the EPBC Act. The ecological community is a complex of rainforest and coastal vine thickets on the east coast of Australia influenced by its proximity to the sea; and provides habitat for over 70 threatened plants and animals and provides important stepping stones along the eastern Australian coast for various migratory and marine birds (DoE&PI, 2014). It also provides an important buffer to coastal erosion and wind damage (TSSC, 2015a; DoEE, 2017s).

The ecological community occurs as a series of naturally disjunct and localised stands within two kilometres of the eastern coastline of Australia or adjacent to a large saltwater body, such as an estuary on a range of landforms including dunes and flats, headlands and sea-cliffs, including offshore islands, from Princess Charlotte Bay, Cape York Peninsula to the Gippsland Lakes in Victoria (TSSC, 2015a). Figure 2-12 shows the detailed distribution of Littoral Rainforest within East Gippsland. Figure 2-13 shows the distribution of Littoral Rainforest in New South Wales.

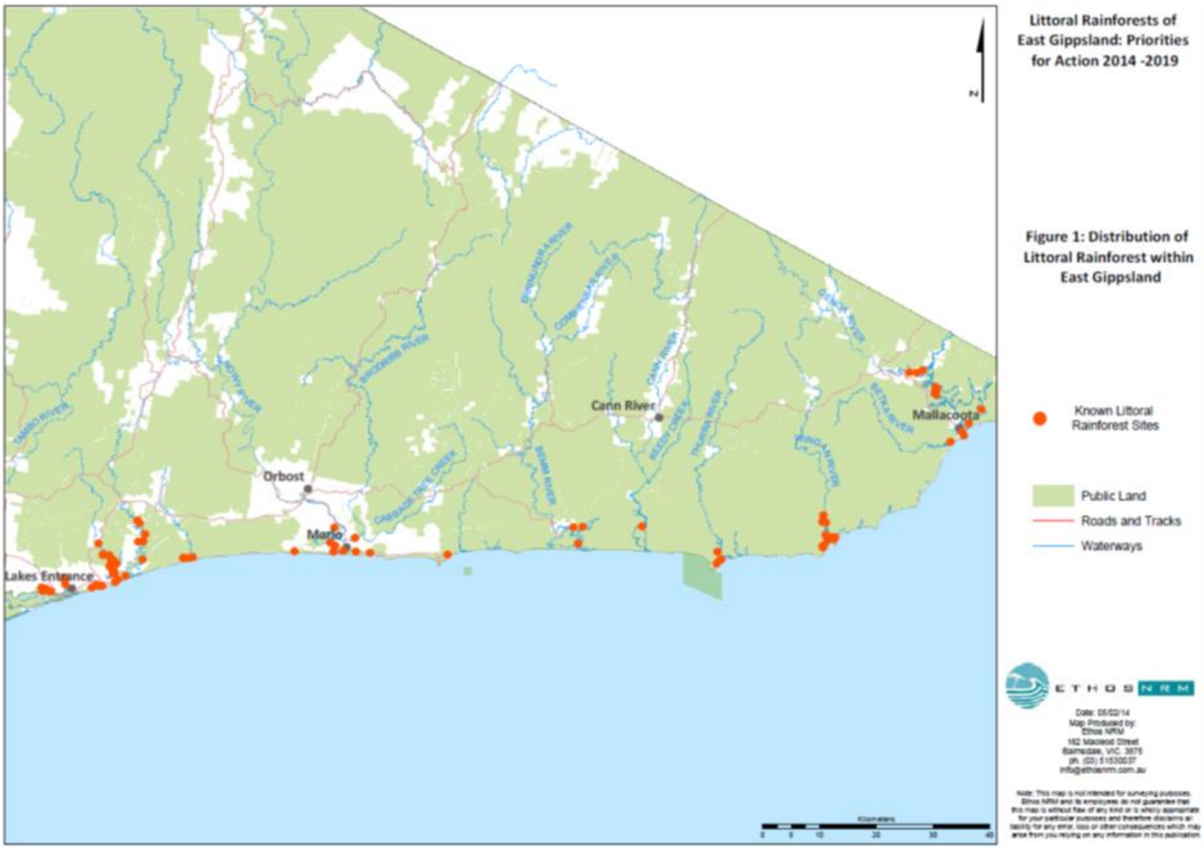


Figure 2-12 Distribution of Threatened Ecological Communities - Littoral Rainforest within East Gippsland (Vic DoE&PI, 2014 Littoral Rainforests of East Gippsland: Priorities for Action 2014-2019)

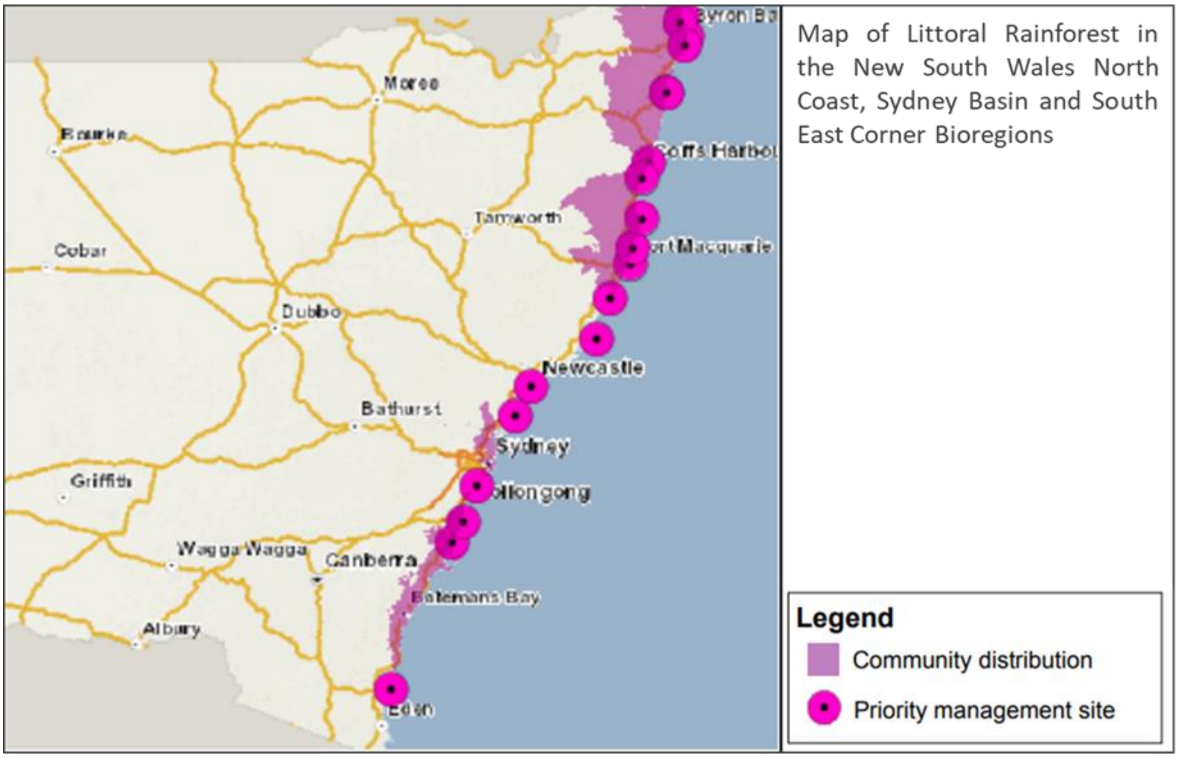


Figure 2-13 Distribution of Threatened Ecological Communities - Littoral Rainforest in NSW (NSW OEH, 2017)

2.2.4.3 Subtropical and Temperate Coastal Saltmarsh

The 'Subtropical and Temperate Coastal Saltmarsh' is listed as a vulnerable Threatened Ecological Community (TEC) under the EPBC Act, and its known distribution includes the southern and eastern coasts of Australia (Figure 2-14). The Subtropical and Temperate Coastal Saltmarsh ecological community occurs within a relatively narrow margin along the Australian coast, within the subtropical and temperate climatic zones; and includes coastal saltmarsh occurring on islands within these climatic zones (TSSC, 2013a). The physical environment for the ecological community is coastal areas under regular or intermittent tidal influence (TSSC, 2013a).

The ecological community consists mainly of salt-tolerant vegetation (halophytes) including: grasses, herbs, sedges, rushes and shrubs (TSSC, 2013a). Many species of non-vascular plants are also found in saltmarsh, including epiphytic algae, diatoms and cyanobacterial mats (TSSC, 2013a). The ecological community is inhabited by a wide range of infaunal and epifaunal invertebrates, and temporary inhabitants such as prawns, fish and birds (and can often constitute important nursery habitat for fish and prawn species) (TSSC, 2013a). Insects are also abundant and an important food source for other fauna, with some species being important pollinators (TSSC, 2013a). The dominant marine residents are benthic invertebrates, including molluscs and crabs that rely on the sediments, vascular plants, and algae, as providers of food and habitat across the intertidal landscape (TSSC, 2013a).

The key threats affecting the ecological community include: clearing and fragmentation, infilling, altered hydrology/tidal restriction, invasive species, climate change, mangrove encroachment, damage from recreational activities, pollution (including oil spills), eutrophication, acid sulphate soils, grazing, insect control, salt and other mining activities, and inappropriate fire regimes (TSSC, 2013a).

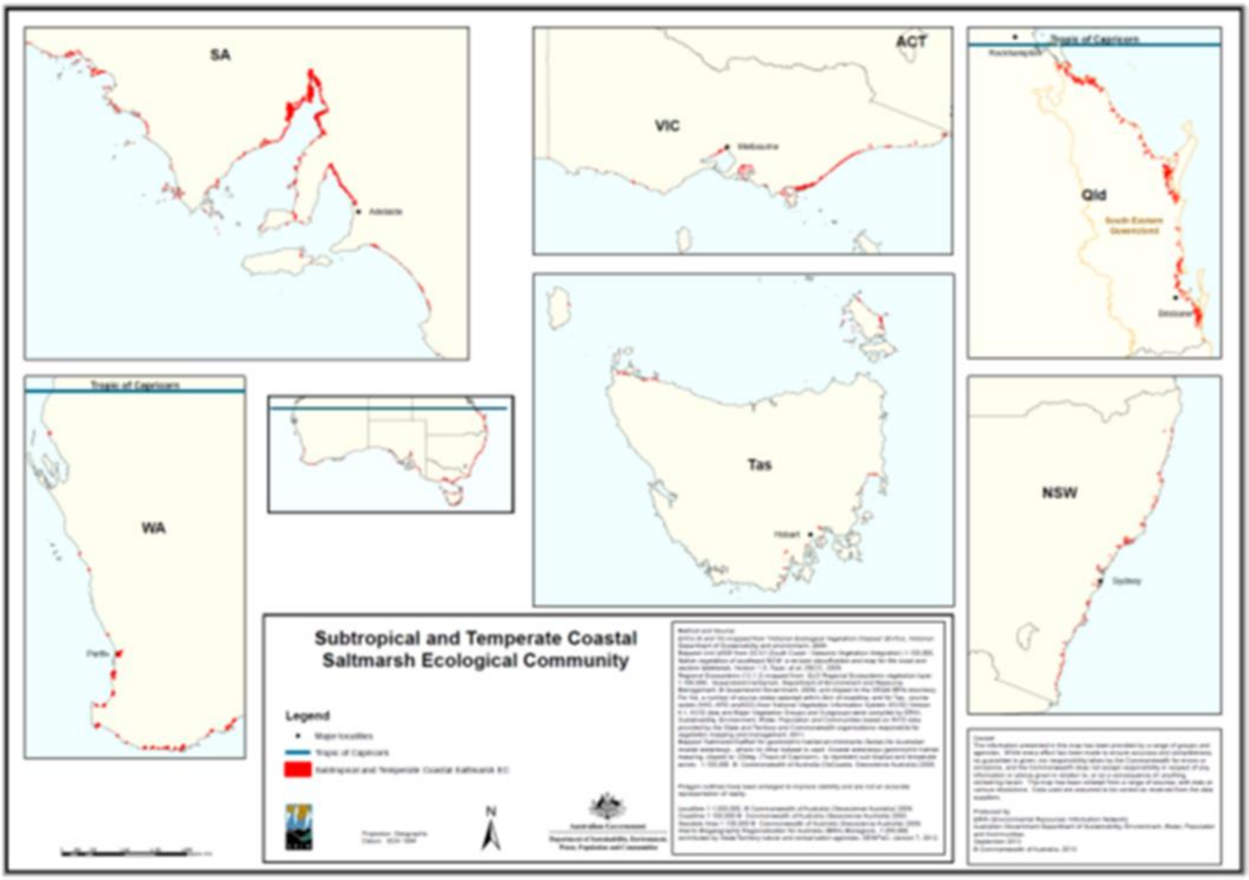


Figure 2-14 Distribution of the TEC Subtropical and Temperate Coastal Saltmarsh

2.2.5 Commonwealth Marine Areas

Six marine regions have been identified in Commonwealth waters around Australia. Marine bioregional planning is designed to better protect marine environments, conserve biodiversity and deliver greater certainty to resource users and decision-makers about the marine conservation priorities of the Australian Government. The majority of the DA lies within the South-east Marine Region. A portion of the north-eastern section of the DA overlaps with the Temperate East Marine Region (Refer Figure 2-15 in Section 2.2.6 below).

The key conservation values of the South-east Marine Region are:

- Features with high biodiversity and productivity, such as the east Tasmania subtropical convergence zone, Bass Cascade, Upwelling east of Eden, Seamounts south and east of Tasmania and Bonney coast upwelling.
- Breeding and resting areas for Southern right whale.
- Migration areas for Blue, Fin, Sei, Southern right and Humpback whales.
- Foraging areas for Australian sea-lion, White shark, Harrison's dogfish, Killer and Sei whales, Australasian gannet, Fairy prion, Black-faced cormorant, Little penguin, Crested tern, and several species of seal, penguin, albatross, petrel, shearwater and gulls.
- Wrecks of MV City of Rayville, SS Cambridge and ketch Eliza Davies.
- 10 provincial bioregions and 17 seafloor types are represented in the network (DoEE, 2015a)

The Temperate East Marine Region spans an area of approximately 1.4 million square kilometres from the southern boundary of the Great Barrier Reef in Queensland to Bermagui in Southern New South Wales. The key conservation values of the Temperate East Marine Region relevant to the DA are:

- Features with high biodiversity and productivity such as the Canyons of the Eastern Continental Slope and Shelf rocky reefs

- Nesting sites for listed seabirds on islands along the NSW coast, including Montague Island (Short-tailed shearwater, Sooty shearwater)
- Breeding sites for Little penguin, shearwater, Wilson's storm petrel, Crested tern
- Migration areas for Humpback whale
- Breeding sites for Indo-Pacific Bottlenose Dolphin
- Foraging sites for several species of petrel, albatross, shearwater
- 3 provincial bioregions

2.2.6 Australian Marine Parks

Australian Marine Parks have been established in Commonwealth waters for to contribute to the long term conservation of marine ecosystems and protect marine biodiversity found in them, while also allowing for sustainable use of natural resources. The Australian Marine Parks are protected areas.

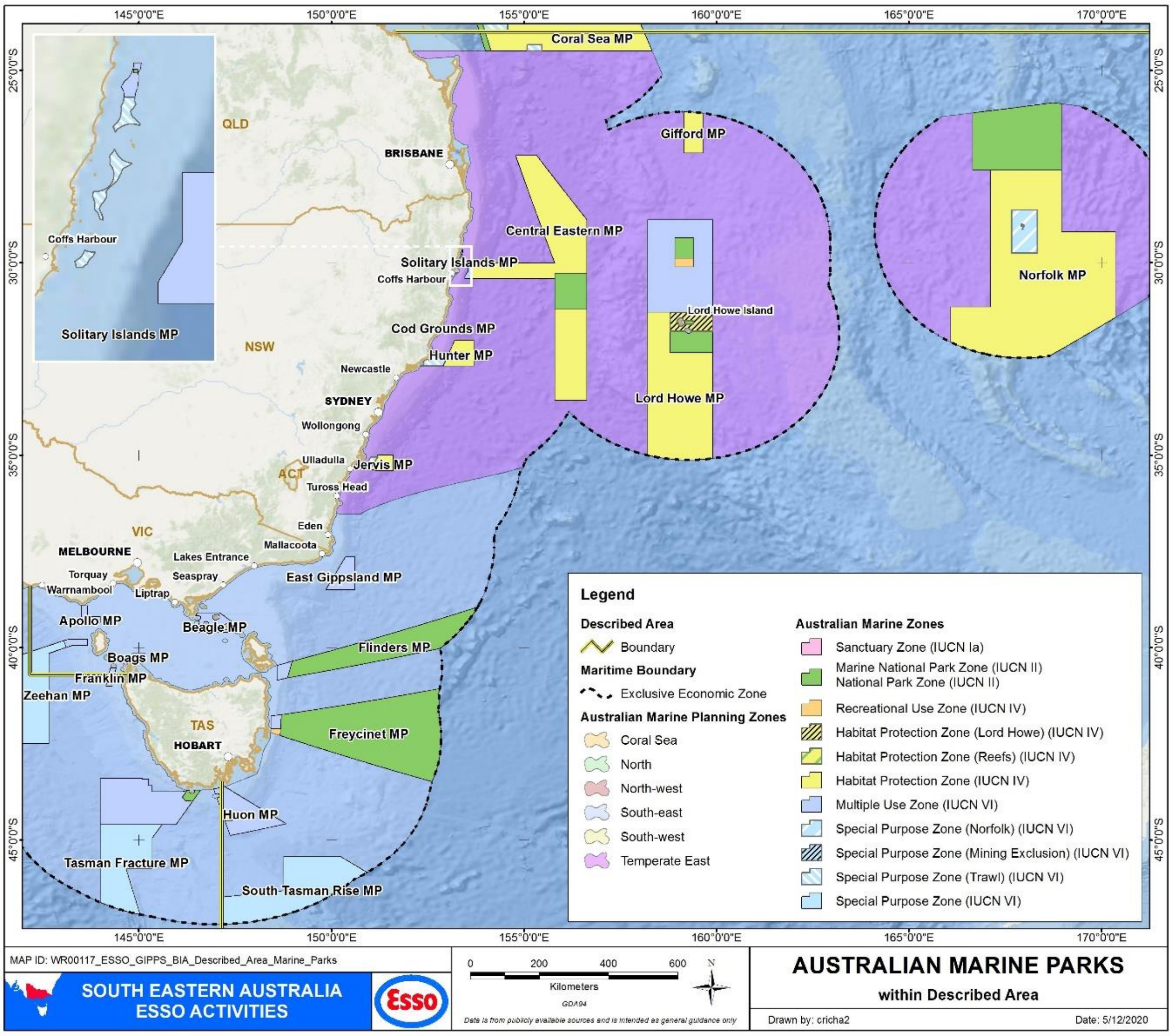


Figure 2-15 Australian Marine Parks within the DA

2.2.6.1 East Gippsland Marine Park

The East Gippsland Marine Park (4,137 km2) is off the north-east corner of Victoria, on the continental slope and escarpment and the closest of the Marine Parks to the EGBPA. The full area of the Marine Park is designated as a multiple use zone (IUCN VI).

The East Australian Current funnels warm waters through the marine park over the complex seafloor features causing eddies to form off Cape Howe. This results in conditions in which phytoplankton flourish, thereby attracting and supporting an abundance of marine life. The main features of the seafloor are the continental shelf, the steep escarpments and deep canyons.

Details of the East Gippsland Marine Park are listed in Table 2-13 (DNP, 2013). The full extent of the East Gippsland Marine Park occurs within the DA (Figure 2-15); as such all conservation values identified above are considered applicable to this region.

Table 2-13 East Gippsland CMR: SE Commonwealth Marine Reserves Network Management Plan 2013-2023 (DNP, 2013)

<table>
<tr><td>Proclaimed</td><td colspan="4">28 June 2007</td></tr>
<tr><td>IUCN category assigned by this Management Plan and reserve management zone name</td><td colspan="4">IUCN VI—Multiple Use Zone</td></tr>
<tr><td rowspan="2">Assigned zones in reserve:</td><td>IUCN Ia</td><td>IUCN II</td><td>IUCN IV</td><td>IUCN VI</td></tr>
<tr><td></td><td></td><td></td><td>Multiple Use Zone</td></tr>
<tr><td>Depth of reserve below seabed</td><td colspan="4">100 m</td></tr>
<tr><td>Total area</td><td colspan="4">4,137 km^2 (413 700 ha).</td></tr>
<tr><td>Major conservation values</td><td colspan="4">Examples of ecosystems, habitats and communities associated with:
• the Southeast Transition
and associated with sea-floor features:
• abyssal plain/deep ocean floor
• canyon
• escarpment
• knoll/abyssal hill
• slope
Features with high biodiversity and productivity:
• Bass Cascade
• upwelling east of Eden
Important foraging area for:
• Wandering, Black-browed, Yellow-nosed and Shy albatrosses; Great-winged petrel; Wedge-tailed shearwater; and Cape petrel
Important migration area for:
• Humpback whale</td></tr>
<tr><td>Location</td><td colspan="4">The East Gippsland Commonwealth Marine Reserve is off the north-east corner of Victoria, on the continental slope and escarpment.</td></tr>
<tr><td>General description of the reserve</td><td colspan="4">The East Gippsland Commonwealth Marine Reserve contains representative samples of an extensive network of canyons, continental slope and escarpment at depths from 600 m to more than 4000 m.

The geomorphic features of this reserve include rocky-substrate habitat, submarine canyons, escarpments and a knoll, which juts out from the base of the continental slope.

The reserve includes both warm and temperate waters, which create habitat for free-floating aquatic plants or microscopic plants (i.e. phytoplankton) communities. Complex seasonality in oceanographic patterns influences the biodiversity and local productivity.

The East Australian Current brings subtropical water from the north, and around Cape Howe the current forms large eddies, with a central core of warm water. Around the outside of the eddies, cooler, nutrient-rich waters mix with the warm water creating conditions for highly productive phytoplankton growth, which supports a rich abundance</td></tr>
</table>

	of marine life. During winter, upwellings of cold water may occur and bring nutrient-rich waters to the surface, boosting productivity. Many oceanic seabirds forage in these waters, including albatrosses (e.g. Wandering, Black-browed, Yellow-nosed and Shy albatrosses), the Great- winged petrel, Wedge-tailed shearwater and Cape petrel. Humpback whales pass by during their migrations north and south along the eastern seaboard.

2.2.6.2 Beagle Marine Park

The Beagle Marine Park (2,928 km2) lies entirely within Bass Strait, encompassing Tasmania's Kent Group Marine Reserve and the Hogan and Curtis Island groups; and is nearby to the north-east is Victoria's Wilsons Promontory Marine National Park. The full area of the Marine Park is designated as a multiple use zone (IUCN VI).

The Beagle Marine Park was once dry land which connected mainland Australia to Tasmania. After the ending of the last ice-age, the melting glaciers caused sea levels to rise and the connection to Tasmania was lost leaving the Bass Strait islands and an area of shallow waters 50-70m depth. Further information on the Hogan Group of islands, the Kent Group and other protected areas is described in Section 2.2.8, National Parks and Reserves. Detailed information on the Beagle Marine Park is presented in Table 2-14 (DNP, 2013).

The full extent of the Beagle Marine Park occurs within the DA (Figure 2-15); as such all conservation values identified in the park are considered applicable to this region.

Table 2-14 Beagle CMR: SE Commonwealth Marine Reserves Network Management Plan 2013-2023 (DNP, 2013)

Proclaimed	28 June 2007			
IUCN category assigned by this Management Plan and reserve management zone name	IUCN VI—Multiple Use Zone			
Assigned zones in reserve:	IUCN Ia	IUCN II	IUCN IV	IUCN VI
				Multiple Use Zone
Depth of reserve below seabed	100 m			
Total area	2,928 km^2 (292 800 ha)			
Major conservation values	Ecosystems, habitats and communities associated with: • the Southeast Shelf Transition. and associated with sea-floor features: • basin • plateau • shelf • sill Important migration and resting on migration area for: • southern right whale Important foraging area for: • Australian fur seal • Killer whale • Shy albatross, Australasian gannet, Short-tailed shearwater, Pacific and Silver gulls, • Crested tern, Common diving petrel, Fairy prion, Black-faced cormorant and Little penguin			

	• White shark Cultural and heritage sites: • the wreck of the steamship SS Cambridge • the wreck of the ketch Eliza Davies
Location	The Beagle Commonwealth Marine Reserve lies entirely within Bass Strait, with its north-western edge abutting Victorian waters south-east of Wilson's Promontory. It is a shallow-water reserve surrounding a collection of Bass Strait islands.
General description of the reserve	The Beagle Commonwealth Marine Reserve represents an area of shallow continental shelf ecosystems in depths of about 50–70 m that extends around south-eastern Australia to the east of Tasmania. The sea floor that it covers formed a land bridge between Tasmania and Victoria during the last ice age 10 000 years ago. Its boundary encloses Tasmania's Kent Group Marine Reserve and the Hogan and Curtis Island groups. Nearby to the north-east is Victoria's Wilsons Promontory Marine National Park. The reserve encompasses the fauna of central Bass Strait, which is expected to be especially rich based on studies of several sea floor–dwelling animal groups. Its ecosystems are similar to those documented for the deeper sections of the Kent Group Marine Reserve, especially those based around habitats of 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. Islands encompassed by the reserve and nearby islands support important breeding colonies for many seabirds and for the Australian fur seal. The waters of the reserve provide an important foraging area for those species breeding nearby. The rich marine life also attracts top predators, such as the great white shark and killer whales. The SS Cambridge, a British freighter, which lies in the reserve to the east of Wilson's Promontory, was sunk in 1940 by a WWII mine. The trading ketch Eliza Davies, which lies in the reserve to the east of Wilson's Promontory, sunk under tow in 1924.

2.2.6.3 Flinders Marine Park

The Flinders Marine Park (27,043 km2) is east of the north-east tip of Tasmania and Flinders Island, and extends over 400 km eastward. The Marine Park has two management zones: Marine National Park (IUCN II), and a multiple use zone (IUCN VI).

Seafloor habitats found in this marine park are the continental shelf, and a long section of steep continental slope cut through by a series of deep canyons, a large seamount and areas of sandy and muddy sediments. As per the East Gippsland Marine Park, Flinders Marine Park is influenced by the East Australian Current forming large-scale eddies which ultimately result in an abundance of marine fauna. Detailed information on the Beagle Marine Park is presented in Table 2-15 ((DNP, 2013)).

The full extent of the Flinders Marine Park occurs within the DA (Figure 2-15); as such all conservation values identified above are considered applicable to this region.

Table 2-15 Flinders CMR: SE Commonwealth Marine Reserves Network Management Plan 2013-2023 (DNP, 2013)

Proclaimed	28 June 2007			
IUCN category assigned by this Management Plan and reserve management zone name	IUCN II—Marine National Park zone			
	IUCN Ia	IUCN II	IUCN IV	IUCN VI

Assigned zones in reserve: **2**		Marine National Park Zone		Multiple Use Zone
Depth of reserve below seabed	100 m			
Total area	27 043 km^2 (2 704 300 ha)			
Major conservation values	Examples of ecosystems, habitats and communities associated with: • the Tasmania Province • the Tasmanian Shelf Province • the Southeast Transition • the Southeast Shelf Transition And associated with sea-floor features: • abyssal plain/deep ocean floor • canyon • plateau • seamount/guyot • shelf slope Features with high biodiversity and productivity: • east Tasmania subtropical convergence zone Important foraging area for: • wandering, black-browed, yellow-nosed and shy albatrosses, northern giant petrel, Gould's petrel and cape petrel • killer whale • white shark • Harrison's dogfish Important migration area for: • humpback whale			
Location	The Flinders Commonwealth Marine Reserve is east of the north-east tip of Tasmania and Flinders Island, and extends over 400 km eastward.			
General description of the reserve	The Flinders Commonwealth Marine Reserve covers a depth range from about 40 m on the shallow continental shelf to abyssal depths of 3000 m or more near the edge of Australia's exclusive economic zone. Key features of this area are the continental shelf, and a long section of steep continental slope, incised by a series of deep submarine canyons. Sea bottom habitats include sheer rocky walls and large rocky outcrops that support a rich diversity of small seabed animals, such as lace corals and sponges. These and the large expanses of sandy and muddy sediments are habitats to a wide variety of fishes and to populations of the giant crab. Areas between 400 m and 600 m of the continental slope sea floor are habitat for dogfish and gulper sharks, and Harrison's dogfish has been recently recorded in the reserve. The biodiversity of the reserve is influenced by summer incursions of the warm East Australian Current and associated large-scale eddies. Another prominent feature is a large offshore seamount believed to be too deep to have been fished. Seamounts are generally considered to be important centres of deep ocean biodiversity, offering a wide range of habitats at different depths and			

	orientations to currents. The large seamounts to the east of Tasmania are believed to be individually important, providing habitat to species that may be unique to each seamount and to a range of more widely occurring species that make their homes only on their rocky slopes. Presently, little is known about the fauna of these seamounts, but based on information from other better known offshore seamounts, seabed animals are expected to include endemic species.

2.2.6.4 Freycinet Marine Park

The Freycinet Commonwealth Marine Park (57,942 km2) is east of Tasmania, offshore from the Freycinet Peninsula. The Marine Park has three management zones: Marine National Park (IUCN II), recreational use zone (IUCN IV) and a multiple use zone (IUCN VI).

The Freycinet Marine Park begins offshore from Bicheno and Freycinet National Park on the east coast of Tasmania and extends out to over 3,000 m depth covering seafloor features such as seamounts, deep sea (abyssal) plains, canyons and deep granite reefs. Detailed information on the Freycinet Marine Park is presented in Table 2-16 (DNP, 2013).

The offshore region of the Freycinet Marine Park occurs within the DA (Figure 2-15); as such all conservation values relevant to the deeper offshore waters are considered applicable to this region.

Table 2-16 Freycinet CMR: SE Commonwealth Marine Reserves Network Management Plan 2013-2023 (DNP, 2013)

Proclaimed	28 June 2007			
IUCN category assigned by this Management Plan and reserve management zone name	IUCN II—Marine National Park zone			
Assigned zones in reserve:	IUCN Ia	IUCN II	IUCN IV	IUCN VI
3		Marine National Park Zone	Recreational Use Zone	Multiple Use Zone
Depth of reserve below seabed	100 m			
Total area	57 942 km^2 (5 794 200 ha)			
Major conservation values	Examples of ecosystems, habitats and communities associated with: • the Tasmania Province • the Tasmanian Shelf Province • the Southeast Transition And associated with sea-floor features: • abyssal plain/deep ocean floor • canyon • escarpment • knoll/abyssal hill • saddle • seamount/guyot • shelf			

	• terrace Features with high biodiversity and productivity: • east Tasmania subtropical convergence zone Important foraging area for: • wandering, black-browed and shy albatrosses, cape petrel and fairy prion • sei whales and killer whales Important migration and resting on migration area for: • southern right whale Important migration area for: • humpback whale
Location	The Freycinet Commonwealth Marine Reserve is east of Tasmania, offshore from the Freycinet Peninsula.
General description of the reserve	The Freycinet Commonwealth Marine Reserve covers a depth range from about 40 m on the shallow continental shelf, to abyssal depths of 3000 m or more at the edge of Australia's exclusive economic zone. The reserve spans the continental shelf and deeper water ecosystems that extend around south-eastern Australia to the east of Tasmania. The shelf is adjoined to a large offshore saddle. The reserve also includes large offshore seamounts, which are believed to be too deep to have been fished. Seamounts are generally considered to be important centres of biodiversity. They offer a wide range of habitats at different depths and orientations to currents. The seamounts east of Tasmania are also believed to be individually important, providing habitat to species that may be unique to each seamount. The shallower part of the reserve includes habitat important to seabirds. White shark also forage in the reserve.

2.2.6.5 Boags Marine Park

The Boags Marine Park is north of Three Hummock Island off Tasmania's north-west coast. It covers 537 square kilometres, with depths mostly between 40 metres and 80 metres.

The shallow waters of central Bass Strait are home to rich arrays of animals that live on the seafloor and in the sediment, including crustaceans, molluscs and polychaete worms. Seabirds from colonies on nearby islands forage also in the area (DNP, 2013).

The marine park is a Multiple Use Zone.

Table 2-17 Boags CMR: SE Commonwealth Marine Reserves Network Management Plan 2013-2023 (DNP, 2013)

Proclaimed	28 June 2007			
IUCN category assigned by this Management Plan and reserve management zone name	IUCN VI—Multiple Use Zone			
Assigned zones in reserve:	IUCN Ia	IUCN II	IUCN IV	IUCN VI
				Multiple Use Zone

Depth of reserve below seabed	100 m
Total area	537 km2 (53 700 ha).
Major conservation values	Ecosystems, habitats and communities associated with:: • the Bass Strait Shelf Province And associated with sea-floor features: • plateau • tidal sandwave/sandbank Important foraging area for: • shy albatross, Australasian gannet, short-tailed shearwater, fairy prion, black-faced cormorant, common diving petrel and little penguin
Location	The Boags Commonwealth Marine Reserve is off the north-west tip of Tasmania, north of Three Hummock Island. The reserve is wholly contained within western Bass Strait.
General description of the reserve	The Boags Commonwealth Marine Reserve represents an area of shallow ecosystems that has a depth range mostly between 40m and 80 m. It encompasses the fauna of central Bass Strait, which is expected to be especially rich based on studies of several sea floor–dwelling animal groups. The Boags Marine Reserve contains a rich array of life, particularly bottom-dwelling animals and animals living in the sea-floor sediments and muds, such as crustaceans, polychaete worms and molluscs, as is common for the Bass Strait seabed. The reserve is adjacent to the important seabird breeding colonies of Tasmania's north-west, particularly the Hunter group of islands (Three Hummock Island, Hunter Island, Steep Island, Bird Island, Stack Island and Penguin Islet), and so is an important foraging area for a variety of seabirds. White shark also forage in the reserve.

2.2.6.6 Apollo Marine Park

The Apollo Commonwealth Marine Reserve (118,400 ha) is representative of the continental shelf that extends from South Australia to the west of Tasmania. The park is located off the southern tip of Cape Otway just beyond the Victorian state boundary down to the north of King Island in Tasmania. The waters of the reserve are exposed to large swell waves generated from the south-west and strong tidal flows. Detailed information on the Apollo Marine Park is presented in Table 2-18 (PA, 2019c).

Table 2-18 Apollo CMR: SE Commonwealth Marine Reserves Network Management Plan 2013-2023 (PA, 2019c)

Proclaimed	28 June 2007			
IUCN category assigned by this Management Plan and reserve management zone name	IUCN VI—Multiple Use Zone			
Assigned zones in reserve:	IUCN Ia	IUCN II	IUCN IV	IUCN VI
				Multiple Use Zone
Depth of reserve below seabed	100 m			
Total area	1184 km2 (118 400 ha).			
Major conservation values	Ecosystems, habitats and communities associated with:: • the Western Bass Strait Shelf Transition • Bass Strait Shelf Province And associated with sea-floor features: • deep hole valley			

	• 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
Location	The Apollo Commonwealth Marine Reserve is in Bass Strait south of Cape Otway and Apollo Bay in western Victoria, and north-west of King Island.
General description of the reserve	The Apollo Commonwealth Marine Reserve represents the continental shelf that extends from South Australia to the west of Tasmania. The cool waters of the reserve are less than 50 m deep near Cape Otway. The reserve includes the Otway Depression, a 100 m deep undersea valley joining the Bass Basin to the open ocean. This valley was an outlet channel for the ancient Bass Lake and mainland river systems, which existed during the last ice age. The waters of the reserve are exposed to large swell waves generated from the southwest and strong tidal flows. The sea floor has many rocky reef patches interspersed with areas of sediment and, in places, has rich, benthic fauna dominated by sponges. Seabirds, dolphins, seals and white shark forage in the reserve, and blue whales migrate through Bass Strait. The MV City of Rayville, a United States of America freighter, which lies in the reserve south of Cape Otway, was sunk in 1940 by a mine.

2.2.6.7 Zeehan Marine Park

The Zeehan marine park is south-west of King Island. It covers 19,897 km^2 with depths from about 50 metres to over 3000 metres. The park has four undersea canyons cutting into the continental shelf. The Zeehan current, an extension of the Leeuwin current from the west runs along the west coast of Tasmania and reaches the southern tip at its strongest point in winter. Zeehan Marine Park is a nursery ground for blue warehou and ocean perch. Concentrations of larval fish of these species are found in the marine park as well as the commercially fished species of Tasmanian giant (PA, 2019e).

Table 2-19 Zeehan CMR: SE Commonwealth Marine Reserves Network Management Plan 2013-2023 (PA, 2019e)

<table>
<tr><td>Proclaimed</td><td colspan="4">28 June 2007</td></tr>
<tr><td>IUCN category assigned by this Management Plan and reserve management zone name</td><td colspan="4">IUCN VI—Multiple Use Zone</td></tr>
<tr><td rowspan="3">Assigned zones in reserve: 2</td><td>IUCN Ia</td><td>IUCN II</td><td>IUCN IV</td><td>IUCN VI</td></tr>
<tr><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td>Multiple Use Zone (933 km2)</td></tr>
<tr><td>Special Purpose Zone

(18 967 km^2)</td></tr>
<tr><td>Depth of reserve below seabed</td><td colspan="4">100 m</td></tr>
<tr><td>Total area</td><td colspan="4">19,897 km2 (1,989,700 ha).</td></tr>
<tr><td>Major conservation values</td><td colspan="4">Ecosystems, habitats and communities associated with::

• the Tasmania Province
• the West Tasmania Transition
• the Western Bass Strait Shelf Transition</td></tr>
</table>

	• Bass Strait Shelf Province And associated with sea-floor features: • abyssal plain/dep ocean floor • canyon • deep hole valley • knoll/abyssal hill • shelf • slope Important migration area for: • blue and humpback whales Important foraging area for: • black-browed, wandering and shy albatross and great-winged and cape petrels
Location	The Zeehan Commonwealth Marine Reserve is north-west of Tasmania.
General description of the reserve	The Zeehan Commonwealth Marine Reserve covers a broad depth range, from the shallow continental shelf at a depth of about 50 m to the abyssal plain, which is over 3000 m deep. A significant feature of this reserve is a series of four submarine canyons that incise the continental slope, extending from the shelf edge to the abyssal plain. Biodiversity and productivity on the outer shelf and upper slope in this reserve are influenced by the Zeehan Current and its interactions with the canyons. The reserve includes a variety of seabed habitats, including exposed limestone, that support rich animal communities of large sponges and other, permanently fixed, invertebrates on the continental shelf. There are also extensive 'thickets' of low invertebrate animals, such as lace corals and sponges, on the continental slope. These communities are exceptionally diverse and include species new to science. The rocky limestone provides important habitats for a variety of commercial fish species, including Australia's giant crab. Concentrations of larval blue warehou and ocean perch indicate the area is a nursery ground. It is also a foraging area for a variety of seabirds and white shark.

2.2.6.8 Franklin Marine Park

The Franklin Marine Park is located off the north-western point of Tasmania, south of King Island. It mostly comprises of water depths of approximately 40 m except for a deep valley in the southern end of the reserve which drops to 150m depth. Seabirds from the numerous breeding colonies on nearby islands including Albatross Island, Black Pyramid Rock and other Hunter Group islands forage in the park (PA, 2019d). Detailed information on the Franklin Marine Park is presented in Table 2-20 (PA, 2019d).

Table 2-20 Franklin CMR: SE Commonwealth Marine Reserves Network Management Plan 2013-2023 (PA, 2019d))

Proclaimed	28 June 2007			
IUCN category assigned by this Management Plan and reserve management zone name	IUCN VI—Multiple Use Zone			
Assigned zones in reserve:	IUCN Ia	IUCN II	IUCN IV	IUCN VI
				Multiple Use Zone
Depth of reserve below seabed	100 m			
Total area	671 km2 (67 100 ha).			
Major conservation values	Ecosystems, habitats and communities associated with:: • The Tasmanian Shelf province • the Western Bass Strait Shelf Transition			

	And associated with sea-floor features: • shelf • deep hole valley • escarpment • plateau Important foraging area for: • shy albatross, short-tailed shearwater, Australasian gannet, fairy prion, little penguin, common diving petrel, black-faced cormorant and silver gull
Location	The Franklin Commonwealth Marine Reserve is west of the north-western corner of Tasmania and south-east of King Island.
General description of the reserve	The Franklin Commonwealth Marine Reserve represents an area of shallow continental shelf ecosystems and incorporates areas of two major bioregions: western Bass Strait and the Tasmanian shelf. Its cool temperate waters are exposed to large swells driven by westerly gales. At its northern end, the waters are only 40 m deep, and in much of the reserve the sea floor slopes gently and is covered by fine and coarse sediments. At the southern end of the reserve there is a valley where the water is up to 150 m deep. The reserve provides a feeding ground for a variety of seabirds, such as the fairy prion, shy albatross, silver gull, short-tailed shearwater, black-faced cormorant and common diving petrel that have breeding colonies on the nearby Hunter group of islands. Black Pyramid Rock, 6 km north of the reserve supports the largest breeding colony of the Australasian gannet in Tasmania, and one of only eight breeding sites for this species in Australia. White shark also forage in the reserve

2.2.6.9 Huon Marine Park

The Huon Commonwealth Marine Park off Southern Tasmania covers approximately 991 square kilometres of outer continental shelf, continental slope and deeper seabed, ranging from 70 metres to over 3000 metres. It has more than 120 seamounts within the marine park, the largest cluster in Australia. The seamounts are cone-shaped remnants of extinct volcanoes rising from the seafloor, up to 25km across at the base and rising 200 to 500 m from the seabed. Some 'summits' are over 1000 metres below the surface. In an otherwise bare substrate, seamounts provide hard, elevated and current swept attachment sites for communities of filter feeding fauna such as corals, sponges, sea stars and anemones (CSIRO, 2007). Their structural form made of massive accumulations of the reef building stony coral also provides habitat for a smaller mobile fauna such as crustaceans, brittle stars, urchins and molluscs. The marine park protects spawning grounds for basketwork eels and commercial fish species, including ocean perch. Details of the Huon Marine Park are listed in Table 2-21 (PA, 2019a).

The marine park has Habitat Protection and Multiple Use zones. The Tasmanian seamounts are also on the Commonwealth Heritage List and are also listed as a key ecological feature (refer Section 2.2.7.5).

Table 2-21 Huon CMR: SE Commonwealth Marine Reserves Network Management Plan 2013-2023 (PA, 2019a)

Proclaimed	28 June 2007			
IUCN category assigned by this Management Plan and reserve management zone name	IUCN VI—Multiple Use Zone			
Assigned zones in reserve:			IUCN IV	IUCN VI
2			Habitat Protection Zone (389 km2)	Multiple Use Zone (9602 km2)

Depth of reserve below seabed	100 m
Total area	9991 km2 (999 100 ha)
Major conservation values	Examples of ecosystems, habitats and communities associated with: • the Tasmanian Shelf Province • the Tasmania Province And associated with sea-floor features: • canyon • knoll/abyssal hill (seamount) • pinnacle • saddle • shelf • terrace Features with high biodiversity and productivity: • seamounts south and east of Tasmania Important foraging area for: • black-browed, Buller's and shy albatrosses, great-winged petrel, short-tail shearwater and fairy prion • Australian fur seal and killer whale • Important migration area for: • humpback whale
Location	The Huon Commonwealth Marine Reserve is south-east of Tasmania.
General description	The Huon Commonwealth Marine Reserve covers a broad depth range from the inner continental shelf at about 70 m, to abyssal depths of more than 3000 m. The majority of the area is in deep water. The Tasman Seamounts Marine Reserve that was proclaimed in 1999 has been wholly incorporated into the Huon Commonwealth marine reserve. The reserve contains a cluster of seamounts that appear as cone-shaped submerged mountains, which provide a range of depths for a diversity of plants and animals. The peaks of many of the reserve's seamounts are between 750 m and 1000m below the sea surface and support endemic species, including large erect corals and sponges. Some of the flora and fauna are hundreds and possibly thousands of years old, making them some of the longest-lived animals on Earth. The reserve also provides an important connection between seamounts of the Indian Ocean and the Tasman Sea. Seamounts are regarded as areas of increased productivity in the otherwise nutrient-poor open ocean. Their topography accelerates water currents to provide a consistent and relatively rich food source for filter feeders, and which sweeps the seamounts clear of fine sediments, exposing rocks for animals, such as corals, to attach to. Seamounts are generally considered to be important stepping stones in the transoceanic dispersal of larvae of bottom-dwelling species. The habitat protection zone was established to protect the unique and vulnerable benthic communities of the reserve's seamounts. The zone includes seamounts rising 650–1000 m above the sea floor, which have been subject to commercial fishing. Deeper seamounts, peaking at 1150–1700 m above the sea floor, have not been fished, and are in pristine condition. Benthic communities include coral dominated communities found at depths less than 1400 m. The hard coral Solensomilia variabilis forms a dense matrix that provides a platform for hydroids and sponges; stone corals; and black, gold and bamboo corals. Benthic communities deeper than 1400 m are urchin dominated. The reserve is a foraging area for white shark and seabirds and a spawning or nursery area for important commercial fish, including ocean perch and blue warehou.

2.2.6.10 Solitary Islands Marine Park

Solitary Islands Marine Park offshore northern NSW is a place where many species occur at the limits of their range as the East Australian Current meets cooler waters from the south. The marine park includes Pimpernel Rock, a submerged pinnacle rising to within a few metres of the surface. Also, the critically endangered grey nurse sharks gather here, making it a popular dive spot. Details of the park are described in Table 2-22 (DNP, 2018).

Table 2-22 Solitary Islands Marine Park CMR: Temperate East Marine Parks Network Management Plan

<table>
<tr><td>Proclaimed</td><td colspan="4">14 December 2013</td></tr>
<tr><td>IUCN category assigned by this Management Plan and reserve management zone name</td><td colspan="4">IUCN category VI – Multiple Use Zone</td></tr>
<tr><td rowspan="3">Assigned zones in reserve:</td><td>IUCN Ia</td><td>IUCN II</td><td>IUCN IV</td><td>IUCN VI</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">National Park Zone</td><td rowspan="2"></td><td>Multiple Use Zone</td></tr>
<tr><td>Special Purpose Zone (Trawl)</td></tr>
<tr><td>Depth of reserve below seabed</td><td colspan="4">between 15 m and 70 m.</td></tr>
<tr><td>Total area</td><td colspan="4">152 km ²</td></tr>
<tr><td>Major conservation values</td><td colspan="4">Natural values:
• Open-ocean, subtidal reef and soft substrate habitats.
• Pimpernel Rock is a significant feature of the Marine Park. It is a submerged pinnacle that rises from the seabed to within a few metres of the surface. It provides habitat for benthic communities, pelagic fish, and other marine life.
• Ecosystems of this area are influenced by tropical waters of the East Australian Current meeting temperate, southern waters, creating a combination of tropical and temperate environments.
• Supports a range of species, including species listed as threatened, migratory, marine or cetacean
Important area for:
• Foraging of seabirds
• Migrating and foraging habitat for sharks
• Migrating humpback whales

Culture
• Sea country is valued for Indigenous cultural identity, health and wellbeing.
• Across Australia, Indigenous people have been sustainably managing their sea country for tens of thousands of years. Yaegl People have native title over this area with their sea country extending into the southern portion of the Marine Park
Heritage
• Nil

Social and economic values
• Tourism, commercial fishing, recreation, including fishing, are important activities in the Marine Park. These activities contribute to the wellbeing of regional communities and the prosperity of the nation.</td></tr>
</table>

Location	Located approximately 5.5 km offshore of New South Wales, adjacent to the NSW Solitary Islands Marine Park (adjacent to the north coast, NSW).
General description of the reserve	The Solitary Islands Marine Park is significant because it contains habitats, species and ecological communities associated with the Central Eastern Shelf Transition. The Marine Park contains habitat for species of special conservation interest such as grey nurse sharks, and biologically important areas for humpback whale, white shark and a number of migratory seabirds. The Marine Park includes habitats connecting to and complementing the adjacent New South Wales Solitary Islands Marine Park. The Marine Park includes habitats connecting to and complementing the adjacent New South Wales Lord Howe Island Marine Park.

2.2.6.11 Lord Howe Marine Park

The Lord Howe Marine Park surrounds the NSW Lord Howe Island Marine Park (refer Section 2.2.8.37) and extends further seaward to 12 nautical miles. The waters – a unique mix of warm tropical and cool temperate ocean currents – are home to over 500 fish species, more than 90 coral species and countless other marine species, many only found in the immediate area. A wide range of habitats include a barrier coral reef and lagoon, and fringing reefs dominated either by coral or macroalgal communities. Details of the park are described in Table 2-23 (DNP, 2018).

Table 2-23 Lord Howe Marine Park CMR: Temperate East Marine Parks Network Management Plan 2018 (DNP, 2018)

Proclaimed	14 December 2013			
IUCN category assigned by this Management Plan and reserve management zone name	IUCN category IV - Habitat Protection Zone			
Assigned zones in reserve:	IUCN Ia	IUCN II	IUCN IV	IUCN VI
		National Park Zone	Habitat Protection Zone Habitat Protection Zone (Lord Howe) Recreation Zone	Special Purpose Zone (Trawl)
Depth of reserve below seabed	between 15 m and 6000 m.			
Total area	110,126 km ²			
Major conservation values	Ecosystems, habitats and communities associated with:: • Lord Howe Province—due to the convergence of warm, tropical and cooler temperate waters in the area, the Marine Park supports a unique mix of tropical, subtropical and temperate species, many found at the northern or southern extent of their range. • Tasman Basin Province—interactions between currents, eddies and seamounts and the movements of the deep sub-Antarctic water mass influence biological productivity in this area. Important area for: • Foraging and breeding of seabirds • Migrating humpback whales			

	Key ecological features of the Marine Park are: • Lord Howe Seamount Chain—a chain of submerged volcanoes running 1000 km north–south, the seamount chain includes Lord Howe Island and Elizabeth and Middleton Reefs. These isolated, oceanic reefs support a diverse range of tropical and temperate marine life, including both warm-water and cold-water corals and an abundance of fish species. This diversity is a result of the effect of the East Australian Current on the reefs as it exposes the area to its warm waters, in contrast to the surrounding cooler ocean. • Elizabeth and Middleton Reefs—small, isolated, oceanic platforms reefs that occur on top of the volcanic seamounts of the Lord Howe seamount chain. The lagoons of both reefs are important areas for populations of black cod and the Galapagos shark. • Tasman Front and eddy field—a region that separates the warm, nutrient-poor waters of the Coral Sea from the cold, nutrient-rich waters of the Tasman Sea, providing increased nutrients and plankton aggregations, and enhanced productivity that attracts mobile species such as turtles, cetaceans, tuna and billfish. Culture • The marine environment around Lord Howe Island has long held significance among Lord Howe Islanders. A unique community and culture has developed by those who have visited and settled the island over time Sea country is valued for Indigenous cultural identity, health and wellbeing. • Across Australia, Indigenous people have been sustainably managing their sea country for tens of thousands of years. At the commencement of this plan, there is limited information about the cultural significance of this Marine Park due to its remote location World Heritage • Parts of the Marine Park are within the world heritage-listed Lord Howe Island Group, which was listed as an area of outstanding universal value under the World Heritage Convention in 1982. The Lord Howe Island Group comprises Lord Howe Island, Admiralty Islands, Mutton Bird Islands, Ball's Pyramid, and associated coral reefs and marine environments. It includes spectacular landscapes, volcanic mountains, and diverse low-lying rainforests, palm forests and grasslands. There are a large number of species of native plants, of which many are endemic to Lord Howe Island, and colonies of endangered seabirds. National Heritage • The Lord Howe Island Group was included in the National Heritage List in 2007. Historic shipwrecks • The Marine Park contains over 25 known shipwrecks listed under the Historic Shipwrecks Act 1976. Social and economic values • Tourism, commercial fishing, recreation, including fishing, and scientific research, are important activities in the Marine Park. These activities contribute to the wellbeing of regional communities and the prosperity of the nation.
Location	The Lord Howe Marine Park is located approximately 550 km offshore of New South Wales, adjacent to the New South Wales Lord Howe Island Marine Park and World Heritage Area.
General description of the reserve	The Lord Howe Marine Park is significant because it includes habitats, species and ecological communities associated with the Lord Howe Province and the Tasman Basin Province. It includes three key ecological features: the Lord Howe Seamount Chain; Elizabeth and Middleton Reefs (the southernmost coral reefs in the world); and the Tasman Front and eddy field, all valued for high productivity, aggregations of marine life, biodiversity and endemism. The Elizabeth and Middleton Reefs Ramsar site is located within the Marine Park. The site was listed under the Ramsar Convention in 2002 and is a wetland of

	international importance under the EPBC Act, due to its unique nature as the southernmost open-ocean coral-reef platform in the world. The Marine Park includes habitats connecting to and complementing the adjacent New South Wales Lord Howe Island Marine Park.

2.2.6.12 Central Eastern Marine Park

Central Eastern Marine Park begins 30 kilometres east of Coffs Harbour. It covers 70,054 km², with depths from 120 m to 6000 m. It has National Park, Habitat Protection and Multiple Use zones. And is located between the Hunter and the Lord Howe Commonwealth Marine Parks. Details of the park are described in Table 2-24 (DNP, 2018).

Table 2-24 Central Eastern Marine Park CMR: Temperate East Marine Parks Network Management Plan 2018 (DNP, 2018)

<table>
<tr><td>Proclaimed</td><td colspan="4">14 December 2013</td></tr>
<tr><td>IUCN category assigned by this Management Plan and reserve management zone name</td><td colspan="4">IUCN category IV - Habitat Protection Zone</td></tr>
<tr><td rowspan="2">Assigned zones in reserve:</td><td>IUCN Ia</td><td>IUCN II</td><td>IUCN IV</td><td>IUCN VI</td></tr>
<tr><td></td><td>National Park Zone</td><td>Habitat Protection Zone</td><td>Special Purpose Zone (Trawl)</td></tr>
<tr><td>Depth of reserve below seabed</td><td colspan="4">between 120 m and 6000 m.</td></tr>
<tr><td>Total area</td><td colspan="4">70,054 km ²</td></tr>
<tr><td>Major conservation values</td><td colspan="4">Ecosystems, habitats and communities associated with:
• Central Eastern Province—includes canyons along the shelf that interact with currents and ocean gyres resulting in upwellings that influence biological productivity. Plankton blooms associated with the upwellings attract aggregations of tuna, whale and albatross and support over 50 fish species endemic to the area.
• Central Eastern Shelf Transition—upwellings caused by the East Australian Current crossing the continental shelf, and river sediment influence biological productivity
• Tasman Basin Province—interactions between currents, eddies and seamounts and the movements of the deep sub-Antarctic water mass influence biological productivity in this area. The deep-reef coral communities on seamounts are dominated by filter feeders and provide stepping stones for large oceanic species moving between breeding, nesting, calving and foraging sites.
Important area for:
• Foraging and breeding of seabirds
• Migrating humpback whales

Key ecological features of the Marine Park are:
• Tasmantid Seamount Chain—a series of underwater volcanic mountains comprised of guyots, seamounts, tablemounts, banks, plateaux and terraces that runs in a north–south direction, and extends into the Tasman Basin. The feature rises from approximately 4800 m deep to 125 m from the surface at Taupo Seamount in the south, approximately 280 m from the surface at Derwent–Hunter Seamount in the centre of the Marine Park, and to approximately 350 m from the surface at Queensland Guyot in the north of the</td></tr>
</table>

	Marine Park. The seamounts support a diverse range of habitats in temperate and subtropical waters • Canyons on the eastern continental slope—canyons enhance diversity and abundance of species, driven by the combined effects of steep and rugged topography, ocean currents, seafloor types and nutrient availability. Canyons also create localised changes in productivity in the water column above them, providing feeding opportunities for a range of species. • Tasman Front and eddy field—a region that separates the warm, nutrient-poor waters of the Coral Sea from the cold, nutrient-rich waters of the Tasman Sea, providing increased nutrients and plankton aggregations, and enhanced productivity that attracts mobile species such as turtles, cetaceans, tuna and billfish. Culture Sea country is valued for Indigenous cultural identity, health and wellbeing. Across Australia, Indigenous people have been sustainably managing their sea country for tens of thousands of years. At the commencement of this plan, there is limited information about the cultural significance of this Marine Park. Heritage • The Marine Park contains two known shipwrecks listed under the Historic Shipwrecks Act 1976— Amelia (wrecked in 1816) and Illagong (wrecked in 1872). Social and economic values • Tourism, commercial fishing, and recreation, including fishing, are important activities in the Marine Park. These activities contribute to the wellbeing of regional communities and the prosperity of the nation.
Location	The Central Eastern Marine Park is located approximately 30 km east of Coffs Harbour at the edge of the continental shelf. It extends to deep ocean waters approximately 200 km offshore of New South Wales.
General description of the reserve	The Central Eastern Marine Park is significant because it includes habitats, species and ecological communities associated with the Central Eastern Province, the Central Eastern Shelf Transition and the Tasman Basin Province. It includes three key ecological features: canyons on the eastern continental slope (valued as a unique seafloor feature with ecological properties of regional significance); the Tasmantid Seamount Chain; and the Tasman Front and eddy field (both valued for high productivity, aggregations of marine life, biodiversity and endemism).

2.2.6.13 Hunter Marine Park

Encompassing three key ecological features, the Hunter Marine Park is located offshore from Port Stephens in NSW and extends out approximately 100km. Details of the Hunter Marine Park are described in Table 2-25 (DNP, 2018).

Table 2-25 Hunter CMR: Temperate East Marine Parks Network Management Plan 2018 (DNP, 2018)

Proclaimed	14 December 2013			
IUCN category assigned by this Management Plan and reserve management zone name	IUCN category IV - Habitat Protection Zone			
Assigned zones in reserve:	IUCN Ia	IUCN II	IUCN IV	IUCN VI
			Habitat Protection Zone	Special Purpose Zone (Trawl)

Depth of reserve below seabed	between 15 m and 6000 m.
Total area	6257 km²
Major conservation values	Ecosystems, habitats and communities associated with:: • Central Eastern Province—includes canyons along the shelf that interact with currents and ocean gyres resulting in upwellings that influence biological productivity. Plankton blooms associated with the upwellings attract aggregations of tuna, whale and albatross and support over 50 fish species endemic to the area. • Central Eastern Shelf Province—upwellings caused by the East Australian Current crossing the continental shelf, and river sediment influence biological productivity in this provincial bioregion that extends south over the continental shelf from the boundary of the Great Barrier Reef Marine Park to offshore Coffs Harbour. Important area for: • Foraging seabirds and humpback whales • Migrating humpback whales • Aggregation of grey nurse sharks Key ecological features of the Marine Park are: • Canyons on the eastern continental slope—canyons enhance diversity and abundance of species, driven by the combined effects of steep and rugged topography, ocean currents, seafloor types and nutrient availability. Canyons also create localised changes in productivity in the water column above them, providing feeding opportunities for a range of species. • Shelf rocky reefs—which have a complex range of benthic habitat that supports diverse benthic communities. • Tasman Front and eddy field—a region that separates the warm, nutrient-poor waters of the Coral Sea from the cold, nutrient-rich waters of the Tasman Sea, providing increased nutrients and plankton aggregations, and enhanced productivity that attracts mobile species such as turtles, cetaceans, tuna and billfish. Heritage • The Marine Park contains one known shipwreck listed under the Historic Shipwrecks Act 1976— India (wrecked in 1884). Social and economic values • Commercial fishing, tourism and recreation, including fishing, are important activities in the Marine Park. These activities contribute to the wellbeing of regional communities and the prosperity of the nation
Location	The Hunter Marine Park extends from the New South Wales state water boundary to approximately 100 km offshore, and adjacent to the New South Wales Port Stephens–Great Lakes Marine Park.
General description of the reserve	The Hunter Marine Park is significant because it contains habitats, species and ecological communities, representative of the Central Eastern Province and the Central Eastern Shelf Province. It includes three key ecological features: canyons on the eastern continental slope (valued for a unique seafloor feature with ecological properties of regional significance); shelf rocky reefs (valued for a unique seafloor feature with ecological properties of regional significance); and the Tasman Front and eddy field (valued for high productivity, aggregations of marine life, biodiversity and endemism). The Marine Park supports a range of species, including species listed as threatened, migratory, marine or cetacean under the EPBC Act. The Marine Park includes habitats connecting to and complementing the adjacent New South Wales Port Stephens–Great Lakes Marine Park.

2.2.6.14 Cod Grounds Marine Park

Cod Grounds covers a small, 4km2 area, 5.5 km offshore, NSW (south of Port Macquarie). It is an important aggregation ground for grey nurse sharks (DNP, 2018). Details of the Cod Ground Marine Park are described in Table 2-26 (DNP, 2018).

Table 2-26 Cod Grounds CMR: Temperate East Marine Parks Network Management Plan 2018 (DNP, 2018)

Proclaimed	14 December 2013			
IUCN category assigned by this Management Plan and reserve management zone name	IUCN category II – National Park Zone			
Assigned zones in reserve:	IUCN Ia	IUCN II	IUCN IV	IUCN VI
		National Park Zone		
Depth of reserve below seabed	between 21 m and 46 m.			
Total area	4 km²			
Major conservation values	Ecosystems, habitats and communities associated with:: • Central Eastern Shelf Transition— ecosystems in this area are influenced by tropical waters of the Eastern Australian Current meeting temperate waters, creating a combination of topical and temperate environments. Many species found within the marine park are at or close to, either their southern or northern geographical limits. Important area for: • Migratory pathway and aggregation area for grey nurse sharks • Migratory and foraging habitat for humpback whales • Foraging habitat for seabirds Key ecological features of the Marine Park are: • Shelf rocky reefs— predominantly rocky reef surrounded by boulder and cobble slopes that support diverse and abundant marine communities. The reefs are interlaced with sand and cobble gutters. Cultural • Sea country is valued for Indigenous cultural identity, health and wellbeing. Across Australia. There is limited, other information about the cultural significance of this Marine Park. Social and economic values • Tourism, scientific research and recreation activities are important in the Marine Park. These activities contribute to the wellbeing of regional communities and the prosperity of the nation			
Location	The Cod Grounds Marine Park is 5.5 km offshore, NSW (south of Port Macquarie).			
General description of the reserve	The Cod Grounds Marine Park is significant because it contains habitats, species and ecological communities representative of the Central Eastern Shelf Transition. It provides habitat for grey nurse sharks.			

2.2.6.15 Jervis Marine Park

Jervis Marine Park comprises an area of 2473 square kilometres and covers a depth range from 120 m to 5000 m approximately.

Seafloor features represented in the reserve include abyssal-plain/deep ocean floor, canyons, shelf and slope. The reserve include two key ecological features, it is one of three shelf incising canyons occurring within the region (unique sea-floor feature with ecological properties of regional significance) and shelf rocky reefs. Details of the Jervis Marine Park are described in Table 2-27 (DNP, 2018).

Table 2-27 Jervis CMR: Temperate East Marine Parks Network Management Plan 2018 (DNP, 2018)

<table>
<tr><td>Proclaimed</td><td colspan="4">14 December 2013</td></tr>
<tr><td>IUCN category assigned by this Management Plan and reserve management zone name</td><td colspan="4">IUCN category IV - Habitat Protection Zone</td></tr>
<tr><td rowspan="2">Assigned zones in reserve:</td><td>IUCN Ia</td><td>IUCN II</td><td>IUCN IV</td><td>IUCN VI</td></tr>
<tr><td></td><td></td><td>Habitat Protection Zone</td><td>Special Purpose Zone (Trawl)</td></tr>
<tr><td>Depth of reserve below seabed</td><td colspan="4">between 120 m and 5000 m</td></tr>
<tr><td>Total area</td><td colspan="4">2473 km²</td></tr>
<tr><td>Major conservation values</td><td colspan="4">Ecosystems, habitats and communities associated with::
• the Central Eastern Province and Southeast Shelf Transition

Important foraging area for:
• seabirds, grey nurse sharks and humpback whales

Key ecological features of the Marine Park are:
• Canyons on the eastern continental slope—canyons enhance diversity and abundance of species, driven by the combined effects of steep and rugged topography, ocean currents, seafloor types and nutrient availability. Canyons also create localised changes in productivity in the water column above them, providing feeding opportunities for a range of species.
• Shelf rocky reefs—which have a complex range of benthic habitat that supports diverse benthic communities.
Heritage
The Marine Park contains one known shipwreck listed under the Historic Shipwrecks Act 1976—HMAS Tattoo (wrecked in 1939).</td></tr>
<tr><td>Location</td><td colspan="4">The Jervis Marine Park is located approximately 20 km offshore, adjacent to the New South Wales Jervis Bay Marine Park and Commonwealth Booderee National Park.</td></tr>
<tr><td>General description of the reserve</td><td colspan="4">The Marine Park supports a range of species, including species listed as threatened, migratory, marine or cetacean under the EPBC Act. Biologically important areas within the Marine Park include foraging habitat for seabirds, grey nurse sharks and humpback whales.</td></tr>
</table>

	Tourism, commercial fishing, and recreation are important activities in the Marine Park. These activities contribute to the wellbeing of regional communities and the prosperity of the nation. Sea country is valued for Indigenous cultural identity, health and wellbeing. Across Australia, Indigenous people have been sustainably managing their sea country for tens of thousands of years. At the commencement of this plan (Temperate East Management Plan), there was limited information about the cultural significance of this Marine Park. The Native Title Services Corporation is the Native Title Service Provider for the New South Wales region.

2.2.6.16 South Tasman Rise Marine Park

The South Tasman Rise is an area of seafloor that lies 550 km south of Hobart, Tasmania in the Southern Ocean where water depths are about 1,500 metres. This deep ocean park covers 27,704 square kilometres. It is designated as a Special Purpose zone.

The reserve supports unique environments for marine life and is an area of significant scientific interest. The seamounts here have flat tops, evidence they were once above the ocean's surface where they were shaped by wind and wave erosion. The rise most probably originates from subsided continental crust that fragmented as Australia and Antarctica separated (AMP, 2019). Australia and New Zealand agreed that there would be no fishing in 2007-08 and indefinitely thereafter. No permits have been issued for this fishery since 2007 (AFMA, 2019). Details of the South Tasman Rise Marine Park are listed in Table 2-28 (DNP, 2013).

Table 2-28 South Tasman Rise CMR: SE Commonwealth Marine Reserves Network Management Plan 2013-2023 (DNP, 2013)

Proclaimed	28 June 2007			
IUCN category assigned by this Management Plan and reserve management zone name	IUCN VI—Special Purpose Zone			
Assigned zones in reserve:	IUCN Ia	IUCN II	IUCN IV	IUCN VI
				Special Purpose Zone
Depth of reserve below seabed	100 m			
Total area	27,704 km^2 (27 704 00 ha)			
Major conservation values	Ecosystems, habitats and communities associated with: • Tasman Province and associated with sea-floor features: • Abyssal plain/deep ocean floor • canyon • plateau • seamount/guyot • slope Important foraging area for: • wandering and black-browed albatrosses, Short-tailed shearwater • white-headed and white-chinned petrels			

Location	The South Tasman Rise Commonwealth Marine Reserve is south-east of Tasmania, with its southern edge following the boundary of the Australian exclusive economic zone, 200 nm from land.
General description of the reserve	The South Tasman Rise Commonwealth Marine Reserve occurs in the deep ocean and includes a section of the mid-continental slope at depths of 1200–3000 m. It encloses a submerged plateau of continental rock that stands as the last remnant of the link between Australia and Antarctica. The sea floor in this reserve was deformed by the massive rifting process when the Australian continental block moved north. The reserve supports unique environments for marine life and is an area of significant scientific interest. It contains several seamounts, some of which have flat summits, which indicates that they were exposed above the surface at some time.

2.2.6.17 Gifford Marine Park

Gifford Marine Park is located in the norther region of the Temperate East Marine Region. Details of the Gifford Marine Park are listed in Table 2-29 (DNP, 2018)

Table 2-29 Gifford CMR: Temperate East Marine Parks Network Management Plan 2018 (DNP, 2018)

Proclaimed	14 December 2014, renamed Gifford Marine Park on 9 October 2017			
IUCN category assigned by this Management Plan and reserve management zone name	IUCN IV—Special Purpose Zone			
Assigned zones in reserve:	IUCN Ia	IUCN II	IUCN IV	IUCN VI
			Habitat Protection Zone	
Depth of reserve below seabed	Depth range of 220 and 4000 m			
Total area	5,828 km^2			
Major conservation values	Ecosystems, habitats and communities associated with: • Ecosystems representative of Lord Howe Province • Abyssal plain/deep ocean floor • canyon • plateau • Lord Howe Seamount Chain • slope Important area for: • a range of threatened species including migratory, marine and cetacean species • foraging habitat for seabirds • migratory pathway for humpback whales Commercial fishing is an important activity in the marine park			
Location	The Gifford Marine Park located approximately 480 km north of Lord Howe Island and borders on the limit of Australia's exclusive economic zone.			
General description of the reserve	The Gifford Marine Park is significant because it contains habitats, species and ecological communities associated with the Lord Howe Province. It includes one key ecological feature: the Lord Howe Seamount Chain, valued for high productivity, aggregations of marine life, biodiversity and endemism.			

2.2.6.18 Norfolk Marine Park

Norfolk Island Marine Park is around Norfolk Island in the External Territories, over 1500 km from mainland Australia. Details of the Norfolk Marine Park are listed in Table 2-30 (DNP, 2018)

Table 2-30 Norfolk Island CMR: Temperate East Marine Parks Network Management Plan 2018 (DNP, 2018)

<table>
<tr><td>Proclaimed</td><td colspan="4">14 December 2013, renamed Norfolk Marine Park on 9 October 2017.</td></tr>
<tr><td>IUCN category assigned by this Management Plan and reserve management zone name</td><td colspan="4">IUCN IV</td></tr>
<tr><td rowspan="2">Assigned zones in reserve:</td><td>IUCN I</td><td>IUCN II</td><td>IUCN IV</td><td>IUCN VI</td></tr>
<tr><td></td><td>National Park Zone</td><td>Habitat Protection Zone</td><td>Special Purpose Zone (Norfolk)</td></tr>
<tr><td>Depth of reserve below seabed</td><td colspan="4">5000 m</td></tr>
<tr><td>Total area</td><td colspan="4">188,444 km^2</td></tr>
<tr><td>Major conservation values</td><td colspan="4">Natural Values:
• ecosystems representative of the Norfolk Island Province:
• mixing of warm-water and cold-water currents and eddies, and their interactions with seamounts influence biological productivity
• Tasman Front transports Coral Sea biota including corals, crustaceans and molluscs to the area
• The shallow-water habitats of Norfolk Island support diverse tropical and temperate species of fish, corals and other marine organisms similar to those found in the reefs surrounding Lord Howe Island, but with a unique reef fish assemblage of endemic, sub-tropical and temperate species.
KEFs:
• Tasman Front and eddy field
• Norfolk Ridge
Important area for:
• a range of threatened species including migratory, marine and cetacean species
• foraging habitat for seabirds
• migratory pathway for humpback whales
Cultural
The marine environment around Norfolk Island has long held significance among Norfolk Islanders. A unique community and culture has developed by those who have visited and settled the island over time. The Polynesians were the first inhabitants before the island was made a penal settlement and then the settlers from Pitcairn Island who constituted the third settlement.
Heritage
• Kingston and Arthur's Vale Historic Area World Heritage Australian Convict Site (ref Section 2.2.1.1)
• Norfolk Island, Nepean Island Reserve and Phillip Island providing important breeding habitat for at least eight species of seabird that also forage in the Marine Park.
• With Captain James Cook discovering Norfolk Island in 1774 – it is also important for European Heritage
Social and Economic</td></tr>
</table>

	• Fishing, boating and shipping, tourism and recreation are important activities contributing to the economy and wellbeing of the island community
Location	The Norfolk Marine Park is around Norfolk Island, including Nepean Island Reserve and Phillip Island, approximately 1400 km offshore from Evans Head in New South Wales.
General description of the reserve	The Norfolk Marine Park is significant because it contains habitats, species and ecological communities associated with the Norfolk Island Province. It includes two key ecological features: Norfolk Ridge, and the Tasman Front and eddy field, both valued for high productivity, aggregations of marine life, biodiversity and endemism.

2.2.6.19 Coral Sea Marine Park

The Coral Sea Marine Park southern boundary commences at latitude 24º 30’ 00” and extends north for over 1400 kms. The southern end of the park intersects with the limits of the DA by approximately 75 kms. Details of the Coral Sea Marine Park are listed in Table 2-31 (DNP, 2018b)

Table 2-31 Coral Sea CMR: Coral Sea Marine Park Management Plan 2018 (DNP, 2018b)

Proclaimed	14 December 2013, renamed on 9 October 2017			
IUCN category assigned by this Management Plan and reserve management zone name	IUCN IV—Habitat Protection Zone			
Assigned zones in reserve:	IUCN II	IUCN IV	IUCN IV	IUCN VI
	National Park Zone	Habitat Protection Zone	Habitat Protection Zone (reefs)	Special Purpose Zone
Depth of reserve below seabed	From 15 m to depths of 6,000 m			
Total area	989,836 km²			
Major conservation values	Ecosystems representative of: • Cape Province, Northern Transition and Province, Central Eastern Transition, Kenn Province and Transition KEFs: • Tasmantid Seamount Chain • Reefs, cays and herbivorous fish of the Queensland and Marion Plateau Important area for: • the only known spawning aggregation of black marlin in the Pacific Ocean (occurs near Osprey Reef) • breeding and or foraging habitat for seabirds, internesting habitat for marine turtles, and a migratory pathway for humpback whales • Supporting migratory birds • Coringa-Herald and Lihou Reefs and Cays Ramsar site (beyond the DA) Historic, social and economic values • Tourism, commercial fishing, and recreation, including fishing contribute to the wellbeing of regional communities and the prosperity of the nation • 45 historic shipwrecks are found in the park			
Location	The Coral Sea Marine Park extends from Cape York Peninsula to an east–west line approximately 40 km north of Bundaberg in Queensland. The nearest point of the Marine Park to mainland Australia is approximately 60 km and it extends to approximately 1100 km from the coast. It lies immediately to the east of the Great Barrier Reef Marine Park.			

General description of the reserve	The marine environment of the Coral Sea Marine Park is characterised by shallow-water tropical marine ecosystems, a large area of continental shelf and continental slope, two areas of abyssal plain with depths to 6000 m, high incidence of cyclones, high, mostly tropical species diversity and globally significant populations of internationally threatened species. There are approximately 34 reefs, and 56 cays and islets in the Marine Park, with a total reef area of approximately 15,024 km^2. It is influenced by a complex system of ocean currents that change seasonally and between years. Currents have also influenced the composition of reef species. The east–west-flowing South Equatorial Current cuts through the centre of the Marine Park before dividing to form the north-flowing Hiri Current and the south-flowing East Australian Current. These currents create a barrier reducing the mixing of species between the north and south of the Marine Park, forming distinct communities. The southern part of the Marine Park transitions between tropical and temperate waters and includes the northern extent of the range of some temperate species typical of the Temperate East Marine Region.

2.2.7 Key Ecological Features (KEF)

Key Ecological Features (KEF) are elements of the Commonwealth marine environment that are considered to be of regional importance for either a region's biodiversity or its ecosystem function and integrity. KEFs are not matters of national environmental significance and have no legal status in their own right. However, they are components of the Commonwealth marine area. Fourteen KEFs occur in the DA as identified in the Conservation Values Atlas (DoEE 2015b). The eleven KEFs that have been spatially defined are shown in Figure 2-16.

The location of the three KEFs that are not spatially defined (Bass Cascade, shelf rocky reefs and hard substrates (South East Marine Region) and the East Tasmania subtropical convergence zone) are described below.

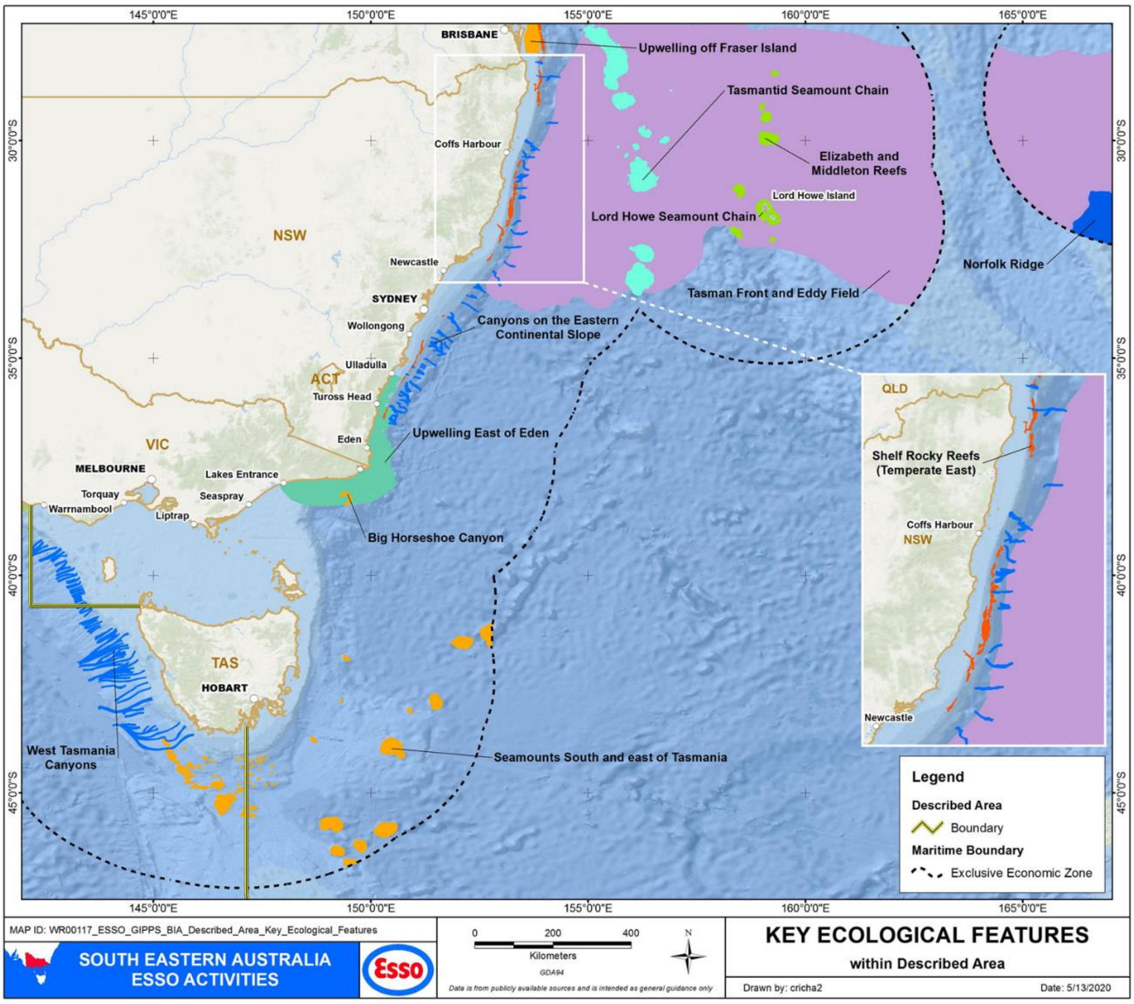


Figure 2-16 Spatially defined Key Ecological Features within the DA

2.2.7.1 Big Horseshoe Canyon

Big Horseshoe Canyon is defined as a key ecological feature as it is an area of high productivity and aggregations of marine life.

The steep, rocky slopes of the Big Horseshoe Canyon provide hard substrate habitat for attached large epifauna. Sponges and other habitat forming species provide structural refuges for benthic fishes, including the commercially important pink ling.

The Big Horseshoe Canyon is the largest south eastern canyon sampled for benthic biodiversity (Williams et al., 2009). It has a total area of 319 km2 in 1500-m depth that supports a rich, abundant, filter-feeding benthic megafauna, including large sponges in dense beds of large individuals at 120 m and at 300–400 m, dense stands of the stalked crinoid Metacrinus cyaneus in 200–300 m, and many species of octocoral (especially gold corals) at depths >700 m (Kloser et al., 2001). It is the only known temperate location of the stalked crinoid Metacrinus cyaneu.

Big Horseshoe Canyon lies south of the coast of eastern Victoria. This feature is the eastern most arm of the Bass Canyon system (DoEE 2015a).

2.2.7.2 Upwelling East of Eden:

The Upwelling east of Eden is defined as a key ecological feature as it is an area of high productivity and aggregations of marine life.

Dynamic eddies of the East Australian Current cause episodic productivity events when they interact with the continental shelf and headlands. The episodic mixing and nutrient enrichment events drive phytoplankton blooms that are the basis of productive food chains including zooplankton, copepods, krill and small pelagic fish.

The upwelling supports regionally high primary productivity that supports fisheries and biodiversity, including top order predators, marine mammals and seabirds. This area is one of two feeding areas for blue whales and humpback whales, known to arrive when significant krill aggregations form. The area is also important for seals, other cetaceans, sharks and seabirds.

This feature displays seasonal and annual variation, and is present along the eastern Victorian and southern NSW coasts.

2.2.7.3 East Tasmania subtropical convergence zone (East coast of Tasmania):

A zone of enhanced pelagic productivity where eddies of the East Australian Current interact with subantarctic waters driven by westerly winds. This is a complex feature that is characterised by autumn and spring phytoplankton blooms that form the basis of a productive food chain which supports cetaceans, seals, sharks and seabirds. The phytoplankton blooms attract migratory commercial fish stocks such as Southern bluefin tuna, barracouta, and jack mackerel, and are also important for krill, which in turn form an important component of the diet of many pelagic species. This KEF has not been spatially defined and hence is not shown in Figure 2-16 however it is not expected to occur within the DA. The northern and southern extent of the feature are approximately level with the north-east tip of Tasmania and the Tasman Peninsula.

2.2.7.4 The Bass Cascade (along the Bass Canyon System)

The Bass Cascade refers to the "underwater waterfall" effect brought about by the northward flow of Bass Strait waters in winter which are more saline and slightly warmer than surrounding Tasman Sea waters. As the water approaches the mainland in the area of the Bass Canyon group it forms an undercurrent that flows down the continental slope. The cascading water has a displacing effect causing nutrient rich waters to rise, which in turn leads to increased primary productivity in those areas. The cascading water also concentrates nutrients and some fish and whales are known to aggregate along its leading edge. The Bass Cascade occurs during winter months only.

This KEF has not been spatially defined and hence is not shown in Figure 2-16, however it is expected to occur within the DA.

2.2.7.5 Seamounts south and east of Tasmania (south and east of Tasmania):

The Seamounts south and east of Tasmania are defined as a key ecological feature as they are an area of high productivity and aggregations of marine life.

These seamounts are a chain or cluster of seamounts rising from the abyssal plain, continental rise or plateau situated 200 km or more from shore (east of Flinders Island to south east of southern Tasmania). Seamounts with hard substrate summits and slopes provide attachment points for sessile invertebrates, while the soft sediments can be habitat for species that burrow into the sediments.

The Seamounts south and east of Tasmania extend into the southern offshore waters of the DA (Figure 2-16).These seamounts create localised upwellings of nutrient rich waters from the seafloor. The hard substrate support sessile invertebrates.

2.2.7.6 Shelf rocky reefs and hard substrates (Southeast Marine Region)

Rocky reefs and hard grounds are located in all areas of the South-east Marine Region continental shelf including Bass Strait, in 50 m to 150–220 m water depth. They support macroalgae and sessile invertebrates and provide habitat and shelter for fish and are important for aggregations of biodiversity and enhanced productivity. This KEF has not been spatially defined and hence do not appear on Figure 2-16 however it is expected to occur along the continental shelf of Bass Strait within the DA.

2.2.7.7 West Tasmania Canyons

The West Tasmania Canyons are located in the Southeast Marine Bioregion on the edge of the continental shelf offshore of the north-west corner of Tasmania and they extend down as far south as Macquarie Harbour. The northern section of the canyons intersect the DA. These canyons can influence currents, act as sinks for rich organic sediments and debris, and can trap waters or create upwellings that result in productivity and biodiversity hotspots. For example, plumes of sediment and nutrient-rich water can be seen at or near the heads of canyons. 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 (refer Section 2.2.7.5 above) (DoEE, 2015a).

2.2.7.8 Tasmantid Seamount Chain

Just 150-600 km east of the Australian mainland is a 2000 km long chain of submerged volcanoes (from approximately Latitude 19ºdeg south to 33º deg south) are the Tasmantid Seamount Chain that rise over 4000 m above the seafloor - nearly twice the height of the highest mountain on the mainland. These undersea mountains, the Tasmantid Seamounts, are extinct volcanoes formed from around 40 to 6 million years ago above a mantle hotspot, similar to the Hawaiian Islands. The seamount chain includes Lord Howe Island and Elizabeth and Middleton Reefs. These isolated, oceanic reefs are thought to support a diverse range of tropical and temperate marine life, including both warm-water and cold-water corals and an abundance of fish species. This diversity is a result of the effect of the East Australian Current on the reefs as it exposes the area to its warm waters, in contrast to the surrounding cooler ocean. The information on the Tasmantid Seamounts has been based on observations from some seamounts in other locations, however for benthic ecosystems, the data for the Tasmantid seamount chain is poor (CSIRO, 2012). Thus the seamount chain's conservation values are defined in terms of containing feature scale geomorphic surrogates for biodiversity (basin, plateau, seamount and abyssal plain/deep ocean floor). In general what is known is that Taupo seamount supports a diverse and dense invertebrate megafauna and abundant sharks; a high diversity of demersal fishes is recorded in commercial fishery logbooks and fishery observers; individual seamounts vary greatly in size in shelf and upper/mid slope depths where benthic biodiversity is expected to be greatest (CSIRO, 2012).

2.2.7.9 Lord Howe Seamount Chain

Lord Howe Seamount Chain is a chain of submerged volcanoes running 1000 km north–south, the seamount chain includes Lord Howe Island and Elizabeth and Middleton Reefs. This seamount chain runs east of the Tasmantid Seamount discussed above (refer Section 2.2.7.8). These isolated, oceanic reefs support a diverse range of tropical and temperate marine life, including both warm-water and cold-water corals and an abundance of fish species. This diversity is a result of the effect of the East Australian Current on the reefs as it exposes the area to its warm waters, in contrast to the surrounding cooler ocean (DSEWPAC, 2012a).

2.2.7.10 Tasman Front and eddy field

The Tasman Front and eddy field occurs in the Temperate East Marine Region and is defined as a key ecological feature formed by complex and dynamic oceanographic processes supporting transient patches of enhanced productivity that, in turn, attract aggregations of species across trophic levels, including top predators such as tuna and sharks. This feature also supports biological connectivity with seamount habitats (Tasmantid Seamount Chain – refer Section 2.2.7.8 above) further offshore. The Tasman Front is formed by a current that moves to the north in winter and to the south in summer. The Front separates the warm, nutrient-poor waters of the Coral Sea from the nutrient-rich waters of the Tasman Sea and its boundary can and associated eddies vary in shape, strength and location. The front is formed between 27º S and 33º S. In the southern portion of the Temperate East Marine Region, the Tasman Front creates a complex oceanographic environment with vertical mixing causing enhanced productivity. Patches of productivity are important for mid-level consumers including turtles and top fish predators. This is supported by Fisheries oceanography studies that describe a positive relationship between fish catch rates and proximity to frontal features, and a predominance of bigeye tuna and swordfish associated with the Tasman Front (DoEE, 2019t).

2.2.7.11 Shelf rocky reefs (Temperate East Marine Region)

The Shelf Rocky Reefs habitat has been identified as a key ecological feature as it is considered a unique sea-floor feature which is associated with ecological properties of regional significance.

Shelf rocky reefs feature support a range of complex benthic habitats that, in turn, support diverse benthic communities. Along the continental shelf, south of the Great Barrier Reef, benthic communities on rock outcrops and boulder substrates shift from algae-dominated communities to those dominated by attached invertebrates, including dense populations of large sponges, with a mixed assemblage of moss animals and soft corals; this shift generally occurs at a depth of 45 m. Below wave-influenced areas, massive and branched growth forms of sponges are more prevalent, and sponge species richness and density generally increases with depth along the New South Wales coast.

Collectively, these invertebrates create a complex habitat-forming community that supports microorganisms and other invertebrates, such as crustaceans, molluscs, annelids and echinoderms. These habitats also contribute to increased survival of juvenile fish by providing refuge from predation. Rocky reef habitats on Australia's east coast support a diverse assemblage of demersal fish, which show distinct patterns of association with shelf-reef habitats; e.g. jackass morwong, barracouta, orange-spotted catshark, eastern orange perch, butterfly perch and warehou are species that distinguish rocky-reef habitats at depths greater than 45 m from those of soft sediments. Unlike the shelf rocky reef and hard substrate of the South East Marine Region, this KEF has been spatially defined and is shown in Figure 2-16.

2.2.7.12 Canyons on the eastern continental slope

The Canyons on the eastern continental slope are defined as a key ecological feature as they are a unique seafloor feature with enhanced ecological functioning and integrity, and biodiversity, which apply to both its benthic and pelagic habitats.

Canyon systems have a marked influence on diversity and abundance of species through their combined effects of topography, geology and localised currents, all of which act to funnel nutrients and sediments into the canyon. As such, these features are valued for their enhanced productivity and biological diversity properties. Canyons contribute to habitat diversity by providing a hard surface that offers anchoring points and vertical relief for filter feeder benthic species. Hard substrata support different species assemblages; particularly favouring large filter feeder–dominated benthic species (e.g. attached sponges and crinoids) that thrive in abundance in the enhanced current flow conditions. Large benthic animals such as sponges and feather stars are abundant, with particularly high diversity found in the upper slope regions (150–700 m). A range of higher trophic level species, including crustaceans, echinoderms, bivalves, cephalopods and fish are then attracted to these regions. Canyons are therefore significant contributors to overall biodiversity, particularly in terms of benthic organisms. Due to isolation, restricted dispersal and connectivity, it is also expected this diversity encompasses a high degree of endemism, further contributing to the social and biological values of these communities.

The Canyons on the eastern continental slope lie off the coast of NSW (Figure 2-16).

2.2.7.13 Upwelling off Fraser Island

In two areas near Fraser Island, upwellings of cold, deep waters mix with surface waters. Tides, wind and currents draw these nutrient-rich waters onto the shelf, where they generate blooms of phytoplankton that support animals higher in the food chain, including a number of commercially valuable and threatened species (DSEWPAC, 2012a). The spatial boundary for this KEF is an area of enhanced productivity (identified through areas of enhanced chlorophyll levels) spanning shelf-edge, slope and off-shelf areas running from the northwest to the southeast of Fraser Island. The feature also appears to be an important area of connectivity in migrations of small pelagic fish and top predators. The subtropical waters off Fraser Island are an important spawning area for temperate small pelagic fish (i.e. the sardine, round herring and Australian anchovy), the adults of which appear to migrate from the south and whose larvae are subsequently transported back into temperate nursery areas by the East Australian Current (DAWE, 2020b).

2.2.7.14 Norfolk Ridge

The Norfolk Ridge occurs in a region of remnant volcanic arcs, plateaux, troughs and basins (ranging from 50 m to 3,900 m). The ridge runs southward from New Caledonia to New Zealand, between the New Caledonia Trough to the west and the Norfolk Basin to the east (DSEWPAC, 2012a). There are likely to be high levels of diversity in seamount communities (1.24% is classed as pinnacles or seamount/guyot) including endemic species, caused by relatively productive seafloor habitats that support population densities far higher than surrounding areas. Benthic habitats along the Norfolk Ridge are also thought to act as ‘stepping stones’ for animal dispersal, connecting deep water species from New Caledonia to New Zealand (DSEWPAC, 2012a). Similar to the Lord Howe chain, the ridge also generates localised oceanographic changes which create sites of enhanced productivity and aggregate marine species (DAWE, 2020c).

2.2.8 National Parks and Reserves

National parks and reserves which include marine protected areas and terrestrial protected areas are declared under each individual state's legislation and are managed by state authorities. A number of state marine protected areas occur within the DA. The parks which are located within approximately 100 kms of the EGBPA are all on the Victorian coastline between Point Hicks National Park and Corner Inlet and Nooramunga Marine and Coastal Parks. Figure 2-17 shows National Parks and Reserves in the DA in Victoria. Figure 2-18 shows the Parks and Reserves in the DA in the islands of Tasmania in northern Bass Strait, Figure 2-19 shows the Parks and Reserves in the DA in Tasmania and Figure 2-20 shows the Parks and Reserves in the DA in NSW.

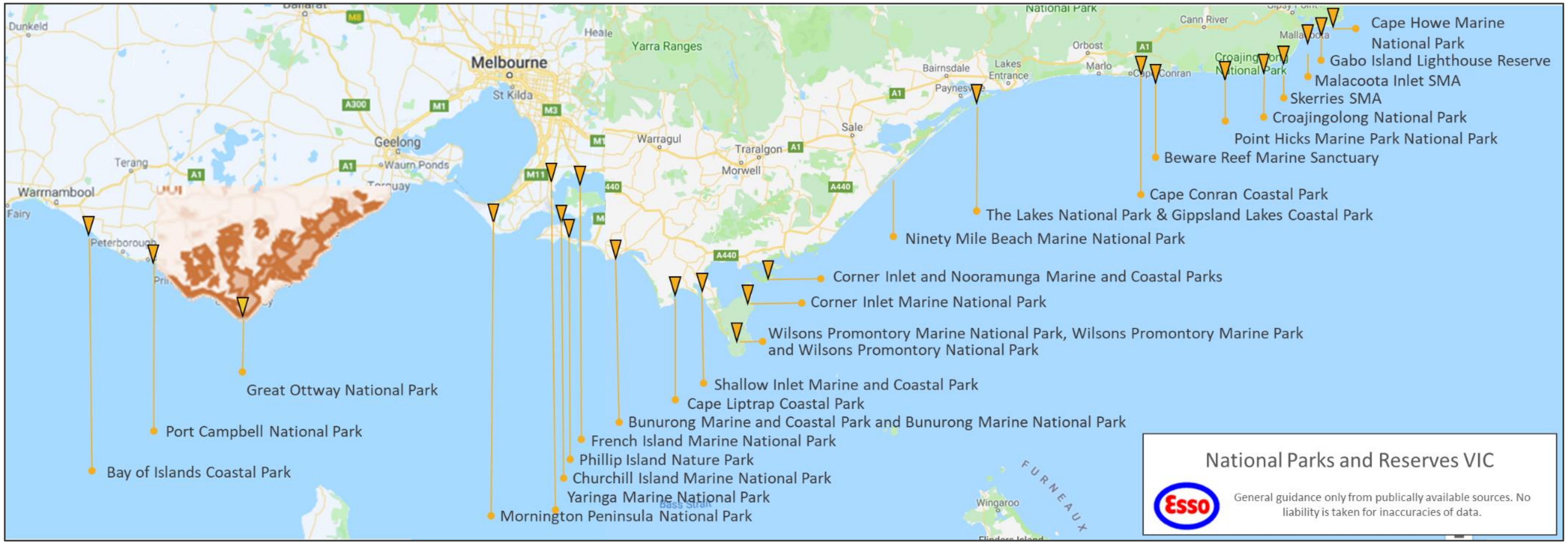


Figure 2-17 National Parks and reserves in the DA in Victoria

Figure 2-18 National Parks and reserves in the DA on the islands of Tasmania in northern Bass Strait

Figure 2-19 National Parks and Reserves in the DA on and around mainland Tasmania

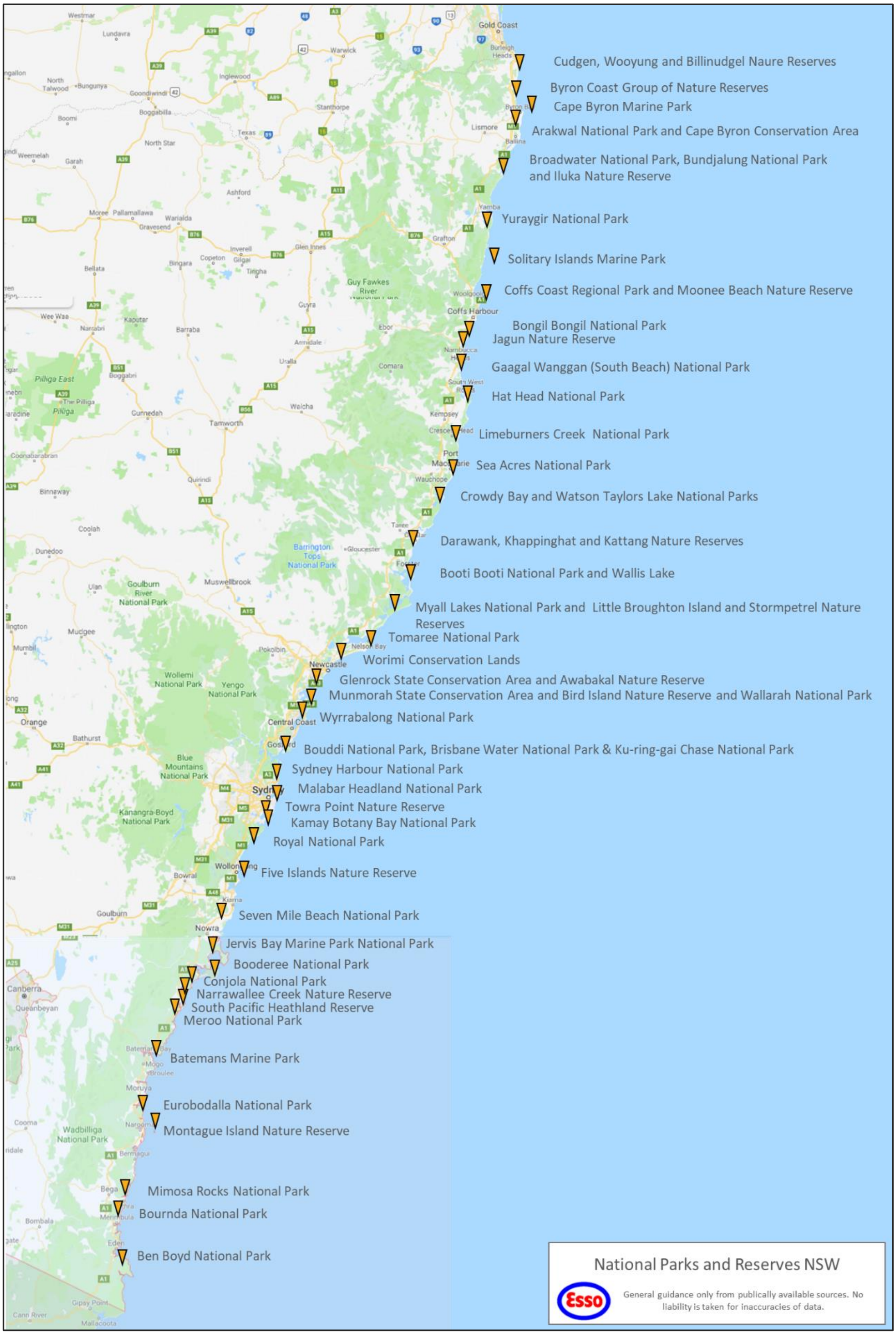


Figure 2-20 National Parks and reserves in the DA in New South Wales

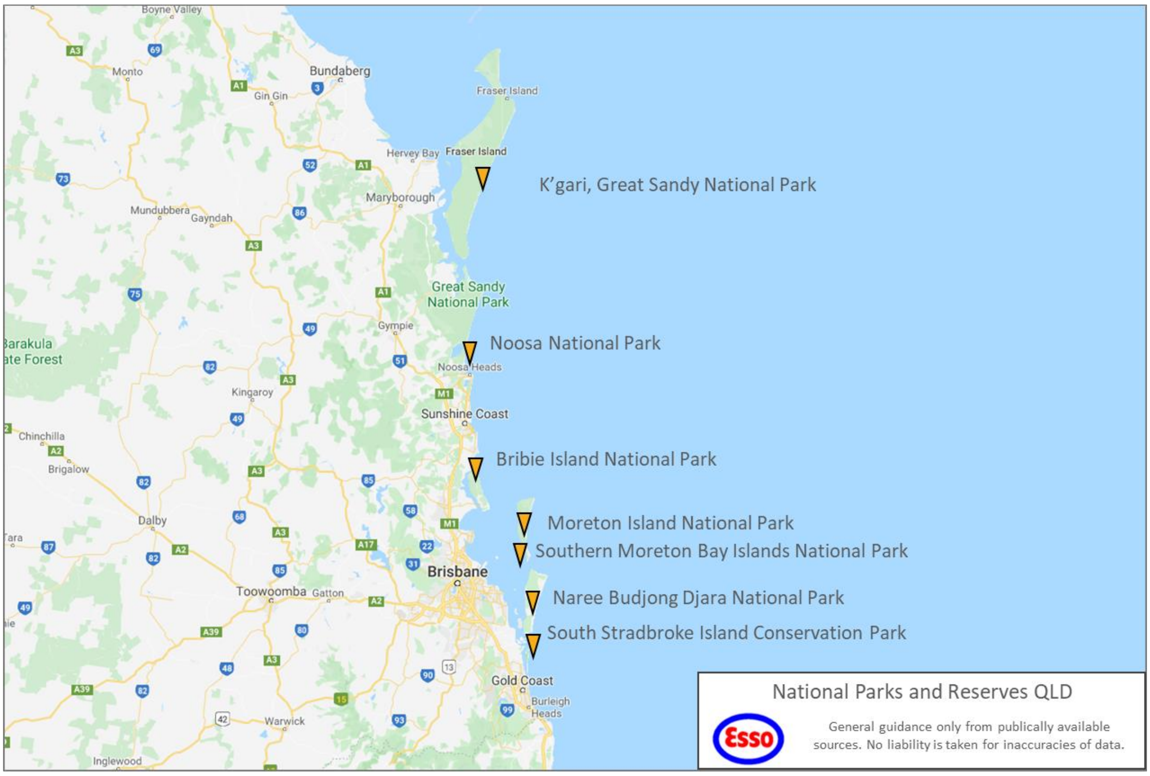


Figure 2-21 National Parks and reserves in the DA in Queensland

2.2.8.1 Cape Howe Marine National Park - VIC

The Cape Howe Marine National Park is situated in the far east of Victoria alongside the border with New South Wales. The habitats found in the park include kelp forests, granite and sandstone reefs, sandy beaches and soft sediments. The marine life of the area is particularly diverse because species of both warm and cool areas can reside here. Whales pass by Cape Howe on their migration from Antarctica and are sometimes followed by a pod of orcas. Little penguins also forage at the rook on Gabo Island. (ParksVic 2017l).

2.2.8.2 Gabo Island Lighthouse Reserve - VIC

Gabo Island is considered to be of State zoological significance due to the presence of one of the largest breeding colonies of Little penguins in the world. Short-tailed shearwaters also breed on Gabo Island.

Common species of whale sighted from the island include Southern right whales, Humpback whales and Killer whales. Whales pass Gabo Island on their annual migration south to feed in Antarctic waters from late winter to early spring and then again during autumn on their northern migration to calve in tropical areas. Pods of dolphins are also regularly sighted from Gabo Island. Species include Common dolphins and Bottlenose dolphins. Australian and New Zealand Fur Seals are also often seen on the rocks surrounding the island.

The lighthouse was constructed from 1858 to 1862 and is the only operating island lighthouse in Victoria (ParksVic, 2017f).

2.2.8.3 Mallacoota Inlet Special Management Area (Victoria)

The Mallacoota Inlet Special Management Area is a special management area. Flora, fauna and areas of geomorphological significance are protected in this area.

2.2.8.4 The Skerries Special Management Area (Victoria)

The Skerries Special Management Area is a special management area. The Skerries is home to a major seal breeding colony with an estimated population of 11,500 representing approximately 12% of the national population.

2.2.8.5 Croajingolong National Park & Nadgee Nature Reserve - VIC

The Croajingolong National Park follows the far-eastern coastline of Victoria for 100 km and together with the adjoining Nadgee Nature Reserve in New South Wales is classified as a UNESCO World Biosphere Reserve. Over 1000 species of native plants have been recorded in the park including 90 species of orchids. The park also contains areas of cool temperate and warm temperate rainforest, eucalypt forest and coastal heathland.

Of the 52 mammal species recorded in the park, arboreal mammals, such as possums, gliders and bats are common. Seals, whales and dolphins occur in coastal waters adjacent to the park. The islands and ocean beaches attract migratory seabirds and waders, the wetlands are habitat for a diversity of waterfowl and the coastal woodlands are favoured habitat for birds of prey. Significant populations of reptiles and amphibians also occur within the park.

The park's secluded coastal camping locations make it popular for beach walks, bird watching, boating and fishing (ParksVic 2017h).

The Skerries, offshore from Wingan Inlet, is home to a major seal breeding colony with an estimated population of 11,500 representing approximately 12% of the national population.

Dry open forest areas occur widely throughout Nadgee Nature Reserve with patches of rainforest occurring in creek catchments and low shrubby heaths being encountered at Mt Nadgee and along the coast. Nadgee Nature Reserve also contains examples of both fresh and salt water wetlands.

The near-coastal areas are significant breeding and foraging habitat for the Eastern bristlebird and seabirds such as the Short-tailed shearwater, Crested tern and Gannet. Most of the park's beaches support a breeding pair of Hooded plovers. Sea caves support important invertebrate 'guano' communities.

The reserve is largely undisturbed by recreational development and contains the only coastal Wilderness Area in NSW (NPWS 2017a).

2.2.8.6 Point Hicks Marine National Park - VIC

The Point Hicks Marine National Park is located alongside Croajingolong National Park, East Gippsland. Many creatures found here are not found further west because the water is too cold, for example the large black sea urchin. The National Park is approximately 4,000 ha in area, with fauna including intertidal and shallow subtidal invertebrates, diverse sessile invertebrates living on subtidal reefs, kelps and small algae, and a high diversity of reef fish. In addition to the subtidal reef, the marine environment around Point Hicks includes intertidal rock operational areas and offshore sands (ParksVic 2017a). Point Hicks Marine National Park is also a popular location for recreational divers. Remains of two shipwrecks can be encountered in the National Park.

2.2.8.7 Beware Reef Marine Sanctuary - VIC

The Beware Reef Marine Sanctuary is a State marine protected area, IUCN Category II, located approximately 5 km southeast of Cape Conran and to the north-east of the operational area, comprises a granite outcrop covering an area of 220 ha and extending for a distance of approximately 500 m from the edge of the exposed reef. It rises from a depth of approximately 30 m and is exposed at low tide, providing a resting area for Australian fur seals. The reef is covered by outcrops of Bull kelp (Durvillaea sp.) and supports a range of marine life, including seahorses and leafy seadragons (ParksVic, 2017b). Beware Reef is a popular location for recreational divers and the remains of numerous shipwrecks can be encountered in the sanctuary.

2.2.8.8 Cape Conran Coastal Park - VIC

The Cape Conran Coastal Park extends from Sydenham Inlet in the east to Point Ricardo near Marlo. The park includes ocean beaches and is a popular park for water activities - swimming, diving, boating, fishing and rock pooling.

Many birds feed on the nectar rich plants of the heathlands and banksia woodlands including the threatened Ground parrot (Pezoporus wallicus wallicus). Lizards and large lace monitors are common around Cape Conran (Parks Victoria 2017i).

2.2.8.9 The Lakes National Park and Gippsland Lakes Coastal Park - VIC

The Gippsland Lakes are a group of large coastal lagoons in eastern Victoria, separated from the sea by sand dunes and fringed on the seaward side by Ninety Mile Beach. The main lakes - Wellington, Victoria and King cover an area of 340 km2 and have a shoreline of 320 km. The lakes are fed by a number of river systems. The largest of the rivers are the Latrobe River and the Avon River (flowing into Lake Wellington), and the Mitchell River, Nicholson River and Tambo River (flowing into Lake King). The system is linked to the sea by an artificial entrance near the eastern end, opened in 1889, where the town of Lakes Entrance is now situated (ParksVic, 2017j, ParksVic, 2017k).

The Lakes National Park covers 2390 ha bounded by Lake Victoria, Lake Reeve and the township of Loch Sport. Gippsland Lakes Coastal Park is a narrow coastal reserve covering 17,600 ha along approximately 90km of Ninety Mile Beach from Seaspray to Lakes Entrance. The Lakes National Park contains large areas of diverse and relatively undisturbed flora and fauna communities representative of the inner barrier of the Gippsland Lakes system. Gippsland Lakes Coastal Park takes in extensive coastal dune systems, woodlands and heathlands, as well as water bodies such as Lake Reeve and Bunga Arm (ParksVic 2017k).

The Gippsland Lakes system is listed under the Convention on Wetlands of International Importance (Ramsar). The Gippsland Lakes provide important feeding, resting and breeding habitat for approximately 80 waterbird species (ParksVic 2003, 2017j,k), and the lakes, and associated swamps and morasses, regularly support approximately 40,000 to 50,000 waterbirds.

Clydebank Morass, Macleod Morass and Jones Bay (within Lake King) support many species of migratory waders. Lake Wellington, Lake Victoria and Lake King support migratory seabirds, including the little tern and fairy tern, as well as a range of other waterfowl. Lake Reeve provides significant habitat for a large number of migratory waders, and is listed as one of the five most important areas for shorebirds in Victoria (Parks Victoria, 2003). Bunga Arm supports breeding populations of threatened species e.g. Little tern, Fairy tern, Hooded plover and White-bellied sea-eagle (ParksVic 2003, 2017k).

2.2.8.10 Ninety Mile Beach Marine National Park - VIC

Located 30 km south of Sale and adjacent to Gippsland Lakes Coastal Park, the Ninety Mile Beach Marine National Park covers 5 km of coastline. The huge subtidal sandy expanses characteristic of the area exhibit particularly high species diversity including tube building worms, small molluscs and many tiny crustaceans. Many pelagic fish species feed on the benthos, and young Great white sharks have also been observed feeding in the area (ParksVic 2017c).

2.2.8.11 Corner Inlet and Nooramunga Marine and Coastal Park - VIC

The Corner Inlet and Nooramunga Marine and Coastal Parks are protected from Bass Strait by sand barrier islands and Wilsons Promontory. Corner Inlet and Nooramunga consist of shallow marine waters, intertidal mudflats and a series of sand islands. Corner Inlet and Nooramunga Marine and Coastal Parks contain a diverse range of habitats including large stands of white mangrove and saltmarsh areas. Seaward of the mangroves are extensive areas of intertidal mud and sand flats which provide food for thousands of migratory wading birds each year.

Thirty two species of migratory waders have been recorded, including the largest concentrations of Bar tailed godwit and Great knot in south eastern Australia. In summer, the ocean beaches and sand spits are also used as nesting sites by shorebirds like the Pied oyster catcher, Crested tern, Caspian tern, Fairy tern, Hooded plover and the endangered Little tern. Fringing the saltmarshes and mangroves on the mainland and islands are stands of swamp paperbark and coast tea-tree, and further inland woodlands of coast banksia and manna gum. These are home for a variety of animals including the New Holland mouse, swamp antechinus, Orange-bellied parrot, Ground parrot and White-bellied sea eagle. The parks are recognised as wetlands of international importance under the Ramsar convention (Parks Victoria 2017d and 2017e).

2.2.8.12 Corner Inlet Marine National Park - VIC

Corner Inlet Marine National Park is located north and east of Wilson's Promontory adjacent to the southern shores of Corner Inlet. The National Park protects large areas of seagrass including the only extensive Posidonia australis meadow in southern Australia. Amongst the seagrass live over 300 marine invertebrates including crabs, seastars, sea snails, squid and many fish including pipefish, stingrays, flathead, whiting and flounder. The seagrass and surrounding marshes are particularly important for international migratory birds such as the Eastern curlew (Parks Victoria 2017e). The area has been listed as part of the Corner Inlet Ramsar Site.

2.2.8.13 Wilsons Promontory Marine National Park - VIC

Wilsons Promontory Marine National Park is Victoria's largest Marine Protected Area (MPA) at 15,550 ha and is located around the southern tip of Wilsons Promontory. There is a diversity of marine life including octopus, sharks and rays. It is a popular location for recreational divers particularly around the sponge gardens. The offshore islands support many colonies of fur seals and oceanic birds such as Little penguins, Fairy prions, Silver gulls and Pacific gulls (Parks Victoria 2017g).

Wilsons Promontory National Park is a popular tourist destination due to its coastal scenery and diverse natural environments. Tourist activities include walking, camping, sightseeing, viewing wildlife, fishing, boating, diving, sea kayaking and surfing.

The park is important for its range of plants and animals, including many threatened species including the New Holland mouse, Ground parrot and White-bellied sea eagle. Coastal features include expansive intertidal mudflats, sandy beaches and sheltered coves interrupted by prominent headlands and granite cliffs in the south, backed by coastal dunes and swamps.

The avifauna recorded for Wilsons Promontory includes around half of all Victorian bird species. Significant species of migratory wading birds feed on the tidal mudflats of Corner Inlet within and adjoining the park. The offshore islands have breeding and roosting sites for sea birds, including a large number of Short-tailed shearwaters (Parks Victoria 2017g).

2.2.8.14 Cape Liptrap Coastal Park - VIC

Cape Liptrap is a narrow peninsula formed by the spine of the Hoddle Range running out to sea. It consists of steep cliffs flanked by rock pinnacles and wave cut platforms. Between Venus Bay and Cape Liptrap the coast varies between cliffs of dune limestone and rock stacks and pebble beaches to broad sandy beaches backed by high dunes.

The Gunai/Kurnai and Boonwurry people have inhabited this area for over 6000 years. Middens mark the location of camps along the coast.

Along the coast Pacific Gulls, Silver gulls, Sooty oystercatchers and herons feed on the beach and rock platforms, and cormorants and Australian gannets forage for fish (ParksVic, 2018).

2.2.8.15 Bunurong Marine and Coastal Park and Bunurong Wilsons Promontory Marine National Park - VIC

The Bunurong group of parks stretches along 17 km of coastline. The Bunurong Marine National Park is 2,100 ha in size and adjoins the Bunurong Marine Park and Bunurong Coastal Reserve.

The coastal waters protect a remarkable range of habitats including intertidal reefs, subtidal rocky reefs, algal gardens and seagrass beds. The coastal waters share the cool waters of Victoria's central and western coasts but, unlike those shores, are relatively protected from the oceanic south-westerly swell by the position of distant King Island. The gently sloping rocky seafloor is also unusual in Victoria.

The marine life of the region is considered special due to the unusual set of environmental conditions. The intertidal sandstone reefs of the area boast the highest recorded diversity of intertidal and subtidal invertebrates in eastern Victoria. The range of seaweed species is also large and includes greens, blue-greens, browns and encrusting, coralline reds.

Seagrass meadows and sandy bays are also important habitats within the area. The diversity of habitats supports many marine animals including seastars, featherstars, crabs, snails, Port Jackson Sharks and up to 87 species of fish.

The coastal area is home to the Hooded plover which breeds on the beaches (ParksVic, 2018).

2.2.8.16 Phillip Island Nature Park - VIC

Phillip Island Nature Parks is part of the United Nations Scientific and Cultural Organisation (UNESCO) Western Port Biosphere Reserve, and abuts the Western Port Ramsar wetland. Phillip Island is part of Bunurong and Boonwurrung country, and the Nature Parks conserves important elements of the area's indigenous heritage, as well as historical sites of European settlement and agriculture. It is an important ecotourism site for Victoria and protects threatened flora and fauna and is a known breeding site for threatened marine species of Little Penguin and Short-Tailed Shearwaters, Hooded Plovers and has a population of Australian Fur Seals (PoV, 2013).

2.2.8.17 French Island Marine National Park - VIC

The park is 2,978 hectares in size and approximately 10 kilometres south of the township of Tooradin on the Victorian coast. The main ecological communities protected by the park include subtidal and intertidal soft sediments (including seagrasses, mangroves and a small area of saltmarsh), and the water column. Over 73 per cent of the park is intertidal. French Island Marine National Park provides important feeding and roosting habitat for forty listed bird species such as the grey-tailed tattler Heteroscelus brevipes and the intermediate egret Ardea intermedia and the critically endangered orange-bellied parrot Neophema chrysogaster. The park is also feeding habitat for twenty-seven internationally important migratory bird species. Syngnathids, the group that includes seahorses and pipefish, are protected and are found in the park (ParksVic, 2019c).

2.2.8.18 Churchill Island Marine National Park - VIC

Churchill Island Marine National Park covers 670 hectares and is located south of Rhyll on the eastern shore of Phillip Island. The main habitats protected by the park include intertidal and subtidal soft sediments (including small areas of mangroves and saltmarsh, and seagrasses), some shingle-cobble rock areas, and the water column. The park provides important feeding and roosting habitat for forty-one listed bird species including the critically endangered orange-bellied parrot Neophema chrysogaster. The park and surrounds is a feeding area for twenty-nine internationally important migratory bird species (ParksVic, 2019 a).

2.2.8.19 Yaringa Marine National Park - VIC

Yaringa Marine National Park covers 970 ha along the north of Western Port Bay in Victoria. It is typified by saltmarsh communities, coastal heaths and open woodlands and forms part of the Western Port Ramsar Site. The areas above high water mark are protected within Western Port Nature Conservation Reserve. The natural values include the seagrass, mangrove and saltmarsh communities that provide habitat for migratory wader and shorebird species. Extensive intertidal mudflats support a diverse range of invertebrate and fish species. The areas are also a place of Indigenous cultural significance. Boating, birdwatching and marine education are elements of its social value (ParksVic, 2007).

2.2.8.20 Mornington Peninsula National Park - VIC

Mornington Peninsula National Park covers 2,686-hectares along the coastline of the Mornington Peninsula situated approximately 90 km south of Melbourne. It contains important areas of native vegetation remaining on the Mornington Peninsula following depletion since European settlement. Of particular note are communities of coastal grassy forests, banksia woodlands and sand heathlands. The park has known breeding habitat in Victoria for the threatened Hooded Plover. The park's tourism values are important to Victoria (ParksVic, 2019 b).

2.2.8.21 Great Otway National Park - VIC

Great Otway National Park (103,185 ha) includes extensive forests and heathlands on much of the southern fall and many northern areas of the Otway Ranges, and much of the coastline between Torquay in the east and Princetown in the west. The area of the park is not continuous but contains large areas of public land, private and rural communities with larger towns nearby such as Anglesea, Lorne and Apollo Bay. The park is an integral element of Victoria's most popular regional tourism destination. The Great Ocean Road and Scenic Environs, also on Australia's National Heritage list (refer Section 2.2.2.1) intersects the park in many places. Covering a large area both on the coast and inland, the park has many values from European and Indigenous historic significance to educational and scientific significance for its geomorphic and geological forms. Its proximity to Melbourne and its past (logging) and present uses for rural and forestry are managed with the high demand for its scenic and recreational values including fishing, hunting and touring. Relevant to this plan are the conservation values of the park in the coastal regions and the numerous tourist and recreational values the coastline and beaches offer, primarily due to their natural beauty. The park supports several species of migratory birds and listed threatened species include the Shy Albatross, Wandering Albatross and Fairy Prion (ParksVic and DSE, 2009).

2.2.8.22 Port Campbell National Park and Bay of Islands Coastal Park - VIC

Port Campbell National Park and Bay of Islands Coastal Park combine to form a linear reserve along 65 km of Victoria's southern ocean coastline extending past the limits of the Great Otway National Park and covering a total area of 2,700 ha. The park extends to the limits of the National Heritage Great Ocean Road and Scenic Evirons place (refer Section 2.2.2.1). The Parks' geomorphical features including sheer cliffs and gorges, the arches and the off-shore stacks draw over five million visitors to the Great Ocean Road region each year. The park contains a wide range of remnant coastal vegetation types, including important coastal heathlands, which provide a valuable link between other patches of remnant vegetation in the area and contains a high diversity of plants. The area supports the endangered Australasian Bittern and listed marine species like the Great Egret and White-bellied sea-eagle (ParksVic, 1998).

2.2.8.23 Hogan Group - TAS

Hogan Island, the largest island in the Hogan Group, is a 232 ha granite island located in northern Bass Strait between the Furneaux Group and Wilsons Promontory. Recorded breeding seabird and wader species include Little penguin, Short-tailed shearwater, Pacific gull, Silver gull and Sooty oystercatcher (Brothers et al., 2001).

2.2.8.24 West Moncoeur Island and East Moncoeur Island - TAS

West Moncoeur Island and East Moncoeur Island are part of Tasmania's Rodondo Group lying in northern Bass Strait south of Wilsons Promontory. The islands are granite islands ringed by steep cliffs. Recorded breeding seabird and wader species include Little penguin, Short-tailed shearwater, Fairy prion, Common diving petrel, Pacific gull and Sooty oystercatcher. Both islands are considered important breeding sites for seabirds (Brothers et al., 2001). West Moncoeur Island holds an important breeding colony of Australian fur seals and is a nature reserve (DPIPWE, 2000).

2.2.8.25 Curtis Island Nature Reserve and Devils Tower Nature Reserve - TAS

Curtis Island, part of the Curtis Group, is a granite island with an area of 150 ha lying in northern Bass Strait between the Furneaux Group and Wilsons Promontory. It is a nature reserve and supports up to 390,000 breeding pairs of Short-tailed shearwaters. Other recorded breeding seabird and wader species include Little penguin, Fairy prion, Pacific gull and Sooty oystercatcher.

Other islands in the Curtis Group are Cone Islet, Sugarloaf Rock and Devils Tower. Devils Tower comprises two small granite islands with a combined area of 4.77 ha. It is a nature reserve and recorded breeding seabird species include Short-tailed shearwater, Fairy prion and Common diving-petrel. The island is also used as a regular haul-out site for Australian fur seals (Brothers et al., 2001)

2.2.8.26 Kent Group National Park and Kent Group Marine Reserve - TAS

The six islands and islets of the Kent Group comprise Tasmania's northernmost National Park. Surrounding the largest of the islands, the Kent Group Marine Reserve covers 29,000 ha of marine habitat including deep and shallow reefs as well as extensive sponge beds (TPWS 2017). The waters around the Kent Group include the southernmost strongholds of several fish species including the violet roughy, mosaic leatherjacket and Wilson's weedfish, and the southern limit of distribution of Maori wrasse, one spot puller and Bank's shovelnose. The Marine Protected Area (MPA) is made up of a sanctuary zone which is a 'no take' zone, and a habitat protection zone which allows for lower impact fishing (e.g. abalone and rock lobster fishing, hand line fishing).

The North East Isle is a 32.62 ha unpopulated granite island with a peak elevation of 125 m above sea level. Recorded breeding seabird and wader species include Little penguin, Short-tailed shearwater, Fairy prior, Common diving petrel, Pacific gull and Sooty oystercatcher (Brothers et al., 2001).

2.2.8.27 Logan Lagoon Conservation Area - TAS

Logan Lagoon Conservation Area is also a Ramsar wetland of international significance. Refer to Section 2.2.3.3 Logan Lagoon Ramsar Site for further information.

2.2.8.28 Strzelecki National Park - TAS

Strzelecki National Park covers 4216 hectares in the south-western corner of Flinders Island. Flinders is the main island in the Furneaux Group, a group of 54 islands in Bass Strait off the north-east coast of mainland Tasmania.

The national park protects rich and varied ecosystems as well as spectacular coastal and granite mountain landscapes. Strzelecki forms an area where plant and animal species found on mainland Australia and Tasmania overlap, making the park of important biogeographic significance. The park is also home to a high number of endemic species, rare flora and fauna and significant vegetation communities.

Flinders Island has particular significance as an important stop-over point for bird species migrating between the Australian mainland and Tasmania. A number of rare and threatened species occur in the park, including the Swift parrot, Forty-spotted pardalote, Grey-tailed tattler, and the Hooded plover (Tas Parks, 2018).

2.2.8.29 Lavinia State Reserve – TAS

Lavinia State Reserve located on the north-eastern side of King Island contains the Lavinia Ramsar wetland site which accounts for its primary values. Refer to Section 2.2.3.10 for information on this reserve.

2.2.8.30 Hunter Island Group – TAS

The Hunter Group of Islands is a group of 13 islands which lay off the north-west tip of Tasmania in Bass Strait. The two largest islands are Hunter Island and Three Hummock Island and they are surrounded by many smaller islands including Albatross Island, Kangaroo Island (Tasmania), Bird Island and Stack Island. The group supports large numbers of migratory and seabirds. The endangered Northern Royal Albatross, southern Giant Petrel and Grey- headed Albatross are only some of the listed migratory species. The Critically endangered Great Knot and endangered Sand Plover are known to roost on the islands. The Critically endangered Curlew Sandpiper and Eastern Curlew are known to occur in the area and the islands are breeding and feeding or foraging areas for many other threatened bird species (DoEE, 2019r). The Hunter Group of Island is listed as an Important Bird Area by Birdlife International, formerly the International Council for Bird Preservation.

2.2.8.31 Rocky Cape National Park - TAS

Rocky Cape National park has an area of about 3064 ha on the north coast of Tasmania. As the name suggests the park is valued for its geoheritage where the age of the rocks and the geomorphosis, movement and erosion over time has created a spectacular coastline, including caves which are now 20M above the waterline. Threatened species habitat for critically endangered Curlew Sandpiper, Swift Parrot, Bar-tailed Godwit, Far Eastern Curlew and a migration route for the critically endangered Orange-Bellied Parrot (TSSC, 2006).

2.2.8.32 Narawntapu National Park - TAS

The Park has a total area of about 4,500 hectares and stretches on the north coast of Tasmania along the coast of Bass Strait from the Port Sorell estuary in the west to the mouth of the Tamar River in the east. The Park includes the adjacent islands in the Port Sorell estuary and The Carbuncle, covers primarily land mass extending to the low water mark and the tidal flats but does not include marine or estuarine waters. Threatened ecological communities of saltmarsh occur in the area. Endemic flora species such as velvet bush, threatened species such as the grass tree, and several plant communities which are unreserved or poorly reserved elsewhere in the State reserve system make this park an area of high conservation value for Tasmania. Threatened fauna species recorded are the Green and Gold frog, Swift Parrot, Wedge Tail Eagle and Great Crested Grebe. Endemic species found here are the Tasmanian Pademelon and the Bettong (TPWS, 2016).

2.2.8.33 Mt William National Park - TAS

Mt William National Park located in the far north-east corner of Tasmania is an important area for the conservation of Tasmania's coastal heathlands and dry sclerophyll plants. Being a coastal park, Mt. William is an excellent area for observing sea birds. Gulls, terns, gannets, and albatrosses can be seen, as well as both the Pied and Sooty oystercatcher. Although not common, both the White-bellied sea eagle and the Wedge-tailed eagle can sometimes be spotted soaring overhead. Mt William is also the first and last stop off point for some migratory birds such as shearwaters (TPWS, 2014).

2.2.8.34 Freycinet National Park and Wye River State Reserve - TAS

Freycinet National Park on the east coast of Tasmania comprises a total area of some 16,803 hectares and includes Freycinet Peninsula, Schouten Island and nearby offshore islets and rocks extending in each case to the low water mark. The park has visitor, recreation and conservation zones which also include cultural and historical values. Freycinet National Park is important for the conservation of Tasmania's dry sclerophyll plant communities on granite and dolerite, and the conservation of a range of rare and endemic plant species, including several threatened species. The Park is important for wading birds due to its proximity to Moulting Lagoon, a wetland of international importance. All of the Park's offshore islands, islets and rocks are important breeding and resting sites for seabirds. Australian Fur Seals and Leopard Seals haul out to rest on the Islands. Vulnerable species include the Hooded Plover, Swift Parrot, Wedge Tail Eagle, White-bellied Sea Eagle, Shy Albatross and Black-browed Albatross, White-fronted Tern and Fairy Tern. With the wide diversity in habitats, the park is important for conservation of numerous native and endemic species of flora and fauna and together with its social values is a renowned Tasmanian recreation and tourist destination (TPWS, 2000).

2.2.8.35 Maria Island National Park and Ile des Phoques Nature Reserve - TAS

Maria Island lies off the south-east coast of Tasmania and has a total area of about 11,550 hectares which includes a marine area of 1878 hectares. Except for Lachlan Island in Mercury Passage, the Park includes all the islands, rocks, and reefs adjacent to the coastline, most notably Ile du Nord (Rabbit Island) and Ile des Phoques Nature Reserve located midpoint between Maria Island and Schouten Island (TPWS, 1998). Threatened ecological communities include Giant Kelp Marine Forests and subtropical and temperate coastal saltmarsh (EPBC, 2019a). The area includes 53 threatened species including the critically endangered Swift Parrot, Curlew Sandpiper, Eastern Curlew and Bar-tailed Godwit. The waters around Maria Island are known foraging and feeding areas for vulnerable Humpback Whales and other marine mammals may also feed in the area. The park is rich in poorly reserved flora species. The Australian Convict Site, Darlington Probation Station is listed in the world Heritage list and was a penal colony established by Governor Arthur.

The Maria Island Marine Reserve on the north and north-west coast of the island covers 1250 ha and extend out to 1km from shore (or 20m depth) and include a sanctuary zone for the protection of kelp species (TPWS, 2019).

2.2.8.36 Tasman National Park and Reserves - TAS

Tasman National Park in the south-east of Tasmania has an area of 10,755 hectares and includes the adjacent offshore rocks and islands and includes several reserves. As many of the national parks on the east coast, the Tasman Park has geoheritage significance. Due to the substantially undisturbed landscape it is significant for flora and fauna conservation. Threatened fauna include the endangered Wedge- Tailed Eagle, Shy Albatross, Swift Parrot, Live-Bearing Sea Star. Several threatened flora species also occur in the Park. Several historic sites have been recorded in the park and reserves, and include examples of historic heritage from the convict era, through to maritime history and timber harvesting (TPWS, 2011). Whilst it does not include the world heritage Port Arthur site, the park spans either site of the entry to the port.

2.2.8.37 South Bruny National Park - TAS

South Bruny National Park (5,059 ha) provides key habitat for a number of threatened species, particularly bird life. The hooded plover uses the sandy beaches and dunes to nest, and the critically endangered swift parrot depends on blue gums for its specialised diet. The marine environment surrounding the park is home to seals and whales. The Australian fur seal, the most common seal in Tasmanian waters, can be seen around The Friars. Bruny Island was home to the Nuenonne clan of the South East nation of Tasmanian Aboriginal people and the park contains a number of important Aboriginal sites, including middens, quarries and artefact scatters (TPWS, 2020a).

2.2.8.38 Southport Lagoon Conservation Area – TAS

Lying approximately 80 kms south of Hobart the 4,280 hectare Southport Lagoon Conservation Area possesses a wide diversity of significant natural, cultural and recreational values. The lagoons and fringing vegetation support many bird species and fish nurseries. The historically significant Bruni D'Entrecasteaux's 1792 expedition documented plants found at the time, all of which still remain, including the 25 species that were thought to be extinct. Whaling stations operated to the north of the lagoon in the early 1900's but became unviable by the late 1840s due to overfishing (TPWS, 2020b).

2.2.8.39 Lord Howe Island Permanent Park Preserve - NSW

Lord Howe Island Permanent Park Preserve includes a major part of the Lord Howe Island Group but excludes the settlement areas of the island (residential and tourist accommodation and agricultural lands). Whereas a National Park does not allow any harvesting, the management of the *Preserve* allows for sustainable harvesting of some natural resources, in this case mainly palm seeds. Lord Howe is listed as World Heritage (refer to Section 2.2.1.2) for its exceptional natural beauty and for a place which has habitats where populations of rare or endangered species of plants and animals still survive. The Lord Howe Island Group forms one of the major seabird breeding sites in the Tasman Sea and is thought to be home to the most diverse and largest number of seabirds in Australia, 34 bird species regularly breed on the island. The summit and slopes of Mt Lidgbird and Mt Gower support almost the entire breeding population of the marine bird, providence petrel (Pterodroma solandri); the only known breeding locality in Australasia of the grey ternlet (Procelsterna cerulea) and vulnerable Kermadec petrel (Pterodroma neglecta neglecta); and the southernmost breeding locality in the world for the threatened masked booby (Sula dactylatra tasmani), sooty tern (Sterna fuscata) and common noddy (Anous stolidus) (DECCW, 2010a).

2.2.8.40 Cudgen, Wooyung and Billinudgel Nature Reserves - NSW

Cudgen, Wooyung and Billinudgel Nature Reserves are located just south of the QLD/NSW border and collectively cover approximately 7km of coastline. All are characterised by high species diversity and contain an overlap of the tropical and subtropical species close to the extent of their range. The three reserves conserve important coastal landscapes, remnant vegetation, and wildlife habitat in a region subject to considerable pressures from agricultural, residential, infrastructure and tourism development (DECC, 2007).

Cudgen Nature Reserve is also significant for wetland conservation in a local, regional and state context (NPWS, 1998d).

2.2.8.41 Cape Byron Marine Park - NSW

The Cape Byron Marine (State) Park is situated off the far north coast of NSW, wrapping around Cape Byron headland at Byron Bay and covers approximately 220 km^2 of NSW waters from the mean high water mark to 3 nautical miles offshore. It includes the tidal waters of the Brunswick River and its tributaries and Belongil and Tallow Creeks. It has multiple zones including Sanctuary, Habitat Protection and General Use.

The marine park conserves many subtropical marine habitats which support high levels of biodiversity including some threatened and protected species. It is strongly influenced by the East Australian Current (EAC) as warm waters from the north come together with cooler waters from the south. Julian Rocks within the park is an aggregation site for the endangered Grey Nurse Sharks, Carcharias taurus, who visit in winter (DPI, 2019a).

2.2.8.42 Byron Coast Group of Nature Reserves - NSW

The Brunswick Heads, Tyagarah and Broken Head nature reserves, together form the Byron Coast Group of Nature Reserves and cover about 922 hectares to the north and south of Byron Bay, a major tourist location. Like many of the parks and reserves described in this region, their importance as a group of protected areas is greater than their importance individually for nature conservation. These reserves, together with the surrounding parks and reserves form a discontinuous chain that protect habitats which support a diverse range of wildlife and plant communities including refuges for animals of ecological significance and important links in the north-south migration of certain animal species. Protection of these reserves becomes increasingly important in the face of growing population and recreational use (NPWS, 1998c).

2.2.8.43 Arakwal National Park and Cape Byron Conservation Area- NSW

Arakwal National Park is a 185.2 ha area created under an Indigenous Land Use Agreement (ILUA) with the Arakwal people as part of resolving a native title claim. It is situated 2km south of Byron Bay which is a regional and international tourist destination. It is a core component of the protected areas in the Byron Coast Group of reserves discussed above and also has significant values to its aboriginal people, the Arakwal people, who have been associated with the coastal landscape for over 22,000 years. The Park protects significant coastal habitat including a large area of honeysuckle country (Banksia heathland) that is home to a range of native plants and animals including threatened ecological communities and species (DEC, 2007).

Situated on the most easterly point of the Australian mainland on the far north coast of NSW, Cape Byron Headland Reserve is a State Conservation Area of 98.5 ha. It adjoins the Arakwal National Park and is equally important to the Arakwal people. It has rich historical heritage symbolised by the Cape Byron Lighthouse and is a major tourist attraction in walking distance to the Byron Bay township, providing various recreational activities including hiking, hang-gliding and whale watching (CBT, 2002).

2.2.8.44 Broadwater National Park, Bundjalung National Park and Iluka Nature Reserve - NSW

Broadwater National Park, Bundjalung National Park and Iluka Nature Reserve collectively form part of a major conservation system covering much of the subtropical coast of northern NSW. They protect most of the coastline (over 20,000 ha of coastal land) from Ballina on the Richmond River to the north and Iluka on the Clarence River to the south. The parks are significant as they exhibit high levels of biodiversity and a range of faunal species, which reflects the diverse vegetation communities and climatic conditions within the three areas. They contain subtropical communities, being at the end of the southern range of the subtropics, as well as coastal communities and also support temperate species. The parks protect more than 280 species of reptiles, birds and mammals. Twenty-six species of birds are recognised as being either endangered or vulnerable and therefore of high conservation status. (NPWS, 1997). The coastal wetlands, dunes and ocean foreshores are important feeding and roosting sites for a number of migratory and resident shorebirds. The Iluka Nature Reserve also protects a significant remnant area of sub-tropical littoral rainforest as part of a system of rainforest parks which are World Heritage listed (refer 2.2.1.3) (NPWS, 1997).

2.2.8.45 Yuraygir National Park - NSW

Yuraygir National Park on the north coast of NSW covers an area of 32,898 ha including over 80 kms of coastline. The park protects a wide range of vegetation communities and protects habitats which support a diverse range of wildlife communities including animals of ecological significance and species at the limit of their distribution (tropical and subtropical overlap). The park is also an important link in the north-south migration of certain animal species including the little tern, ruddy turnstone, Mongolian plover, pied oyster-catcher, sooty oyster-catcher, white-bellied sea eagle, eastern curlew, red-necked stint and the common sandpiper (NPWS, 2003).

2.2.8.46 Solitary Islands (State) Marine Park - NSW

Adjacent to the Yuraygir National Park and continuing south to Coffs Harbour is the Solitary Islands Marine Park which covers the area between the coast and the Commonwealth Solitary Islands Marine Park (refer Section 2.2.6.10). It has multiple zones including Sanctuary, Habitat Protection and General Use. It is approximately 710 km^2 from the mean high water mark to three nautical miles offshore, including estuaries to their tidal limit. The marine park is unique in that it contains diverse habitats (estuaries, sandy beaches, intertidal rocky shores, sub-tidal reefs, submerged solitary islands and open oceans) that support a diverse range of fish species including large pelagic fish. Turtles, shelled animals and many marine snails and slugs are also present, especially on the western side. In Anemone Bay in the north of the park the wildlife is particularly diverse and supports the dense coverage of anemone and anemone fish. The park is also the northern most breeding site recorded for the giant cuttlefish (DPI, 2019b).

2.2.8.47 Coffs Coast Regional Park and Moonee Beach Nature Reserve - NSW

Coffs Coast Regional Park covers a narrow, disjunct strip of coastal land stretching from near Corindi to the northern end of Park Beach, Coffs Harbour, covering an area of 562ha. The position of the park adjacent to a major regional city, a number of coastal villages and a wide range of tourism accommodation (including resorts and caravan parks) leads to pressure on the park from high visitation rates and varied land uses next to the park (NSW OEH, 2017c).

Moonee Beach Nature Reserve covers 336 ha and is located between areas covered by the Coffs Coast Regional Park. Many threatened species of fauna are found in the reserve, many of which are migratory bird species such as the wedge-tailed shearwater and the little tern. They too are threatened by increasing visitation rates (NSW OEH, 2012d).

2.2.8.48 Muttonbird Island Nature Reserve - NSW

Muttonbird Island Nature Reserve covers an area of around 9 hectares and is located adjacent to the coastline at Coffs Harbour on the mid north coast of NSW. It consists of two islands: Muttonbird Island and Little Muttonbird Island. As the name suggests, the reserve is a significant breeding site for the listed migratory wedge-tailed shearwaters (Puffinus pacificus) which migrate from Asia every year in August to breed on the island. As well as the migratory birds a number of threatened species have been recorded on the island including the vulnerable black-winged petrel (Pterodroma nigripennis), osprey (Pandion haliaetus) and sooty oystercatcher (Haematopus fuliginosus) (NPWS, 2009b)

2.2.8.49 Bongil Bongil National Park - NSW

Located 10km south of Coffs Harbour on the north coast of NSW is the 4,316 ha Bongil Bongil National Park. The park has over 10 km of coastline and is important as it protects coastal wetlands, creeks and estuaries that are crucial habitat for many native plant and animal species. The park contains diverse range of vegetation including threatened ecological communities such as Littoral Rainforest and Swamp Sclerophyll Forest on Coastal Floodplains. The park supports many species of shorebirds including the endangered Curlew sandpiper and Little Tern. With its close proximity to Coffs Harbour city and other smaller town, visitation to the park and enjoyment of the coastal areas is high (NSW OEH, 2017b)

2.2.8.50 Jagun Nature Reserve - NSW

Jagun reserve is located adjacent to the township of Valla Beach on the mid north coast of NSW. Although it is only 103 ha, the reserve is a critical part of a regional habitat corridor known as the

Oyster Creek Urunga Corridor linking large areas of coastal vegetation from Deep Creek in the south to the Bellinger River in the north, providing potential key linkages for threatened forest fauna. Jagun Nature Reserve has a number of small drainage lines which flow into Oyster Creek, which intermittently opens and closes to the ocean thereby having a short distance of transition between marine and freshwater vegetation, and variations in salinity dependent upon contact with the ocean. The entrance to Oyster Creek is highly significant to the Aboriginal Gumbaynggir people (NPWS, 2008).

2.2.8.51 Gaagal Wanggaan (South Beach) National Park- NSW

Gaagal Wanggaan (South Beach) National Park (637ha) is owned by the Aboriginal Gumbaynggir people and leased back to and jointly managed with the NSW Parks and Wildlife Service. Encompassing Warrell Creek, Gaagal Wanggaan (South Beach) National Park covers an undisturbed coastal dune system, littoral rainforest, shrubland, and estuarine mangroves which support a diverse range of coastal fauna and flora. The park contains significant Aboriginal cultural values including sites that show the continuous use of the area by Aboriginal people, as they have for thousands of years (NSW OEH, 2019b).

2.2.8.52 Hat Head National Park- NSW

Together with Limeburners Creek Nature Reserve, Sea Acres Nature Reserve and Crowdy Bay National Park, Hat Head National Park (7,220 ha) forms a system of protected areas between Harrington in the south and South West Rocks in the north which is broken only by the coastal towns and villages. Extensive wetlands of the Limeburners Creek Nature Reserve discussed below (refer Section 2.2.8.53) parallel the beaches of Hat Head National Park although these are being invaded by huge mobile dunes. Hat Head National Park contains the northern range limit of a number of temperate species of flora and fauna as well as the southern limit of many tropical and sub-tropical species as it is located at the Macleay-Mcpheerson Overlap; an ecological transition zone between the temperate southern areas of eastern Australia and the tropical north. The zone of overlap has significance for the number and diversity of both plant and animal species (NPWS, 1998a).

2.2.8.53 Limeburners Creek National Park - NSW

Limeburners Creek National Park covers 9,123 ha of coastal land north of Port Maquarie on the NSW mid-north coast. It incorporates large portion of Limeburners Creek Nature Reserve which is nationally significant freshwater and estuarine wetland. These provide habitat for many threatened and migratory bird species. Oher natural values include wet and dry heathland, littoral rainforest, eucalypt forest and woodland. The park contains a high concentration of indigenous relics including what may be fish trap, one of only three in the north coast of New South Wales (NPWS, 1998b).

2.2.8.54 Sea Acres National Park - NSW

Sea Acres National Park is located near Port Macquarie on the mid-north coast region of New South Wales. It is famous for its 1.3 km rainforest walk however has a coastal region also where evidence of its indigenous heritage and the way that the Birpai People likely used the area for fishing, hunting and gathering (NPWS, 2019c).

2.2.8.55 Crowdy Bay National Park and Watson Taylors Lake - NSW

Located on the mid-north coast of New South Wales, 25 km north-east of Taree is the 8,022 ha Crowdy Bay National Park which has within it the nationally significant, freshwater Watson Taylors Lake wetland. Part of the wetland is Blackfellows Bog, which is of high scientific value as it contains a wealth of palynological material which will allow scientists to reconstruct the many vegetative and climatic changes that have occurred over the last several thousand years in the Crowdy Bay area. Other significant natural values of the park include remnant stands of littoral rainforest at Crowdy Gap and Diamond Head and both wet and dry heath communities. The heath contributes to the park's attraction as a place for spring wildflower display, being renowned for many scenic features of the park together with beaches, headlands and sand plains. The park also contains undisturbed indigenous middens dating back approximately 6,000 years (NPWS, 1987).

2.2.8.56 Darawank, Khappinghat and Kattang Nature Reserves - NSW

Along the coast between Forster and Camden Haven are the Darawank (1191 ha), Khappinghat and Kattang (68 ha) Nature Reserves. Darawank Nature Reserve, occupies the largest area along the coast and supports a diversity of wetland and coastal vegetation communities providing habitat for threatened shorebird species including the Australian pied oystercatcher (Haematopus longirostris) and little tern (Sternula albifrons) and nesting site for the endangered black-necked stork (Ephippiorhynchus asiaticus). Consistent with the adjacent parks, these reserves have important ecological communities of littoral rainforest and subtropical rainforest (NSW OEH, 2014). Khappinghat is mainly inland but includes the approximately 3.45km of beach and Kattang is a dramatic cliffed headland which is a popular spot for fishing, viewing wildflowers and whale hatching (NPWS, 2019b).

2.2.8.57 Booti Booti National Park and Wallis Lake - NSW

Booti Booti National Park is 1566 ha park, approximately 10km long, 3.25 km wide at its widest point and 400m wide at its narrowest. It's a peninsula which runs between the Forster town in the North and Charlotte Head in the south and separates the ocean from Wallis Lake, which is a nationally important wetland. The park consists of what was 3 hill, island complexes that have been joined to the mainland through deposited sand. The dominant plant community is dry, subtropical rainforest and also includes Littoral rainforest as well as other plant communities (Griffith et al., 2014). Its estuarine waters provide habitat to over 200 bird species including the endangered little tern (NPWS, 2019d).

Wallis Lake is a nationally significant wetland and one of the lakes which form The Great Lakes of NSW (including Myall Lakes see Section 2.2.8.58 below). Wallis Lake supports the northern-most limit of the seagrass Posidonia australis and 20 per cent of the total seagrass communities in New South Wales (DoEE, 2006).

2.2.8.58 Myall Lakes National Park Little Broughton Island and Stormpetrel Nature Reserves-NSW

The extensive waterways including Bombah Broadwater, Boolambayte Lake and Myall Lake are the dominant feature of this park. The Myall Lakes Ramsar site also overlaps with the park (refer Section 2.2.3.10). Its proximity to Newcastle and Forster on the central coast of NSW and the dunes, waterways and 40kms of beach make Myall National Park the most frequently visited National Park in northern NSW.

The Myall Coast Reserves include Little Broughton Island (36 ha) and two islands known as Inner Rock and North Rock which together form Stormpetrel Nature Reserve (8 ha). They are located about 3 km offshore near Broughton Island. The three islands are important breeding sites for seabirds, of particular note are the White-bellied Sea Eagle and the Wedge-tailed Shearwater. Little Broughton Island is also recognised as the northern most breeding site for the short-tailed Shearwater (NPWS, 2002).

2.2.8.59 Tomaree National Park - NSW

Tomaree National Park is located in the Port Stephens area of NSW, approximately 45km north of Newcastle and covers an area of approximately 2,310 ha. The park is one of a group of conservation reserves in the Port Stephens area which protect a coastal landscape of regional and state importance. Nearby Nelson Bay is a popular holiday destination for people in Sydney and the park has over 100,000 visitors per year. The park's important values include evidence of important geological events, essential wintering habitat for a variety of birds, conservation of heath communities on volcanic rock (rhyodacite) which have restricted distribution in NSW (NPWS, 2006).

2.2.8.60 Worimi Conservation Lands - NSW

The Worimi Conservation Lands covers a total area of 4029 ha comprising the Worimi National Park (1812 ha), 881 ha of state conservation area and 1336 ha of regional park. It is located north of the Hunter River, Newcastle and covers approximately 25km of coastline including the intertidal zone down to the low water mark. Ownership of the land is by the Aboriginal Worimi people and it is leased back to the New South Wales government. It is managed under a jointly between the government and the Worimi people. It has significant indigenous heritage values with burial sites, ceremonial cites, middens extensive archaeological material. Worimi is an important habitat link within a broader wildlife corridor comprising the Wetlands National Park in the south-east and Tomaree National Park in the north-east (refer Section 2.2.8.59), linking Port Stephens to the Watagans, south-east of Newcastle. Many listed bird species are known to occur there including the endangered curlew sandpiper, little tern and pied oystercatcher (NSW, OEH, 2015).

2.2.8.61 Glenrock State Conservation Area and Awabakal Nature Reserve - NSW

Glenrock State Conservation Area of 534 ha is significant as it contains ten nationally significant vegetation communities, including lagoon (Glenrock Lagoon) and the threatened ecological community of littoral rainforest. The conservation area contains many cultural records, both Aboriginal and European, and is located within the Awabakal Local Aboriginal Land Council area (NPWS, 2010).

Awabakal Nature Reserve to the south of Glenrock State Conservation Area has similar values to Glenrock. The Redhead Lagoon provides one of the most important sources of information on the vegetation history of eastern Australia through the last full glacial–interglacial cycle.

Both areas are important habitat for the threatened terrestrial birds and mammal species. The proximity of these areas (8km and 15km to Newcastle city respectively) makes these highly used areas for educational and recreational purposes (NPWS, 2014c).

2.2.8.62 Munmorah State Conservation Area and Bird Island Nature Reserve and Wallarah National Park - NSW

Munmorah State Conservation Area is on the coast of NSW, approx. 40 km north of Gosford and has an area of 1,515 ha, including 12km of coastline. A range of vegetation communities including woodlands, open forests, wetlands, coastal tea tree shrubland and coastal heath support diverse fauna including the listed osprey (*Pandion haliaetus)* and sooty oystercatcher *(Haematopus fuliginosus).* The 7.3 ha Bird Island with its steep vertical cliffs is an important nesting and roosting area for seabirds including listed and migratory species including species of shearwater, godwit, curlew, terns and the arctic jaeger (also known as arctic skua) (*Stercorarius parasiticus)* (DoEE, 2019o) (NPWS, 2009a).

To the north of the park is the Wallarah National Park, primarily an inland park of 178 ha with approximately 2km of coastline. Seabirds and migratory birds found in the Munmorah State Conservation Area may also occur here (NPWS, 2014b)

2.2.8.63 Wyrrabalong National Park - NSW

Wyrrabalong National Park is located on the Central Coast of New South Wales approximately 105 km north of Sydney. The 620 ha park conserves the largest stands of littoral rainforest and Sydney red gums on the NSW Central Coast as well as significant freshwater wetlands. It also contains six endangered ecological communities (coastal saltmarsh, Littoral rainforest, swap oak and swap sclerophyll forest, freshwater wetlands and themeda grassland), significant habitat for a number of threatened animal species and a variety of Aboriginal sites, including an extensive midden at Pelican Point. The protected lake and foreshore and island provide important habitat for migratory birds and seabirds (NPWS, 2013).

2.2.8.64 Bouddi National Park, Brisbane Water National Park & Ku-ring-gai Chase National Park - NSW

Broken Bay, 46 km north of Sydney has three national parks at its entrance and is also the mouth of the Hawksbury River. Bouddi is at the north headland and comprises approximately 1,532 ha (NPWS, 2019a) and one of the first marine parks to extend down to the low water mark and therefore one of the first marine protected areas. Brisbane Waters National Park comprises approximately 11,506 ha. Both parks are significant is their representation of sandstone parks, coastal habitats and communities typical of the Sydney region. They are important in that together with the Ku-ring-gai Chase National Park on the south of the bay, also a National Heritage listed place (refer Section 2.2.2.2), they are a part of a system of reserves which protects the State and regionally significant waterways of the lower Hawkesbury River, Broken Bay, Pittwater and Brisbane Waters. The extensive areas covered by the three parks support a diverse range of communities which support native floral and faunal species. The parks also contain a large number of significant indigenous sites and representations of Sydney rock art (NPWS, 1992). With their proximity to suburban Sydney they are popular tourist and recreational locations.

2.2.8.65 Sydney Harbour National Park - NSW

Sydney Harbour National Park covers 393 ha of headlands, beaches and islands in and around Sydney Harbour. The park includes six headlands including North Head on the northern side and South Head on the south side. The five islands within the park are Shark Island, Clark Island, Fort Denison, Goat Island and Rodd Island, extending well into the harbour past the Sydney Harbour Bridge. All parts of the park are within suburban Sydney city. Its list of values include historic, conservation values for the protection of native flora and fauna, indigenous heritage, landscape and recreation and tourism (NPWS, 2012),

2.2.8.66 Malabar Headland National Park - NSW

The Malabar headland, located in Malabar, 12 km south of Sydney, is a 177 ha park which has dramatic sandstone cliffs and provides spectacular coastal views. The western and eastern sections of the headland contain rare examples of the once extensive Port Jackson mallee scrub (Eucalyptus obstans, formerly Obtusiflora). Malabar headland also contains one of the largest, continuous remnants of the endangered ecological community listed as Eastern Suburbs Banksia Scrub. The site is a renowned site for viewing seabirds and marine mammals, in particular the white bellied sea eagle and the humpback whale (NPWS, 2014a). The headland also has indigenous heritage significance and includes shell middens that can be seen today.

2.2.8.67 Towra Point Nature Reserve - NSW

Located at Kurnell, Botany Bay, in Southern Sydney, Towra Point Nature Reserve is a 603 ha reserve. The site is one of the first contacts between European and Aboriginal peoples, Towra Point is a hugely important place for Australia as we know it today. In April 1770, the Cook expedition explored the area and mapped Towra Lagoon as a source of fresh water. Its fresh drinking water and historical richness in seafood provided an abundant source of food to the indigenous people and the nature reserve is now a dedicated Aboriginal Place. Towra Point Nature reserve forms the largest and most diverse estuarine wetland complex in NSW. Representing around half of the remaining mangrove area near Sydney, and most of the saltmarshes remaining in the region. The abundance of mudflat, fresh water wetlands and sea grass beds, it provides breeding, feeding and roosting sites for many threatened and migratory bird species. Towra Point can only be accessed by boat or kayak (DECCW, 2010b).

2.2.8.68 Kamay Botany Bay National Park - NSW

Located within the Sydney metropolitan area, Kamay Botany Bay National Park (or Botany Bay National Park) covers approximately 456 ha of the northern and southern headlands of the entrance to Botany Bay and includes over 13 km of coastline. As discussed in the section on National Heritage (Section 2.2.2) the park includes the Kurnell Peninsula and Botany Bay botanical sites, listed National Heritage Places. It is also renowned for the place of arrival of the French expedition under the command of Jean-Francois de Galaup, Comte de Laperouse in 1788 before the departure of the first fleet. Laperouse stayed in Botany Bay for six weeks and built a stockade, observatory and a garden for fresh produce on the La Perouse peninsula before leaving and not seen again. The association of the park with the history of the European exploration and the botanical collection of native plants by Banks and Solander are the two most prominent values, however, together with those is the symbolism of the meeting of the Indigenous and European cultures and the historical social issues that have developed from that and the opportunity to further explore current social issues such as reconciliation (NPWS, 2016). The retention of the largest remnants of the original vegetation communities of the Kurnell Peninsula and Eastern Suburbs and prominent scenic coastal headlands at the entrance to Botany Bay are also defined as core values of the park. The park is also part of a broader network of conservation areas in the region that provide secure protection for native plants and animals, sites of Aboriginal and historic heritage value and recreational opportunities for a growing population. On the southern Headland, the park abuts the Caltex fuel import terminal on the inland side of the park (NPWS, 2018).

2.2.8.69 Royal National Park - NSW

Royal National Park is a 15,068 ha park situated on the coast of NSW, adjacent to the southern fringe of metropolitan Sydney and about 30 km north of Wollongong. Royal National Park adjoins Heathcote National Park (2,251 ha) to the west and Garawarra State Recreation Area (900ha) to the southwest. These adjoining parks do not include coastal areas. The parks are significant for many reasons and these can be partially attributed to their accessibility to suburban Sydney combined with the parks' diversity of natural and cultural heritage which makes for high public profile and visitation rates for recreation, scientific and educational purposes (NPWS, 2000)

The park is amongst the most floristically diverse areas of its size in the temperate parts of the world. Well over 1000 plant species have been recorded, including 26 species which are listed as nationally rare or threatened. The place is important for its richness in a wide array of species including heaths (Epacridaceae), peas and wattles (Mimosaceae and Fabaceae), orchids (Orchidaceae), grevilleas and banksias (Proteaceae) and members of the eucalypt family (Myrtaceae) (DoEE, 2019).

Royal National Park is also recognised for its rich invertebrate fauna. The place is also extremely important as a centre of temperate animal species richness for a range of groups including perching birds (Passeriformes) especially honeyeaters (Meliphagidae), tree-frogs (Hylidae), reptiles (Reptilia) and butterflies (Lepidoptera). The place can be regarded as exemplifying the biodiverse Hawkesbury Sandstone environment.

Royal NP is one of only four coastal national parks in NSW that protect land below high water mark and associated estuarine habitats. The submerged and intertidal lands of South West Arm and Cabbage Tree Basin, both in Port Hacking, are part of Royal NP. Both areas are sheltered bodies of water which support nursery grounds for juvenile fish and invertebrates, seagrass beds and a diverse benthic fauna. Cabbage Tree Basin also supports a mangrove community and is an area frequented by migratory birds (NPWS 2000).

The Royal National Park and Garawarra State Conservation Area are listed on the National Heritage list, recognised for its importance as Australia's first National Park and the diverse and fascinating nature environments protected in the area (refer Section 2.2.2).

Other values of the park include:

Indigenous Heritage

- Aboriginal sites in the parks are of importance to the present day Aboriginal community for cultural revival, educational and historical reasons.
- Provides protection for a large number of Aboriginal sites, particularly rock engravings stylistically distinct from those north of the Georges River.
- Royal National Park protects several cultural landscapes, including the Audley precinct and the Bulgo and South Era cabins.

Natural Heritage

- The three reserves comprise a moderately large area of land protecting important landforms and plant and animal communities which are typical of the coastal and sub-coastal parts of the Sydney Basin.
- The three reserves are an important link in a corridor of natural lands extending from southern and south-western Sydney southwards to the Illawarra escarpment, the water catchment areas and beyond.

Historic

- Royal National Park protects several cultural landscapes, including the Audley precinct and the Bulgo and South Era cabins.

2.2.8.70 Five Islands Nature Reserve - NSW

Five Islands Nature Reserve includes five small islands clustered off the coast of Port Kembla, immediately south of the city of Wollongong within the Wollongong Local Government Area. The islands are clustered between approximately 0.5 kilometres and 3.5 kilometres off the coast. The main values of the islands include (NPWS, 2005):

- Evidence of geological and geomorphologic processes related to the formation of the Sydney Basin and subsequent landscape evolution;
- Habitat and breeding sites for the sooty oystercatcher (Haematopus fuliginosus), classified as vulnerable
- Breeding sites for the wedge-tailed shearwater (Puffinus pacificus), the shorttailed shearwater (Puffinus tenuirostris) and habitat for the white-bellied sea-eagle (Haliaeetus leucogaster), all of which are listed migratory species
- Importance to the Aboriginal community due to continuing cultural associations and past occupation of the area.

2.2.8.71 Seven Mile Beach National Park and Comerong Island Nature Reserve - NSW

Seven Mile Beach National Park and Comerong Island Nature Reserve are located on the south coast of NSW, approximately 50 km south of Wollongong. The national park covers much of the sand dune barrier along Seven Mile Beach and part of adjacent Coomonderry Swamp (NPWS, 2019). It was reserved in 1971 and has a current area of 898 ha. The nature reserve comprises several islands in the Shoalhaven delta and the beds of Comerong Bay, Comerong Lagoon and the channels between the islands. It was reserved in 1986 and has an area of 660 ha. Seven Mile Beach National Park contains one of the largest areas of natural coastal dune vegetation on the central part of the NSW coastline and the uncommon orchid *Dipodium hamiltonianum* occurs there.

Coomonderry Swamp is the only large semi-permanent freshwater wetland on the south coast and protects approximately one third of this type of habitat within NSW. It is an important drought refuge when smaller coastal wetlands and inland wetlands are dry and supports a diverse range of bird species. The swamp has a large population of the threatened green and golden bell frog *Litoria aurea*. Other threatened fauna recorded at Coomonderry Swamp include the Australasian bittern *Botaurus poiciloptilus* and black-necked stork *Ephippiorhynchus asiaticus*. Threatened species recorded elsewhere in the national park include the tiger quoll *Dasyurus maculatus*, yellow-bellied sheathtail-bat

Saccolaimus flaviventris, greater broad-nosed bat *Scoteanax rueppellii*, swift parrot *Lathamus discolor*, olive whistler *Pachycephala olivacea*, regent honeyeater *Xanthomyza phrygia*, masked owl *Tyto novaehollandiae* and powerful owl *Ninox strenua*.

The Comerong Island nature reserve protects one of the few large naturally vegetated delta systems in NSW. It contains an important sample of three major habitat types - tidal shallows, mangrove swamp and has the largest remaining area of littoral forest on the south coast of NSW. It provides habitat for a large number of threatened waterbirds and shorebirds including two species of oystercatchers and sandpipers and is an important estuarine system for waders. The park and reserve are important recreational resources for sightseeing and fishing (NPWS 1998).

2.2.8.72 Jervis Bay Marine Park - NSW

Jervis Bay Marine Park on the NSW South coast covers approximately 215 km2 and spans over 100 km of coastline and adjacent oceanic and estuarine waters. It extends from Kinghorn Point south to Sussex Inlet. It includes most of the waters of Jervis Bay, with the remainder forming part of the Booderee National Park on Bherwerre Peninsula. It contains the tidal waters of Currambene Creek, Moona Creek, Carama Inlet, Wowly Gully, Callala Creek and Currarong Creek, and the mean high water mark along the shores. The marine park has six estuaries, excluding Jervis Bay, four small coastal creeks and two larger, wave-dominated estuaries. Four seagrass species are abundant making it an important nursery for fish and providing food and shelter for recreationally and commercially valuable species such as snapper, bream, luderick, whiting and flathead. The rocky shores are important roosting and feeding grounds for shorebirds including the threatened sooty oystercatcher. Shallow and intermediate reefs support a wide range of biodiversity, including habitat for commercially and recreationally valuable fish and for invertebrates such as cuttlefish, crabs and rock lobsters (NSW DPI, 2019).

The park was established in 1998. The park contains important habitat for the endangered grey nurse shark. Protected species known to occur in the park include the eastern blue devilfish, elegant wrasse, black rockcod, some hard and soft corals, sea anemones, zooanthids, and all pipefishes and seahorses. Pied and sooty oystercatchers, hooded plovers and ospreys are among the threatened bird species known to nest, roost and/or feed on the rocky shores. Humpback and southern right whales are often spotted during migration and are an important tourist attraction.

Indigenous people have strong ties to the land with midden sites located in areas around the marine park. Nine shipwrecks have been found in Jervis Bay, including the Hive which was the only convict transport ship to be wrecked on mainland Australia.

2.2.8.73 Booderee National Park - NSW

Booderee National Park stretches across 6,379 hectares at the southern section of Jervis Bay on the south coast of New South Wales and includes 875 hectares of marine environment with values similar to those in Jervis Bay Marine Park. Booderee National Park is owned by the Wreck Bay Aboriginal Community and is jointly managed with Parks Australia. The park includes Bowen Island which has a sanctuary zone on the west coast to protect nesting seabirds and their habitat from disturbance. The marine environment has a habitat protection zoning designed to safeguard sensitive, rare and endangered habitats, including littoral areas and seagrass beds (PA, 2019 b).

2.2.8.74 Conjola National Park - NSW

Located in the mid coast of NSW the Conjola National Park covers 11,060 ha including forests, woodlands, rainforest, coastal scrub and wetlands and four endangered ecological communities: Coastal Saltmarsh; Swamp Sclerophyll Forest (important feeding; Swamp Oak Floodplain Forest and Bangalay Sand Forest. 429 plant species are represented, five of which are threatened. Twenty five species of threatened fauna occur in the park. Of these the regent honeyeater (Xanthomyza phrygia), swift parrot (Lathamus discolor), little tern (Sterna albifrons), hooded plover (Thinornis rubricollis) and green and golden bell frog (Litoria aurea) are endangered. High diversity and occurrence of Aboriginal sites including middens, campsites, rock shelters and grinding grooves. A number of heritage features are located in the park including a burial and monument for the 1870 shipwreck of the Walter Hood (NPWS, 2009).

2.2.8.75 Narrawallee Creek Nature Reserve - NSW

Narrawallee Creek Nature Reserve is located on the mid south coast of New South Wales approximately 7km north of Ulladulla and covers an area of 878 ha. It includes five endangered ecological communities being Coastal Saltmarsh, Swamp Sclerophyll Forest (dominated by swamp mahogany, an important food source for several threatened fauna including the yellow-bellied glider and grey-headed flying fox), Swamp Oak Floodplain Forest, Littoral Rainforest and Bangalay Sand Forest). Eleven species of threatened fauna recorded, including breeding sites for the little tern, hooded plover and pied oystercatcher. Both indigenous and historical values are placed on the reserve (NPWS, 2006).

2.2.8.76 South Pacific Heathland Reserve - NSW

The South Pacific Heathland Reserve is a 14 hectare flora and fauna reserve on the cliffs above the rock platform between Rennies Beach and Racecourse Beach at the southern end of Ulladulla. Its value is based on its diversity of local flora, birdlife, and spectacular heathland and panoramic coastal views and is a popular nature walking track. Whales may be seen from the viewing platforms during their migration seasons (DNSW, 2019).

2.2.8.77 Parks & Reserves – Meroo National Park - NSW

Meroo National Park is 3,731 ha of coastline, coastal lakes and inland forested areas located 5 km south of Ulladulla on the NSW south coast. High conservation values are attributed to the coastal lakes included in the park (Termeil, Tabourie and Wairo Beach Lagoon) and the foreshores and fringing wetlands of the adjoining lakes s (Meroo, Burrill and Willinga Lakes). As per the Narrawallee Creek Nature Reserve it includes endangered ecological communities Swamp Oak Floodplain Forest (Casuarina glauca – Melaleuca ericifolia), Coastal Saltmarsh, Littoral Rainforest, Bangalay Sand Forest (E. botryoides – Banksia serrata) and Themeda Grassland on Seacliffs and Coastal Headlands. At least 12 threatened fauna species including significant populations of the nationally endangered green and golden bell frog (Litoria aurea) have been recorded here. The park also has indigenous and recreational values due to mythological sites and a range of bush camping locations (NPWS, 2010).

2.2.8.78 Murramurang National Park - NSW

Murramurang National Park spans 44 km of coastline on the NSW south coast and supports more than 90 species of bird including gannets, shearwaters, White-faced storm petrels, Sooty oystercatchers and Little penguins. The forest of spotted gums stretches right to the ocean (NPWS, 2018).

2.2.8.79 Batemans Marine Park - NSW

The Batemans Marine Park was established in 2006 and covers approximately 85,000 hectares, extending from the north end of Murramarang Beach near Bawley Point to Wallaga Lake in the south. It includes all of the seabed and waters from the mean high water mark on the coast to three nautical miles offshore. It includes all estuaries, creeks, rivers and lakes (except Nargal Lake) to the limit of tidal influence. Scuba diving, snorkelling, beach going, whale, seal and other wildlife watching, fishing, swimming, surfing and boating are all popular pastimes.

The park covers a range of habitats, including continental shelf sea floor along with sponge gardens, beaches, rocky shores, kelp beds, coralline algal banks, rocky reefs, islands, seagrass, mangroves and estuarine habitats.

The Montague Island Nature Reserve, within the Marine Park, is a breeding and nesting place for over 40,000 sea birds including Shearwaters, Little penguins, Crested terns and Silver gulls and is a haul out site for Australian and New Zealand fur seals. Both Montague Island and the Tollgate Islands (also within the park) are aggregation sites for Grey nurse sharks.

Local Aboriginal communities have strong links to the area within and adjoining the Marine Park. The local Aboriginal communities within the Yuin Nation are actively involved in consultation on park issues affecting traditional use (DPI, 2018).

2.2.8.80 Eurobodalla National Park - NSW

Eurobodalla National Park contains a range of aquatic environments including lagoons, lakes, estuaries, sheltered and wild beaches that protect a wide variety of plants and animals. The National

Park provides an important habitat for a wide variety of birds with 131 bird species having been recorded in the park. Estuaries and headlands are important over-wintering areas for migratory birds, including 17 species of waders, and the Hooded plover and Little tern nest on the sand islands, sand spits and dunes.

Water based activities such as boating, fishing and swimming are all popular in the park (NPWS, 2018).

2.2.8.81 Mimosa Rocks National Park - NSW

Mimosa Rocks National Park takes its name from the Paddle Steamer Mimosa that wrecked in 1863 after running aground on rocks at the northern end of the park. The rocks of the park have distinctive castle-like features that are the result of geological folds, faults and intrusions.

The park provides important habitat for many migratory birds, including Hooded plovers and Pied oystercatchers that nest along the coastline. The Bar tailed godwit rests briefly here in summer months during its migration from Alaska to New Zealand.

The park is popular for fishing, surfing, snorkelling and birdwatching. From May to November, the headlands are excellent whale watching vantage points (NPWS, 2018).

2.2.8.82 Bournda National Park - NSW

Bournda has been a special place for the Dhurga and Yuin people for thousands of years and its name means ‘place of tea tree and kangaroos’. The estuarine wetlands provide roosting and feeding areas for a large variety of waders and waterfowl including threatened species such as Little tern, Hooded plover and Pied oystercatcher (NPWS, 2018).

2.2.8.83 Ben Boyd National Park - NSW

The Ben Boyd National Park is comprised of three sections, extending approximately 45 km along the coast north and south of Twofold Bay near Eden. The park’s vegetation reflects its location in the driest, windiest part of the state’s coastline. Open forest and woodland cover most of the park. The park’s varied habitat supports a highly diverse bird population and about 50 species of mammal including a number of threatened species. Migrating whales can often be seen from the coast between late May and December and the former Davidson Whaling Station located on Twofold Bay is a tourist attraction (NPWS 2017b).

2.2.8.84 K’gari, Great Sandy National Park – QLD

Fraser Island, Cooloola, Hervey Bay and some adjacent areas in south-east Queensland form the K’gari, Great Sandy Region National Park of about 840,000ha and is listed on the World Heritage list (refer Section 2.2.1.4). The habitats of a number of internationally and nationally threatened terrestrial and marine animals and plants occur within the Region. The marine areas and associated tidal wetlands of Hervey Bay, and the Great Sandy Strait and adjacent beaches support and harbour a diversity of marine life. Species include seasonal populations of humpback whales, dugong, dolphins, turtles, and trans-equatorial migratory wading birds which depend upon the Region for roosting and staging during their annual migrations. The Great Sandy Strait is recognised as a Ramsar Wetland of International Importance (refer Section 2.2.3.16) (QEPA, 2005).

2.2.8.85 Noosa National Park – QLD

Noosa National Park (2,280 ha) is situated on the Sunshine Coast about 150 km north of Brisbane. The Sunshine Coast has strong links to the adjacent Great Sandy Region in terms of geology, landscape components, climate, soils and vegetation. More than 181 bird species have been recorded in the park and adjacent intertidal areas. The Noosa Heads area provides habitat for 28 birds of conservation significance, including 20 migratory birds covered under agreements between Australia and Japan (JAMBA) and Australia and China (CAMBA) (QPWS, 1999).

2.2.8.86 Bribie Island National Park – QLD

Bribie Island is part of a network of coastal sand landscapes stretching from Stradbroke Island to Woodgate. The island is low-lying, with a maximum elevation of less than 10 metres, and the coastal environments including the salt marsh, tidal flats, mangroves, sandy beaches, wetlands and freshwater lakes, provide habitat for diversity of native animals including internationally protected resident and migratory shorebirds. The critically endangered eastern curlew is known to roost there. Shorebirds are threatened by human disturbance and destruction of nest sites (QPWS, 2013a).

2.2.8.87 Moreton Island, Southern Moreton Bay Islands South Stradbroke Island National Park – QLD

Moreton Island National Park (16,900ha), Southern Moreton Bay Islands National Park (1,646 ha) and North and South Stradbroke Island Conservation Park (1,440 ha) are located on the eastern edge of Moreton Bay, Queensland. Like the surrounding sand islands, these are ecologically significant with forest woodland, heathland, mangrove and grassland communities. The Southern Moreton Bay Islands National Park contains the most southern distribution of black mangrove Lumnitzera racemosa in Queensland (QPWS, 2013b). Moreton Bay and the sand islands provide a vital feeding and resting point for over 50,000 migratory waders and parts of Moreton Bay are listed as a wetland of international importance (refer Section 2.2.3.15) (PQWS, 2007), each area representing different extents of the various wetland systems.

2.2.8.88 Naree Budjong Djara National Park – QLD

Naree Budjong Djara National Park (132 km^2, forming approximately 50% of North Stradbroke Island) features places of incredible conservation value and a variety of special habitats, including endangered heathlands, freshwater lakes and woodlands, similar to the other islands in Moreton Bay. Its cultural significance to the traditional owners, the Quandamooka people, dates back thousands of years and the park is jointly managed by the Quandamooka people and Queensland Parks and Wildlife Service (QPWS) (QPWS, 2020).

2.2.8.89 Special Management Areas

Skerries

The Skerries, offshore from Wingan Inlet, near Croajingolong National Park is home to a major seal breeding colony with an estimated population of 11,500 representing approximately 12% of the national population.

Montague Island

The Montague Island Nature Reserve, within the Batemans Marine Park (Refer Section 2.2.8.79), is a breeding and nesting place for over 40,000 sea birds including Shearwaters, Little penguins, Crested terns and Silver gulls and is a haul out site for Australian and New Zealand fur seals. Both Montague Island and the Tollgate Islands (also within the park) are aggregation sites for Grey nurse sharks.

2.3 Ecological Environment

2.3.1 Fauna

The EPBC Act Protected Matters search tool on the Department of Environment and Energy site was used to inform the listed marine, migratory and threatened faunal species (or species habitat) that occur, or may occur in the DA (DoEE 2019b, DoEE 2019l, DoEE 2019m, DoEE 2019r, DoEE 2019at, DoEE 2019au).

2.3.1.1 Fish

2.3.1.2 Fish (bony)

Bony fish are a diverse group of fish that have skeletons primarily composed of bone tissue, as opposed to cartilage; most living species of fish are bony fish. The vast majority of fish are members of Osteichthyes, which is an extremely diverse and abundant group consisting of 45 orders, and over 435 families and 28,000 species.

Syngnathidae is a group of bony fishes that includes seahorses, pipefishes, pipehorses and sea dragons; the closely related Solenostomidae family includes ghost pipefish. These species occupy a range of habitats, however generally display a preference for seagrass and macroalgal beds, coral reefs, mangroves or sponge gardens (i.e. a habitat offering a protective environment. Habitat that supports syngnathid populations is generally patchy, so populations of syngnathid species may be dispersed and fragmented (DSEWPaC, 2012f). Syngnathids are typically carnivorous, feeding in the water column on or near the sea floor; their diet including small crustaceans, invertebrates, and zooplankton. Generally, the pipefishes, seahorses and seadragons are associated with vegetation in sheltered to moderately exposed reef areas at a range of depths from 0 to 50 m, depending on the species (Edgar, 1997), but usually at depths of between 5 and 25 m. Given that these species normally inhabit shallow reefs and kelp beds (Kuiter 2000).

It is estimated that there are over 500 species of fish found in the Gippsland Basin, including a number of species of importance to commercial and recreational fisheries (LCC, 1993). Species of commercial importance are covered in Section 2.4.1.

Fish species listed under the EPBC Act that may occur in the DA are given in Table 2-32 (DoEE, 2019b, DoEE, 2019l, DoEE, 2019m). Two species listed as ‘critically endangered’, the Spotted handfish and the Red handfish, may occur within the DA. There are less than forty Red handfish known to exist with a second (secret) location only recently discovered along the east coast of Tasmania (ABC 2018). Ziebell’s Handfish, also may occur in the DA and is listed as vulnerable. Handfish have a depth distribution of 3-20 metres and use their hand-like fins to crawl across the sea floor. The species’ diet includes small crustaceans and polychaete worms and the species is endemic to Tasmania (DoEE, 2015).

Two other fish species potentially occurring within the DA were listed as ‘vulnerable’ under the EPBC Act; the Australian grayling (Prototroctes maraena) and the Black rockcod (Epinephelus daemelii) (DoEE 2017a). The Australian grayling is a small to medium-sized, slender, silvery fish with soft-rayed fins. It is endemic to south-eastern Australia, including Victoria, Tasmania and New South Wales, and is a migratory species that inhabits estuarine waters and coastal seas as larvae/juveniles, but spend most of their lives in freshwater, inhabiting rivers and streams as adults (DSE, 2008). The Black cod’s range includes warm temperate and subtropical waters of the southwestern Pacific, including south-eastern Australia and the North Island, Kermadec Islands and Poor Knights Islands of New Zealand. The last known significant population of Black cod is at Elizabeth and Middleton Reefs (refer 2.2.3.14). Black cod generally inhabit near-shore rocky and offshore coral reefs at depths down to 50 m. In coastal waters juveniles are often found in estuary systems with adults moving into rock caves, rock gutters and on rock reefs (DoEE, 2012a).

Pipefishes, seahorses and seadragons, as listed under the EPBC Act, require a permit to remove them from the area. Generally, the pipefishes, seahorses and seadragons are associated with vegetation in sheltered to moderately exposed reef areas at a range of depths from 0 to 50 m, depending on the species (Edgar, 1997), but usually at depths of between 5 and 25 m. These species normally inhabit shallow reefs and kelp beds, they are not commonly found within the operational area itself but occur around adjacent shorelines in the DA (Kuiter 2000). Four additional species of pipefish and seadragon are listed as may occur within the DA.

A review of data collected in 1998 and 1999 by Neira (2005) suggested that the presence of Bass Strait offshore production facilities (and subsea infrastructure) within and near the Gippsland Basin Exclusion Zone provides additional habitat for early life stages of a large suite of teleost fish families. However, it is likely that both species composition and abundance around the operational area are closely linked to the ichthyofauna inhabiting hard/soft megahabitats off the Gippsland coastline and, to a lesser extent, those at the south-east corner of mainland Australia (e.g. Howe/Gabo complex).

Table 2-32 EPBC Act listed fish species or species habitat that may occur within the DA (DoEE, 2019b, DoEE, 2019l, DoEE, 2019m)

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	Type of Presence
Fish					
Acentronura tentaculata	Shortpouch pygmy pipehorse			✓	MO
Brachionichthys hirsutus	Spotted Handfish	CE			MO

Brachiopsilus ziebelli	Ziebell's Handfish	V			MO
Campichthys tryoni	Tryon's Pipefish			✓	MO
Corythoichthys amplexus	Fijian Banded pipefish			✓	MO
Corythoichthys ocellatus	Orange-spotted Pipefish,			✓	MO
Cosmocampus howensis	Lord Howe pipefish			✓	MO
Epinephelus daemelii	Black rockcod	V			MO
Festucalex cinctus	Girdled Pipefish			✓	MO
Filicampus tigris	Tiger Pipefish			✓	MO
Halicampus boothae	Booth's Pipefish			✓	MO
Halicampus grayi	Mud Pipefish,			✓	MO
Heraldia nocturna	Upside-down pipefish			✓	MO
Hippichthys cyanospilos	Blue-speckled Pipefish			✓	MO
Hippichthys heptagonus	Madura Pipefish			✓	MO
Hippichthys penicillus	Beady Pipefish,			✓	MO
Hippocampus abdominalis	Big-belly seahorse			✓	MO
Hippocampus breviceps	Short-head seahorse			✓	MO
Hippocampus kelloggi	Kellogg's Seahorse			✓	MO
Hippocampus kuda	Spotted Seahorse			✓	MO
Hippocampus minotaur	Bullneck seahorse			✓	MO
Hippocampus planifrons	Flat-face Seahorse			✓	MO
Hippocampus trimaculatus	Three-spot Seahorse,			✓	MO
Hippocampus whitei	White's seahorse			✓	MO
Histiogamphelus briggsii	Briggs' crested pipefish			✓	MO
Histiogamphelus cristatus	Rhino pipefish			✓	MO
Hypselognathus rostratus	Knife-snout pipefish			✓	MO

Kaupus costatus	Deep-bodied pipefish			✓	MO
Kimblaeus bassensis	Trawl pipefish			✓	MO
Leptoichthys fistularius	Brushtail pipefish			✓	MO
Lissocampus caudalis	Smooth pipefish			✓	MO
Lissocampus runa	Javelin pipefish			✓	MO
Maroubra perserrata	Sawtooth pipefish			✓	MO
Micrognathus andersonii	Anderson's Pipefish,			✓	MO
Micrognathus brevirostris	Thorn-tailed Pipefish			✓	MO
Microphis manadensis	Manado Pipefish			✓	MO
Mitotichthys mollisoni	Mollison's pipefish			✓	MO
Mitotichthys semistriatus	Halfbanded pipefish			✓	MO
Mitotichthys tuckeri	Tucker's pipefish			✓	MO
Notiocampus ruber	Red pipefish			✓	MO
Phycodrus eques	Leafy seadragon			✓	MO
Phyllopteryx taeniolatus	Weedy seadragon			✓	MO
Pristis zijsron	Green Sawfish	V	✓	✓	BKO
Prototroctes maraena	Australian grayling	V			LO
Pugnaso curtirostris	Pugnose pipefish			✓	MO
Solegnathus dunckeri	Duncker's Pipehorse			✓	MO
Solegnathus hardwickii	Pallid Pipehorse			✓	MO
Solegnathus robustus	Robust spiny pipehorse			✓	MO
Solegnathus spinosissimus	Australian spiny pipehorse			✓	MO
Solenostomus cyanopterus	Robust ghostpipefish			✓	MO
Solenostomus paradoxus	Ornate Ghostpipefish			✓	MO
Stigmatopora argus	Spotted pipefish			✓	MO

Stigmatopora nigra	Widebody pipefish			✓	MO
Stipecampus cristatus	Ringback pipefish			✓	MO
Syngnathoides biaculeatus	Double-ended pipehorse			✓	MO
Thymichthys politus	Red handfish	CE			MO
Trachyrhamphus bicoarctatus	Bentstick Pipefish			✓	MO
Urocampus carinirostris	Hairy pipefish			✓	MO
Vanacampus margaritifer	Mother-of-pearl pipefish			✓	MO
Vanacampus phillipi	Port Phillip pipefish			✓	MO
Vanacampus poecilolaemus	Australian long-snout pipefish			✓	MO
<u>Threatened Species</u>: *V Vulnerable* *CE Critically Endangered*	*<u>Type of Presence</u>:* *MO Species or species habitat may occur within the area*				

Table 2-33 Key threats and management actions for threatened fish species or species habitat that may occur within the DA

Common Name	Conservation Advice or Recovery Plan	Key Threats (relevant to petroleum activities)
Spotted Handfish	Approved Conservation Advice for *Brachionichthys hirsutus* (spotted handfish) (DoEE, 2012c). Australian national Recovery Plan for Three Handfish Species: spotted handfish (*Brachionichthys hirsutus*), red handfish (*Thymichthys politus*) and Ziebell's handfish (*Brachiopsilus ziebelli*) (DoEE, 2015e	None identified
Ziebell's Handfish	Australian national Recovery Plan for Three Handfish Species: spotted handfish (*Brachionichthys hirsutus*), red handfish (*Thymichthys politus*) and Ziebell's handfish (*Brachiopsilus ziebelli*) (DoEE, 2015)	None identified
Red Handfish	Australian national Recovery Plan for Three Handfish Species: spotted handfish (*Brachionichthys hirsutus*), red handfish (*Thymichthys politus*) and Ziebell's handfish (*Brachiopsilus ziebelli*) (DoEE, 2015)	None Identified
Black Rock cod	Approved Conservation Advice for *Epinephelus daemelii* (black cod) (DoEE, 2012a)	None Identified
Australian Grayling	National Recovery Plan for the Australian Grayling Prototroctes maraena, 2008 (VDSE, 2008)	Reduction in water quality

2.3.1.3 Fish (cartilaginous)

Cartilaginous fish are jawed vertebrates with skeletons made of cartilage rather than bone. This group includes two subclasses:

- Elasmobranchii (sharks, rays, skates and sawfish); and
- Holocephali (chimaeras or ghost sharks).

There are six shark and three ray species (or species habitat) that may occur within the DA; this includes species classified as threatened and migratory (Table 2-32) (DoEE, 2019b, DoEE, 2019l, DoEE, 2019m). Only one species (Great White Shark) has an important behaviour (breeding) identified for the DA.

A list of the conservation advice and/or recovery plans, with relevant management actions, is shown in Table 2-35.

Sharks and Rays

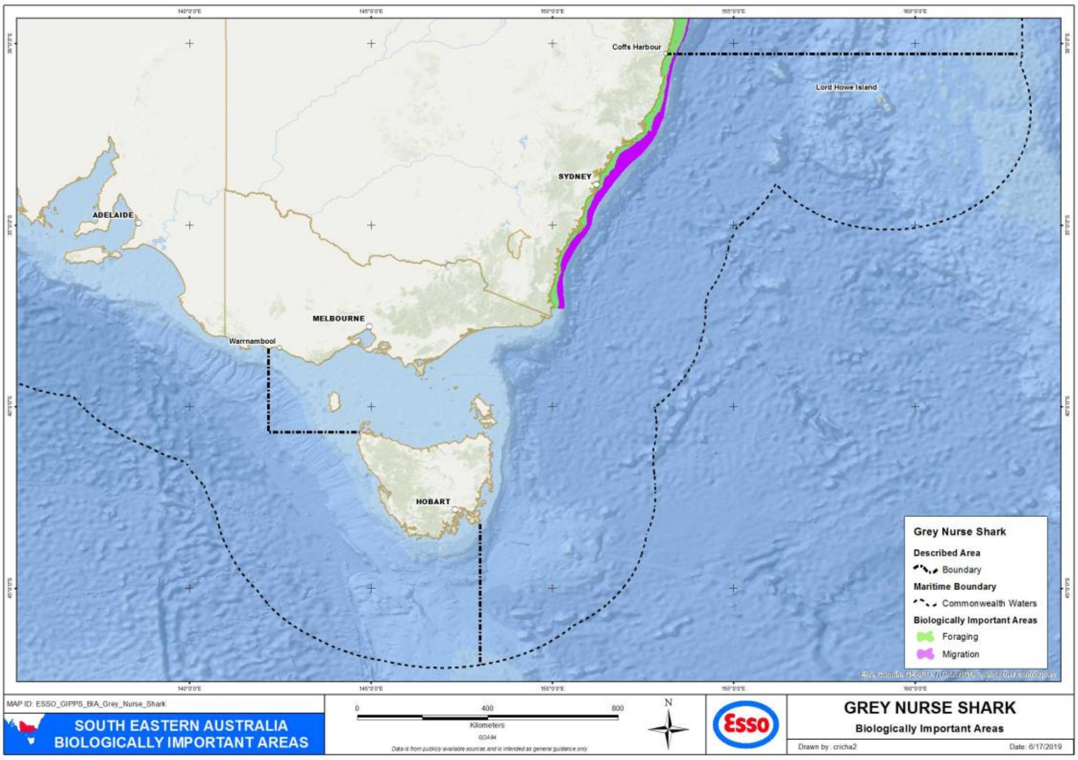
In Australia, the Grey Nurse Shark primarily has an inshore coastal distribution in sub-tropical to cool temperate waters on the continental shelf (DoE, 2014). The east coast population covers a range extending from the Capricornia coast (central Queensland) to Narooma in southern New South Wales (DoE, 2014), and is listed as critically endangered (TSSC, 2001). The species is rarely found travelling in the northern section of the Commonwealth south-east marine bioregion (DoEE 2015a and is uncommon in Victorian, South Australian and Tasmanian waters. The Grey Nurse Shark generally occurs as solitary individuals or in small schools; larger aggregations of individuals may occur for courtship and mating (DoE, 2014). A number of key aggregation sites[2] and habitat critical for the survival of the Grey Nurse Shark have been identified; the following two areas occur within the DA: Tollgate Islands (near Batemans Bay), and Montague Island (near Narooma). The Grey Nurse Shark migrates within its range, making seasonal north–south movements to form aggregations at critical habitat sites, thought to be related to breeding (DoEE, 2017f). The precise timing of mating and pupping in Australian waters is unknown; however, in South Africa mating occurs between late-October and late-November (DoEE, 2017f). A BIA for foraging and migration has been identified for the Grey Nurse Shark along the east coast of Australia (Figure 2-22).

The shortfin mako shark (*Isurus oxyrinchus*) has been recorded in offshore waters all around the Australian coastline except for the Arafura Sea, Gulf of Carpentaria and Torres Strait in the north (TSSC, 2014b). It is a pelagic species, primarily occurring in offshore, oceanic waters (Last and Stevens, 2009). The shortfin mako is highly migratory and can cover large distances, migrating from Australian waters to areas well beyond the Australian Exclusive Economic Zone (Rogers et al., 2009). The shortfin mako inhabits depths down to 600 m, with a slight trend indicating the species spend the majority of the night in shallow water, and the majority of daylight hours in deeper waters (Rogers et al., 2009). It is not normally found in waters below 16°C (RPS, 2015). Satellite tracking data for shortfin mako showed a potential for year round occupation of the Otway, Bass Strait and Gippsland Basins (Rogers and Bailleul, 2015). The longfin mako (*Isurus paucus)*, often mistaken for the shortfin mako, is an epipelagic species with a usual depth range between 120 and 240 metres. Its exact range is not known however it known to have a worldwide distribution in tropical and temperate seas. Within Australia it is known to occur in the north and to the south to at least Port Stephens in NSW. It is thought to feed on pelagic fish and cephalopods (DSEWPAC, 2012g).

The Great White Shark has a range extending from central Queensland, around the south coast, to north-west Western Australia (DSEWPaC, 2013a). The shark is primarily found on the continental shelf and coastal waters, including inshore waters around oceanic islands. The Great White Shark is not evenly distributed throughout its range, with observations more frequent in some areas, including those around fur-seal or sea-lion colonies (DSEWPaC, 2013a). Juveniles appear to aggregate seasonally in key areas, including Wilsons Promontory (Victoria), and the Skerries (DSEWPaC, 2013a). Recent studies have found that juvenile white sharks (<3m) occupy estuaries Corner Inlet, Victoria during October to January (Harasti *et al*., 2017). A BIA for breeding (nursery ground) has been established in

[2] 'Key Aggregation Sites' defined as being locations where five or more Grey Nurse Sharks were consistently found throughout the year (DoEE, 2014).

the coastal region extending east from Wilsons Promontory (Figure 2-22). The Great White Shark moves seasonally along the south and east Australian coasts, moving northerly along the coast during autumn and winter, and returning to southern Australian waters by early summer. The Great White Shark is not known to form and defend territories, however, its ability to return on a seasonal basis implies a degree of site fidelity (DSEWPaC, 2013a).



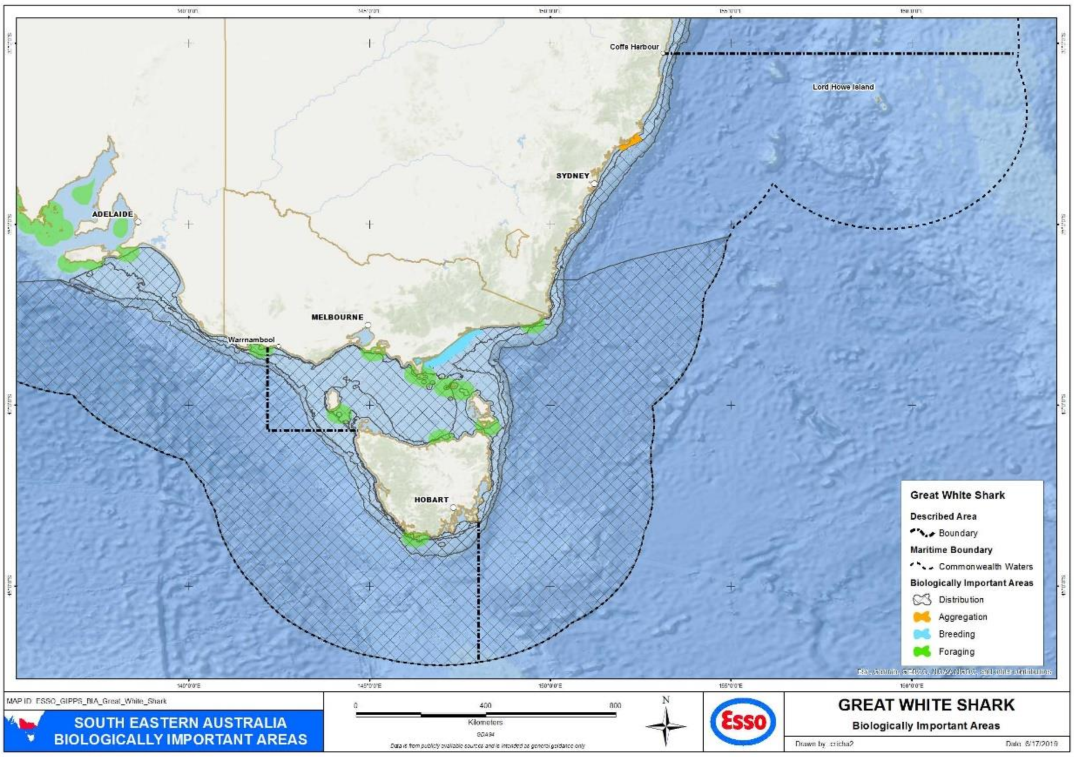


Figure 2-22 Biologically important areas for shark species

Whale sharks (*Rhincodon typus*) are generally found in warmer oceanic waters (where temperatures range from 21 to 25°C) and mainly occur in waters off the Northern Territory, Queensland and northern Western Australia. However, there have been a few isolated reports of immature male whale sharks in New South Wales and Victoria (Last & Stevens 1994). The Whale sharks are not likely to occur in the EGBPA.

The Porbeagle or Mackerel Shark (*Lamna nasus*) is listed as a migratory marine species under the EPBC Act, likely to occur in the DA. The timing and details of these migratory movements are not well-understood for the Porbeagle however it primarily inhabits oceanic waters and areas around the edge of the continental shelf. They occasionally move into coastal waters, but these movements are temporary. The Porbeagle utilises a broad vertical range of the water column and is known to dive to depths exceeding 1300 m. The Porbeagle is thought to be reasonably flexible in the types of habitat used for foraging. Whilst protected from targeted fishing, bycatch remains its greatest threat.

The Giant manta ray (*Manta birostris*) (Australian Museum, 2014) is the largest species of ray in the world. The Manta ray lives in tropical waters but is also found occasionally in temperate seas. In Australia it is recorded from south-western Western Australia, around the tropical north of the country and south to the southern coast of NSW, where it may overlap with the DA. The Manta ray feeds on plankton which are filtered from the water through the gills (DoEE, 2018c).

Another species of the Manta found in the DA is the Reef manta ray (*Manta alfredi*), distinguishable from the Giant manta ray as it has dark spots on the ventral surface between the gills (Australian Museum, 2019). It is a listed migratory species and has similar distribution and feeding habits as the Giant Manta ray. No specific conservation advice exits for either species of the ray (DoEE, 2019x).

The Green Sawfish, is a species of ray listed as vulnerable, with a body of a shark and a flattened head and an elongated snout with 24–28 pairs of unevenly-spaced rostral (saw-like) teeth. The species was last recorded in waters of NSW in 1926 but appears to have contracted its range and has not been detected in NSW or southern Queensland waters since then. It is currently distributed from the Whitsundays in Queensland across northern Australian waters to Shark Bay in Western Australia. The fins are highly sought after in the international market and anecdotal reports suggest sawfish populations have declined significantly as a result (DoEE, 2019ap).

Table 2-34 Fish species or species habitat that may occur within the DA (DoEE, 2019b, DoEE, 2019l, DoEE, 2019m)

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Sharks and Rays						
Carcharias Taurus (east coast population)	Grey Nurse Shark (east coast population)	CE			d	KO
Carcharodon carcharias	Great White Shark	V	✓		b, d	BKO
Isurus oxyrinchus	Shortfin Mako		✓			LO
Isurus paucus	Longfin Mako		✓			MO
Lamna nasus	Porbeagle		✓			LO
Manta birostris	Giant Manta Ray		✓			KO
Manta aldfredi	Reef Manta Ray		✓			KO
Pristis zijsron	Green Sawfish, Dindagubba, Narrowsnout Sawfish	V	✓			BKO

Rhincodon typus	Whale Shark	V	✓			MO
Threatened Species: *V Vulnerable* *CE Critically Endangered* *Biologically Important Areas*: *b Breeding* *d Distribution*	*Type of Presence*: *MO Species or species habitat may occur within the area* *LO Species or species habitat likely to occur within the area* *KO Species or species habitat known to occur within the area* *BKO Breeding known to occur within the area*					

Table 2-35 Key threats and management actions for threatened fish species or species habitat that may occur within the DA

Common Name	Conservation Advice or Recovery Plan	Key Threats (relevant to petroleum activities)
Grey Nurse Shark	Recovery Plan for the Grey Nurse Shark (*Carcharias Taurus*)	None identified
Great White Shark	Recovery Plan for the White Shark (*Carcharodon carcharias*)	None identified
Whale Shark	Approved Conservation Advice for *Rhincodon typus* (Whale Shark)	Vessel strike Habitat disruption from mineral exploration, production and transportation Marine debris

2.3.1.4 Birds

Birds in the marine environment can include both seabirds and shorebirds:

- Seabirds refers to those species of bird whose normal habitat and food sources are derived from the ocean (both coastal and pelagic); seabirds include such species as pelicans, gannets, cormorants, albatrosses and petrels.
- Shorebirds (sometimes referred to as wading birds) refers to those species of bird commonly found along sandy or rocky shorelines, mudflats, and shallow waters; shorebirds include such species as plovers and sandpipers.

There are 121 seabird and shorebird species (or species habitat) that may occur within the DA; this includes species classified as threatened and migratory (Table 2-36) (DoEE, 2019b, DoEE, 2019l, DoEE, 2019m). The type of presence varies between species, and includes important behaviours (e.g. foraging, roosting, breeding) for some species.

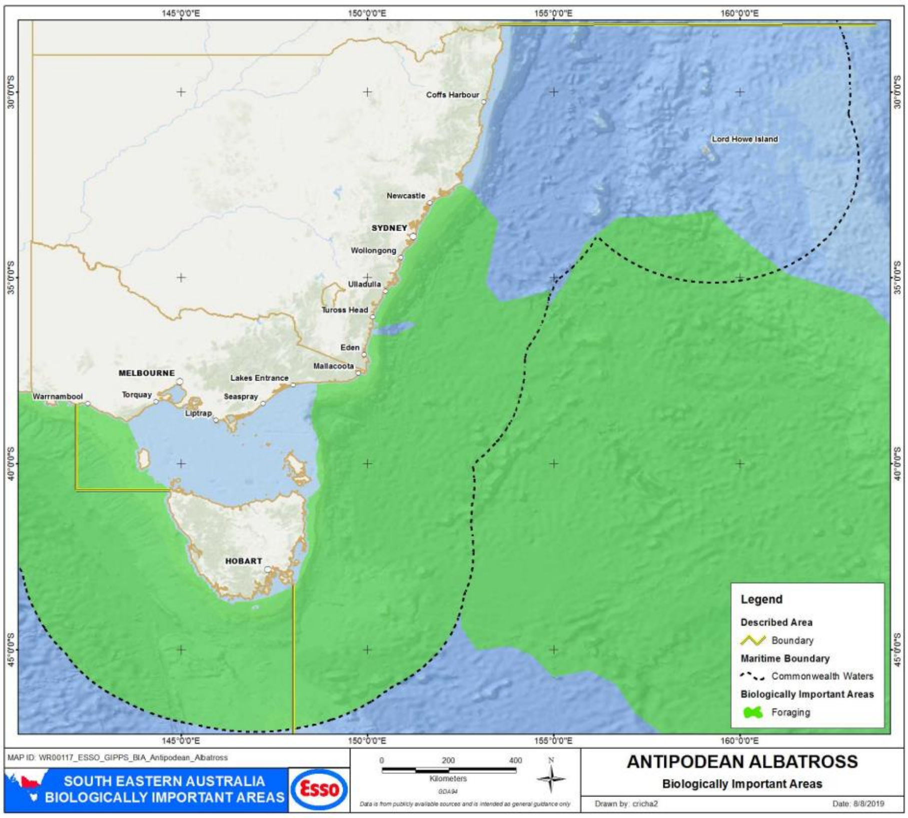
The coast and neighbouring islands within the DA provide feeding and nesting habitats for many coastal and migratory bird species. Seabirds spend much of their lives at sea in search of prey only to return for a short time to breed and raise chicks. Most species tend to forage on their own, though large feeding flocks will gather at rich or passing food sources. Squid, fish and krill are common sources of food. Islands in the Gippsland Basin are nesting sites for many seabird species, many of which migrate to these islands each year. Colonies of seabirds occur in Corner Inlet and on the islands around Wilsons Promontory, to the east at The Skerries, Tullaberga Island and Gabo Island and to the south on Curtis Island and the Hogan Island Group (Harris & Norman 1981). Species that nest and breed on these islands include the listed marine species, Little penguin (*Eudyptula minor*), White-faced storm petrel (*Pelagodroma marina*), Short-tailed shearwater (*Puffinus tenuirostris*) and the Fairy prion (*Pachyptila turtur*).

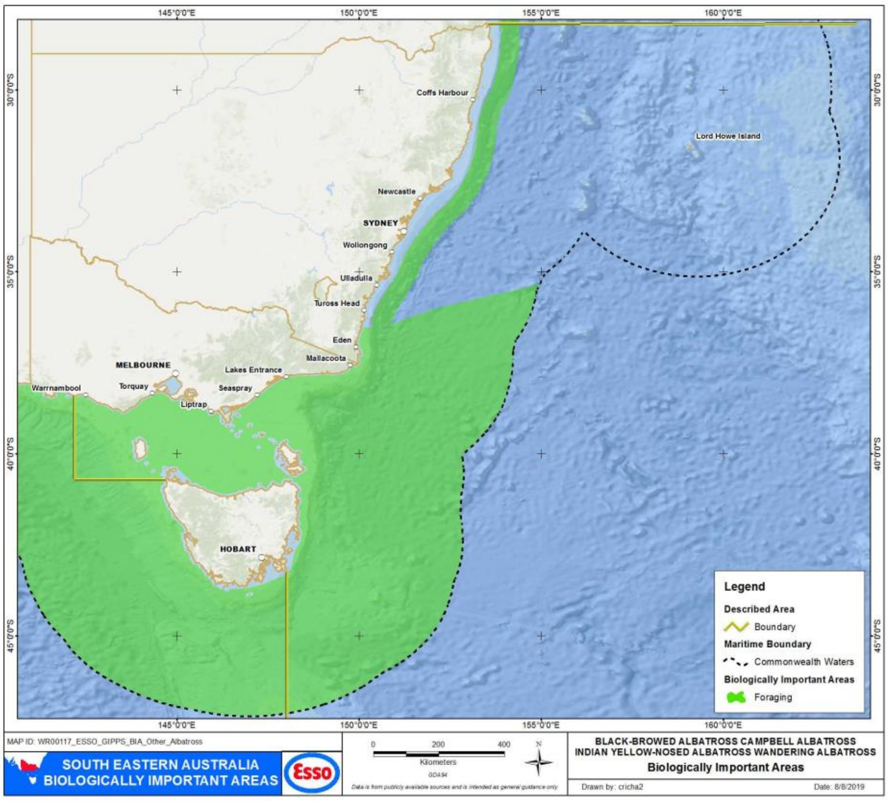
A list of the conservation advice and/or recovery plans, with relevant management actions for petroleum activities, is shown in Table 2-37.

Albatross

There are 15 species of albatross that may occur within the DA, and all except two (Sooty Albatross and Grey-headed Albatross) has been identified as using the area for foraging (Table 2-36). Albatross species exhibit a broad range of diets and foraging behaviours; this combined with their ability to cover vast oceanic distances, means all waters within Australian jurisdiction can be considered foraging habitat for this species (DSEWPaC, 2011a). However, the most critical foraging habitat is considered to be in waters south of 25°S where most species spend the majority of their foraging time (DSEWPaC, 2011a).

Albatross' typically feed offshore, mainly along the edge of the continental shelf and over open waters, where they catch fish and cephalopods (e.g. squid, cuttlefish) by diving into the water (DSEWPaC, 2011a). A BIA for foraging, has been identified for the following albatross species: Antipodean, Buller's, Shy, Black-browed, Campbell, Wandering, Indian Yellow-nosed and White-capped (Figure 2-23) (DoEE, 2015h). There is only one species, the Shy Albatross, that is known to breed within the waters off mainland Australia, and this occurs outside of the DA.

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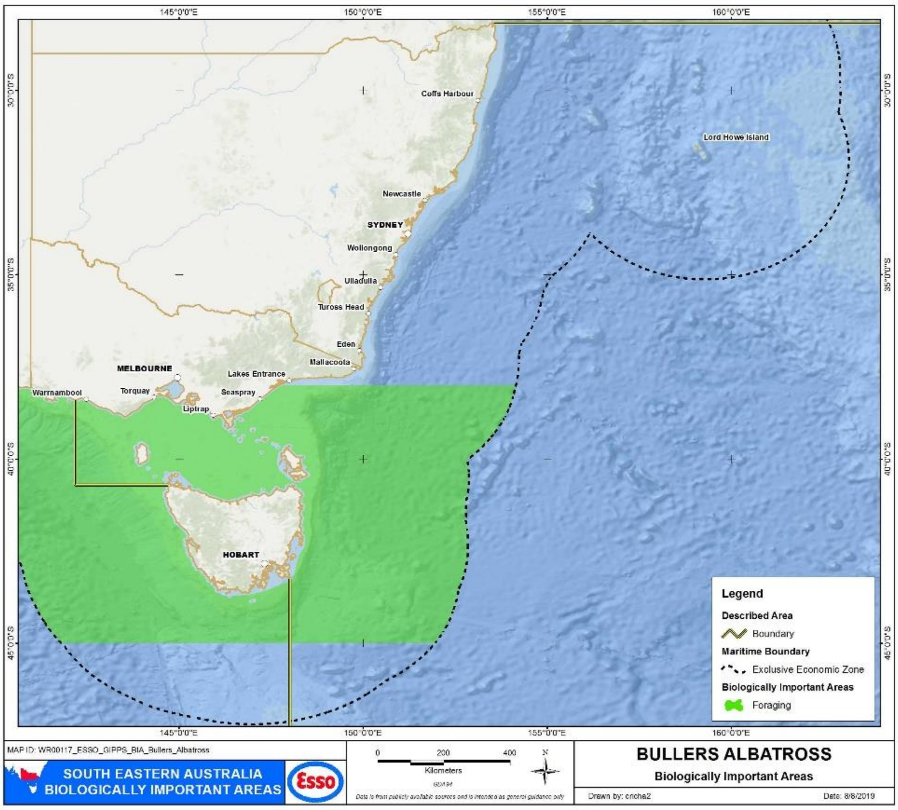
SOUTH EASTERN AUSTRALIA
BIOLOGICALLY IMPORTANT AREAS
BLACK-BROWED ALBATROSS CAMPBELL ALBATROSS
INDIAN YELLOW-NOSED ALBATROSS WANDERING ALBATROSS
Biologically Important Areas
Drawn by: cricha2
Date: 8/8/2019
Legend
Described Area
Boundary
Maritime Boundary
Commonwealth Waters
Biologically Important Areas
Foraging
Coffs Harbour
Lord Howe Island
Newcastle
SYDNEY
Wollongong
Ulladulla
Tuross Head
Eden
Mallacoota
MELBOURNE
Lakes Entrance
Warrnambool
Torquay
Seaspray
Liptrap
HOBART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SOUTH EASTERN AUSTRALIA
BIOLOGICALLY IMPORTANT AREAS
BULLERS ALBATROSS
Biologically Important Areas
Drawn by: cricha2
Date: 8/8/2019
Legend
Described Area
Boundary
Maritime Boundary
Exclusive Economic Zone
Biologically Important Areas
Foraging
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Lord Howe Island
Newcastle
SYDNEY
Wollongong
Ulladulla
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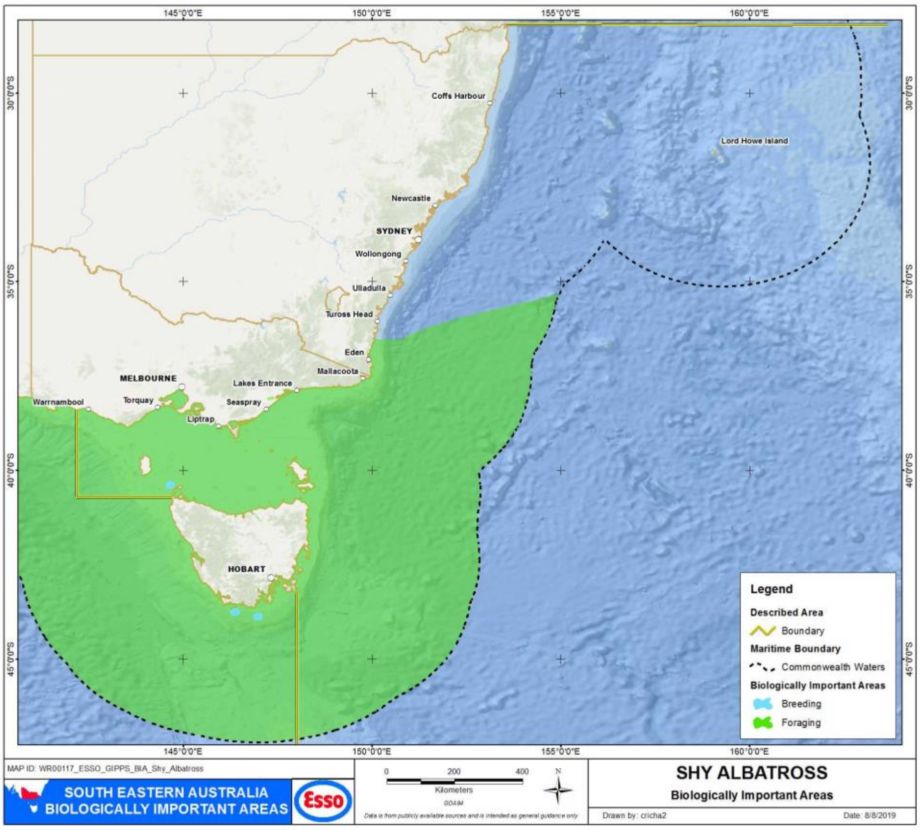
Seaspray
Liptrap
HOBART



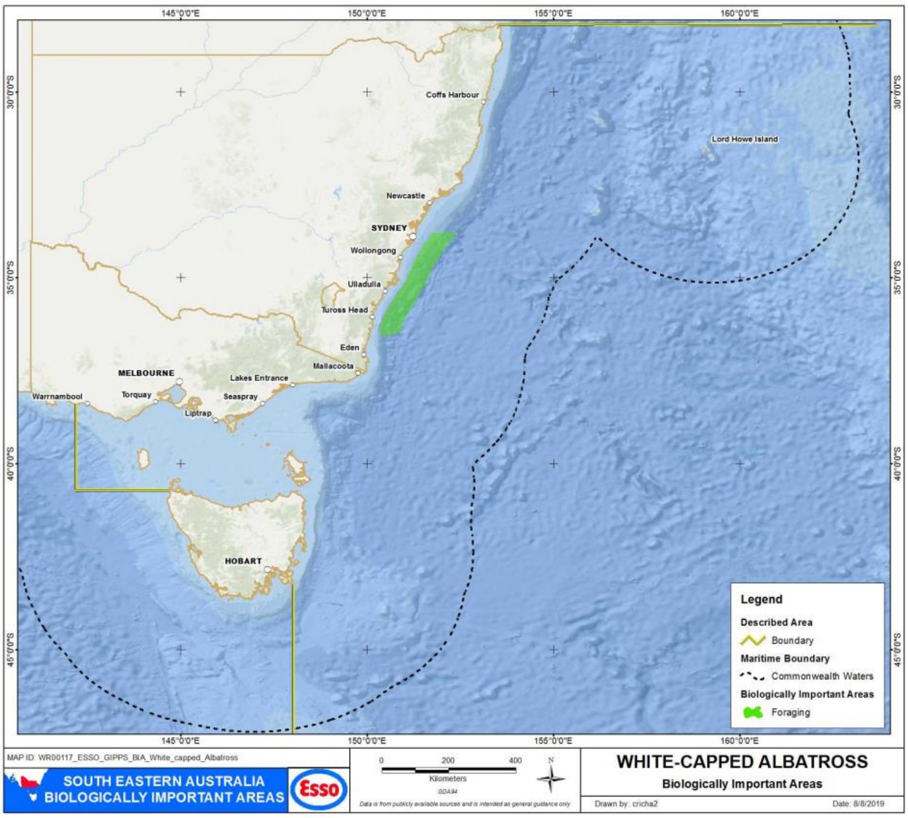


Figure 2-23 Biologically Important Areas for albatross species

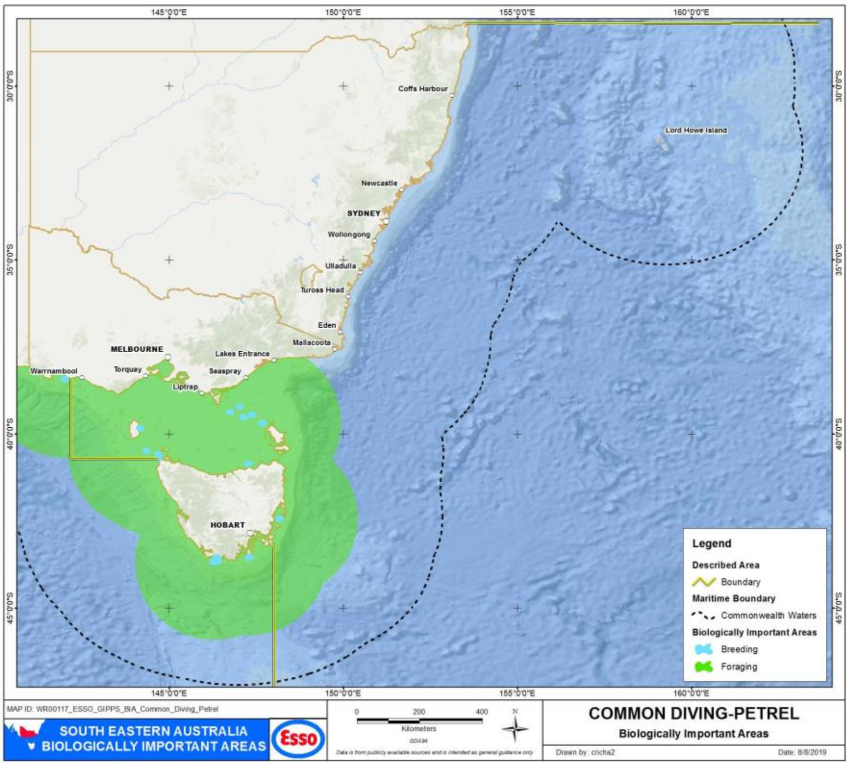
Petrels

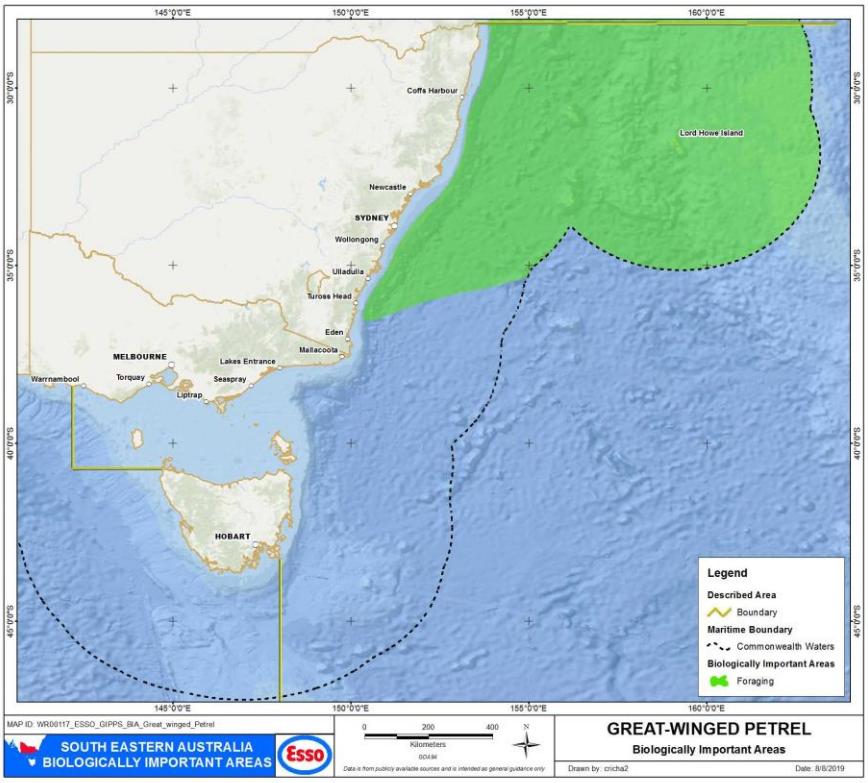
There are 13 species of petrel that may occur within the DA, with most either foraging and/or breeding within the area (Table 2-36). Similar to albatrosses, the petrels have a diverse foraging range, and all waters within Australian jurisdiction can be considered foraging habitat for this species. Typical diet for petrels includes cephalopods (e.g. squid) and fish, and prey is predominately caught by surface-seizing (DSEWPaC, 2011a).

BIAs, for foraging and breeding, have been identified for the White-faced Storm Petrel, Common Diving-Petrel, Black-winged Petrel and Providence Petrel. BIAs for foraging have also been defined for the Northern and Southern Giant Petrel and the Great-winged Petrel (Figure 2-24) (DoEE, 2015h).

Both the Common Diving-Petrel and the White-faced Storm Petrel are listed as marine species under the EPBC Act, and have large populations within Australia, accounting for 5% and 25% respectively of the global population (DoEE, 2015a). 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) (DoEE, 2015a). There are 15 sites with significant breeding colonies in Tasmania, and three sites with Victoria, for the White-faced Storm Petrel (DoEE, 2015a). One critically endangered species, the Herald Petrel has been estimated to only have about 10-25 breeding birds in Australia. Although they are known to breed on Raine Island in North Queensland waters, they are highly oceanic birds that are listed as likely to occur in the DA (TSSC 2015).

The Black-winged Petrel (Pterodroma nigripennis) and Providence Petrel (Pterodroma solandri) are listed marine species whose only known breeding sites in Australia are on Lord Howe Island, and for the Providence Petrel, Philip Island (in NSW off Norfolk island). Both have been identified as a conservation value in the Temperate East Marine Region (DoEE, 2019af). The Black-winged Petrel forms a burrow of up to 1m long in sandy soil to nest and is prone to predation by the Masked Owl and introduced rodents. The Black-winged Petrel is also known to occur in other parts of the Pacific (NSW OEH, 2019c). The distribution of the Providence Petrel is far more restricted with breeding sites only known to occur in Lord Howe and Philip Island. Their main known threats are from predation and disturbance of nests by tourists on the island. They nest on the tops of Mount Gower and Mount Lidgbird and to a less extent, on the lower slopes of the mountains (NSW OEH, 2019d).

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155°0'0"E
160°0'0"E
30°0'0"S
35°0'0"S
40°0'0"S
45°0'0"S
Coffs Harbour
Lord Howe Island
Newcastle
SYDNEY
Wollongong
Ulladulla
Tuross Head
Eden
Mallacoota
MELBOURNE
Lakes Entrance
Warrnambool
Torquay
Seaspray
Liptrap
HOBART
Legend
Described Area
Boundary
Maritime Boundary
Commonwealth Waters
Biologically Important Areas
Foraging
MAP ID: WR00117_ESSO_GIPPS_BIA_Great_winged_Petrel
SOUTH EASTERN AUSTRALIA
BIOLOGICALLY IMPORTANT AREAS
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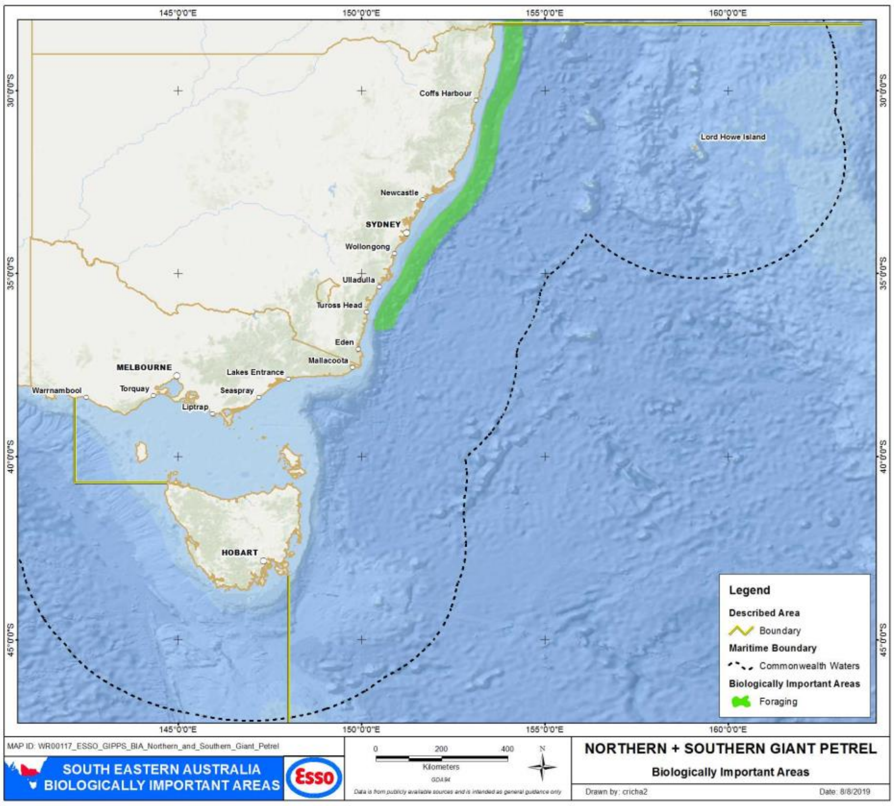
200
400
Kilometers
N
GREAT-WINGED PETREL
Biologically Important Areas
Drawn by: cricha2
Date: 8/8/2019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Coffs Harbour
Lord Howe Island
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SYDNEY
Wollongong
Ulladulla
Tuross Head
Eden
Mallacoota
MELBOURNE
Lakes Entrance
Warrnambool
Torquay
Seaspray
Liptrap
HOBART
Legend
Described Area
Boundary
Maritime Boundary
Commonwealth Waters
Biologically Important Areas
Foraging
MAP ID: WR00117_ESSO_GIPPS_BIA_Northern_and_Southern_Giant_Petrel
SOUTH EASTERN AUSTRALIA
BIOLOGICALLY IMPORTANT AREAS
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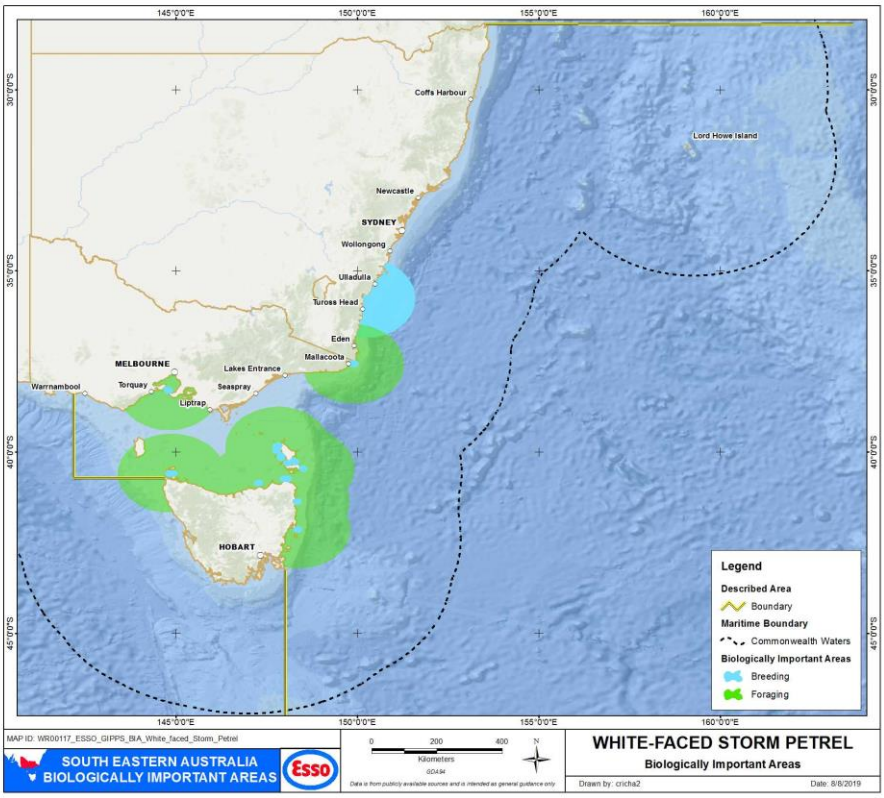
200
400
Kilometers
N
NORTHERN + SOUTHERN GIANT PETREL
Biologically Important Areas
Drawn by: cricha2
Date: 8/8/2019


WHITE-FACED STORM PETREL
Biologically Important Areas
SOUTH EASTERN AUSTRALIA
BIOLOGICALLY IMPORTANT AREAS
Legend
Described Area
Boundary
Maritime Boundary
Commonwealth Waters
Biologically Important Areas
Breeding
Foraging
Coffs Harbour
Lord Howe Island
Newcastle
SYDNEY
Wollongong
Ulladulla
Tuross Head
Eden
Mallacoota
MELBOURNE
Lakes Entrance
Warrnambool
Torquay
Seaspray
Liptrap
HOBART
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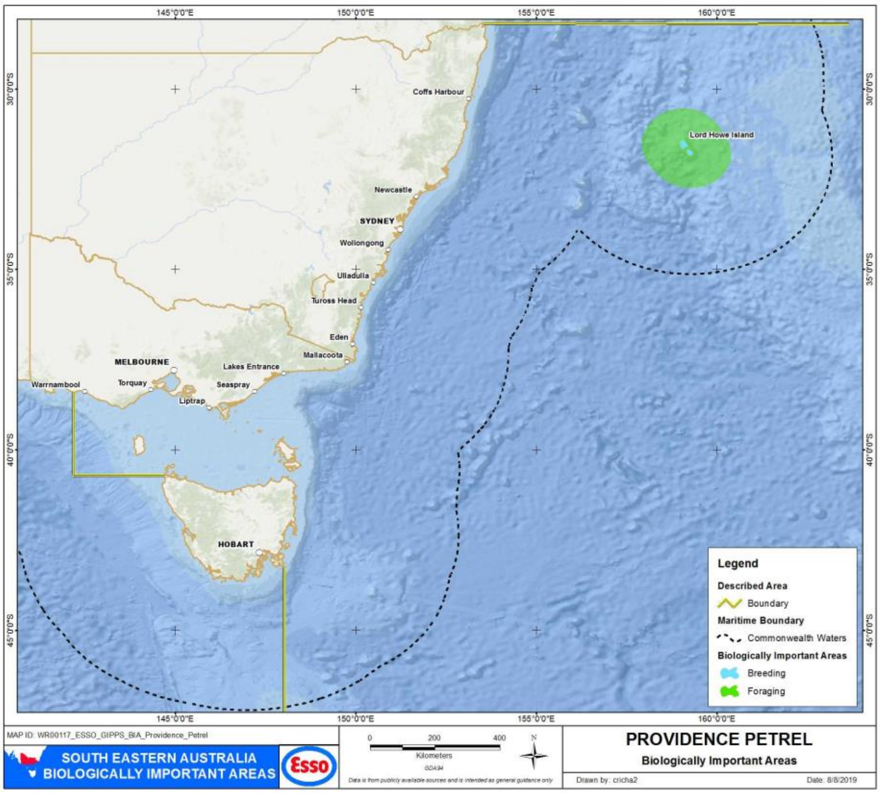
Date: 8/8/2019


PROVIDENCE PETREL
Biologically Important Areas
SOUTH EASTERN AUSTRALIA
BIOLOGICALLY IMPORTANT AREAS
Legend
Described Area
Boundary
Maritime Boundary
Commonwealth Waters
Biologically Important Areas
Breeding
Foraging
Coffs Harbour
Lord Howe Island
Newcastle
SYDNEY
Wollongong
Ulladulla
Tuross Head
Eden
Mallacoota
MELBOURNE
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Torquay
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Date: 8/8/2019

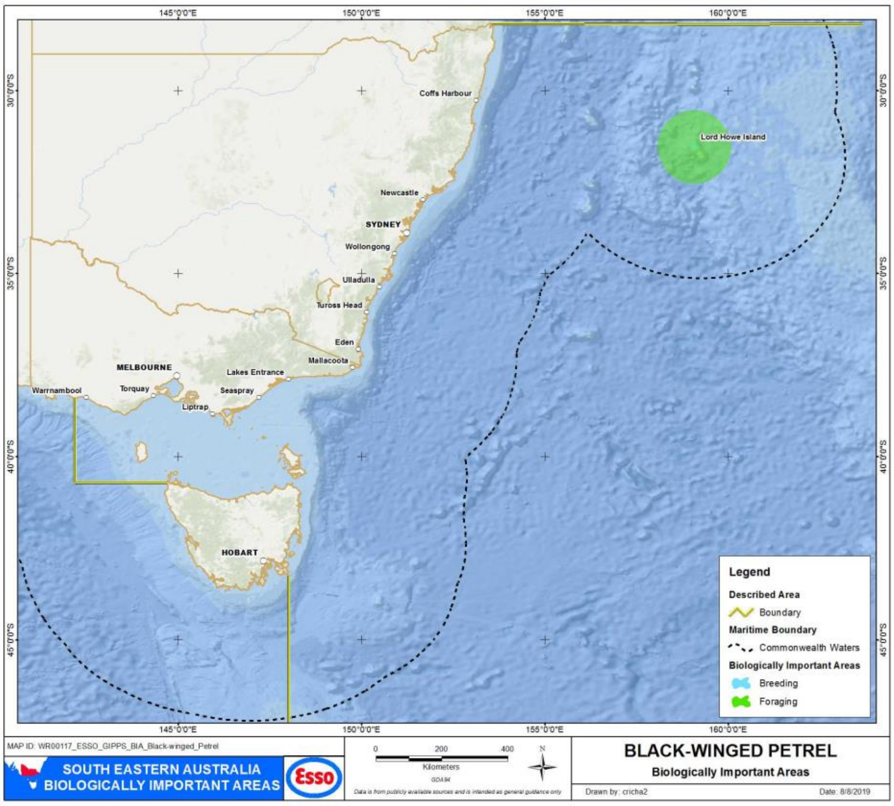


Figure 2-24 Biologically Important Areas for Petrel species.

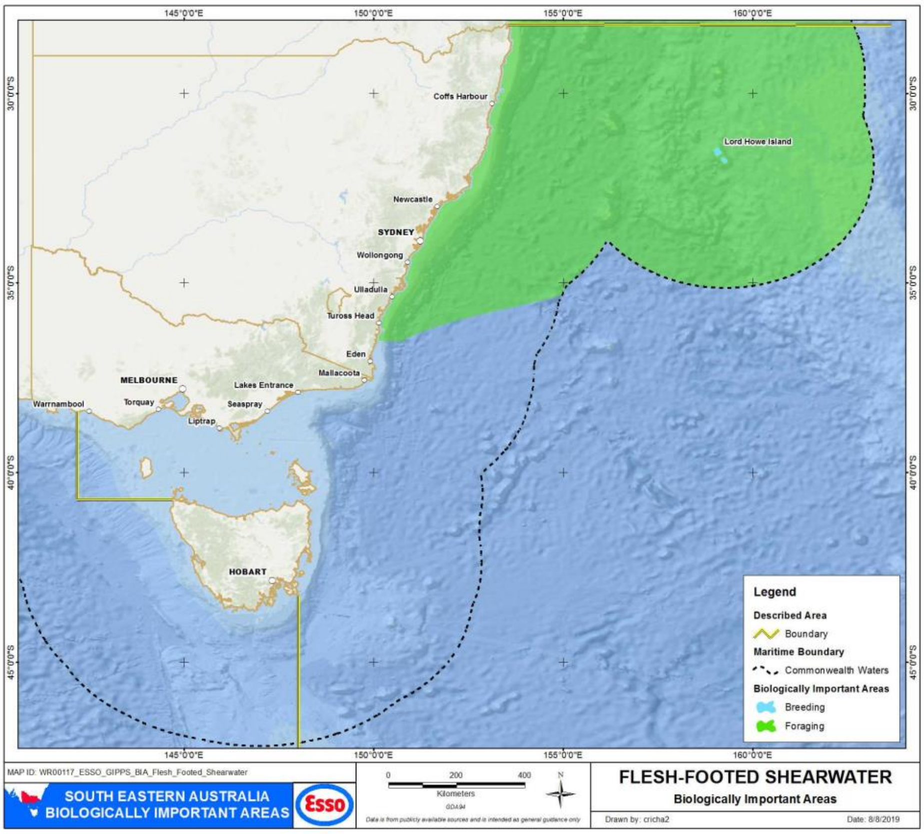
Shearwaters

The shearwaters represent the most abundant seabird in Australia. There are five species of shearwater that may occur within the DA, and all have been identified as using the area for foraging and breeding (Table 2-36). BIAs, for foraging and breeding, have been identified for the following species: Sooty, Wedge-tailed, and Short-tailed shearwaters; and a BIA for foraging for the Flesh-footed Shearwater (Figure 2-25) (DoEE, 2015h).

Shearwaters are typically pelagic species, except during breeding seasons where they are found on remote islands or coastal headlands. Known breeding locations include New South Wales oceanic islands (e.g. Solitary Island, Cabbage Tree Island, Muttonbird Island, Bird Island) (Sooty Shearwater, Wedge-tailed Shearwater). Breeding season in south-eastern Australia for shearwaters is typically over summer; late-August/early-September to May (DoEE 2017a, 2017b, 2017d, 2017e). Shearwater nests are usually in burrows or rock crevices.

Shearwaters are known to forage for a variety of pelagic prey, including krill, cephalopods, fish and crustaceans. Food is usually taken by pursuit-plunging, surface plunging or surface-seizing; however other methods (e.g. hydroplaning, deep plunging) may be used.

The Short-tailed Shearwater is one of few native birds that is commercially harvested (Tasmania Parks & Wildlife Service, 2014).



FLESH-FOOTED SHEARWATER
Biologically Important Areas
SOUTH EASTERN AUSTRALIA
BIOLOGICALLY IMPORTANT AREAS
MAP ID: WR00117_ESSO_GIPPS_BIA_Flesh_Footed_Shearwater
Legend
Described Area
Boundary
Maritime Boundary
Commonwealth Waters
Biologically Important Areas
Breeding
Foraging
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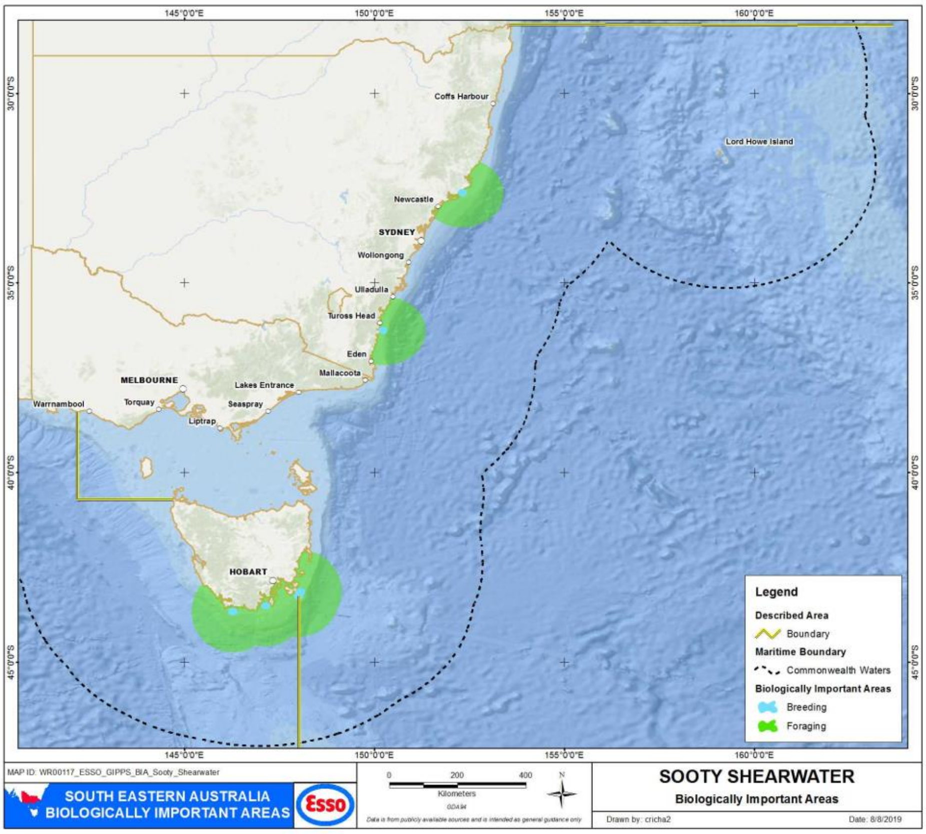
Lord Howe Island
Newcastle
SYDNEY
Wollongong
Ulladulla
Tuross Head
Eden
Mallacoota
MELBOURNE
Lakes Entrance
Warrnambool
Torquay
Seaspray
Liptrap
HOBART
Kilometers
Drawn by: cricha2
Date: 8/8/2019



SOOTY SHEARWATER
Biologically Important Areas
SOUTH EASTERN AUSTRALIA
BIOLOGICALLY IMPORTANT AREAS
MAP ID: WR00117_ESSO_GIPPS_BIA_Sooty_Shearwater
Legend
Described Area
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Maritime Boundary
Commonwealth Waters
Biologically Important Areas
Breeding
Foraging
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Lord Howe Island
Newcastle
SYDNEY
Wollongong
Ulladulla
Tuross Head
Eden
Mallacoota
MELBOURNE
Lakes Entrance
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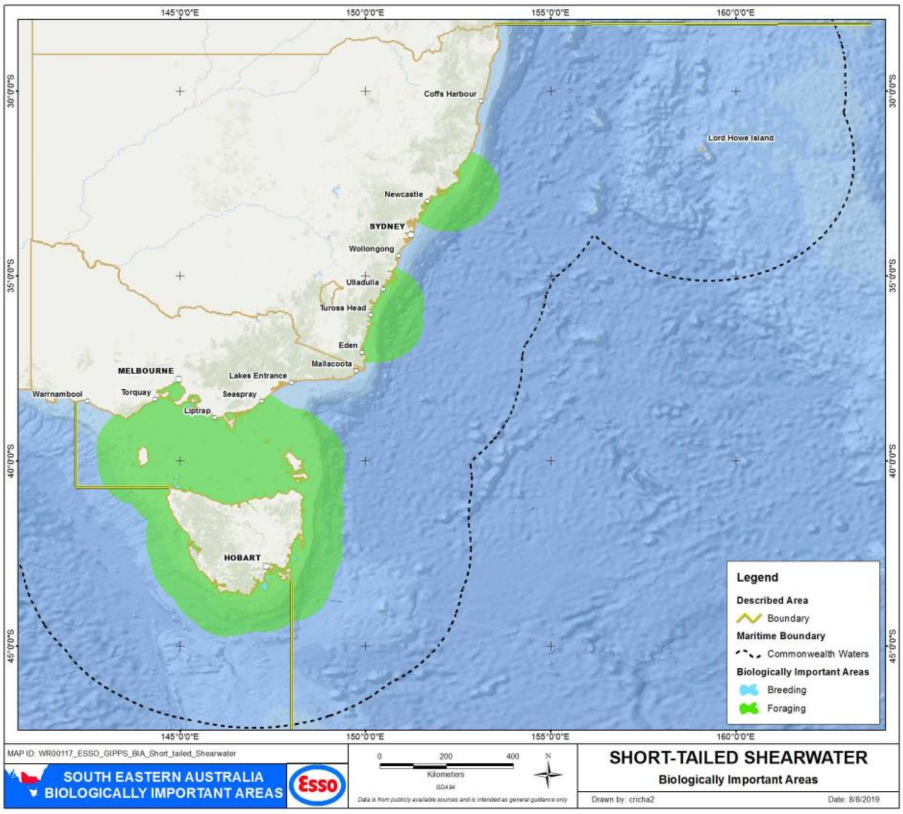
Drawn by: cricha2
Date: 8/8/2019



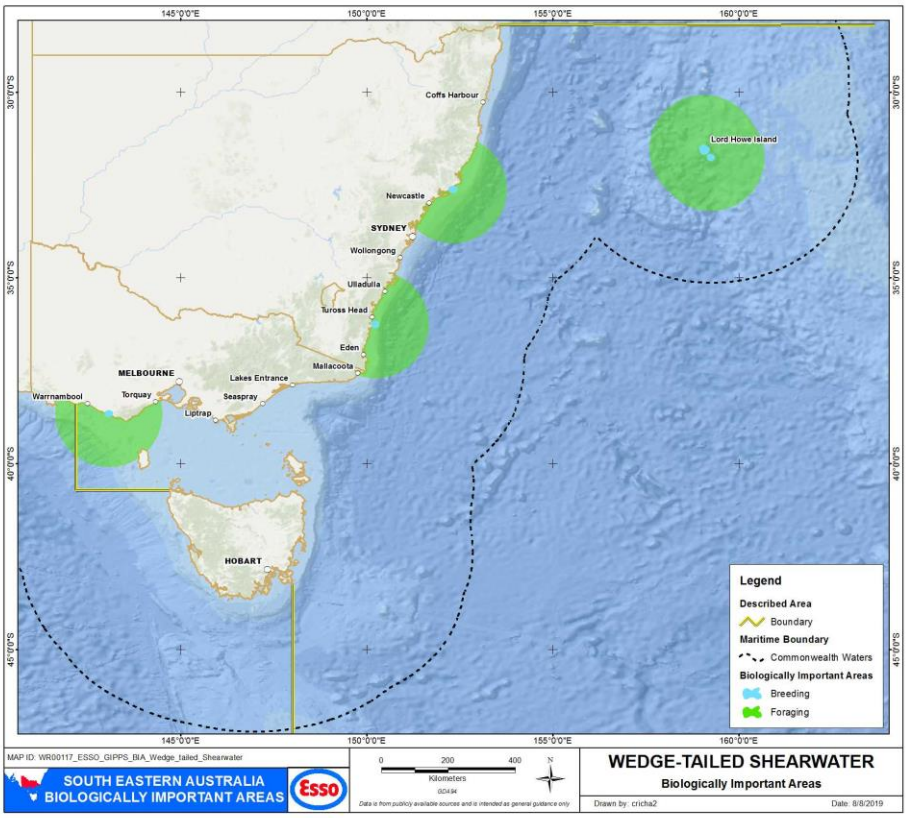


Figure 2-25 Biologically Important Areas for Shearwater species

Terns

There are eight species of tern that may occur within the DA, and all have been identified as using the area for breeding (Table 2-36). A BIA, for foraging and breeding, has been identified for the Crested Tern (Figure 2-26) (DoEE, 2015h).

Many of the tern species are widespread and occupy beach, wetland, grassland and beach habitats. Terns rarely swim; they hunt for prey in flight, dipping to the water surface or plunge-diving for prey (Flegg, 2002) usually within sight of land, for fish, squid, jellyfish and sometimes crustaceans (DEHWA, 2007).

Terns breed in colonies on small offshore islands, including those of the Furneaux Group in eastern Bass Strait. Nests are typically in sand or coral scrapes (Birdlife Australia, 2017a, 2017b; NSW OEH, 2017a).

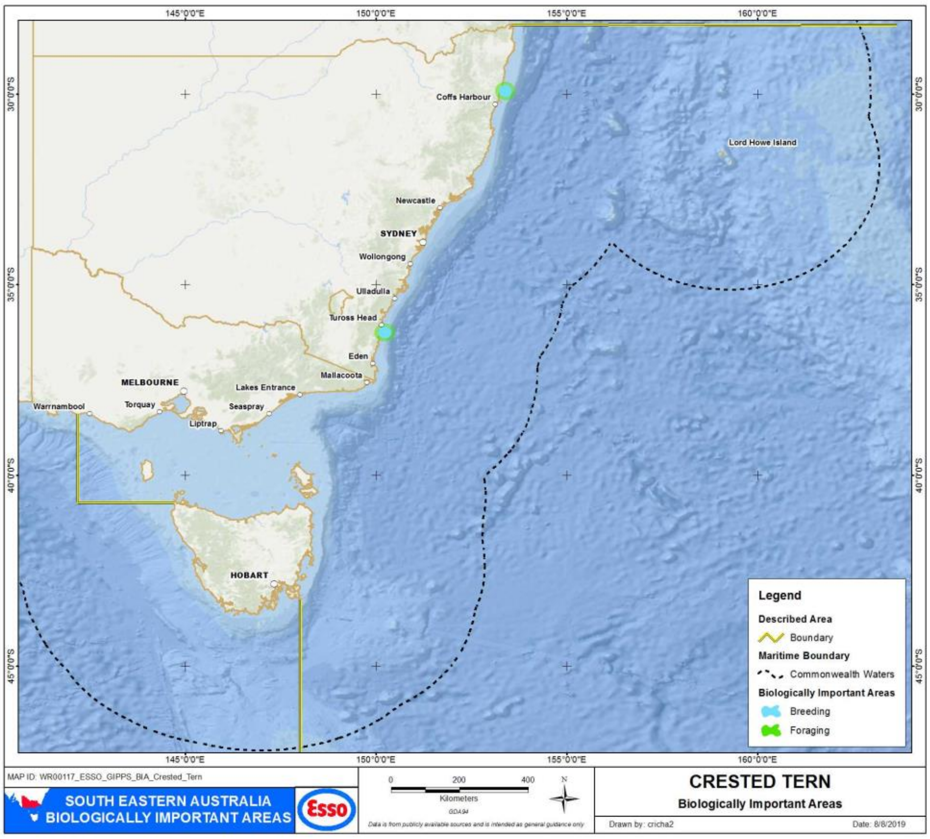


Figure 2-26 Biologically Important Areas for Crested Tern

Migratory Waterbirds

Migratory birds are species where a substantial proportion of the global or a regional population makes regular cyclical movements beyond the breeding range, with predictable timing and destinations. Many species of migratory waterbirds occur in the DA including eight species of sandpipers

Plovers

There are nine species of plover that are known to occur in the DA, six of which are wetland migratory species and most of which have a known to feed or form rookeries in the DA. Many plovers feed by running along wet sand, mud or beaches and shorelines, snapping up small, aquatic, molluscs and insects for food. The nest is in a slight hollow in the ground where two to five (usually four) spotted eggs are laid and both parents incubate and care for the young. Some of the species here including the vulnerable Greater Sand Plover and the endangered Lesser Sand Plover are strongly migratory, birds breeding in the northern hemisphere and wintering in sandy beaches of Asia and Australasia. These are part of the East Asian – Australasian Flyway (EAAF) (DoEE, 2019ah) which stretches from the Russian Far East and Alaska, southwards through East Asia and South-east Asia, to Australia and New

Zealand and encompasses 22 countries. During migration, waterbirds rely on a system of highly productive wetlands to rest and feed, building up sufficient energy to fuel the next phase of their journey. Whilst wintering in Australia, they occur in coastal areas of all states though the greatest numbers occur in northern Australia. Of the three non-migratory species, the eastern form of the Hooded Plover (*Thinornis cucullatus cucullatus)* is listed as vulnerable. It is a small bird that nests on the back of usually wide beaches above the high water mark. Its main threat is human disturbance from unleashed domestic dogs (DoEE, 2019ai).

Sandpipers

Eight sandpiper species are known to occur within the DA. Sandpiper refers to the small to middle sized shorebirds (15-30sm) in the family Scolopacidae which are seen at beaches and inland mudflats during migration and wintering. They are all migratory breeding in the northern hemisphere Arctic and sub-Arctic regions and travel in large flocks when migrating. The majority of these species eat small invertebrates probed out of the mud or soil or sand with their sensitive bills which distinguishes them from the plovers that are darting across the surface feeding by sight. The critically endangered Curlew Sandpiper's (*Calidris ferruginea*) sighted population in Australia has significantly declined. Breeding does not occur in Australia, it is part of the EAAF and breeding occurs in Siberia, however its wetland resting habitat on its winter migration, particularly in East Asia, is being threatened by degradation through habitat loss, pollution and other human disturbance resulting in an estimated reduction in population size in Australia by >80% (DoEE, 2015b). In Australia the main threat for all sandpipers is from disturbance from humans and their domestic animals.

Also in the Scolopacidae family are all of the other listed wetland migratory species found in the DA (other than the Osprey) including the snipes, knots, godwits, dowitchers, sanderlings, turnstones, shanks, curlews, phalarope, whimbrel and tatters. These have similar breeding habits as the Sandpipers. Their feeding habitat is generally coastal with large intertidal mudflats or sandflats and they roost on sandy beaches, sandbars, and spits. There are three critically endangered species, the Great Knot, the Northern Siberian Bar-tailed Godwit and the Eastern Curlew. The Red Knot is listed as endangered and the Bar-tailed Godwit (auera) is listed as vulnerable (note the Bar-tailed Godwit is a subspecies of the Siberian Bar-tailed Godwit (TSSC, 2016a)). These species are all migratory birds breeding in the northern hemisphere (e.g., Siberia/Alaska) and migrating south during their winter. Recorded numbers are in decline in Australia and, like the Sandpipers, this is largely attributed to the decline in wetlands in Asia used as staging areas for resting and feeding during migration. In Australia threats include human disturbance as well as habitat loss and degradation from pollution, changes to the water regime and invasive plants (DoEE, 2015c).

Other

Many other species also occur within areas of the DA (Table 2-36), those that are critically endangered, endangered or vulnerable are discussed below.

The Swift Parrot and Orange-bellied Parrot are both critically endangered, they both breed in Tasmania and migrate to the mainland for the non-breeding season. The Swift parrot's habitat is mainly forest and it's threatened mainly by native predators and also loss of forest habitat (TSSC, 2016b). The orange bellied parrot is ground feeding and inhabits salt marshes, coastal dunes, pastures, shrub lands, estuaries, islands, beaches and moorlands generally within 10 km of the coast. As with many of the migratory species, it is threatened by the loss of wetland habitat, in this case through changes to land use practices such as drainage of wetlands for grazing, alteration and destruction of saltmarsh for industrial and urban development, vegetation clearance for agricultural purposes (TSSC, 2006).

The Australian Painted snipe, a listed endangered species has been recorded at wetlands in all states of Australia and whilst called a snipe it is in the family Rostratulidae. It is known to nest in Australia and generally inhabits shallow terrestrial freshwater but also brackish wetland and also seen in saltmarshes. Its decline has been attributed to the loss of wetland habitat since European settlement in Australia (DoEE, 2019aj).

The endangered Australasian Bittern is mainly a freshwater wetland species and rarely occurs in estuaries or tidal wetlands, favouring tall dense vegetation where it forages on small aquatic animals including frogs, fish, freshwater crayfish, reptiles and insects. These birds are also culturally significant to Aboriginal people. This species is capable of moving between habitats from south-east Queensland to south-east South Australia as suitability changes. Wetland habitat loss and degradation is a threat to the Australasian Bittern (TSSC, 2019).

The endangered Eastern Bristlebird is a small, well-camouflaged, ground-dwelling bird spending most of its time in low, dense vegetation in coastal, subcoastal and coastal escarpment scrubland / grassland / sedgeland and in open grassy forest on inland ranges. The species has contracted to four genetically isolated populations in three disjunct areas of south-eastern Australia. Within the DA these are the Illawarra and Jervis Bay regions of eastern NSW (central populations) and the NSW/Victorian border coastal region (southern population) near Nadgee Mallacoota. They feed mainly on invertebrates but also on seeds and grasses. Habitat loss through clearing of coastal heath and escarpment forest is recognised as the main process that has reduced the distribution and abundance of the Eastern Bristlebird in the last 150 years. Another potential threat to the species is predation, particularly by feral predators and particularly after fire (NSW OEH, 2012c).

Within Australia, the vulnerable Fairy Prion (southern) breeds only on Maquarie Island (outside of the DA) and outside Australia is also known to breed in other subantarctic islands including New Zealand and Falklands. During the non-breeding season it frequents sub-tropical waters and it feeds by plucking food off the ocean surface. Its main threat in Australia was predation from introduced black rats which have now been eradicated on Macaquarie Island (TSSC, 2015e).

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 (DoEE, 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. A BIA for breeding and foraging, has been identified for the Little Penguin (Figure 2-27) (DoEE, 2015h). Little penguins are also an important component of the Australian and New Zealand fur-seals' diet (PoSA, 2011).

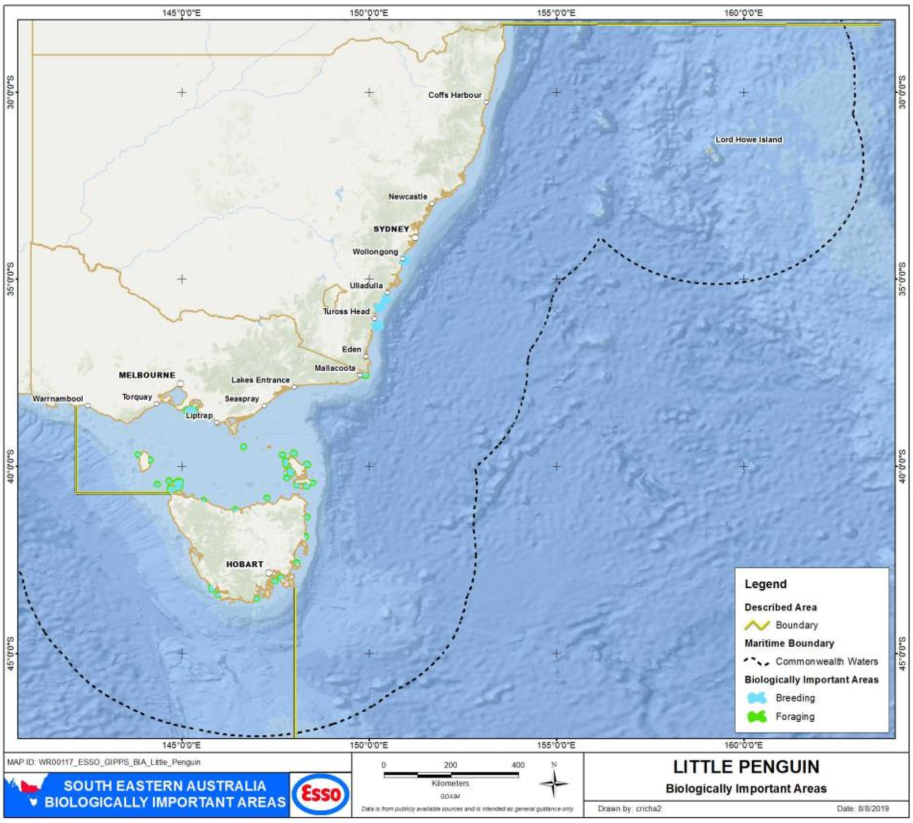


Figure 2-27 Biologically Important Area for Little Penguin

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 (DoEE, 2015a). While breeding behaviour has been identified (Table 1), known important breeding locations for the Australian Gannet occur outside the DA at Pedra Branca, Eddystone Rocks, Sidmouth Rocks, and Black Pyramid (Tasmania) and Lawrence Rocks (Victoria).

The Black-faced Cormorant is endemic to southern Australia (DoEE, 2015a); and favours rocky coasts. The species feeds in coastal waters on a variety of fish, typically catching prey by pursuit-diving. There are 40 significant breeding sites (defined as more than 10 breeding pairs) known for the species in southern Australia. Breeding usually occurs on rocky islands, but also on stacks, slopes and sea cliffs in colonies of up to 2500 individuals (DoEE, 2015a).

The Red-tailed Tropicbird is a medium sized (45-55cm) seabird and listed marine and migratory species that exists in tropical Pacific and Indian oceans (DoEE, 2019v). It nests on cliffs by the water's edge, and less so inland on smaller islands and has been identified as a conservation value in the Temperate East Marine Region. The red-tailed tropicbird is mostly a plunge-diver, diving anywhere from an above-water height 6 to 50 metres to a depth of about 4.5 metres (AOLA, 2019a). No specific conservation plans exist for this species.

The Masked Booby is a large listed marine and migratory species that has a breeding population on Lord Howe Island (Mutton Bird Point, King Point, Roach Island, South Island, Sugarloaf Island, Mutton Bird Island, Gower Island, Sail Rocks and Ball's Pyramid) that is the most southerly known breeding colony in the world (DoEE, 2019w). The masked Booby nests in small colonies, laying on sandy beaches and feeds by plunge diving on the ocean (AOLA, 2019b).

The Red-necked Phalarope (*Phalaropus lobatus*) is a listed migratory and marine wader and the smallest of the Phalarope species (18-19 cm). This is one of only two Phalaropes that occurs regularly at sea where feeding is expected to occur. In Australia it is recorded in both coastal and inland lakes/swamps including highly saline waters and saltfields. In Victoria it has been seen in near coastal lakes such as Lake Cooewarre and Lake Victoria near the entrance to Port Phillip Bay. Sightings occur from Mid October to early April. From a global perspective there are no important sites for this species in Australia (i.e. a site is considered important if it is occupied by more than 1% of the bird's total population). It breeds in the Arctic and sub-Arctic North America and spends its non-breeding winter season at sea (DoEE, 2019ag).

The Magpie Goose is widespread in northern Australia, where it may congregate in huge flocks, often comprising thousands of birds. They were also commonly found in the southern parts of Australia but are now not seen in Tasmania, endangered in Victoria and vulnerable in NSW. They are a listed marine species, a waterfowl which nests near wetlands on floating reeds or tree-tops. They feed on aquatic vegetation (Birdlife Australia, 2019).

Some listed bird species, whilst not seabirds or shorebirds, inhabit islands and nearshore habitats such as forests and freshwater wetlands and include the critically endangered Regent Honeyeater, endangered Wedge-tailed Eagle (Tasmanian), Forty-spotted Pardalote, and the vulnerable Masked Owl and Painted Honeyeater. These are terrestrial/freshwater species and though they occur in or near the DA they are not expected to be impacted by petroleum activities.

The Regent Honeyeater is most commonly associated with box-ironbark eucalypt woodland and dry sclerophyll forest. Its utilisation of lowland coastal forest occurs when its usual habitat is affected by drought and coastal regions become a refuge. Its diet primarily consists of nectar, but also includes invertebrates (mostly insects) and their exudates. Loss of habitat is its primary threat (TSSC, 2015d).

The Wedge-tailed Eagle (Tasmanian) is found only in Tasmania and nearby islands. The subspecies is widespread on mainland Tasmania, where it inhabits coastal, lowland and highland regions. It is carnivorous, and feeds on both live prey and carrion, capable of killing prey several times its own body weight with birds being approximately 10% of items consumed. The major threats to the Wedge-tailed Eagle (Tasmanian) are loss of nesting habitat (old growth Eucalyptus forest) and disturbance of nesting birds and, to a lesser degree, persecution by humans. The loss of suitable habitat has also increased conflict between the Wedge-tailed Eagle (Tasmanian) and the White-bellied Sea-Eagle Haliaeetus leucogaster for nest sites, and this is known to have caused breeding failures in both species (DoEE, 2019ak)

The Masked Owl (Tasmanian) is endemic to Tasmania, including several near-shore islands. It is the second largest nocturnal raptor in Australia with a wingspan up to 128cm. It feeds predominately on introduced rodents and Rabbits and other native fauna in less disturbed habitats. Its greatest threat is loss of habitat through clearing and fragmentation (DEWHA, 2010a).

The Forty-spotted Pardalote is confined to south-eastern Tasmania including the offshore islands. It inhabits sclerophyll forests and open woodlands where White Gum is present and feeds on invertebrates, manna from Eucalyptus trees (including E. dalrympleana and White Gum) and lerps (sugary secretions produced by psyllid insects) (TSSC, 2016c). Its primary threat is of habitat through clearing and fragmentation. Similar to the Pardalote, the Regent Honeyeater also occurs in woodland, mostly box ironbark, and feeds on nectars, insects and their lerps. Its distribution is patchy but extends from south east Queensland to through to Victoria (DoEE, 2015 f). The Painted Honeyeater is the most specialized of Australia's honeyeaters and inhabits eucalypt forests/woodlands but its diet consists mainly of mistletoe fruits and therefore its primary threat is loss of habitat through clearing (DoEE, 2015g).

The endangered Tasmanian Azure Kingfisher is endemic to Tasmania and occurs along several river systems on the south, west and north-west coast with outlying occurrences in the north-east, east, centre and Bass Strait islands. It utilizes a wide range of forest types but mainly wet sclerophyll eucalypt forests. It feeds on small fish, freshwater crayfish, aquatic insects and occasionally amphibians. Its primary threat is habitat clearing and acidic runoff from mining activities (DEWHA, 2010b).

Table 2-36 Seabird and shorebird species or species habitat that may occur within the DA (DoEE, 2019b, DoEE, 2019l, DoEE, 2019m)

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Albatross						
Diomedia antipodensis	Antipodean Albatross	V	✓ (M)	✓	f	FLO
Diomedia epomophora	Southern Royal Albatross	V	✓ (M)	✓		FLO
Diomedia exulans	Wandering Albatross	V	✓ (M)	✓	f	FLO
Diomedia gibsoni	Gibson's Albatross	V		✓		FLO
Diomedia sanfordi	Northern Royal Albatross	E	✓ (M)	✓		FLO
Phoebetria fusca	Sooty Albatross	V	✓ (M)	✓		LO
Thalassarche bulleri	Buller's Albatross	V	✓ (M)	✓	f	FLO
Thalassarche bulleri platei	Pacific Albatross	V		✓		FLO
Thalassarche cauta	Shy Albatross	V	✓ (M)	✓	f	FLO
Thalassarche chrysostoma	Grey-headed Albatross	E	✓ (M)	✓		MO
Thalassarche eremita	Chatham Albatross	E	✓ (M)	✓		FLO

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Thalassarche impavida	Campbell Albatross	V	✓ (M)	✓	f	FLO
Thalassarche melanophris	Black-browed Albatross	V	✓ (M)	✓	f	FLO
Thalassarche salvini	Salvin's Albatross	V	✓ (M)	✓		FLO
Thalassarche steadi	White-capped Albatross	V	✓ (M)	✓	f	FLO
Petrels						
Fregetta grallaria grallaria	White-bellied Storm-Petrel	V				LO
Halobaena caerulea	Blue Petrel	V		✓		MO
Macronectes giganteus	Southern Giant Petrel	E	✓ (M)	✓	f	FLO
Macronectes halli	Northern Giant Petrel	V	✓ (M)	✓	f	MO
Pelagodroma marina	White-faced Storm Petrel			✓	b, f	BKO
Pelecanoides urinatrix	Common Diving-Petrel			✓	b, f	BKO
Pterodroma heraldica	Herald Petrel	CE		✓		LO
Pterodroma leucoptera leucoptera	Gould's Petrel	E				BKO
Pterodroma macroptera	Great-winged Petrel			✓	f	
Pterodroma mollis	Soft-plumaged Petrel	V		✓		MO
Pterodromoa neglecta neglecta	Kermadec Petrel (western)	V				FMO
Pterodroma nigripennis	Black-winged Petrel			✓		BKO
Pterodroma solandri	Providence Petrel			✓		BKO
Plovers						
Charadrius bicinctus	Double-banded Plover		✓ (W)	✓		RKO
Charadrius leschenaultii	Greater Sand Plover	V	✓ (W)	✓		FKO
Charadrius mongolus	Lesser Sand Plover	E	✓ (W)	✓		FKO
Charadrius ruficapillus	Red-capped Plover			✓		RKO
Charadrius veredus	Oriental Plover		✓ (W)	✓		FKO
Pluvialis fulva	Pacific Golden Plover		✓ (W)	✓		RKO

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Pluvialis squatarola	Grey Plover		✓ (W)	✓		RKO
Thinornis rubricollis	Hooded Plover			✓		KO
Thinornis rubricollis rubricollis	Hooded Plover (eastern)	V		✓		KO
Scolopacidae -Sandpipers						
Actitis hypoleucos	Common Sandpiper		✓ (W)	✓		KO
Calidris acuminata	Sharp-tailed Sandpiper		✓ (W)	✓		RKO
Calidris ferruginea	Curlew Sandpiper	CE	✓ (W)	✓		KO
Calidris melanotos	Pectoral Sandpiper		✓ (W)	✓		KO
Limicola falcinellus	Broad-billed Sandpiper		✓ (W)	✓		KO
Tringa glareola	Wood Sandpiper		✓ (W)	✓		FKO
Tringa stagnatilis	Marsh Sandpiper		✓ (W)	✓		FKO
Xenus cinereus	Terek Sandpiper		✓ (W)	✓		FKO
Scolopacidae - Other						
Arenaria interpres	Ruddy Turnstone		✓ (W)	✓		RKO
Calidris alba	Sanderling		✓ (W)	✓		RKO
Calidris canutus	Red Knot	E	✓ (W)	✓		KO
Calidris ruficollis	Red-necked Stint		✓ (W)	✓		RKO
Calidris subminuta	Long-toed Stint		✓ (W)	✓		RKO
Calidris tenuirostris	Great Knot	CE	✓ (W)	✓		RKO
Gallinago hardwickii	Latham's Snipe		✓ (W)	✓		RMO
Gallinago megala	Swinhoe's Snipe		✓ (W)	✓		RLO
Gallinago stenura	Pin-tailed Snipe		✓ (W)	✓		RLO
Heteroscelus brevipes	Grey-tailed Tattler		✓ (W)	✓		FKO
Limnodromus semipalmatus	Asian Dowitcher		✓ (W)	✓		KO
Limosa lapponica	Bar-tailed Godwit		✓ (W)	✓		KO
Limosa lapponica baueri	Bar-tailed Godwit (auera)	V				KO

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit	CE				MO
Limosa limosa	Black-tailed Godwit		✓ (W)	✓		FKO
Numenius madagascariensis	Eastern Curlew	CE	✓ (W)	✓		KO
Numenius minutus	Little Curlew		✓ (W)	✓		RLO
Numenius phaeopus	Whimbrel		✓ (W)	✓		RKO
Phalaropus lobatus	Red-necked Phalarope		✓ (W)	✓		KO
Philmachus pugnax	Ruff		✓ (W)	✓		FKO
Tringa brevipes	Grey-tailed Tattler		✓ (W)	✓		KO
Tringa incana	Wandering Tattler		✓ (W)	✓		KO
Tringa nebularia	Common Greenshank		✓ (W)	✓		KO
Shearwaters						
Calonectris leucomelas	Streaked Shearwater		✓ (M)			MO
Puffinus carneipes	Flesh-footed Shearwater		✓ (M)	✓	f	FLO
Puffinus griseus	Sooty Shearwater		✓ (M)	✓	b, f	BKO
Puffinus pacificus	Wedge-tailed Shearwater		✓ (M)	✓	b, f	BKO
Puffinus tenuirostris	Short-tailed Shearwater		✓ (M)	✓	b, f	BKO
Terns						
Procelsterna cerulea	Grey Ternlet			✓		BKO
Sterna albifrons	Little Tern		✓ (M)	✓		BKO
Sterna bergii	Crested Tern		✓ (M)	✓	b, f	BKO
Sterna caspia	Caspian Tern		✓ (M)	✓		BKO
Sterna fuscata	Sooty Tern			✓		BKO
Sterna nereis	Fairy Tern			✓		BKO
Sterna striata	White-fronted Tern			✓		BKO
Sternula nereis nereis	Australian Fairy Tern	V				BKO
Others						
Anthohaera Phrygia	Regent Honeyeater	CE				KO

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Anous stolidus	Common Noddy		✓ (M)	✓		MO
Apus pacificus	Fork-tailed Swift		✓ (M)	✓		LO
Ardea alba	Great Egret			✓		BKO
Ardea ibis	Cattle Egret			✓		MO
Aseranas semipalmata	Magpie Goose			✓		MO
Aulia audax fleayi	Tasmanian Wedge-tailed Eagle	E				BLO
Botaurus poiciloptilus	Australasian Bittern	E				KO
Catharacta skua	Great Skua			✓		MO
Ceyx azureus	Tasmanian Azure Kingfisher	E				BKO
Cuculus saturatus	Oriental Cuckoo		✓ (T)	✓		KO
Dasyomis brachypterus	Eastern Bristlebird	E				KO
Eudyptula minor	Little Penguin			✓	b, f	BKO
Fregata ariel	Least Frigatebird		✓ (M)	✓		LO
Fregata minor	Great Frigatebird		✓ (M)	✓		MO
Grantiella picta	Painted Honeyeater	V				BKO
Haliaeetus leucogaster	White-bellied Sea Eagle			✓		BKO
Himantopus himantopus	Black-winged Stilt (Pied Stilt)			✓		RKO
Hirundapus caudacutus	White-throated Needletail		✓ (T)	✓		KO
Larus dominicanus	Kelp Gull			✓		BKO
Larus novaehollandiae	Silver Gull			✓		BKO
Larus pacificus	Pacific Gull			✓		BKO
Lathamus discolor	Swift Parrot	CE		✓		KO
Merops ornatus	Rainbow Bee-eater			✓		MO
Monarcha melanopsis	Black-faced Monach		✓ (T)	✓		KO
Monarcha trivirgatus	Spectacled Monach		✓ (T)	✓		KO
Morus serrator	Australian Gannet			✓		BKO

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Motacilla flava	Yellow Wagtail		✓ (T)	✓		MO
Myiagra cyanoleuca	Satin Flycatcher		✓ (T)	✓		KO
Neophema chrysogaster	Orange-bellied Parrot	CE		✓		KO
Pachyptila turtur	Fairy Prion			✓		KO
Pachyptila turtur subantartica	Fairy Prion (southern)	V				KO
Pandion haliaetus	Osprey		✓ (W)	✓		KO
Pardalotus quadragintus	Forty-spotted Pardalote	E				KO
Phaethon rubricauda	Red-tailed Tropicbird		✓(M)	✓		BKO
Phalacrocorax fuscescens	Black-faced Cormorant			✓		BKO
Recurvirostra novaehollandiae	Red-necked Avocet			✓		FKO
Rhipidura rufifrons	Rufous Fantail		✓ (T)	✓		LO
Rostratula australis	Australian Painted Snipe	E		✓		LO
Sula dactylatra	Masked Booby		✓(M)	✓		BKO
Tyto novaehollandiae castanops	Masked Owl (Tasmanian population)	V				BKO
<u>Threatened Species</u>: *V Vulnerable* *E Endangered* *CE Critically Endangered* *<u>Migratory Species</u>:* *M Marine* *W Wetland* *T Terrestrial* *<u>Biologically Important Areas</u>:* *b Breeding* *f Foraging*	*<u>Type of Presence</u>:* *MO Species or species habitat may occur within the area* *LO Species or species habitat likely to occur within the area* *KO Species or species habitat known to occur within the area* *FMO Foraging, feeding or related behaviour may occur within the area* *FLO Foraging, feeding or related behaviour likely to occur within the area* *FKO Foraging, feeding or related behaviour known to occur within the area* *BKO Breeding known to occur within the area* *RMO Roosting may occur within the area* *RLO Roosting likely to occur within the area* *RKO Roosting known to occur within the area*					

Table 2-37 Key threats and management actions for seabird and shorebird threatened species or species habitat that may occur within the DA

Common Name	Conservation Advice or Recovery Plan	Key Threats (relevant to petroleum activities)
Antipodean Albatross	National Recovery Plan for Threatened Albatrosses and Giant Petrels, 2011-2016	Marine pollution, including marine debris
Southern Royal Albatross		
Wandering Albatross		

Common Name	Conservation Advice or Recovery Plan	Key Threats (relevant to petroleum activities)
Gibson's Albatross		
Northern Royal Albatross		
Sooty Albatross		
Buller's Albatross		
Pacific Albatross		
Shy Albatross		
Chatham Albatross		
Campbell Albatross		
Black-browed Albatross		
Salvin's Albatross		
White-capped Albatross		
Grey-headed Albatross	National Recovery Plan for Threatened Albatrosses and Giant Petrels, 2011-2016 Approved Conservation Advice for *Thalassarche chrysostoma* (Grey-headed Albatross)	Marine pollution, including marine debris
White-bellied Storm-Petrel	Lord Howe Island Biodiversity Management Plan	None identified
Blue Petrel	Approved Conservation Advice for *Halobaena caerulea* (Blue Petrel)	None identified
Southern Giant Petrel	National Recovery Plan for Threatened Albatrosses and Giant Petrels, 2011-2016	Marine pollution, including marine debris
Northern Giant Petrel		
Gould's Petrel	Gould's Petrel (*Pterodroma leucoptera leucoptera*) Recovery Plan	Oil spills Note: oil spills in the vicinity Cabbage Tree Island are not considered a threat because the Gould's Petrel does not feed in coastal waters however, oceanic oil spills may pose some risk (NSW DEC, 2006)
Kermadec Petrel (western)	Norfolk Island Region Threatened Species Recovery Plan Lord Howe Island Biodiversity Management Plan	None identified
Herald Petrel	Conservation Advice (*Pterodroma heraldica)* Herald petrel. Canberra: Department of the Environment, 2015 (TSSC, 2015a).	None identified
Greater Sand Plover	Approved Conservation Advice for *Charadrius leschenaultia* (Greater Sand Plover)	Habitat loss and degradation from pollution
Lesser Sand Plover	Approved Conservation Advice for *Charadrius mongolus* (Lesser Sand Plover)	Habitat loss and degradation from pollution
Hooded Plover (eastern)	Approved Conservation Advice for *Thinornis rubricollis* (Hooded Plover, Eastern)	Oil spills Entanglements and ingestion of marine debris

Common Name	**Conservation Advice or Recovery Plan**	**Key Threats (relevant to petroleum activities)**
Curlew Sandpiper	Approved Conservation Advice for *Calidris ferruginea* (Curlew Sandpiper)	Habitat loss and degradation from pollution Environmental pollution
Australian Fairy Tern	Approved Conservation Advice for *Sternula nereis nereis* (Fairy Tern)	Oil spills, particularly in Victoria, where the close proximity of oil facilities poses a risk of oil spills that may affect the species' breeding habitat
Tasmanian Wedge-tailed Eagle	Threatened Tasmanian Eagles Recover Plan, 2006-2010 (DPIW, 2006)	Oiling, entanglement, pollution
Australasian Bittern	Approved Conservation Advice for *Botaurus poiciloptilus* (Australasian Bittern)	Reduced water quality as a result of increasing salinity, siltation and pollution
Red Knot	Approved Conservation Advice for *Calidris canutus* (Red Knot)	Habitat loss and degradation from environmental Pollution Pollution or contamination impacts
Great Knot	Approved Conservation Advice for *Calidris tenuirostris* (Great Knot)	Habitat loss and degradation from environmental Pollution Pollution or contamination impacts
Red knot, Great knot, Bar-tailed godwit, Greater sand plover	Wildlife conservation plan for migratory shorebirds	Habitat loss and degradation from environmental Pollution Pollution or contamination impacts
Eastern Bristlebird	National Recovery Plan for Eastern Bristlebird (*Dasyornis brachypterus*)	None identified
Swift Parrot	Approved Conservation Advice for *Lathamus discolour* (Swift Parrot)	None identified
Bar-tailed Godwit (baueri)	Approved Conservation Advice for *Limosa lapponica bauera* (Bar-tailed Godwit)	Habitat loss and degradation from pollution Pollution/contamination
Tasmanian Masked Owl	Approved Conservation Advice for *Tyto novaehollandiae castanops* (Tasmanian Masked Owl)(DEWHA, 2010)	None identified
Northern Siberian Bar-tailed Godwit	Approved Conservation Advice for *Limosa lapponica menzbieri* (Northern Siberian Bar-tailed Godwit)	Habitat loss and degradation from pollution Pollution/contamination
Orange-bellied Parrot	National Recovery Plan for the Orange-bellied Parrot (*Neophema chrysogaster*)	None identified
Eastern Curlew	Approved Conservation Advice for *Numenius madagascariensis* (Eastern Curlew)	Habitat loss and degradation from pollution Environmental pollution
Fairy Prion (southern)	Approved Conservation Advice for *Pachyptila turtur subantartica* (Fairy Prion Southern)	None identified
Australian Painted Snipe	Approved Conservation Advice for *Rostratula australis* (Australian Painted Snipe)	None identified
Forty-spotted Pardalote	Conservation Advice Pardalotus quadraginatus forty-spotted pardalote (TSSC, 2016c)	None Identified

Common Name	Conservation Advice or Recovery Plan	Key Threats (relevant to petroleum activities)
Regent Honeyeater	Conservation Advice Anthochaera phrygia regent honeyeater. Canberra: Department of the Environment (DOEE, 2015 f)	None Identified
Tasmanian Azure Kingfisher	Approved Conservation Advice for *Ceyx azureus diemenensis* (Tasmanian Azure Kingfisher) (DEWHA, 2010c)	None Identified
Painted Honeyeater	Conservation Advice Grantiella picta painted honeyeater. Canberra: Department of the Environment (DoEE, 2015 g).	None Identified

2.3.1.5 Marine Mammals

2.3.1.6 Cetaceans

Cetaceans are a widely distributed and diverse group of carnivorous, finned, aquatic marine mammals. They comprise whales, dolphins and porpoises. Cetaceans are generally found in the ocean, but can also inhabit river systems.

There are 25 whale, and 18 dolphin species (or species habitat) that may occur within the DA; this includes species classified as threatened and migratory (Table 2-38) (DoEE, 2019b, DoEE, 2019l, DoEE, 2019m). A list of the conservation advice and/or recovery plans, with relevant key threats and management actions, is shown in Table 2-39. The type of presence varies between species, and includes important behaviours (e.g. foraging, breeding) for some species.

Whales

Southern Right Whales generally occur along the southern coast of Australia, they migrate annually along the eastern coastline from high latitude feeding grounds to lower latitudes for calving between mid-May and September (DoEE, 2017h). Known calving and aggregation grounds in the south-east region are Warrnambool, Port Fairy, Port Campbell and Portland in Victoria, and Encounter Bay in South Australia (DSEWPaC, 2012d; DoEE, 2015a). Nursery grounds are occupied from May to October, with female-calf pairs generally staying in the area for two to three months (Charlton, 2017). Calving itself usually occurs in very shallow (<10 m depth) waters. Other population classes stay in the nursery grounds for shorter and variable periods of time; there is typically a lot of movement along the coast, and thus habitat connectivity is important for this species. The summer offshore distribution and migration routes of Southern Right Whales largely is unknown, but is known to include directly southern and western migration pathways, but may include offshore habitat where mating (Burnell, 2001; Mackay et al., 2015). Figure 2-28 shows whale migration pathways and aggregation around the Bass Strait petroleum permit areas, including those for the Southern Right Whales. A BIA for the Southern Right Whale, for migration and distribution exists within the DA (Figure 2-31) (DoEE, 2015h).

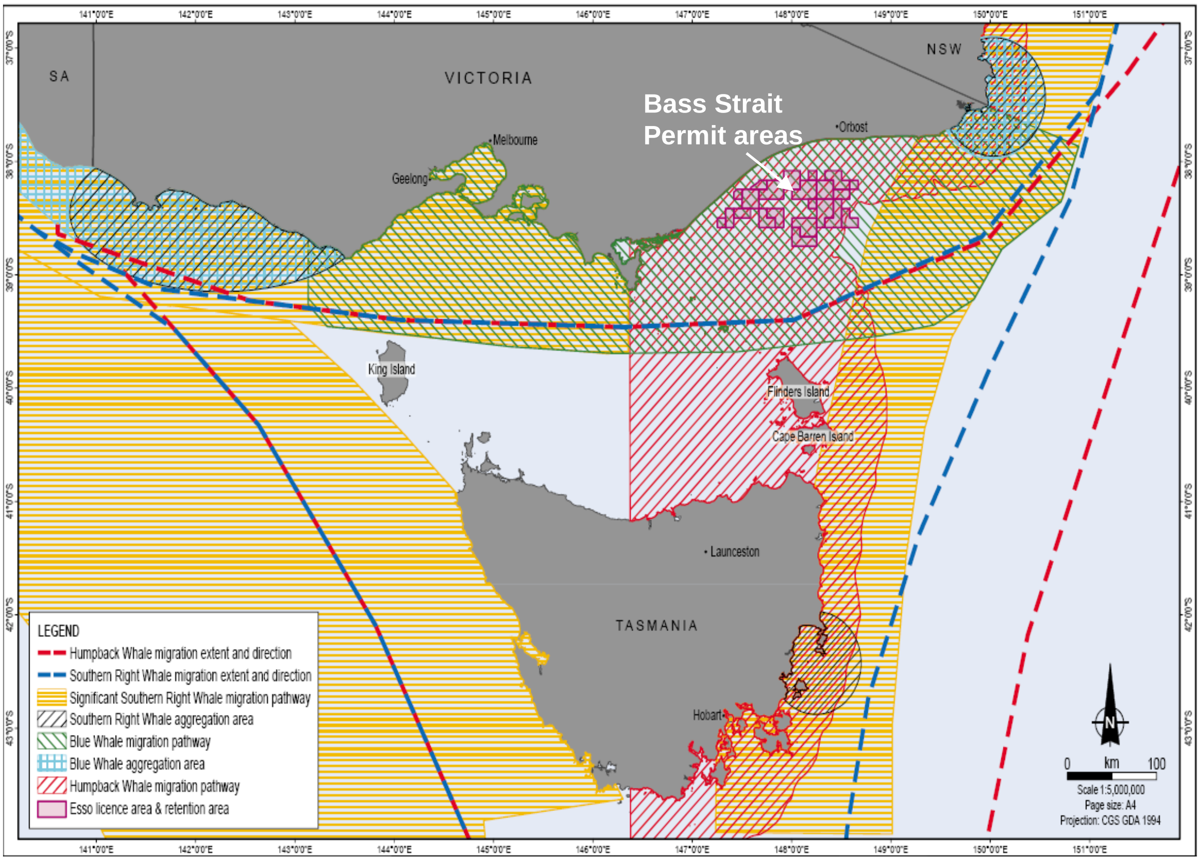


Figure 2-28 Whale migration pathways and aggregation around the Bass Strait petroleum permit areas

Humpback whales migrate annually along the eastern coast of Australia heading north to tropical calving grounds from June to August, and south to Southern Ocean feeding areas from September to November (Figure 2-29). While the main migration route of this species is along the east coast of Australia along the continental shelf to the east of Bass Strait, some animals migrate through Bass Strait. Humpback whales do not feed, breed or rest in Bass Strait and the Victorian coastal waters are not a key location for this whale species (Bannister et al., 1996). Most feeding grounds are south of Australian waters (TSSC, 2015c). A BIA for the Humpback Whale, for migration and breeding, has been identified along the east coast of Australia (Figure 2-31) (DoEE, 2015h). Humpback whales in the southern Hemisphere primarily feed on Antarctic krill (Euphausia superba). While most feeding grounds are south of Australian waters, there are some feeding grounds that are regularly used on the southern migration in Australian coastal waters: off the coast of Eden in New South Wales, and east coast of Tasmania (TSSC, 2015c).

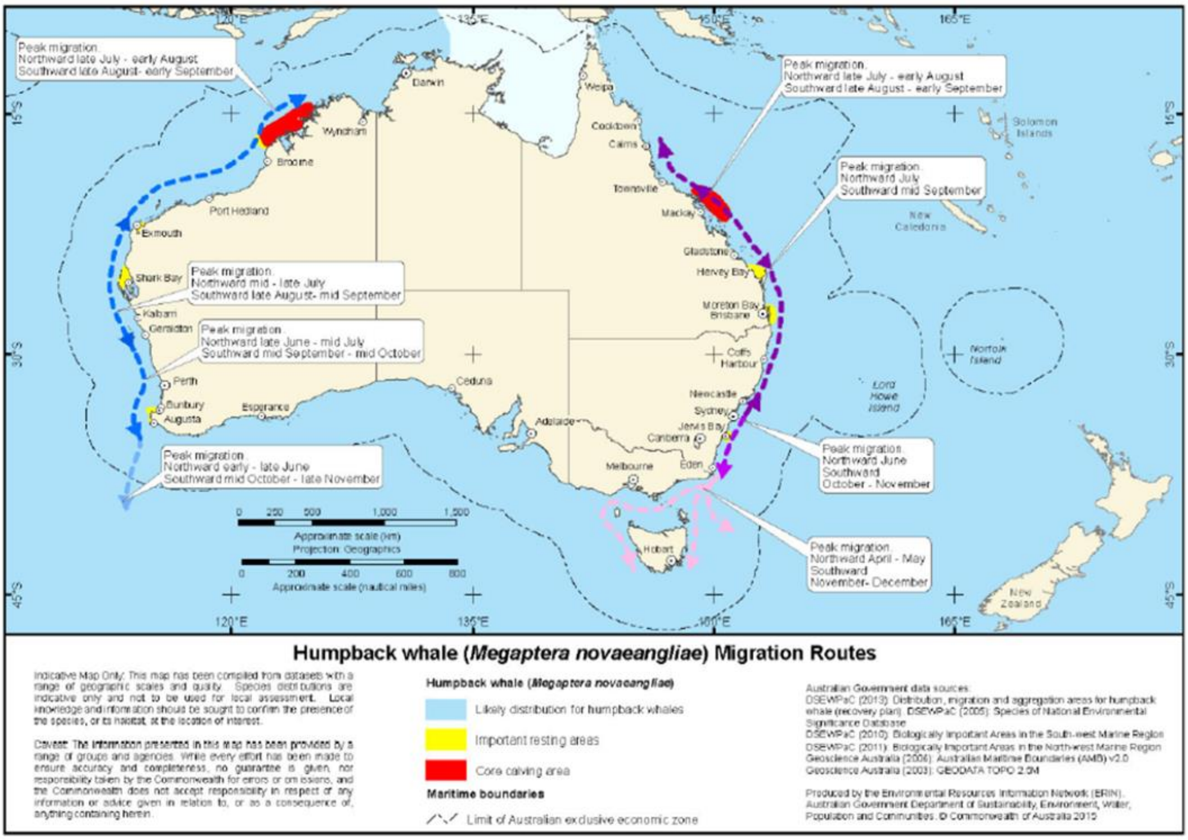


Figure 2-29 Migration routes for Humpback Whales around Australia (TSSC, 2015c)

There are two subspecies of Blue Whale that occur within Australian waters: Antarctic Blue Whale, and the Pygmy Blue Whale. Blue Whales have the highest known prey requirements, consuming up to two tonnes of krill per day (DoEE, 2015d). Blue whale sightings in Australia are widespread, and much of the shelf and coastal waters are unlikely to hold significance for this species with the exception of some foraging locations. Australia has two known seasonal feeding aggregations of Pygmy Blue Whales, one occurs adjacent to the Bonney Upwelling system off South Australia and Victoria (Figure 2-30) (Gill 2002; Gill & Morrice 2003). Pygmy Blue Whales are typically foraging in this area between January and April (DoEE, 2015d). The abundance of whales in the area varies within and between seasons (DoEE, 2015d). Outside these main feeding areas, foraging areas for the Pygmy Blue Whale also include in Bass Strait, and diving and presumably feeding at depth off the west coast of Tasmania (DoEE, 2015d). A BIA for the Pygmy Blue Whale for foraging and distribution has been identified in the DA (Figure 2-31) (DoEE, 2015h). Acoustic detections of blue whales indicates that New Zealand pygmy blue whales occur predominantly eastward of Bass Strait, Australian pygmy blue whales occur west of Bass Strait, and Antarctic blue whales occur along the entire southern coastline (McCauley et al., 2018). Sightings of Blue whales in the Gippsland Basin are reasonably rare (Bannister et al. 1996).

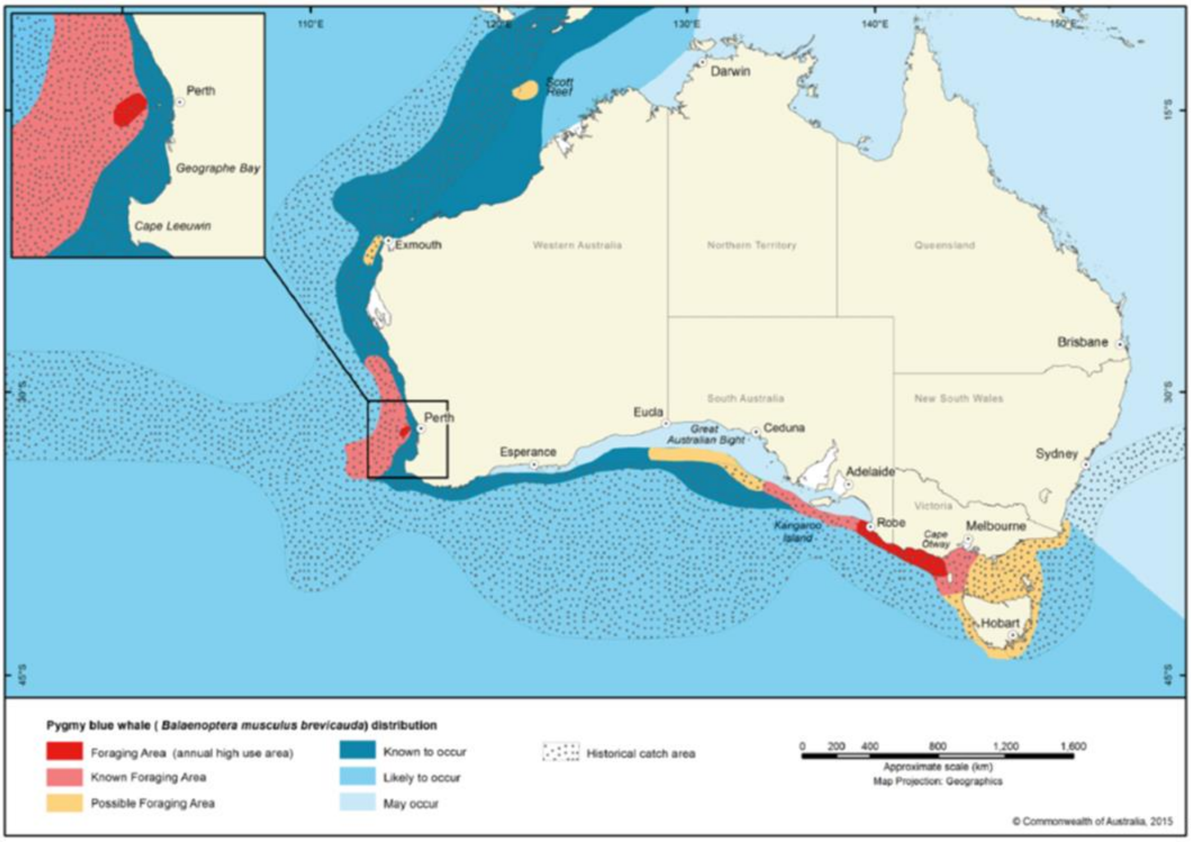
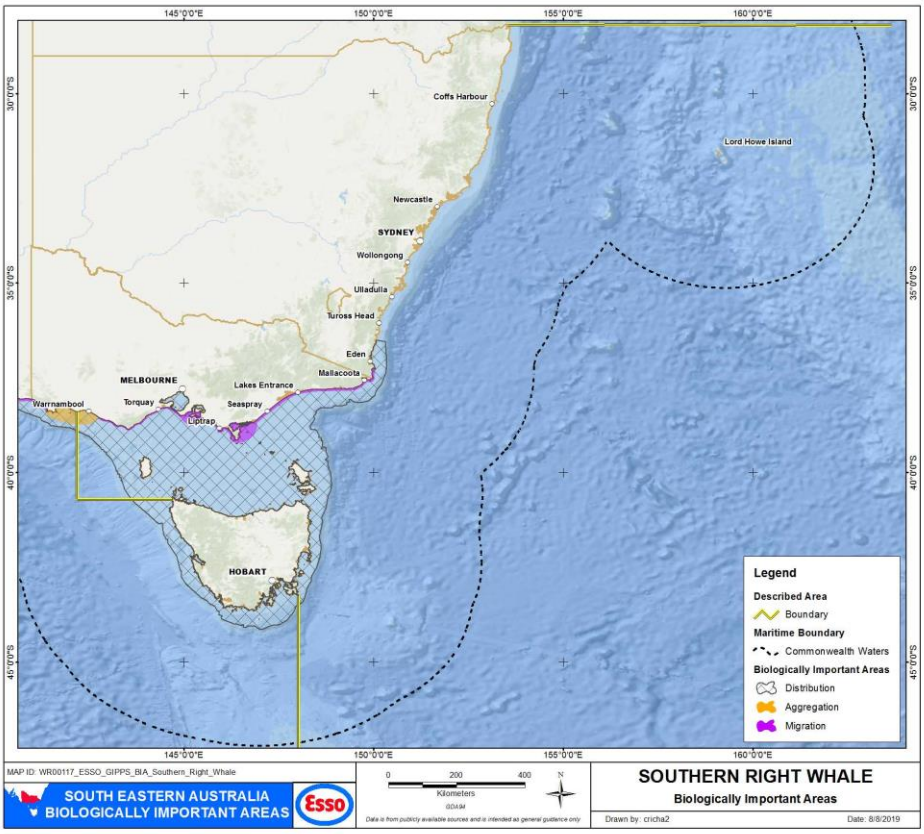


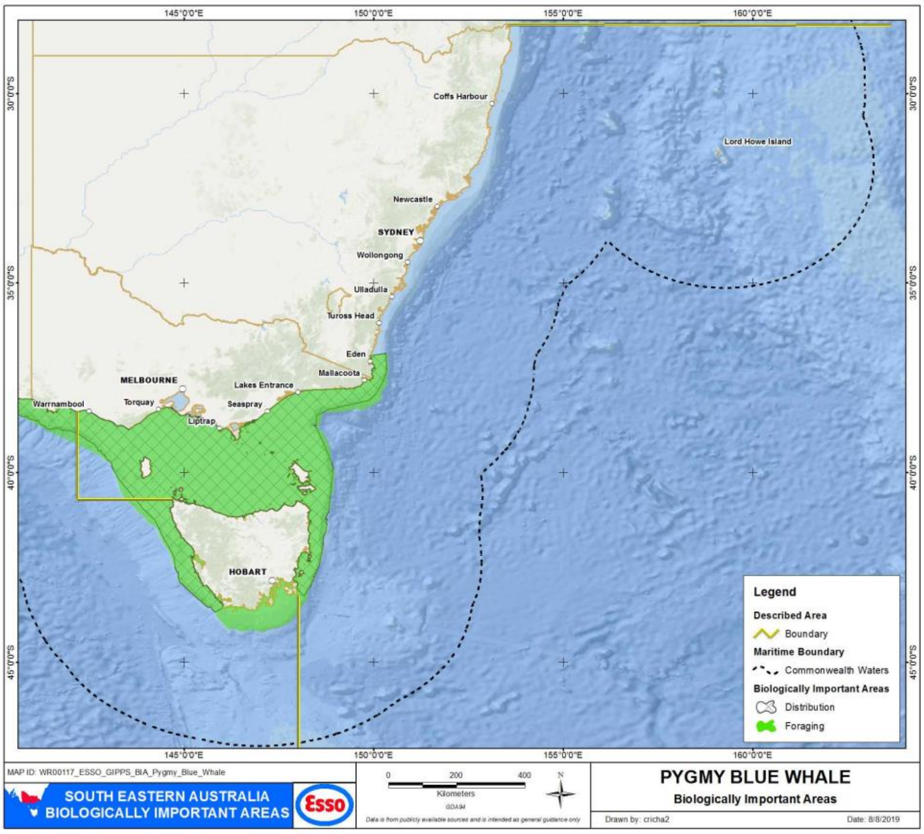
Figure 2-30 Distribution and foraging areas for the Pygmy Blue Whale (DoE, 2015d)

Sei Whales have been infrequently recorded in Australian waters; however occasional sightings have been recorded off Tasmania, New South Wales, Queensland and within the Great Australian Bight (DoEE, 2017p). Sei Whales typically feed between the Antarctic and Subtropical convergences, and their diet is planktonic crustacea, in particular copepods and amphipods. However, Sei Whales have also been observed feeding on the continental shelf in the Bonney Upwelling region during November and May, suggesting the area may be used for opportunistic feeding (DoEE, 2018a).

The distribution of Fin Whales in Australian waters is uncertain, but they have been recorded in Commonwealth waters off most States (the species is rarely found in inshore waters) (DoEE, 2017r). Fin Whales frequently lunge or skim feed, at or near the surface, feeding on planktonic crustacea, some fish and cephalopods (DoEE, 2017r). Fin Whales generally feed in high latitudes, however depending upon prey availability and locality, it may also feed in lower latitudes. Fin whales have been observed in waters off the Bonney Upwelling during November and May, suggesting the region may be used for opportunistic feeding (DoEE 2018b). Fin whales have also been detected acoustically south of Portland, Victoria (Erbe et al., 2016).

Records of Pygmy Right Whales in Australian waters are distributed between 32°S and 47°S, but are not uniformly spread around the coast (DoEE, 2017t). Areas of coastal upwelling events appear to be an important component regulating Pygmy Right Whale distribution. Pygmy right whales (Caperea truncates) have primarily been recorded in areas associated with upwellings and with high zooplankton abundance, which constitute their main prey. There is some evidence to indicate that the area south of 41°S is important for weaned Pygmy Right Whales, possibly because of the higher prey abundance in these waters (DoEE, 2017t).


SOUTHERN RIGHT WHALE
Biologically Important Areas
SOUTH EASTERN AUSTRALIA
BIOLOGICALLY IMPORTANT AREAS
MAP ID: WR00117_ESSO_GIPPS_BIA_Southern_Right_Whale
Legend
Described Area
Boundary
Maritime Boundary
Commonwealth Waters
Biologically Important Areas
Distribution
Aggregation
Migration
Coffs Harbour
Lord Howe Island
Newcastle
SYDNEY
Wollongong
Ulladulla
Tuross Head
Eden
Mallacoota
MELBOURNE
Lakes Entrance
Warrnambool
Torquay
Seaspray
Liptrap
HOBART
Kilometers
Drawn by: cricha2
Date: 8/8/2019


PYGMY BLUE WHALE
Biologically Important Areas
SOUTH EASTERN AUSTRALIA
BIOLOGICALLY IMPORTANT AREAS
MAP ID: WR00117_ESSO_GIPPS_BIA_Pygmy_Blue_Whale
Legend
Described Area
Boundary
Maritime Boundary
Commonwealth Waters
Biologically Important Areas
Distribution
Foraging
Coffs Harbour
Lord Howe Island
Newcastle
SYDNEY
Wollongong
Ulladulla
Tuross Head
Eden
Mallacoota
MELBOURNE
Lakes Entrance
Warrnambool
Torquay
Seaspray
Liptrap
HOBART
Kilometers
Drawn by: cricha2
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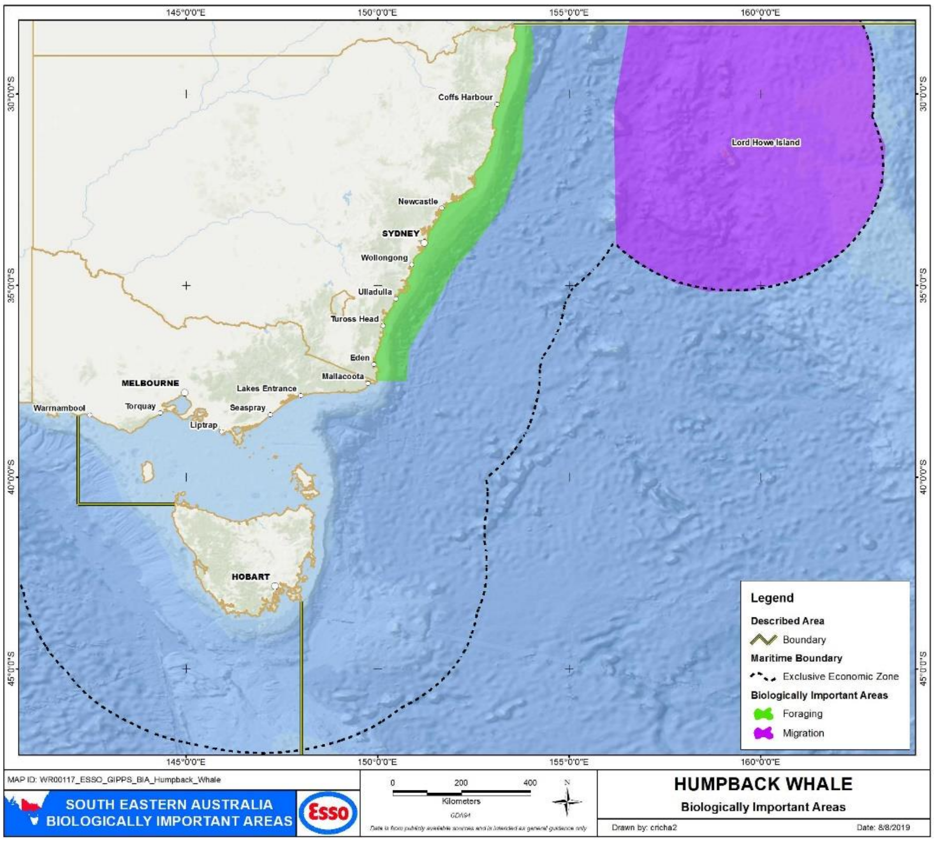

Figure 2-31 Biologically Important Areas for whale species

Dolphins

All dolphins are a protected species in Australian waters. None that are listed as occurring in the DA are listed as vulnerable, endangered or critically endangered. They are found in a variety of marine habitats, from the open ocean to coastal bays and inlets. Dolphins are migratory animals and their habits vary. Species that live in coastal areas are less likely to travel compared to species that live in open water.

The Indian Ocean Bottlenose Dolphin is distributed continuously around Australia (DoEE, 2017u). The Indian Ocean Bottlenose Dolphin occurs mainly in riverine and shallow coastal waters (on the shelf or around oceanic islands) (DSEWPaC, 2012e). Known populations include: Jervis Bay, Twofold Bay, and Phillip Bay (DSEWPaC, 2012e). Calving peaks occur in spring and summer or spring and autumn (DoEE, 2017u). Gestation lasts approximately 12 months, so peak mating period coincides with peak calving period in each location (DoEE, 2017u). A BIA for breeding for the Indian Ocean Bottlenose Dolphin has been identified within New South Wales coastal waters (Figure 2-32) (DoEE, 2015h).

The Indo-Pacific Humpback dolphin (*Sousa chenisis*) has similar habitat type as the Indian Ocean Bottlenose and occurs in tropical/subtropical waters from approximately the Queensland–New South Wales border to western Shark Bay, Western Australia. Humpback dolphins have been observed feeding mainly in near-shore habitats and in a wide range of inshore-estuarine coastal habitats including rivers and creeks, exposed banks, shallow flats, rock and coral reefs as well as over submerged reefs in waters at least up to 40 m deep. Although listed as a migratory species, they do not appear to undergo large scale seasonal migrations (DoEE, 2019y). BIA for this species occur in northern Queensland, outside of this DA (NCVA, 2019).

The Bottle-nosed dolphin (*Tursiops truncates*) and the Common dolphin (Delphinus delphis) are commonly sighted in near-shore Victorian waters.

Dusky dolphins are listed as a migratory marine species likely to be present in the vicinity of the EGBPA. Although they have been sighted off Tasmania, there is no known calving locality for this species in Australian waters (Gill et al. 2000). Of the same genus as the Dusky dolphins are the Hourglass dolphins which may occur in the area. These are circumpolar in pelagic waters of the Subantarctic and Antarctic zones. Little information is known about species feeding or breeding habitats (DoEE, 2019am).

There are a number of pelagic dolphins that may occur in the DA. The population size of these species is not known however none are considered to be rare. No specific conservation or listing advice exists and their distribution has not been specifically defined. All species feed on pelagic fish, squids, octopus, shrimps and other marine fauna taken at depths exceeding 250 m. The extent of occurrence is large in all cases, estimated to be greater than 20,000 km^2. All are tropical to subtropical species (occasionally temperate) with distribution varying depending on water temperature and flow of warm currents.

The Striped Dolphin (*Stenella coeruleoalba*) inhabits pelagic and oceanic waters. All sightings have been made in waters where the sea surface temperature exceeds 25 °C. Striped Dolphins may travel in large groups of several hundreds and even thousands, and are most frequently found in deep waters (deeper than 1000 m), preferring areas with large seasonal changes in surface temperature and thermocline depth and with seasonal upwelling (DoEE, 2019ac). Striped Dolphins do not co-occur with tuna as commonly as Spotted and Spinner Dolphins do, and so are less vulnerable to being entangled and caught in tuna purse seine nets.

The distribution of Spotted Dolphin (also called Pantropical Spotted Dolphins) (*Stenella attenuate)* has not been surveyed however there have been sightings recorded off the Northern Territory, Western Australia down south to Augusta, Queensland and NSW. This species inhabits both near-shore and oceanic habitats in tropical and warm temperate seas. They have also been found on the shelf and along the continental slope, indicating that they may use neritic (over the continental slope) habitat as well. The Spotted Dolphin diet overlaps greatly with that of Yellowfin Tuna and a close association has been noted between these species and sea birds in the eastern tropical Pacific (DoEE, 2019ad).

Long-snouted Spinner Dolphins (*Stenella longirostris*) are primarily pelagic (occurring in open ocean) but they can be neritic (occurring over the continental shelf) in some regions. They occur in tropical, subtropical and occasionally temperate waters around the world. Long-snouted Spinner Dolphins associate with tuna. The lack of abundance and distribution data prohibits definitive assessment of the Australian populations of Long-snouted Spinner Dolphins however they are not considered rare (DoEE, 2019ab).

Similar to the other pelagic dolphin species described above, the Rough-toothed Dolphin (*Steno bredanensis)* has been recorded from Western Australia (Barrow Island), the Northern Territory, Queensland and southern New South Wales. They are regularly seen with Pilot Whales and Bottlenose Dolphins, and occasionally with Spotted and Spinner Dolphins. Specific information on the Rough-toothed Dolphin is also lacking. Their notoriety for stealing bait and fish off fishing lines makes them unpopular with many recreational and commercial fishers and may lead to both incidental captures and mortalities from fisher targeting. Additionally, their regular association with schools of Yellowfin and Skipjack Tuna, plus Dorado (Dolphinfish/Mahi Mahi), may make them susceptible to entanglement in purse-seine nets set for these fish species (DoEEa, 2019ae).

Fraser's Dolphin is another pelagic or oceanic dolphin which in Australia is found north of 300 S and in waters deeper than 1000 m. Increasing ocean temperatures predicted by climate change scenarios could potentially increase the extent of occurrence of Fraser's Dolphin, with warmer water extending southwards along both coasts. Fraser's Dolphin feeds on mesopelagic fish, squid and crustaceans. It is a stocky dolphin with a short beak and thick tail stock. Distribution information on this species in Australia is derived from beach casts and is thought to be potentially abundant, however it is not well surveyed (DoEE, 2019as).

Australian Snubfin Dolphins are characterised by a broadly rounded head and no beak, with a straight mouth line. All available data on the distribution and habitat preferences of Australian Snubfin Dolphins indicate that they mainly occur in one location: shallow coastal and estuarine waters of Queensland, Northern Territory and north Western Australia. Feeding may occur in a variety of habitats, from mangroves to sandy bottom estuaries and embayments, to rock and/or coral reefs, primarily in waters less than 20m depth. A study of a population in Cleveland Bay, north Queensland showed that the species spends most of its time foraging and travelling and little time socialising. This population only spent approximately 30 days in the year in this one location, following a pattern of emigration and reimigration, suggesting that the territories or ranges for this species is large (DoEE, 2019aq).

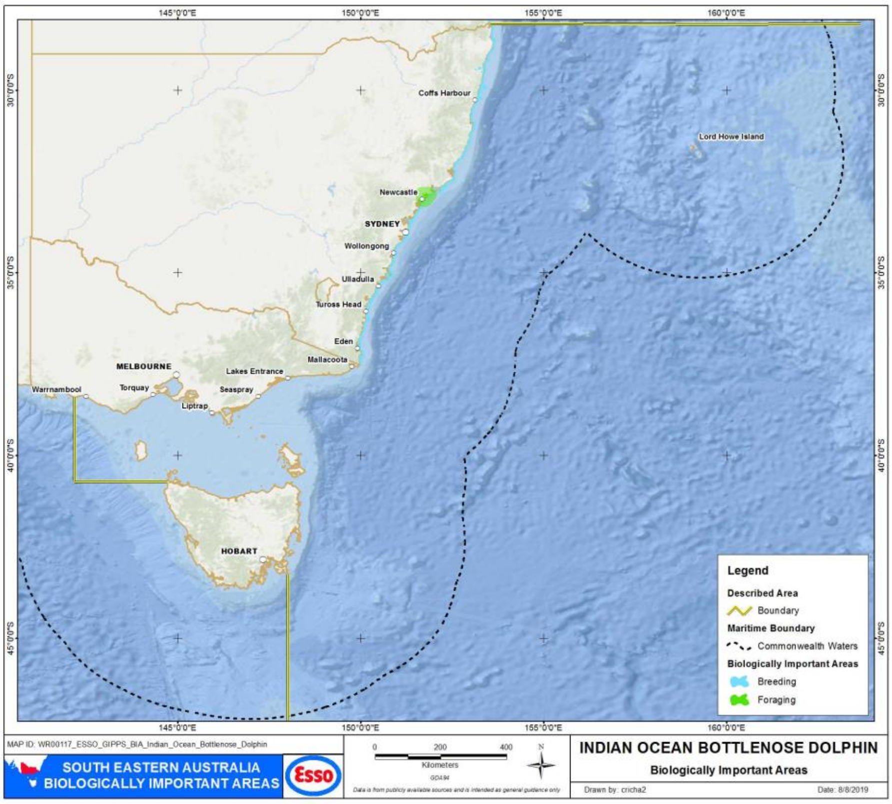

Figure 2-32 Biologically Important Areas for Indian Ocean Bottlenose Dolphin

Table 2-38 Marine mammal (cetacean) species or species habitat that may occur within the DA (DoEE, 2019b, DoEE, 2019l, DoEE, 2019m)

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Whales						
Balaenoptera acutorostrata	Minke Whale					MO
Balaenoptera bonaerensis	Antartic Minke Whale		✓			LO
Balaenoptera borealis	Sei Whale	V	✓			FLO
Balaenoptera edeni	Bryde's Whale		✓			LO
Balaenoptera musculus	Blue Whale	E	✓		f	LO
Balaenoptera physalus	Fin Whale	V	✓			FLO
Berardius arnuxii	Arnoux's Beaked Whale					MO
Caperea marginata	Pygmy Right Whale		✓			FLO
Eubalaena australis	Southern Right Whale	E	✓		m	KO
Globicephala macrorhynchus	Short-finned Pilot Whale					MO
Globicephala melas	Long-finned Pilot Whale					MO

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Hyperoodon planifrons	Southern Bottlenose Whale					MO
Kogia breviceps	Pygmy Sperm Whale					MO
Kogia simus	Dwarf Sperm Whale					MO
Megaptera novaeangliae	Humpback Whale	V	✓		m	FKO
Mesoplodon bowdoini	Andrew's Beaked Whale					MO
Mesoplodon densirostris	Blainville's Beaked Whale					MO
Mesoplodon ginkgodens	Gingko-toothed Beaked Whale					MO
Mesoplodon grayi	Gray's Beaked Whale					MO
Mesoplodon hectori	Hector's Beaked Whale					MO
Mesoplodon layardii	Strap-toothed Beaked Whale					MO
Mesoplodon mirus	True's Beaked Whale					MO
Physeter microcephalus	Sperm Whale		✓			MO
Tasmacetus shepherdi	Shepherd's Beaked Whale					MO
Ziphius cavirostris	Cuvier's Beaked Whale					MO
Dolphins						
Delphinus delphis	Common Dolphin					MO
Feresa attenuata	Pygmy Killer Whale					MO
Grampus griseus	Risso's Dolphin					MO
Lagenorhynchus obscurus	Dusky Dolphin		✓			LO
Lagenodelphis hosei	Fraser's Dolphin, Sarawak Dolphin					MO
Lagenorhynchus cruciger	Hourglass Dolphin					MO
Lissodelphiss peronii	Southern Right Whale Dolphin					MO
Orcaella brevirostris	Australian Snubfin Dolphin (formerly Irrawaddy Dolphin)		✓			LO
Orcinus orca	Killer Whale		✓			LO
Peponocephala electra	Melon-headed Whale					MO
Pseudorca crassidens	False Killer Whale					MO
Sousa chinensis	Indo-Pacific Humpback Dolphin		✓			LO

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Stenalla attenuata	Spotted Dolphin					MO
Stenalla coeruleoalba	Striped Dolphin					MO
Stenalla logirostris	Long-snouted Spinner Dolphin					MO
Steno bredanensis	Rough-toothed Dolphin					MO
Tursiops aduncus	Indian Ocean Bottlenose Dolphin				bc	LO
Tursiops truncatus s. str.	Bottlenose Dolphin					MO
Porpoise						
Phocoena dioptrica	Spectacled Porpoise		✓			MO
Threatened Species: *V Vulnerable* *E Endangered* *Biologically Important Areas:* *bc Breeding, calving* *f Foraging* *m Migration*	*Type of Presence:* *MO Species or species habitat may occur within the area* *LO Species or species habitat likely to occur within the area* *KO Species or species habitat known to occur within the area* *FLO Foraging, feeding or related behaviour likely to occur within the area* *FKO Foraging, feeding or related behaviour known to occur within the area* *BKO Breeding known to occur within the area*					

Table 2-39 Key threats and management actions for threatened marine mammal (cetacean) species or species habitat that may occur within the DA

Common Name	Conservation Advice or Recovery Plan	Key Threats (relevant to petroleum activities)
Sei Whale	Approved Conservation Advice for *Balaenoptera borealis* (Sei Whale)	Anthropogenic noise and acoustic disturbance Habitat degradation including pollution Pollution (persistent toxic pollutants) Vessel strike
Blue Whale	Conservation Management Plan for the Blue Whale, 2015-2025	Noise interference Habitat modification from marine debris or chemical discharge Vessel strike
Fin Whale	Approved Conservation Advice for *Balaenoptera physalus* (Fin Whale)	Anthropogenic noise and acoustic disturbance Pollution (persistent toxic pollutants) Vessel strike
Southern Right Whale	Conservation Management Plan for the Southern Right Whale, 2011-2021	Entanglement Vessel strike Noise Interference Habitat modification
Humpback Whale	Approved Conservation Advice for *Megaptera novaeangliae* (Humpback Whale)	Noise interference Habitat degradation Entanglement Vessel disturbance and strike

2.3.1.7 Pinnipeds

Pinnipeds are a widely distributed and diverse group or carnivorous, fin-footed, semiaquatic marine mammals. They comprise the families Odobenidae (i.e. walrus), Otariidae (i.e. the eared seals, such as sea lions and fur seals), and Phocidae (i.e. the earless or true seals).

There are three pinniped species (or species habitat) that may occur within the DA; this includes species classified as threatened and migratory. The type of presence varies between species, and includes important behaviours (e.g. breeding) for some species (Table 2-40) (DoEE, 2019b, DoEE, 2019l, DoEE, 2019m).

There are 10 established breeding colonies of the Australian fur seal, which are restricted to islands in the Bass Strait; six occurring off the coast of Victoria and four off the coast of Tasmania (Kirkwood et al., 2010; Pemberton & Kirkwood 1994; Warneke, 1995). Australian fur seals breed during the summer months, with pups born from late October to late December. The closest colonies of the Australian fur seal are located at Gabo Island, Kanowna Island (off Wilson's Promontory) and The Skerries, which is home to a major Australian fur seal breeding colony with an estimated population of 11,500, representing approximately 12% of the national population. Between feeding trips seals return to land to rest, for example at the resting site at Cape Conran.

Satellite tracking of seals from both Kanowna Island and The Skerries, and reports from offshore facilities within the Gippsland Basin Exclusion Zone near the shore show that Australian fur seals commonly occur in the vicinity of these facilities (Arnould & Kirkwood, 2008) and commonly rest on these structures.

The New Zealand Fur-seal (long-nosed Fur seal) and the Australian Fur-seal have the widest range of the pinnipeds, occurring in coastal regions from South Australia through to New South Wales. While breeding for the New Zealand Fur-seal does occur along the coasts of Victoria and southern Tasmania (Figure 2-34), the main breeding sites (accounting for over 80% of the national population) are located further east in Western and South Australia (TSSC, 2017; Kirkwood et al., 2009; DSEWPaC, 2012c). Conversely, the main breeding locations for the Australian Fur-seal are typically on islands within Bass Strait (Figure 2-33) (DoEE, 2017n; Kirkwood et al., 2010). New Zealand Fur-seal breeding colonies are typically found in rocky habitat with jumbled boulders; Australian Fur-seal prefer flatter rocky shelves (Shaughnessy, 1999). Colonies for both species are typically occupied year-round, with greater activity during breeding seasons (Shaughnessy, 1999; DoEE, 2017n). Numbers of Australian Fur-seals on Montague Island (New South Wales), fluctuate through the year, with peak numbers occurring in September and October; this reflects the northward migration over the winter, and the subsequent return to the breeding colonies of the Bass Strait in late spring (DoEE, 2017n). The Australian and New Zealand Fur-seals have been recorded using Beware Reef as a haul-out site (Parks Victoria, 2017b).

The Australian Sealion (*Neophoca cineria*) is a listed vulnerable species which is endemic to South Australia, and is found from Kangaroo Island, South Australia, to the Houtman Abrolhos Islands in Western Australia. Breeding colonies occur on islands or remote sections of coastline and biologically important areas occur outside the bounds of the DA (refer Figure 2-35). Lone or small numbers of animals will regularly visit known haul-out sites and occasionally visit other locations. The species has been sighted at over 200 locations and is known to occur within the DA (DoEE, 2019z). The Australian sea-lion uses a variety of habitats when onshore, including exposed islands and reefs, rocky terrain, sandy beaches and vegetated fore dunes and swales. They also use caves and deep cliff overhangs as haul-out sites or breeding habitat. Australian sea-lions are benthic foragers feeding on a wide variety of prey including fish, cephalopods and crustaceans (Gales, 2008). Females forage on the continental shelf, with the majority of diving occurring at 40–80 metres. Young sealions (as young as 7 months old) have been observed foraging at depths of 60m, up to 10km from birth colony (TSSC, 2010).

Table 2-40 Marine mammal (pinniped) species or species habitat that may occur within the DA (DoEE, 2019b, DoEE, 2019l, DoEE, 2019m)

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Arctocephalus forsteri	New Zealand Fur-seal			✓		MO

Arctocephalus pusillus	Australian Fur-seal			✓		BKO
Neophoca cinerea	Australian Sealion	V		✓		KO
Threatened Species: V - Vulnerable *Biologically Important Areas*:	*Type of Presence*: *MO* *Species or species habitat may occur within the area* *BKO* *Breeding known to occur within the area* *KO* *Species or species habitat known to occur within the area*					

Table 2-41 Key threats and management actions for threatened marine mammal (pinniped) species or species habitat that may occur within the DA

Common Name	Conservation Advice or Recovery Plan	Key Threats (relevant to petroleum activities)
Australian Sealion	Commonwealth Listing Advice on Neophoca cinerea (Australian Sea-lion)	Habitat degradation including oil spills, pollution and toxins

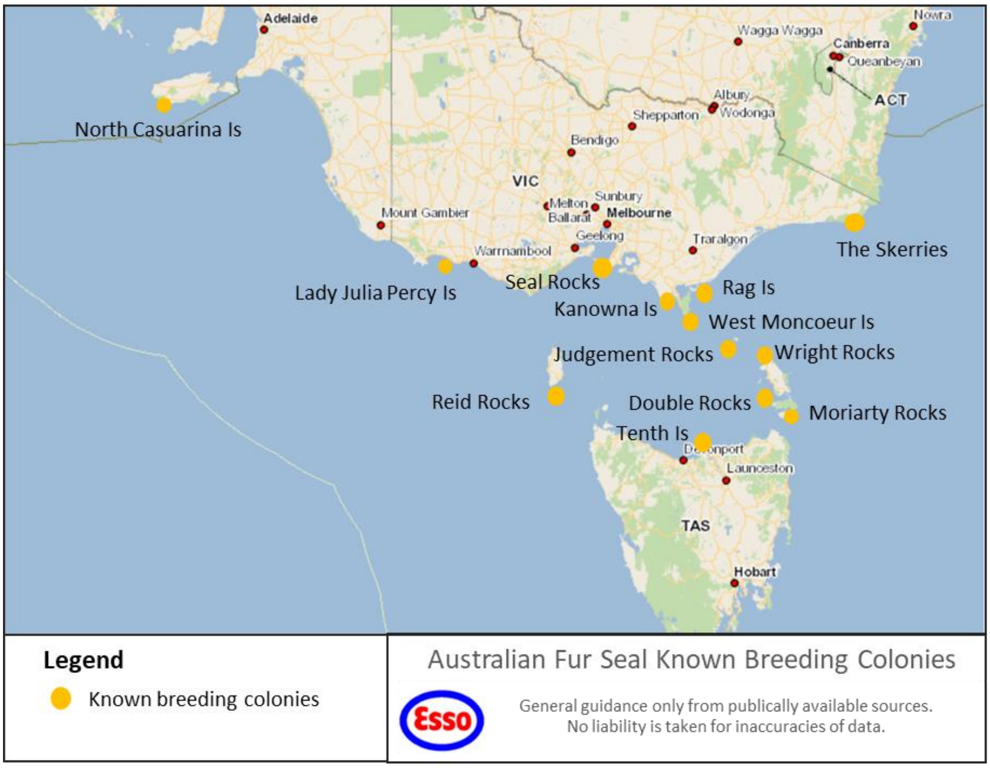

Figure 2-33 Known breeding colonies for the Australian Fur-seal (PINP, 2019)

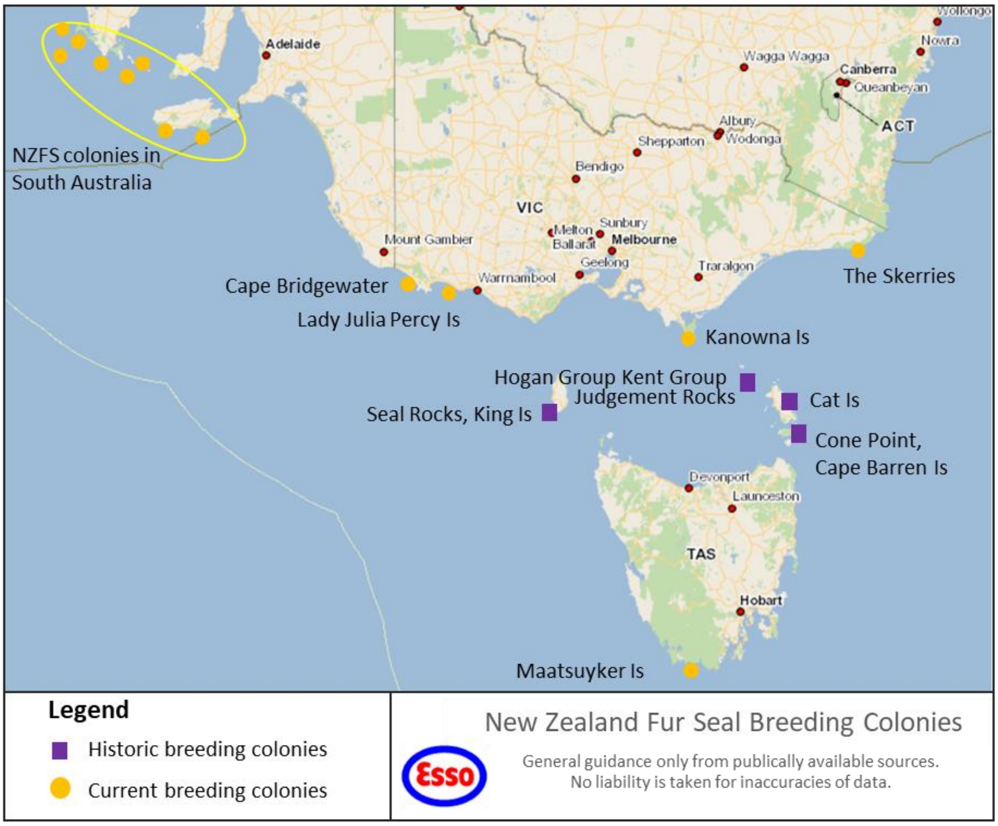

Figure 2-34 Historic (square icon) and current (circle icon) breeding colonies for the New Zealand Fur-seal (K*irkwood et al., 2009)*

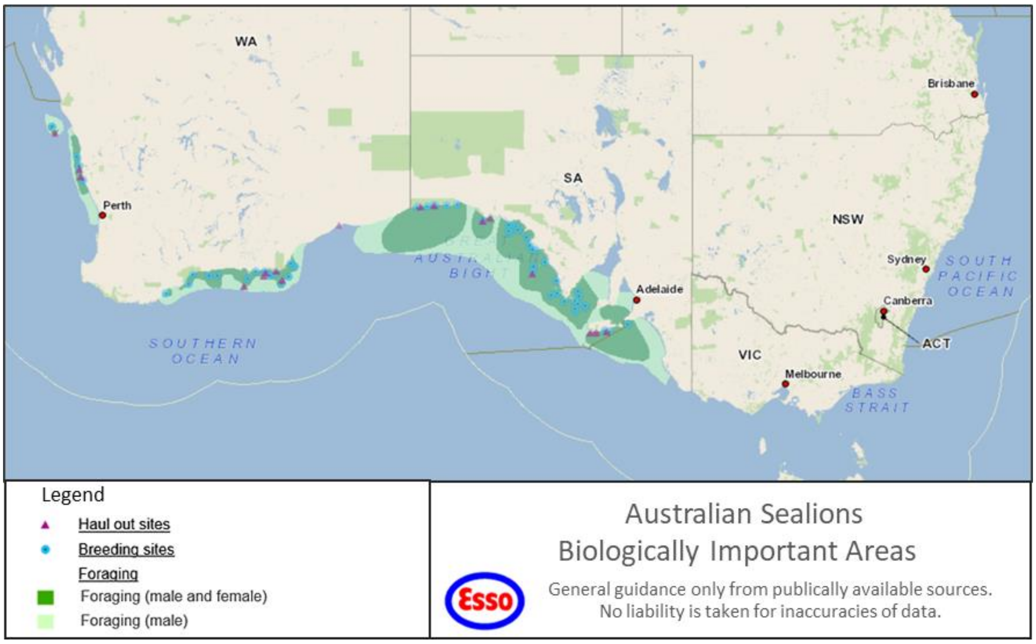

Figure 2-35 Biologically important areas for Australian Sealion (NCVA, 2019)

2.3.1.8 Sirenia

The dugong is the only species in the Family Dugongidae and one of four species in the Order Sirenia. It is most closely related to Steller's Sea Cow (Hydrodamalis gigas), which is extinct (Marsh et al. 2002).

The dugong or its habitat may occur in the north- eastern region of the DA (Table 2-42) (DoEE, 2019b, DoEE, 2019l, DoEE, 2019m). Biologically important areas for the dugong are in the north-west of Australia and do not occur in the DA. Dugongs occur in coastal and inland waters from Shark Bay in Western Australia (25° S) across the northern coastline to Moreton Bay in Queensland (27° S) (Marsh et al. 2002, 2011a). The winter range includes about 24 000 km of Australia's coast, which represents about 19% of the global extent of occurrence along coastline habitats (Marsh et al. 2011a). Stranded dugongs have been recorded as far south as ~36.5° S on the east coast, with occasional sightings south to 32–33.5° S (Newcastle region) in summer. In NSW the dugongs were sighted in coastal and estuarine waters around Wallis Lake, Port Stephens, Lake Macquarie and Brisbane Water in the summer of 2002/2003 (Allen et al., 2004). These areas are associated with some of the largest seagrass beds in New South Wales, some of which contain the Halophila seagrass species. The presence of dugongs in these areas at this time coincided with warm water temperatures (>18 °C).

Table 2-42 Marine mammal (sirenia) species or species habitat that may occur within the DA (DoEE, 2019b, DoEE, 2019l, DoEE, 2019m)

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Dugong dugon	Dugong		✓	✓		MO
Threatened Species: *Biologically Important Areas:*	*Type of Presence:* *MO Species or species habitat may occur within the area*					

2.3.1.9 Marine Reptiles - Turtles

Adult marine turtles spend the majority of their lives in the ocean, typically only coming onshore to nest. Females can lay (on average) between two and six clutches per season (DoEE, 2017g); with the period between clutches known as the internesting period. Female turtles typically remain close to the same nesting site during an internesting period. Egg incubation varies between species, but is typically approximately two months (DoEE, 2017g). Hatchlings disperse into oceanic currents, and the juveniles will stay in pelagic waters until large enough to settle into coastal feeding habitats. Leatherback Turtles are an exception to these general patterns, often exhibiting larger internesting zones, and travelling vast distances to forage rather than settling in a coastal habitat (DoEE, 2017g). Flatback Turtles also lack an oceanic phase and remain in the surface waters of the continental shelf.

There are six marine turtle species (or species habitat) that may occur within the DA; this includes species classified as threatened and migratory (Table 2-43) (DoEE, 2019b, DoEE, 2019l, DoEE, 2019m). A list of the conservation advice and/or recovery plans, with relevant management actions, is shown in Table 2-44. The type of presence varies between species, and includes important behaviours (e.g. foraging, breeding) for some species.

The Loggerhead Turtle has a global distribution throughout tropical, sub-tropical and temperate waters; and in Australia typically occurs in the waters of coral and rocky reefs, seagrass beds, or muddy bays throughout eastern, northern and western Australia (DoEE, 2017i). Loggerhead Turtles are carnivorous, feeding primarily on benthic invertebrates. While the species has a broad foraging range throughout Australian waters, nesting is known to occur (from two different genetic stocks) on sandy beaches on the central western and eastern coasts (Figure 2-36) (DoEE, 2017i). The eastern Australian population is smaller than the western Australian population; and has also undergone a decline from approximately 3,500 nesting females in 1977, to approximately 500 nesting females in 2000 (DoEE, 2017i). No nesting or internesting critical habitat, or BIAs, have been identified for the Loggerhead Turtle within the DA.

Green Turtles are found in tropical and subtropical waters throughout the world; usually occurring within the 20°C isotherms, although individuals can stray into temperate waters (DoEE, 2017j). Within Australia, Green Turtles typically nest, forage and migrate across tropical northern Australia (Figure 2-36) (DoEE, 2017j). No nesting or internesting critical habitat, or BIAs, have been identified for the Green Turtle within the EGBPA. The total Australian population of Green Turtles is approximately

70,000 individuals, with approximately 8,000 of these found in the Southern Great Barrier Reef area. Adult Green Turtles consume mainly seagrass and algae, although they will occasionally eat mangroves, fish-egg cases, jellyfish, and sponges; juvenile Green Turtles are typically more carnivorous, and will also consume plankton during their pelagic stage (DoEE, 2017j).

The Leatherback Turtle has the widest distribution of any marine turtle, occurring in tropical to sub-polar oceans (TSSC, 2008). In Australia, the Leatherback Turtle has been recorded foraging in all Australian states, but no large nesting populations have been recorded (Figure 2-36) (TSSC, 2008). The Leatherback Turtle is a highly pelagic species, venturing close to shore mainly during the nesting season (DoEE, 2017k). Adults feed mainly on pelagic soft-bodied creatures such as jellyfish, tunicates, salps, squid (DoEE, 2017k). No nesting or internesting critical habitat, or BIAs, have been identified for the Leatherback Turtle within the DA.

The Flatback Turtle is found in tropical waters of northern Australia, and is one of only two species of sea turtle without a global distribution (DoEE, 2017l). All known nesting locations for this species are within Australia (Figure 2-36) (DoEE, 2017l). No nesting or internesting critical habitat, or BIAs, have been identified for the Flatback Turtle within the DA. Flatback Turtles are primarily carnivorous, feeding on soft-bodied invertebrates; juveniles eat gastropod molluscs, squid, siphonophores. Limited data also indicate that cuttlefish, hydroids, soft corals, crinoids, molluscs and jellyfish may also form part of their diet (DoEE, 2017l).

The Hawksbill Turtle is found in tropical, subtropical and temperate waters all around the world (DoEE, 2017m). No nesting or internesting critical habitat, or BIAs, have been identified for the Hawksbill Turtle within the DA. Hawksbill Turtles are omnivorous, feeding on sponges, hydroids, cephalopods (octopus and squid), gastropods (marine snails), cnidarians (jellyfish), seagrass and algae (DoEE, 2017g, 2017m). During their pelagic phase (while drifting on ocean currents), young Hawksbill Turtles will feed on plankton. Hawksbill Turtles that forage on the Great Barrier Reef migrate to neighbouring countries including Papua New Guinea, Vanuatu, and the Solomon Islands; it is not known from which stock Hawksbill Turtles foraging in New South Wales originate (DoEE, 2017g).

The Olive Ridley Turtle is the smallest of Australian sea turtles. Low density nesting of the Olive Ridley turtle occurs in the northern parts of Australia including Arnhem Land coast and north-western Cape York Peninsula. Important foraging areas include the Great Barrier Reef but other shallow foraging habitats extend to south-east Queensland; most individuals have been captured by trawlers in the East Coast Otter Trawl fishery in Queensland. The EPBC database lists the species as likely to breed in the area of the DA, the Olive Ridley turtle has been identified as a conservation value in the North and North-west bioregional plans only and the literature suggests that only foraging may occur within the DA (DoEE, 2019ao).

Table 2-43 Marine Reptile turtle species or species habitat that may occur within the DA (DoEE, 2019b, DoEE, 2019l, DoEE, 2019m)

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Turtles						
Caretta caretta	Loggerhead Turtle	E	✓	✓		BLO
Chelonia mydas	Green Turtle	V	✓	✓		FKO
Dermochelys coriacea	Leatherback Turtle	E	✓	✓		FKO
Eretmochelys imbricata	Hawksbill Turtle	V	✓	✓		FKO
Lepidochelys olivacea	Olive Ridley Turtle	V	✓	✓		BKO
Natator depressus	Flatback Turtle	V	✓	✓		FKO

Threatened Species: *V* *Vulnerable* *E* *Endangered*	*Type of Presence*: *FKO* *Foraging, feeding or related behaviour known to occur within the area* *BLO* *Breeding likely to occur within the area*

Table 2-44 Key threats and management actions for threatened marine reptile species or species habitat that may occur within the DA

Common Name	Conservation Advice or Recovery Plan	Key Threats (relevant to petroleum activities)
Loggerhead Turtle	Recovery Plan for Marine Turtles in Australia, 2017-2027	Marine debris Chemical discharge Light pollution Habitat modification Vessel disturbance Noise interference
Olive Ridley Turtle		
Green Turtle		
Hawksbill Turtle		
Flatback Turtle		
Leatherback Turtle	Recovery Plan for Marine Turtles in Australia, 2017-2027 Approved Conservation Advice for *Dermochelys coriacea* (Leatherback Turtle)	As above

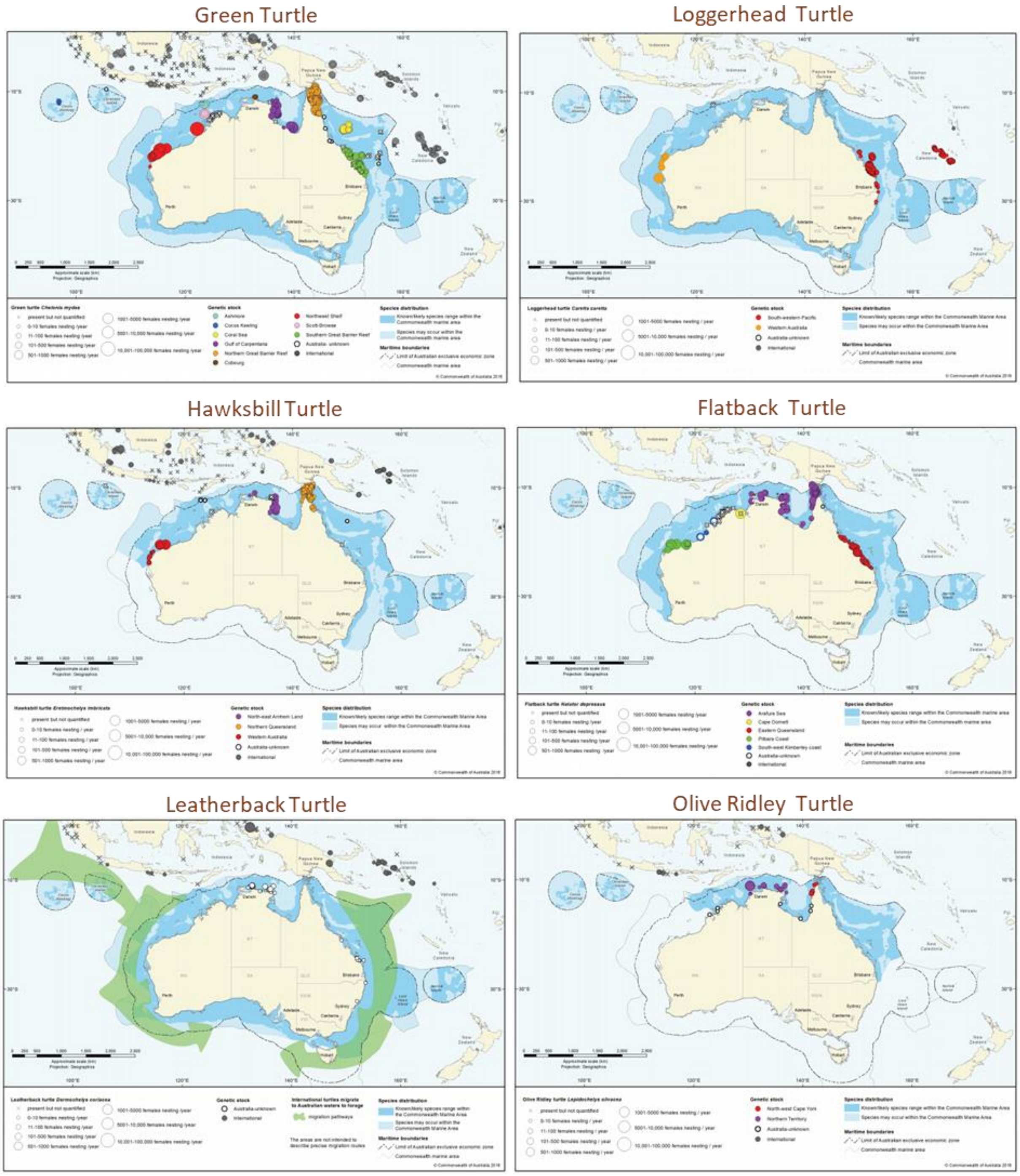

Figure 2-36 Marine turtle species distribution and nesting sites

2.3.1.10 Marine Reptiles –Other

The Elegant Seasnake is widespread in tropical Australia. This includes Queensland, Western Australia and the Northern Territory (Dell & Fry 2003) and it may occur in the DA (DoEE, 2019b, DoEE, 2019l, DoEE, 2019m). Its distribution extends from Shark Bay in Western Australia to Moreton Bay in Queensland. Sea snakes are air breathing reptiles and must come to the surface to breathe, however they can spend from 30 minutes to two hours diving between breaths. They also carry out cutaneous respiration whereby oxygen diffuses from sea water across the snake's skin into the blood. The waste product, carbon dioxide, is then diffused out of the snake's body, via the skin. The Elegant Seasnake uses a variety of marine and estuarine habitats, including sandy substrates in less than two metres of water to depths of approximately 80 m but is also sometimes found in freshwater habitats. They feed on benthic (bottom-dwelling) fish such as Catfish, burrowing eels, Whiting, Gobies and Squid. Their main threat is bycatch from trawling, no specific conservation or listing advice exists for the species (DoEE, 2019z).

The Yellow-bellied sea snake is the most widely distributed of all sea snake species in Australia, while there have not been any recent surveys, it is found in most waters except for the colder southern coastline. The population living near the central coast of New South Wales was thought to be permanent and breeding at the time of the survey in 1975. It is the most pelagic of all known sea snakes, occurring in the open waters well away from coasts and reefs. Fish are attracted to it as it rests motionless on the surface of the sea (like an inanimate object) and are subsequently caught with a sudden lunge. The main threat to the species is through bycatch from trawling. No specific conservation or listing advice exists for the species (DoEE, 2019aa). This snake species may occur in the DA.

The Stokes' Seasnake inhabits the tropical seas of northern Australia, including Western Australia, the Northern Territory and Queensland. It occurs in the Great Barrier Reef Marine Park and in the Commonwealth Reserve of Ashmore Reef in Western Australia. It is amongst the largest and bulkiest of seasnakes reaching 2 metres in length and 26cm in girth. The Stokes' Seasnake is a strong swimmer and forages for slow-moving fish in holes and crevices on the sea floor, muddy substrates and in reefs. In Australia, the Stokes' Seasnake moves southward into more temperate latitudes of Queensland and Western Australia during summer and therefore may approach the DA in this season (DoEE, 2019ar). Of the other five tropical seasnakes the Olive seasnake is also large reaching up to 2 metres.

Sea kraits are sea snakes that depend on the shore of coral islets for digestion, reproduction (mating and egg laying), skin sloughing and resting after foraging at sea. They are distinct by the black bands that go down their body. Two species of sea kraits are listed as may occurring in the DA. Although they are widely distributed from India, particularly the Andaman Islands to the islands of the west Pacific only extralimital specimens have been encountered on beaches in QLD, NSW and VIC. No breeding is known to occur in Australia (DAWE, 2020e).

The Salt-water Crocodile is the largest species of crocodile and the largest living reptile in the world and is found in Australian coastal waters, estuaries, lakes, inland swamps and marshes from Gladstone in Queensland (beyond the DA) through the Northern Territory and as far south as Carnarvon in the Western Australia (DAWE, 2020d).

Table 2-45 Marine Reptile snake species or species habitat that may occur within the DA (DoEE, 2019b, DoEE, 2019l, DoEE, 2019m)

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Acalyptophis peronii	Horned Seasnake			✓		MO
Aipysurus	Dubois' Seasnake			✓		MO
Aipysurus laevis	Olive Seasnake			✓		MO
Astrotia stokesii	Stokes' Seasnake			✓		MO
Disteira major	Olive-headed Seasnake					
Emydocephalus annulatus	Turtle-headed Seasnake					
Hydrophis elegans	Elegant Seasnake			✓		MO
Pelamis platurus	Yellow-bellied Seasnake			✓		MO
Laticauda colubrina	a sea krait			✓		MO
Laticauda laticaudata	a sea krait			✓		MO
Crocodylus porosus	Salt-water Crocodile Estuarine Crocodile		✓			LO

Threatened Species: *Biologically Important Areas:*	*Type of Presence:* *MO Species or species habitat may occur within the area* *LO Species or species habitat likely to occur within the area*

2.3.2 Plankton Species

Plankton species, including both phytoplankton and zooplankton, are a key component in oceanic food chains.

Phytoplankton are autotrophic planktonic organisms living within the photic zone that spend either part or all of their lifecycle drifting with the ocean currents. They and are the start of the food chain in the ocean (McClatchie et al., 2006). Phytoplankton communities are largely comprised of protists, including green algae, diatoms, and dinoflagellates (McClatchie et al. 2006). There are three size classes of phytoplankton: microplankton (20-200 µm), nanoplankton (2-20 µm) and picoplankton (0.2-2 µm). Diatoms and dinoflagellates are the most abundant of the micro and nanoplankton size classes, and are generally responsible for the majority of oceanic primary production (McClatchie et al. 2006). Phytoplankton are dependent on oceanographic processes (e.g. currents and vertical mixing), that supply nutrients needed for photosynthesis. Thus, phytoplankton biomass is typically variable (spatially and temporally), but greatest in areas of upwelling, or in shallow waters where nutrient levels are high. Seasonal variation in phytoplankton (via chlorophyll-a concentrations) has been demonstrated in Australian waters from the analysis for MODIS-Aqua sensor imagery (Figure 2-37).

Phytoplankton biomass ranges across Bass Strait (integrated over 0-100m depth), from about 1.6 µg chlorophyll *a*/L from shallow to 0.1µg/L in deeper waters (Gibbs *et al*. 1991). Phytoplankton biomass rapidly drops off with water depth, to about 0.1 µg/L below 100m, due to diminishing light penetration.

Zooplankton is the faunal component of plankton, comprised of small protozoa, crustaceans (such as krill) and the eggs and larvae from larger animals. More than 170 species of zooplankton have been recorded in eastern and central Bass Strait, but it has been found that seven dominant species make up 80% of individuals (Esso, 2009). Zooplankton biomass is higher in shallow waters of Bass Strait (16.1 mg/m^3 dry weight off Mallacoota and 15.5 mg/m^3 off Seaspray), dropping to between 1.2 – -2.1 mg/m^3 further offshore (integrated over the top 50 m of the water column), near the deepest regions of the EGBPA (Gibbs *et al*. 1991). As with phytoplankton, zooplankton biomass appears to be higher in the shallow waters of the shelf. Copepods dominate the species encountered (Watson & Chaloupka, 1982).

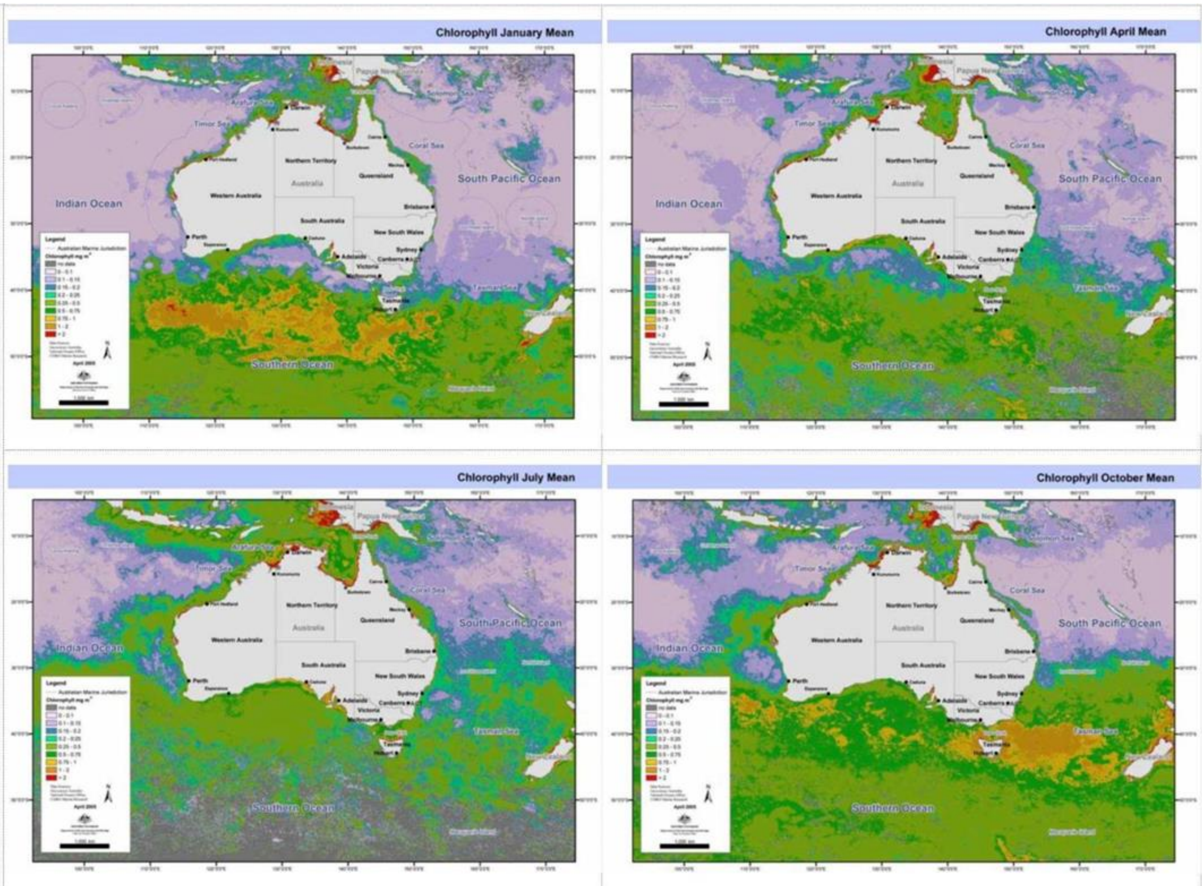

Figure 2-37 Seasonal phytoplankton growth from MODIS ocean colour composites (McClatchie et al. 2006)

2.3.3 Benthic Habitat

2.3.3.1 Bare Substrate

Unvegetated bare substrate is a widespread habitat in both intertidal and subtidal areas, particularly in areas beyond the photic zone. The biodiversity and productivity can vary depending upon depth, light, temperature and the type of sediment present.

In the Gippsland Basin, seabed material is predominantly calcium carbonate comprised of calcarenite marls and marine shales (Esso, 2009). Folk sediment classification of the samples taken at the West Kingfish and Tuna platforms describe the sediments as ranging between slightly muddy, gravelly ((m)/g/S) and muddy, gravelly sand (m/g/S) with two locations at Tuna being classed as gravelly sand (g/S) (Cardno, 2019). Similarly, the West Barracouta geophysical survey classified the seabed as featureless with consistently medium to high variable reflectivity, with backscatter characteristics indicative of fine to coarse calcerous sand with shells (DWSS, 2018). The 2009 Snapper study found that the seabed surrounding the platform is entirely comprised of soft sediments with no areas of hard substrate of rocky reef (Coffey, 2009). Generalised cross section taken from the Blackback Site survey report and accompanying representative sediment photographs indicate that the seabed sediments at the Blackback region are dense fine to medium grained siliceous carbonate sand (carbonate content ~80%) with some silt and shell debris. The samples from the canyon areas had a higher proportion of gravel and shell fragments relative to the slope and ridge samples.

The Gippsland Basin is composed of a series of massive sediment flats, interspersed with small patches of reef, bedrock and consolidated sediment. The sandy plains are only occasionally broken by low ribbons of reef; however, these reefs do not support the large brown seaweeds characteristic of many Victorian reefs, but instead are inhabited by resilient red seaweeds and encrusting animals that can survive the sandy environment (Esso, 2009). A study of the seascape of the south-eastern Australian continental shelf conducted in 2001 found that 89% of the seabed was sediment flats/bare substrate with prominent hard-grounds making up the remaining 11% of the seabed (CSIRO, 2001).

The benthic fauna present on the soft sediment can be broadly divided into two groupings:

- The epibenthos which includes sessile species such as sponges and bryozoans, hydroids, ascidians, poriferans and mobile fauna including hermit crabs, sea stars and octopus;
- The infauna which includes a diverse range of species such as amphipods, shrimps, bivalves, tubeworms, small crustaceans, nematodes, nemerteans, seapens, polychaetes and molluscs (Parry et al. 1990).

Many of these species are burrowing organisms that cause moderate bioturbation (Edgar, 2001).

Scientific surveys have shown that some shallow Victorian sandy environments have the highest levels of animal diversity in the sea ever recorded (ParksVic, 2016). In the area around the Ninety Mile Beach Gippsland more than 600 different marine animal species, many of them very small, have been found within an area of 10 m2 (ParksVic, 2016). This high species richness was a major factor in the creation of a Marine National Park on the Ninety Mile Beach (ParksVic, 2017c). The subtidal sand invertebrate fauna are dominated by small animals, mostly crustaceans, molluscs, echinoderms and polychaetes (Plummer et al. 2003, Bax and Williams, 2001).

Parry et al. (1990) found high diversity and patchiness of benthos sampled off Lakes Entrance, where a total of 353 species of infauna was recorded. Crustaceans (53%), polychaetes (32%) and molluscs (9%) dominated sample results. A significant site for the listed opistobranch mollusc (seaslug) Platydoris galbana is located off Delray Beach, 2 km south-west of Golden Beach on the shoreline (O'Hara & Barmby, 2000). An ROV seabed survey was conducted following drilling at the Snapper operational area in 2009 (Coffey 2010) and a seabed monitoring program conducted near West Tuna in 1999 (URS, 2000) confirmed that polychaetes and crustaceans were the most abundant infaunal taxa present in the seabed sediments.

This results were further supported by two studies conducted in 2018 for Esso. The first, an in-situ sediment quality and infauna sampling program conducted at West Kingfish and Tuna (including reference locations), confirmed that polychaetes, crustaceans and molluscs were the most abundant groups of taxa at all the sampled locations. The dominance (in terms of abundance) of particular taxa varied among zones and reference locations at each platform and between platforms. The benthic infauna assemblages were diverse with a range of taxa having a substantial contribution to the overall assemblage structure. The study investigated the drivers for potential influence on the entire assemblage of benthic infauna and found that it was the proportion of gravel (> 2.00 mm) particles in the sediment that was the most significant influencing factor. Figure 2-38 shows the proportion of the assemblage represented by the Crustacea, Polychaeta, Mollusca, Echinodermata and the Order groups for 'Other Worm Phlya' and 'Other Phyla' for the West Kingfish sampling and Figure 2-39 shows the proportion of the those assemblages for the sampling conducted at Tuna. The graphs show that the proportions of these assemblages were generally consistent between locations at the West Kingfish platform, however there were significant differences in the benthic infauna assemblages between locations at Tuna platform. Analysis indicated these differences were driven by changes in the physical characteristics of the environment, for example grain size and hydrodynamic differences between locations (Cardno, 2019).

The second 2018 Esso baseline study for the West Barracouta project found similarities in the dominant taxa throughout the survey locations which included annelids (polychaetes), crustaceans (amphipoda, isopoda and decapoda) and molluscs (gastropods and bivalves). This study also found that there was dissimilarity between infauna groups and these were variable throughout the survey area, likely reflecting the heterogeneous nature of the survey area (MST, 2018). Figure 2-40 shows the taxa-classed abundance of infauna at each of the monitoring sites at West Barracouta. The variation in abundance seen between the West Kingfish/Tuna studies and the West Barracouta study is due to the sample sizes taken. West Kingfish/Tuna sample size averaged 2.3L. West Barracouta sample size was 66L (0.66m^2).

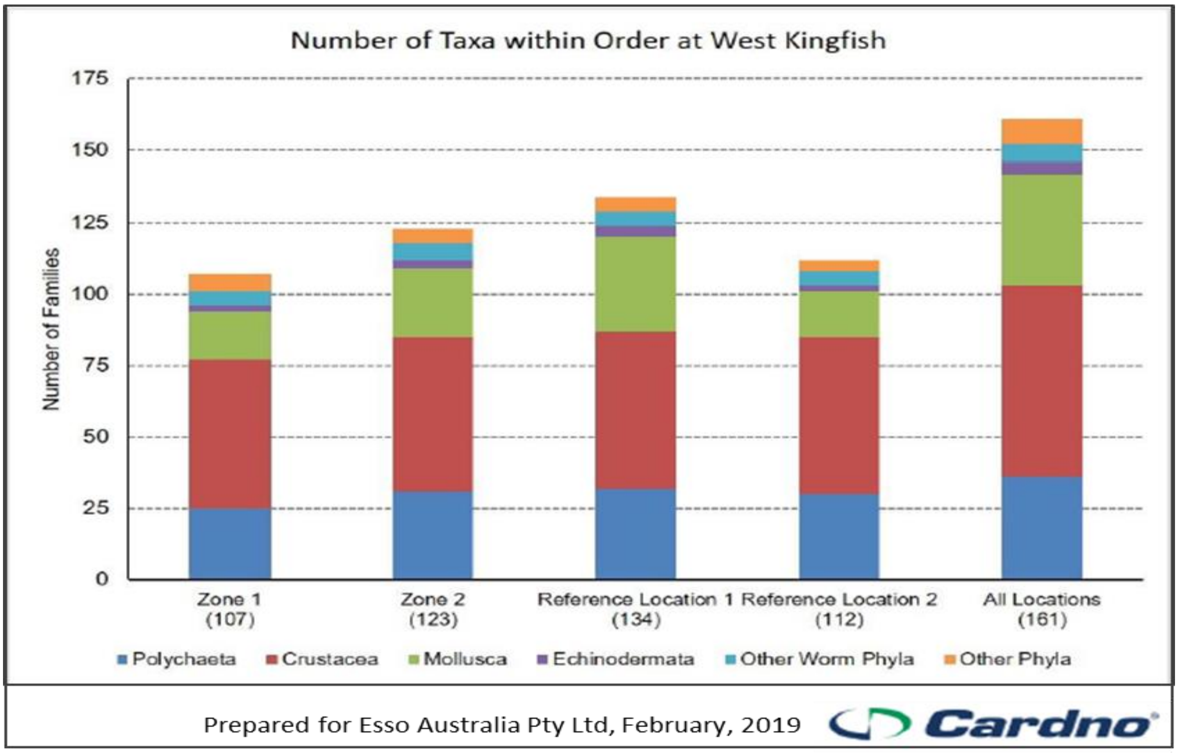

Figure 2-38 Number of taxa sampled at West Kingfish platform (Zones 1 and 2) and reference locations (Locations 1 and 2). Values in parentheses indicate the total number of taxa sampled.

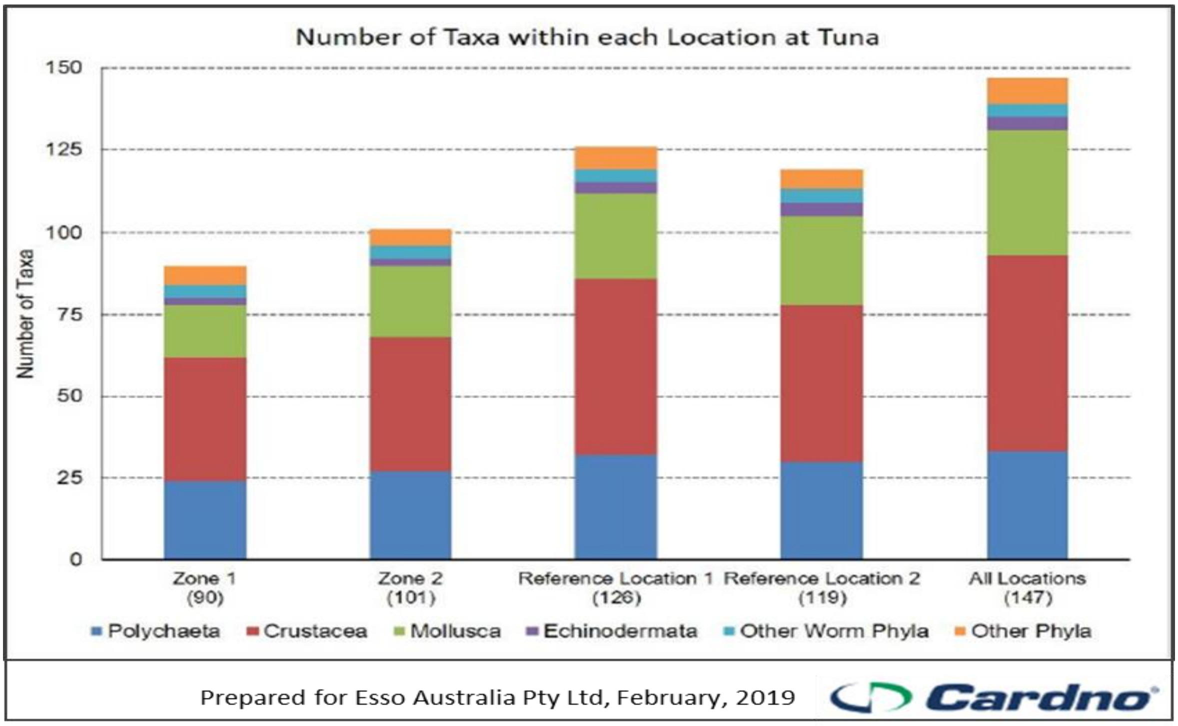

Figure 2-39 Number of taxa sampled at Tuna platform (Zones 1 and 2) and reference locations (Locations 1 and 2). Values in parentheses indicate the total number of taxa sampled.

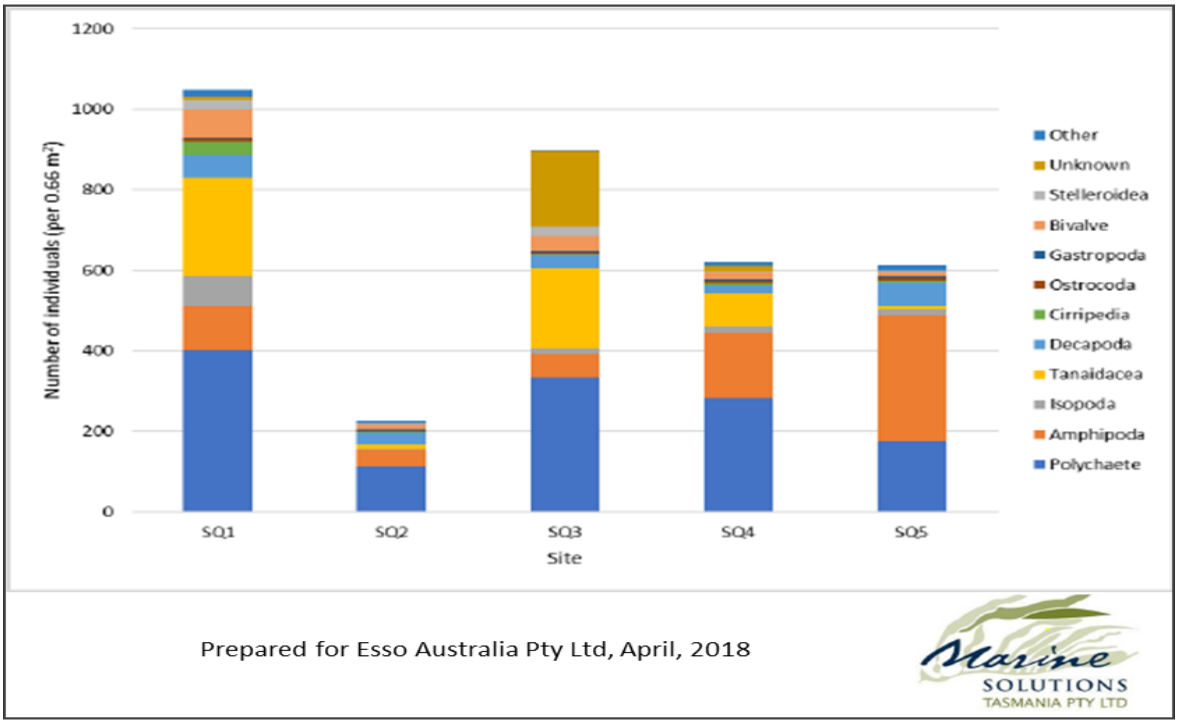

Figure 2-40 Taxa classed abundance of infauna at West Barracouta monitoring

The studies above suggest there is a consistent variation in the types and abundance of benthic infaunal species forming assemblages across the across Bass Strait. Though the benthic infauna taxa collected during this study are similar to those previously recorded, the contribution of each one to the overall assemblage was different in the majority of cases. The differences in the contribution of individual taxa to the overall assemblage between studies could have resulted from a number of natural factors including habitat heterogeneity (mirco and macro-scale), depth and sediment characteristics (URS 2000, Marine Solutions 2018) and temporal differences between sampling periods (Cardno, 2017). This is consistent with the 2004 study of Sediments and Benthic Biota of Bass Strait (GA, 2004), which concluded that it is not possible to classify the biological assemblages into a scheme that can be mapped across Bass Strait. The study emphasized that assemblages can have different distribution patterns to species and that environmental gradients rather than discrete bioregions or habitats better explain the biotic patterns observed in the sea bed of Bass Strait. Analysis of physical variables, derived from data collected on previous surveys by Geoscience Australia and supplemented by more recent data, show that longitude and depth are also important factors in explaining the biological diversity (GA, 2004).

The introduced New Zealand screw shell (Maoricolpus roseus) is present in eastern Bass Strait and is known to form extensive and dense beds on the sandy seafloor spreading to the 80 m isobath off eastern Victoria and NSW (Patil et al. 2004).

Larger animals found in these soft sediment environments in Victoria have included Smooth Stingray (Dasyatis brevicaudata), Pipi (Plebidonax deltoids), Dumpling Squid (Euprymna tasmanica), Common Stargazer (Kathetostoma leave) and Heart Urchin (Echinocardium cordatum) (Parks Victoria, 2016).

Soft sediment habitat is the dominant habitat within the EGBPA.

2.3.3.2 Seagrass

Seagrasses are marine flowering plants, with about 30 species found in Australian waters (Huisman 2000). There is a distinction between tropical and temperate seagrasses, and the approximate latitude for the change occurs at Moreton Bay (southern Queensland). The dominant temperate species in the DA are Amphibolis antarctica, Halophila australis, Heterozostera tasmanica, Posidonia australis, Posidonia angustifolia and Zostera muelleri (Kirkham 1997). Seagrasses generally grow in sediments in intertidal and shallow subtidal waters where there is sufficient light, and are common in sheltered coastal areas such as bays, lees of island and fringing coastal reefs (DEWR, 2006; McLeay et al., 2003; Rogers et al., 2013; McClatchie et al. 2006).

Seagrass meadows are important in trapping and stabilising sediments, as seagrass leaves baffle wave action and reduce water movement to the extent that fine suspended particles settle out and are trapped (Edyvane, 1999). Seagrass meadows also provide habitat and nursery grounds for juvenile fish and invertebrates, enhance biodiversity and promote primary production (Huisman 2000; Rogers et al. 2013; Kirkman 1997).

Known areas of seagrass within the DA include Corner Inlet and Lakes Entrance in Victoria, and numerous inlets and estuaries along the NSW coast (Figure 2-41) (Lucieer et al., 2017). While seagrass meadows are present throughout this region, the proportion of seagrass habitat is not high compared to the rest of Australia, in particular with parts of South Australia and Western Australia) (Kirkham, 1997).

Seagrasses are highly productive habitats that occur on intertidal flats and in shallow coastal waters worldwide from arctic to tropical climates. Water temperature, light penetration, sediment type, salinity, and wave or current energy control seagrass distribution. Seagrasses provide breeding and nursery grounds for fish and wildlife. Seagrasses are used by fish and shellfish as nursery areas.

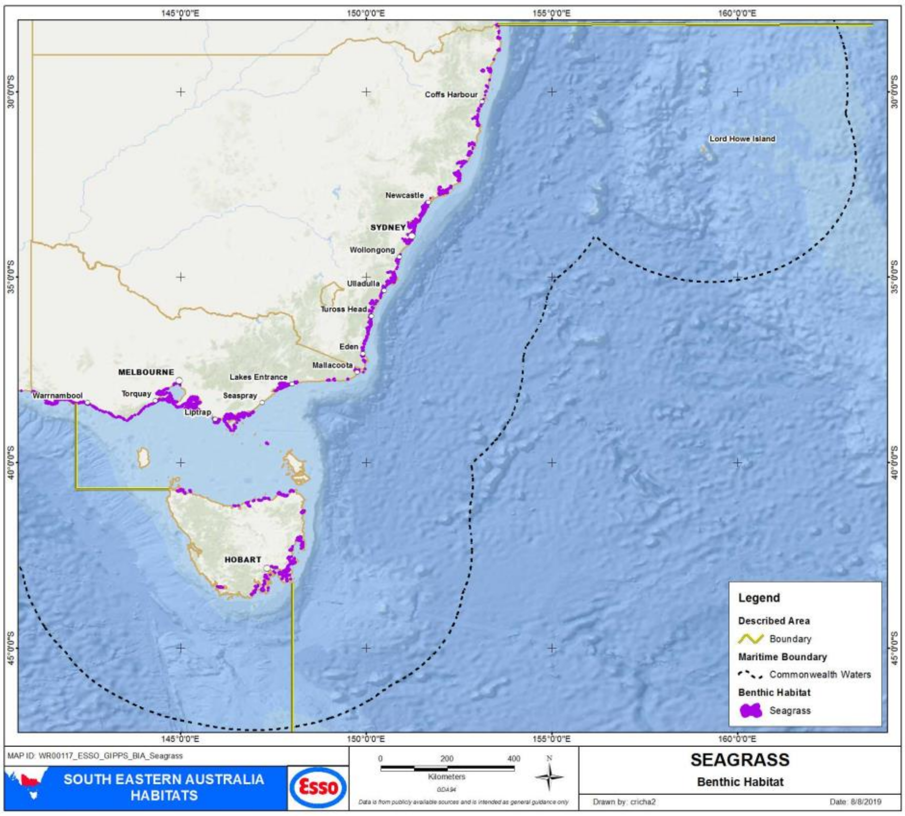

Figure 2-41 Seagrass dominated nearshore habitat within the DA

2.3.3.3 Subtidal Rocky Reefs

This habitat occurs either as extensions of intertidal rocky shores or as isolated offshore reefs and are always submerged. The rocky reefs of southern Australia support a highly endemic marine flora and fauna. Subtidal rocky reefs are scattered along the Gippsland shore and make up approximately 11% of the south-eastern Australian shelf (CSIRO, 2001).

This habitat consists of subtidal substrates composed primarily of limestone reefs and outcrops of sandstone and granite. The composition and characteristics of the substrate varies across the region based on its geologic origin and history. Fossiliferous limestone, as the name suggests, is composed of skeletons of dead animals, such as bivalve and bryozoan clasts. The skeletal elements are cemented together by a fine-grained calcareous matrix formed by a slow rate of sedimentation suggesting that the process is continuing to (slowly) occur on the Gippsland basin continental shelf (CSIRO, 2001). Known locations of this type of substrata are Howe Reef, Gabo Reef and Broken Reef.

Limestones usually form in large, tabular slabs of low relief (<2 m) as is the case in Broken Reef, however they can also form as low-lying hard grounds that are bored and encrusted by benthic organisms. These are likely to form ‘patches’ or mosaics of hard substratum that show little (<20 cm) or no vertical relief. An example of this is the low relief limestone South-east Reef which is mapped to occur in the VIC/L5 licence area and beneath the Cobia platform. Based on ROV video surveillance, the presence of South East Reef is not evident when comparing the abundance of biota around the Cobia platform versus other facilities (base on Esso ROV inspection data from 2010, 2013 and 2014). This may be due to the layer of sediment coverage over the hard substrate or the lack of extrusions/elevations.

Another form of the hard substrate is the coarse-grained, quartz rich sandstone. In Gippsland, sandstone, together with fossiliferous sandstone, occurs as elongate, low relief slabs which crop out from soft sediments along the Gippsland coastline. Whilst not confirmed this type of sandstone is also likely to be a common constituent of banks or reefs further offshore.

On the inner shelf of the Gippsland coastline are relatively localized, higher relief (>10m) outcrops formed of distinctive irregular, hexagonally jointed, coarsely crystalline granite, or hard reefs. Point Hicks and New Zealand Star Banks are areas of granite reef. Figure 2 43 shows high level substrata distribution in south-east Australia (CSIRO, 2001).

Rocky reef habitats can support rich, diverse communities of attached epifauna (e.g., stalked chrinoids, sponges, ascidians etc.) and associated algae and other fauna. Structures with a higher relief (reef or bank) several metres high can provide protection and food and attract a diversity of fish and invertebrate species (NOAA 2010).

The substrata is only one factor which influences the presence of biological communities. The distribution of fish and invertebrate communities is also correlated with latitude, depth, temperature and hydrology. Areas where the overlap of temperate and subtropical currents coincide will have a different distribution of communities to places like Horseshoe Canyon where upwelling occurs.

Other known areas of subtidal rocky reef include ; Bastion Point, Quarry Beach, Little Rame Head, Long Reef, Wingan Point, The Skerries Special Management Area, Rame Head, Petrel Point, Thurra River, Pearl Point, Yeerung River Estuary (Intermittently open), Cape Conran (East Cape, Cowrie Bay, Flat Rocks), Point Ricardo and Ricardo Beach.

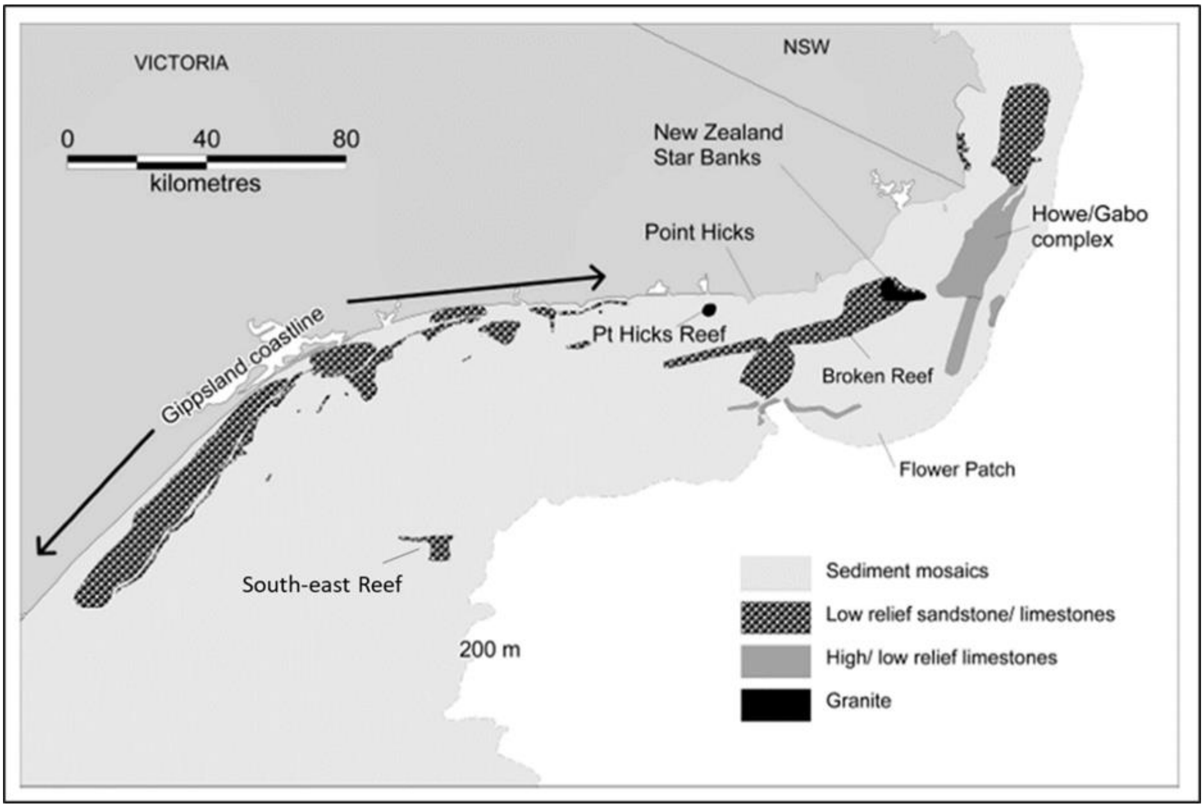

Figure 2-42 Substrata on the south-eastern Australian continental shelf

2.3.3.4 Macroalgae

Macroalgae are multicellular, marine algae, commonly known as seaweed. Macroalgae communities are generally found on intertidal and shallow subtidal rocky substrates as they require a surface to attach themselves to, and can occur throughout Australian nearshore waters. 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). Macroalgae assemblages vary, but Ecklonia radiata and Sargassum sp. are typically common in deeper areas. The principal physical factors affecting the presence and growth of macroalgae include temperature, nutrients, water motion, light, salinity, substratum, sedimentation and pollution (Sanderson, 1997). 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).

Kelps are very large brown algae that grow on hard sub tidal substrates in cold temperate regions. Kelps have a holdfast that attaches to the substrate, a stem-like or trunk-like stipe, and large, flattened, leaf-like blades called fronds. The Giant Kelp Marine Forests are classed as threatened ecological communities. Refer to section 2.2.4.1 for information on giant kelp marine forests.

Macroalgae is not a common dominant habitat within the EGBPA, however known areas include around Gabo Island and within the Bemm River estuary (Figure 2-43) (Lucieer et al., 2017).

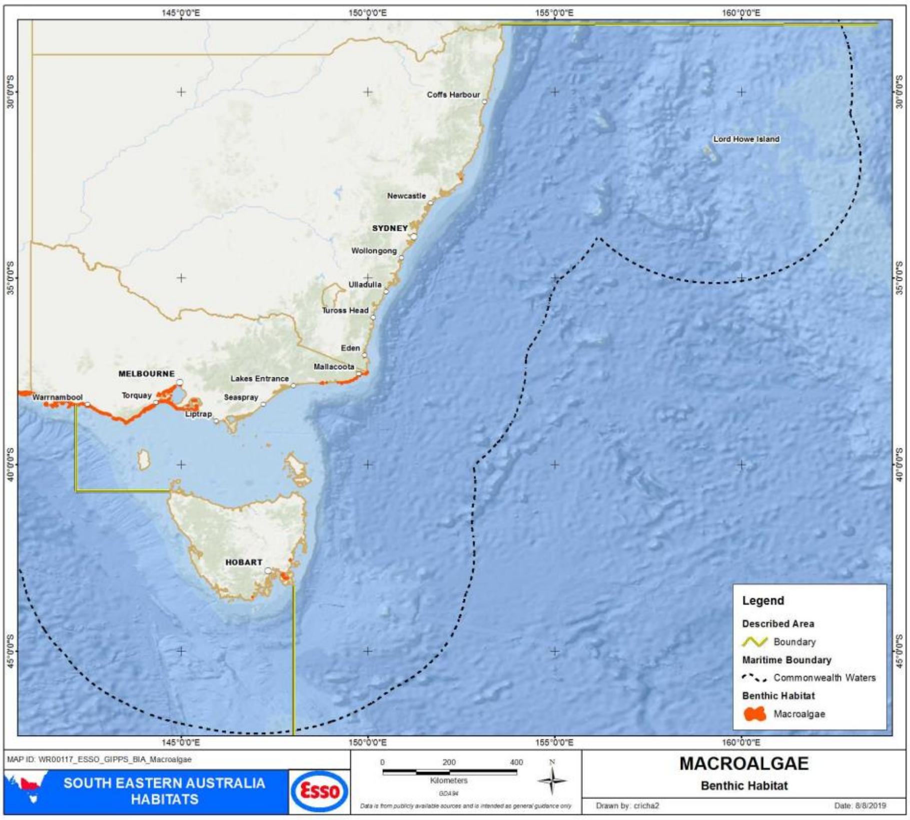

Figure 2-43 Macroalgae dominated nearshore habitat within the DA

2.3.3.5 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 soft corals are found at most depths, including in deeper waters throughout the continental shelf, slope and offslope regions, to well below the limit of light penetration.

There are three factors that appear to drive the spawning of warm water corals – a gradual rise in sea temperature (this triggers the gametes to mature), the lunar cycle, and the diurnal light cycle. As such, the timing of coral spawning events varies around Australia. Large spawning events for Great Barrier Reef corals typically occur four to five days after the full moon in October or November (and occasionally into December). Reproduction methods for cold water corals are not as well understood, 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).

While corals may not occur as a dominant habitat type within the Gippsland sector, their presence has been recorded within the region (e.g. Kent Group Marine Reserve, Freycinet Marine Park, and around Wilsons Promontory). Soft corals are typically present in deeper waters throughout the continental shelf, slope and offslope regions, to well below the limit of light penetration.

Subtidal rocky reefs located along the Gippsland shore include; Bastion Point, Quarry Beach, Little Rame Head, Long Reef, Wingan Point, The Skerries, Rame Head, Petrel Point, Thurra River, Point Hicks Marine National Park, Pearl Point, Yeerung River Estuary (Intermittently open), Cape Conran (East Cape, Cowrie Bay, Flat Rocks), Beware Reef, Point Ricardo and Ricardo Beach.

2.3.3.6 Submarine Canyons

Submarine canyons are abundant features along continental and oceanic island margins that connect continental shelves to deep ocean basins. Because of the physical complexity of canyon habitats, predictions concerning the effects of canyons on diversity are not straightforward since a variety environmental and physical characteristics interact in canyon habitats. The most important driver affecting biodiversity and biomass/abundance patterns in canyons is organic matter input and is mostly related to coastal detrital inputs or pelagic productivity regimes (De Leo et al., 2010).

Seafloor terrain and substrate heterogeneity account for the second most important driver of benthic biodiversity in submarine canyons. One of these factors, sediment grain size, can be considered as a 'super-parameter' (Etter and Grassle 1992) since it directly or indirectly reflects local physical energy and sedimentation patterns. At moderate rates of flow and sediment deposition, suspension- and deposit feeding, macrobenthos can be enhanced in abundance and/or diversity in canyons (Vetter and Dayton, 1998), whereas at high rates of flow and sediment accumulation, canyon fauna can become impoverished, yielding low species richness and high dominance by a few tolerant species (Rowe et al. 1982, Gage et al., 1995, Vetter and Dayton, 1998).

While some studies have reported levels of megafaunal biodiversity in canyons rivalling seamounts (Schlacher et al., 2007), in other cases high disturbance rates (Rowe et al., 1982) and absence of stable habitat heterogeneity lead to faunal impoverishment compared to adjacent slope environments (Vetter et al., 2010).

Bass Canyon System

The Bass Canyon is an 80 km long, narrow (10 km wide) and linear, southeast trending flat bottomed canyon located at 3,000–4,000 m depth in the Gippsland Basin (Figure 2-44) (Mitchell et al., 2007). Entering the head of the Bass Canyon at 3,000 m depth are five shelf-breaching tributary canyons and three slope-confined tributary canyons (Mitchell et al., 2007). The Bass Strait canyons are characterised by dense shelf water cascades (Godfrey et al. 1980).

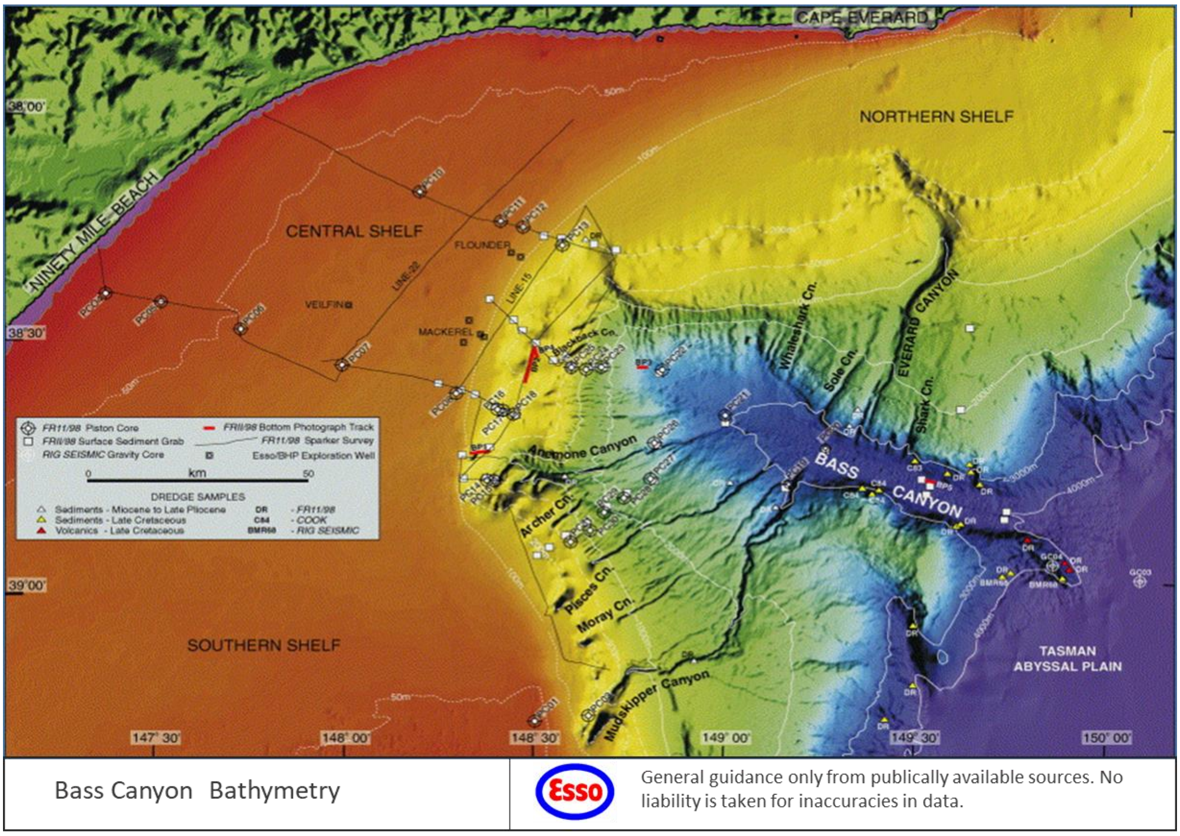

Figure 2-44 Bathymetry of the Bass Canyon

2.3.3.7 Seamounts

Seamounts are also classed as key ecological features. The Seamounts of South and East Tasmania occur in the DA, refer to section 2.2.7.5 for information on seamounts.

2.3.4 Coastal Habitat

A range of shoreline types are represented along the coastal areas within the DA. Figure 2-45 (Griffin et al., 2012) depicts the shorelines in the region and the characteristics of each habitat is described in the sections below.

The coastline, from Wilson’s Promontory in the west to Cape Howe in the east near the NSW border consists mainly of steep sandy beaches and rocky outcrops. The shoreline of the inland waters adjacent to the EGBPA which includes Corner Inlet, the Gippsland Lakes and Mallacoota Inlet consist of sandy beach, salt marsh, mangrove or mudflats (Boon et al., 2010).

The NSW coast consists primarily rocky outcrops with sections of sandy beaches and rocky cliffs. The offshore islands in Bass Strait are characterised by their steep cliffs and rocky shores. These shoreline types are also dominant along the north and east coast of Tasmania.

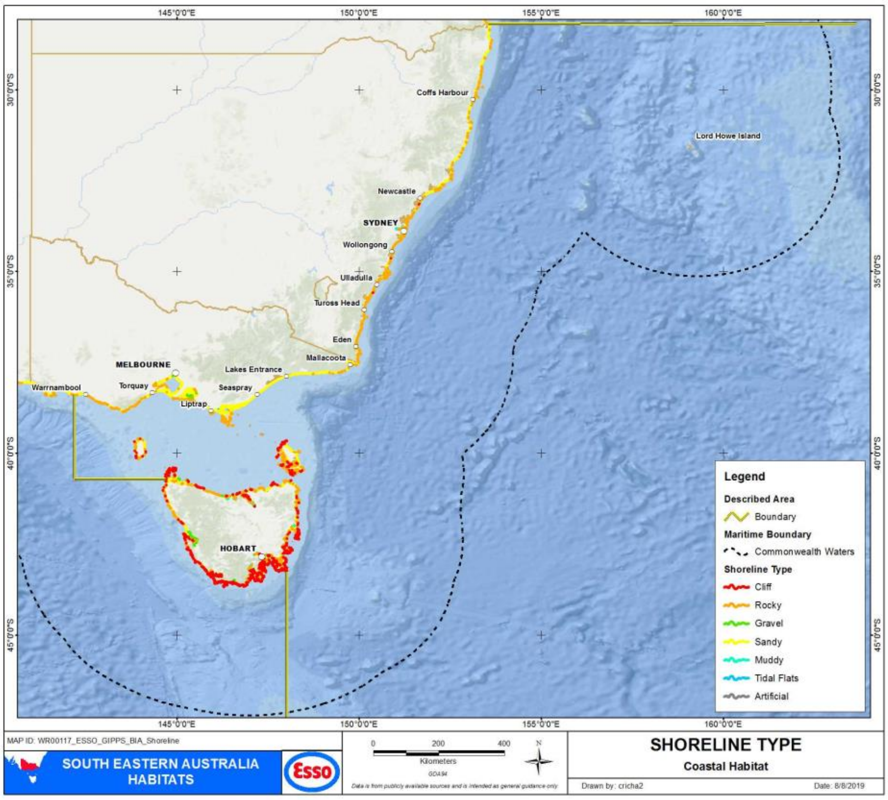

Figure 2-45 Shoreline types within the DA

2.3.4.1 Shoreline (Sandy)

This shoreline type has been defined as beaches dominated by sand-sized (0.063–2 mm) particles, and also includes mixed sandy beaches (i.e. sediments may include muds or gravel, but sand is the dominant particle size).

Sandy beaches are dynamic environments, naturally fluctuating in response to external forcing factors (e.g. waves, currents etc.). Sandy beaches can support a variety of infauna, and provide nesting and/or foraging habitat to shorebirds and seabirds and pinnipeds. Sand particles vary in size, structure and mineral content; this in turn affects the shape, colour and inhabitants, of the beach.

This shoreline type is the most common along the entire Victorian coast, including popular locations such as Ninety Mile Beach (East Gippsland, Victoria) and Squeaky Beach (Wilsons Promontory, Victoria).

2.3.4.2 Shoreline (Rocky)

Sheltered rocky shores are characterized by a rocky substrate that can vary widely in permeability. This shoreline type has been defined as hard and soft rocky shores, including bedrock outcrops, platforms, low cliffs (less than five metres in height), and scarps. Depending on exposure, rocky shores can be host to a diverse range of flora and fauna, including barnacles, mussels, tube building worms, sea squirts (cunjevoi), sea anemones, sponges, sea snails, starfish and algae. Australian fur-seals are also known to use rocky shores for haul-out and/or breeding. Most animals on the intertidal rocky shores are herbivorous molluscs, grazing algae off rock surfaces.

This is a common shoreline type along the southern NSW coast, the islands of Bass Strait, and for smaller areas of Victoria's coast (e.g. Wilsons Promontory). Intertidal rocky shores occur at Bastion Point, Quarry Beach, Shipwreck Creek, Seal Cove, Little Rame Head, Sandpatch Point, Petrel Point, Thurra River, Clinton Rocks, Cloke Rock, Tamboon Inlet and Shelley Beach.

2.3.4.3 Shoreline (Cliff)

The intertidal zone is steep (>30° slope) and narrow with very little width.

Sediment accumulations are uncommon because waves remove debris that has slumped from the eroding cliffs. There is strong vertical zonation of intertidal biological communities. Species density and diversity vary greatly, but barnacles, snails, mussels, polychaetes, and macroalgae can be abundant (NOAA, 2010).

This environment occurs behind Betka Beach and Secret Beach through to Little Rame Head, Sandpatch Point, Wingan Point, The Skerries, Rame Head, Petrel Point, Point Hicks, Clinton Rocks, Tamboon Inlet, Pearl Point, Cape Conran (Needle Rocks, Irvine Rocks, Quincy Rocks Salmon Rocks), and at Ricardo Point.

This is a common shoreline type for the Furneaux Island group in Bass Strait (e.g. Flinders Island, Clarke Island) (Figure 2-45).

2.3.4.4 Muddy- Sheltered Intertidal Flats and Bare Sediment

This shoreline type has been defined as areas with predominantly mud-sized (<0.063 mm) particles, and also includes mixed sediments (e.g. sands, shell or gravel), where the mud fraction is dominant. These areas are also exposed to high tidal variation, including tidal flats, and are often associated with mangrove or saltmarsh environments.

Sheltered intertidal flats are composed primarily of mud with minor amounts of sand and shell. They are usually present in calm-water habitats, sheltered from major wave activity, and frequently backed by marshes like estuaries or bays. The sediments are very soft and cannot support even light foot traffic in many areas. There can be large concentrations of bivalves, worms, and other invertebrates in the sediments. They are heavily used by birds for feeding (NOAA 2010).

Sheltered intertidal flats occur at Corner Inlet and Nooramunga Marine and Coastal Parks. Bare sediment occurs at Mallacoota Inlet, Wingan Inlet, Sydenham Inlet - Bemm River and Mud Lake.

Mangroves

Along the Gippsland coast, mangroves can be found in Corner Inlet and Nooramunga Marine and Coastal Park and more recently have also been found in Cunningham Arm at Lakes Entrance (Figure 2-46) (Lucieer et al., 2017).

The roots and trunks are intertidal, with only the lowest leaves inundated by high tide. The width of the forest can range from one tree, to many kilometres. The substrate can be sand, mud, leaf litter, or peat, often as a veneer over bedrock. They are highly productive, serve as nursery habitat, and support a great diversity and abundance of animal and plant species (NOAA, 2010).

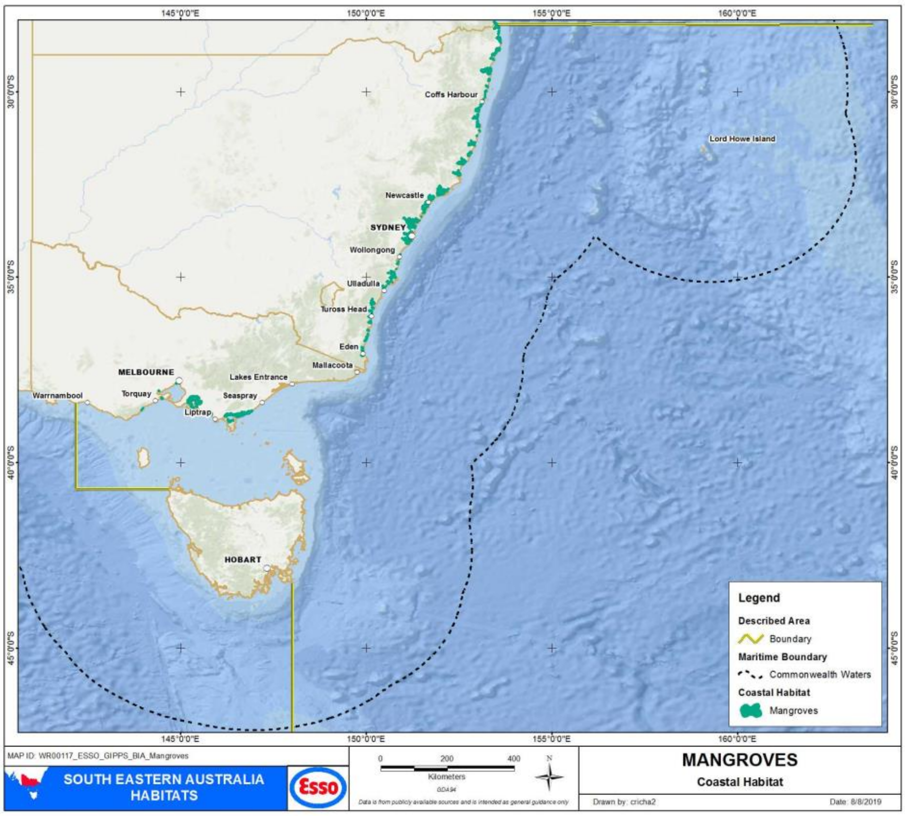

Figure 2-46 Distribution of Mangroves within DA

2.3.4.5 Saltmarsh

Saltmarshes are terrestrial halophytic (salt-adapted) ecosystems that mostly occur in the upper-intertidal zone, and are widespread along the coast. They are typically dominated by dense stands of halophytic plants such as herbs, grasses and low shrubs. Depending on location and inter-annual variations in rainfall and runoff, associated vegetation may include species tolerant or adapted to salt, brackish, or even tidal freshwater conditions. The diversity of saltmarsh plant species increases with increasing latitude (in contrast to mangroves). 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 (NOAA, 2010).

Saltmarsh is found along the coast throughout the DA (Figure 2-47), although is most extensive behind the sand dunes of Ninety Mile Beach in Gippsland (Boon et al., 2011).

Salt marshes can be found behind Mallacoota Entrance to Lake Barracouta, Wingan Inlet, inside Cann River Estuary, Tamboon Inlet, Sydenham Inlet (Bemm River Estuary and Mud Lake), Dock Inlet, inside Snowy River Estuary, Lake Tyers Estuary, and inside Lakes Entrance - Gippsland Lakes Ramsar Site. In southern NSW between Towradgi Creek about 40km north of the limits of the DA to the Victorian border there are approximately 12km2 of saltmarsh spread over 62 estuaries (NSW DPI, 2013). These include the areas of Shoalhaven River, Carama Creek, Clyde River, Tomaga River and Moruya River, Tuross Lake, Wapengo Lake, Bega River, Merimbula Lake and Wonboyn River (Creese et at., 2009).

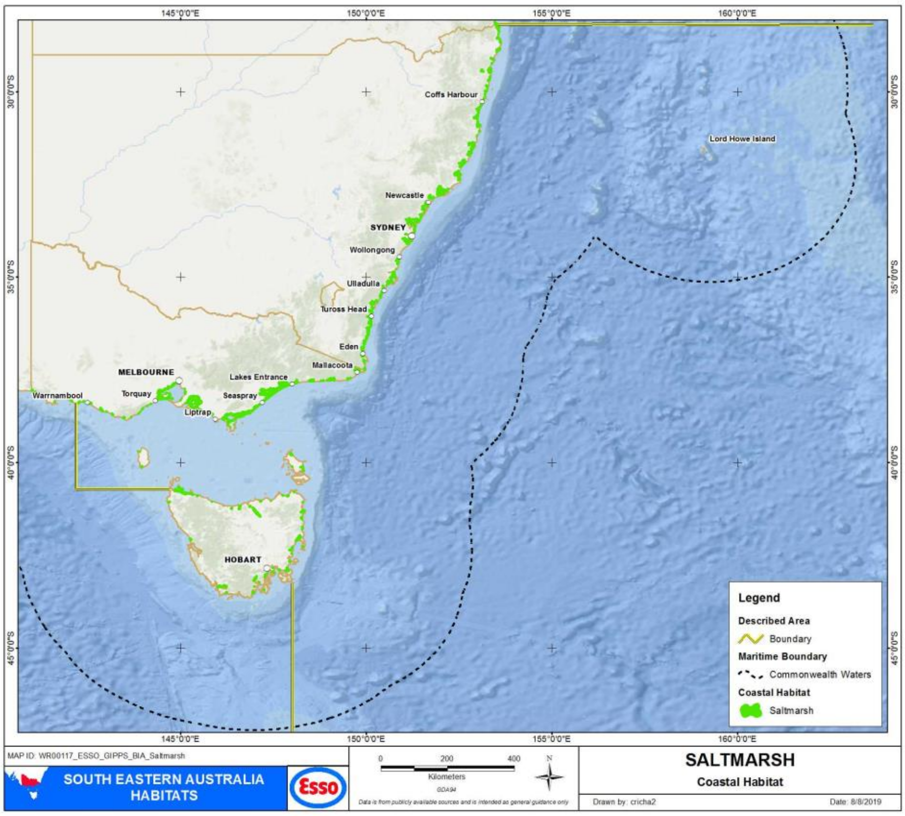

Figure 2-47 Saltmarsh dominated nearshore habitat within the DA

2.3.4.6 Coastal Vine Thicket

Coastal vine thickets are also classed as threatened ecological communities. These occur in the DA, refer to section 2.2.4.2 for information on coastal vine thickets.

2.4 Economic Environment

2.4.1 Fishing

2.4.1.1 Commercial Fishing

Commercial fishing in south-eastern Australia includes inshore coastal waters, mainly state administered fisheries, and areas along the continental slope, mainly Commonwealth fisheries. The majority of the commercial fishing (volume basis) occurs in Commonwealth waters along the continental shelf and the upper continental slope (see Figure 2-48).

The main commercial Commonwealth fisheries in the vicinity of the EGBPA are the Southern and Eastern Scalefish and Shark Fishery (SESSF) which includes ((AFMA, 2014a, 2016, ABARES, 2016 and 2017) :

- Commonwealth Trawl Sector (CTS); and
- Gillnet, Hook and Trap Sectors (GHTS)

Of these, Danish seiners and otter-board trawlers of the Commonwealth Trawl Sector are most likely to be encountered near the EGBPA.

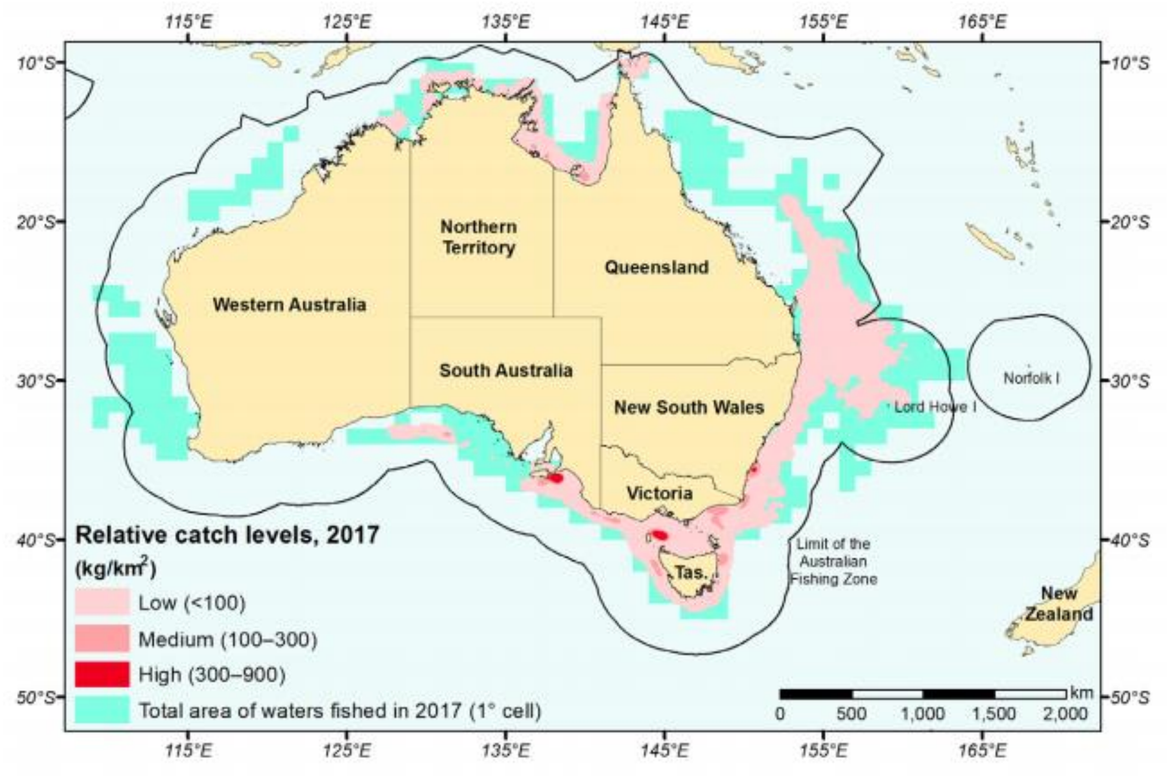

Figure 2-48 Relative catch levels of Commonwealth-managed fisheries, 2017 (ABARES, 2018)

2.4.1.2 Commercial Fishing – Commonwealth

Commonwealth fisheries are managed by the Australian Fisheries Management Authority (AFMA), with the fisheries typically operating within 3 nm to 200 nm offshore (i.e. to the extent of the Australian Fishing Zone). In 2016-2017 the Gross Value of Production (GVP) from Commonwealth fisheries was estimated at $403 million; contribution 23% of Australia's wild catch fisheries GVP (Figure 2-49) (Patterson et al., 2018).

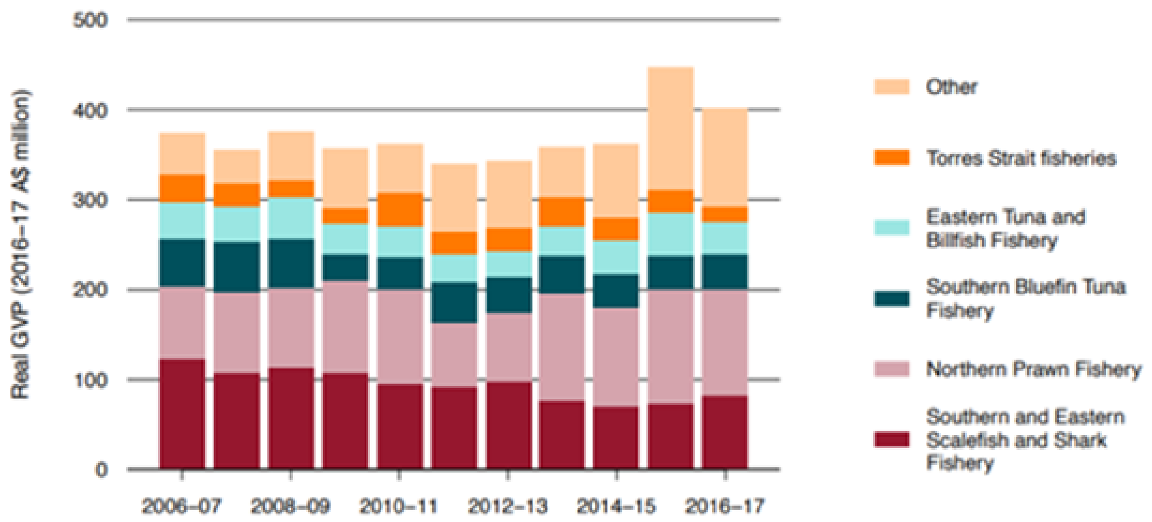

Figure 2-49 Gross Value of Production of Commonwealth Fisheries for 2016-2017 (Patterson et al., 2018).

There are seven commonwealth-managed commercial fisheries with management areas that intersect with the DA:

- Bass Strait Central Zone Scallop;
- Eastern Tuna and Billfish Fishery;
- Small Pelagic Fishery;
- Southern and Eastern Scalefish and Shark Fishery;
- Southern Bluefin Tuna Fishery;
- Southern Squid Jig Fishery; and
- Norfolk Island Fishery.

2.4.1.3 Bass Strait Central Zone Scallop Fishery

There are three zones of scallop fishing in Bass Strait and these are divided into state/commonwealth jurisdictions with the states zones extending out to 20nm from the high tide water mark. The current boundaries were settled in 1986 with an Offshore Constitutional Settlement agreed between the three jurisdictions. Figure 2-50 shows the jurisdictional allocation of the Bass Strait scallop fisheries. Refer to Section 2.4.1.10, Table 2-46 for information on the Victorian and Tasmanian scallop fisheries.

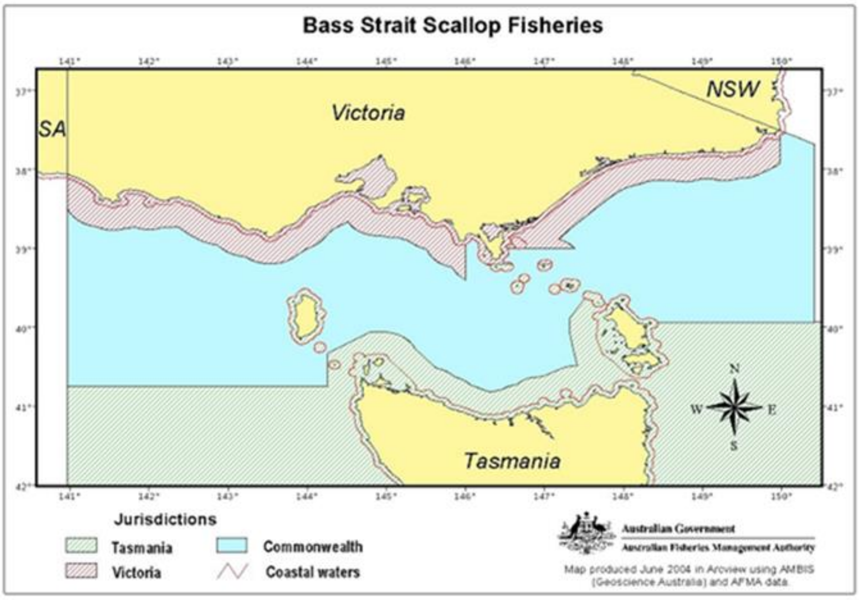

Figure 2-50 Bass Strait Scallop Fisheries (VFA, 2019)

The Bass Strait Central Zone Scallop Fishery operates in Commonwealth waters between Victoria and Tasmania (Figure 2-51). The default fishing season is 1 April to 31 December each year (note, the exact dates can vary each year) (DSEWPaC, 2013c); and the target species is Commercial Scallop (Pecten fumatus). The commercial scallop usually matures at about 12 to 18 months of age. Once maturity has been reached (fecundity increases with age), scallop spawning occurs from winter to spring (June to November); however, the timing is dependent on environmental conditions such as wind and water temperature (Sause et al., 1987). Scallop populations throughout the world fluctuate quite dramatically in response to variable environmental conditions. Relatively high populations occur in some years. These can be followed by relative scarcity, but populations can quickly rebound to large numbers provided enough adults remain for successful breeding and recruitment (VFA 2017b). Scallops are seldom found in commercial quantities in depths greater than 60-70 m.

Fishing method is via scallop dredge. Primary landing ports are Queenscliff and Apollo Bay (Victoria), and Stanley (Tasmania). The primary market for commercial scallops is domestic (Marton et al., 2012).

During 2017, fishing was concentrated on beds east of King Island (a similar area to that of 2014, 2015 and 2016) (Figure 2-51). The fishery experienced a peak in 2017, despite a reduction in dredge-hours

(Patterson et al., 2018).The value of the fishery can vary markedly, with estimates for the 2014-2015 financial year of $2.8 million (Patterson et al., 2016) and 2016-2017 financial year of $6 million (30% increase) (Patterson et al., 2018).

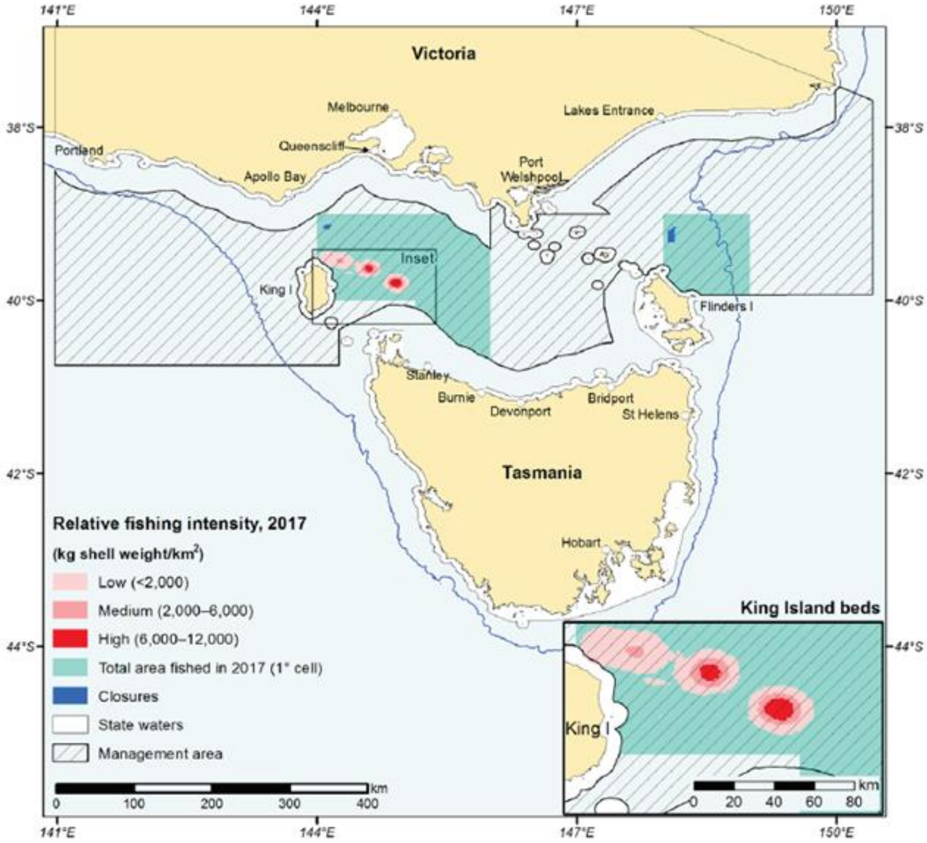

Figure 2-51 Bass Strait Central Zone Scallop Fishery Management Area and 2017 Relative Fishing Intensity (Patterson et al., 2018).

2.4.1.4 Eastern Tuna and Billfish Fishery

The Eastern Tuna and Billfish Fishery operates in Commonwealth waters from Cape York (Queensland) to the Victoria – South Australia border (Figure 2-52).

It is a 12-month fishing season, commencing 1 March each year. Primary target species are:

- Albacore Tuna (Thunnus alulunga);
- Bigeye Tuna (Thunnus obesus);
- Yellowfin Tuna (Thunnus albacares);
- Broadbill Swordfish (Xiphias gladius);
- Striped Marlin (Tetrapturus audux).

Primary landing ports for the Eastern Tuna and Billfish Fishery are Bermagui, Coffs Harbour, Ulladulla (New South Wales), and Cairns, Mooloolaba, Southport (Queensland). Fishing methods include pelagic longline, and minor line (trolling, rod and reel, handline).

During 2017, fishing was concentrated offshore of New South Wales and southern/central Queensland coasts (Figure 2-52). The number of active vessels in the fishery have decreased over the last decade from approximately 150 in 2002 to 39 in 2017 (Patterson et al., 2018). The value of the fishery during 2016-2017 financial year was $35.67 million (Patterson et al., 2018).

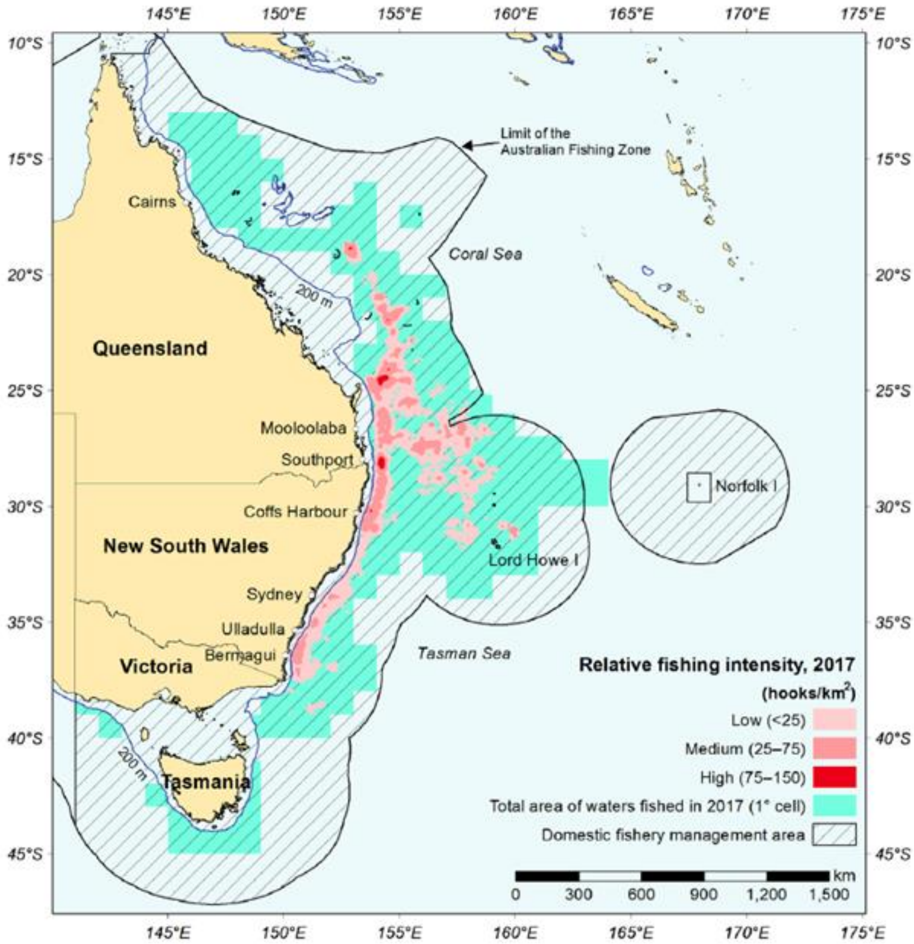

Figure 2-52 Eastern Tuna and Billfish Fishery Management Area and 2017 Relative Fishing Intensity (Patterson et al., 2018).

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2.4.1.5 Small Pelagic Fishery

The Small Pelagic Fishery operates in Commonwealth waters from southern Queensland to southern Western Australia (Figure 2-53). Most historical fishing efforts has occurred of the east and west coasts of Tasmania. It is a 12-month fishing season, commencing 1 May each year. Primary target species are:

- Australian sardine (Sardinops sagax);
- Blue mackerel (Scomber australasicus);
- Jack mackerel (Trachurus declivis, T. murphyi);
- Redbait (Emmelichthys nitidus).

Primary landing ports within the DA are Eden and Iluka (New South Wales). Fishing methods include purse seine and midwater trawl; midwater trawl has been the main method since 2002. Commercial value of the fishery is confidential (Patterson et al., 2018).

Small pelagic fish are generally caught during targeted fishing for a single species. They are also caught in small quantities in other Commonwealth- and state-managed fisheries, including the Southern and Eastern Scalefish and Shark Fishery, the Eastern Tuna and Billfish Fishery, the Western Tuna and Billfish Fishery, and the New South Wales Ocean Hauling Fishery. There are no active small pelagic fisheries near the EGBPA.

Jack mackerel are found in continental shelf waters between 27 to 460 m, although generally in waters less than 300m deep. They live for 16 years, maturing at 3 to 4 years. Spawning occurs between December and March (ABARES, 2018).

Blue mackerel are found in continental shelf waters between 87 to 265 m. They live for about 7 years, maturing at 2 years. Spawning occurs between September and May (ABARES, 2018).

Redbait are found in continental shelf waters between 86 to 500 m. They live for about 21 years, maturing at 2 to 4 years. Spawning occurs between September and November (ABARES 2018).

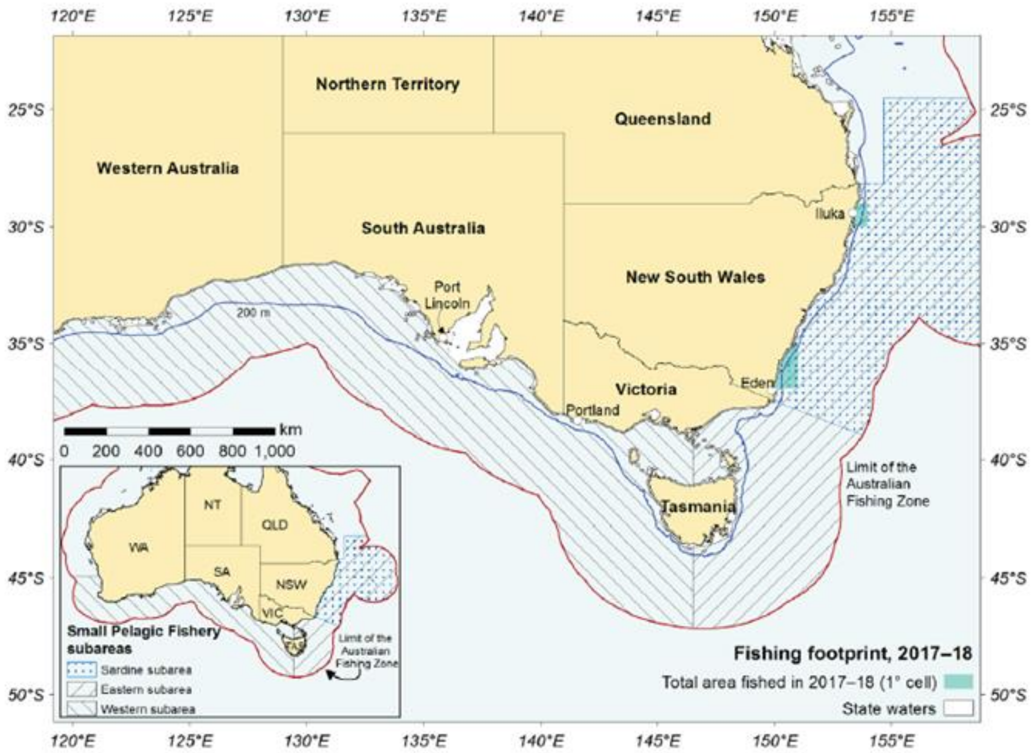


Figure 2-53 Small Pelagic Fishery Management Area and 2017-18 Fishing Footprint

(NB: Some effort data are not shown on this map for confidentiality reasons) (Patterson et al., 2018).

2.4.1.6 Southern and Eastern Scalefish and Shark Fishery

The Southern and Eastern Scalefish and Shark Fishery (SESFF) is a multisector, multigear and multispecies fishery, targeting a variety of fish, squid and shark stock (Figure 2-54). Primary target species include:

- Blue grenadier (Macruronus novaezelandiae);
- Tiger flathead (Neoplatycephalus richardsoni);
- Silver warehou (Seriolella punctata);
- Gummy shark (Mustelus antarcticus);
- Pink ling (Genypterus blacodes).

It is a 12-month fishing season, commencing 1 May each year. Primary ports include Eden (New South Wales), Lakes Entrance, Portland, Port Welshpool (Victoria), and Devonport and Hobart (Tasmania).

The SESSF incorporates the Commonwealth Trawl Sector (formerly the Southeast Trawl Sector), the Great Australian Bight Trawl Sector (GABTS), East Coast Deepwater Trawl Sector (ECDTS) and Gillnet, Hook and Trap Sector (GHTS; formerly the Southern Shark and Southeast Non-trawl Sectors) under a common set of management objectives. The SESSF extends from waters off southern Queensland, south around Tasmania and then west to Cape Leeuwin in Western Australia. Fishing intensity varied in location for each fishery, with no catch effort within the East Coast Deep Water Trawl Sector for 2016-2017 (Figure 2-55). The value of the fishery in 2016-2017 was approximately $72.3 million ($47.01 million from the Commonwealth Trawland Scalefish Hook Sectors; $25.29 million from the Shark Gillnet and Shark Hook Sector) (Patterson et al., 2018).

Sharks are fished using predominantly demersal gillnets (Walker et al., 2001), with a small percentage caught by demersal longlines. The deepwater demersal sharks occur between 50 and 1,800m depth offshore and live up to 50 years, maturing between 25 and 30 years (ABARES, 2016c).

The trawl and scalefish-hook sectors of the fishery include over 100 species that are captured, but 16 species provide the bulk of trawl landings and are subject to quota management. Fishing is year round, varying according to availability, market price and progress with quotas.

The trawl sector includes otter trawl and Danish seine methods. Otter trawlers use larger boats, generally greater than 20 m long, while Danish seiners use smaller boats and operate in nearshore shelf areas often in more restricted areas unavailable to otter trawlers (Larcombe & Begg 2008). Board boats can stay out at sea for 5 -7 days, whilst Danish seiners usually fish for a maximum of three days. The range of Danish seiners, which target predominantly flathead, is limited to a 100 km radius from Lakes Entrance.

Otter board trawlers, operating out of Lakes Entrance, concentrate their fishing operations in deeper waters and consequently catch more morwong, ling, blue grenadier and other deep sea species. The net is towed by two wire ropes and fixed, between these ropes and the net, are paravanes (commonly known as boards or doors). Unlike the Danish seine net which closes and stops fishing after about two minutes of towing, the board trawl net remains open and may be towed for any length of time, although it is rare for tows to exceed four hours (Leftrade 2013). Distribution of the fishing effort shows a predominance of effort concentrated along the 100-250 m contour; ABARES 2017).

The SESSF includes several stocks that are classified as overfished. These overfished stocks are blue warehou (Seriolella brama), eastern gemfish (Rexea solandri), gulper sharks (Centrophorus harrissoni, C. moluccensis, C. zeehaani), school shark (Galeorhinus galeus), redfish (Centroberyx affinis) and orange roughy (Hoplostethus atlanticus) in two zones (southern and western) (ABARES, 2017).

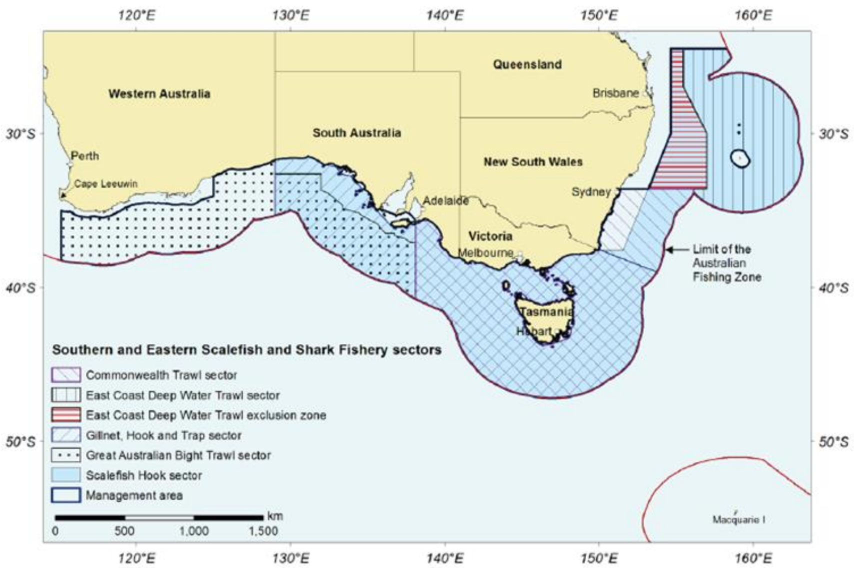
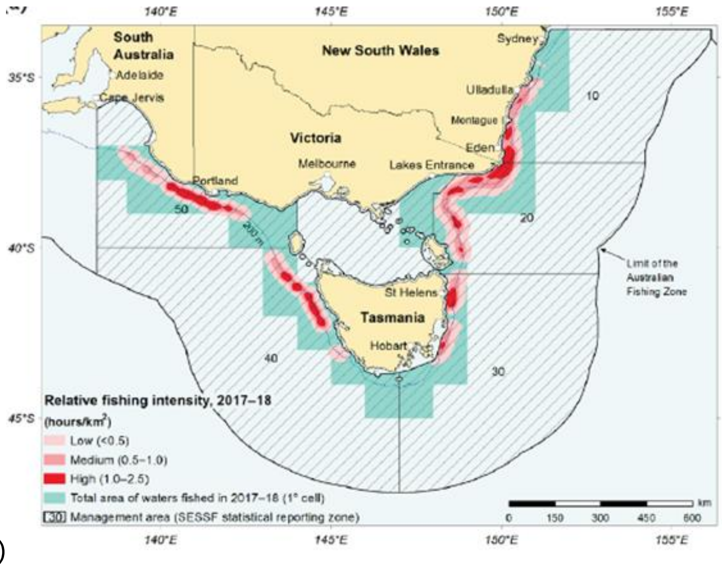
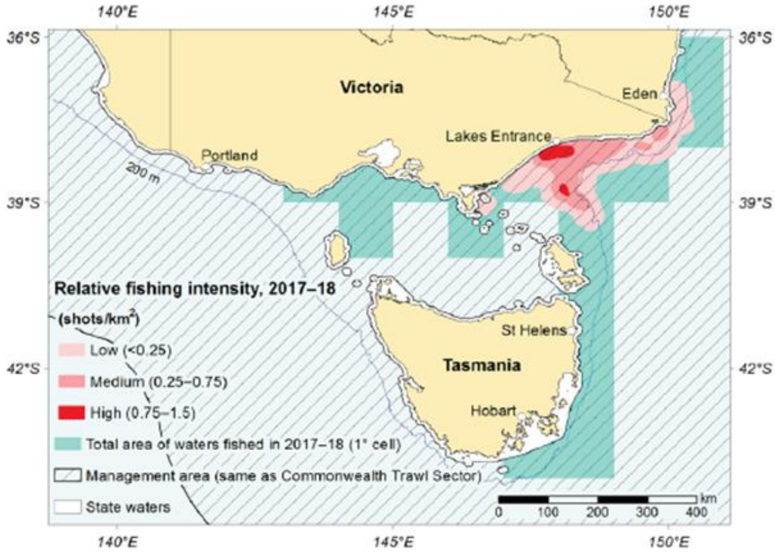
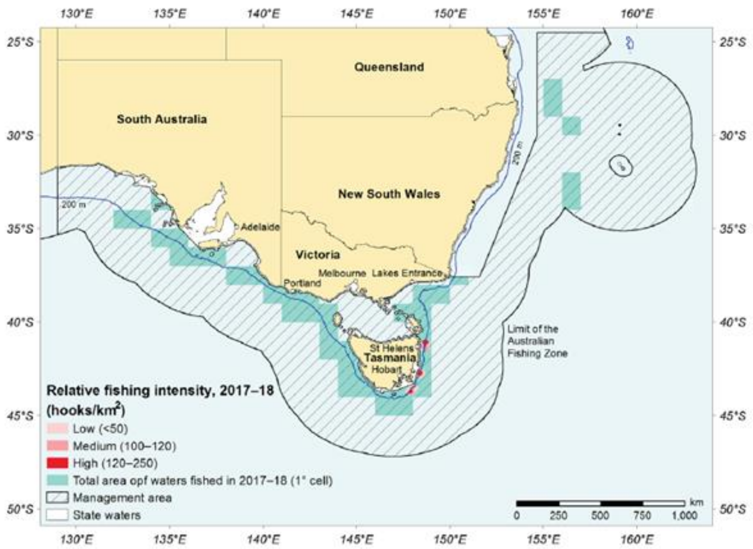
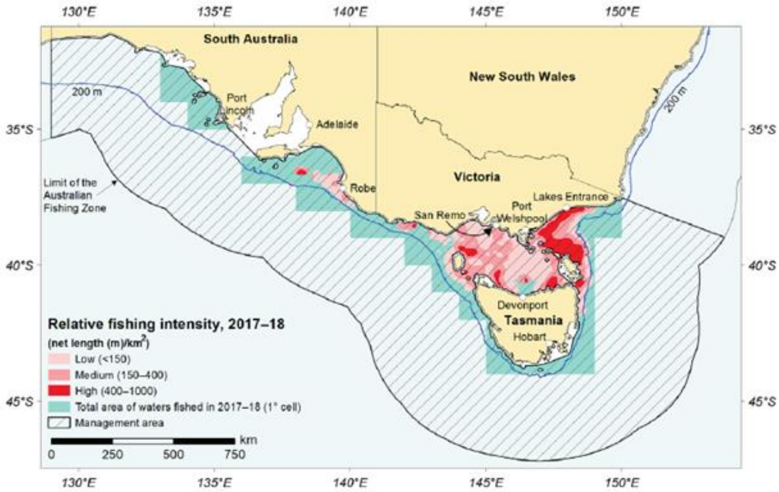


Figure 2-54 Southern and Eastern Scalefish and Shark Fishery Management Area (Patterson et al., 2018)

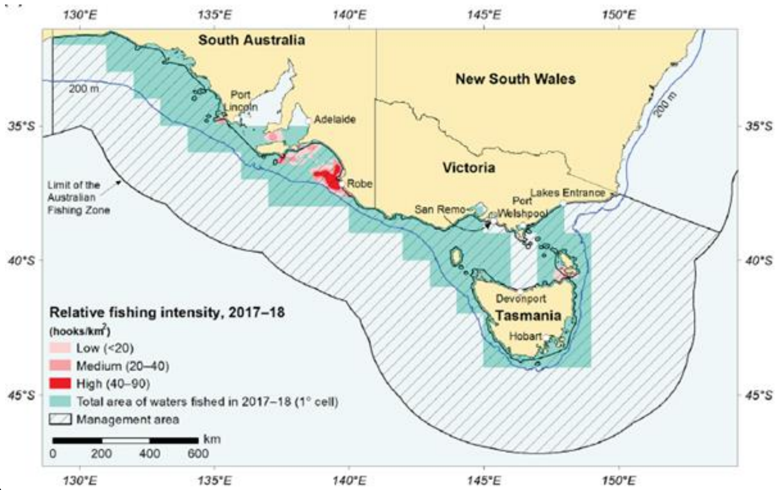

South Australia
Adelaide
Cape Jervis
New South Wales
Sydney
Ulladulla
Montague I
Eden
Victoria
Melbourne
Lakes Entrance
Portland
St Helens
Tasmania
Hobart
10
20
30
40
50
200 m
Limit of the Australian Fishing Zone
Relative fishing intensity, 2017–18 (hours/km²)
Low (<0.5)
Medium (0.5–1.0)
High (1.0–2.5)
Total area of waters fished in 2017–18 (1° cell)
30 Management area (SESSF statistical reporting zone)
0 150 300 450 600 km
140°E 145°E 150°E 155°E
35°S 40°S 45°S
(a)


Victoria
Eden
Lakes Entrance
Portland
200 m
St Helens
Tasmania
Hobart
Relative fishing intensity, 2017–18 (shots/km²)
Low (<0.25)
Medium (0.25–0.75)
High (0.75–1.5)
Total area of waters fished in 2017–18 (1° cell)
Management area (same as Commonwealth Trawl Sector)
State waters
0 100 200 300 400 km
140°E 145°E 150°E
36°S 39°S 42°S
(b)


Queensland
South Australia
New South Wales
Adelaide
Victoria
Melbourne
Lakes Entrance
Portland
St Helens
Tasmania
Hobart
200 m
Limit of the Australian Fishing Zone
Relative fishing intensity, 2017–18 (hooks/km²)
Low (<50)
Medium (100–120)
High (120–250)
Total area opf waters fished in 2017–18 (1° cell)
Management area
State waters
0 250 500 750 1,000 km
130°E 135°E 140°E 145°E 150°E 155°E 160°E
25°S 30°S 35°S 40°S 45°S 50°S
(c)



(d)



(e)

Figure 2-55 2017-2018 Relative Fishing Intensity for (a) Commonwealth Trawl Sector (b) Commonwealth Trawl Sector: Danish-seine, (c) Scalefish Hook Sector, (d) Shark Gillnet Sector, and (e) Shark Hook Sector (Patterson et al., 2018)

2.4.1.7 Southern Bluefin Tuna Fishery

The Southern Bluefin Tuna Fishery operates within the Australian Fishing Zone. It is a 12-month fishing season, commencing 1 December each year. Primary target species is the Southern Bluefin Tuna (Thunnus maccoyii).

The majority of the catch is taken in the Great Australian Bight (i.e. outside of the Environment Sectors) by purse-seine vessels. Longline fishing is used off the east coast, and the number of vessels and fishing intensity is variable (Figure 2-56). The value of the fishery during 2016-2017 financial year was $38.54 million (Patterson et al., 2018).

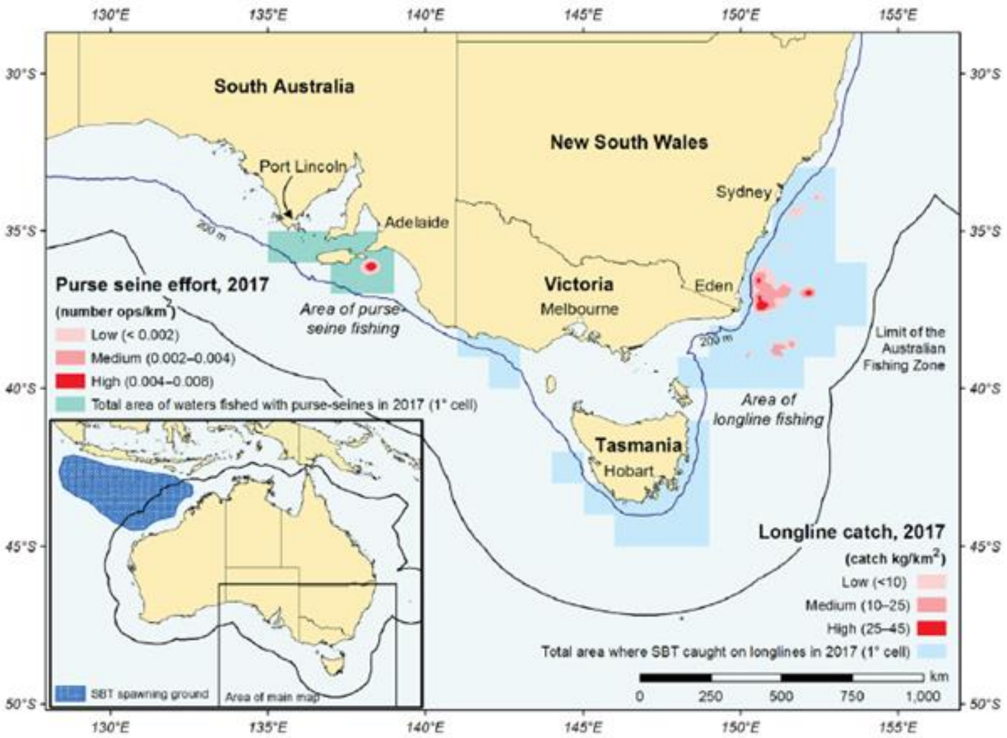
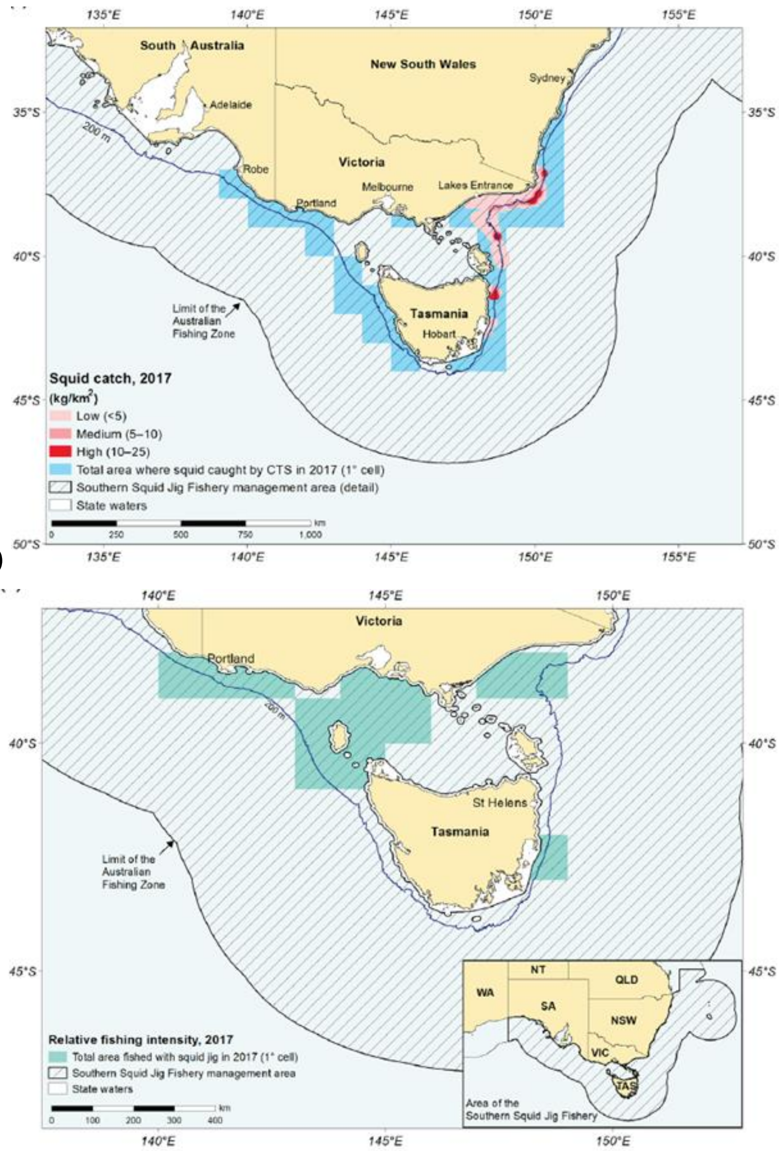


Figure 2-56 Southern Bluefin Tuna Management Area and 2017 Fishing Intensity (Patterson et al., 2018)

2.4.1.8 Southern Squid Jig Fishery

The Southern Squid Jig Fishery is located in waters off New South Wales, Victoria, Tasmania and South Australia, and in a small area off southern Queensland. The Southern Squid Jig Fishery is a single-method (jigging) fishery, primarily targeting the Gould's squid (Nototodarus gould). Vessels typically operate at night in continental shelf waters between 60–120 m water depths. Squid are also caught in the Commonwealth Trawl Sector and GAB Trawl Sector of the Southern and Eastern Scalefish and Shark Fishery.

It has a 12-month fishing season, commencing 1 January each year. Most direct fishing effort occurs off Lakes Entrance (Victoria) (Figure 2-57) (a)), however in recent years a greater catch has come from the Trawl Sectors (Figure 2-57(b)). The value of the Southern Squid Jig Fishery during the 2016-2017 financial year is $2.24 million (Patterson et al., 2018).



(a)

(b)

Figure 2-57 (a) Squid Catch from the Commonwealth Trawl Sector 2017, and (b) 2017 Fishing Intensity in the Southern Squid Jig Fishery (Patterson et al., 2018)

2.4.1.9 Norfolk Island Fishery

The Norfolk Island Fishery is currently an inshore recreational and charter-based line fishery (Figure 2-58).

An offshore exploratory commercial trawl-and-line fishery operated between 2000 and 2003. Limited effort in the fishery during this period meant that the permit holders failed to meet the required 50 days of fishing over three years.

No harvest strategy has been developed for the fishery because of the absence of commercial fishing. A harvest strategy and management plan will need to be developed before establishment of a commercial fishery (Patterson et al., 2019).

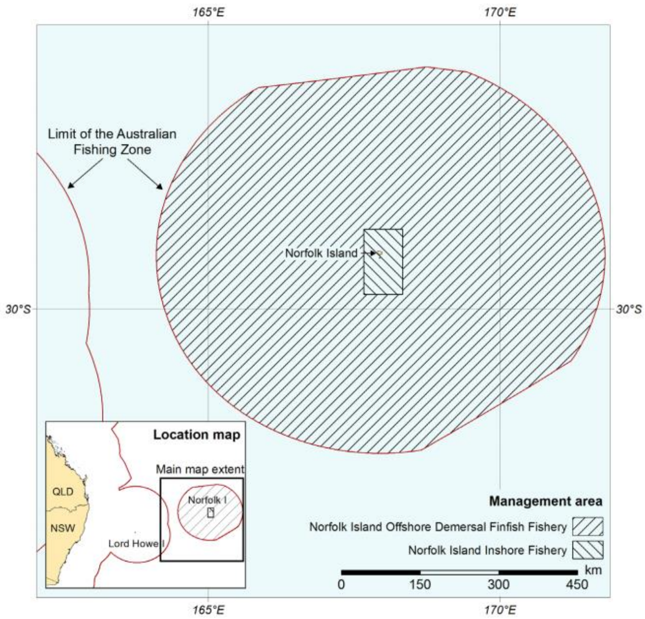


Figure 2-58 Managed area of the Norfolk Island Fishery

2.4.1.10 Commercial Fishing - State

Each state operations under their own constitutional arrangement:

- Tasmanian fisheries are managed under the Living Marine Resources Management Act 1995;
- South Australian fisheries are managed under the Fisheries Management Act 2007;
- Victorian fisheries are managed under the Fisheries Act 1995;
- New South Wales fisheries are managed under the Fisheries Management Act 1994; and
- Queensland fisheries are managed under the Fisheries Act 1994.

The Offshore Constitutional Settlement (OCS) allows for individual fisheries to be managed under relevant State government, with fishing areas extending into both Commonwealth and State waters.

There are seven Victorian and eight New South Wales state-managed commercial fisheries with management areas that intersect with the DA (Table 2-46).

Table 2-46 State-managed commercial fisheries with management areas that intersect the DA.

Fishery	Description	Extends into Cth Waters	Target Species
Victoria			
Abalone Fishery	Abalone are caught along the majority of the Victorian coastline. Abalone diving activity typically occurs close to the shoreline (generally up to water depths of 30 m). The fishery is quota managed, with a total allowable commercial catch set annually based on the outcomes of a stock assessment process. There are three (Western, Central and Eastern) management zones. The blacklip abalone (Haliotis rubra) forms the basis of the abalone fisheries in NSW, Victoria and Tasmania, however greenlip abalone (Haliotis laevegata) are also targeted. Blacklip abalone are commonly found, mainly on rocky substrates, and are widely distributed along the southern half of Australia as far as Rottnest Island in the West to Coffs Harbour in the East. Abalone are sourced from the wild and from coastal farms. There are about 40 reefs from Iron Prince to Marlo Reef in Victoria. In NSW, most commercial abalone fishing takes place on the south coast, primarily from Jervis Bay to the Victorian border (DPI 2007). Victoria's abalone farms are situated primarily in Port Phillip Bay and southwest Victoria, however farms are also located off Tullaberga Island and Gabo Island.	Yes	Greenlip Abalone (*Haliotis laevigate*) Blacklip Abalone (*Haliotis rubra*)
Eel Fishery	Eel are harvested in Victorian coastal river basins south of the Great Dividing Range. Short-finned eels are found across the State, while long-finned eels are only found in eastern Victoria.	No	Short-finned eel (*Anguilla australis*) Long-finned eel (*Anguilla reinhardtii*)
Giant Crab Fishery	The commercial fishery has two management zones, the Western Zone and Eastern Zone, a division which reflects the zonal boundaries of the rock lobster fishery. The fishery is based in the Western Zone; at the time of writing there was no giant crab fishing in the Eastern Zone. Giant crabs inhabit the continental slope at approximately 200 m depth and are most abundant along the narrow band of the shelf edge.	Yes	Giant crab (*Pseudocarcinus gigas*)
Pipi Fishery	Pipi is the common name given to the small bivalve which is found on high-energy sandy beaches in the intertidal zone. The fishery covers the entire Victorian coastline, with the exception of Port Phillip Bay and Marine National Parks where shellfish cannot be harvested in the intertidal region. However, the fishery is only currently open at Discovery Bay (targeted primarily by commercial fishers) and Venus Bay (primarily a recreational fishery).	No	Pipi (*Donax deltoids*)

Fishery	Description	Extends into Cth Waters	Target Species
Rock Lobster Fishery	The fishery is divided into two separately managed zones: Eastern and Western. The Eastern Zone extends west from the New South Wales border to Apollo Bay; the Western Zone extends from Apollo Bay west to the border with South Australia. The main ports in the Eastern Zone are Queenscliff, San Remo and Lakes Entrance. The Victorian, the southern rock lobster (Jasus edwardsii). Rock lobster is Victoria's second most profitable fishery after abalone. Southern Rock Lobsters are found to depths of 150 m, with most of the catch coming from inshore waters less than 100 m deep. Eastern rock lobster (Jasus verreauxi) is the main species harvested by the NSW Lobster Fishery, but occasionally southern rock lobster, and tropical rock lobster are also caught. Rock lobster fishing grounds exist around Ulladulla and Bateman's Bay, the southern tip of Wilsons Promontory and around Bass Strait islands, such as the Hogan Group, Curtis Group, Kent Group islands and Flinders Island. Most fishing occurs between mid-November and March, outside the June to mid-November spawning season.	Yes	Southern rock lobster (*Jasus edwardsii*) Eastern rock lobster (Jasus verreauxi)
Scallop Fishery	The Victorian Scallop Fishery is one of three scallop zones in the Bass Strait, and extends out from the coastline to 20 nm excluding the bays and inlets along the coast where commercial fishing for scallops is prohibited. The same arrangement is in place for Tasmania. Historically, the majority of the fishing activity in the Victorian zone has occurred in the eastern waters of the State, with most vessels launching from the ports of Lakes Entrance and Welshpool. The Victorian Scallop Fishery is based on the species, Pecten Fumatus. Occasionally, incidental catches of doughboy scallops (Chlamys asperrimus) are taken as by-product, but are generally not in commercial quantities. Scallop abundance is naturally highly variable causing catches to fluctuate widely from season to season. When open, the fishery is managed using a quota management system of individual transferable quota. Annual consultation is undertaken to determine the total allowable catch (TAC) and is based on a combination of stock survey analysis and scientific and industry expertise. Fisheries Victoria, on behalf of the Minister for Agriculture and Food Security, sets the TAC via a Quota Notice which is distributed equally amongst the 91 maximum allowable licences.	No	Primary: Commercial scallop (*Pecten fumatus*) Other: Doughboy scallop (*Chlamys asperrimus*)
Wrasse Fishery	The commercial fishery extends along the entire length of the Victorian coastline and out to 20 nm offshore, except for marine reserves. Most wrasse is harvested by hook and line although commercial rock lobster fishers who also hold a commercial wrasse licences can keep those fish that they catch in their rock lobster pots.	No	Primary: Bluethroat Wrasse (*Notolabrus tetricus*) Purple Wrasse (*N. fucicola*) Other:

Fishery	Description	Extends into Cth Waters	Target Species
			Rosy Wrasse (*Pseudolabrus psittaculus*) Senator Wrasse (*Pictilabrus laticlavius*) Southern Maori Wrasse (*Ophthalmolepis lineolatus*)
Sea Urchin Fishery	The sea urchin fishery comprises four individual management zones. The central and eastern zones intersect the DA. The central zone covers Victorian waters from Hopkins River to Lakes Entrance. The eastern zone extends from Lakes Entrance to the NSW border. The target species are the White sea urchin (*Heliocidaris erythrogramma*) and the Black, long-spined sea urchin (*Centrostephanus rodgersii*). The sea urchin is usually collected by hand by divers. Currently, sea urchin will only be harvested in eastern Victoria, primarily out of Mallacoota, and in Port Phillip Bay (VFA 2017b).		White sea urchin (*Heliocidaris erythrogramma*) Black, long-spined sea urchin (*Centrostephanus rodgersii*)
Commercial Bay and Inlet Fisheries	The commercial bay and inlet fisheries of Victoria are a collection of complex multi-species, multi-gear fisheries which operate in environments that are ecologically distinct to those existing in waters of both their catchment tributaries and the nearby ocean. Although between 60 to 80 fish species have been recorded from commercial bay and inlet catches, only about a dozen or so key species, including King George whiting, black bream, snapper, flathead, mullet, garfish, flounder, anchovies and pilchards, are usually targeted by commercial fishers. Commercial fishing for fin fish occurs in Port Phillip Bay, Corner Inlet/Nooramunga and the Gippsland Lakes. All other Victorian bays, inlets and estuaries are closed to commercial fishing (other than for eels and bait). The main bay and inlet commercial fishing methods are seine nets and gillnets.	no	King George Whiting Black Bream Snapper Flathead Mullet Garfish Flounder Anchovies Pilchards
New South Wales			
Abalone Fishery	The blacklip abalone forms the basis of the abalone fishery in NSW. Abalone are commercially harvested from rocky reefs by divers typically using surface-supplied air or scuba. In practice, most commercial abalone fishing	No	Blacklip abalone (*Haliotis rubra*)

Fishery	Description	Extends into Cth Waters	Target Species
	takes place on the south coast of NSW, primarily from Jervis Bay to the Victorian border, with most abalone found close to the shore.		
Estuary General Fishery	The Estuary General Fishery is a diverse multi-species multi-method fishery that may operate in 76 of the NSW's estuarine systems. This fishery is a significant contributor to regional and state economies providing high quality seafood and bait to the community. The fishery includes all forms of commercial estuarine fishing (other than estuary prawn trawling) in addition to the gathering of pipis and beachworms from ocean beaches. The most frequently used fishing methods are mesh and haul netting. Other methods used include trapping, hand-lining and hand-gathering. Sea mullet, luderick, yellowfin bream, school prawn, blue swimmer crab, dusky flathead, sand whiting, pipi, mud crab and silver biddy make up over 80% of the catch (DPI 2014).	No	Sea Mullet (*Mugil cephalus*) Luderick (*Girella tricuspidata*) Yellowfin bream (*Acanthopagrus australis*) School Prawn (*Metapenaeus macleayi*) Blue Swimmer Crab (*Portunus pelagicus*) Dusky Flathead (*Platycephalus fuscus*) Sand Whiting (*Sillago ciliata*) Pipi (*Donax deltoides*) Mud Crab (*Scylla serrata*) Silver Biddy (*Gerres subfasciatus*)
Estuary Prawn Trawl Fishery	The fishery uses otter trawl nets in three estuaries in NSW, (the Clarence, Hawkesbury and Hunter Rivers). With the exception of the Hawkesbury River, the fishery operates for defined seasons (generally October to May) and within each estuary is confined to specific times and areas. The majority of prawn catches are landed during the 'dark' of the moon (between the last and first quarter), on either run out or 'slack' tides.	No	School Prawns Eastern King Prawns
Lobster Fishery	The Fishery extends from the Queensland border to the Victorian border and includes all waters under jurisdiction of NSW to around 80 miles from the coast.	Yes	Primary:

Fishery	Description	Extends into Cth Waters	Target Species
	It is characterised by inshore and offshore sectors. Inshore fishers use small beehive or square traps in waters up to 10 metres in depth, whilst offshore fishers use large rectangular traps.		Eastern rock lobster (*Sagmaraisus verreauxi*) Other: Southern Rock Lobster (*Jasus edwardsii*) Tropical Rock Lobster (*Panulirus longipes* and *P. ornatus*).
Ocean Hauling Fishery	The Ocean Hauling Fishery is broken up into seven regions along the NSW coast and targets approximately 20 finfish species using commercial hauling and purse seine nets from sea beaches and in ocean waters within 3 nautical miles of the coast.	No	Pilchards (*Sardinops sagax*) Sea Mullet (*Mugil cephalus*) Australian Salmon (*Arripis trutta*) Blue Mackerel (*Scomber australasicus*) Yellowtail Scad (*Trachurus novaezelandiae*) Yellowfin Bream (*Acanthopagrus australis*)
Ocean Trap and Line Fishery	The Ocean Trap and Line fishery is a multi-method, multi species fishery targeting demersal and pelagic fish along the entire NSW coast, in continental shelf and slope waters. The Ocean Trap and Line Fishery is a share management fishery. This means that commercial fishers must hold sufficient shares to be eligible for an endorsement to operate in the fishery. An endorsement authorises the use of specific gear to take fish for sale from certain waters.	Yes	Primary: Snapper Yellowtail kingfish Leatherjackets Bonito Silver trevally

Fishery	Description	Extends into Cth Waters	Target Species
			Other: Rubberlip (grey) Morwong Blue-eye Trevalla Sharks Bar Cod Yellowfin Bream Spanner Crabs
Ocean Trawl Fishery	There are two sectors to the Ocean Trawl Fishery: the prawn trawl sector and the fish trawl sector. Both sectors use otter trawl nets. The fishery is a share management fishery; meaning commercial fishers must hold sufficient shares to be eligible for an endorsement to operate in the fishery. An endorsement authorises the use of specific gear to take fish for sale from certain waters. Many of the fishers endorsed for fish trawling are also endorsed for prawn trawling.	Yes	School whiting (comprising of stout whiting and red spot whiting) Eastern King, School and Royal Red prawns Tiger Flathead Silver Trevally Various species of sharks and rays, squid, octopus and bugs
Sea Urchin and Turban Shell Restricted Fishery	The NSW Sea Urchin and Turban Shell restricted fishery is relatively small with few divers participating. The main constraint on development is high processing costs and limited domestic markets. Fishing for sea urchins is generally constrained to that part of the year when the roe is well developed. A number of the fishing sub-regions have been closed to commercial fishing since 1994.	No	Sea Urchin Turban Shell
Tasmania			
Shellfish Fishery	The commercial shellfish fishery includes clams (*Veneruptis largillierti*) for which there are three licences restricted to Georges Bay, native oyster (*Ostrea angasi*) for which there are two licences restricted to Georges Bay and cockles (*Katelysia scalarina*) for which there are four licences restricted to Ansons Bay and wild Pacific oyster (*Crassostrea gigas*) (DPIPWE 2017d).	no	clams (Veneruptis largillierti) native oyster (*Ostrea angasi*)

Fishery	Description	Extends into Cth Waters	Target Species
	Temperate climate bivalves generally have two spawning periods within a year following spring and autumnal peaks in phytoplankton production.		cockles (*Katelysia scalarina*) wild Pacific oyster (*Crassostrea gigas*)
Abalone Fishery	The Tasmanian abalone fishery is the largest wild abalone fishery in the world and the fishery area surrounds the entire island of Tasmania extending northwards into Bass Strait to include Bass Strait islands such as the Furneaux Group. The Tasmanian wild harvest abalone fishery for Blacklip *(H. rubra*) and Greenlip *(H. laevigata*) produces 25% of the total annual global production of wild caught abalone and is harvested by divers. Annual catch limits are set by the government and the limits are spread across the fishing zones to manage resource sustainability. This system includes closures of some parts of the fishery as published by the Tasmanian regulator Department of Primary Industries, Parks, Water & Environment (DPIPWE, 2019a).	no	Blacklip (H. rubra) Greenlip (H. laevigata)
Rock Lobster Fishery	The rock lobster fishery is a major Tasmanian industry providing significant benefits from exports from the commercial fishery. The Southern rock lobster (*Jasus edwardsii*) commonly known as crayfish, lives in a variety of habitats ranging from shallow rocky inshore pools out to the continental shelf. Pots are used as the catch method and over 300 licences issued each year. The fishery is managed by quota management, supplemented by size limits, gear restrictions and seasonal closures (DPIPWE, 2019b).	no	Southern rock lobster (Jasus edwardsii)
Giant Crab	The Giant Crab (*Pseudocarcinus gigas*) fishery is a comparatively small fishery with annual harvest set at 46.6 tonnes, but is of relatively high value, with the landed valued estimated to be around $2 million. The Tasmanian Giant Crab fishery is managed by limited entry, setting a total annual commercial catch and by an individual transferable quota management system. This regime is supplemented by size limits, gear restrictions and seasonal closures. The permitted gear types are pot (or trap) for the commercial fishery. (Ogier et al., 2018)	no	Giant Crab (*Pseudocarcinus gigas*)
Scalefish Fishery	The Tasmanian Scalefish Fishery is a multi-species and multi-gear fishery that is predominantly made up of small owner operated commercial businesses and a large and diverse recreational fishery. Some of the species commercially targeted include: banded morwong, southern calamari, octopus, tiger flathead, school whiting, southern garfish, wrasse, Gould's squid, bastard trumpeter, blue warehou, silver warehou, flounder, silver trevally and striped trumpeter. The main gear types include gillnet, hooks and seine nets, other fishing gears in use include traps, Danish seine, dip nets and spears. For many commercial operators, scalefish represent an adjunct to other activities, for instance rock lobster fishing (DPIPWE, 2019c)	yes	Wrasse Banded morwong (*Cheilodactylus spectabilis)* Southern calamari *(Sepioteuthis australis)*

Fishery	Description	Extends into Cth Waters	Target Species
Commercial Dive Fishery	The fishery primarily targets Purple Sea Urchin (*Heliocidaris erythrogramma*), Longspine Sea Urchin (*Centrostephanus rodgersii*), and Periwinkle (*Lunella undulata*). It operates entirely in state waters in five separate management zones (central eastern, south eastern, north eastern, northern and eastern) (DoEE, 2016).	no	Purple Sea Urchin (*Heliocidaris erythrogramma*) Longspine Sea Urchin (*Centrostephanus rodgersii*) Periwinkle (*Lunella undulata*)
Scallop	This fishery targets Commercial Scallop (*Pecten fumatus*) using a scallop harvester (dredge). Although commercial fishers can legally take the doughboy scallop and the queen scallop, these species have only minor commercial significance in Tasmania. Pre-season surveys are carried out to determine which areas meet predetermined criteria and can be opened for scallop fishing. The market for commercial harvested scallops is largely domestic. Scallops beds occur on the shelf in water deeper than 20 metres (Ogier et al., 2018).	no	Commercial Scallop (*Pecten fumatus*)
Queensland			
Type	**Category**	**Name**	**Target species**
Crab	Crab Method: Pots Fishing Area: throughout the state's coastal waters, including the Gulf of Carpentaria, except for areas that are closed to fishing in general or to crabbing in particular.	Blue Swimmer Crab Fishery Mud Crab Fishery Spanner Crab Fishery	• mud crab fishery • blue swimmer crab fishery • spanner crab fishery.
Eel	Eel Method: eel trap Fishing Area: All of the east coast drainage division catchments except offshore islands but mainly in privately owned farm dams	Eel Fishery	• longfin eel (*Anguilla reinhardtii*) • southern shortfin eel (*A. australis*)

Fishery	Description		Extends into Cth Waters	Target Species
Harvest Method: Generally harvested by hand or by using handheld implements. This often involves the use of underwater breathing apparatus, such as scuba or hookah	Sea cucumber Fishing Area: Along entire QLD coast	Sea Cucumber Fishery (East Coast)		• blackfish *(Actinopyga palauensis*) • burrowing blackfish *(Actinopyga spinea)* • sandfish (Holothuria scabra) • white teatfish (*Holothuria fuscogilva*) • prickly redfish (*Thelenota ananas).*
	Marine aquarium Fishing Area: Throughout Qld Sunshine Coast area (8 licences) Moreton Bay area (11 licences).	Marine Aquarium Fish Fishery Marine Specimen Shell Fishery		• damselfish (*family Pomacentridae)* • butterflyfish and bannerfish (family Chaetodontidae) • angelfish (family *Pomacanthidae*) • wrasses (family *Labridae*) • surgeonfish (family *Acanthuridae*) • gobies (family *Gobiidae*).
	Coral Method: Coral may only be taken by hand or by using handheld non-mechanical implements, such as a hammer and chisel. Licence-holders may also use scuba or hookah when taking coral. Fishing Area: Throughout Qld	Coral Fishery		• live corals, such as *Euphyllidae, Zoanthida, Corallimorpharia and Fungidae* families • sea anemones • ornamental (non-living) corals, such as *Acroporidae and Pocilloporidae* families

Fishery	Description	Extends into Cth Waters	Target Species
	The fishery has limited entry, with 59 licences currently endorsed.		• live rock (dead coral skeletons with algae and other organisms living on them) • coral rubble (coarsely broken up coral fragments) • coral sand (finely ground-up particles of coral skeleton, which fishers can only take as incidental catch and must not target in marine park waters).
	Trochus Does not occur south of Gladstone	East Coast Trochus Fishery	
	Tropical Rock Lobster Method: Commercial collection of tropical rock lobster is carried out using hand spears, spear guns or handheld non-mechanical implements such as noose rods. Fishing Area: The east coast crayfish and rock lobster fishery includes all tidal waters east of longitude 142°31'49'E, south of latitude 10°41'S and north of latitude 14°S.	Commercial Crayfish and Rocklobster Fishery	• tropical spiny rock lobster (*Panulirus ornatus)*
	Minor harvest fisheries Fishing Area: Throughout QLD	East Coast Pearl	• bait fisheries, such as beachworms, bloodworms and yabbies • marine specimen shells • pearl shells • wild-caught oysters.

<table>
<tr><th>Fishery</th><th colspan="2">Description</th><th>Extends into Cth Waters</th><th>Target Species</th></tr>
<tr><td>Line</td><td>Method:
Bottom handlines and trolling gear, with drop (or trot) line limited to the deepwater multiple-hook fishery (operating outside the 200m bathymetric line).

Fishing Area:
Throughout Qld

4 main areas:
- the Great Barrier Reef Marine Park (85%)
- south of the Great Barrier Reef Marine Park to the New South Wales border (7%)
- the Gulf of Carpentaria (8%)
- in waters deeper than 200m outside the Great Barrier Reef Marine Park.</td><td>East Coast Spanish Mackerel Fishery
Queensland Line Fishery (Coral)</td><td colspan="2">In the commercial fishery, 3 species dominate the total catch:
• coral trout, at about 35% of total line catch
• Spanish mackerel, at about 20%
• red throat emperor, at about 15%.
The other significant species (or species groups) are:
• coral reef fin fish including cods, emperors and tropical snappers
• snapper (Pagrus auratus)
• trevally
• spotted mackerel.</td></tr>
<tr><td>Trawl</td><td>Method:
Beam trawl, Otter trawl

Fishing Area:
Operate in all tidal waters out to the Queensland east coast offshore constitutional settlement boundary between Cape York and the New South Wales border, with some exceptions</td><td>Commercial Trawl (Fin Fish) Fishery
East Coast Otter Trawl Fishery
Moreton Bay Beche-de-mer Fishery
River and Inshore Beam Trawl Fishery</td><td colspan="2">• Prawns (tiger, endeavour, red spot, banana, eastern king and bay prawn)
• Scallops (Amusium balloti and A. pleuronectes)
• Whiting (Stout whiting (Sillago robusta)
• Moreton Bay Bugs (Thenus australiensis and T.parindicus)
• Squid (pencil, tiger and arrow)</td></tr>
<tr><td>Net</td><td>Method: Net
Fishing Area:
Operate along the entire Queensland coastline</td><td>Deep Water Fin Fish Fishery
East Coast Inshore Fin Fish Fishery
Rocky Reef Fin Fish Fishery</td><td colspan="2">The northern areas of the east coast inshore fin fish fishery harvests mainly tropical species, such as:</td></tr>
</table>

Fishery	Description		Extends into Cth Waters	Target Species
	East coast fin fishery has 2 major commercial net fisheries:: - the Gulf of Carpentaria inshore fin fish fishery (not in DA) - the east coast inshore fin fish fishery.			• king and blue threadfins - 7% of total net catch • barramundi - 6% of total net catch • shark - 9% of total net catch • grey mackerel - 3% of total net catch. The southern areas of the east coast inshore fin fish fishery harvests mainly subtropical fin fish species, such as: • mullet • tailor • whiting • flathead • bream • mulloway • school mackerel
Development	Developmental fishing determines whether a potential new fishery is commercially viable, socially acceptable and ecologically sustainable. Developmental fishing is generally regarded as: • fishing for a species of fish that has been previously unexploited or significantly underutilised • fishing for an existing commercial species using apparatus currently not permitted by legislation • fishing for an existing commercial species or use of prescribed apparatus (or both) in locations where such activities have not previously occurred • combinations of the above.	Developmental Jellyfish Fishery		

2.4.1.11 Commercial Aquaculture – State

The Sydney rock oyster (Saccostrea glomerata) is the main species grown in NSW. Commercial production in the State occurs in 41 estuaries between Eden in the south to the Tweed River in the north. Wallis Lake and the Hawkesbury River are the main producing areas.

The Sydney rock oyster industry in NSW is largely dependent on natural spawning. The first spawning of a Sydney rock oyster is usually as a male and subsequent spawnings as a female. During spawning, adult females disperse up to 20 million eggs and males hundreds of millions of sperms into the water when the tide and current are optimal for the widest distribution. Fertilisation takes place in the water column and development continues for up to 3 to 4 weeks as the larval stages of the oyster grow, with the 'spat' ultimately being caught on 'sticks'. Oysters are knocked off these sticks at 0.5 to 3 years of age for growing intertidally on trays until maturity in 3 to 4 years. Alternative growing systems such as baskets and tumblers are also being used, and some oysters are grown subtidally on rafts or on floating culture.

2.4.2 Oil and Gas

Statistics from 2014–2015 showed that oil (38%) and gas (24%) remained Australia's largest energy sources (APPEA, 2017). The industry also contributed approximately $34 billion to the Australian economy during the 2014–2015 financial year (APPEA, 2016).

Victoria's petroleum (oil and gas) exploration and production is concentrated in the offshore Commonwealth waters of the Otway and Gippsland basins; there are a number of current exploration and offshore production permit areas within both basins (Figure 2-59). Information on the Production licences, Exploration Permits and Retention Leases within Gippsland Basin at the time of writing are presented in Table 2-47.

From 1967–2015, the Gippsland Basin Joint Venture alone produced 54% of Australia's crude oil and gas (DIIS, 2017). Petroleum infrastructure in Gippsland Basin is well developed, with a network of pipelines transporting hydrocarbons produced offshore to onshore petroleum processing facilities at Longford and Orbost (Figure 2-60). Overall production of crude oil and condensate from the Gippsland Basin had been declining for over three decades, while gas production remained steady. However, in recent years, hydrocarbon production has remained relatively strong due to infill drilling in the developed fields and work-overs undertaken to renew down-hole equipment and to open new zones (DIIS, 2017). Total petroleum production from the Gippsland Basin was 74.8 MMboe (11.9 GL) in 2016, up from 61.4 MMboe (9.76 GL) in 2015 (DIIS, 2017).

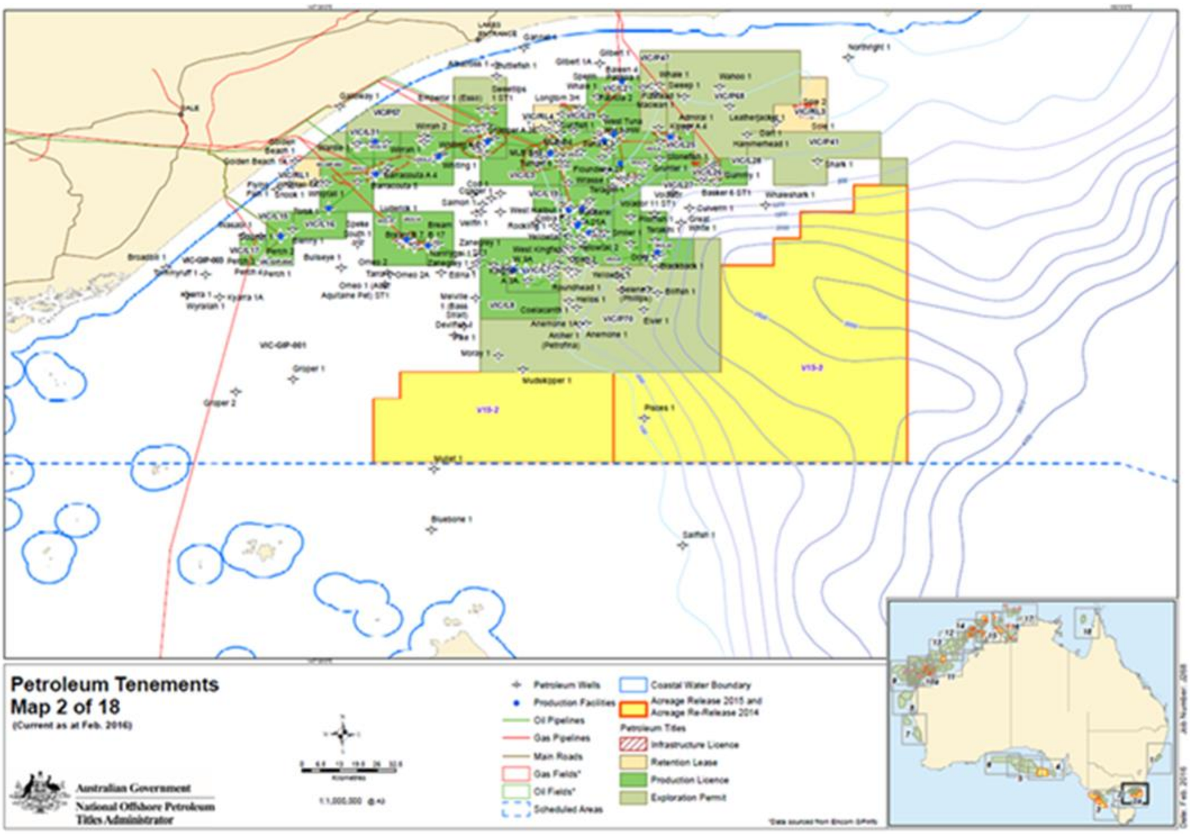


Figure 2-59 Gippsland Basin oil and gas fields (NOPTA, 2016)

Table 2-47 Production licenses, Exploration Permits and Retention Leases within Gippsland Basin

Title	Title Holder/s	Field
Production Licenses, Gippsland Basin		
VIC/L1	EARPL, BHPB	Barracouta/Tarwhine/ Whiptail
VIC/L10	EARPL, BHPB	Snapper
VIC/L11	EARPL, BHPB	Flounder
VIC/L13-14	EARPL, BHPB	Bream
VIC/L15	EARPL, BHPB	Dolphin
VIC/L16	EARPL, BHPB	Torsk
VIC/L17	EARPL, BHPB	Perch
VIC/L18	EARPL, BHPB	Seahorse
VIC/L19	EARPL, BHPB	West Fortescue
VIC/L2	EARPL, BHPB	Barracouta/Whiting/Wirrah
VIC/L20	EARPL, BHPB	Blackback
VIC/L21	Cooper Energy	Patricia Baleen
VIC/L25	EARPL, BHPB, MEPAU	Kipper
VIC/L29	SGH Energy	Longtom
VIC/L3	EARPL, BHPB	Marlin/Turrum/North Turrum
VIC/L32	Cooper Energy	Sole

VIC/L4	EARPL, BHPB	Marlin/Turrum/Tuna/Baldfish/Flounder
VIC/L5	EARPL, BHPB	Halibut/Fortescue/Cobia/ Mackerel
VIC/L6	EARPL, BHPB	Mackerel/Flounder
VIC/L7-8	EARPL, BHPB	Kingfish
VIC/L9	EARPL, BHPB	Tuna
VIC/L31	Carnarvon Hibiscus	West Seahorse (see VIC/P57)
Exploration Permits, Gippsland Basin		
VIC/P47	Emperor Energy / Shelf Energy	Judith/Moby
VIC/P57	Carnarvon Hibiscus	West Seahorse/Sea Lion (See VIC/L31)
VIC/P68	Bass Oil	Leatherjacket
VIC/P70	Esso Deepwater	Dory/Baldfish
VIC/P71	Llanberis Energy	-
VIC/P72	Cooper Energy	-
Retention Leases, Gippsland Basin		
VIC/RL1	EARPL, BHP (Pending Renewal)	Golden Beach
VIC/RL13 VIC/RL14 VIC/RL15	Cooper Energy	Basker, Manta, Gummy Field
VIC/RL4	EARPL, BHP (Pending Renewal)	Remora

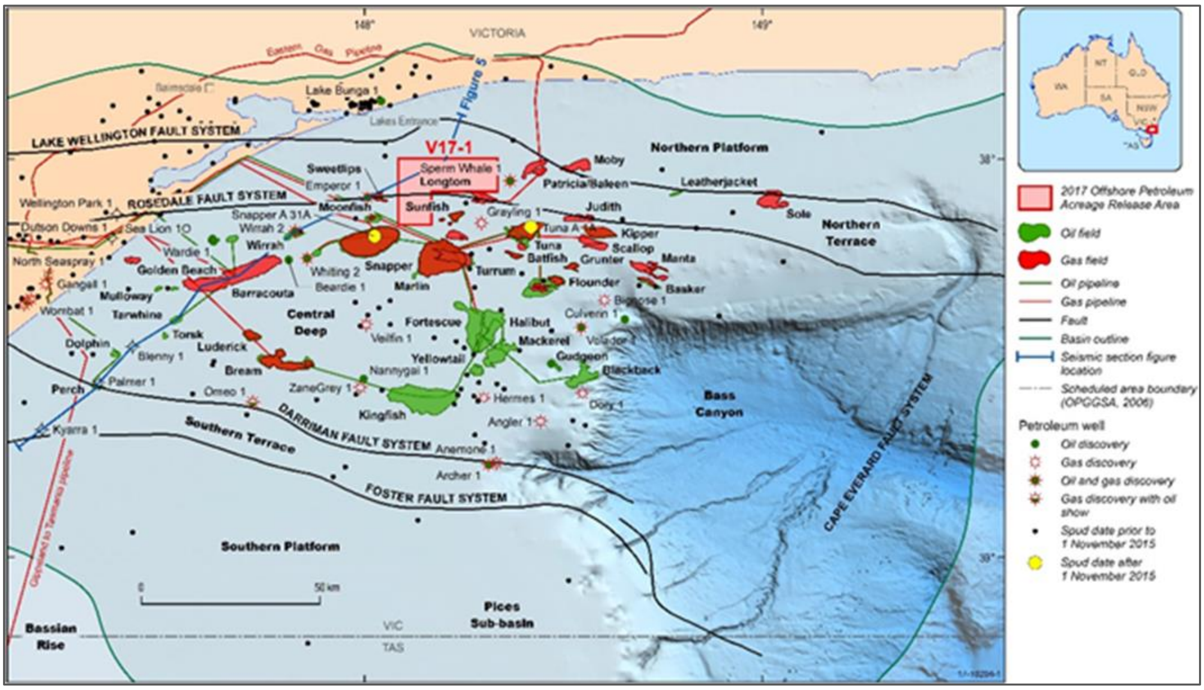


Figure 2-60 Gippsland Basin regional geology with petroleum fields and infrastructure (DIIS, 2017)

2.4.3 Shipping

The south-east and eastern coasts are some of Australia's busiest in terms of shipping activity and volumes. This traffic includes international and coastal cargo trade, and passenger and ferry services. Major ports include Melbourne, Geelong, Western Port, Sydney and Brisbane; with other minor ports important to commercial and recreational fishing, yachts and other pleasure craft. Bass Strait is one of Australia's busiest shipping areas, with more than 3,000 vessels passing through Bass Strait each year (NOO 2002).

A shipping exclusion zone ('area to be avoided') exists around the operating oil and gas platforms in the Gippsland Basin, whereby unauthorised vessels larger than 200 gross tonnes are excluded from entry (Figure 2-61). Two traffic separation schemes have been implemented to enhance safety of navigation around the 'Area to be Avoided' by separating shipping into one-direction lanes for vessels heading north eastwards and those heading south westwards. One separation area is located south of Wilson's Promontory, and the other south of the Kingfish B platform.

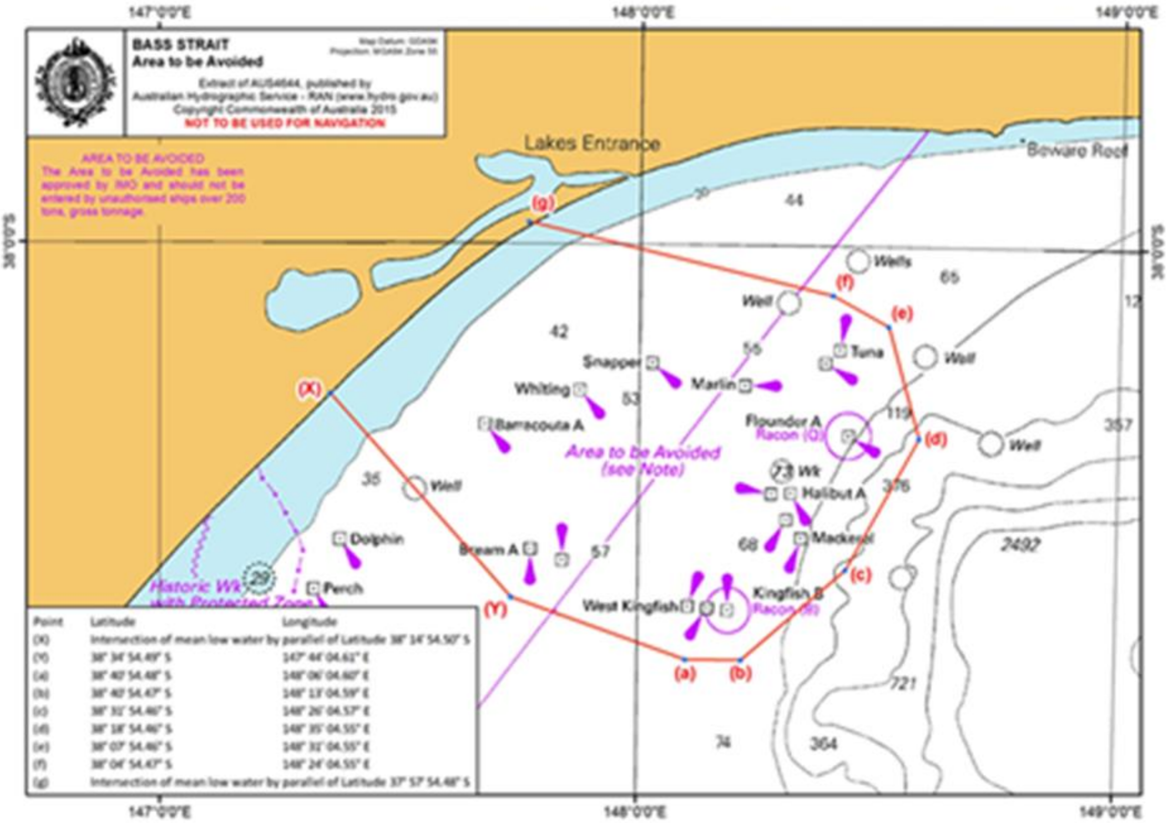


Figure 2-61 Shipping exclusion zones (Area to be Avoided) (ABF, 2017)

Figure 2-62 show real time vessel density maps around the area to be avoided as derived from the position of individual vessels, as broadcast by AIS (Automatic Identification System). Figure 2-63 shows similar time vessel density map for the DA.

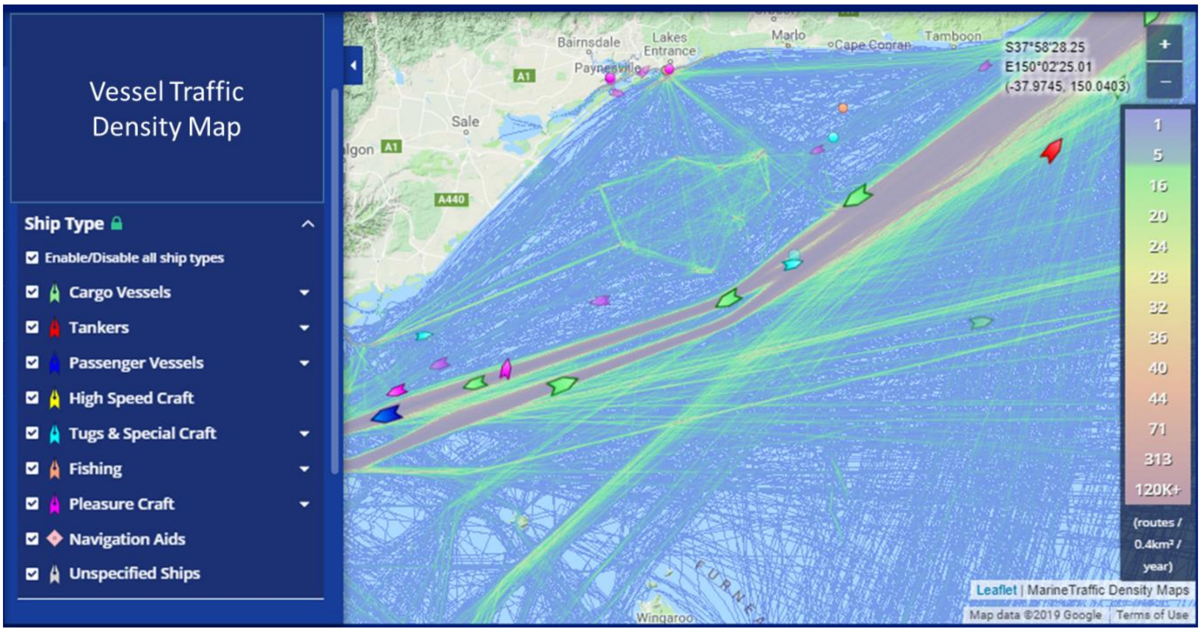


Figure 2-62 Shipping density around the Area to be Avoided real time data April, 2019 (VT, 2019)

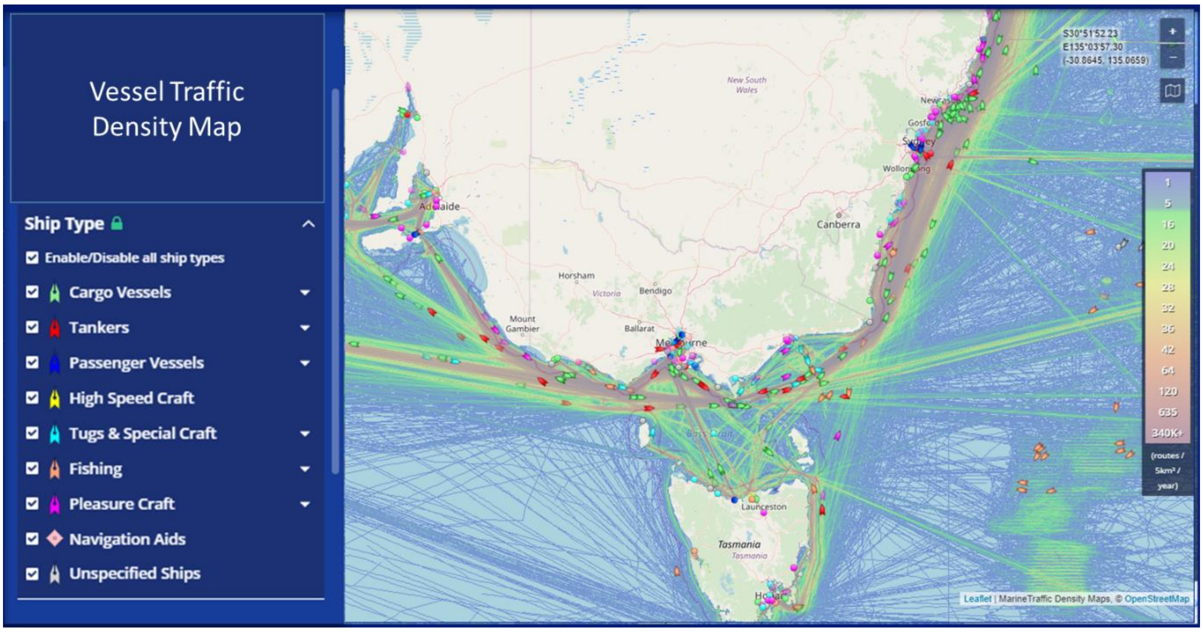


Figure 2-63 Shipping density in the DA real time data May, 2019 (VT, 2019)

2.4.4 Defence

The Australian Defence Force conducts a range of training, research activities, and preparatory operations in Australian waters (Figure 2-64). These activities may include transit of naval vessels, training exercises, shipbuilding and repairs, hydrographic survey, surveillance and enforcement, demolition, use of explosives, use of radar, sonar, sonobuoys, flares, sensors and other equipment, and search and rescue.

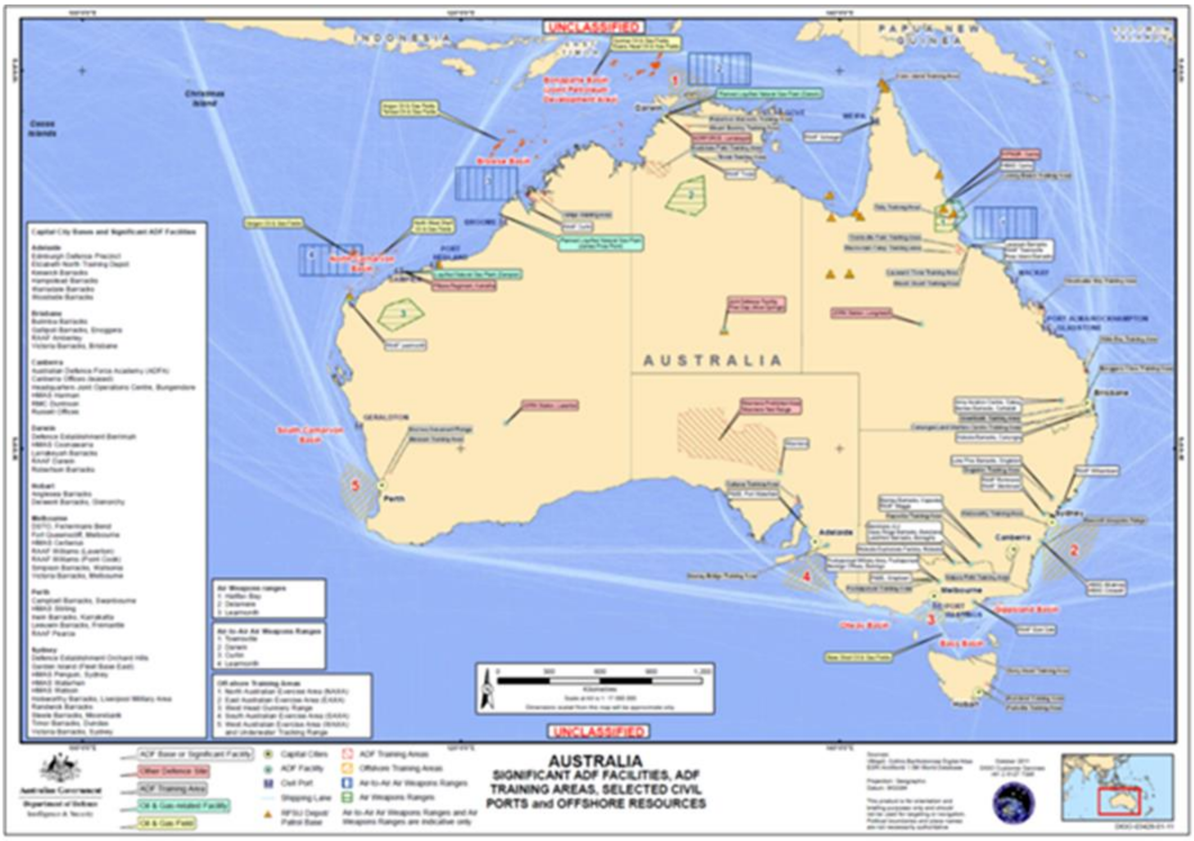


Figure 2-64 Significant Defence bases and facilities (Department of Defence, 2014)

Major defence bases within the DA include the multi-purpose wharf (naval operations) at Twofold Bay, Eden (New South Wales).

Primary training locations within the DA include the East Australia Exercise Area off the south coast of New South Wales.

Mine fields were laid in Australian waters during World War II. Post-war minefields were swept to remove mines and to make marine waters safe for maritime activities. There are three areas identified as dangerous due to unexploded ordnances, located south and east of Wilson's Promontory.

2.4.5 Tourism

The Australian coast and marine waters provide a diverse range of recreation and tourism opportunities, including scuba diving, charter boat cruises, cruise shipping, whale and wildlife watching, sailing, snorkelling, surfing, and kayaking.

In 2013-2014 the tourism industry contributed approximately $1.2 billion to the Gippsland economy; and employed approximately 12,400 (12.2%) (Tourism Victoria, 2014a, 2014b). Overnight visitors to the Gippsland area were predominantly Australian (86% intrastate, 11% interstate), with low (3%) international visitors (Tourism Victoria, 2014a). In East Gippsland, primary tourist locations are the Gippsland Lakes (the largest inland waterway in Australia), Lakes Entrance, Marlo, Cape Conran and Mallacoota. The area is renowned for its nature-based tourism (e.g. Croajingolong National Park), recreational fishing and water sports (lake and beaches) (Travel Victoria, 2017).

NSW has the highest expenditure and most domestic and international visitors in all of Australia, even excluding Sydney, regional NSW leads regional Australia in its share of visitors (Destination NSW, 2019). In 2017-2018 the South Coast NSW tourism industry contributed $2.6 billion to the economy. National and international visitor surveys identified ‘going to the beach’ as the second most popular activity (Destination NSW, 2018). The South Coast Region includes all the towns from Wollongong south to the Victorian border. The northern NSW regions, including Central, Hunter and North coast, collectively contributed approximately $9.3 billion to the economy (Destination NSW, 2019).

Tourism in Tasmania directly contributed $1.44 billion or about 4.9% to Tasmania's Gross Product in the 2016-2017 period (TT, 2019). It directly supports around 18 900 jobs in Tasmania or about 7.9 per cent of total Tasmanian employment.

Tourism directly and indirectly supports around 38,000 jobs in Tasmania or about 15.8% of total Tasmanian employment - higher than the national average and the highest in the country.

The East Coast has been identified as one of the most tourism-dependent regions in Australia. Port Arthur and the Freycinet National Park are rated in the top ten destinations in Tasmania (DT, 2019).

Visitors to the three, southern most tourist regions of QLD (Gold Coast, Brisbane and Sunshine Coast) spent over $15 billion in the year ending September 2019 (TEQ, 2020a), representing three of the top four tourist regions in Qld (Tropical North Queensland is the 3rd highest performing region). Tourism is QLD's third largest export industry and supports over 200,000 jobs directly and indirectly (TEQ, 2020b).

2.5 Cultural

The Commonwealth Heritage List is a list of Indigenous, historic and natural heritage places owned or controlled by the Australian Government which have a significant heritage value to the nation. These and other places within the DA with cultural values are described in this section.

2.5.1 Indigenous

No indigenous places are listed on the Commonwealth Heritage List within the DA. Other indigenous protected and recognised places are described below. In addition, places with indigenous cultural values are described within the National Parks and Reserves where they exist (Refer Section 2.2.8).

Indigenous Protected Areas

Indigenous Protected Areas are an essential component of Australia's National Reserve System, which is the network of formally recognised parks, reserves and protected areas across Australia, designed to protect the nation's biodiversity. Indigenous Protected Areas protect cultural heritage into the future, and provide employment, education and training opportunities for Indigenous people in remote areas. At the time of writing there were 75 Indigenous Protected Areas in Australia of which five occur in the DA. They are all areas on and around Flinders Island in Tasmania as shown in Figure 2-65 and are all important rookeries for mutton birds and important cultural resource for Tasmanian Aboriginal people.

Figure 2-65 Indigenous Protected Areas in the DA (DMPC, 2019 a)

Native Title

Non-exclusive native title rights and interests that exist over land and water in the determination area include:

- Rights of access.
- Rights to use and enjoy the land.
- Rights to take resources from the land for non-commercial purposes.
- Rights to protect and maintain sites of importance within the determination area.
- Rights to engage in certain activities on the land (including camping, cultural activities, rituals, ceremonies, meetings, gatherings, and teaching about the sites of significance within the determination area).

These rights do not confer exclusive rights of possession, use and enjoyment of the land or waters. Native title does not exist in minerals, petroleum or groundwater.

The Gunai-Kurnai people hold native title over much of Gippsland. The native title determination area (Tribunal file no. VCD2010/001) covers approximately 45,000 hectares and extends from west Gippsland near Warragul, east to the Snowy River, and north to the Great Dividing Range, (Figure 2-66). It also includes 200 metres of offshore sea territory between Lakes Entrance and Marlo. The area includes 10 parks and reserves that are jointly managed by the Victorian government and the Gunai-Kurnai people (NNTT, 2010).

Aboriginal occupancy by the Gunai-Kurnai people pre-dates the time at which the sea reached its present level by many thousands of years; thus, many early hunting grounds are now under the sea.

In the past, coastal wetlands were highly productive areas for hunter-gatherer people, having a variety of habitats and species, so the majority of archaeological sites in Victoria are found within 1 km of the coast (LCC 1993). Along the Gippsland coast, stone artefacts that have been found were mostly made from silcrete and quartz from the hinterland. Middens on offshore islands indicate that in the past, Aboriginal people from the area now known as Wilsons Promontory were likely to have visited (Jones & Allen 1979).

At the time of writing a Native Title Claimant Application was registered by the Gunai-Kurnai People (VID734/2014) for an area covering the Wilsons Promontory area (NNTT, 2019).

There are no native title determinations in NSW within the limits of the DA however a Native Title Claimant Application was registered by the South Coast People (NSD1331/2017) for an area covering the NSW south coast from the south of Sydney to Eden, including the coastal waters (NNTT, 2018). Indigenous places along the southern NSW coast include Barlings Beach, Ten Pelican Lake BrouBarunguba Aboriginal Place, Mystery Bay Fish Trap, Merriman Island and Bermagui Waterhole (NSW OEH, 2019a).

There are no native title determinations in Tasmania, although there are areas of indigenous cultural significance and indigenous protected areas including Mt Chappell Island, Badger Island, Babel Island, Great Dog Island in the Fernaux Group (DPMC, 2019).

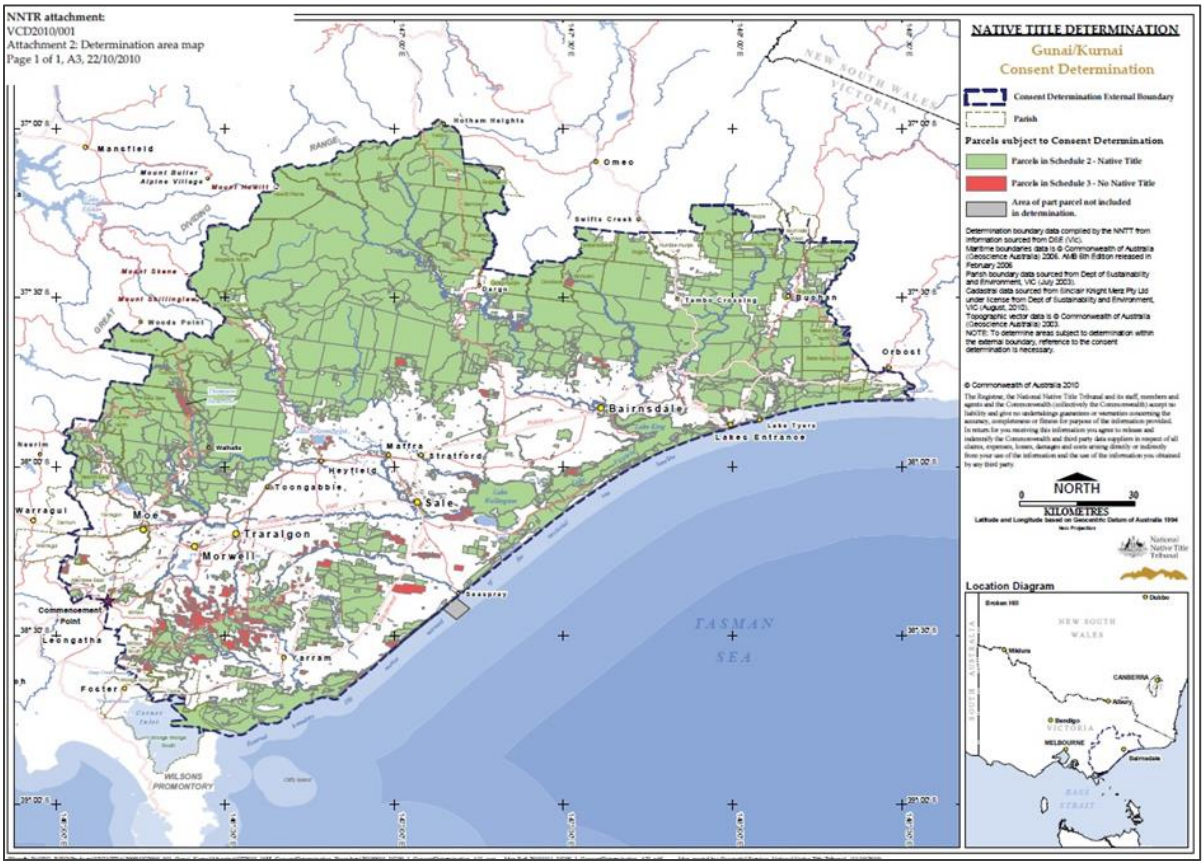


Figure 2-66 Gunai-Kurnai Native Title Determination Area (VCD2010/01)

2.5.2 Natural

The Commonwealth Heritage List is a list of Indigenous, historic and natural heritage places owned or controlled by the Australian Government. There are four listings on the Commonwealth Heritage list under the natural classification which occur in the DA.

- Point Wilson is an important part of the Western Port Phillip Bay Ramsar Area in Victoria, an internationally significant wetland that provides habitat for many migratory and resident wading birds and waterfowl. The Point Wilson Defence Area is a productive and diverse wetland and saltmarsh habitat supporting many shorebirds.
- The Beecroft Peninsula is the best example of a Permian cliffed coast in New South Wales. It is about 4040ha south of the town of Currarong. The area supports a high diversity of vegetation types within a small area including mangroves, saltmarsh, freshwater swamps, heathland, eucalypt forest and subtropical and littoral rainforest. Beecroft Peninsula retains the largest area of heath remaining on the south coast of New South Wales. This floristically rich vegetation provides important habitat for a variety of bird species, including the vulnerable ground parrot

(PEZOPORUS WALLICUS). The place supports 35 bird species listed on international migratory bird treaties (JAMBA, CAMBA, and the Bonn Convention). The ground parrot (PEZOPORUS WALLICUS), which is listed as vulnerable in New South Wales, occurs in heath, swamp and sedgeland habitats and has an estimated maximum population size of 450 individuals on the peninsula.

- The Malabar Headland just north of Botany Bay, NSW contains two significant bushland remnants – referred to as the coastal section and the western section. Together, these contain what is probably the largest area of essentially unmodified bushland in Sydney's Eastern Suburbs. The bushland is a significant part of one of two semi-natural corridors between Botany Bay and Port Jackson. The two sections support at least seven distinct plant communities. This diversity of habitats is only matched in the Eastern Suburbs in Botany Bay National Park (DoEE, 2019al).
- Tasmanian Seamounts Area – also a key ecological feature, refer to Section 2.2.7.5 for information on the Seamounts South and East of Tasmania.

2.5.3 Historic – Commonwealth Heritage

The majority of listings on the Commonwealth Heritage list under the historic classification which occur in the DA are lighthouses; these and the other listings are not considered relevant.

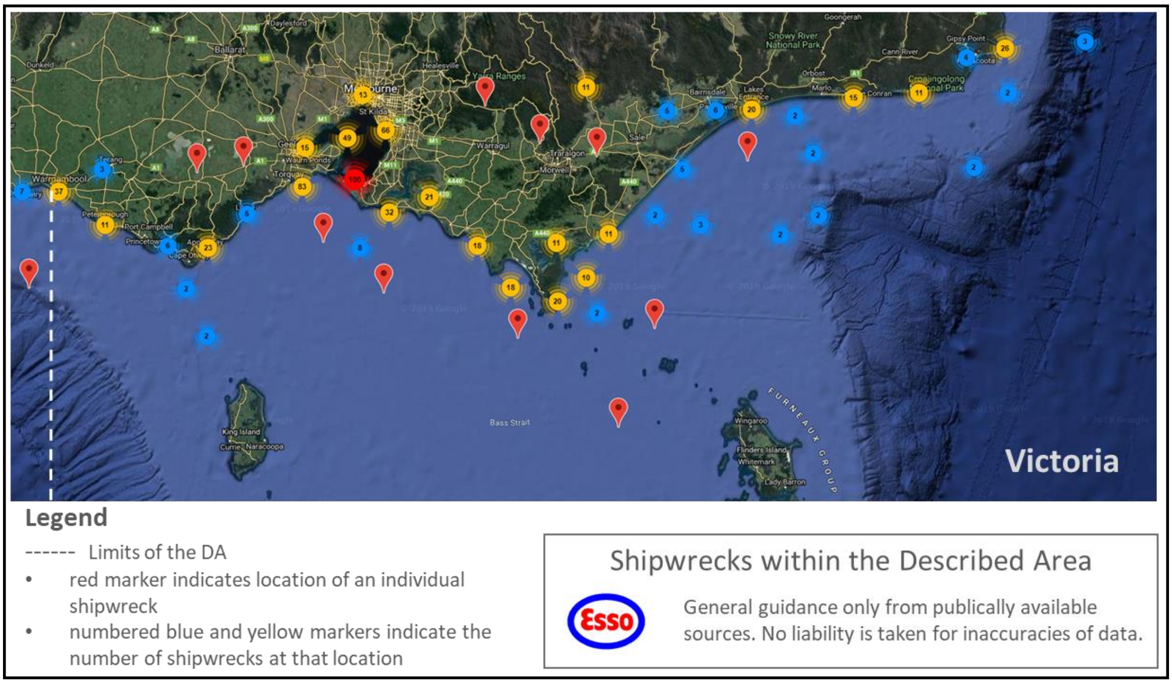
No Historic Indigenous Commonwealth listed places were found within the DA (DoEE, 2019am).

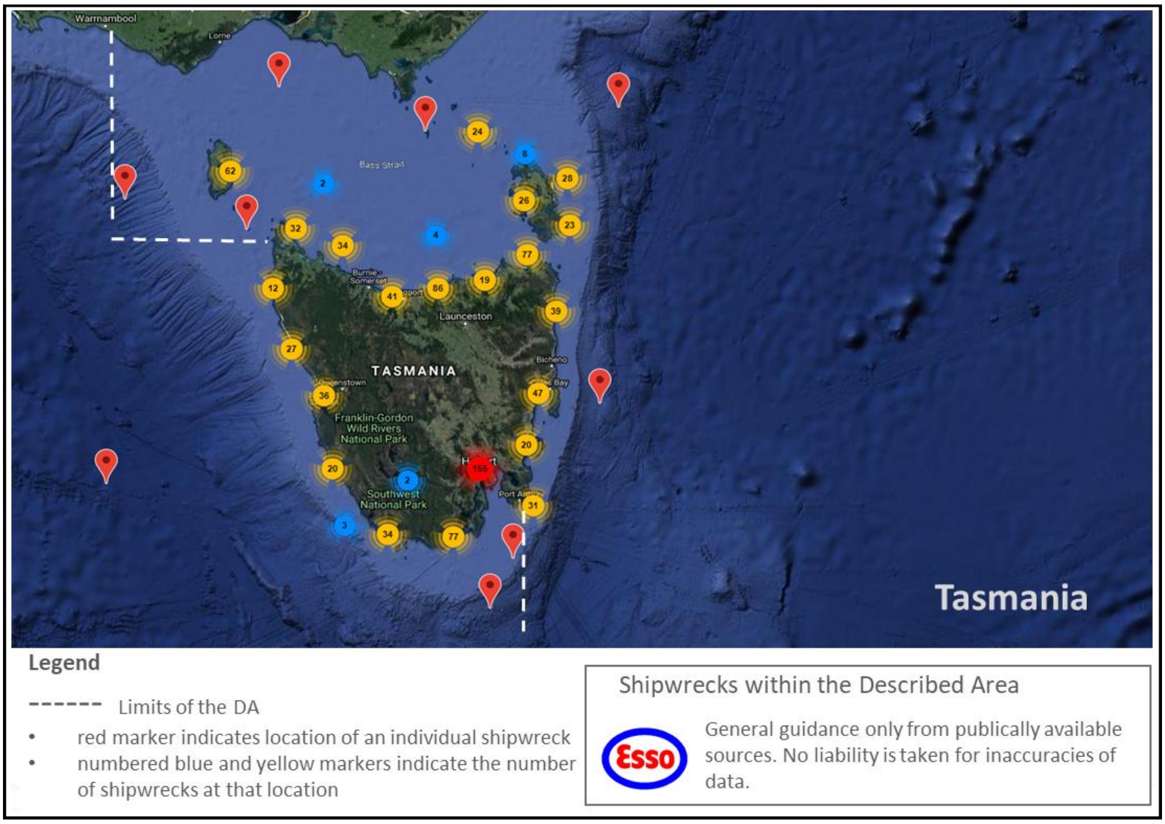
2.5.3.1 Historic – Maritime

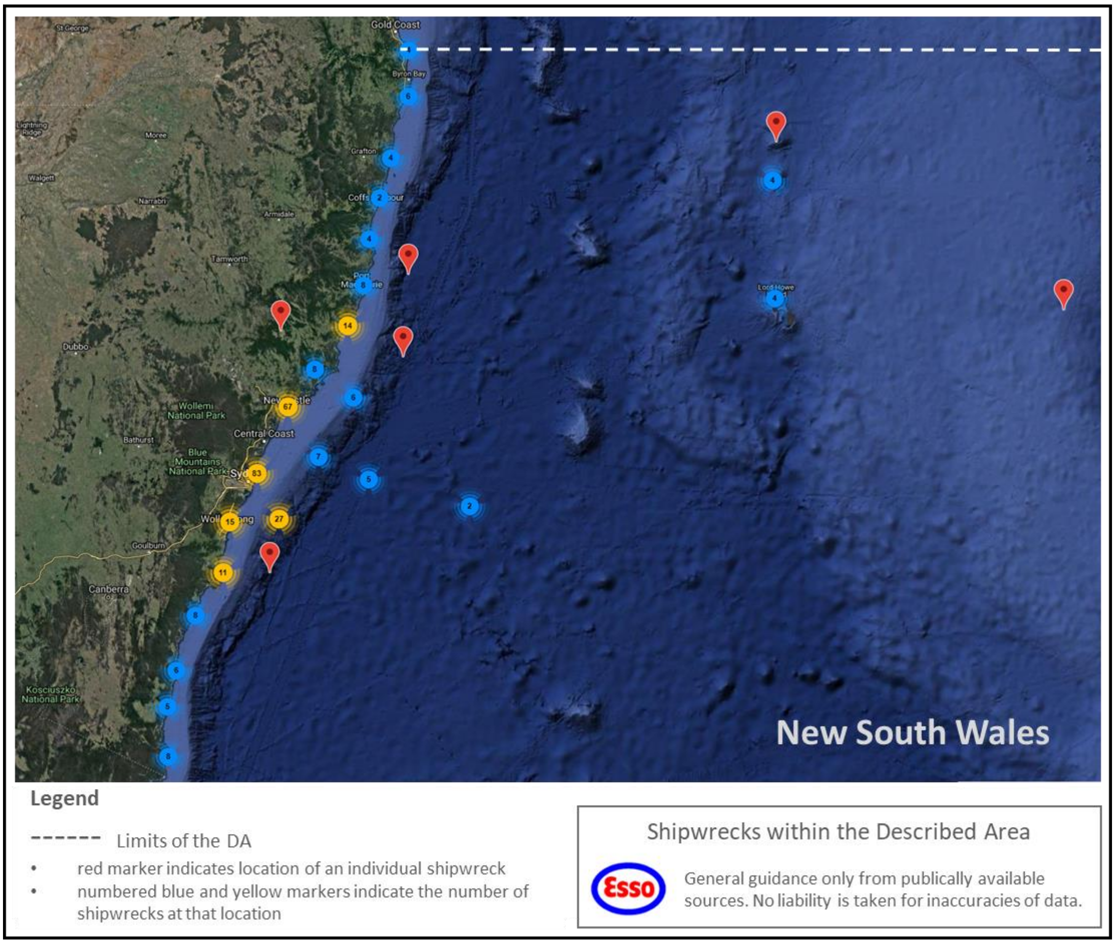
A search of the National Shipwrecks Database which includes all known shipwrecks in Australian waters, identified 1160 historic shipwrecks within the DA at the time of writing. The Historic Shipwrecks Act, 1976, protects historic wrecks that are more than 75 years old and in Commonwealth waters (DoEE, 2019g). Table 2-48 below summarises both the historic and other shipwrecks within the DA, by state. Figure 2-67 maps the location of the shipwrecks.

Table 2-48 Shipwreck numbers within the DA by state

	Historic Shipwrecks	Other Shipwrecks
Victoria	417	126
Tasmania	415	167
New South Wales	328	76
Queensland	172	54


Victoria
Legend
------ Limits of the DA
• red marker indicates location of an individual shipwreck
• numbered blue and yellow markers indicate the number of shipwrecks at that location
Shipwrecks within the Described Area
Esso
General guidance only from publically available sources. No liability is taken for inaccuracies of data.


TASMANIA
Launceston
Tasmania
Legend
------ Limits of the DA
• red marker indicates location of an individual shipwreck
• numbered blue and yellow markers indicate the number of shipwrecks at that location
Shipwrecks within the Described Area
Esso
General guidance only from publically available sources. No liability is taken for inaccuracies of data.



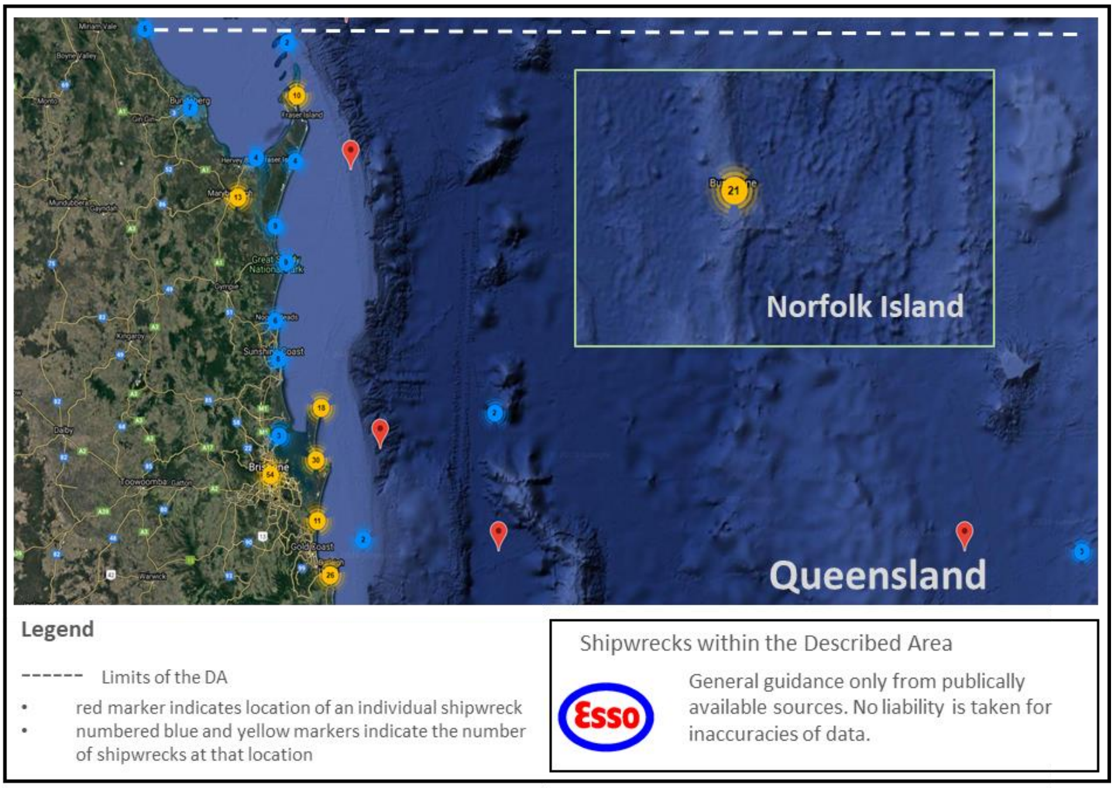


Figure 2-67 Shipwreck sites in the DA as listed in the National Shipwrecks Database (DoEE, 2019)

Table 2-49 lists the shipwrecks within the ATBA; five of these are along the coastline and none occur within the exclusion zones of the production facilities.

Table 2-49 Shipwrecks within the Area to Be Avoided.

Vessel Name	Year wrecked	Location Latitude	Location Longitude
Struan Sailing vessel	1856	-38.5	147.75
Rembrandt Sailing vessel	1861	-38.67	148.2
Talark	unknown	-38.37	148.3
Favourite Sailing Vessel	1852	-38.215	147.95
Unidentified (ID 6719)*	unknown	-37.98	147.79
Latrobe Sailing Vessel*	1978	-37.97	147.79
Pretty Jane*	1882	-38.045	147.64
Norfolk Screw Steamer*	1914	-38.055	147.61
Julius*	1892	-38.09	147.565
Leven Lass	1854	-38.165	148.46
Colleen Bawn	1913	-38.265	147.425

* *Coastal shipwrecks*

Some historic shipwrecks lie within protected or no-entry zones. These zones cover an area around a wreck site, and ensure that a fragile or sensitive historic shipwreck is actively managed.

Five of the historic shipwreck protected zones occur within nearshore coastal waters of the DA (Figure 2-68):

- SS Alert (1893)
- Clonmel (1841)
- SS Glenelg (1900),
- SS Federal (1901) and
- M24 (Japanese Midget Submarine) (1942)
- AHS Centaur (1943)
- Aarhus (1894)

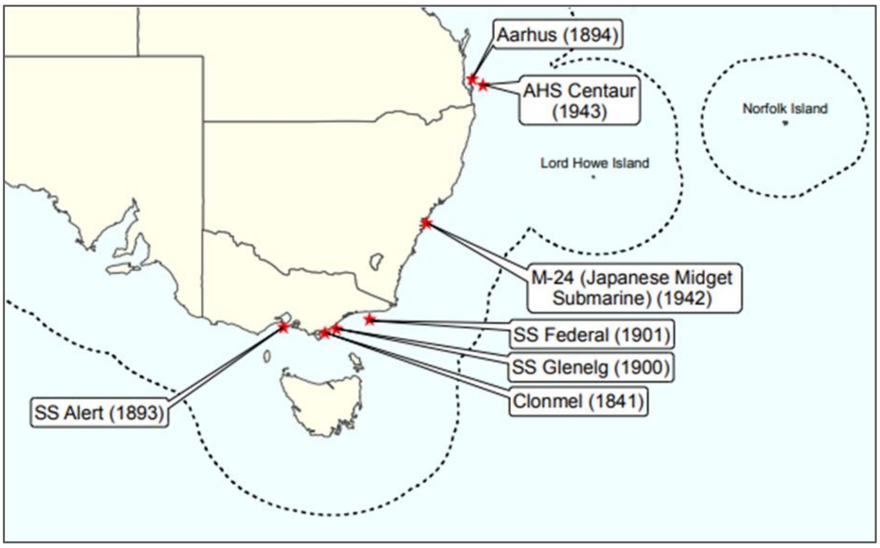


Figure 2-68 Historic Shipwreck Protected Zones within DA (ERIN, 2017)

The SS Glenelg, located approximately 10km from the EGBPA at the entrance to Gippsland Lakes, was a twin screw steamer owned by J.B.Ellerker. It was put on the coastal run during 1893 in opposition to Huddart Parker's S.S. Despatch. The vessel foundered suddenly on 25 March 1900, shortly after leaving Lakes Entrance. Only three people got ashore in a lifeboat. At the Marine Court of Inquiry, a number of possible reasons for the disaster were suggested. However, no evidence was found to explain the sinking, which took 38 lives.

The Clonmel is a famous Australian historic shipwreck located at the entrance to Corner Inlet approximately 60km west of the EGBPA. The luxury paddle steamer Clonmel was one of the first steamships to operate in Australian waters and was built especially for the Australian intercolonial passenger trade, intending to ply the sea-route between Sydney, Melbourne and Launceston in the early 1840s. It was also one of the last wooden steamships to be built before iron became the more popular construction material.

On just its second inter-colonial voyage, en route from Sydney to Port Phillip (Melbourne) with 80 passengers and crew, the Clonmel stuck a sandbar on the east coast of Victoria. All passengers were transferred to the shore, where a makeshift survivors' camp was established. The passengers stayed for nine days after the wrecking, before being finally transferred to their destination.

Favourable descriptions of the arable land and 'welcoming bay' near the wrecksite were seized upon with great enthusiasm by the press and shortly thereafter the Gipps Land Company was formed. The wreck of the Clonmel was consequently instrumental in opening up East Gippsland for trade and pastoral settlement, and throughout the 1850s and 1860s was the centre of trade for south eastern Victoria (DOEE, 2019). Little is known about the SS Federal other than it was last seen in Cape Everand off Bass Strait. It was discovered during mine sweeping operations in World War I.

Both the M24 submarine and the AHS Centaur were wrecks resulting from World War II. No one knew of the fate of the M24 until it was discovered in 2006. It was last seen leaving Sydney in May 1942. The AHS Centaur was a merchant ship converted to an Australian Hospital Ship (AHS) but was torpedoed on its first medical voyage by the Japanese resulting in 268 casualties (DAWE, 2020f). The Aarhus, wrecked in 1894 was an Iron sailing Barque which sailed from New York and wrecked on Smith Rock off cape Morton whilst waiting for a pilot vessel. It is now a popular dive site as the wreck is in 21m of water (DEHP, 2020).

2.6 Social Environment

The Social values of the environment can be defined in many ways and the relative importance of the values will vary depending on the perspective and interests of the people, groups or organisations affected (or otherwise). Social values, therefore can be described in terms of conservation and biodiversity values (Section 2.2), economic drivers (Section 2.4) or cultural significance (Section 2.5). These values have been described in the sections noted. This section describes the values of the recreational activities in the DA.

2.6.1 Recreational Fishing

Recreational fishing in Australia is a multi-billion dollar industry. Most recreational fishing typically occurs in nearshore coastal waters (shore or inshore vessels), and within bays and estuaries. Offshore fishing (>5 km from the coast) only accounts for approximately 4% of recreational fishing activity in Australia; charter fishing vessels are likely to account for the majority of this offshore fishing activity.

The variation in recreational fishing intensity along the coast is illustrated in Figure 2-69; there is moderate to high recreational use along the majority of the coast in the DA. Common recreational fish species include Tiger Flathead, bream, snapper, Australian Salmon, and lobster. Offshore catches can include mackerel, tuna, groper and shark.

Recreational fishing amongst the Nooramunga islands, on the Gippsland Lakes, along Ninety Mile Beach, at Cape Conran Coastal Park and Croajingolong National Park and off the coast of Mallacoota, comprising both boat based fishing and beach based surf fishing. Boat based fishing includes charter operations and private craft launched from boat ramps in the region. Boatyards and slipways are located at Bullock Island (Lakes Entrance), Port Welshpool and Mallacoota.

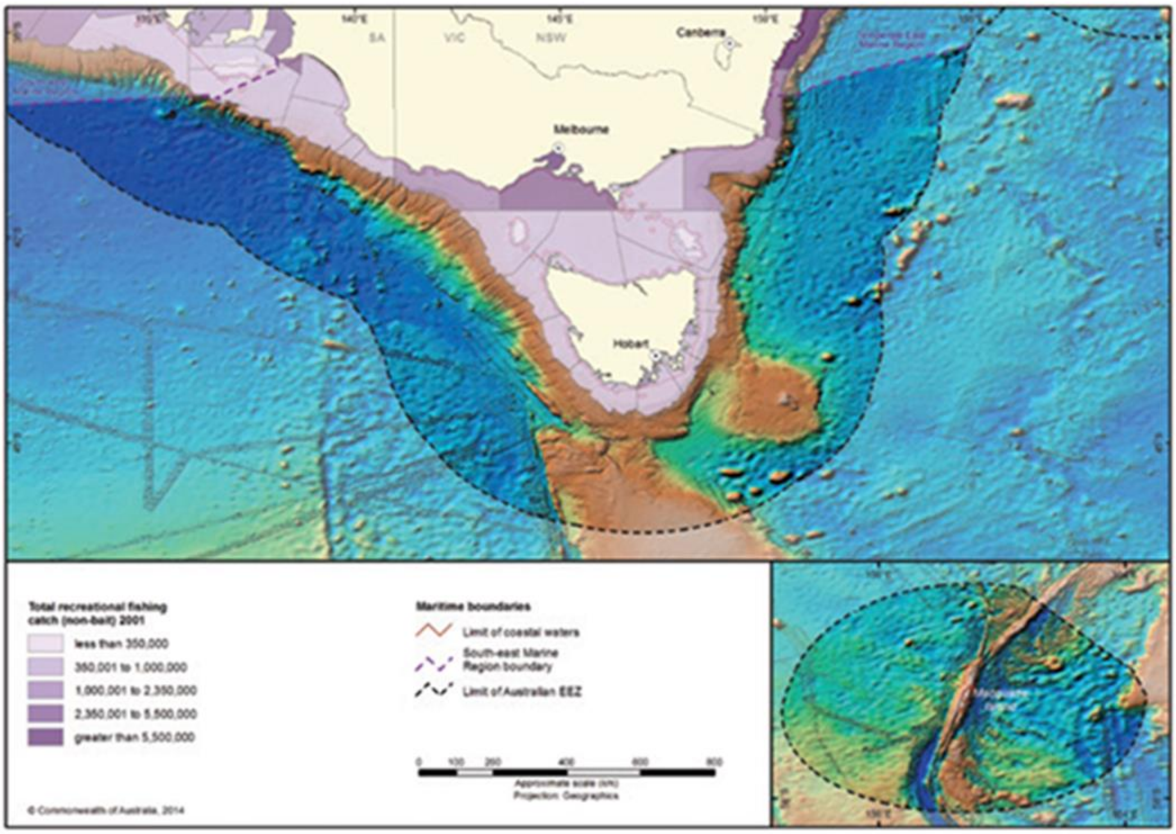


Figure 2-69 Recreational Fishing Catch in Temperate East (top) and South-eastern (bottom) Marine Region (DoEE, 2015a)

2.6.2 Recreational Boating and Leisure Activities

Australia and its people are renowned for their love of the outdoors – the outback and the beaches are often celebrated as part of its (our) cultural identity. With the majority of the population residing in coastal areas, recreational boating, coastal camping, hiking, touring and visits to the beach are leisure activities accessible to all most people and are integral to life in Australia for all ages. Popular coastal destinations are located across the coastline of the DA. Further description of declared parks and reserves are provided in Section 2.2.8.

3 Legislative and other requirements

3.1 Legislative Framework

The principal offshore legislation for production activities beyond three nautical miles to the outer extent of the Australian Exclusive Economic Zone at 200 nautical miles is the Commonwealth Offshore Petroleum and Greenhouse Gas Storage (OPGGS) Act 2006. The OPGGS Act is administered by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

3.2 Relevant Legislation

In accordance with Regulation 13(4), relevant Commonwealth, Victorian, New South Wales and Tasmanian Legislation as it applies to the operation of facilities and petroleum pipelines and projects is provided in Table 3-1, Table 3-2, Table 3-3 and Table 3-4 respectively.

The Australian Petroleum Production and Exploration Association (APPEA) Code of Environmental Practice 2008 provides guidance on a set of recommended minimum standards for petroleum industry activities offshore. These standards are aimed at minimising adverse impact on the environment, and ensuring public health and safety by using the best practical technologies available.

The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000) are also relevant to the activity and provide water quality guidelines proposed to protect and manage the environmental values supported by the water resources.

Table 3-1 Key Commonwealth legislation

Legislation	Coverage and Applicability to Activity		International Convention Enacted	Administering Authority
Offshore Petroleum & Greenhouse Gas Storage Act 2006 & associated regulations (associated regulations include: OPGGS (Environment) Regulations 2009, Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011 [RMAR], Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009)	The *OPGGS Act* addresses all **licensing, health, safety, environmental** and royalty **issues for offshore petroleum exploration and recovery operations** extending beyond the 3 nautical mile limit. The *OPGGS (Environment) Regulations* ensures that petroleum activities are carried out in a manner; consistent with the principles of ecologically sustainable development set out in section 3A of the EPBC Act; and by which the environmental impacts and risks of the activity will be reduced to as low as reasonably practicable and will be of an acceptable level.	All Gippsland facilities operate under an accepted Environment Plan in accordance with the *OPGGS (Environment) Regulations, 2009.* All Gippsland facilities operate under an approved Safety Case per the *OPGGS (Safety) Regulations, 2009*. All wells in Gippsland are operated under an approved Well Operations Management Plan per the *OPGGS (Resource Management and Administration) Regulations 2011* which includes measures for well control as described in Vol 2		National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA)
Environment Protection & Biodiversity Conservation Act 1999	This Act focuses on environmental matters of National Significance, streamlines the Commonwealth environmental assessment and approval process and provides an integrated system for biodiversity conservation and management of protected areas. **Matters of national environmental significance** are world heritage properties; Ramsar wetlands; listed threatened species and communities; migratory species under international agreements; nuclear actions and the	Relevant Matters of National environmental significance covered in Volume 1 – Description of the Environment EPBC Protected matters search tool utilised to identify relevant data Approved conservation advice and management plans relating to listed species or threatened ecological communities have been identified and considered where appropriate	1992 Convention on Biological Diversity & Agenda 21. Convention on International Trade in Endangered Species of Wildlife and Flora 1973 (CITES). Japan/Australia Migratory Birds Agreement 1974 (JAMBA). China/Australia Migratory Birds Agreement 1974 (CAMBA).	Department of Agriculture, Water and the Environment (DAWE) For petroleum activities in Commonwealth waters, National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA)

Legislation	Coverage and Applicability to Activity		International Convention Enacted	Administering Authority
	commonwealth marine environment. On 28 February 2014, NOPSEMA became the sole designated assessor of petroleum and greenhouse gas activities in Commonwealth waters in accordance with the Ministers for the Environment's endorsement of NOPSEMA' s environmental authorisation process under Part 10, Section 146 of the EPBC Act.		Republic of Korea Migratory Birds Agreement 2006 (ROKAMBA). USSR-Australia Migratory Bird Agreement. Convention on Wetlands of International Importance especially waterfowl habitat 1971 (Ramsar). International Convention on Whaling 1946. Convention on the Migratory Species of Wild Animals (Bonn Convention) 1979. Convention concerning the Protection of the World Cultural and Natural Heritage 1972.	
Environment Protection (Sea Dumping) Act 1981	Act prevents the deliberate **disposal of wastes** (loading, dumping, and incineration) **at sea** from vessels, aircraft, and operational areas.	Activities described in this plan are controlled to prevent actions that would contravene this Act. Relevant control measures are described in Vol 2 and the implementation strategy is described in Vol 4.	Convention on the Prevention of Marine Pollution by dumping of waste & other materials 1972 (London Convention) MARPOL	Department of Agriculture, Water and the Environment (DAWE)
Australian Maritime Safety Authority Act 1990	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	Oil spill preparedness and response plans for dealing with a potential worst case scenario spill is described in Vol 3 including consultation and coordination of activities with AMSA	International Convention on Oil Pollution (Preparedness, Response and Cooperation) 1990 (OPRC)	Australian Maritime Safety Authority (AMSA)

Legislation	Coverage and Applicability to Activity		International Convention Enacted	Administering Authority
	emergencies. Requirements are given effect through AMSA.			
Historic Shipwrecks Act 1976	Protects the heritage values of shipwrecks and relics.	Heritage listed shipwrecks within the DA are identified in Vol 1.	Convention on Conservation of Nature in the South Pacific (APIA Convention) 1976. Aust-Netherlands Agreement concerning old Dutch Shipwrecks 1972. Convention on Protection of Underwater Cultural Heritage 2001.	Department of Agriculture, Water and the Environment (DAWE)
National Environment Protection Council Act 1994 Associated act: National Environment Protection Measures (Implementation) Act 1998	Council develops (in conjunction with other state authorities) through the Intergovernmental Agreement on the Environment on consistent environmental standards to be adopted between states. These requirements take the form of National Environment Pollution Measures (NEPMs) such as **National Pollutant Inventory.**	Standards required under the NEPM are used to define operating limits and reporting of emissions required by the National Pollutant Inventory is conducted annually for all Esso operated activities covered by this plan.		Natural Resources Management Ministerial Council / Environment Protection & Heritage Council
National Greenhouse and Energy Reporting Act 2007	Provides for the reporting and dissemination of information related to greenhouse gas emissions, greenhouse gas projects, energy production and energy consumption.	Annual submission covering Gippsland activities provided to Clean Energy Regulator	United Nations Framework Convention on Climate Change,1992, and the Kyoto Protocol	Clean Energy Regulator
Protection of the Sea (Prevention of Pollution from Ships) Act 1983	Regulates ship-related operational activities and invokes certain requirements of the MARPOL convention relating to discharge of noxious liquid substances, sewage, garbage, air pollution etc.	Activities described in this plan are controlled to prevent actions that would contravene this Act. Relevant control measures are described in Vol 2 and the implementation strategy is described in Vol 3	International Convention for the Prevention of Pollution from Ships [MARPOL 73/78] provisions and unified interpretations of the articles, protocols and Annexes of MARPOL 73/78, including the	Australian Maritime Safety Authority (AMSA)

Legislation	Coverage and Applicability to Activity		International Convention Enacted	Administering Authority
			incorporation of all of the amendments that have been adopted by the MEPC and have entered into force, up to and including the 2000 amendments (as adopted by resolution MEPC 89(45)).	
Biosecurity Act 2015	The Act is about managing diseases and pests that may cause harm to human, animal or plant health or the environment. It empowers authorities to monitor, authorise, respond to and control biosecurity risks for the movement of goods, vessels and people to **prevent the introduction, establishment or spread of diseases or pests** affecting human beings, animals, or plants.	The risk of introduction of Invasive Marine Species is considered and managed for all vessels covered under this activity as described in Vol 2.	International Convention for the Control and Management of Ships Ballast Water & Sediments 2004 United Nations Convention on the Law of the Sea 1982 Convention on Biological Diversity 1992	Department of Agriculture, Water and the Environment (DAWE)
Navigation Act 2012	Regulates ship-related activities and invokes certain requirements of the MARPOL convention relating to **equipment and construction of ships**.	Vessels operating within the permit areas comply with the requirements of the Navigation Act. Specifically in relation to environment protection, activities relating to control of discharges are discussed in Vol 2.	International Convention for the Prevention of Pollution from Ships [MARPOL 73/78] (certain sections) Convention on the International Regulations for Preventing Collisions at Sea 1972	Department of Infrastructure, Regional Development and Cities(DoIRDC) /AMSA (formerly Department of Infrastructure & Regional Development)
Coastal Waters (State Powers) Act 1980	This Act transferred **constitutional power over coastal waters**, and title to seabed minerals within territorial	Consultation, reporting and other matters impacting coastal waters are addressed with State authorities as described in Vol 4		Geoscience Australia (Maritime Boundaries Advice Unit)

Legislation	Coverage and Applicability to Activity		International Convention Enacted	Administering Authority
	limits, from the Commonwealth to the States.			
Protection of the Sea (Harmful Anti-fouling Systems) Act 2006	Regulates the use of harmful **anti-fouling systems employed on vessels** and their effects on the marine environment.	The risk of introduction of Invasive Marine Species is considered and managed for all vessels covered under this activity as described in Vol 2. This includes consideration of appropriate antifouling systems.	International Convention on the Control of Harmful Anti-fouling Systems on Ships 2001	AMSA
Native Title Act 1993	Allows for **recognition of native title** through a claims and mediation process and also sets up regimes for obtaining interests **in lands or waters** where native title may exist.	Native Title within the DA is identified and recognised in Vol 1.		Attorney-General's Department
Civil Aviation Act 1988 and associated regulations (including Civil Aviation Safety Regulations 1998)	The Act sets up a Civil Aviation Safety Authority with functions to regulate the safety of civil aviation, including the carrying of dangerous goods, airworthiness standards for aviation, maintenance; general operational and flight rules; and aerial application operations.	Rotary wing aircraft servicing the Gippsland facilities operate under the requirements of CASA. This contributes to safe operation and transport of goods thereby reducing risk of incidents which could have environmental impacts as described in Vol 2.	Chicago Convention 1944.	Civil Aviation Safety Authority (CASA)
Radiocommunications Act 1992	The Act provides for the **management of the radiofrequency spectrum** in order to make adequate provision of the spectrum for use by agencies involved in the defence or national security of Australia, law enforcement or the provision of emergency services; and for use by the public or community services.	Radiocommunications systems on platforms, vessels and aircraft operate within frequency ranges permitted under the Act. Clear communication channels are required to enable effective controls preventing or limiting potential impacts from incidents (e.g., collision, emergency response) as defined in Vol 2 and Vol 3		Australian Communications and Media Authority (ACMA)

Legislation	Coverage and Applicability to Activity		International Convention Enacted	Administering Authority
		Prevention of collision		

Table 3-2 Key Victorian legislation

Legislation	Coverage
Environment Protection Act 1970	This Act is the key Victorian Legislation regulating emissions to the environment within Victoria (relevant for waste transfer and disposal, National Pollutant Inventory reporting). Administered by the Victorian Environment Protection Authority.
Pollution of Waters by Oil and Noxious Substances Act 1986	This Act is the Victorian state legislation giving effect to the requirements of MARPOL 73/78 within state waters. Administered by the Victorian Environment Protection Authority
Emergency Management Act 1986	This Act ensures that the components of emergency management (prevention, response and recovery) are organised to facilitate planning, preparedness, operational coordination and community participation. Administered by Department of Justice's Police and Emergency Management Division.
Port Management Act 1995	Under this Act all managers of local and commercial ports must prepare a Safety Management Plan and Environmental Management Plan (together known as SEMPs).
Marine Safety Act 2010	This Act provides for safe marine operations in Victoria.
Heritage Act 1995	This Act is the Victorian state legislation which protects the heritage values of shipwrecks and relics within state waters. Administered by the Heritage Council of Victoria.
National Parks Act 1975	This Act provides for the protection, use and management of Victoria's national and other parks. Administered by the Department of Environment and Primary Industries.
Radiation Act 2005	This Act provides for licencing for use and management of radioactive sources, and conducting radiation practice (including radiation testing).
Catchment and Land Protection Act 1994	This Act sets up a framework for the integrated management and protection of catchments. Administered by the Catchment Management Authorities.
Coastal Management Act 1995	This Act provides for co-ordinated strategic planning and management for Victorian coast, the preparation and implementation of management plans for coastal Crown land and a co-ordinated approach to approvals for use and development of coastal Crown land.
Land Titles Validation Act 1994	This Act validates past acts, provides for compensation rights for the holders of native title which has been affected by past acts, and confirms certain existing rights. The Act also confirms ownership by the Crown of natural resources, the right to regulate water flows and

Legislation	Coverage
	existing fishing rights under State law; and public access to waterways, beds and banks of waterways, coastal waters, beaches and public areas.
Dangerous Goods Act 1985	This Act, the associated Dangerous Goods (Storage and Handling) Regulations 2012 and the Code of Practice for the Storage and Handling of Dangerous Goods 2013 (WorkSafe) promotes the safety of persons and property in relation to the manufacture, storage, transfer, transport, sale, purchase and use of dangerous goods and the import of explosives and other dangerous goods.
OPGGS Act 2010 and OPGGS Regulations 2011	This Act and Regulations apply to petroleum operations effectively within three nautical miles of the Victorian coast and address licensing, health, safety, environmental and royalty issues for offshore petroleum exploration and development operations. Waters greater than 3 nautical miles offshore from the coast are Commonwealth waters and are covered by Commonwealth legislation (*OPGGS Act 2006*). The Commonwealth and Victorian legislation are, by agreement, very similar with regard to petroleum.

Table 3-3 Key New South Wales legislation

Legislation	Coverage
Protection of the Environment Operations Act 1997	This is the main piece of NSW environmental legislation covering water, land, air and noise pollution and waste management. Administered by the NSW Environment Protection Authority
Marine Pollution Act 2012	This Act is the NSW state legislation giving effect to the requirements of MARPOL 73/78 within state waters. Administered by Transport for NSW.
Ports and Maritime Administration Act 1995	This Act provides for the provision of marine safety services and emergency environment protection services for dealing with pollution incidents in NSW waters.
Heritage Act 1977	This Act provides for the identification, registration and interim protection of items of State heritage significance (including shipwrecks within state waters) in NSW. Administered by Heritage Council of NSW.
National Parks and Wildlife Act 1974	This Act provides for the care, control and management of all national parks, historic sites, nature reserves, conservation reserves, Aboriginal areas and game reserves, and the protection and care of native flora and fauna, and Aboriginal places and objects. Administered by the NSW National Parks and Wildlife Service.
Wilderness Act 1987	This Act affords declared wilderness the most secure level of protection, requiring it to be managed in a way that will maintain its wilderness values and pristine condition by limiting activities likely to damage flora, fauna and cultural heritage. Administered by the NSW National Parks and Wildlife Service.
Marine Parks Act 1997	This Act provides for the protection and management of marine areas. Administered by the NSW Marine Parks Authority.

Table 3-4 Key Tasmanian legislation

Legislation	Coverage
Environmental Management and Pollution Control Act 1994	This is the primary environment protection and pollution control legislation in Tasmania. Administered by the Environment Protection Authority Tasmania
Pollution of Waters by Oil and Noxious Substances Act 1987	This Act is the Tasmanian state legislation giving effect to the requirements of MARPOL 73/78 within state waters. Administered by Environment Protection Authority Tasmania.
Emergency Management Act 2006	This Act establishes the Tasmanian emergency management framework which operates at state, regional and municipal levels.
Marine and Safety Authority Act 1997	This Act establishes Marine and Safety Tasmania as the authority responsible for the safe No probs. operation of vessels in Tasmanian waters and managing its marine facilities.
Historic Cultural Heritage Act 1995	This Act provides for the identification, assessment, protection and conservation of places having historic cultural heritage significance (including shipwrecks within state waters) in Tasmania. Administered by Tasmanian Heritage Council and Historic Heritage Section of Parks and Wildlife Service Tasmania (shipwrecks).
National Parks and Reserves Management Act 2002	This Act provides for the management of national parks and other reserved land. Administered by the Parks and Wildlife Service Tasmania.

APPENDIX A – Esso's Environmental Policy

INTRODUCTION

The high quality of the directors, officers, and employees of Exxon Mobil Corporation is the Corporation's greatest strength. The resourcefulness, professionalism, and dedication of those directors, officers, and employees make the Corporation competitive in the short term and well positioned for ongoing success in the long term.

The Corporation's directors, officers, and employees are responsible for developing, approving, and implementing plans and actions designed to achieve corporate objectives. The methods we employ to attain results are as important as the results themselves. The Corporation's directors, officers, and employees are expected to observe the highest standards of integrity in the conduct of the Corporation's business.

The Board of Directors of the Corporation has adopted and oversees the administration of the Corporation's *Standards of Business Conduct*. The policies in the *Standards of Business Conduct* are the foundation policies of the Corporation. Wholly-owned and majority-owned subsidiaries of Exxon Mobil Corporation generally adopt policies similar to the Corporation's foundation policies. Thus, the Corporation's foundation policies collectively express the Corporation's expectations and define the basis for the worldwide conduct of the businesses of the Corporation and its majority-owned subsidiaries.

The directors, officers, and employees of Exxon Mobil Corporation are expected to review these foundation policies periodically and apply them to all of their work. The Corporation publishes from time to time guidelines with respect to selected policies. Those guidelines are interpretive and administrative and are not part of the *Standards of Business Conduct*. Any employee who has questions concerning any aspect of these policies should not hesitate to seek answers from management or the other sources indicated in the section below called "Procedures and Open Door Communication."

No one in the ExxonMobil organization has the authority to make exceptions or grant waivers with respect to the foundation policies. Regardless of how much difficulty we encounter or pressure we face in performing our jobs, no situation can justify the willful violation of these policies. Our reputation as a corporate citizen depends on our understanding of and compliance with these policies.

Darren W. Woods
Chairman
January 2017

ENVIRONMENT POLICY

It is Exxon Mobil Corporation's policy to conduct its business in a manner that is compatible with the balanced environmental and economic needs of the communities in which it operates. The Corporation is committed to continuous efforts to improve environmental performance throughout its operations.

Accordingly, the Corporation's policy is to:

- comply with all applicable environmental laws and regulations and apply responsible standards where laws and regulations do not exist;
- encourage concern and respect for the environment, emphasize every employee's responsibility in environmental performance, and foster appropriate operating practices and training;
- work with government and industry groups to foster timely development of effective environmental laws and regulations based on sound science and considering risks, costs, and benefits, including effects on energy and product supply;
- manage its business with the goal of preventing incidents and of controlling emissions and wastes to below harmful levels; design, operate, and maintain facilities to this end;
- respond quickly and effectively to incidents resulting from its operations, in cooperation with industry organizations and authorized government agencies;
- conduct and support research to improve understanding of the impact of its business on the environment, to improve methods of environmental protection, and to enhance its capability to make operations and products compatible with the environment;
- communicate with the public on environmental matters and share its experience with others to facilitate improvements in industry performance;
- undertake appropriate reviews and evaluations of its operations to measure progress and to foster compliance with this policy.

APPENDIX B – References

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APPENDIX C – EPBC Act Search Reports

Australian Government

Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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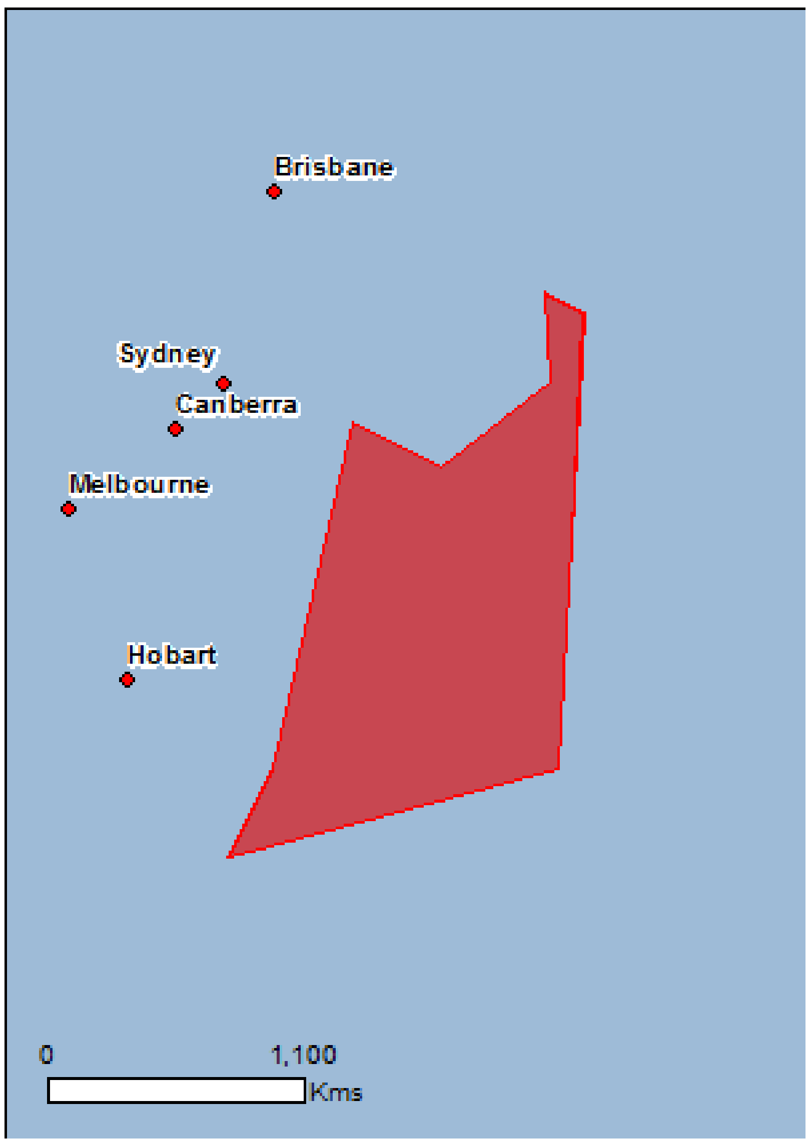
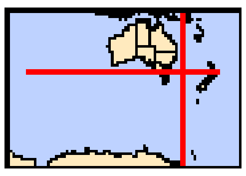


Coordinates

Buffer: 1.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	36
Listed Migratory Species:	41

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	34
Whales and Other Cetaceans:	40
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	None
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	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 the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
Extended Continental Shelf

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	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	Species or species habitat likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	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 may occur within

Name	Status	Type of Presence
		area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pterodroma heraldica Herald Petrel [66973]	Critically Endangered	Species or species habitat may 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
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat 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	Species or species habitat likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Foraging, feeding or related behaviour likely

Name	Status	Type of Presence
		to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat may 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 may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat may occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species

[Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat may occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
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 likely to occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Foraging, feeding or related behaviour likely to 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	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat 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	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat likely to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
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 may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Phocoena dioptrica Spectacled Porpoise [66728]		Species or species habitat may 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
Calidris canutus Red Knot, Knot [855]	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]

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Anous stolidus Common Noddy [825]		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 melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat may occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may 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	Species or species habitat likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat likely to occur

Name	Threatened	Type of Presence
		within 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
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat may 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 may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat may occur within

Name	Threatened	Type of Presence
		area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat 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	Species or species habitat 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]		Species or species habitat may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may 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
Hyperoodon planifrons Southern Bottlenose Whale [71]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia simus Dwarf Sperm Whale [58]		Species or species habitat may occur within area

Name	Status	Type of Presence
Lagenorhynchus cruciger Hourglass Dolphin [42]		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]	Vulnerable	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 ginkgodens Gingko-toothed Beaked Whale, Gingko-toothed Whale, Gingko Beaked Whale [59564]		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
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
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area
Phocoena dioptrica Spectacled Porpoise [66728]		Species or species habitat may 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
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area

Name	Status	Type of Presence
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area
Tasmacetus shepherdi Shepherd's Beaked Whale, Tasman Beaked Whale [55]		Species or species habitat may 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

Extra Information

Caveat

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

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

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

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

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Acknowledgements

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-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
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-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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Australian Government

Department of the Environment and Energy

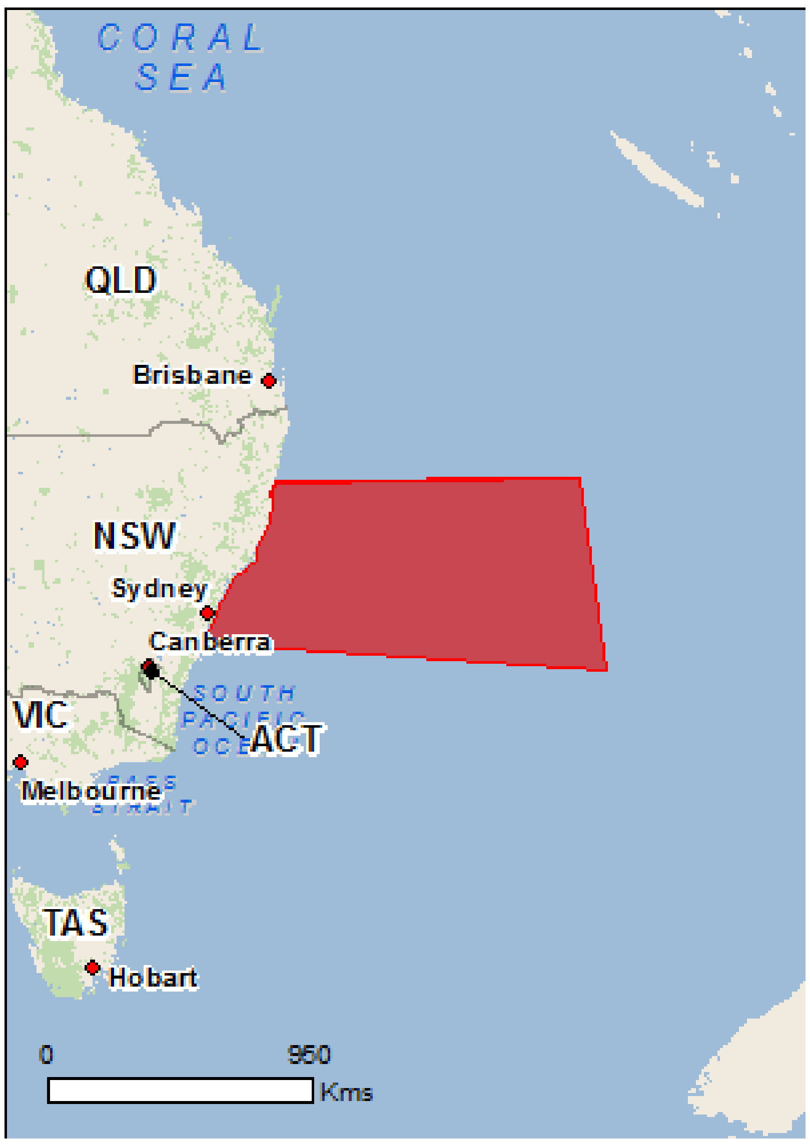
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

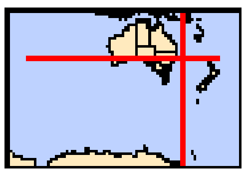
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 27/05/19 20:16:47



Coordinates

Buffer: 1.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	1
National Heritage Places:	8
Wetlands of International Importance:	3
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	10
Listed Threatened Species:	152
Listed Migratory Species:	91

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	21
Commonwealth Heritage Places:	19
Listed Marine Species:	138
Whales and Other Cetaceans:	40
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	11

Extra Information

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

State and Territory Reserves:	42
Regional Forest Agreements:	1
Invasive Species:	58
Nationally Important Wetlands:	7
Key Ecological Features (Marine)	5

Details

Matters of National Environmental Significance

World Heritage Properties [Resource Information]

Name	State	Status
Lord Howe Island Group	NSW	Declared property

National Heritage Properties [Resource Information]

Name	State	Status
Natural		
Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves	NSW	Listed place
Lord Howe Island Group	NSW	Listed place
Royal National Park and Garawarra State Conservation Area	NSW	Listed place
Historic		
Bondi Beach	NSW	Listed place
Kamay Botany Bay: botanical collection sites	NSW	Listed place
Kurnell Peninsula Headland	NSW	Listed place
North Head - Sydney	NSW	Listed place
Bondi Surf Pavilion	NSW	Within listed place

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Hunter estuary wetlands	Within 10km of Ramsar
Myall lakes	Within Ramsar site
Towra point nature reserve	Within 10km of Ramsar

Commonwealth Marine Area [Resource Information]

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

Name
EEZ and Territorial Sea
Extended Continental Shelf

Marine Regions [Resource Information]

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

Name
Temperate East

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Central Hunter Valley eucalypt forest and woodland	Critically Endangered	Community may occur within area
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area
Coastal Upland Swamps in the Sydney Basin Bioregion	Endangered	Community likely to occur within area
Eastern Suburbs Banksia Scrub of the Sydney Region	Endangered	Community known to occur within area
Illawarra and south coast lowland forest and woodland ecological community	Critically Endangered	Community likely to occur within area
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area

Name	Status	Type of Presence
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area
Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion	Endangered	Community likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion	Endangered	Community may occur within area

Listed Threatened Species

[Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia		
Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris		
Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius leschenaultii		
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus		
Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Dasyornis brachypterus		
Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
Diomedea antipodensis		
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni		
Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora		
Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans		
Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi		
Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Erythrotriorchis radiatus		
Red Goshawk [942]	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	Breeding known to occur within area
Grantiella picta		
Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Hypotaenidia sylvestris Lord Howe Woodhen [87732]	Endangered	Breeding likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may 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
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma heraldica Herald Petrel [66973]	Critically Endangered	Species or species habitat likely to occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Breeding known to occur within area
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Breeding known to occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding likely to occur within area
Strepera graculina crissalis Lord Howe Island Currawong, Pied Currawong (Lord Howe Island) [25994]	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 bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Status	Type of Presence
Thalassarche cauta steadi		
White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita		
Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini		
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Fish		
Epinephelus daemelii		
Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Maccullochella peelii		
Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Macquaria australasica		
Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Prototroctes maraena		
Australian Grayling [26179]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Heleioporus australiacus		
Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat known to occur within area
Litoria aurea		
Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area
Litoria littlejohni		
Littlejohn's Tree Frog, Heath Frog [64733]	Vulnerable	Species or species habitat likely to occur within area
Mixophyes balbus		
Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area
Mixophyes iteratus		
Giant Barred Frog, Southern Barred Frog [1944]	Endangered	Species or species habitat may occur within area
Insects		
Argynnis hyperbius inconstans		
Australian Fritillary [88056]	Critically Endangered	Species or species habitat likely to occur within area
Dryococelus australis		
Lord Howe Island Phasmid, Land Lobster [66752]	Critically Endangered	Species or species habitat known to occur within area
Phyllodes imperialis smithersi		
Pink Underwing Moth [86084]	Endangered	Species or species habitat may occur within area
Mammals		

Name	Status	Type of Presence
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 may occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Chalinolobus dwyeri		
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area
Dasyurus maculatus maculatus (SE mainland population)		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Isoodon obesulus obesulus		
Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern) [68050]	Endangered	Species or species habitat known to occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Petauroides volans		
Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
Petrogale penicillata		
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus		
Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat known to occur within area
Pseudomys novaehollandiae		
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Other		
Gudeoconcha sophiae magnifica		
Magnificent Helicarionid Land Snail [82864]	Critically Endangered	Species or species habitat likely to occur within area
Mystivagor mastersi		
Masters' Charopid Land Snail [81247]	Critically Endangered	Species or species habitat known to occur within area
Placostylus bivaricosus		
Lord Howe Flax Snail, Lord Howe Placostylus [66769]	Endangered	Species or species habitat known to occur within area
Pseudocharopa ledgbirdi		
Mount Lidgbird Charopid Land Snail [85279]	Critically Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Pseudocharopa whiteleggei Whitelegge's Land Snail [81249]	Critically Endangered	Species or species habitat likely to occur within area
Plants		
Acacia bynoeana Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat may occur within area
Acacia courtii Northern Brother Wattle [56299]	Vulnerable	Species or species habitat likely to occur within area
Acacia terminalis subsp. terminalis MS Sunshine Wattle (Sydney region) [88882]	Endangered	Species or species habitat known to occur within area
Acronychia littoralis Scented Acronychia [8582]	Endangered	Species or species habitat likely to occur within area
Allocasuarina defungens Dwarf Heath Casuarina [21924]	Endangered	Species or species habitat known to occur within area
Allocasuarina glareicola [21932]	Endangered	Species or species habitat may occur within area
Allocasuarina portuensis Nielsen Park She-oak [21937]	Endangered	Species or species habitat known to occur within area
Allocasuarina simulans Nabiac Casuarina [21935]	Vulnerable	Species or species habitat likely to occur within area
Allocasuarina thalassoscopica [21927]	Endangered	Species or species habitat known to occur within area
Angophora inopina Charmhaven Apple [64832]	Vulnerable	Species or species habitat may occur within area
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat known to occur within area
Asperula asthenes Trailing Woodruff [14004]	Vulnerable	Species or species habitat likely to occur within area
Asterolasia elegans [56780]	Endangered	Species or species habitat known to occur within area
Caladenia tessellata Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat known to occur within area
Calystegia affinis [48909]	Critically Endangered	Species or species habitat known to occur within area
Commersonia prostrata Dwarf Kerrawang [87152]	Endangered	Species or species habitat may occur within area
Corunastylis insignis Wyong Midge Orchid 1, Variable Midge Orchid 1 [84692]	Critically Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
Corunastylis littoralis Tuncurry Midge Orchid [82945]	Critically Endangered	Species or species habitat likely to occur within area
Cryptocarya foetida Stinking Cryptocarya, Stinking Laurel [11976]	Vulnerable	Species or species habitat may occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat known to occur within area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat known to occur within area
Diploglottis campbellii Small-leaved Tamarind [21484]	Endangered	Species or species habitat may occur within area
Diuris praecox Newcastle Doubletail [55086]	Vulnerable	Species or species habitat likely to occur within area
Elymus multiflorus subsp. kingianus Phillip Island Wheat Grass [82413]	Critically Endangered	Species or species habitat known to occur within area
Endiandra hayesii Rusty Rose Walnut, Velvet Laurel [13866]	Vulnerable	Species or species habitat may occur within area
Eucalyptus camfieldii Camfield's Stringybark [15460]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus parramattensis subsp. decadens Earp's Gum, Earp's Dirty Gum [56148]	Vulnerable	Species or species habitat known to occur within area
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat may occur within area
Geniostoma huttonii [56368]	Endangered	Species or species habitat known to occur within area
Genoplesium baueri Yellow Gnat-orchid [7528]	Endangered	Species or species habitat likely to occur within area
Grevillea caleyi Caley's Grevillea [9683]	Critically Endangered	Species or species habitat likely to occur within area
Grevillea parviflora subsp. parviflora Small-flower Grevillea [64910]	Vulnerable	Species or species habitat may occur within area
Grevillea shiressii [19186]	Vulnerable	Species or species habitat may occur within area
Haloragis exalata subsp. exalata Wingless Raspwort, Square Raspwort [24636]	Vulnerable	Species or species habitat likely to occur within area
Haloragodendron lucasii Hal [6480]	Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Hicksbeachia pinnatifolia Monkey Nut, Bopple Nut, Red Bopple, Red Bopple Nut, Red Nut, Beef Nut, Red Apple Nut, Red Boppel Nut, Ivory Silky Oak [21189]	Vulnerable	Species or species habitat may occur within area
Kunzea rupestris [8798]	Vulnerable	Species or species habitat likely to occur within area
Lepidorrhachis mooreana Little Mountain Palm, Moorei Palm [6388]	Critically Endangered	Species or species habitat known to occur within area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within area
Macadamia tetraphylla Rough-shelled Bush Nut, Macadamia Nut, Rough-shelled Macadamia, Rough-leaved Queensland Nut [6581]	Vulnerable	Species or species habitat known to occur within area
Marsdenia longiloba Clear Milkvine [2794]	Vulnerable	Species or species habitat likely to occur within area
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat known to occur within area
Melaleuca deanei Deane's Melaleuca [5818]	Vulnerable	Species or species habitat may occur within area
Parsonsia dorrigoensis Milky Silkpod [64684]	Endangered	Species or species habitat likely to occur within area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat likely to occur within area
Persoonia hirsuta Hairy Geebung, Hairy Persoonia [19006]	Endangered	Species or species habitat known to occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat known to occur within area
Pimelea curviflora var. curviflora [4182]	Vulnerable	Species or species habitat known to occur within area
Pimelea spicata Spiked Rice-flower [20834]	Endangered	Species or species habitat likely to occur within area
Polystichum moorei Rock Shield Fern [40755]	Endangered	Species or species habitat likely to occur within area
Prasophyllum sp. Wybong (C.Phelps ORG 5269) a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area
Prostanthera askania Tranquillity Mintbush, Tranquility Mintbush [64958]	Endangered	Species or species habitat known to occur within area
Prostanthera densa Villous Mintbush [12233]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Prostanthera junonis Somersby Mintbush [64960]	Endangered	Species or species habitat may occur within area
Pterostylis gibbosa Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat likely to occur within area
Pterostylis saxicola Sydney Plains Greenhood [64537]	Endangered	Species or species habitat may occur within area
Pterostylis sp. Botany Bay (A.Bishop J221/1-13) Botany Bay Bearded Greenhood, Botany Bay Bearded Orchid [64965]	Endangered	Species or species habitat likely to occur within area
Pultenaea aristata [18062]	Vulnerable	Species or species habitat likely to occur within area
Pultenaea glabra Smooth Bush-pea, Swamp Bush-pea [11887]	Vulnerable	Species or species habitat likely to occur within area
Rutidosis heterogama Heath Wrinklewort [13132]	Vulnerable	Species or species habitat known to occur within area
Samadera sp. Moonee Creek (J.King s.n. Nov. 1949) [86885]	Endangered	Species or species habitat likely to occur within area
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat known to occur within area
Tetratheca juncea Black-eyed Susan [21407]	Vulnerable	Species or species habitat known to occur within area
Thelymitra kangaloonica Kangaloon Sun Orchid [81861]	Critically Endangered	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat known to occur within area
Tylophora woollsii [20503]	Endangered	Species or species habitat likely to occur within area
Xylosma parvifolia [48040]	Endangered	Species or species habitat known to occur within area
Zieria granulata Hill Zieria, Hilly Zieria, Illawarra Zieria [17147]	Endangered	Species or species habitat likely to occur within area
Zieria prostrata Headland Zieria [56782]	Endangered	Species or species habitat known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Name	Status	Type of Presence
Christinus guentheri		
Lord Howe Island Gecko, Lord Howe Island Southern Gecko [59250]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Hoplocephalus bungaroides		
Broad-headed Snake [1182]	Vulnerable	Species or species habitat likely to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Oligosoma lichenigera		
Lord Howe Island Skink [82034]	Vulnerable	Species or species habitat known to occur within area
Saiphos reticulatus		
Three-toed Snake-tooth Skink [88328]	Vulnerable	Species or species habitat may occur within area
Sharks		
Carcharias taurus (east coast population)		
Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat known to occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Breeding known to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus		
Common Noddy [825]		Breeding known 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]		Breeding known to occur within area
Ardenna grisea		
Sooty Shearwater [82651]		Breeding known to occur within area
Ardenna pacifica		
Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Ardenna tenuirostris		
Short-tailed Shearwater [82652]		Breeding known to occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat known to occur within area
Diomedea antipodensis		
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
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
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phaethon rubricauda Red-tailed Tropicbird [994]		Breeding known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Sternula albifrons Little Tern [82849]		Breeding known to occur within area
Sula dactylatra Masked Booby [1021]		Breeding known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur

Name	Threatened	Type of Presence
		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 likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Breeding known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		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
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat known to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour 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
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species

Name	Threatened	Type of Presence
		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 subminuta Long-toed Stint [861]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Roosting known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Foraging, feeding or related behaviour 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
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
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]		Breeding known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Thalasseus bergii Crested Tern [83000]		Breeding known to occur

Name	Threatened	Type of Presence
		within area
[Tringa brevipes] Grey-tailed Tattler [851]		Roosting known to occur within area
[Tringa incana] Wandering Tattler [831]		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]		Foraging, feeding or related behaviour known to occur within area
[Xenus cinereus] Terek Sandpiper [59300]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land -
Commonwealth Land - Australian & Overseas Telecommunications Corporation
Commonwealth Land - Australian Postal Commission
Commonwealth Land - Australian Postal Corporation
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Australian Telecommunications Corporation
Commonwealth Land - Commonwealth Bank of Australia
Commonwealth Land - Defence Housing Authority
Commonwealth Land - Defence Service Homes Corporation
Commonwealth Land - Director of War Service Homes
Commonwealth Land - Telstra Corporation Limited
Defence - DEE WHY DEPOT
Defence - HMAS WATSON
Defence - LADY GOWRIE HOUSE
Defence - OFFICES
Defence - PITTWATER DIVING ANNEX (forms part of "RAN Torpedo Range")
Defence - THROSBY TRG DEPOT-PORT KEMBLA
Defence - TRAINING SHIP CONDAMINE
Defence - TS TOBRUK
Defence - Training Depot
Defence - VAUCLUSE TRAINING DEPOT

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Natural		
Malabar Headland	NSW	Listed place
Historic		
Army Cottage with return verandah	NSW	Listed place
Barracks Group HMAS Watson	NSW	Listed place
Bondi Beach Post Office	NSW	Listed place
Cape Baily Lighthouse	NSW	Listed place
Cliff House	NSW	Listed place
Cottage at Macquarie Lighthouse	NSW	Listed place
Defence site - Georges Heights and Middle Head	NSW	Listed place
Macquarie Lighthouse	NSW	Listed place
Macquarie Lighthouse Group	NSW	Listed place
Macquarie Lighthouse Surrounding Wall	NSW	Listed place
Marine Biological Station (former)	NSW	Listed place
Military Road Framework - Defence Land	NSW	Listed place

Name	State	Status
Nobbys Lighthouse	NSW	Listed place
North Head Artillery Barracks	NSW	Listed place
Shark Point Battery	NSW	Listed place
Smoky Cape Lighthouse	NSW	Listed place
Sugarloaf Point Lighthouse	NSW	Listed place
Ten Terminal Regiment Headquarters and AusAid Training Centre	NSW	Listed place

Listed Marine Species

[Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Breeding known to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Breeding likely to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris subminuta Long-toed Stint [861]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur

Name	Threatened	Type of Presence
		within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Roosting 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 gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Eudyptula minor Little Penguin [1085]		Breeding known to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Foraging, feeding or related behaviour 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
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Heteroscelus incanus Wandering Tattler [59547]		Roosting known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Larus dominicanus Kelp Gull [809]		Breeding known to occur within area

Name	Threatened	Type of Presence
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Pelagodroma marina White-faced Storm-Petrel [1016]		Breeding known to occur within area
Phaethon rubricauda Red-tailed Tropicbird [994]		Breeding known to occur within area

Name	Threatened	Type of Presence
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may 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
Procelsterna cerulea Grey Noddy, Grey Ternlet [64378]		Breeding known to occur within area
Pterodroma nigripennis Black-winged Petrel [1038]		Breeding known to occur within area
Pterodroma solandri Providence Petrel [1040]		Breeding known to occur within area
Puffinus assimilis Little Shearwater [59363]		Breeding known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Breeding known to occur within area
Puffinus griseus Sooty Shearwater [1024]		Breeding known to occur within area
Puffinus pacificus Wedge-tailed Shearwater [1027]		Breeding known to occur within area
Puffinus tenuirostris Short-tailed Shearwater [1029]		Breeding known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Roosting known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna albifrons Little Tern [813]		Breeding known to occur within area
Sterna bergii Crested Tern [816]		Breeding known to occur within area
Sula dactylatra Masked Booby [1021]		Breeding known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed	Vulnerable	Species or species

Name	Threatened	Type of Presence
Albatross [64459]		habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Foraging, feeding or related behaviour known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area
Fish		
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Campichthys tryoni Tryon's Pipefish [66193]		Species or species habitat may occur within area
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area
Corythoichthys ocellatus Orange-spotted Pipefish, Ocellated Pipefish [66203]		Species or species habitat may occur within area
Cosmocampus howensis Lord Howe Pipefish [66208]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus boothae Booth's Pipefish [66218]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippichthys cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish [66228]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Hippichthys heptagonus Madura Pipefish, Reticulated Freshwater Pipefish [66229]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		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
Hippocampus kelloggi Kellogg's Seahorse, Great Seahorse [66723]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]		Species or species habitat known to occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Kimblaeus bassensis Trawl Pipefish, Bass Strait Pipefish [66247]		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
Micrognathus andersonii Anderson's Pipefish, Shortnose Pipefish [66253]		Species or species habitat may occur within area
Micrognathus brevirostris thorntail Pipefish, Thorn-tailed Pipefish [66254]		Species or species habitat may occur within area
Microphis manadensis Manado Pipefish, Manado River Pipefish [66258]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Solegnathus dunckeri Duncker's Pipehorse [66271]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		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
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		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
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known

Name	Threatened	Type of Presence
		to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera 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 likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may 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 Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may 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

Name	Status	Type of Presence
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Hyperoodon planifrons Southern Bottlenose Whale [71]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia simus Dwarf Sperm Whale [58]		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]	Vulnerable	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 ginkgodens Gingko-toothed Beaked Whale, Gingko-toothed Whale, Gingko Beaked Whale [59564]		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
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
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may 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

Name	Status	Type of Presence
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area
Tasmacetus shepherdi Shepherd's Beaked Whale, Tasman Beaked Whale [55]		Species or species habitat may 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]

Name	Label
Central Eastern	Habitat Protection Zone (IUCN IV)
Central Eastern	Multiple Use Zone (IUCN VI)
Central Eastern	National Park Zone (IUCN II)
Cod Grounds	National Park Zone (IUCN II)
Hunter	Habitat Protection Zone (IUCN IV)
Hunter	Special Purpose Zone (Trawl) (IUCN VI)
Lord Howe	Habitat Protection Zone (IUCN IV)
Lord Howe	Habitat Protection Zone (Lord Howe)
Lord Howe	Multiple Use Zone (IUCN VI)
Lord Howe	National Park Zone (IUCN II)
Solitary Islands	Special Purpose Zone (Trawl) (IUCN VI)

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Arakoon	NSW
Awabakal	NSW
Bird Island	NSW
Bongil Bongil	NSW
Boondelbah	NSW
Booti Booti	NSW
Botany Bay	NSW
Bouddi	NSW
Coffs Coast	NSW
Crowdy Bay	NSW
Darawank	NSW
Five Islands	NSW
Gaagal Wanggaan (South Beach)	NSW
Goolawah	NSW
Gumma	NSW

Name	State
Hat Head	NSW
Jagun	NSW
John Gould	NSW
Kattang	NSW
Ku-ring-gai Chase	NSW
LNE Special Management Zone No1	NSW
Lake Innes	NSW
Limeburners Creek	NSW
Little Broughton Island	NSW
Lord Howe Island	NSW
Malabar Headland	NSW
Munmorah	NSW
Muttonbird Island	NSW
Myall Lakes	NSW
North Head	NSW
Queens Lake	NSW
Royal	NSW
Sea Acres	NSW
Seal Rocks	NSW
Shark Island	NSW
Stormpetrel	NSW
Sydney Harbour	NSW
Tomaree	NSW
Valla	NSW
Wamberal Lagoon	NSW
Worimi	NSW
Wyrrabalong	NSW

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Turdus philomelos Song Thrush [597]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Rattus rattus		
Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa		
Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes		
Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides		
Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia		
Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus		
Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides		
Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus		
Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Asparagus scandens		
Asparagus Fern, Climbing Asparagus Fern [23255]		Species or species habitat likely to occur within area
Cabomba caroliniana		
Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera		
Bitou Bush, Boneseed [18983]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. monilifera		
Boneseed [16905]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata		
Bitou Bush [16332]		Species or species habitat likely to occur within area
Cytisus scoparius		
Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Dolichandra unguis-cati		
Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Eichhornia crassipes		
Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista linifolia		
Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista monspessulana		
Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom		Species or species habitat likely to occur

Name	Status	Type of Presence
[20126]		within area
Genista sp. X Genista monspessulana		
Broom [67538]		Species or species habitat may occur within area
Lantana camara		
Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum		
African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana		
Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma		
Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Opuntia spp.		
Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata		
Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate		
Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla		
Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii		
Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta		
Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis		
Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Solanum elaeagnifolium		
Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area
Ulex europaeus		
Gorse, Furze [7693]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus		
Asian House Gecko [1708]		Species or species habitat likely to occur within area

Nationally Important Wetlands

[Resource Information]

Name	State
Avoca Lagoon	NSW
Clybucca Creek Estuary	NSW
Cockrone Lagoon	NSW
Crowdy Bay National Park	NSW

Name	State
Five Islands Nature Reserve	NSW
Limeburners Creek Nature Reserve	NSW
Port Stephens Estuary	NSW

Key Ecological Features (Marine) [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
Canyons on the eastern continental slope	Temperate east
Lord Howe seamount chain	Temperate east
Shelf rocky reefs	Temperate east
Tasman Front and eddy field	Temperate east
Tasmantid seamount chain	Temperate east

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

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

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

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

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

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

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

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

Coordinates
-34.643629 150.895723,-34.63911 150.901216,-34.643629 150.901216,-34.317606 150.939668,-34.135932 151.131929,-33.981202 151.258272,-33.625167 151.291231,-33.524479 151.401094,-32.885611 151.818574,-32.742495 152.186616,-32.668539 152.208589,-32.432395 152.538179,-32.21887 152.565645,-32.139831 152.521699,-31.397281 152.961152,-30.856522 153.054536,-30.64881 152.999605,-30.288982 153.092988,-30.175077 162.936738,-35.381463 163.793672,-34.643629 150.895723

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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EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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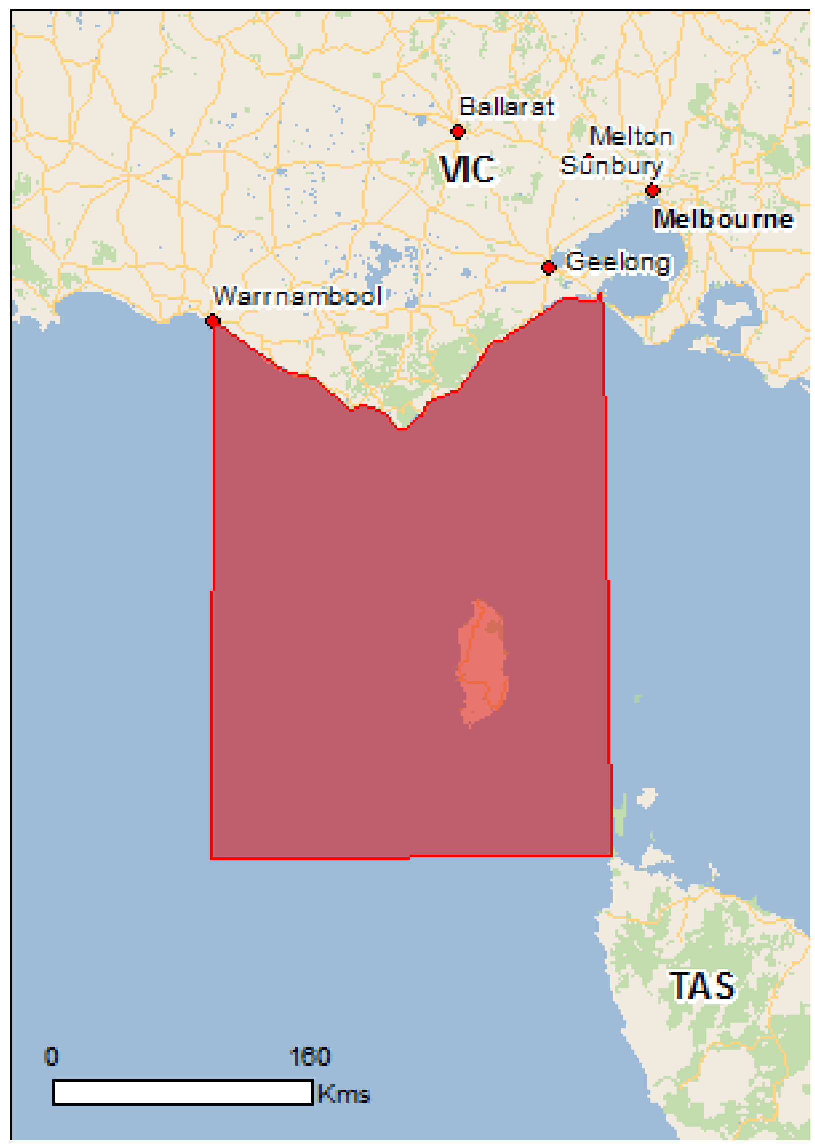

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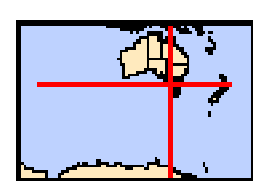

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	2
Wetlands of International Importance:	2
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	8
Listed Threatened Species:	98
Listed Migratory Species:	69

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	1
Commonwealth Heritage Places:	1
Listed Marine Species:	113
Whales and Other Cetaceans:	29
Critical Habitats:	1
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	4

Extra Information

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

State and Territory Reserves:	63
Regional Forest Agreements:	2
Invasive Species:	52
Nationally Important Wetlands:	11
Key Ecological Features (Marine)	1

Details

Matters of National Environmental Significance

National Heritage Properties [Resource Information]

Name	State	Status
Historic		
Great Ocean Road and Scenic Environs	VIC	Listed place
Point Nepean Defence Sites and Quarantine Station Area	VIC	Listed place

Wetlands of International Importance (Ramsar) [Resource Information]

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 the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

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

Name
South-east

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community	Endangered	Community likely to occur within area
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 likely 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
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
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]

Name	Status	Type of Presence
Birds		
Acanthiza pusilla archibaldi		
King Island Brown Thornbill, Brown Thornbill (King Island) [59430]	Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
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
Aquila audax fleayi Tasmanian Wedge-tailed Eagle, Wedge-tailed Eagle (Tasmanian) [64435]	Endangered	Breeding likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting 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	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route 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 likely to 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, Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding likely 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 cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Breeding known to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini		
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis rubricollis		
Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat known to occur within area
Tyto novaehollandiae castanops (Tasmanian population)		
Masked Owl (Tasmanian) [67051]	Vulnerable	Species or species habitat known to occur within area
Crustaceans		
Astacopsis gouldi		
Giant Freshwater Crayfish, Tasmanian Giant Freshwater Lobster [64415]	Vulnerable	Species or species habitat may occur within area
Fish		
Galaxiella pusilla		
Eastern Dwarf Galaxias, Dwarf Galaxias [56790]	Vulnerable	Species or species habitat likely to occur within area
Maccullochella peelii		
Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Nannoperca obscura		
Yarra Pygmy Perch [26177]	Vulnerable	Species or species habitat likely to occur within area
Prototroctes maraena		
Australian Grayling [26179]	Vulnerable	Species or species habitat known to occur within area
Frogs		
Litoria raniformis		
Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog [1828]	Vulnerable	Species or species habitat known to occur within area
Insects		
Synemon plana		
Golden Sun Moth [25234]	Critically Endangered	Species or species habitat may occur within area
Mammals		
Antechinus minimus maritimus		
Swamp Antechinus (mainland) [83086]	Vulnerable	Species or species habitat known to occur within area
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	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

Name	Status	Type of Presence
Dasyurus maculatus maculatus (Tasmanian population) Spotted-tail Quoll, Spot-tailed Quoll, Tiger Quoll (Tasmanian population) [75183]	Vulnerable	Species or species habitat known to occur within area
Dasyurus viverrinus Eastern Quoll, Luaner [333]	Endangered	Species or species habitat may 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
Megaptera novaeangliae Humpback Whale [38]	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]	Vulnerable	Species or species habitat known to occur within area
Perameles gunnii gunnii Eastern Barred Bandicoot (Tasmania) [66651]	Vulnerable	Species or species habitat likely to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat known to occur within area
Pseudomys fumeus Smoky Mouse, Konoom [88]	Endangered	Species or species habitat likely to 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	Foraging, feeding or related behaviour likely to occur within area
Sarcophilus harrisii Tasmanian Devil [299]	Endangered	Species or species habitat likely to occur within area
Plants		
Amphibromus fluitans River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat likely to occur within area
Caladenia caudata Tailed Spider-orchid [17067]	Vulnerable	Species or species habitat likely to occur within area
Diuris lanceolata Snake Orchid [10231]	Endangered	Species or species habitat known to occur within area
Glycine latrobeana Clover Glycine, Purple Clover [13910]	Vulnerable	Species or species

Name	Status	Type of Presence
		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
Hypolepis distans Scrambling Ground-fern [2148]	Endangered	Species or species habitat likely to occur within area
Ixodia achillaeoides subsp. arenicola Sand Ixodia, Ixodia [21474]	Vulnerable	Species or species habitat may 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 Pepper-cress [10976]	Vulnerable	Species or species habitat likely to 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 frenchii Maroon Leek-orchid, Slaty Leek-orchid, Stout Leek-orchid, French's Leek-orchid, Swamp Leek-orchid [9704]	Endangered	Species or species habitat likely to occur within area
Prasophyllum secutum Northern Leek-orchid [64954]	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 likely to occur within area
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
Senecio psilocarpus Swamp Fireweed, Smooth-fruited Groundsel [64976]	Vulnerable	Species or species habitat likely to occur within area
Taraxacum cygnorum Coast Dandelion [2508]	Vulnerable	Species or species habitat likely 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 likely to occur

Name	Status	Type of Presence
		within area
Xerochrysum palustre Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Listed Migratory Species

[Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
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
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	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Sternula 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 cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Breeding known 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 likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Breeding known to 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
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	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species

Name	Threatened	Type of Presence
		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]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		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]		Breeding known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur

Name	Threatened	Type of Presence
		within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting 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
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
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 Land [Resource Information]

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

Name
Commonwealth Land -

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Historic		
Cape Wickham Lighthouse	TAS	Listed place

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
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
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Catharacta skua Great Skua [59472]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
[Charadrius bicinctus](#) Double-banded Plover [895]		Roosting known to occur within area
[Charadrius leschenaultii](#) Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
[Charadrius mongolus](#) Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
[Charadrius ruficapillus](#) Red-capped Plover [881]		Roosting known to occur within area
[Chrysococcyx osculans](#) Black-eared Cuckoo [705]		Species or species habitat known to occur within area
[Diomedea antipodensis](#) Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea epomophora](#) Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[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]		Roosting 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
[Haliaeetus leucogaster](#) White-bellied Sea-Eagle [943]		Breeding known to occur within area
[Halobaena caerulea](#) Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
[Heteroscelus brevipes](#) Grey-tailed Tattler [59311]		Roosting known to occur within area
[Himantopus himantopus](#) Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area
[Hirundapus caudacutus](#) White-throated Needletail [682]		Species or species habitat known to occur within area
[Larus novaehollandiae](#) Silver Gull [810]		Breeding known to occur within area
[Larus pacificus](#) Pacific Gull [811]		Breeding known to occur within area
[Lathamus discolor](#) Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur

Name	Threatened	Type of Presence
		within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat likely 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
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
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
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

Name	Threatened	Type of Presence
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Puffinus tenuirostris Short-tailed Shearwater [1029]		Breeding known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Roosting known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna albifrons Little Tern [813]		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 cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Breeding known to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat known to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area
Fish		
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, 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
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

Name	Threatened	Type of Presence
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
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
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Breeding likely to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Name	Threatened	Type of Presence
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area

Whales and other Cetaceans

[Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata		
Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera 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 Dophin, 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
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 simus		
Dwarf Sperm Whale [58]		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]	Vulnerable	Species or species

Name	Status	Type of Presence
		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
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

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]

Name	Label
Apollo	Multiple Use Zone (IUCN VI)
Franklin	Multiple Use Zone (IUCN VI)
Zeehan	Multiple Use Zone (IUCN VI)
Zeehan	Special Purpose Zone (IUCN VI)

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Aire River	VIC
Aire River W.R.	VIC
Albatross Island	TAS
Anglesea B.R.	VIC
Anglesea Heath	VIC
Badger Box Creek	TAS
Bay of Islands Coastal Park	VIC
Breamlea F.F.R.	VIC
Cape Wickham	TAS
Cape Wickham	TAS
Christmas Island	TAS
City of Melbourne Bay	TAS
Colliers Forest Reserve	TAS
Colliers Swamp	TAS
Councillor Island	TAS
Counsel Hill	TAS
Currie Lightkeepers Residence	TAS
Deep Lagoons	TAS
Disappointment Bay	TAS
Edna Bowman N.C.R.	VIC
Eldorado	TAS
Gentle Annie	TAS
Great Otway National Park	VIC
Hunter Island	TAS
Kentford Forest	TAS
Kentford Forest	TAS
Kentford Road	TAS
King Island	TAS
Lake Connewarre W.R	VIC
Lake Flannigan	TAS
Lavinia	TAS
Lily Lagoon	TAS
Lily Pond B.R.	VIC
Loorana	TAS
Lymwood	TAS
Marengo N.C.R.	VIC
Millwood Road	TAS
Muddy Lagoon	TAS
New Year Island	TAS
Nugara	TAS
Pegarah	TAS
Pegarah Forest	TAS
Point Nepean National Park	VIC
Port Campbell National Park	VIC
Queenscliff N.F.R	VIC
Red Hut Point	TAS
Red Hut Road #1	TAS
Reekara	TAS
Sandfly Beach	TAS
Sea Elephant	TAS
Sea Elephant Bootlace	TAS
Sea Elephant River	TAS
Seal Rocks	TAS
Seal Rocks	TAS
Stokes Point	TAS
Stony Creek (Otways)	VIC
Tambar	TAS
Tathams Lagoon	TAS
The Doughboys	TAS
Unnamed P0176	VIC
Wicks Road Nugara	TAS
Wild Dog Creek SS.R.	VIC
Yambacoona	TAS

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
Tasmania RFA	Tasmania
West Victoria RFA	Victoria

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Callipepla californica California Quail [59451]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Meleagris gallopavo Wild Turkey [64380]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Pavo cristatus Indian Peafowl, Peacock [919]		Species or species habitat likely to occur within area
Phasianus colchicus Common Pheasant [920]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Turdus philomelos Song Thrush [597]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Asparagus scandens Asparagus Fern, Climbing Asparagus Fern [23255]		Species or species habitat likely to occur within area
Austrocylindropuntia spp. Prickly Pears [85132]		Species or species habitat likely to occur within area
Carrichtera annua Ward's Weed [9511]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Bungaree Lagoon	TAS
Lake Connewarre State Wildlife Reserve	VIC
Lake Flannigan	TAS
Lavinia Nature Reserve	TAS
Lower Aire River Wetlands	VIC
Pearshape Lagoon 1	TAS
Pearshape Lagoon 2	TAS
Pearshape Lagoon 3	TAS
Pearshape Lagoon 4	TAS
Princetown Wetlands	VIC
Swan Bay & Swan Island	VIC

Key Ecological Features (Marine) [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

Caveat

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

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

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

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-38.391427 142.485689,-38.404342 142.513154,-38.602087 142.863344,-38.636422 143.054231,-38.758606 143.223146,-38.770385 143.261598,-38.748968 143.309663,-38.757535 143.374208,-38.783232 143.431886,-38.857059 143.50879,-38.853851 143.552736,-38.792866 143.624147,-38.795007 143.648866,-38.74147 143.676332,-38.685749 143.826021,-38.687893 143.839753,-38.544109 143.985322,-38.533367 143.974336,-38.466733 144.045747,-38.466733 144.089692,-38.462432 144.119905,-38.430165 144.139131,-38.425862 144.177583,-38.281554 144.430269,-38.291255 144.612916,-38.264304 144.639009,-38.304188 144.655488,-40.681912 144.699434,-40.686078 142.469209,-38.386045 142.485689,-38.391427 142.485689

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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EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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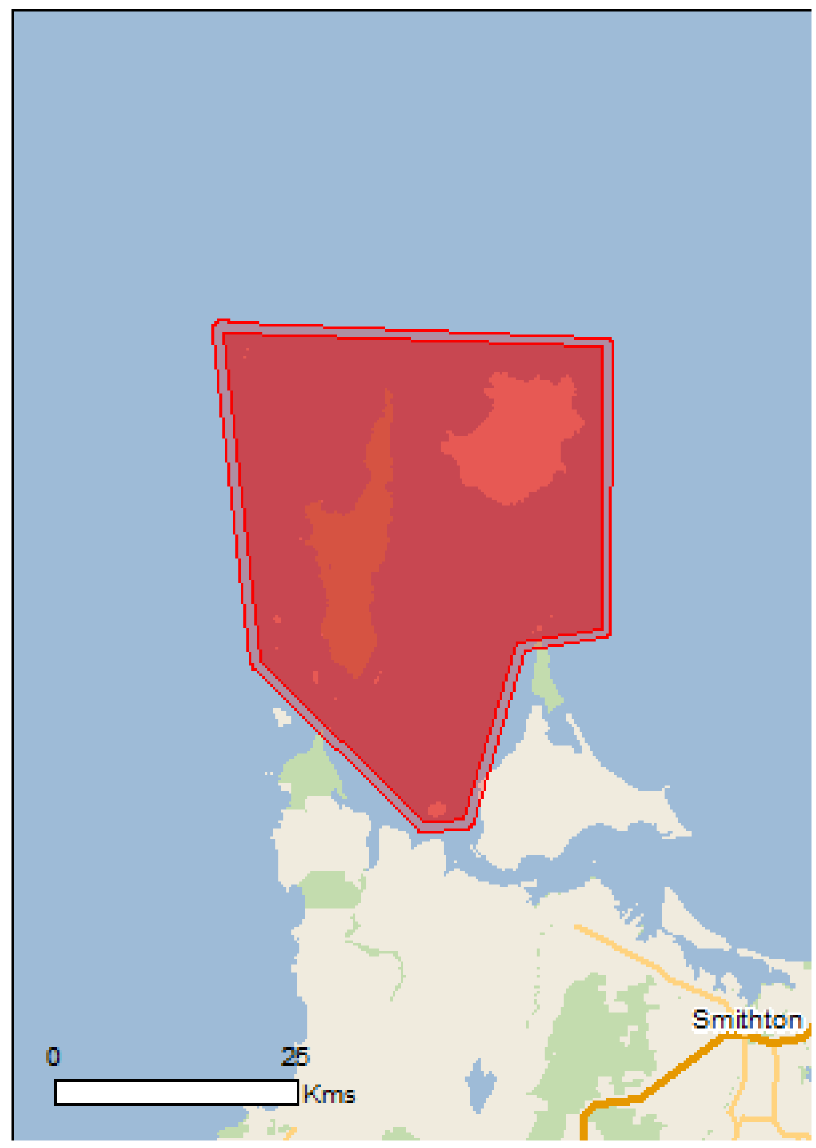

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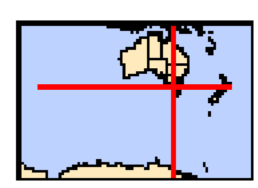

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	58
Listed Migratory Species:	60

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	99
Whales and Other Cetaceans:	13
Critical Habitats:	1
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	10
Regional Forest Agreements:	1
Invasive Species:	21
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	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 the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

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

Name
South-east

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Giant Kelp Marine Forests of South East Australia	Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Aquila audax fleayi		
Tasmanian Wedge-tailed Eagle, Wedge-tailed Eagle (Tasmanian) [64435]	Endangered	Breeding likely to occur within area
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat likely 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 tenuirostris		
Great Knot [862]	Critically Endangered	Roosting known to occur within area
Ceyx azureus diemenensis		
Tasmanian Azure Kingfisher [25977]	Endangered	Species or species habitat likely to occur within area
Charadrius leschenaultii		
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus		
Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur

Name	Status	Type of Presence
		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
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
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route 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
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
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Breeding known to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat known to occur within area
Tyto novaehollandiae castanops (Tasmanian population) Masked Owl (Tasmanian) [67051]	Vulnerable	Species or species habitat known to occur within area
Crustaceans		
Astacopsis gouldi Giant Freshwater Crayfish, Tasmanian Giant Freshwater Lobster [64415]	Vulnerable	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
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Litoria raniformis Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog [1828]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Dasyurus maculatus maculatus (Tasmanian population) Spotted-tail Quoll, Spot-tailed Quoll, Tiger Quoll (Tasmanian population) [75183]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Dasyurus viverrinus Eastern Quoll, Luaner [333]	Endangered	Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Sarcophilus harrisii Tasmanian Devil [299]	Endangered	Species or species habitat likely to occur within area
Plants		
Caladenia caudata Tailed Spider-orchid [17067]	Vulnerable	Species or species habitat likely to occur within area
Caladenia dienema Windswept Spider-orchid [64858]	Endangered	Species or species habitat may occur within area
Diuris lanceolata Snake Orchid [10231]	Endangered	Species or species habitat likely to occur within area
Prasophyllum atratum Three Hummock Leek-orchid [82677]	Critically Endangered	Species or species habitat known to 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 known to occur within area
Pterostylis ziegeleri Grassland Greenhood, Cape Portland Greenhood [64971]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
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
Hydroprogne caspia Caspian Tern [808]		Breeding 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	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Breeding known 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 likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely

Name	Threatened	Type of Presence
		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
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]		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
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area

Name	Threatened	Type of Presence
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 may occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting 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
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
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
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
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
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
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely

Name	Threatened	Type of Presence
		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
Eudyptula minor Little Penguin [1085]		Breeding known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting 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
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area
Larus pacificus Pacific Gull [811]		Breeding known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
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	Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
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
Phalacrocorax fuscescens Black-faced Cormorant [59660]		Breeding known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		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
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Puffinus tenuirostris Short-tailed Shearwater [1029]		Breeding known to occur within area
Sterna albifrons Little Tern [813]		Species or species habitat may occur within area
Sterna caspia Caspian Tern [59467]		Breeding known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Breeding known to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat known to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area
Fish		
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, 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
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

Name	Threatened	Type of Presence
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys semistriatus Halfbanded Pipefish [66261]		Species or species habitat may occur within area
Mitotichthys tuckeri Tucker's Pipefish [66262]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus robustus Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within 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
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		

Name	Threatened	Type of Presence
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
Reptiles		
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
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]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		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

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Albatross Island	TAS
Bird Island	TAS
Harbour Islets	TAS
Hunter Island	TAS
Kangaroo Island	TAS
Penguin Islet	TAS
Petrel Islands	TAS
Seacrow Islet	TAS
Stack Island	TAS
Three Hummock Island	TAS

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
Tasmania RFA	Tasmania

Invasive Species [Resource Information]

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

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

Name	Status	Type of Presence
Pavo cristatus Indian Peafowl, Peacock [919]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Plants		
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Caveat

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

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

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

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-40.360133 144.632349,-40.35804 144.632349,-40.360133 144.632349,-40.370597 144.985285,-40.569095 144.983911,-40.578483 144.905634,-40.70353 144.856195,-40.705612 144.819116,-40.593084 144.668054,-40.360133 144.632349

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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EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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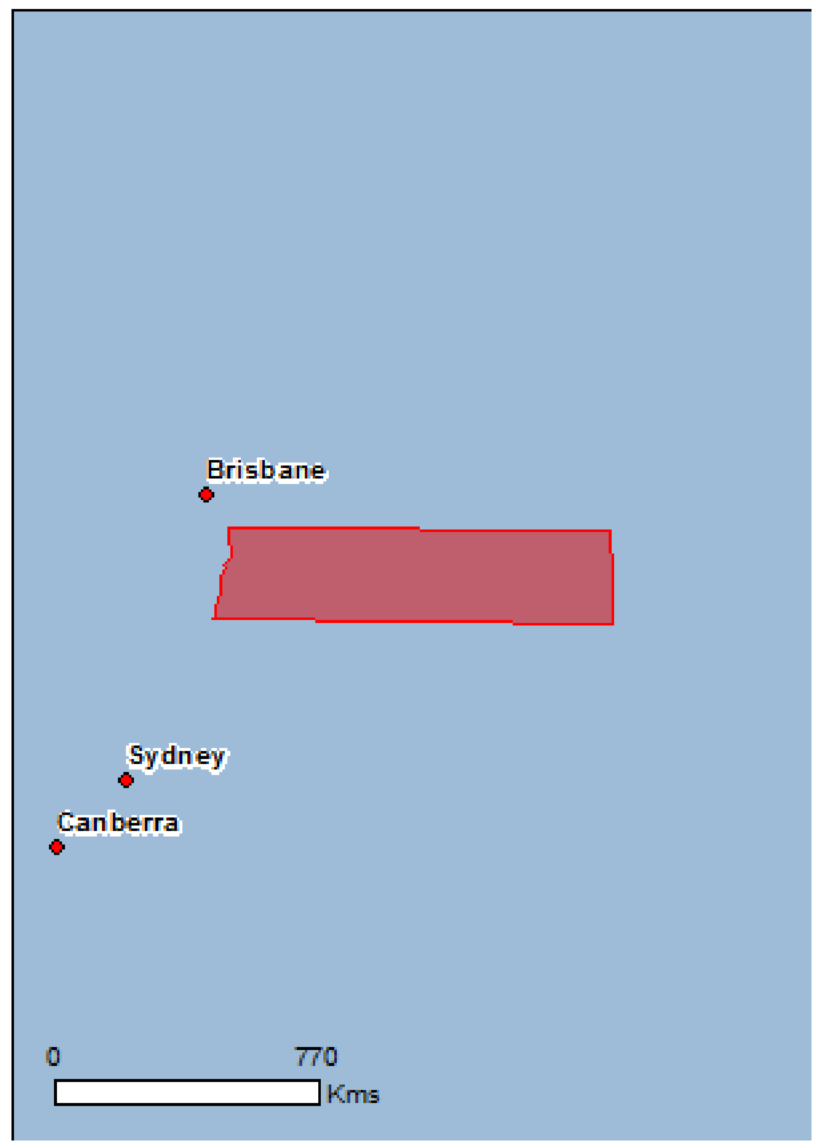

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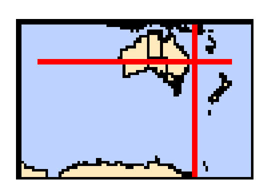

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	107
Listed Migratory Species:	89

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	1
Listed Marine Species:	118
Whales and Other Cetaceans:	36
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	9

Extra Information

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

State and Territory Reserves:	15
Regional Forest Agreements:	1
Invasive Species:	43
Nationally Important Wetlands:	3
Key Ecological Features (Marine)	6

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Elizabeth and middleton reefs marine national nature reserve	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 the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea
Extended Continental Shelf

Marine Regions [Resource Information]

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

Name
Temperate East

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia		
Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris		
Great Knot [862]	Critically Endangered	Roosting known to occur within area

Name	Status	Type of Presence
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Cyclopsitta diophthalma coxeni Coxen's Fig-Parrot [59714]	Endangered	Species or species habitat known to occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	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
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
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat known 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
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
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

Name	Status	Type of Presence
		within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Poephila cincta cincta Southern Black-throated Finch [64447]	Endangered	Species or species habitat may occur within area
Pterodroma heraldica Herald Petrel [66973]	Critically Endangered	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 neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	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 bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat likely to occur within area
Fish		
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Nannoperca oxleyana Oxleyan Pygmy Perch [64468]	Endangered	Species or species habitat known to occur within area
Frogs		
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat known to occur within area
Litoria olongburensis Wallum Sedge Frog [1821]	Vulnerable	Species or species habitat known to occur within area
Mixophyes fleayi Fleay's Frog [25960]	Endangered	Species or species habitat likely to occur within area
Mixophyes iteratus Giant Barred Frog, Southern Barred Frog [1944]	Endangered	Species or species habitat may occur within area
Insects		
Argynnis hyperbius inconstans Australian Fritillary [88056]	Critically Endangered	Species or species habitat likely to occur within area
Phyllodes imperialis smithersi Pink Underwing Moth [86084]	Endangered	Breeding may occur within area
Mammals		
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 may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat likely to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE Mainland) [66645]	Vulnerable	Species or species habitat likely to occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur

Name	Status	Type of Presence
		within area
Xeromys myoides Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat likely to occur within area
Other		
Thersites mitchellae Mitchell's Rainforest Snail [66774]	Critically Endangered	Species or species habitat known to occur within area
Plants		
Acronychia littoralis Scented Acronychia [8582]	Endangered	Species or species habitat likely to occur within area
Allocasuarina thalassoscopica [21927]	Endangered	Species or species habitat known to occur within area
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat known to occur within area
Corokia whiteana [17820]	Vulnerable	Species or species habitat likely to occur within area
Cryptocarya foetida Stinking Cryptocarya, Stinking Laurel [11976]	Vulnerable	Species or species habitat known to occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat likely to occur within area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area
Davidsonia jerseyana Davidson's Plum [67219]	Endangered	Species or species habitat known to occur within area
Davidsonia johnsonii Smooth Davidsonia, Smooth Davidson's Plum, Small-leaved Davidson's Plum [67178]	Endangered	Species or species habitat likely to occur within area
Diploglottis campbellii Small-leaved Tamarind [21484]	Endangered	Species or species habitat may occur within area
Elaeocarpus williamsianus Hairy Quandong [8956]	Endangered	Species or species habitat likely to occur within area
Endiandra floydii Floyd's Walnut [52955]	Endangered	Species or species habitat known to occur within area
Endiandra hayesii Rusty Rose Walnut, Velvet Laurel [13866]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus tetrapleura Square-fruited Ironbark [7490]	Vulnerable	Species or species habitat may occur within area
Floydia praealta Ball Nut, Possum Nut, Big Nut, Beefwood [15762]	Vulnerable	Species or species habitat likely to occur within area
Fontainea australis Southern Fontainea [24037]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Hicksbeachia pinnatifolia Monkey Nut, Bopple Nut, Red Bopple, Red Bopple Nut, Red Nut, Beef Nut, Red Apple Nut, Red Boppel Nut, Ivory Silky Oak [21189]	Vulnerable	Species or species habitat likely to occur within area
Leucopogon confertus Torrington Beard-heath [14417]	Endangered	Species or species habitat likely to occur within area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within area
Macadamia tetraphylla Rough-shelled Bush Nut, Macadamia Nut, Rough-shelled Macadamia, Rough-leaved Queensland Nut [6581]	Vulnerable	Species or species habitat known to occur within area
Marsdenia longiloba Clear Milkvine [2794]	Vulnerable	Species or species habitat likely to occur within area
Ochrosia moorei Southern Ochrosia [11350]	Endangered	Species or species habitat likely to occur within area
Olax angulata Minnie Waters Olax [10666]	Vulnerable	Species or species habitat likely to occur within area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat likely to occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat known to occur within area
Prostanthera palustris Swamp Mint-bush [66703]	Vulnerable	Species or species habitat likely to occur within area
Randia moorei Spiny Gardenia [10577]	Endangered	Species or species habitat known to occur within area
Rutidosis heterogama Heath Wrinklewort [13132]	Vulnerable	Species or species habitat likely to occur within area
Samadera sp. Moonee Creek (J.King s.n. Nov. 1949) [86885]	Endangered	Species or species habitat likely to occur within area
Syzygium hodgkinsoniae Smooth-bark Rose Apple, Red Lilly Pilly [3539]	Vulnerable	Species or species habitat likely to occur within area
Syzygium moorei Rose Apple, Coolamon, Robby, Durobby, Watermelon Tree, Coolamon Rose Apple [12284]	Vulnerable	Species or species habitat known to occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat known to occur within area
Zieria prostrata Headland Zieria [56782]	Endangered	Species or species habitat known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur

Name	Status	Type of Presence
		within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Delma torquata Adorned Delma, Collared Delma [1656]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Furina dunmalli Dunmall's Snake [59254]	Vulnerable	Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sharks		
Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat known to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Breeding may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species

[Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
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]		Species or species habitat known to occur within area
Ardenna pacifica Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
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
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Sternula albifrons Little Tern [82849]		Breeding known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat likely to occur within area
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
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 likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to 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	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding known to occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding likely to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat known to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Breeding may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat known to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
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
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris subminuta Long-toed Stint [861]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Roosting known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting 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
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
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 known to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Thalasseus bergii Crested Tern [83000]		Breeding known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area

Name	Threatened	Type of Presence
Tringa incana Wandering Tattler [831]		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 Heritage Places [Resource Information]

Name	State	Status
Historic		
Cape Byron Lighthouse	NSW	Listed place

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
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
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris subminuta Long-toed Stint [861]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Roosting 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 gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Eudyptula minor Little Penguin [1085]		Breeding known to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting known to occur within area

Name	Threatened	Type of Presence
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Heteroscelus incanus Wandering Tattler [59547]		Roosting known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting known to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat known to occur within area
Puffinus pacificus Wedge-tailed Shearwater [1027]		Breeding known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna albifrons Little Tern [813]		Breeding known to occur within area
Sterna bergii Crested Tern [816]		Breeding known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area
Fish		
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Campichthys tryoni Tryon's Pipefish [66193]		Species or species habitat may occur within area
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area
Corythoichthys ocellatus Orange-spotted Pipefish, Ocellated Pipefish [66203]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Hippichthys cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish [66228]		Species or species habitat may occur within area
Hippichthys heptagonus Madura Pipefish, Reticulated Freshwater Pipefish [66229]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus kelloggi Kellogg's Seahorse, Great Seahorse [66723]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]		Species or species habitat known to 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
Micrognathus andersonii Anderson's Pipefish, Shortnose Pipefish [66253]		Species or species habitat may occur within area
Micrognathus brevirostris thorntail Pipefish, Thorn-tailed Pipefish [66254]		Species or species habitat may occur within area
Microphis manadensis Manado Pipefish, Manado River Pipefish [66258]		Species or species habitat may occur within area
Solegnathus dunckeri Duncker's Pipehorse [66271]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		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
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		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

Name	Threatened	Type of Presence
Mammals		
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Reptiles		
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera 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 likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area

Name	Status	Type of Presence
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may 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
Hyperoodon planifrons Southern Bottlenose Whale [71]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia simus Dwarf Sperm Whale [58]		Species or species habitat may occur within area
Lagenodelphis hosei Fraser's Dolphin, Sarawak Dolphin [41]		Species or species habitat may occur within area
Lissodelphis peronii Southern Right Whale Dolphin [44]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation 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 ginkgodens Gingko-toothed Beaked Whale, Gingko-toothed Whale, Gingko Beaked Whale [59564]		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
Mesoplodon layardii Strap-toothed Beaked Whale, Strap-toothed Whale, Layard's Beaked Whale [25556]		Species or species habitat may occur within area
Orcaella brevirostris Irrawaddy Dolphin [45]		Species or species habitat likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area

Name	Status	Type of Presence
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may 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
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat known to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may 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]

Name	Label
Central Eastern	Habitat Protection Zone (IUCN IV)
Central Eastern	Multiple Use Zone (IUCN VI)
Central Eastern	National Park Zone (IUCN II)
Lord Howe	Multiple Use Zone (IUCN VI)
Lord Howe	National Park Zone (IUCN II)
Lord Howe	Recreational Use Zone (IUCN IV)
Solitary Islands	Multiple Use Zone (IUCN VI)
Solitary Islands	National Park Zone (IUCN II)
Solitary Islands	Special Purpose Zone (Trawl) (IUCN VI)

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Billinudgel	NSW
Broadwater	NSW
Brunswick Heads	NSW
Bundjalung	NSW
Cape Byron	NSW
Coffs Coast	NSW
Julian Rocks Nguthungulli	NSW
Marshalls Creek	NSW
Moonee Beach	NSW

Name	State
North Rock	NSW
North Solitary Island	NSW
North-West Solitary Island	NSW
South West Solitary Island	NSW
Split Solitary Island	NSW
Yuraygir	NSW

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus africanus Climbing Asparagus, Climbing Asparagus Fern [66907]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Dolichandra unguis-cati Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Bundjalung National Park	NSW
Elizabeth and Middleton Reefs	EXT
Solitary Islands Marine Park	NSW

Key Ecological Features (Marine) [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
Canyons on the eastern continental slope	Temperate east
Elizabeth and Middleton reefs	Temperate east
Lord Howe seamount chain	Temperate east
Shelf rocky reefs	Temperate east

Name	Region
Tasman Front and eddy field	Temperate east
Tasmantid seamount chain	Temperate east

Caveat

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

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

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

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-30.263753 153.204456,-30.263753 153.207168,-30.256636 153.157729,-30.190186 153.218154,-30.12369 153.215407,-30.040508 153.223647,-29.890603 153.308791,-29.871552 153.289565,-29.666517 153.35823,-29.64981 153.336257,-29.484975 153.388442,-29.465846 153.377456,-29.365362 153.399428,-29.305502 153.355483,-29.111316 153.498305,-29.084917 153.443374,-28.86867 153.621902,-28.639919 153.654861,-28.52415 153.564223,-28.258365 153.610915,-28.21481 153.580703,-28.212389 153.665881,-28.251107 163.553577,-30.377556 163.619495,-30.263753 153.204456

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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Australian Government

Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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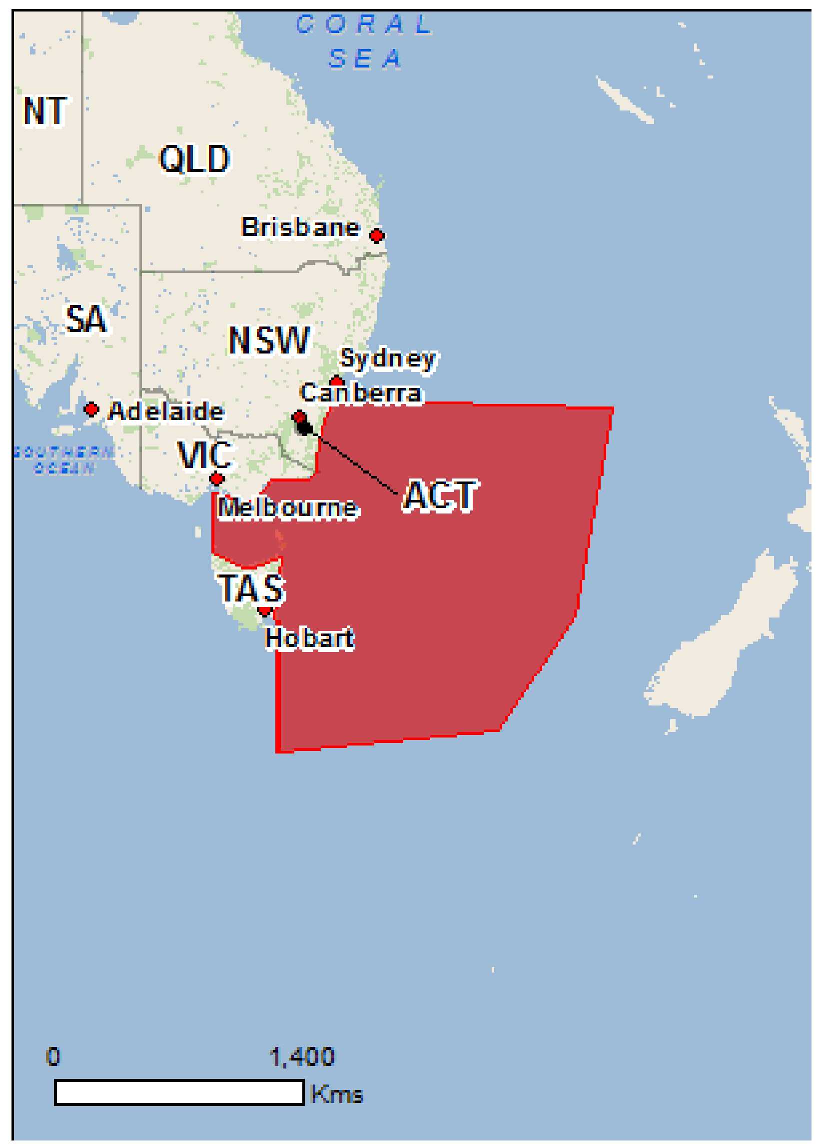
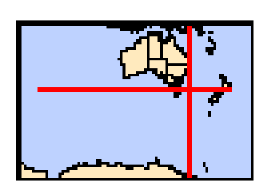


Coordinates

Buffer: 1.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	2
National Heritage Places:	4
Wetlands of International Importance:	11
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	17
Listed Threatened Species:	213
Listed Migratory Species:	91

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	29
Commonwealth Heritage Places:	20
Listed Marine Species:	143
Whales and Other Cetaceans:	38
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	13

Extra Information

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

State and Territory Reserves:	615
Regional Forest Agreements:	5
Invasive Species:	64
Nationally Important Wetlands:	93
Key Ecological Features (Marine)	5

Details

Matters of National Environmental Significance

World Heritage Properties [Resource Information]

Name	State	Status
Australian Convict Sites (Darlington Probation Station Buffer Zone)	TAS	Buffer zone
Australian Convict Sites (Darlington Probation Station)	TAS	Declared property

National Heritage Properties [Resource Information]

Name	State	Status
Historic		
Darlington Probation Station	TAS	Listed place
Point Nepean Defence Sites and Quarantine Station Area	VIC	Listed place
Port Arthur Historic Site	TAS	Listed place
Quarantine Station and Surrounds	VIC	Within listed place

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Apsley marshes	Within Ramsar site
Corner inlet	Within Ramsar site
East coast cape barren island lagoons	Within Ramsar site
Flood plain lower ringarooma river	Within Ramsar site
Gippsland lakes	Within Ramsar site
Jocks lagoon	Within Ramsar site
Little waterhouse lake	Within Ramsar site
Logan lagoon	Within Ramsar site
Moulting lagoon	Within Ramsar site
Port phillip bay (western shoreline) and bellarine peninsula	Within 10km of Ramsar
Western port	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 the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea
Extended Continental Shelf

Marine Regions [Resource Information]

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

Name
South-east
Temperate East

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Alpine Sphagnum Bogs and Associated Fens	Endangered	Community likely to occur within area
Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community	Endangered	Community likely to occur within area
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area

Name	Status	Type of Presence
Eucalyptus ovata - Callitris oblonga Forest	Vulnerable	Community likely to occur within area
Giant Kelp Marine Forests of South East Australia	Endangered	Community likely to occur within area
Gippsland Red Gum (Eucalyptus tereticornis subsp. mediana) Grassy Woodland and Associated Native Grassland	Critically Endangered	Community likely to occur within area
Illawarra and south coast lowland forest and woodland ecological community	Critically Endangered	Community likely to occur within area
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area
Lowland Grassy Woodland in the South East Corner Bioregion	Critically Endangered	Community likely to occur within area
Lowland Native Grasslands of Tasmania	Critically Endangered	Community likely 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 South Eastern Highlands	Critically Endangered	Community may occur within area
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	Critically Endangered	Community likely to occur within area
Southern Highlands Shale Forest and Woodland in the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion	Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area

Listed Threatened Species

[Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Aquila audax fleayi Tasmanian Wedge-tailed Eagle, Wedge-tailed Eagle (Tasmanian) [64435]	Endangered	Breeding likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Ceyx azureus diemenensis Tasmanian Azure Kingfisher [25977]	Endangered	Breeding known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Status	Type of Presence
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Breeding known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Breeding known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	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
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
Pardalotus quadragintus Forty-spotted Pardalote [418]	Endangered	Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pterodroma heraldica Herald Petrel [66973]	Critically Endangered	Species or species habitat likely to occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Breeding known to occur within area

Name	Status	Type of Presence
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding known 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 cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat known to occur within area
Tyto novaehollandiae castanops (Tasmanian population) Masked Owl (Tasmanian) [67051]	Vulnerable	Breeding known to occur within area
Crustaceans		
Astacopsis gouldi Giant Freshwater Crayfish, Tasmanian Giant Freshwater Lobster [64415]	Vulnerable	Species or species habitat known to occur within area
Engaeus granulatus Central North Burrowing Crayfish [78959]	Endangered	Species or species habitat known to occur within area
Engaeus martigener Furneaux Burrowing Crayfish [67220]	Endangered	Species or species habitat known to occur within area
Engaeus yabbimunna Burnie Burrowing Crayfish [66781]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat known to occur within area
Fish		
Brachionichthys hirsutus Spotted Handfish [64418]	Critically Endangered	Species or species habitat may occur within area
Brachiopsilus ziebelli Ziebell's Handfish, Waterfall Bay Handfish [83757]	Vulnerable	Species or species habitat likely to occur within area
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Galaxias fontanus Swan Galaxias [26167]	Endangered	Species or species habitat likely to occur within area
Galaxiella pusilla Eastern Dwarf Galaxias, Dwarf Galaxias [56790]	Vulnerable	Species or species habitat known to occur within area
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat known to occur within area
Thymichthys politus Red Handfish [83756]	Critically Endangered	Species or species habitat likely to occur within area
Frogs		
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat known to occur within area
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area
Litoria littlejohni Littlejohn's Tree Frog, Heath Frog [64733]	Vulnerable	Species or species habitat known to occur within area
Litoria raniformis Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog [1828]	Vulnerable	Species or species habitat known to occur within area
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area
Insects		
Antipodia chaostola leucophaea Tasmanian Chaostola Skipper, Heath-sand Skipper [77672]	Endangered	Species or species habitat known to occur within area
Hoplogonus bornemisszai Bornemissza's Stag Beetle [66754]	Critically Endangered	Species or species habitat known to occur within area
Hoplogonus simsoni Simson's Stag Beetle [66796]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Lissotes latidens Broad-toothed Stag Beetle, Wielangta Stag Beetle [66760]	Endangered	Species or species habitat known to occur within area
Oreixenica ptunarra Ptunarra Brown, Ptunarra Brown Butterfly, Ptunarra Xenica [26327]	Endangered	Species or species habitat may occur within area
Synemon plana Golden Sun Moth [25234]	Critically Endangered	Species or species habitat may occur within area
Mammals		
Antechinus minimus maritimus Swamp Antechinus (mainland) [83086]	Vulnerable	Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known 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
Dasyurus maculatus maculatus (Tasmanian population) Spotted-tail Quoll, Spot-tailed Quoll, Tiger Quoll (Tasmanian population) [75183]	Vulnerable	Species or species habitat known to occur within area
Dasyurus viverrinus Eastern Quoll, Luaner [333]	Endangered	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
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
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Perameles gunnii gunnii Eastern Barred Bandicoot (Tasmania) [66651]	Vulnerable	Species or species habitat known to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous longipes		
Long-footed Potoroo [217]	Endangered	Species or species habitat known to occur within area
Potorous tridactylus tridactylus		
Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat known to occur within area
Pseudomys fumeus		
Smoky Mouse, Konoom [88]	Endangered	Species or species habitat likely to occur within area
Pseudomys novaehollandiae		
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Sarcophilus harrisii		
Tasmanian Devil [299]	Endangered	Translocated population known to occur within area
Other		
Megascolides australis		
Giant Gippsland Earthworm [64420]	Vulnerable	Species or species habitat likely to occur within area
Parvulastra vivipara		
Tasmanian Live-bearing Seastar [85451]	Vulnerable	Species or species habitat likely to occur within area
Tasmanipatus anophthalmus		
Blind Velvet Worm [66773]	Endangered	Species or species habitat known to occur within area
Plants		
Acacia axillaris		
Midlands Mimosa, Midlands Wattle [13563]	Vulnerable	Species or species habitat known to occur within area
Acacia bynoeana		
Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat may occur within area
Acacia caerulescens		
Limestone Blue Wattle, Buchan Blue, Buchan Blue Wattle [21883]	Vulnerable	Species or species habitat known to occur within area
Acacia constablei		
Narrabarba Wattle [10798]	Vulnerable	Species or species habitat known to occur within area
Acacia georgensis		
Bega Wattle [9848]	Vulnerable	Species or species habitat known to occur within area
Amphibromus fluitans		
River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat known to occur within area
Astrotricha crassifolia		
Thick-leaf Star-hair [10352]	Vulnerable	Species or species habitat may occur within area
Banksia vincentia		
[88276]	Critically Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
Barbarea australis Native Wintercress, Riverbed Wintercress [12540]	Endangered	Species or species habitat likely to occur within area
Bertya tasmanica subsp. tasmanica Tasmanian Bertya [78359]	Endangered	Species or species habitat known to occur within area
Boronia deanei Deane's Boronia [8397]	Vulnerable	Species or species habitat known to occur within area
Boronia gunnii Gunn's Boronia, Cataract Gorge Boronia [29394]	Vulnerable	Species or species habitat known to occur within area
Boronia hippopala Velvet Boronia [78925]	Vulnerable	Species or species habitat known to occur within area
Budawangia gnidioides Budawangs Cliff-heath [55850]	Vulnerable	Species or species habitat may occur within area
Caladenia campbellii Thick-stem Caladenia [64857]	Critically Endangered	Species or species habitat known to occur within area
Caladenia caudata Tailed Spider-orchid [17067]	Vulnerable	Species or species habitat known to occur within area
Caladenia dienema Windswept Spider-orchid [64858]	Endangered	Species or species habitat may occur within area
Caladenia lindleyana Lindley's Spider-orchid [9305]	Critically Endangered	Species or species habitat may occur within area
Caladenia orientalis Eastern Spider Orchid [83410]	Endangered	Species or species habitat known to occur within area
Caladenia robinsonii Frankston Spider-orchid [24375]	Endangered	Species or species habitat likely to occur within area
Caladenia tessellata Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat known to occur within area
Caladenia tonellii Robust Fingers [64861]	Critically Endangered	Species or species habitat known to occur within area
Callitris oblonga Pygmy Cypress-pine, Pigmy Cypress-pine, Dwarf Cypress-pine [66687]	Vulnerable	Species or species habitat likely to occur within area
Callitris oblonga subsp. oblonga South Esk Pine [64864]	Endangered	Species or species habitat known to occur within area
Cassinia rugata Wrinkled Cassinia, Wrinkled Dollybush [21885]	Vulnerable	Species or species habitat may occur within area
Colobanthus curtisiae Curtis' Colobanth [23961]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Commersonia prostrata Dwarf Kerrawang [87152]	Endangered	Species or species habitat known to occur within area
Conospermum hookeri Variable Smoke-bush [68161]	Vulnerable	Species or species habitat likely to occur within area
Correa baeuerlenii Chef's Cap [17007]	Vulnerable	Species or species habitat likely to occur within area
Corunastylis brachystachya Short-spiked Midge-orchid [76410]	Endangered	Species or species habitat known to occur within area
Corunastylis firthii Firth's Midge-orchid [76411]	Critically Endangered	Species or species habitat known to occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat known to occur within area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat known to occur within area
Daphnandra johnsonii Illawarra Socketwood [67186]	Endangered	Species or species habitat likely to occur within area
Dianella amoena Matted Flax-lily [64886]	Endangered	Species or species habitat known to occur within area
Diuris lanceolata Snake Orchid [10231]	Endangered	Species or species habitat known to occur within area
Dodonaea procumbens Trailing Hop-bush [12149]	Vulnerable	Species or species habitat known to occur within area
Epacris apsleyensis Apsley Heath [15428]	Endangered	Species or species habitat likely to occur within area
Epacris barbata Bearded Heath, Freycinet Heath [17625]	Endangered	Species or species habitat likely to occur within area
Epacris exserta South Esk Heath [19879]	Endangered	Species or species habitat known to occur within area
Epacris grandis Grand Heath, Tall Heath [18719]	Endangered	Species or species habitat known to occur within area
Epacris limbata Border Heath, Bordered Heath [24011]	Critically Endangered	Species or species habitat known to occur within area
Epacris virgata Pretty Heath, Dan Hill Heath [20375]	Endangered	Species or species habitat known to occur within area
Eucalyptus langleyi Albatross Mallee [56224]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Eucalyptus strzeleckii Strzelecki Gum [55400]	Vulnerable	Species or species habitat likely to occur within area
Euphrasia amphisysepala Shiny Cliff Eyebright [4534]	Vulnerable	Species or species habitat likely to occur within area
Euphrasia collina subsp. muelleri Purple Eyebright, Mueller's Eyebright [16151]	Endangered	Species or species habitat known to occur within area
Euphrasia phragmostoma Buftons Eyebright, Hairy Cliff Eyebright [7720]	Vulnerable	Species or species habitat likely to occur within area
Euphrasia semipicta Peninsula Eyebright [9986]	Endangered	Species or species habitat likely to occur within area
Euphrasia sp. Bivouac Bay (W.R.Barker 7626 et al.) Masked Eyebright, Masked Cliff Eyebright [82044]	Endangered	Species or species habitat known to occur within area
Genoplesium baueri Yellow Gnat-orchid [7528]	Endangered	Species or species habitat known to occur within area
Genoplesium vernale East Lynne Midge-orchid [68379]	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
Grevillea celata Colquhoun Grevillea, Nowa Nowa Grevillea [64907]	Vulnerable	Species or species habitat likely to occur within area
Grevillea parviflora subsp. parviflora Small-flower Grevillea [64910]	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
Irenepharsus trypherus Delicate Cress, Illawarra Irene [14664]	Endangered	Species or species habitat known to occur within area
Leionema ralstonii [64926]	Vulnerable	Species or species habitat likely to occur within area
Lepidium hyssopifolium Basalt Pepper-cress, Peppercress, Rubble Pepper-cress, Pepperweed [16542]	Endangered	Species or species habitat known to occur within area
Leucochrysum albicans var. tricolor Hoary Sunray, Grassland Paper-daisy [56204]	Endangered	Species or species habitat known to occur within area
Limonium australe var. baudinii Baudin's Sea-lavender [86369]	Vulnerable	Species or species habitat likely to occur within area
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat likely to occur within area
Persoonia hirsuta Hairy Geebung, Hairy Persoonia [19006]	Endangered	Species or species habitat may occur within area
Phebalium daviesii Davies' Waxflower, St Helens Waxflower [16959]	Critically Endangered	Species or species habitat known to occur within area
Philotheca freyciana Freycinet Waxflower [68227]	Endangered	Species or species habitat known to occur within area
Pimelea spicata Spiked Rice-flower [20834]	Endangered	Species or species habitat known to occur within area
Pomaderris brunnea Rufous Pomaderris [16845]	Vulnerable	Species or species habitat likely to occur within area
Pomaderris parrisiae Parris' Pomaderris [22119]	Vulnerable	Species or species habitat likely to occur within area
Prasophyllum affine Jervis Bay Leek Orchid, Culburra Leek-orchid, Kinghorn Point Leek-orchid [2210]	Endangered	Species or species habitat likely to occur within area
Prasophyllum apoxychilum Tapered Leek-orchid [64947]	Endangered	Species or species habitat known to occur within area
Prasophyllum atratum Three Hummock Leek-orchid [82677]	Critically Endangered	Species or species habitat known to occur within area
Prasophyllum castaneum Chestnut Leek-orchid [64948]	Critically Endangered	Species or species habitat likely to occur within area
Prasophyllum correctum Gaping Leek-orchid [64533]	Endangered	Species or species habitat likely to occur within area
Prasophyllum frenchii Maroon Leek-orchid, Slaty Leek-orchid, Stout Leek-orchid, French's Leek-orchid, Swamp Leek-orchid [9704]	Endangered	Species or species habitat likely to occur within area
Prasophyllum incorrectum Golfers Leek-orchid [78898]	Critically Endangered	Species or species habitat may occur within area
Prasophyllum limnetes Marsh Leek-orchid [82678]	Critically Endangered	Species or species habitat may occur within area
Prasophyllum pulchellum Pretty Leek-orchid [64953]	Critically Endangered	Species or species habitat known to occur within area
Prasophyllum secutum Northern Leek-orchid [64954]	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

Name	Status	Type of Presence
Prostanthera densa Villous Mintbush [12233]	Vulnerable	Species or species habitat likely to occur within area
Prostanthera galbraithiae Wellington Mintbush [64959]	Vulnerable	Species or species habitat known to occur within area
Pterostylis chlorogramma Green-striped Greenhood [56510]	Vulnerable	Species or species habitat known to occur within area
Pterostylis commutata Midland Greenhood [64535]	Critically Endangered	Species or species habitat may occur within area
Pterostylis cucullata Leafy Greenhood [15459]	Vulnerable	Species or species habitat known to occur within area
Pterostylis gibbosa Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat known to occur within area
Pterostylis pulchella Pretty Greenhood [6448]	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 vernalis Halbury Rustyhood [84711]	Critically Endangered	Species or species habitat known to occur within area
Pterostylis ziegeleri Grassland Greenhood, Cape Portland Greenhood [64971]	Vulnerable	Species or species habitat likely to occur within area
Pultenaea aristata [18062]	Vulnerable	Species or species habitat may occur within area
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat known to occur within area
Senecio psilocarpus Swamp Fireweed, Smooth-fruited Groundsel [64976]	Vulnerable	Species or species habitat may occur within area
Spyridium lawrencei Small-leaf Spyridium [27036]	Endangered	Species or species habitat likely to occur within area
Spyridium obcordatum Creeping Dusty Miller [17447]	Vulnerable	Species or species habitat likely to occur within area
Stenanthemum pimeleoides Spreading Stenanthemum, Propellor Plant [15450]	Vulnerable	Species or species habitat may occur within area
Stonesiella selaginoides Clubmoss Bush-pea [68100]	Endangered	Species or species habitat likely to occur within area
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Thelymitra epipactoides Metallic Sun-orchid [11896]	Endangered	Species or species habitat known to occur within area
Thelymitra jonesii Sky-blue Sun-orchid [76352]	Endangered	Species or species habitat known to occur within area
Thelymitra kangaloonica Kangaloon Sun Orchid [81861]	Critically Endangered	Species or species habitat likely to occur within area
Thelymitra matthewsii Spiral Sun-orchid [4168]	Vulnerable	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat known to occur within area
Triplarina nowraensis Nowra Heath-myrtle [64544]	Endangered	Species or species habitat known to occur within area
Xanthorrhoea arenaria Sand Grasstree [21603]	Vulnerable	Species or species habitat likely to occur within area
Xanthorrhoea bracteata Shiny Grasstree [7950]	Endangered	Species or species habitat known to occur within area
Xerochrysum palustre Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat known to occur within area
Zieria baeuerlenii Bomaderry Zieria, Bomaderry Creek Zieria [56781]	Endangered	Species or species habitat known to occur within area
Zieria granulata Hill Zieria, Hilly Zieria, Illawarra Zieria [17147]	Endangered	Species or species habitat likely to occur within area
Zieria tuberculata Warty Zieria [56736]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Hoplocephalus bungaroides Broad-headed Snake [1182]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Name	Status	Type of Presence
Sharks		
Carcharias taurus (east coast population)		
Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat known to occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Breeding known to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
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
Ardenna grisea		
Sooty Shearwater [82651]		Breeding known to occur within area
Ardenna pacifica		
Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Ardenna tenuirostris		
Short-tailed Shearwater [82652]		Breeding known to occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat known to occur within area
Diomedea antipodensis		
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora		
Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
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
Fregata ariel		
Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor		
Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Hydroprogne caspia		
Caspian Tern [808]		Breeding known to occur within area
Macronectes giganteus		
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely

Name	Threatened	Type of Presence
		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]		Breeding known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to 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 likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera 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 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 likely to occur within area

Name	Threatened	Type of Presence
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Breeding known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		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
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Phocoena dioptrica Spectacled Porpoise [66728]		Species or species habitat may occur within area
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		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Foraging, feeding or related behaviour known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting known to occur within area

Name	Threatened	Type of Presence
Gallinago megala Swinhoe's Snipe [864]		Species or species habitat known to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limnodromus semipalmatus Asian Dowitcher [843]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
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 known to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Thalasseus bergii Crested Tern [83000]		Breeding known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area
Tringa incana Wandering Tattler [831]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land -
Commonwealth Land - Australian Academy of Science
Commonwealth Land - Australian National University
Commonwealth Land - Australian Postal Commission
Commonwealth Land - Australian Postal Corporation
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Booderee National Park
Commonwealth Land - Commonwealth Trading Bank of Australia
Commonwealth Land - Defence Housing Authority
Commonwealth Land - Defence Service Homes Corporation
Commonwealth Land - Director of War Service Homes
Commonwealth Land - Royal Australian Navy Central Canteens Board
Commonwealth Land - Telstra Corporation Limited
Defence - BAIRNSDALE TRAINING DEPOT
Defence - BEECROFT RAPIER RANGE
Defence - BUCKLAND TRAINING AREA
Defence - BURNIE TRAINING DEPOT
Defence - DCO NOWRA
Defence - DEVONPORT TRAINING DEPOT
Defence - DUTSON BOMBING RANGE
Defence - HMAS ALBATROSS
Defence - PARACHUTE DROPPING ZONE (PARACHUTE TRAINING SCHOOL) ; NOWRA - PTS
Defence - STONYHEAD TRAINING AREA
Defence - SUSSEX INLET - DEFENCE RESERVE
Defence - Shop 3
Defence - Suite 18, Holt Centre
Defence - TRAINING CENTRE (Norris Barracks) - Portsea
Defence - TS Leven
Defence - WEST HEAD GUNNERY RANGE

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Natural		
Beecroft Peninsula	NSW	Listed place
Indigenous		
Jervis Bay Territory	ACT	Listed place
Crocodile Head Area	NSW	Within listed place
Currarong Rockshelters Area	NSW	Within listed place
Historic		
Cape St George Lighthouse Ruins & Curtilage	ACT	Listed place
Christians Minde Settlement	ACT	Listed place
Eddystone Lighthouse	TAS	Listed place
Gabo Island Lighthouse	VIC	Listed place
Goose Island Lighthouse	TAS	Listed place
Jervis Bay Botanic Gardens	ACT	Listed place
Kiama Post Office	NSW	Listed place
Mersey Bluff Lighthouse	TAS	Listed place
Montague Island Lighthouse	NSW	Listed place
Point Perpendicular Lightstation	NSW	Listed place
Royal Australian Naval College	ACT	Listed place
Sorrento Post Office	VIC	Listed place
Swan Island Lighthouse	TAS	Listed place
Table Cape Lighthouse	TAS	Listed place
Tasman Island Lighthouse	TAS	Listed place
Wilsons Promontory Lighthouse	VIC	Listed place

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
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
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Foraging, feeding or related behaviour known to occur within area

Name	Threatened	Type of Presence
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Eudyptula minor Little Penguin [1085]		Breeding known to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Species or species habitat known to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Heteroscelus incanus Wandering Tattler [59547]		Roosting known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Larus dominicanus Kelp Gull [809]		Breeding known to occur within area
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area

Name	Threatened	Type of Presence
Larus pacificus Pacific Gull [811]		Breeding known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Breeding known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limnodromus semipalmatus Asian Dowitcher [843]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	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
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Morus serrator Australasian Gannet [1020]		Breeding 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
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route 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 known to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Pelagodroma marina White-faced Storm-Petrel [1016]		Breeding known to occur within area

Name	Threatened	Type of Presence
Pelecanoides urinatrix Common Diving-Petrel [1018]		Breeding known to occur within area
Phalacrocorax fuscescens Black-faced Cormorant [59660]		Breeding known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
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
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		Breeding known to occur within area
Puffinus pacificus Wedge-tailed Shearwater [1027]		Breeding known to occur within area
Puffinus tenuirostris Short-tailed Shearwater [1029]		Breeding known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Roosting known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna albifrons Little Tern [813]		Breeding known to occur within area
Sterna bergii Crested Tern [816]		Breeding known to occur within area
Sterna caspia Caspian Tern [59467]		Breeding known to occur within area
Sterna fuscata Sooty Tern [794]		Breeding known to occur within area
Sterna nereis Fairy Tern [796]		Breeding known to occur within area
Sterna striata White-fronted Tern [799]		Breeding known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely

Name	Threatened	Type of Presence
		to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat known to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat known to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area
Fish		
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Cosmocampus howensis Lord Howe Pipefish [66208]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species

Name	Threatened	Type of Presence
		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
Hippocampus minotaur Bullneck Seahorse [66705]		Species or species habitat may occur within area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]		Species or species habitat known to occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Hypselognathus rostratus Knifesnout Pipefish, Knife-snouted Pipefish [66245]		Species or species habitat may occur within area
Kaupus costatus Deepbody Pipefish, Deep-bodied Pipefish [66246]		Species or species habitat may occur within area
Kimblaeus bassensis Trawl Pipefish, Bass Strait Pipefish [66247]		Species or species habitat may occur within area
Leptoichthys fistularius Brushtail Pipefish [66248]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys 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

Name	Threatened	Type of Presence
		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
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Breeding known to occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera 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 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
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 likely to occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area

Name	Status	Type of Presence
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
Hyperoodon planifrons Southern Bottlenose Whale [71]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia simus Dwarf Sperm Whale [58]		Species or species habitat may occur within area
Lagenorhynchus cruciger Hourglass Dolphin [42]		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]	Vulnerable	Foraging, feeding or related behaviour 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 ginkgodens Gingko-toothed Beaked Whale, Gingko-toothed Whale, Gingko Beaked Whale [59564]		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
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
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area

Name	Status	Type of Presence
Phocoena dioptrica Spectacled Porpoise [66728]		Species or species habitat may 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
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area
Tasmacetus shepherdi Shepherd's Beaked Whale, Tasman Beaked Whale [55]		Species or species habitat may 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]

Name	Label
Beagle	Multiple Use Zone (IUCN VI)
Boags	Multiple Use Zone (IUCN VI)
East Gippsland	Multiple Use Zone (IUCN VI)
Flinders	Marine National Park Zone (IUCN II)
Flinders	Multiple Use Zone (IUCN VI)
Freycinet	Marine National Park Zone (IUCN II)
Freycinet	Multiple Use Zone (IUCN VI)
Freycinet	Recreational Use Zone (IUCN IV)
Huon	Multiple Use Zone (IUCN VI)
Jervis	Habitat Protection Zone (IUCN IV)
Jervis	Special Purpose Zone (Trawl) (IUCN VI)
Lord Howe	Habitat Protection Zone (IUCN IV)
South Tasman Rise	Special Purpose Zone (IUCN VI)

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Africa Gully	TAS
Alma Tier	TAS
Anderson Islands	TAS
Anser Island	VIC
Ansons Bay	TAS
Ansons River	TAS
Ansons River	TAS
Ansons Road Gladstone	TAS
Apslawn	TAS
Apslawn #1	TAS
Apslawn #2	TAS
Apsley	TAS

Name	State
Apsley River	TAS
Arthurs Seat	VIC
Avenue River	TAS
Baawang	VIC
Babel Island	TAS
Backwater Morass G.L.R.	VIC
Badger Corner	TAS
Badger Head	TAS
Badger Island	TAS
Bairnsdale F.R.	VIC
Bald Hills B.R.	VIC
Bancroft Bay - Kalimna G.L.R.	VIC
Bangor	TAS
Bangor #2	TAS
Bangor - Bobs Gully	TAS
Bangor - Jacks Gully	TAS
Bangor - Musk Gully	TAS
Barga	VIC
Barren Grounds	NSW
Bass River SS.R.	VIC
Baxter Island G.L.R.	VIC
Bay of Fires	TAS
Baynes Island	TAS
Bell Bird Creek	NSW
Bellettes Bay	TAS
Bellingham	TAS
Bellingham Vineyard	TAS
Bells Marsh	TAS
Belmont	TAS
Belowla Island	NSW
Bemm, Goolengook, Arte and Errinundra Rivers	VIC
Ben Boyd	NSW
Benedore River	VIC
Bengworden N.C.R.	VIC
Bermaguee	NSW
Bermagui	NSW
Berwicks Flats	TAS
Biamanga	NSW
Big Green Island	TAS
Big Silver	TAS
Binalongtime	TAS
Binns Creek - North Sister	TAS
Bird Island	TAS
Black River	TAS
Black River Bridge	TAS
Blindburn Creek	TAS
Blond Bay G.L.R.	VIC
Blond Bay W.R.	VIC
Blowhole Road #1	TAS
Blowhole Road #2	TAS
Blowhole Road #3	TAS
Blowhole Road #4	TAS
Blue Hills #2	TAS
Blue Tier	TAS
Bluemans Creek	TAS
Bluemans Run	TAS
Blyth Point	TAS
Blythe River	TAS
Boat Harbour Road	TAS
Boggy Creek	TAS
Boltons Beach	TAS
Bomaderry Creek	NSW
Boobyalla	TAS
Boobyalla Downs	TAS
Booderee	JBT
Booderee	JBT

Name	State
Boot Bay	TAS
Bournda	NSW
Bournda	NSW
Boxen Island	TAS
Brashton Dairies	TAS
Break O'Day	TAS
Bream Creek	TAS
Bresnehans Rd	TAS
Briggs	TAS
Briggs Islet	TAS
Brodribb River F.F.R	VIC
Brougham Sugarloaf	TAS
Broulee Island	NSW
Brundee Swamp	NSW
Brush Island	NSW
Budderoo	NSW
Bull Rock	TAS
Bun Beetons Point	TAS
Butlers Ridge	TAS
Buxton River	TAS
Cam River	TAS
Cambewarra Range	NSW
Cambria #1	TAS
Cambria #2	TAS
Cameron	TAS
Cape Bernier	TAS
Cape Conran Coastal Park	VIC
Cape Howe	VIC
Cape Liptrap Coastal Park	VIC
Cape Patterson N.C.R	VIC
Cape Portland	TAS
Carisbrook	TAS
Cat Island	TAS
Catos Creek	TAS
Chalky Island	TAS
Chasm Creek	TAS
Cheeseberry Hill	TAS
Cherry Tree Hill	TAS
Chronicle Point	TAS
Clovelly	TAS
Clyde River	NSW
Coles Bay	TAS
Coles Bay Road	TAS
Comerong Island	NSW
Cone Islet	TAS
Conjola	NSW
Connemara	TAS
Corramy	NSW
Coswell Beach	TAS
Craggy Island	TAS
Cranbrook House	TAS
Crayfish Creek	TAS
Cressy Beach	TAS
Croajingolong National Park	VIC
Cullendulla Creek	NSW
Curtis Island	TAS
Curtis Road St Marys	TAS
Cusicks Hill	TAS
Cygnet River	TAS
Dalmayne Road Gray	TAS
Darling Range	TAS
Darriman H29 B.R	VIC
Dart Island	TAS
Dead Dog Hill	TAS
Denison Rivulet	TAS
Denneys Road	TAS

Name	State
Devils Tower	TAS
Diamond Island	TAS
Dickies Ridge	TAS
Dip Range	TAS
Doctors Peak	TAS
Doctors Rocks	TAS
Don Heads	TAS
Double Sandy Point	TAS
Doughboy Island	TAS
Douglas River 1	TAS
Douglas River 2	TAS
Douglas-Apsley	TAS
Drumdlemara H1 B.R	VIC
Drumdlemara H2 B.R	VIC
Drumdlemara H4 B.R	VIC
Dry Creek East	TAS
Dry Creek South	TAS
Dry Creek West	TAS
Eagle Point G.L.R.	VIC
Eaglehawk Bay	TAS
Eaglehawk Bay-Flinders Bay	TAS
Eaglehawk Neck	TAS
Eagles Claw	NSW
East Gippsland Coastal streams	VIC
East Kangaroo Island	TAS
East Moncoeur Island	TAS
Eastern Tiers	TAS
Eddystone Point Lighthouse	TAS
Eden Region	NSW
Edgcumbe Beach	TAS
Elephant Farm Elephant Pass	TAS
Emita	TAS
Emu River	TAS
Enstone Park	TAS
Entrance Point	VIC
Ericksons Road	TAS
Esmerelda Enterprises	TAS
Eurobodalla	NSW
Ewing Morass W.R	VIC
Fannys Bay	TAS
Fingal B.R	VIC
Fingal Rivulet	TAS
First and Second Islands F.R.	VIC
Five Mile Bluff	TAS
Flacks Road Coles Bay	TAS
Flannagan Island G.L.R.	VIC
Flinders G234 B.R.	VIC
Flinders N.F.R.	VIC
Foochow	TAS
Forestry Management Areas in Batemans Bay	NSW
Forestry Management Areas in Eden	NSW
Forestry Management Areas in Narooma	NSW
Forestry Management Areas in Nowra	NSW
Forsyth Island	TAS
Forwards Beach	TAS
Fossil Bluff	TAS
Foster Islands	TAS
Fotheringate Bay	TAS
Four Mile Creek	TAS
Four Mile Creek #1	TAS
Four Mile Creek #2	TAS
Fozards	TAS
Fraser Island G.L.R.	VIC
Fresh-water Swamp, Woodside Beach W.R	VIC
Freycinet	TAS
Friendly Beaches	TAS

Name	State
Friendly Beaches	TAS
Friendly Beaches #2	TAS
Friendly Beaches #3	TAS
Friendly Beaches #4	TAS
Gala Estates	TAS
Gala Estates - Bluemans Creek	TAS
German Town	TAS
Giffard (Rifle Range) F.R.	VIC
Giffard H30 B.R	VIC
Giffard H31 B.R	VIC
Gippsland Lakes Coastal Park	VIC
Girl Guides	TAS
Goose Island	TAS
Grahams Run	TAS
Grahams Run Forest	TAS
Granite Point	TAS
Gravelly Hill	TAS
Gray #1	TAS
Gray #2	TAS
Great Dog Island	TAS
Greens Beach	TAS
Gulaga	NSW
Gull Island	TAS
Harbour Islets	TAS
Hardings Falls	TAS
Hawks Hill	TAS
Hawley	TAS
Henderson Park	TAS
Heybridge	TAS
Highfield	TAS
Hogan Group	TAS
Hollands Landing G.L.R.	VIC
Holts Point	TAS
Honeysuckle Avenue	TAS
Hospital Creek	TAS
Humbug Point	TAS
Hunter Island	TAS
Huntsmans Cap	TAS
Ile des Phoques	TAS
Illawong	NSW
Isabella Island	TAS
Jack Smith Lake W.R	VIC
Jacksons Cove	TAS
Jenwood	TAS
Jerrawangala	NSW
Jervis Bay	NSW
Jones Bay G.L.R	VIC
Jones Bay W.R	VIC
Kelvedon	TAS
Kelvedon Beach	TAS
Kilcunda N.C.R.	VIC
Killiecrankie	TAS
Killymoon	TAS
King George Island	TAS
Kings Flat F.R	VIC
Koonya	TAS
Lachlan Island	TAS
Lackrana	TAS
Lagoons Beach	TAS
Lake Coleman W.R	VIC
Lake Coleman West W.R	VIC
Lake Corringle W.R	VIC
Lake Curlip W.R.	VIC
Lake Denison W.R	VIC
Lake Leake	TAS
Lake Tyers	VIC

Name	State
Lanark Farm #1	TAS
Lanark Farm #2	TAS
Lanark Farm #3	TAS
Lanark Farm #4	TAS
Lanark Farm #5	TAS
Lanark Farm #6	TAS
Lands End	TAS
Lefroy	TAS
Lewis Hill	TAS
Lewis Hill #2	TAS
Liitle Swanport River	TAS
Lilla Villa	TAS
Lime Pit Road	TAS
Lisdillon	TAS
Lisdillon Rivulet	TAS
Little Beach	TAS
Little Beach	TAS
Little Christmas Island	TAS
Little Dog Island	TAS
Little Green Island	TAS
Little Island	TAS
Little Peggs Beach	TAS
Little Pipers River	TAS
Little Silver	TAS
Little Swan Island	TAS
Little Swanport	TAS
Little Swanport #2	TAS
Little Swanport #4	TAS
Little Waterhouse Island	TAS
Llechwedd-y-Creigiogg Apslawn	TAS
Logan Lagoon	TAS
Logan Lagoon	TAS
Logans Lagoon	TAS
Long Bay	TAS
Long Island	TAS
Long Point Reserve	TAS
Long Reach	TAS
Long Reach	TAS
Long Spit	TAS
Lookout Rock	TAS
Low Head	TAS
Low Head	TAS
Low Point	TAS
Lower German Town Road St Marys #1	TAS
Lower German Town Road St Marys #2	TAS
Lower German Town Road St Marys #3	TAS
Lower German Town Road St Marys #4	TAS
Lower German Town Road St Marys #5	TAS
Lower Marsh Creek	TAS
Lughrata	TAS
Lyall Road Binalong Bay	TAS
Lyons Cottage	TAS
MacLaines Creek	TAS
Macleod Morass W.R.	VIC
Main Ridge N.C.R.	VIC
Mallacoota B.R.	VIC
Marchwiel #3	TAS
Marchwiel #4	TAS
Marchwiel #5	TAS
Marchwiel #6	TAS
Marchwiel Bream Creek	TAS
Marchwiel Cockle Bay	TAS
Marchwiel Falls Festival #1	TAS
Marchwiel Falls Festival #2	TAS
Maria Island	TAS
Marshall Beach	TAS

Name	State
Marthvale	TAS
Maxwells	NSW
Mayfield	TAS
Mayfield Bay	TAS
McDonalds Point	TAS
Medeas Cove	TAS
Memana	TAS
Meroo	NSW
Mersey Bluff	TAS
Metung B.R.	VIC
Mile Island	TAS
Millingtons Beach	TAS
Mimosa Rocks	NSW
Mitchell River Silt Jetties G.L.R.	VIC
Mitchell River water reserve G.L.R.	VIC
Mitchell and Wonnangatta Rivers	VIC
Montague Island	NSW
Moormurng F.F.R.	VIC
Morielle (Bellingham)	TAS
Morley Swamp G.L.R.	VIC
Mornington Peninsula National Park	VIC
Mortimers Paddock B.R.	VIC
Morton	NSW
Moulting Lagoon	TAS
Mount Elephant	TAS
Mount Montgomery	TAS
Mount Montgomery	TAS
Mount Pearson	TAS
Mount Puzzler	TAS
Mount Tanner	TAS
Mount Vereker Creek	VIC
Mount William	TAS
Mount William	TAS
Mt Chappell Island	TAS
Mt Murray	TAS
Mulligans Hill	TAS
Mulligans Hill	TAS
Mumbulla	NSW
Murrah	NSW
Murramarang	NSW
Musselroe Bay	TAS
Musselroe Bay	TAS
Nadgee	NSW
Nameless Sylvan	NSW
Narawntapu	TAS
Narrawallee Creek	NSW
Neds Reef	TAS
Newmans Beach	TAS
Newmans Creek	TAS
Newmans Creek Koonya	TAS
Nicholas Range	TAS
Nicholson floodplain G.L.R	VIC
Ninth Island	TAS
Norfolk Bay	TAS
North East Islet	TAS
North East River	TAS
Nungurner B.R.	VIC
Nyerimilang Park G.L.R.	VIC
Oak Bank Little Swanport River	TAS
Okehampton	TAS
Old Billys Creek	TAS
Oyster Rocks	TAS
Paddys Island	TAS
Palana Beach	TAS
Parma Creek	NSW
Parnella	TAS

Name	State
Pasco Group	TAS
Passage Island	TAS
Patriarchs	TAS
Patriarchs	TAS
Peggs Beach	TAS
Penguin Islet	TAS
Petrel Islands	TAS
Phillip Island Nature Park	VIC
Pirates Bay	TAS
Poddy Bay G.L.R	VIC
Point Bailly	TAS
Point Fullarton G.L.R.	VIC
Point Nepean National Park	VIC
Port Sorell	TAS
Possums Place	TAS
Powers Rivulet	TAS
Premaydena Point	TAS
Prime Seal Island	TAS
Ram Island	TAS
Rame Head	VIC
Raspins Beach	TAS
Ravensdale #1	TAS
Ravensdale #2	TAS
Raymond Island G.L.R.	VIC
Rayners Hill	TAS
Red Morass G.L.R.	VIC
Red Rock	TAS
Redbanks	TAS
Redbanks Sisters Creek	TAS
Redbill Point	TAS
Reedy Lagoon	TAS
Reef Island and Bass River Mouth N.C.R	VIC
Rigby Island G.L.R.	VIC
Ringarooma Tier	TAS
River of Peace	TAS
Rocky Cape	TAS
Rocky Hills #1	TAS
Rocky Hills #2	TAS
Rocky Hills #2	TAS
Rocky Hills #3	TAS
Rocky Hills #4	TAS
Rocky Hills #5	TAS
Rocky Hills #6	TAS
Rocky Hills - North	TAS
Rodondo Island	TAS
Rodway	NSW
Rosebud B.R.	VIC
Roseneath Peninsula (1) G.L.R.	VIC
Roseneath Peninsula (2) G.L.R.	VIC
Roydon Island	TAS
Rudds Hill	TAS
Rudds Hill Orford	TAS
Salt Lake - Backwater Morass G.L.R.	VIC
Saltwater Swamp	NSW
Sandpatch	VIC
Sandridge	TAS
Sandspit River	TAS
Sandspit River	TAS
Sassafras Gully	TAS
Scamander	TAS
Scamander	TAS
Screw Creek N.C.R.	VIC
Seacrow Islet	TAS
Seaford	TAS
Seal Creek	VIC
Seal Islands W.R.	VIC

Name	State
Seaview Farm	TAS
Sellars Lagoon	TAS
Sentinel Island	TAS
Settlement Point	TAS
Seven Mile Beach	NSW
Seymour	TAS
Seymour #1	TAS
Seymour #2	TAS
Seymour #3	TAS
Seymour #4	TAS
Shag Lagoon	TAS
Shingle Hill	TAS
Shiny Grasstrees	TAS
Single Tree Plain	TAS
Sister Islands	TAS
Sisters Beach	TAS
Slaughterhouse Creek G.L.R	VIC
Snowy River	VIC
South Coast Subregion of Southern Region	NSW
South Esk Pine	TAS
South Esk Pine	TAS
South Pats River	TAS
Southern Wilsons Promontory	VIC
Spike Island	TAS
Spiky Beach	TAS
Spring Beach Orford	TAS
St Helens	TAS
St Helens 1 Marthavale	TAS
St Helens 2	TAS
St Marys Pass	TAS
St Patricks Head	TAS
St Patricks Head	TAS
Stack Island	TAS
Stanley	TAS
Steel Bay - Newland Backwater G.L.R.	VIC
Stewarts Bay	TAS
Storehouse Island	TAS
Strzelecki	TAS
Sugarloaf Rock	TAS
Summer Camp	TAS
Summerhill Drive Port Sorell	TAS
Swan Reach Bay G.L.R.	VIC
Swan River	TAS
Swansea	TAS
Swell Point - Roseneath Point G.L.R.	VIC
Sydney Cove	TAS
Sympathy Hills	TAS
Table Cape	TAS
Table Cape	TAS
Tamar Crescent	TAS
Tambo Delta - Metung G.L.R.	VIC
Tambo floodplain G.L.R.	VIC
Tanja	NSW
Tarra Tarra B.R	VIC
Tarwin Lower F.R.	VIC
Tasman	TAS
Tasman Monument	TAS
Tatlows Beach	TAS
Tessellated Pavement	TAS
The Dock	TAS
The Dutchman	TAS
The Grange #1	TAS
The Grange #2	TAS
The Lakes National Park	VIC
The Nut	TAS
Three Hummock Island	TAS

Name	State
Three Thumbs	TAS
Tippogoree Hills	TAS
Tollgate Islands	NSW
Township Hill	TAS
Toxteth Park #1	TAS
Toxteth Park #2	TAS
Toxteth Park #3	TAS
Toxteth Park #4	TAS
Triplarina	NSW
Trousers Point Beach	TAS
Tucker Swamp G.L.R	VIC
Tullochgorum #1a	TAS
Two Mile Creek	TAS
Umtali	TAS
Unnamed (Badger Head Road)	TAS
Unnamed (Fern Glade)	TAS
Unnamed (Pipers Brook)	TAS
Unnamed (Sandspit River)	TAS
Unnamed P0155	VIC
Vansittart Island	TAS
Ventnor B.R.	VIC
Vereker Creek	VIC
Victoria Lagoon G.L.R.	VIC
Waratah B.R	VIC
Wardlaws Creek	TAS
Warrigal Creek SS.R.	VIC
Waterfall Bay Road	TAS
Waterhouse	TAS
Waterhouse Island	TAS
Waters Meeting	TAS
Waters Meeting Cranbrook	TAS
Watershed	TAS
Wattle Point G.L.R.	VIC
Waubadebars Grave	TAS
Welshpool H17 B.R	VIC
West Arm	TAS
West Moncoeur Island	TAS
Whalers Lookout	TAS
White Beach	TAS
Whites Gully	TAS
Wielangta	TAS
Wildbird	TAS
William Hunter F.R	VIC
Wilsons Promontory	VIC
Wilsons Promontory Islands	VIC
Wilsons Promontory National Park	VIC
Wind Song	TAS
Wingaroo	TAS
Winifred Curtis Trust Scamander	TAS
Wonthaggi G237 B.R.	VIC
Wonthaggi G238 B.R.	VIC
Wonthaggi G239 B.R.	VIC
Wonthaggi G240 B.R.	VIC
Wonthaggi G241 B.R.	VIC
Wonthaggi G242 B.R.	VIC
Wonthaggi G243 B.R.	VIC
Wonthaggi G244 B.R.	VIC
Wonthaggi G245 B.R.	VIC
Wonthaggi G246 B.R	VIC
Wonthaggi Heathlands N.C.R	VIC
Woodside H27 B.R	VIC
Woodside H28 B.R	VIC
Woodspen Farm	TAS
Woollamia	NSW
Woolpack Hill	TAS
Worrigee	NSW

Name	State
Wybalenna Island	TAS
Wye River	TAS
Wye River	TAS
Yanakie F.R	VIC
Yatteyattah	NSW
Yellow Bluff Creek	TAS
Yorktown	TAS
Youngs Creek	TAS
lungatalanana	TAS

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
East Gippsland RFA	Victoria
Eden RFA	New South Wales
Gippsland RFA	Victoria
Southern RFA	New South Wales
Tasmania RFA	Tasmania

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Callipepla californica California Quail [59451]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Gallus gallus Red Junglefowl, Domestic Fowl [917]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Meleagris gallopavo Wild Turkey [64380]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Pavo cristatus Indian Peafowl, Peacock [919]		Species or species habitat likely to occur within area
Phasianus colchicus Common Pheasant [920]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Turdus philomelos Song Thrush [597]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat may occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Asparagus scandens Asparagus Fern, Climbing Asparagus Fern [23255]		Species or species habitat likely to occur within area
Austrocylindropuntia spp. Prickly Pears [85132]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Carrichtera annua Ward's Weed [9511]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Nationally Important Wetlands	[Resource Information]
Name	State
Anderson Inlet	VIC
Aspley Marshes	TAS
Beecroft Peninsula	NSW
Bemm, Goolengook, Arte and Errinundra Rivers	VIC
Benedore River	VIC
Blackmans Lagoon	TAS
Bondi Lake	NSW
Bosses/Nebbor Swamp	VIC
Boulanger Bay - Robbins Passage	TAS
Clyde River Estuary	NSW
Coila Creek Delta	NSW
Coomonderry Swamp	NSW
Cormorant Beach	NSW
Corner Inlet	VIC
Cullendulla Creek and Embayment	NSW
Douglas River	TAS
Durras Lake	NSW
Earlham Lagoon	TAS
Ewing's Marsh (Morass)	VIC
Fergusons Lagoon	TAS
Flyover Lagoon 1	TAS
Flyover Lagoon 2	TAS
Freshwater Lagoon	TAS
Hardings Falls Forest Reserve	TAS
Hogans Lagoon	TAS
Jack Smith Lake State Game Reserve	VIC
Jervis Bay	NSW
Jervis Bay Sea Cliffs	NSW
Jocks Lagoon	TAS
Killalea Lagoon	NSW
Lagoon Head	NSW
Lake Bunga	VIC
Lake Illawarra	NSW
Lake King Wetlands	VIC
Lake Tyers	VIC
Lake Victoria Wetlands	VIC
Lake Wellington Wetlands	VIC
Little Thirsty Lagoon	TAS
Little Waterhouse Lake	TAS
Logan Lagoon	TAS
Lower Snowy River Wetlands System	VIC
Macleod Morass	VIC
Mallacoota Inlet Wetlands	VIC
Maria Island Marine Reserve	TAS
Merimbula Lake	NSW
Meroo Lake Wetland Complex	NSW
Minnamurra River Estuary	NSW
Moruya River Estuary Saltmarshes	NSW
Moulting Lagoon	TAS
Nadgee Lake and tributary wetlands	NSW
Nargal Lake	NSW
Nelson Lagoon	NSW
Pambula Estuarine Wetlands	NSW
Powlett River Mouth	VIC
Rocky Cape Marine Area	TAS
Russells Swamp	VIC
Sellars Lagoon	TAS
Shallow Inlet Marine & Coastal Park	VIC
Shoalhaven/Crookhaven Estuary	NSW
Snowy River	VIC
St Georges Basin	NSW
Stans Lagoon	TAS
Swan Lagoon	NSW
Sydenham Inlet Wetlands	VIC
Syndicate Lagoon	TAS

Name	State
Tabourie Lake	NSW
Tambo River (Lower Reaches) East Swamps	VIC
Tamboon Inlet Wetlands	VIC
Termeil Lake Wetland Complex	NSW
Thompsons Lagoon	TAS
Thurra River	VIC
Tregaron Lagoons 1	TAS
Tregaron Lagoons 2	TAS
Tuross River Estuary	NSW
Twofold Bay	NSW
Unnamed Wetland	TAS
Unnamed Wetland	TAS
Unnamed Wetland	TAS
Unnamed Wetland	TAS
Unnamed Wetland	TAS
Unnamed Wetland	TAS
Unnamed Wetland	TAS
Unnamed Wetland	TAS
Unnamed Wetland	TAS
Unnamed Wetland	TAS
Unnamed Wetland	TAS
Unnamed Wetland	TAS
Unnamed wetland	TAS
Waldrons Swamp	NSW
Wallaga Lake	NSW
Wallagoot Lagoon (Wallagoot Lake)	NSW
Western Port	VIC
Wollumboola Lake	NSW

Key Ecological Features (Marine) [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
Big Horseshoe Canyon	South-east
Seamounts South and east of Tasmania	South-east
Upwelling East of Eden	South-east
Canyons on the eastern continental slope	Temperate east
Shelf rocky reefs	Temperate east

Caveat

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

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

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

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-34.511027 150.765611,-34.511027 150.765611,-34.511027 150.765611,-34.854327 164.828111,-43.008614 162.894517,-47.103738 159.049302,-47.83155 147.953111,-46.833845 147.953111,-43.201122 147.953111,-43.056798 147.77733,-40.817915 148.150865,-41.166198 146.700669,-41.166198 146.12938,-40.618071 144.701158,-38.311438 144.657212,-38.552408 145.79979,-38.758314 145.909654,-38.792574 146.151353,-38.706893 146.173326,-38.552408 146.876451,-37.827088 147.579576,-37.74026 149.469224,-37.426834 149.842759,-37.147128 149.952623,-37.04197 149.842759,-35.733081 150.150376,-34.511027 150.765611

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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EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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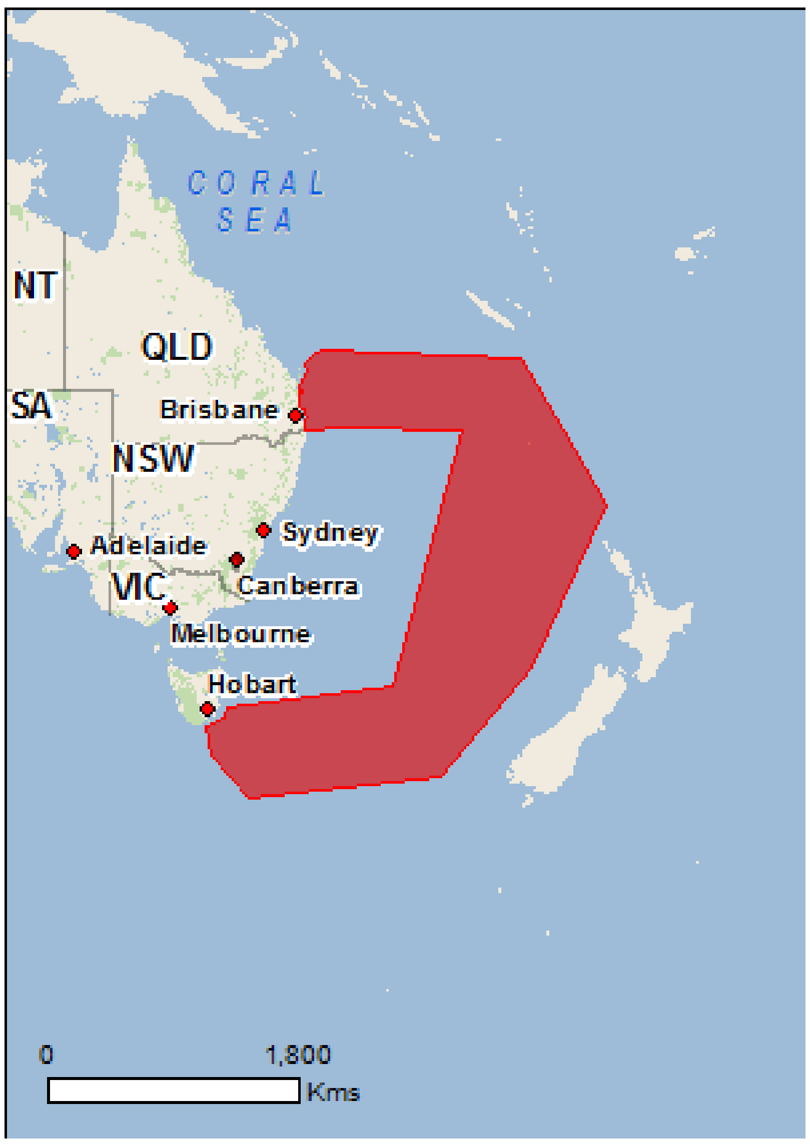
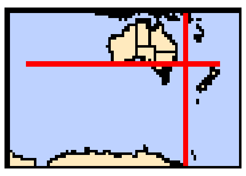


Coordinates
Buffer: 1.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	3
National Heritage Places:	4
Wetlands of International Importance:	2
Great Barrier Reef Marine Park:	2
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	168
Listed Migratory Species:	96

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	2
Commonwealth Heritage Places:	7
Listed Marine Species:	150
Whales and Other Cetaceans:	44
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	3
Australian Marine Parks:	12

Extra Information

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

State and Territory Reserves:	12
Regional Forest Agreements:	2
Invasive Species:	54
Nationally Important Wetlands:	8
Key Ecological Features (Marine)	9

Details

Matters of National Environmental Significance

World Heritage Properties [Resource Information]

Name	State	Status
Australian Convict Sites (Kingston and Arthurs Vale Historic Area)	EXT	Declared property
Fraser Island	QLD	Declared property
Great Barrier Reef	QLD	Declared property

National Heritage Properties [Resource Information]

Name	State	Status
Natural		
Fraser Island	QLD	Listed place
Great Barrier Reef	QLD	Listed place
Historic		
HMS Sirius Shipwreck	EXT	Listed place
Kingston and Arthurs Vale Historic Area	EXT	Listed place

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Great sandy strait (including great sandy strait, tin can bay and tin can	Within Ramsar site
Moreton bay	Within Ramsar site

Great Barrier Reef Marine Park [Resource Information]

Type	Zone	IUCN
Buffer	B-22-3012	IV
Marine National Park	MNP-22-1154	II

Commonwealth Marine Area [Resource Information]

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

Name
EEZ and Territorial Sea
Extended Continental Shelf

Marine Regions [Resource Information]

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

Name
Coral Sea
South-east
Temperate East

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area
Giant Kelp Marine Forests of South East Australia	Endangered	Community may 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 may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Cyanoramphus cookii Norfolk Island Green Parrot, Tasman Parakeet, Norfolk Island Parakeet [67046]	Endangered	Breeding known to occur within area
Cyclopsitta diophthalma coxeni Coxen's Fig-Parrot [59714]	Endangered	Species or species habitat may occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	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
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
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat known 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
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	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
Ninox novaeseelandiae undulata Norfolk Island Boobook, Southern Boobook (Norfolk Island) [26188]	Endangered	Breeding known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachycephala pectoralis xanthoprocta Golden Whistler (Norfolk Island) [64444]	Vulnerable	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
Petroica multicolor Norfolk Island Robin, Pacific Robin [604]	Vulnerable	Breeding likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pterodroma heraldica Herald Petrel [66973]	Critically Endangered	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
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Breeding known to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross	Vulnerable	Foraging, feeding or

Name	Status	Type of Presence
[82273]		related behaviour likely to occur within area
Thalassarche cauta cauta Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat known to occur within area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat known to occur within area
Tyto novaehollandiae castanops (Tasmanian population) Masked Owl (Tasmanian) [67051]	Vulnerable	Species or species habitat likely to occur within area
Fish		
Brachionichthys hirsutus Spotted Handfish [64418]	Critically Endangered	Species or species habitat may occur within area
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Nannoperca oxleyana Oxleyan Pygmy Perch [64468]	Endangered	Species or species habitat likely to occur within area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat likely to occur within area
Thymichthys politus Red Handfish [83756]	Critically Endangered	Species or species habitat may occur within area
Frogs		
Litoria olongburensis Wallum Sedge Frog [1821]	Vulnerable	Species or species habitat known to occur within area
Mixophyes fleayi Fleay's Frog [25960]	Endangered	Species or species habitat may occur within area
Insects		

Name	Status	Type of Presence
Argynnis hyperbius inconstans Australian Fritillary [88056]	Critically Endangered	Species or species habitat may occur within area
Phyllodes imperialis smithersi Pink Underwing Moth [86084]	Endangered	Species or species habitat may occur within area
Mammals		
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
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat 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 likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE Mainland) [66645]	Vulnerable	Species or species habitat likely to 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
Xeromys myoides Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat known to occur within area
Other		
Advena campbellii Campbell's Helicarionid Land Snail [81250]	Critically Endangered	Species or species habitat known to occur within area
Mathewsoconcha grayi ms Gray's Helicarionid Land Snail [81852]	Critically Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Mathewsoconcha phillipii Phillip Island Helicarionid Land Snail [81252]	Critically Endangered	Species or species habitat likely to occur within area
Mathewsoconcha suteri a helicarionid land snail [81851]	Critically Endangered	Species or species habitat likely to occur within area
Quintalia stoddartii Stoddart's Helicarionid Land Snail [81253]	Critically Endangered	Species or species habitat likely to occur within area
Thersites mitchellae Mitchell's Rainforest Snail [66774]	Critically Endangered	Species or species habitat may occur within area
Plants		
Abutilon julianae Norfolk Island Abutilon [27797]	Critically Endangered	Species or species habitat known to occur within area
Acacia attenuata [10690]	Vulnerable	Species or species habitat likely to occur within area
Achyranthes arborescens Chaff Tree, Soft-wood [65879]	Critically Endangered	Species or species habitat known to occur within area
Achyranthes margaretarum Phillip Island Chaffy Tree [68426]	Critically Endangered	Species or species habitat known to occur within area
Acronychia littoralis Scented Acronychia [8582]	Endangered	Species or species habitat known to occur within area
Allocasuarina thalassoscopica [21927]	Endangered	Species or species habitat may occur within area
Archidendron lovelliae Bacon Wood, Tulip Siris [13451]	Vulnerable	Species or species habitat likely to occur within area
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat likely to occur within area
Baloghia marmorata Marbled Balogia, Jointed Baloghia [8463]	Vulnerable	Species or species habitat may occur within area
Blechnum norfolkianum Norfolk Island Water-fern [65885]	Endangered	Species or species habitat known to occur within area
Boehmeria australis subsp. australis Tree Nettle, Nettletree [83309]	Critically Endangered	Species or species habitat known to occur within area
Bosistoa transversa Three-leaved Bosistoa, Yellow Satinheart [16091]	Vulnerable	Species or species habitat likely to occur within area
Calystegia affinis [48909]	Critically Endangered	Species or species habitat known to occur within area
Clematis dubia a creeper, Clematis [22035]	Critically Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
Coprosma baueri Coastal Coprosma [37851]	Endangered	Species or species habitat known to occur within area
Coprosma pilosa Mountain Coprosma [37884]	Endangered	Species or species habitat known to occur within area
Cordyline obtecta Ti [65878]	Vulnerable	Species or species habitat known to occur within area
Cryptocarya foetida Stinking Cryptocarya, Stinking Laurel [11976]	Vulnerable	Species or species habitat known to occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat known to occur within area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat may occur within area
Dendrobium brachypus Norfolk Island Orchid [2592]	Endangered	Species or species habitat known to occur within area
Diploglottis campbellii Small-leaved Tamarind [21484]	Endangered	Species or species habitat may occur within area
Dysoxylum bijugum Sharkwood, a tree [65892]	Vulnerable	Species or species habitat known to occur within area
Elatostema montanum Mountain Procris [33862]	Critically Endangered	Species or species habitat known to occur within area
Elymus multiflorus subsp. kingianus Phillip Island Wheat Grass [82413]	Critically Endangered	Species or species habitat known to occur within area
Endiandra floydii Floyd's Walnut [52955]	Endangered	Species or species habitat likely to occur within area
Eucalyptus conglomerata Swamp Stringybark [3160]	Endangered	Species or species habitat may occur within area
Euphorbia norfolkiana Norfolk Island Euphorbia [65887]	Critically Endangered	Species or species habitat known to occur within area
Euphorbia obliqua a herb [44385]	Vulnerable	Species or species habitat likely to occur within area
Fontainea australis Southern Fontainea [24037]	Vulnerable	Species or species habitat may occur within area
Gossia fragrantissima Sweet Myrtle, Small-leaved Myrtle [78867]	Endangered	Species or species habitat may occur within area
Hibiscus insularis Phillip Island Hibiscus [30614]	Critically Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Hypolepis dicksonioides Downy Ground-fern, Brake Fern, Ground Fern [10243]	Vulnerable	Species or species habitat likely to occur within area
Ileostylus micranthus Mistletoe [65891]	Vulnerable	Species or species habitat known to occur within area
Lastreopsis calantha Shield-fern, Shieldfern [65884]	Endangered	Species or species habitat known to occur within area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat known to occur within area
Macadamia ternifolia Small-fruited Queensland Nut, Gympie Nut [7214]	Vulnerable	Species or species habitat likely to occur within area
Macadamia tetraphylla Rough-shelled Bush Nut, Macadamia Nut, Rough-shelled Macadamia, Rough-leaved Queensland Nut [6581]	Vulnerable	Species or species habitat likely to occur within area
Macrozamia pauli-guilielmi Pineapple Zamia [5712]	Endangered	Species or species habitat likely to occur within area
Marattia salicina King Fern, Para, Potato Fern [16197]	Endangered	Species or species habitat likely to occur within area
Melicope littoralis Shade Tree [22042]	Vulnerable	Species or species habitat known to occur within area
Melicytus latifolius Norfolk Island Mahoe [56677]	Critically Endangered	Species or species habitat known to occur within area
Melicytus ramiflorus subsp. oblongifolius Whiteywood, a tree [56680]	Vulnerable	Species or species habitat likely to occur within area
Meryta angustifolia a tree [65881]	Vulnerable	Species or species habitat known to occur within area
Meryta latifolia Shade Tree, Broad-leaved Meryta [65882]	Critically Endangered	Species or species habitat likely to occur within area
Muehlenbeckia australis Shrubby Creeper, Pohuehue [68510]	Endangered	Species or species habitat known to occur within area
Myoporum obscurum Popwood, Sandalwood, Bastard Ironwood [50255]	Critically Endangered	Species or species habitat known to occur within area
Myrsine ralstoniae Beech [83889]	Vulnerable	Species or species habitat known to occur within area
Pennantia endlicheri Pennantia [65890]	Endangered	Species or species habitat known to occur within area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat known to occur within area
Phaius bernaysii Yellow Swamp-orchid [4918]	Endangered	Species or species habitat likely to occur within area
Phreatia limenophylax Norfolk Island Phreatia [9239]	Critically Endangered	Species or species habitat known to occur within area
Phreatia paleata an orchid [20193]	Endangered	Species or species habitat known to occur within area
Pittosporum bracteolatum Oleander [47181]	Vulnerable	Species or species habitat known to occur within area
Planchonella costata [30944]	Endangered	Species or species habitat known to occur within area
Polyphlebium endlicherianum Middle Filmy Fern [87494]	Endangered	Species or species habitat known to occur within area
Pteris kingiana King's Brakefern [35183]	Endangered	Species or species habitat likely to occur within area
Pteris zahlbruckneriana Netted Brakefern [65893]	Endangered	Species or species habitat likely to occur within area
Randia moorei Spiny Gardenia [10577]	Endangered	Species or species habitat known to occur within area
Samadera bidwillii Quassia [29708]	Vulnerable	Species or species habitat likely to occur within area
Senecio australis a daisy [40250]	Vulnerable	Species or species habitat likely to occur within area
Senecio evansianus a daisy [55340]	Endangered	Species or species habitat known to occur within area
Senecio hooglandii a daisy [55346]	Vulnerable	Species or species habitat known to occur within area
Sophora fraseri [8836]	Vulnerable	Species or species habitat may occur within area
Streblus pendulinus Siah's Backbone, Sia's Backbone, Isaac Wood [21618]	Endangered	Species or species habitat known to occur within area
Syzygium hodgkinsoniae Smooth-bark Rose Apple, Red Lilly Pilly [3539]	Vulnerable	Species or species habitat likely to occur within area
Syzygium moorei Rose Apple, Coolamon, Robby, Durobby, Watermelon Tree, Coolamon Rose Apple [12284]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Taeniophyllum norfolkianum Minute Orchid, Ribbon-root Orchid [82347]	Vulnerable	Species or species habitat likely to occur within area
Thelymitra jonesii Sky-blue Sun-orchid [76352]	Endangered	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
Tmesipteris norfolkensis Hanging Fork-fern [65895]	Vulnerable	Species or species habitat known to occur within area
Triunia robusta Glossy Spice Bush [14747]	Endangered	Species or species habitat likely to occur within area
Ungeria floribunda Bastard Oak [41714]	Vulnerable	Species or species habitat known to occur within area
Wikstroemia australis Kurrajong [42074]	Critically Endangered	Species or species habitat known to occur within area
Zehneria baueriana Native Cucumber, Giant Cucumber [39253]	Endangered	Species or species habitat known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Christinus guentheri Lord Howe Island Gecko, Lord Howe Island Southern Gecko [59250]	Vulnerable	Species or species habitat likely to occur within area
Delma torquata Adorned Delma, Collared Delma [1656]	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
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Furina dunmalli Dunmall's Snake [59254]	Vulnerable	Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Foraging, feeding or related behaviour known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Oligosoma lichenigera Lord Howe Island Skink [82034]	Vulnerable	Species or species habitat likely to occur within area
Saiphos reticulatus Three-toed Snake-tooth Skink [88328]	Vulnerable	Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Sharks		
Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat known to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Breeding may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species

[Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Breeding known 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]		Species or species habitat known to occur within area
Ardenna grisea Sooty Shearwater [82651]		Species or species habitat likely to occur within area
Ardenna pacifica Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
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
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		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

Name	Threatened	Type of Presence
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Phaethon rubricauda Red-tailed Tropicbird [994]		Breeding known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Sternula albifrons Little Tern [82849]		Breeding known to occur within area
Sula dactylatra Masked Booby [1021]		Breeding known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to 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 likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera 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 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

Name	Threatened	Type of Presence
		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	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		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
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Foraging, feeding or related behaviour known to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat known to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur

Name	Threatened	Type of Presence
		within area
Phocoena dioptrica Spectacled Porpoise [66728]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Breeding may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Breeding known to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
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
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur

Name	Threatened	Type of Presence
		within area
Calidris subminuta Long-toed Stint [861]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Roosting known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting 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
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limnodromus semipalmatus Asian Dowitcher [843]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
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 known to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area
Tringa incana Wandering Tattler [831]		Roosting known to occur within area

Name	Threatened	Type of Presence
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis		
Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus		
Terek Sandpiper [59300]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land -
Commonwealth Land - Norfolk Island National Park

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Natural		
Nepean Island Reserve	EXT	Listed place
Phillip Island	EXT	Listed place
Selwyn Reserve (2003 boundary)	EXT	Listed place
Tasmanian Seamounts Area	EXT	Listed place
Historic		
Arched Building, Longridge	EXT	Listed place
HMS Sirius Shipwreck	EXT	Listed place
Kingston and Arthurs Vale Commonwealth Tenure Area	EXT	Listed place

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus		
Common Noddy [825]		Breeding known to occur within area
Anseranas semipalmata		
Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris subminuta Long-toed Stint [861]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Roosting 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 gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting 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
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Heteroscelus incanus Wandering Tattler [59547]		Roosting known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limnodromus semipalmatus Asian Dowitcher [843]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	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
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Morus serrator Australasian Gannet [1020]		Breeding known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting known to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Phaethon rubricauda Red-tailed Tropicbird [994]		Breeding known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		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
Procelsterna cerulea Grey Noddy, Grey Ternlet [64378]		Breeding known to occur within area
Pterodroma cervicalis White-necked Petrel [59642]		Breeding known to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Pterodroma nigripennis Black-winged Petrel [1038]		Breeding known to occur within area
Pterodroma solandri Providence Petrel [1040]		Breeding known to occur within area
Puffinus assimilis Little Shearwater [59363]		Breeding known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat known to occur within area
Puffinus griseus Sooty Shearwater [1024]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Puffinus pacificus Wedge-tailed Shearwater [1027]		Breeding known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Roosting known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat known to occur within area
Sterna albifrons Little Tern [813]		Breeding known to occur within area
Sula dactylatra Masked Booby [1021]		Breeding known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat known to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area

Name	Threatened	Type of Presence
Fish		
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Campichthys tryoni Tryon's Pipefish [66193]		Species or species habitat may occur within area
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area
Corythoichthys ocellatus Orange-spotted Pipefish, Ocellated Pipefish [66203]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus boothae Booth's Pipefish [66218]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippichthys cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish [66228]		Species or species habitat may occur within area
Hippichthys heptagonus Madura Pipefish, Reticulated Freshwater Pipefish [66229]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		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
Hippocampus kelloggi Kellogg's Seahorse, Great Seahorse [66723]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]		Species or species habitat known to occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		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
Micrognathus andersonii Anderson's Pipefish, Shortnose Pipefish [66253]		Species or species habitat may occur within area
Micrognathus brevirostris thorntail Pipefish, Thorn-tailed Pipefish [66254]		Species or species habitat may occur within area
Microphis manadensis Manado Pipefish, Manado River Pipefish [66258]		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
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Solegnathus dunckeri Duncker's Pipehorse [66271]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		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

Name	Threatened	Type of Presence
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		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
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Laticauda colubrina a sea krait [1092]		Species or species habitat may occur within area
Laticauda laticaudata a sea krait [1093]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Foraging, feeding or related behaviour known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera 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 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
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 Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species

Name	Status	Type of Presence
		habitat known to occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may 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
Hyperoodon planifrons Southern Bottlenose Whale [71]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia simus Dwarf Sperm Whale [58]		Species or species habitat may occur within area
Lagenodelphis hosei Fraser's Dolphin, Sarawak Dolphin [41]		Species or species habitat may occur within area
Lagenorhynchus cruciger Hourglass Dolphin [42]		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]	Vulnerable	Foraging, feeding or related behaviour 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 ginkgodens Gingko-toothed Beaked Whale, Gingko-toothed Whale, Gingko Beaked Whale [59564]		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
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

Name	Status	Type of Presence
		area
Mesoplodon mirus True's Beaked Whale [54]		Species or species habitat may occur within area
Orcaella brevirostris Irrawaddy Dolphin [45]		Species or species habitat likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area
Phocoena dioptrica Spectacled Porpoise [66728]		Species or species habitat may 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
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Breeding known to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area
Tasmacetus shepherdi Shepherd's Beaked Whale, Tasman Beaked Whale [55]		Species or species habitat may 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

Commonwealth ReservesTerrestrial [Resource Information]

Name	State	Type
Norfolk Island	EXT	Botanic Gardens
Norfolk Island (Mt Pitt)	EXT	National Park (Commonwealth)
Norfolk Island (Phillip Island)	EXT	National Park (Commonwealth)

Australian Marine Parks	[Resource Information]
Name	Label
Central Eastern	Habitat Protection Zone (IUCN IV)
Coral Sea	Habitat Protection Zone (IUCN IV)
Coral Sea	National Park Zone (IUCN II)
Coral Sea	Special Purpose Zone (Trawl) (IUCN VI)
Freycinet	Marine National Park Zone (IUCN II)
Gifford	Habitat Protection Zone (IUCN IV)
Huon	Habitat Protection Zone (IUCN IV)
Huon	Multiple Use Zone (IUCN VI)
Norfolk	Habitat Protection Zone (IUCN IV)
Norfolk	National Park Zone (IUCN II)
Norfolk	Special Purpose Zone (Norfolk) (IUCN
South Tasman Rise	Special Purpose Zone (IUCN VI)

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Bribie Island	QLD
Burleigh Head	QLD
Currumbin Hill	QLD
Ex-HMAS Brisbane	QLD
Great Sandy	QLD
Main Beach	QLD
Maroochy River	QLD
Moreton Island	QLD
Naree Budjong Djara	QLD
Noosa	QLD
South Bruny	TAS
South Stradbroke Island	QLD

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales
Tasmania RFA	Tasmania

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Callipepla californica California Quail [59451]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Gallus gallus Red Junglefowl, Feral Chicken, Domestic Fowl [917]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Turdus philomelos Song Thrush [597]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Rattus exulans Pacific Rat, Polynesian Rat [79]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus africanus Climbing Asparagus, Climbing Asparagus Fern [66907]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Asparagus scandens Asparagus Fern, Climbing Asparagus Fern [23255]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Cryptostegia grandiflora Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda [18913]		Species or species habitat likely to occur within area
Dolichandra unguis-cati Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area

Name	Status	Type of Presence
Hymenachne amplexicaulis		
Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to occur within area
Lantana camara		
Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum		
African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Opuntia spp.		
Prickly Pears [82753]		Species or species habitat likely to occur within area
Parthenium hysterophorus		
Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area
Pinus radiata		
Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate		
Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla		
Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii		
Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta		
Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis		
Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus		
Asian House Gecko [1708]		Species or species habitat likely to occur within area
Ramphotyphlops braminus		
Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat likely to occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Bribie Island	QLD
Fraser Island	QLD
Great Barrier Reef Marine Park	QLD
Great Sandy Strait	QLD
Moreton Bay	QLD
Noosa River Wetlands	QLD
North Stradbroke Island	QLD
Pumicestone Passage	QLD

Key Ecological Features (Marine) [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
Tasmantid seamount chain	Coral Sea
Seamounts South and east of Tasmania	South-east
Canyons on the eastern continental slope	Temperate east
Lord Howe seamount chain	Temperate east
Norfolk Ridge	Temperate east
Shelf rocky reefs	Temperate east
Tasman Front and eddy field	Temperate east
Tasmantid seamount chain	Temperate east
Upwelling off Fraser Island	Temperate east

Caveat

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

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

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

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-28.169474 153.604828,-28.168945 153.556934,-28.159789 153.550497,-28.164178 153.52442,-28.123006 153.487342,-28.123006 153.481848,-28.089694 153.463309,-28.084848 153.455069,-27.996366 153.437903,-27.931473 153.439963,-27.929046 153.431723,-27.921159 153.431723,-27.636845 153.472235,-27.42556 153.560126,-27.365816 153.433783,-27.322511 153.447516,-27.020742 153.477042,-27.015237 153.451636,-27.064164 153.21955,-26.813188 153.139212,-26.800318 153.165991,-26.671538 153.145392,-26.667243 153.115866,-26.369872 153.125479,-26.379715 153.089774,-26.316338 153.069174,-25.92238 153.20513,-25.919909 153.182471,-25.817348 153.078787,-25.749955 153.105567,-25.683142 153.082907,-24.846092 153.675954,-24.306578 153.522146,-23.925536 153.917654,-23.623916 154.407919,-24.066052 167.371786,-32.3424 172.86495,-40.796782 167.98702,-45.843744 162.142294,-46.814741 149.793661,-44.886643 147.376669,-43.595928 147.102697,-43.260826 148.278234,-42.698202 148.465002,-41.656107 159.154012,-28.168415 163.636434,-28.129667 155.858114,-28.169626 153.647544,-28.169323 153.606367,-28.169474 153.604828

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

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

Please feel free to provide feedback via the Contact Us page.

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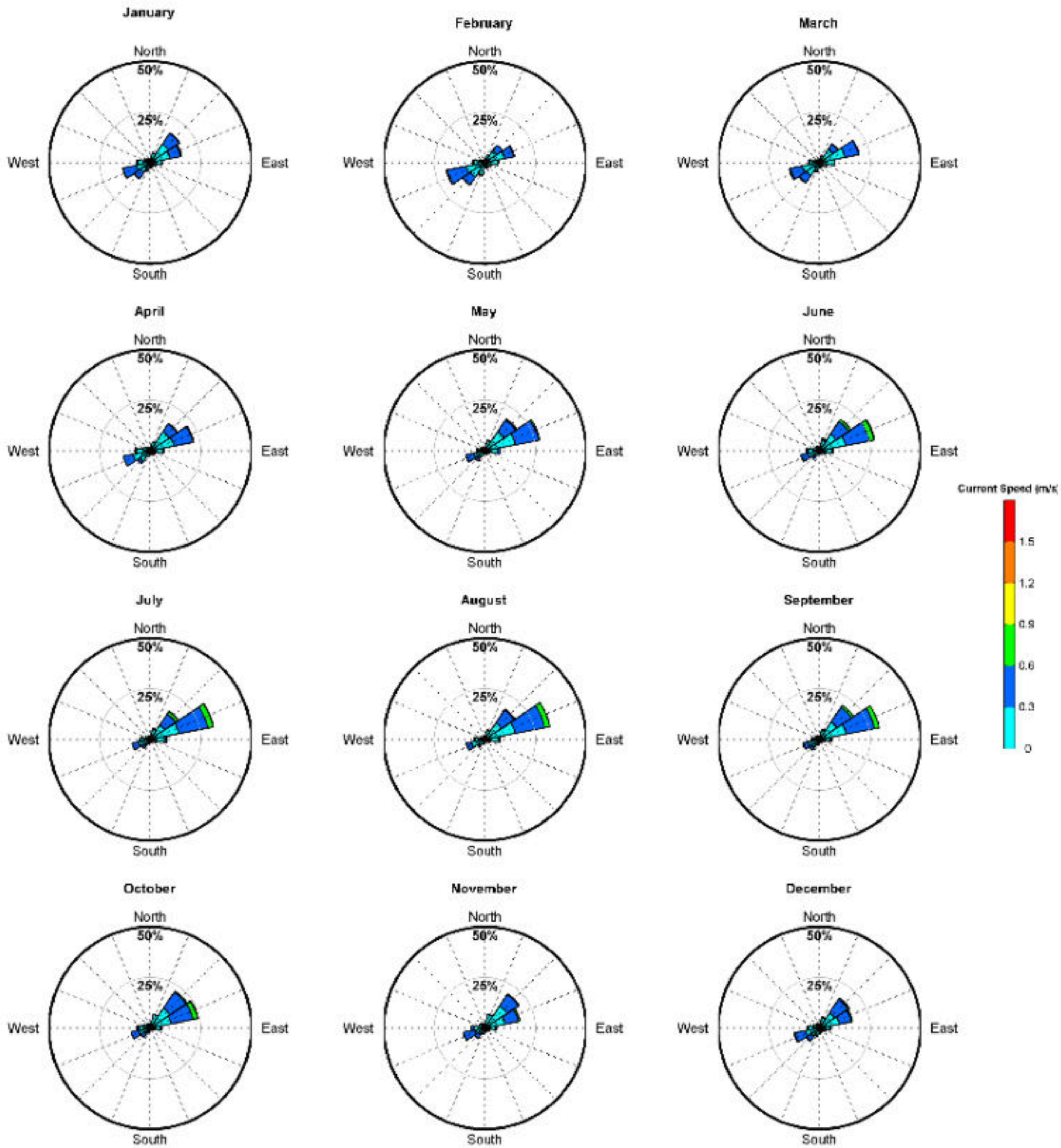
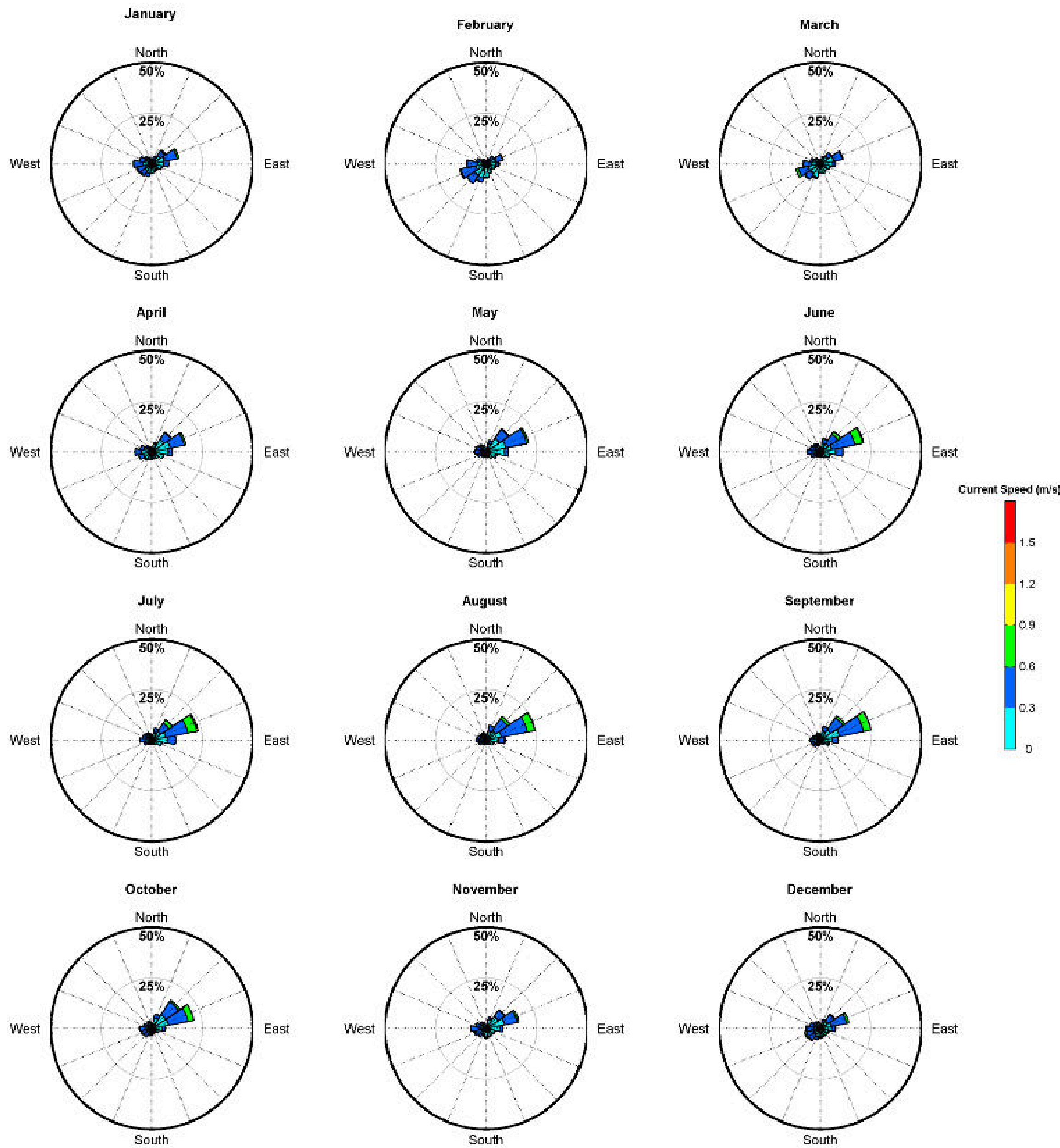
APPENDIX D – Current Roses

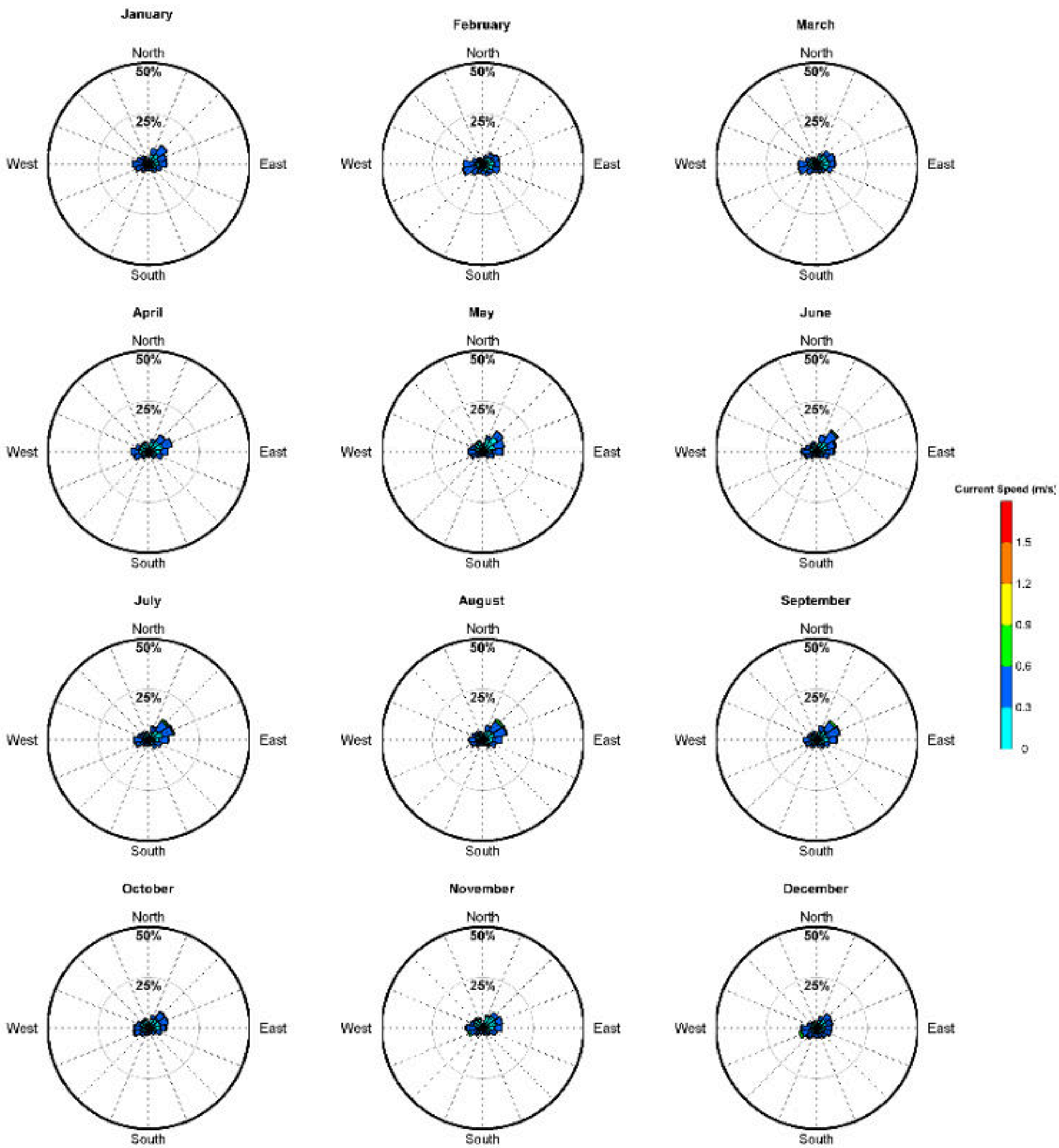
SNA – Monthly average currents (2010-2014)



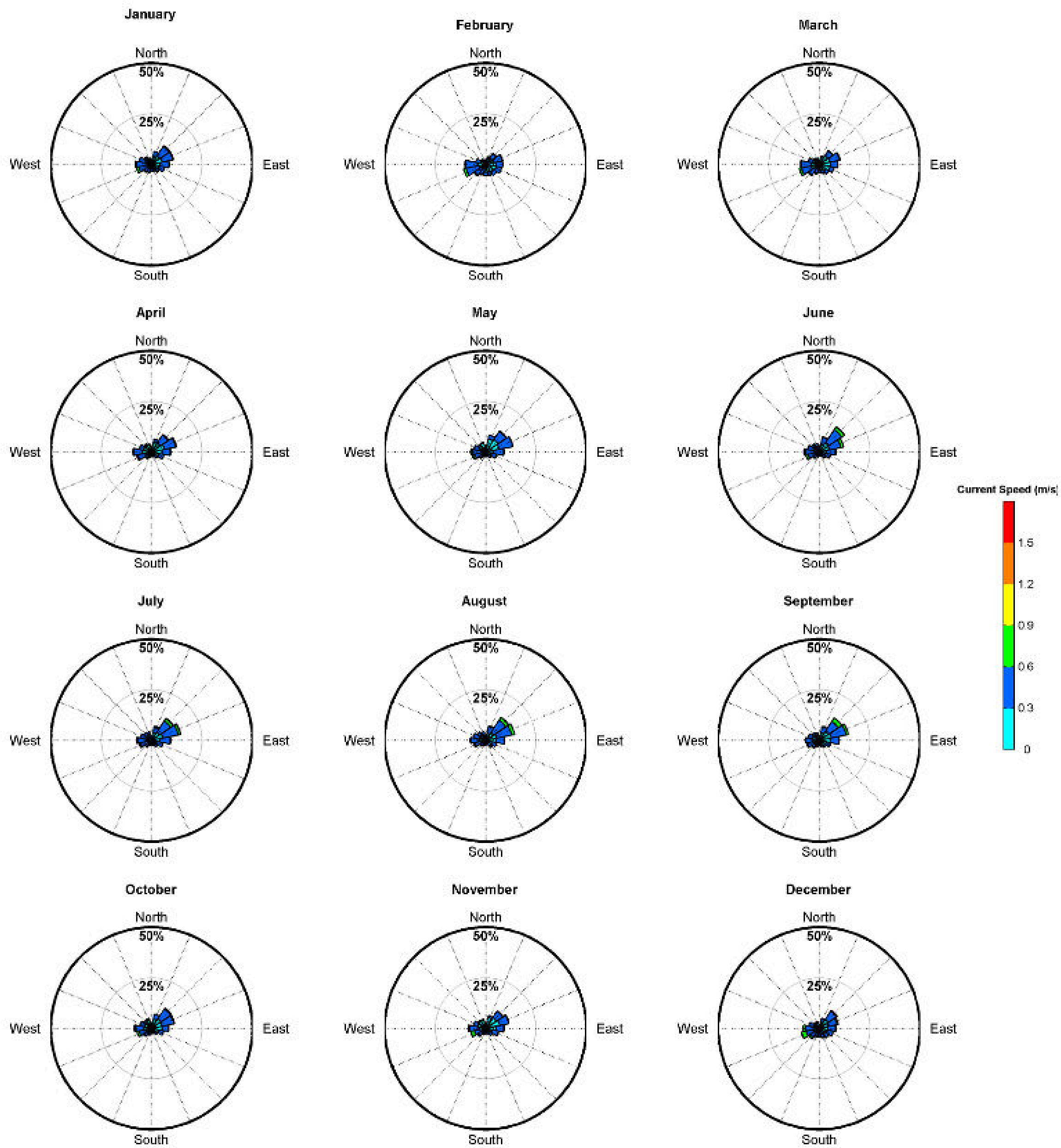
TNA – Monthly average currents (2010-2014)



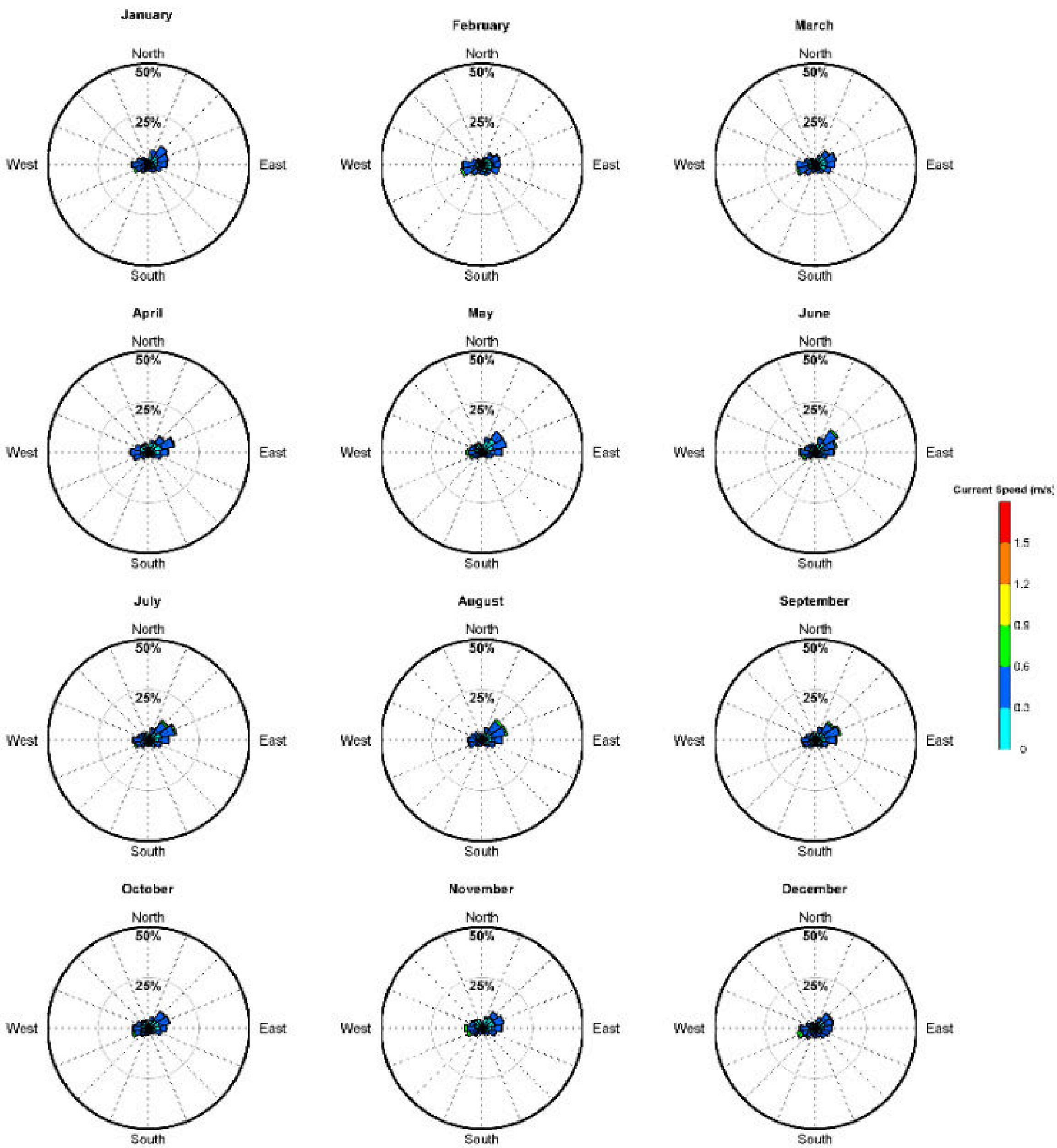
FTA – Monthly average currents (2010-2014)



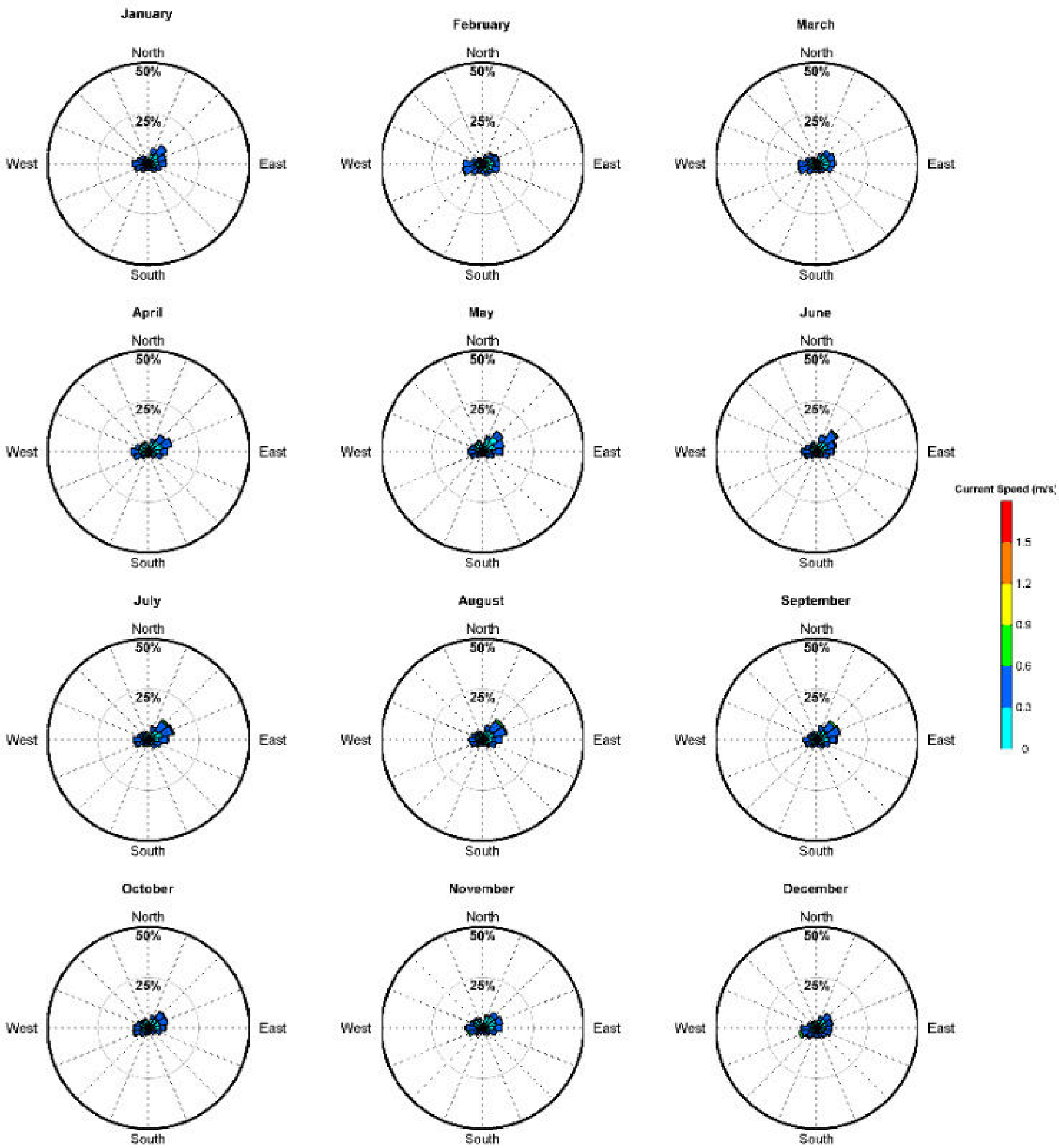
HLA – Monthly average currents (2010-2014)



CBA – Monthly average currents (2010-2014)



MKA – Monthly average currents (2010-2014)



Esso Australia Resources Pty Ltd

OPERATIONS IMPACTS AND RISKS

BASS STRAIT ENVIRONMENT PLAN

Volume 2

Document Number: AUGO-EV-EMM-002

OIMS MANUAL - DOCUMENT CONTROL DETAILS

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Approved By	Simon Kemp	Offshore Asset Manager	On file	26 Mar 21

Endorsed / approved by Esso Australia Pty Ltd, for and on behalf of Esso Australia Resources Pty Ltd.

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0	Issued for NOPSEMA Acceptance as part of the Bass Strait Operations EP	10 Sept 2019	Sarah McCarthy	Simon Kemp

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This document should be reviewed for accuracy and currency on a 5 yearly basis commencing from the original formal issue date. Major revisions to this manual are to comply with the OIMS System Manual/Process Management of Change procedures.

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TITLEHOLDER DETAILS

Esso Australia Resources Pty Ltd (Esso), a wholly owned subsidiary of ExxonMobil Australia Pty Ltd, is the operator for the Gippsland Basin Joint Venture (GBJV) (Esso and BHP Billiton Petroleum (Bass Strait) Pty Ltd (BHP)) and the Kipper Unit Joint Venture (KUJV) (Esso, BHP, and MEPAU A Pty Ltd). Esso receives services, including personnel, from its wholly owned subsidiary, Esso Australia Pty Ltd, which is also a wholly owned subsidiary of ExxonMobil Australia Pty Ltd.

Petroleum Production Licences and pipeline licences applicable to this Environment Plan are listed in Appendix A.

Petroleum Production Licenses fall under the GBJV with the exception of VIC/L25 which falls under KUJV.

The nominated registered office for the proponent is as follows:

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The Regulator will be notified of a change in titleholder, a change in the environmental contact or a change in the contact details for either the titleholder or the environmental contact in accordance with Regulation 15(3) of the Offshore Petroleum and Greenhouse Gas (Environment) Regulations 2009 (OPGGS(E)R).

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Abbreviations

AFFF	Aqueous Film Forming Foam
AFI	Agreed for Implementation
AHS	Australian Hydrographic Society
ALARP	As Low as Reasonably Practicable
AMSA	Australian Maritime Safety Authority
AMP	Australian Marine Parks
ANZECC	Australian and New Zealand Environment and Conservation Council
API	American Petroleum Institute gravity
ASOG	Activity Specific Operating Guidelines
ATBA	Area to Be Avoided
BHPB	BHP Billiton Petroleum (Bass Strait) Pty Ltd
BIA	Biologically Important Area
BKA	Blackback Subsea Facility
BMA	Bream A Platform
BMB	Bream B Platform
BOD	Biochemical Oxygen Demand
BOP	Blow-out Preventor
BSPNSC	Bass Strait Pipeline Network Safety Case
BTA	Barracouta Platform
BTW	West Barracouta Planned Subsea Facility
BWMC	Ballast Water Management Certificate
BWMP	Ballast Water Management Plan
CAMO	Critical Activity Mode
CASA	Civil Aviation Safety Authority
CBA	Cobia Platform
CDSP	Closed Drain Skimmer Pile
CFSR	Climate Forecast System Reanalysis
DA	Described Area
DAWR	Department of Agriculture and Water Resources
Db	Decibels
DGF	Dissolved Gas Flotation
DP	Dynamic Positioning
DPA	Dolphin Monotower
DWH	Deepwater Horizon
EAPL	Esso Australia Pty Ltd
EARPL	Esso Australia Resources Pty Ltd
EP	Environment Plan
EPBC	Environment Protection and Biodiversity Conservation
EPO	Environmental Performance Objectives
ES	Equipment Strategies
ESD	Ecologically Sustainable Development
FIMS	Facility Integrity Management System
FLA	Flounder Platform
FLEM	Flowline End Manifold

FMEA	Failure Mode and Effects Analysis
FTA	Fortescue Platform
GBJVOA	Gippsland Basin Joint Venture Operational Agreement
GHG	Greenhouse Gases
GoM	Gulf of Mexico
GWP	Global Warming Potential
HFC	Hydrofluorocarbon
HLA	Halibut Platform
IBC	Intermediate Bulk Container
IMO	International Maritime Organisation
IMR	Inspection, Maintenance and Repair
IMS	Invasive Marine Species
JRCC	Joint Rescue Coordination Centre
JV	Joint Venture
KEF	Key Ecological Feature
KFA	Kingfish A Platform
KFB	Kingfish B Platform
Kg	Kilogram
KL	Kilolitre
KPa	Kilopascal
KPA	Kipper Subsea Facility
KUJV	Kipper Unit Joint Venture
KUJVOA	Kipper Unit Joint Venture Operational Agreement
L	Litre
LOC	Loss of Control
LWD	Logging While Drilling
m	Metres
MARPOL	International Convention for the Prevention of Pollution from Ships
MARS	Maritime Arrivals Reporting System
MC	Measurement Criteria
MDO	Marine Diesel Oil
MEG	Monoethylene Glycol
MEPAU A	Mitsui E&P Australia Pty Ltd
MKA	Mackerel Platform
MLA	Marlin A Platform
MLB	Marlin B Platform
MNES	Matters of National Environmental Significance
MODU	Mobile Offshore Drilling Unit
MOL	Main Oil Line
MSL	Mean Sea Level
NCEP	National Centre for Environment Prediction
NDT	Non-destructive Testing
NBMG	National Biofouling Management Guidelines
NM	Nautical Mile
NMFS	National Marine Fisheries Service
NOAA	National Ocean and Atmospheric Administration

NORM	Naturally Occurring Radioactive Material
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NSW	New South Wales
ODSP	Open Drain Skimmer Pile
OGUK	Oil and Gas UK (previously UKOOA)
OIMS	Operations Integrity Management System
OIS	Offset Installation System
OPEP	Oil Pollution Emergency Plan
OPGGS Act	Offshore Petroleum and Greenhouse Gas Storage Act 2006
OPGGS(E)R	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
OPGGS(S)R	Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009
OSMP	Oil Spill Monitoring Program
OWS	Oily water separator
PBT	Persistent, Bioaccumulative and Toxic
PCA	Perch Monotower
PEA	Potentially Exposed Area
PFAS	Per- and polyfluoroalkyl substances
PFC	Perfluorocarbons
PFP	Passive Fire Protection
PFW	Produced Formation Water
PMST	Protected Matters Search Tool
POB	Persons on Board
ppb	Parts per billion
PSV	Platform Supply Vessel
PSZ	Petroleum Safety Zone
PTA	Pipeline Termination Assembly
RAMSAR	Convention on Wetlands of International Importance
RAT	Riser Access Tower
RMS	Root Mean Squared voltage
RO	Reverse Osmosis
ROV	Remotely Operated Vehicle
SCM	Subsea Control Module
SDS	Safety Data Sheet (previously Material Safety Data Sheet, MSDS)
SEPP	State (VIC) Environment Protection Policy
SIMAP	Spill Impact Mapping and Analysis Program
SHA	Seahorse Subsea Facility
SMPEP	Shipboard Marine Pollution Emergency Plan
SNA	Snapper Platform
SOLAS	Safety of Life at Sea
SOPEP	Shipboard Oil Pollution Emergency Plan
ssd	Species Sensitivity Distribution
SSHE	Safety, Security, Health, Environment
TEC	Threatened Ecological Community
TGB	Temporary Guide Base
TMS	Tether Management System
TNA	Tuna Platform

TOFD	Time of Flight Detection
TTS	Temporary Threshold Shift
TWA	Tarwhine Subsea Facility
UAV	Unmanned Aerial Vehicle
US	United States
UTA	Umbilical Termination Assembly
VIC	Victoria
VOC	Volatile Organic Compounds
WCDS	Worst Case Discharge Scenario
WKF	West Kingfish Platform
WOMP	Well Operations Management Plan
WTA	Whiting Platform
WTN	West Tuna Platform

1 Introduction

1.1 Overview

Esso Australia Resources Pty Ltd (Esso) is the operator of joint ventures for the exploration, development and production of oil and gas from Bass Strait, Victoria. Bass Strait operations consist of 19 platforms and five subsea facilities (four existing and one proposed) located within Commonwealth waters, and ~600 km of subsea pipeline.

Esso has developed this Environment Plan (EP) to identify, evaluate and manage the environmental impacts and risks associated with operation and maintenance of its oil and gas production facilities in Bass Strait.

This EP is submitted as a revision to the following EPs, and will cover a period of 5 years from the date of acceptance:

- Barracouta Whiting Environment Plan (AUGO-PO-EMP-033) NOPSEMA Reference: A384170 ID2787
- Bream Environment Plan (AUGO-PO-EMP-036) NOPSEMA Reference: A398118 ID2956
- Central Fields Environment Plan (AUGO-PO-EMP-034) NOPSEMA Reference: A398121 ID2957
- Flounder Environment Plan (AUGO-PO-EMP-035) NOPSEMA Reference: A387094 ID2893
- Kingfish Environment Plan (AUGO-PO-EMP-037) NOPSEMA Reference: A402033 ID2996
- Marlin Complex Environment Plan (AUGO-PO-EMP-031) NOPSEMA Reference: A401973 ID2999
- Perch Dolphin Environment Plan (AUGO-PO-EMP-032) NOPSEMA Reference: A384504 IDRMS2791
- Snapper Environment Plan (AUGO-PO-EMP-038) NOPSEMA Reference: A401990 ID2997
- Tuna Environment Plan (AUGO-PO-EMP-039) NOPSEMA Reference: A387092 ID2894
- West Tuna Environment Plan (AUGO-PO-EMP-030) NOPSEMA Reference: A384187 ID2357

This EP also includes the start-up, operations and maintenance of the West Barracouta subsea facility, which will be installed in 2020. Installation of the facility will be covered under a separate EP.

1.2 Scope

1.2.1 Operational Area

The Operational Area applicable to the scope of this EP includes the area within a 500 m Petroleum Safety Zone (PSZ) around the platforms and subsea facilities listed in , and a 200 m operational zone around the petroleum pipelines and secondary lines within Commonwealth waters (>3 NM from shore), as defined in the "Bass Strait Pipeline Network Safety Case" (BSPNSC).

1.2.2 Activities

Activities included in the scope of this EP are described in Section 2, and include Platform Operations, Support Operations, Inspection Maintenance and Repair (IMR), and Wellwork.

Activities excluded from the scope of this EP include:

- Activities in State waters, such as operation of export pipelines. These are managed under the Bass Strait State Waters Environment Plan (AUGO-PO-EMP-059) under the Victorian Offshore Petroleum and Greenhouse Gas Storage Act 2010 and associated regulations.
- Management of onshore activities.

- Vessels transiting to or from the Operational Area. These vessels are deemed to be operating under the Commonwealth Navigation Act 2012 and not performing a petroleum activity.
- Decommissioning activities. These will be covered in future permissioning documents.
- Activities using mobile offshore drilling units or platform-based drilling rigs.

1.2.3 Infrastructure

The infrastructure applicable to this Environment Plan is listed in Volume 2, Appendix A.

1.2.4 Stages of activity

A titleholder may choose what is involved in a particular stage of a petroleum activity and provide adequately for those activities in an EP. As defined in the NOPSEMA Guideline A515816, a New Stage of activity is defined as “A change to the spatial or temporal limits of the petroleum activity described in the accepted EP”. Esso has defined the stages of petroleum activity for pipelines and facilities in Figure 1-1 and Table 1-1.

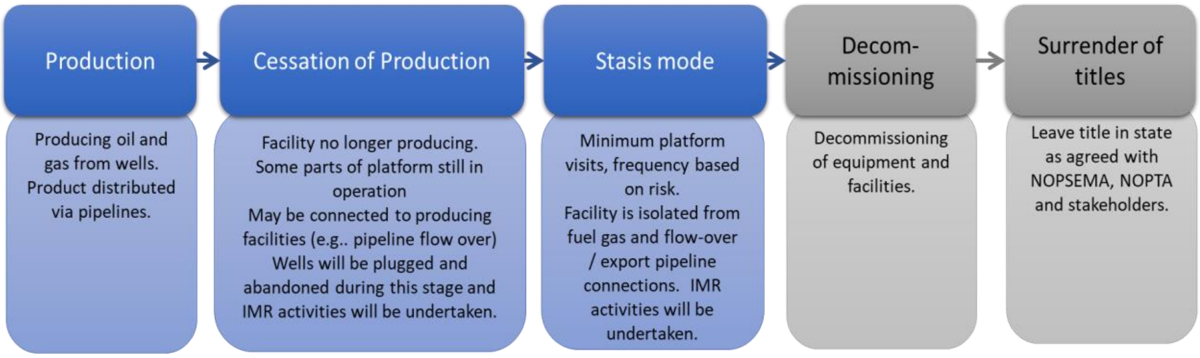


Figure 1-1 Lifecycle of a Facility

Stages of activity within the scope of this Environment Plan include:

- Production
- Cessation of Production
- Platform ‘Stasis Mode’.

The decommissioning and surrender of titles/licences stage of pipelines and facilities is not within the scope of this EP.

Once a platform ceases production of oil and gas it may be a number of years before all of the activities under the Cessation of Production stage are completed. Early in the Cessation of Production stage, wells may be required to be temporarily brought online to support key activities of the stage (e.g. pipeline pigging using gas driven pig). Given the complexity and interconnectedness of the Esso Bass Strait network, a platform may continue to be maintained to facilitate operations on other producing platforms (e.g. via pipeline ‘flow over’) and platform systems may also be used to prepare facilities for decommissioning (such as enabling the flushing of pipelines or umbilicals and subsequent liquids disposal) and support IMR activities. Hence, a platform may continue to be ‘in use’ for many years following the commencement of Cessation of Production stage. During this period, activities will continue in order to maintain the platform to an appropriate standard, to ensure safety and environmental risks are reduced to ALARP and acceptable levels, and to preserve all decommissioning outcomes up to and including full removal (as required under the OPGGS Act 2006 unless deviations are justified and accepted by NOPSEMA). These activities include well integrity testing, structural and corrosion control maintenance/repair (as required) and checks on operating systems such as fuel gas, air compressors, crane and lifting equipment, open and closed piles and safety systems.

During the Cessation of Production stage, normally once wells are plugged and abandoned, a variety of activities will take place on the platform to make it safe and prepare for decommissioning (e.g. isolate and shutdown systems; prepare the topsides and jackets for lifting activities; remove hydrocarbons; cleaning of import and export pipelines; air-gapping of risers on platforms and in some cases underwater cutting of pipelines and risers). Pipeline fluids may continue to 'flow over' platforms during the Cessation of Production stage whilst upstream facilities continue to produce or whilst they are prepared for decommissioning. It is expected to be a number of years before this work is completed and a facility or pipeline is ready for decommissioning.

Decommissioning of facilities is expected to be carried out via the use of a Heavy Lift Vessel (HLV) during one or more decommissioning campaigns as discussed further in Section 3.2 (although removal of smaller items of property will be ongoing consistent with the philosophy described in Section 3.1.3) – this stage of the activity is not within the scope of this EP. Therefore, following the completion of preparation for decommissioning, some facilities may remain in Stasis Mode with appropriate visits for IMR activities until such time as a decommissioning campaign commences. This stage is within the scope of this EP.

Following the completion of decommissioning and the undertaking of post decommissioning monitoring as appropriate and agreed with NOPSEMA, Esso will apply to NOPTA to surrender the relevant petroleum titles.

Notwithstanding that the decommissioning and surrender of titles stages are not activities covered by this EP, an overview of the planning underway for the decommissioning of facilities, equipment and pipelines is provided in Sections 3.1 – 3.3. The indicative decommissioning plans and schedules provided in these sections are preliminary and subject to change as technical, environmental and execution studies progress as well as key contracting activities are completed.

Table 1-1 Stages of activity

Item	Definition		Within the scope of this EP	Relevant Activities
	Facilities (including platforms and subsea)	Pipelines		
Production	Facility is producing oil and gas which is distributed via pipelines. In some instances during this stage, production may temporarily be ceased while future development plans are being evaluated. A facility will move to the CoP stage when production has ceased and there is no intention of returning to production in the future.	Pipeline used to transport oil and/or gas to shore or; used to supply other facilities with required resources (e.g. fuel gas, gas-lift gas, hydraulic fluid, hydrate inhibitor). For clarity, production stage includes pipelines which are used to transport oil and/or gas to shore from an upstream facility which is still in Production stage. Transport of oil and/or gas in a pipeline in production stage may 'flow over' or supply resources to a platform which is in CoP stage. A pipeline may remain in service while the associated platform has ceased production to allow flow over of product from other platforms.	Yes	• Operations (Section 2.4.1) • Wellwork (Section 2.4.2) • IMR (Section 2.4.3) • Support Operations (Section 2.4.3)
Cessation of production (CoP)	<u>Key change from prior stage:</u> Cessation of Production (CoP) stage commences when a facility is no longer producing oil and gas (wells are shut-in). There are a number of activities within the CoP stage: Care and Preservation (C&P) pre well plug and abandonment (P&A): • Wells are shut–in except in certain circumstances such as for supply of fuel gas for power generation. • Systems are being maintained and/or preserved where they are required for future P&A and decommissioning activities and/or to facilitate upstream asset ongoing production. • Wells continue to be monitored as per the WIMS and risk assessments undertaken as required prior to P&A. Wells may be plugged and secured (P&S) using a wireline rig to preserve wellbore integrity for the period prior to P&A.	In Cessation of Production stage, pipelines are no longer used to transport oil and gas to shore or to supply other facilities with resources. Some pipelines, while in CoP stage, may still be used to support activities in the lead up to decommissioning (e.g. for wellwork and/or platform flushing and draining and ultimately for pipeline flushing). Normal maintenance and inspection operations, excluding regular pigging activities, will continue for pipelines which remain in service while they are in CoP stage. During the CoP stage: • Risk based inspection and/or maintenance activities will be undertaken to prepare pipelines for decommissioning. • Pipelines will be filled with water treated with chemicals suitable for the period until decommissioning.	Yes	• Operations (Section 2.4.1) • Wellwork (Section 2.4.2) • IMR (Section 2.4.3) • Support Operations (Section 2.4.3)

<table>
<tr><th rowspan="2">Item</th><th colspan="2">Definition</th><th rowspan="2">Within the scope of this EP</th><th rowspan="2">Relevant Activities</th></tr>
<tr><th>Facilities (including platforms and subsea)</th><th>Pipelines</th></tr>
<tr><td></td><td>Once platforms are de-staffed, periodic platform visits are conducted as required to complete operations and maintenance tasks (e.g. WIMS testing, well operations, restart equipment that has shut down, top up lube oils, launch / receive pigs, re-establish communications) to facilitate upstream platform operations and/or maintain equipment for future decommissioning preparation activities. Platform visits may be conducted as day trips, or by temporarily re-staffing the facility for several weeks.

Well Plug and Abandonment (P&A) and Well Conductor Pull:
• Wells will be plugged and abandoned (P&A) during the CoP stage. Timing of P&A is dependent on the risk profile of the well.
• Well conductors will be removed either post P&A or as part of the Decommissioning stage.
• Some systems on the platform are still in operation with temporary or permanent connections (e.g. power, air, safety systems, fuel systems, pig launcher/receivers, cathodic protection, etc.)
Care and Preservation (C&P) post well P&A (as applicable):
• Platforms are normally de-staffed, with platform visits conducted as required to complete operations and maintenance tasks (e.g. restart equipment that has shut down, top up lube oils, launch/receive pigs, re-establish communications) to facilitate upstream platform operations and/or maintain equipment for future decommissioning preparation activities. Platform visits may be conducted as day trips, or by temporarily re-staffing the facility for several weeks.
Preparation for Decommissioning:
• Activities are being undertaken to prepare the platform for decommissioning in parallel with IMR to preserve the facility for a period of Stasis Mode.</td><td>• Sections of risers and pipelines including below FVOs/LVOs and/or underwater may be removed in preparation for platform or pipeline decommissioning.</td><td></td><td></td></tr>
</table>

Item	Definition		Within the scope of this EP	Relevant Activities
	Facilities (including platforms and subsea)	Pipelines		
	• Facilities will be progressively isolated from fuel gas and flow-over / export pipeline connections. The overall duration of CoP is dependent on current and potential future use requirements of the facility. Due to the high level of interconnectedness of the Bass Strait facilities, some platforms are used to allow pipeline 'flow over' to or from producing facilities. Some platform systems will also be used to facilitate the preparation of other facilities for decommissioning such as the flushing of pipelines and umbilicals, and removal of topsides hydrocarbons.			
Stasis Mode (minimal visits)	<u>Key change from prior stage</u> Activities to prepare facility for a period of minimal activity and decommissioning are complete. • Facilities are isolated from fuel gas and flow-over / export pipeline connections. • Facilities are considered to be 'not in use, nor to be used' in connection with the operations (as per Section 572 of the OPGGS Act 2006) when Stasis Mode is reached. Facility is ready for Decommissioning. The duration for which a platform will remain in 'Stasis Mode' is dependent on the current and future use requirements (i.e. to facilitate preparation for removal of other facilities) of the facility and the timing of decommissioning campaigns. Platform visits may be undertaken to complete IMR activities to maintain platform prior to future decommissioning.	Pipeline is ready for Decommissioning. Pipelines are considered to be 'not in use, nor to be used' in connection with the operations (as per Section 572 of the OPGGS Act 2006) when Stasis Mode is reached. Pipeline filled with seawater or water treated with chemicals suitable for the period until decommissioning.	Yes	• IMR (Section 2.4.3) • Support Operations (Section 2.4.3)
Decommissioning	This stage is not part of this EP. Dependent on technical, environmental and execution studies, regulatory approvals and feedback from stakeholders, decommissioning may include:	This stage is not part of this EP. Dependent on technical, environmental and execution studies, regulatory approvals and	No	• Not applicable to this plan.

Item	Definition		Within the scope of this EP	Relevant Activities
	Facilities (including platforms and subsea)	**Pipelines**		
	• Complete removal • Partial removal • Decommissioned in-situ or at another designated location Decommissioning activities will be undertaken on a campaign basis by specialised third party contractors with the appropriate vessels, equipment and expertise to undertake this work.	feedback from stakeholders, decommissioning may include: • Complete removal • Partial removal • In situ decommissioning Subsea asset decommissioning activities will be undertaken on a campaign basis by specialised third party contractors with the appropriate vessels, equipment and expertise to undertake this work.		Decommissioning activities will be addressed in a separate permissioning document(s).

2 Description of the Activity

2.1 Operations history

In 1965 the Esso/BHP Billiton joint venture under the GBJV operating agreement drilled Australia's first offshore well and discovered the Barracouta gas field in Bass Strait. Two years later Kingfish was discovered, the first offshore oil field, which to this day remains the largest oil field ever discovered in Australia.

The GBJV invested in the continued exploration, development and production of oil and gas in the Bass Strait which has been used to power industry, fuel vehicles, heat homes and manufacture products in Australia and overseas for the last 50 years.

The offshore activities in Bass Strait are supported by up to 350 people who live and work offshore at any one time. They are supported by many more onshore, who process the oil and gas at our plants at Longford and Long Island Point before sending to customers.

Platform operations are also supported by helicopters and supply vessels. The helicopter fleet operates regular flights to transfer personnel to and from platforms, and supply vessels operate out of Barry Beach Marine Terminal, moving between platforms to load and unload cargo.

Since establishment, the Bass Strait operations have produced over 50% of Australia's crude oil and liquids production and supplied over 40% of all Eastern Australia's natural gas consumption.

2.2 Location of the Activity

The Gippsland Basin is located in the Bass Strait, offshore Victoria's southern coast. Facilities and permit areas are shown in Figure 2-1.

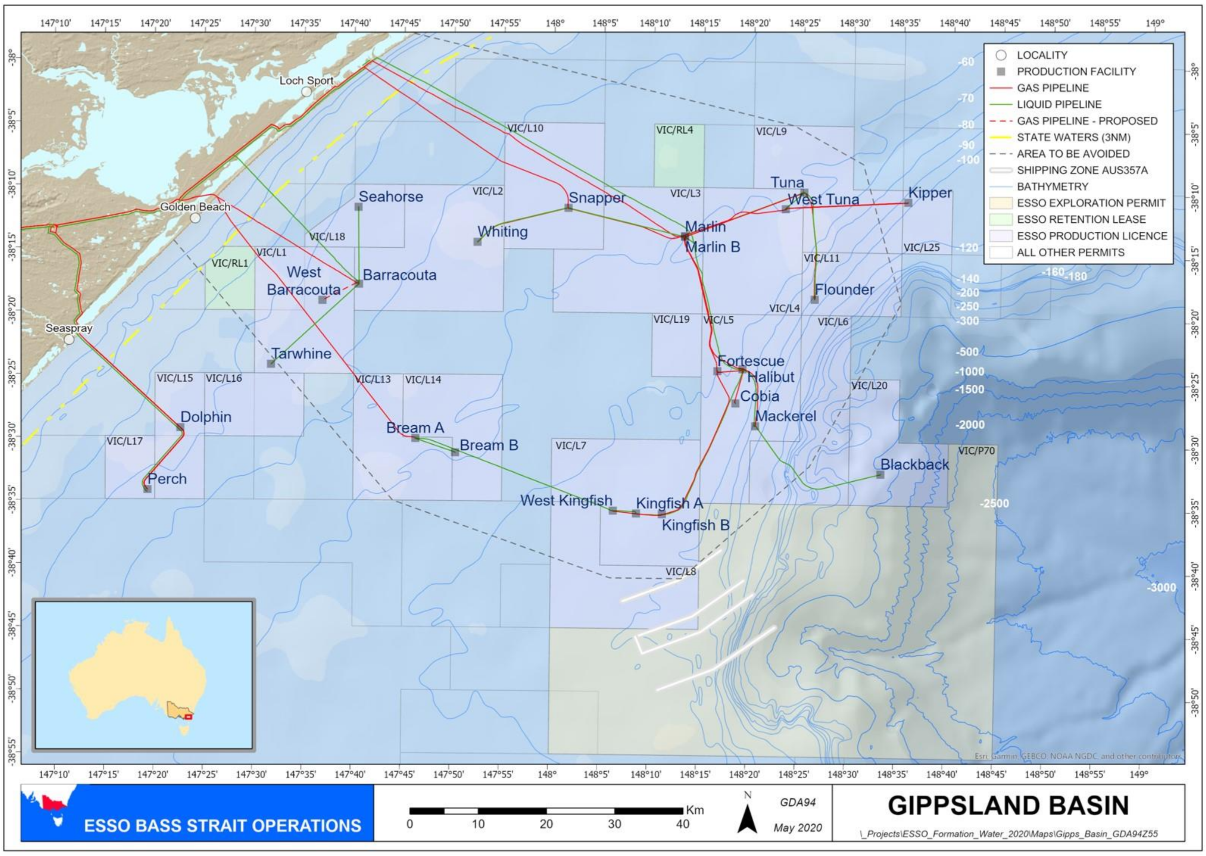


Figure 2-1 Esso Production Facilities in Bass Strait

The infrastructure includes 19 platforms, 5 subsea facilities (including the planned BTW Subsea Facility), and a network of subsea pipelines. Water depths at each facility range from 38 m (DPA) to 95 m (KPA).

An Area to Be Avoided (ATBA) excludes unauthorised vessels greater than 200 tonnes or 24 m length from entering the area around the Bass Strait platforms. The ATBA is defined in Schedule 2 of the Offshore Petroleum and Greenhouse Gas Storage Act 2006 (OPGGS Act) and administered by NOPSEMA. A traffic separation scheme operates to the south of the ATBA to control coastal shipping.

All the Esso operated Bass Strait Platforms (with the exception of PCA and DPA) are located within the ATBA. The BTW, SHA and TWA subsea facilities are located within the ATBA, whilst KPA and BKA are located outside. All pipelines (with the exception of part of the WTN350 (North & South), MKA-BKA65 and BKA – MKA200, and the PCA – Shore300 and Shore – PCA100) are located within the ATBA.

2.3 Gippsland Basin Facilities Description

The Bass Strait Oil and Gas Production Systems consist of staffed and unstaffed facilities and subsea systems as described in Appendix A, with interconnecting pipelines and umbilicals.

2.3.1 Platforms

Esso operates 19 platforms in the Bass Strait as listed in Table 2-1. The location and status of all facilities is summarised in Appendix A.

Note that the Marlin A and Marlin B platforms are connected via a walkway.

Table 2-1 Platforms

#	Title	Name	Abbreviation
1	VIC/L02	Barracouta	BTA
2	VIC/L02	Whiting	WTA
3	VIC/L03	Marlin A	MLA
4	VIC/L03	Marlin B	MLB
5	VIC/L04	West Tuna	WTN
6	VIC/L05	Halibut	HLA
7	VIC/L05	Fortescue	FTA
8	VIC/L05	Cobia	CBA
9	VIC/L05	Mackerel	MKA
10	VIC/L07	Kingfish B	KFB
11	VIC/L07	West Kingfish	WKF
12	VIC/L07	Kingfish A	KFA
13	VIC/L09	Tuna	TNA
14	VIC/L10	Snapper	SNA
15	VIC/L11	Flounder	FLA
16	VIC/L13	Bream A	BMA
17	VIC/L14	Bream B	BMB
18	VIC/L15	Dolphin	DPA
19	VIC/L17	Perch	PCA

Most of Esso's platforms have a tubular steel base structure (or jacket) which is fastened to the sea floor by piles. The jackets support the 'topsides' which include the production facilities, living quarters for the personnel working on the platform and a helicopter landing pad. Each platform typically consists of the following elements:

- Conductors, connecting the wellheads to the seabed.
- Pipeline risers connecting the platform to pipelines.
- Processing Equipment / Production facilities which typically include –
- Gas separators/scrubbers, oil separators, test separators, slug catcher/receivers
- Open and closed drain systems, including skimmer vessels and open and closed drain piles
- Potable water systems
- Produced water processing facilities, including hydrocyclones and/or dissolved gas flotation units
- Diesel/methanol/glycol storage & injection systems
- LPG/condensate reinjection facilities
- Instrument air systems
- Workover/wireline rig
- Living quarters, including
- Control room, radio room, offices
- Ablutions, laundry and galley
- Macerators for disposal of food scraps and sewage treatment
- Helideck
- Safety features including evacuation capsules
- Variable number of decks, including sea deck and cellar deck
- Laydown area and one or more cranes
- Pumps, compressors and electricity generators
- Maintenance workshop
- Flare/vent boom & scrubbers

Figure 2-2 shows a schematic of a typical Bass Strait oil and gas platform.

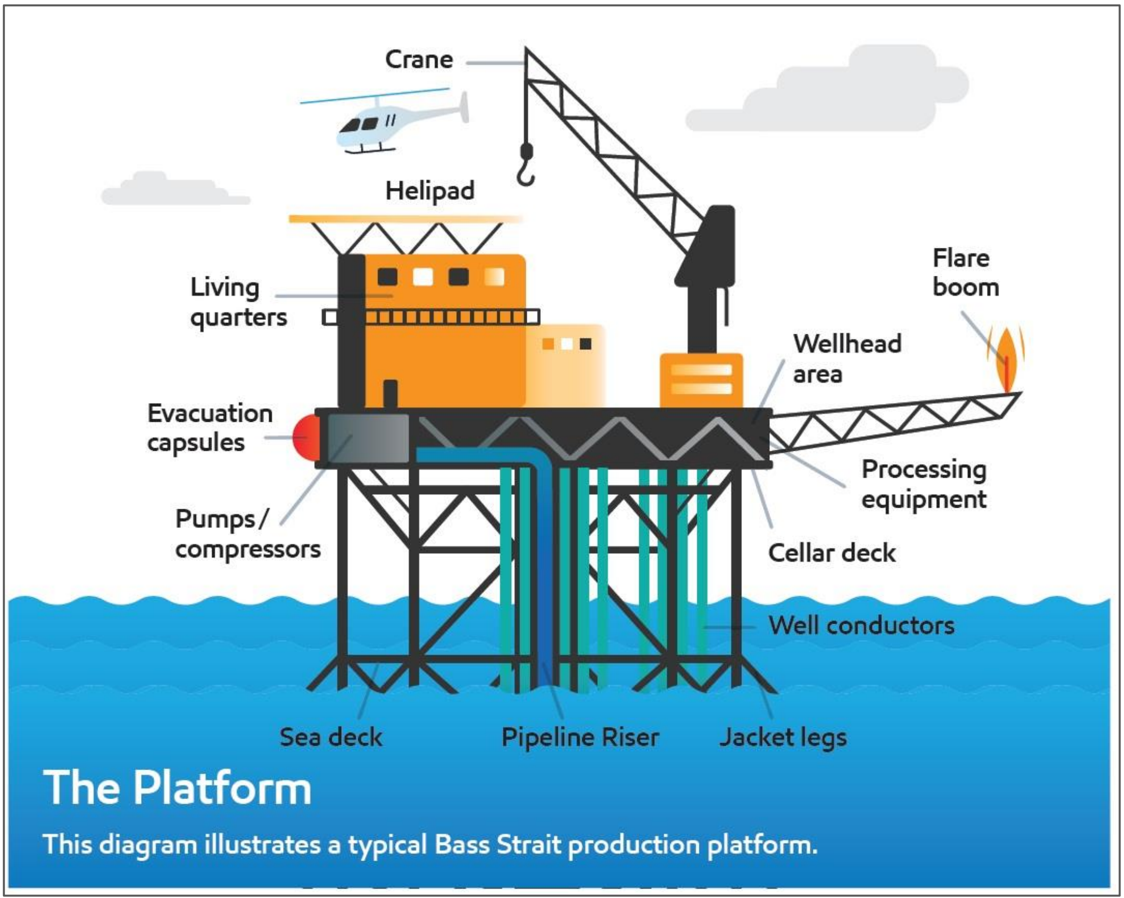


Figure 2-2 Schematic - Bass Strait Oil and Gas Platform

2.3.2 Subsea Facilities

Esso operates 5 subsea in the Bass Strait as listed in Table 2-2. The location and status of all facilities is summarised in Appendix A.

Table 2-2 Subsea Facilities

#	Title	Name	Abbreviation
1	VIC/L01	Tarwhine	TWA
2	VIC/L02	West Barracouta	BTW
3	VIC/L18	Seahorse	SHA
4	VIC/L20	Blackback	BKA
5	VIC/L25	Kipper	KPA

2.3.2.1 Kipper Subsea Facility

The Kipper Subsea Facility (KPA) consists of four subsea trees with trawl protection frames and four subsea coolers, designed to reduce the temperature of the produced hydrocarbons, connected via flowlines/jumpers and flying leads to a production manifold. KPA is connected to the WTN platform via two 350 mm pipelines, designed to allow round trip pigging, and an electrical and chemical (MEG, methanol and hydraulic fluid) umbilical.

2.3.2.2 West Barracouta Subsea Facility

The West Barracouta Subsea Facility (BTW) was installed in early 2021 with operations commencing in April 2021. BTW will consist of two subsea trees with trawl-protection frames connected via jumpers and flying leads to a Flowline End Manifold (FLEM) and umbilical termination assembly (UTA). BTW will be connected via an electrical and chemical umbilical to BTA platform, and via the BTW300 pipeline and subsea hot tap into the existing BTA-Shore 450 mm pipeline.

2.3.2.3 Blackback Subsea Facility

The Blackback Subsea Facility (BKA) was permanently plugged and abandoned in 2019 and the subsea trees were removed. The disconnected flowlines and electrical and chemical connections remain on the seabed. The UTA, umbilical, pipeline termination assembly (PTA) and 200 mm production pipeline and associated gas lift line connected to MKA platform also remain on the seabed. This equipment will be assessed for removal in the future, as described in Section 2.4.4.3.

2.3.2.4 Seahorse and Tarwhine Subsea Facilities

The Seahorse (SHA) and Tarwhine (TWA) Subsea Facilities was permanently plugged and abandoned in October 2020. Subsea trees were removed during the plug and abandonment activities. Minor infrastructure remained in place at these facilities for removal in the future, as described in Section 2.4.4.3.

2.3.3 Pipelines

Crude oil and gas produced offshore are transported to Longford Plants for processing, via a network of pipelines. Crude oil is collected offshore at three points (Halibut, Barracouta and Perch-Dolphin) and then piped to Longford Plants via dedicated pipelines. Gas is transported from the four major gas-producing offshore platforms (Marlin, Barracouta, Bream A and Snapper) to Longford Plants through dedicated gas pipelines. There are 31 licensed pipelines and eight secondary (gaslift and fuel gas) lines, as listed in Appendix A. For pipelines to shore, this EP covers the portion of these pipelines in Commonwealth Waters up to the 3 NM Victorian waters boundary only.

2.3.4 Products

A variety of products are produced from operations around the Strait, ranging from gas, condensate to oil. Different reservoirs produce hydrocarbon products with different properties. Pipelines contain a combination of different reservoir fluids.

The range of condensates and crude oils produced by the Bass Strait operations have been presented in Appendix A. Bass Strait Crudes can be classified into three groups based on ITOPF Oil Type classifications (ITOPF, 2015) as outlined in Table 2-3.

The main physical properties that affect the behaviour of spilt oil are specific gravity, distillation characteristics, viscosity and pour points.

Table 2-3 Physical Properties of condensate and crude oils produced in Bass Strait Operations

Group (ITOPF, 2015)	Oil Type	Description
Group 1	Condensate	Condensate is a Group 1 liquid hydrocarbon resulting from a change in pressure and or temperature of gas — 'liquid gas'. Condensates comprise a very high content of volatile (or non-persistent) constituents (~97–99%). Therefore, it is expected that any hydrocarbons reaching the sea-surface would quickly be lost to the atmosphere via evaporation. Any persistent (heavy) hydrocarbons may persist longer in the form of small solid relatively non-toxic waxy flakes on the sea-surface or entrained in the water column

Group (ITOPF, 2015)	Oil Type	Description
		Group I oils (non-persistent) tend to dissipate completely through evaporation within a few hours and do not normally form emulsions.
Group 2	Light Crude	Light crudes contain volatiles and semi to low volatile compounds constituting approximately 85% of the crude. The remaining proportion is heavier hydrocarbons. In the marine environment, light ends will evaporate leaving the heavier hydrocarbons. Group II and III oils can lose up to 40% volume through evaporation but because of their tendency to form viscous emulsions, there is an initial volume increase as well as a curtailment of natural dispersion.
Group 4	Waxy Crude	These crudes contain a high proportion of wax–with a corresponding high pour point. Group IV oils are very persistent in the marine environment due to their lack of volatile material and high viscosity, which precludes evaporation and dispersion.

2.4 Description of Activities resulting in Environmental Aspects

The primary purpose of offshore facilities is to extract, process and store oil and gas in order to transport products onshore for further processing and distribution to customers. In order to do this, a wide variety of activities are undertaken to directly and indirectly support oil and gas production. In order to decommission facilities, many of these activities continue, even once production of oil and gas has ceased.

This section describes the activities within the scope of this EP that have the potential to result in environmental aspects leading to impacts on, or risks to the environment. The activities included are:

- Operations (including platform, subsea facility and pipelines)
- Wellwork
- Inspection, maintenance and repair (including activities to prepare for decommissioning)
- Support operations (including vessels, ROV and Helicopters)

2.4.1 Operations

2.4.1.1 Platform Operations

All Esso platforms (with the exception of PCA and DPA) are located within the Area to Be Avoided (ATBA). Petroleum Safety Zones (PSZ) extending 500 m from each of the platforms and subsea facilities have also been established under the OPGGS Act. Vessels are prohibited from unauthorised entry into, or presence in, a PSZ.

All platforms are equipped with navigation lighting but also have a variety of other light sources including crane clearance lights, helipad lights and radio tower lights. Where facilities are staffed there is also lighting for accommodation and related infrastructure.

Gas compression turbines and the turbine power generators on platforms produce continuous noise. Fuel combustion equipment on platforms burn fuel gas and diesel. Equipment includes standby generators and compressors, and normally-operating turbines, compressors, generators and pumps, as well as other smaller equipment. Once facilities cease producing oil and gas, power generation systems remain in service, supplied by fuel gas or diesel.

Platforms usually generate potable water by reverse osmosis (RO) desalination of sea water. However, supply vessels may supply additional potable water, if required.

Platforms that have overnight accommodation discharge food and sewage / greywater. Platforms without overnight accommodation discharge sewage / greywater only when staffed. Domestic wastes generated on platforms are primarily sewage and liquid wastes from the kitchens, bathrooms and laundries. The grey water is comprised of potable water, soap and detergents. Persons on Board (POB) and staffing status at each platform is provided in Appendix A.

Platform operation generates both general wastes (solid inert materials including plastics, paper, glass and metal) and hazardous wastes (such as waste oil and chemicals, laboratory wastes, separator sludge and sand, oily filters, oily rags and empty drums containing oil or chemical residues). Solid and hazardous wastes are temporarily stored on the platform, then transported onshore and appropriately disposed.

Oils and Chemicals Storage and Handling

Oils and chemicals are used as part of the daily operation of the platform (e.g. cleaning decks, fuelling crane, striping and painting handrails etc.) and in the platform process (e.g. corrosion inhibitors, water handling chemicals, well workover base fluid and chemical additives), and are bulk stored on the platform. Use of chemicals is part of the daily operation and production process and these production chemicals may be discharged to the environment, provided they meet environmental discharge criteria.

Oils and chemicals are transferred via crane and stored as either packaged goods, in drums or in intermediate bulk containers (IBCs). If larger volumes are required (such as for diesel, glycol or methanol) they can be transferred to the platform via hose into a tank.

Bulk stored volumes vary between platforms, with the greatest volumes stored on WTN (582,000 L of glycol stored), SNA (diesel tank has a maximum capacity of 80,000 L) and TNA (220,000 L of methanol stored in TNA jacket leg). There is no storage of large volumes of glycol, methanol or diesel on FLA, HLA, KFA, KFB, WKF, MKA, MLA, MLB, PCA or DPA. Volumes of glycol at WTN will increase during the 5 year period for which this EP is in place, however volumes are not expected to be larger than those stored at other platforms.

Drain and pile system

There are three distinct drain systems on the platform:

Deluge drains that:

- Dispose of excess deluge water directly overboard.

Open drain (low pressure) systems that handle:

- Chemicals, oils and waste from bunded areas or designated containment areas.
- Residual chemicals and hydrocarbons from process equipment draining
- Rainwater or sea spray runoff on decks

Closed drain (high pressure) systems that:

- Drain process equipment at higher than atmospheric pressure such as wellheads, separators and flowlines, process equipment and instrument bridles.
- Handle oils, chemicals and water in process streams, such as drainage from pressured equipment such as pig launchers/receivers and separators.

Skimmer piles are used to separate hydrocarbons from water in liquids directed to the open and closed drain. The open and closed drain systems each have their own skimmer pile caisson that interfaces with the sea via the pile window. Hydrocarbon vapours and liquids migrate to the top of each pile and settle out on top of the water (Figure 2-3). The piles run at atmospheric pressure.

Hydrocarbon liquids from the open drain system are pumped to the closed drain skimmer pile. Hydrocarbon liquids from the closed drain skimmer pile are recycled to the process.

Note Figure 2-3 shows a schematic of the open drain and pile system with feeds from deck drains. Feeds from the closed pile system come from pressurised equipment. Details of feeds to the pile systems are described in Table 2-5.

As feeds to the pile are either the same density or less dense than water, as they enter the pile they displace existing water in the pile downwards, resulting in the displaced water being discharged from the subsea window. As hydrocarbons are pumped out of the pile, the volume is replaced with fresh seawater from the subsea window.

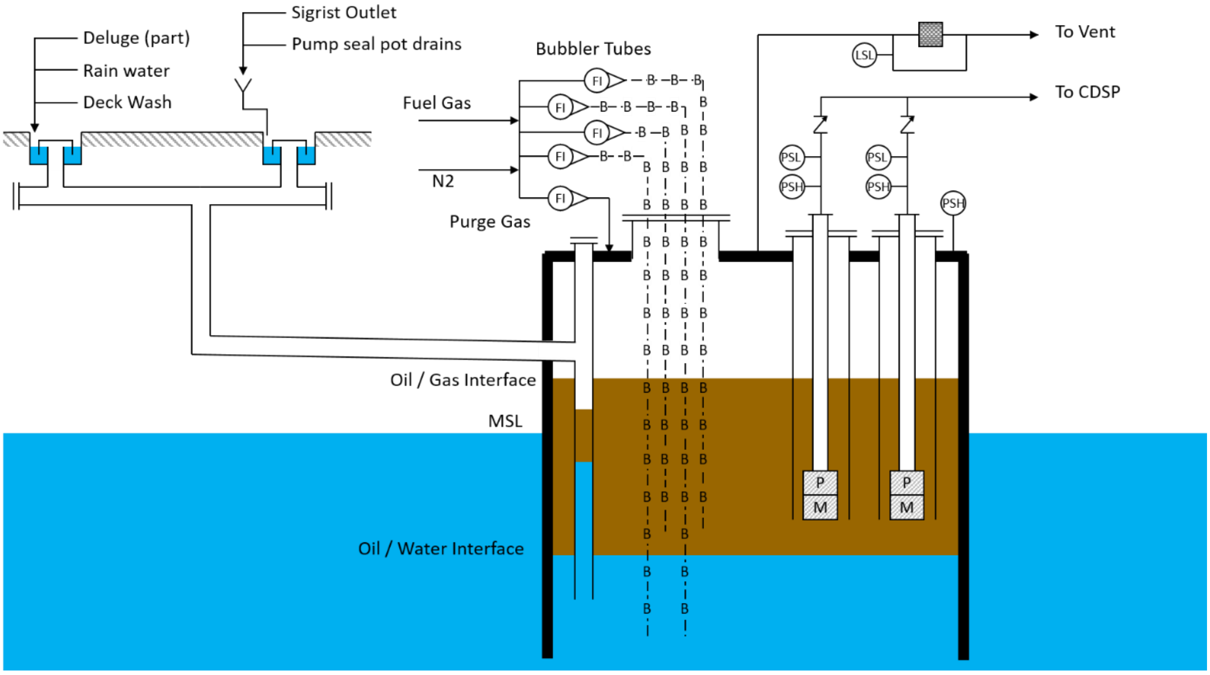


Figure 2-3 Schematic of open drains and pile system

Open Drain Skimmer Pile (ODSP)

The open drain skimmer pile is used to collect all liquids from the atmospheric drains and to separate the hydrocarbons from the water by allowing water to flow out to sea via the sub-sea window, more than 30 metres below sea level. Hydrocarbons are then pumped to the closed drain skimmer pile by the open drain skimmer pile pump(s) and then to the skimmer vessel by the closed drain skimmer pile pump.

All open drains connected to the open drain skimmer pile have an atmospheric break between the equipment and the open drain header to avoid the possibility of pressuring up the open drains or open drain skimmer pile system. The only connection to the closed drain skimmer pile is via the open pile pump discharge line, which is protected against backflow by check valves and a shutdown valve.

Closed Drain Skimmer Pile (CDSP)

The closed drain skimmer pile is used to collect all liquids from the closed drain system, and to separate the hydrocarbons from water by allowing the water to flow out to sea via the subsea window, again more than 30 metres below sea level. Hydrocarbons are then pumped to the skimmer vessel by the closed drain skimmer pile pumps.

Details of the open and closed drain skimmer piles for all platforms are included in Table 2-4.

The volume of oil in each skimmer pile is determined from the position of the oil/water interface. This is detected by measuring the differential pressure across two bubbler tubes positioned at different depths in the pile. For example, the WTN CDSP has these at 4m below MSL and 35m below MSL. The position of this interface can be measured directly as long as the interface sits between these levels. Levels are kept within these limits by high and low level trips that activate the pumps. Purge gas is used to operate the bubbler tubes (nitrogen gas may be used if purge gas is not available).

Signals from level interface transmitters are used to:

- Start and stop the submersible skimmer pump(s) automatically, although a manual mode is available to suit operational requirement to ensure hydrocarbon does not escape out of the subsea window;

- Shutdown the pump(s) on low oil volume level to protect the pump(s) from damage
- Trigger low / high oil volume alarm(s), and / or;
- Trigger a surface shutdown on high oil volume (typically CDSP only).

Table 2-4 Open and Closed Drain Skimmer Piles

Platform	Closed Drain Skimmer Pile (CDSP)	Open Drain Skimmer Pile (ODSP)
BMA	• CDSP volume – 200 kL (at 23 m) • Subsea window depth (MSL) – 50.9m • The CDSP is dosed with biocides (BMB only). • Liquid originates from the production system and the ODSP.	• ODSP volume – 23 kL (at 23 m) • ODSP subsea window – 34.2 m • Liquid originates from BMA open drain systems
BMB	• BMB has the HP Drain Vessel that is used to drain process fluids when preparing equipment for maintenance. • HP Drain Vessel volume – 0.9 kL • The vessel is connected to the BMB-BMA pipeline. There are no planned discharges from this vessel.	• BMB has an Open Drain (OD) Sump Tank • Sump Tank Volume – 2 kL • This tank is fitted with two coalescer plate packs and a hydrocarbon skimmer box. • Liquid originates from BMB open drain system.
BTA	• CDSP volume – 12.5 kL • Subsea window depth (MSL) – 43 m • The CDSP is dosed with biocides, emulsion breakers, and other process chemicals. • Liquid originates from the production system and the ODSP	• ODSP volume – 12.5 kL • ODSP subsea window – 43 m • Liquid originates from open drain system, hydrocarbon liquids from fuel gas system
CBA	• CDSP volume – 240 kL (at 35 m) • Subsea window depth (MSL) – 55.7 – 57.7 m • The CDSP is dosed with biocides, emulsion breakers, and other process chemicals. • Liquid originates from the production system and the ODSP	• ODSP volume – 38 kL (38 m) • ODSP subsea window – 55.7 – 57.7 m • Liquid originates from open drain system
FLA	• CDSP volume – 200 kL (at 25 m) • Subsea window depth (MSL) – 49.6 m • The CDSP is dosed with biocides, emulsion breakers, and other process chemicals. • Liquid originates from the production system and the ODSP	• ODSP volume – 35 kL (at 32 m) • ODSP subsea window – 40 m • Liquid originates from open drain system
FTA	• CDSP volume – 164 kL (at 18 m) • Subsea window depth (MSL) – 60 m • The CDSP is dosed with biocides, emulsion breakers, and other process chemicals. • Liquid originates from the production system and the ODSP	• ODSP volume – 38 kL (at 35 m) • ODSP subsea window – 40 m • Liquid originates from open drain system
HLA	• CDSP volume – 17.9 kL • Subsea window depth (MSL) – 50 m • The CDSP is dosed with biocides and demulsifier. • Liquid originates from the production system, the flare scrubber and the ODSP	• ODSP volume – 5.5 kL • ODSP subsea window – 46.5 m • Liquid originates from open drain system
KFA	• CDSP volume – 35.5 kL (at 35 m) • Subsea window depth (MSL) – 50 m • The CDSP is dosed with biocides, emulsion breakers, and other process chemicals. • Liquids originate from the production system, flare scrubber and ODSP.	• ODSP volume – 35.5 kL (at 35 m) • ODSP subsea window – 46 m • Liquid originates from open drain system
KFB	• KFB - 35.5 kL (at 35 m) • Subsea window depth (MSL) - 50 m • The CDSP is dosed with biocides, emulsion breakers, and other process chemicals. • Liquids originate from the production system, flare scrubber and ODSP.	• ODSP volume – 35.5 kL (at 35 m) • ODSP subsea window – 46 m • Liquid originates from open drain system

Platform	Closed Drain Skimmer Pile (CDSP)	Open Drain Skimmer Pile (ODSP)
MKA	• CDSP volume – 235 kL (at 30 m) • Subsea window depth (MSL) – 84m, 85m, 86m, 87m (4 windows) • The CDSP is dosed with biocides and demulsifier. • Liquid originates from the production system and the ODSP	• ODSP volume – 38 kL (at 35 m) • ODSP subsea window – 56.5 m • Liquid originates from open drain system
MLA	• CDSP volume – 14.5 kL • Subsea window depth (MSL) – 47 m • The CDSP is dosed with biocides, emulsion breakers, and other process chemicals • Liquid originates from the MLA production system, ODSP, fuel gas scrubber	• ODSP volume – 14.5 kL • ODSP subsea window – 47 m • Liquid originates from open drain system
MLB	• CDSP volume – 57.5 kL • Subsea window depth (MSL) – 16.9 m • The CDSP is dosed with biocides, emulsion breakers, and other process chemicals • Liquid originates from MLB production system, flare scrubber and the ODSP (via the skimmer vessel)	• ODSP volume – 57.5 kL • ODSP subsea window – 16.9 m • Liquid originates from open drain system
PCA /DPA	• PCA and DPA have a drain sump that is used to drain process fluids when preparing equipment for maintenance. • Drain sump is connected to the pipeline. There are no planned discharges from this sump. • The drain sump is dosed with biocides, emulsion breakers, and other process chemicals	
SNA	• CDSP volume – 240 kL • Subsea window depth (MSL) – 49 m • The CDSP is dosed with biocides, emulsion breakers, and other process chemicals • Liquid originates from the Low pressure drain systems, and the ODSP	• ODSP volume – 38 kL • ODSP subsea window – 35.8 m • Liquid originates from open drain system, fuel gas system
TNA	• CDSP volume – 215 kL (at 21.4 m) • Subsea window depth (MSL) – 52.1 m • The CDSP is dosed with biocides, emulsion breakers, and other process chemicals • Liquid originates from the production system and the ODSP	• ODSP volume – 38 kL (35 m) • ODSP subsea window – 38.5 m • Liquid originates from open drain system, fuel gas system
WKF	• CDSP volume – 240 kL (at 35 m) • Subsea window depth (MSL) – 69.5 m • The CDSP is dosed with biocides, emulsion breakers, and other process chemicals. • Liquids originate from the production system, flare scrubber and ODSP.	• ODSP volume – 55 kL (35 m) • ODSP subsea window – 67 m • Liquid originates from open drain system
WTA	• CDSP volume – 113 kL • Subsea window depth (MSL) – 50 m • The CDSP is dosed with biocides, emulsion breakers, and other process chemicals • Liquid originates from the ODSP	• ODSP volume – 55 kL • ODSP subsea window – 50 m • Liquid originates from open drain system
WTN	• CDSP volume – 150 kL • Subsea window depth (MSL) – 44 m • The CDSP is dosed with biocides, emulsion breakers, and other process chemicals. • Liquids originate from the skimmer vessel, HP closed drain system flare scrubber, ODSP.	• ODSP volume – 130 kL • ODSP subsea window – 44 m • Liquid originates from the open drain system, hydrocarbon liquids from fuel gas system

Pile Feeds

Feeds to pile systems vary between platforms. In general, platforms which have a low pressure oil production system process liquids which may be directed to the pile system. Platforms which produce primarily gas and condensate have minimal feeds to the pile system as they produce less liquids. Platforms that have ceased production have minimal feeds to the pile system.

PLATFORMS WITH OIL PRODUCTION SYSTEMS – CBA, HLA, MLB, SNA, TNA, WKF, WTN

On platforms with oil production systems, trends show that, during normal operations, hydrocarbons from the closed pile system are pumped out approximately once per month removing approximately 15-20% of the pile volume each time. This accounts for the volume of feeds to the pile during normal operations from activities.

Pile feeds could include continuous feeds from platform equipment, produced water clean-up, discharges due to equipment or platform trips, pigging etc. Ongoing production fluids are generally directed to the closed pile system. Minimal residual production fluids may be directed to the open pile system however, the open pile system primarily processes water runoff from platform decks. A detailed list of pile feeds is provided in Table 2-5.

During periods of planned maintenance or during annual shut downs, discharges will increase and piles are required to be pumped out more frequently. Annual shutdowns can result in up to ~400 kL of discharges to the pile over the duration of the shutdown (generally 2 – 4 weeks). Planned shutdowns occur once per year although unplanned shutdowns (due to unplanned maintenance requirements) could occur 2 – 3 times per year.

Rate and / or duration of discharges to the pile are managed dependent on pile volume to ensure levels are maintained below high level alarms and risk of release of hydrocarbons through the subsea pile window is minimised.

Discharge from the closed pile has been modelled assuming 3 m^3 and 8 m^3 per hour to conservatively take into account water components in the discharge which cannot be measured by bubbler tubes. Pile pump out rates indicate that feeds to the pile and hence, discharges to ocean due to displacement, are expected to be significantly less than this.

PRODUCING GAS PLATFORM – BTA, MLA

Platforms which produce primarily gas and condensate have significantly less discharges to the pile system. During planned and unplanned shutdowns, the production system is depressured by flaring gas with minimal volumes of condensate being fed to the pile.

On these platforms, piles are pumped out less frequently, approximately once per three months removing approximately 15-20% of the pile volume each time. This accounts for the volume of feeds to the pile during normal operations from activities and hence, the volume of water displaced and discharged to ocean. Pile feeds on gas platforms are primarily from fuel gas condensate. A detailed list of pile feeds is provided in Table 2-5.

Modelling of pile discharges assumes discharges from producing platform with oil systems with ongoing production discharges. Platforms which produce primarily gas and condensate have significantly less discharges to the pile system and therefore, modelling is assumed to be worst case and highly conservative for gas and non-producing platforms.

NON PRODUCING PLATFORMS – BMA, FLA, FTA, KFA, KFB, MKA, WTA

Non producing platforms will be drained and de-pressured once production is complete and prior to restaffing. This period of draining and de-pressuring is equivalent to a full platform shutdown. This activity has already been completed on the platforms listed but may occur on platforms transitioning to CoP (per Figure 3-1).

- BMA
- FLA
- FTA
- KFA
- KFB
- MKA
- WTA

Once drained and de-pressured, platforms which are no longer producing have minimal feeds to the pile system. Feeds could include liquids from the fuel gas system. A detailed list of pile feeds is provided in Table 2-5.

On these platforms, piles are pumped out intermittently or upon campaign visits to the platforms when pump levels require. Observations from de-staffed platforms indicate a minimal rate of condensate accumulation in the pile requiring pump out once per year.

Modelling of pile discharges assumes discharges from producing platform with ongoing production discharges. Non-producing platforms have minimal discharges and therefore, modelling is assumed to be worst case and highly conservative for gas and non-producing platforms.

Table 2-5 Pile Feeds

Feed	Description	Producing	COP	Stasis mode
Primary pile feeds				
Draining of process fluids during equipment isolation / depressuring or wellwork	Majority of draining from pressured vessels or wellwork operations is directed to the closed pile. Residual process fluids are directed to open drains to confirm vessel or equipment is depressured and hydrocarbon free (draining to closed pile can only be completed until pressure in vessel equalizes with closed drain system). Prior to vessel entry or PVI any residual solids, sand or sludge is collected and disposed of onshore. Prior to wellwork activities, wells will be depressured to the flare (for gas wells) or to the closed pile system (for oil wells)	✓	Applicable during final draining prior to CoP. No continuous draining of process fluids occurs post CoP. Feeds to the pile will occur during wellwork activities to P&S/P&A wells.	Not applicable. All drainage activities complete.
Waste oils from continuous operations (filter coalescers, pump seals, gas lift condensate)	On some platforms, equipment generates low volumes of waste oil from continuous operations. This is directed to the closed pile system where it is recycled into the process via the close pile pump.	✓	Not applicable once production has ceased.	Not applicable once production has ceased.
Liquids from the fuel gas system	In order to supply ongoing power to staffed and destaffed facilities, gas is used as fuel to power generators. Minor amounts of condensate may drop out from the gas lift system. These are directed to the closed pile system.	✓	✓	Not applicable. Power generation ceased during stasis mode.
Low volume feeds				
Waste oils (lube oil, hydraulic fluid, ATF) from machinery servicing	Bulk volumes of waste oils from scheduled machinery servicing are collected in stainless steel waste oil bulkies for onshore disposal. Minor machinery servicing may generate small volumes of waste oils which is directed to the closed pile system and recycled into the process via the closed pile pump.	✓	Significant reduction in discharges as majority of machinery is out of service.	Not applicable. All maintenance and drainage activities complete.
Fluid samples taken from well testing / pipeline sampling	Sampling is undertaken intermittently to test composition of wells or water in pipelines. Involves taking a small sample into an open container (e.g. measuring flask approx.1 L). Once sampling is complete, excess sample is discharged to the open drain system where it can be recycled to the process (via closed pile). The frequency of sampling is dependent on the platform and the number of wells but could be up to several times a month per well.	✓	✓	Not applicable. No ongoing sampling required.
Pigging Wax	On some platforms, pigs received are covered in wax/waxy residue. Wax consistency varies between platforms dependent on crude type. Wax is collected for onshore disposal. Residual amounts of wax may be directed to the open pile system to avoid personnel exposure to unprocessed crude.	✓	✓	Not applicable once pipelines suspended.

Feed	Description	Producing	COP	Stasis mode
Diesel from Pump Seal Draining	On some platforms, flushing of MOL pump seals is required to monitor the integrity of the pump seal system. Seal failure has been identified as a key hazard in offshore safety cases. Flushing of 4-8 L of diesel occurs periodically (daily on some platforms).	✓	Not applicable once production has ceased.	Not applicable once production has ceased.
Water feeds with residual hydrocarbon	For example, water with condensate from flare loop seals, excess water from formation water sampling.	✓	✓	Not applicable once flare is out of service.
Water Feeds				
Water with residuals from deck cleaning	Cleaning chemicals and water are used to clean residue from platform decks. Water from deck cleaning is directed to the open pile system. Water soluble chemicals will leave the pile through the subsea window with the water phase. Any chemicals discharged via subsea window are subject to chemical assessment to ensure they are approved for discharge Residual amounts of sediment from deck cleaning may make their way into the drain system.	✓	✓	Not applicable.
Rain water	Rain water is directed to open drain systems as runoff.	✓	✓	✓
Water from deluge tests	Sea water used during deluge testing is directed to the open drain system as runoff. Pile systems are pumped out prior to testing and the majority of water is directed overboard. An estimated 10-15% of water is directed to the open drains. Tests run for 3-5 minutes.	✓	✓	Not applicable.
Produced water clean up	During start-up of the produced water handling system, water generally has a high oil in water content until the system is running at optimal process conditions. To ensure off spec water is not discharged overboard, oily water is directed to the 'clean up line' until it is below regulatory limits and acceptable limits for discharge. This is to allow excess oil in the water to separate and be recycled to the process. For more detail on the PFW system, refer to Table 2-7.	Applicable for platforms with water handling systems	Not applicable	Not applicable
Other Feeds				
Closed pile biocide	Small volumes of biocide are injected to the closed pile to mitigate the growth of SRB which can cause corrosion leading to loss of integrity.	✓	✓	Not applicable

Cranes and lifting

Each platform is equipped with cranes which undertake lifts for operation and maintenance activities.

Safety Systems

All platforms are equipped with a firefighting system in case of an emergency. Firewater pumps supply water to deluge and sprinkler systems upon detection of a fire.

Fire-fighting foam can be applied via the deluge system or hose reels. It is also used as a pile blanket when removing and replacing the skimmer pile pump(s).

All platforms (excluding PCA and DPA) have a foam deluge system. Operation of the foam deluge system could occur either as part of testing the system or as demanded during an actual fire event.

Flaring and Venting

A flare is present on all platforms apart from PCA, DPA and BMB. Non-routine and safety flaring is conducted for the safe disposal of hydrocarbons during process upset, maintenance, commissioning / start-up or emergency conditions. Flare systems are designed for a maximum flow rate capacity such that the entire platform is able to be blown down rapidly. No routine flaring is undertaken.

Use of flares to combust gas significantly reduces greenhouse gas emissions (CO_2-e levels) when compared to venting because gas (mainly methane, CH_4) is converted to CO_2 and H_2O. Methane has a global warming potential (GWP, or CO_2-e value) of 28 to 36 (i.e. releasing 1 kg of CH_4 into the atmosphere is equivalent to releasing 28 to 36 kg of CO_2). Flares can achieve 95% efficiency, so that flaring of excess gases – instead of cold venting - results in a significant reduction in GWP (over 95% reduction if gas stream is assumed to be 100% methane).

Flares are used to safely combust gases collected from process and emergency streams, ensuring that they are disposed of in a safe manner, minimising the risk to personnel or adverse environmental impact. The safe disposal of hydrocarbon that is unable to be processed is integral to the safe operation of an offshore processing facility. Despite this, the aim is to minimise flaring, both because it results in unnecessary GHG emissions, and it represents an economic loss.

During standard operation, the flare tip remains lit with a pilot light. The pilot light is maintained with a small amount of gas such that the flare normally stays alight. If the pilot light is blown out (e.g. due to high winds) the flare is relit as soon as practicable. Once facilities cease production, the flare remains in service for safety reasons and to allow for depressuring in preparation for decommissioning activities.

Each flare has a flare scrubber located at the base of the flare boom. The flare scrubber removes bulk liquid from the gas stream to minimise burning of liquids at the flare tip. Liquids removed from the flare scrubber are directed to the closed skimmer pile. Typical sources of flared gas are shown in Figure 2-4.

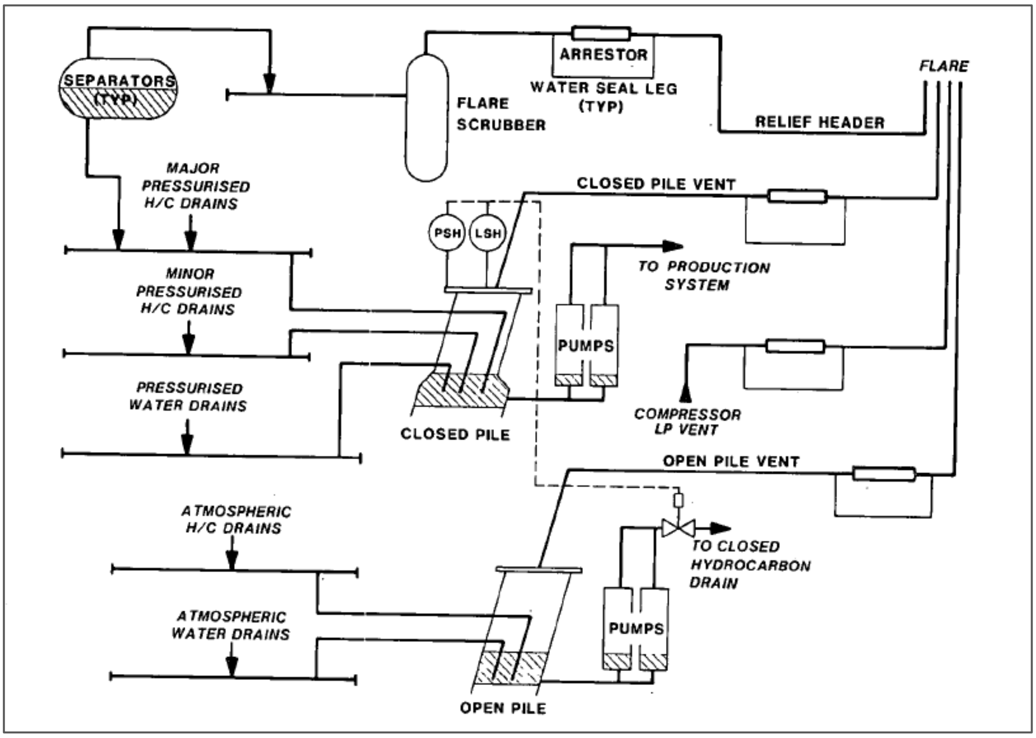


Figure 2-4 Generic Flare Vent & Drain Model

Flaring targets are set annually for all offshore facilities. The combined daily average target is typically 25-30 ksm^3/d. Elevated flaring rates are generally due to process upsets, during maintenance activities, or during start-ups. Annual flaring targets from 2020 until 2025 for each of Esso's platforms in Bass Strait are provided in Table 2-6. These flaring volumes are based on long term averages and account for maintenance and process upsets. Flaring volumes involved in commissioning and start-up are incorporated into the flaring forecasts provided in Table 2-6. Flaring is reviewed daily by OIMs and monitored on a monthly basis by engineers. There is a strong focus on reducing flaring where possible.

Flaring guidelines detail the approval process required where flaring is anticipated to be sustained above normal levels for >12 hours. In maintenance planned activities, the preference will be to send gas to flare rather than vent.

For low pressure systems, such as open and closed drains, there are small volumes of gas that are vented via dedicated lines up the flare boom. These vent sources include low pressure compressor vents, seal gas vents and flexible pipeline gas vents. An annual review is undertaken of all identified venting events via these sources across the offshore platforms. The quantity of venting is typically ~350 tonnes per year.

No additional flaring is expected during start up of West Barracouta operations as BTW feeds directly to the BTA450 pipeline.

Table 2-6 Bass Strait Operations - Flaring Forecast (km^3/day)

Facility	2020	2021	2022	2023	2024	2025	Average
Barracouta	1.1	1.1	1.1	1.1	1.1	0.1	0.9
Bream	1.1	0.1	0.1	0.1	0.1	0.1	0.3
Cobia	1.0	1.0	1.0	0.1	0.1	0.1	0.6
Dolphin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Flounder	1.1	0.1	0.1	0.1	0.1	0.1	0.3
Fortescue	1.1	0.1	0.1	0.1	0.1	0.0	0.3

Facility	2020	2021	2022	2023	2024	2025	Average
Halibut	2.0	2.0	2.0	0.1	0.1	0.1	1.1
Kingfish A	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Kingfish B	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Kipper	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mackerel	0.1	0.1	0.1	0.1	0.0	0.0	0.1
Marlin Complex (A+B)	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Perch	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snapper	2.0	2.0	2.0	1.0	1.0	1.0	1.5
Tuna	4.0	4.0	4.0	1.0	1.0	1.0	2.5
West Kingfish	1.0	1.0	1.0	0.1	0.1	0.1	0.6
West Tuna	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Whiting	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	22.2	19.2	19.2	11.5	11.4	10.3	15.6

Produced Formation Water

Produced Formation Water (PFW) is generated throughout the Bass Strait Operations on platforms SNA, TNA, WTN, HLA, WKF and CBA. PFW is either treated offshore before discharge or transported back to shore. Platforms which are shut in and do not, and will not for the life of the EP discharge PFW include: MKA, KFA, WTA, KFB, FLA, BMA, BMB, PCA, DPA and FTA. Water produced on the MLA, WTN and BTA platforms is transported to shore for treatment. There is currently no PFW discharge at MLB, however water treatment facilities is planned to be commissioned in the future.

Crude and produced water are separated in production separators. Chemical additives are injected at various points to assist oil/water separation. Oily water from separators is drawn off and directed to a secondary separation stage. Secondary separation consists of treatment through dissolved gas flotation units, hydrocyclones, degasser vessels or a combination. Details of PFW treatment systems on each platform are described in Table 2-7.

Reject oil from the secondary separation stage is returned to the process. 'De-oiled' water is discharged. Oil content in PFW being discharged overboard is monitored. In the event that oil in water content of PFW being discharged exceeds accepted limits, the water handling system has an alarm with associated procedures for corrective actions, and an automated water discharge shutdown is triggered if the level is too high. There are also low interface level alarms on the production separators.

Water handling system monitoring and control

A water overboard oil-in-water monitor ("Sigrist") is located upstream of the water overboard line shutdown valve and acts to continuously monitor the oil in water using ultraviolet fluorescence. Alarm and shutdown functions are embedded within the monitor's functionality. The water handling system is bypassed when testing or calibrating the oil-in-water monitor.

A 'clean-up' line allows any oily water in the water handling facilities to be flushed out into the closed drain skimmer pile. The clean-up line is utilised on platform start-up whilst processes are settling or during other process upsets. The line has a restriction orifice plate installed to limit the clean-up flow to the pile, to avert oil present in the water exiting via the closed pile window. The clean-up line is used until typical oil in water quality is obtained at the sample point provided in the clean-up line. There are limitations to the use of the clean-up line however, as whilst the clean-up line is in use, the hydrocyclones cannot operate efficiently because of inadequate differential pressures, and hence they must be started or restarted with the water overboard valve open to gain normal oil-water primary separation following the use of the clean-up line.

Both oil-in-water monitors require to be bypassed whilst flow is diverted to the clean-up line to avoid system shutdown. Manual samples are taken to ensure the system is functioning as intended. Online monitoring is established once the system stabilises and within maximum time limits allowed as stated in procedures.

Dye may be injected into the PFW stream if the need arises to monitor the discharge plume in the environment.

Depth of produced water discharge piping

Due to the difference in temperature and salinity of the produced water discharge, the plume is strongly buoyant, and dilutes rapidly as it rises with the surrounding ambient water owing to the combined effects of the momentum and buoyancy-induced mixing of the fluid discharged from the orifice (Walker *et. al*., 2019). The rate of dilution caused by these forces is quite rapid in the first few seconds to minutes after exiting the orifice and then decreases markedly after the momentum and buoyancy are dissipated. Details of the produced water discharge pipe depth for each platform is shown in Table 2-8.

Table 2-7 Bass Strait Operations – reservoir liquids processing description

Platform	Primary Separation	Secondary Separation	PFW Reject Stream
HLA	Primary separation of bulk fluids is achieved by the production separators with chemicals being injected at varying rates at the inlet of each separator to assist with oil/water separation.	Post primary separation, the water stream is passed through Dissolved Gas Flotation (DGF) vessels and/or a hydrocyclone unit. Treated water from the DGFs and hydrocyclone is discharged to sea.	Reject streams generated from the DGFs and the hydrocyclone will be further processed in the degasser vessel or the skimmer vessel before being reinjected into the oil pipeline.
CBA	Primary separation of bulk fluids is achieved by the production separators.	The water stream generated from the separator is directed to hydrocyclone skids. Treated water generated from the hydrocyclones is discharged overboard through the water overboard line. Chemicals are injected at the inlets of the production separators to aid oil/water separation.	The reject oily water generated from the hydrocyclones flows to degasser vessels and is subsequently pumped back into the main oil line or is automatically directed to the closed skimmer pile.
WKF	Primary separation of bulk fluids is achieved by the production separators	Treated water generated from the hydrocyclones is discharged overboard through the water overboard line.	Reject streams generated from the hydrocyclones are fed to the degasser vessel for further treatment. The gas from the degasser vessel feeds into the relief header, which the liquids are pumped back into the production separators.
TNA	Primary separation of bulk fluids is achieved by the production separators.	The water stream generated from the separator is directed to hydrocyclones. Treated water generated from the hydrocyclones is either passed through a degasser vessel or discharged overboard through the water overboard line.	Reject oily water from the deoiler hydrocyclones is sent to the skimmer vessel for further separation.
SNA	Primary separation of bulk fluids is achieved by the production separators.	The water stream generated from the separator is directed to deoiler hydrocyclones. Chemicals are then injected into the water stream to aid with oil/water separation.	Reject streams generated from the hydrocyclones and the DGF vessel combine and pass through a subsequent DGF vessel. Gas evolved from this is directed to the relief headers whilst oil generated is

Platform	Primary Separation	Secondary Separation	PFW Reject Stream
		Treated water generated from the hydrocyclones is then passed through a DGF vessel and discharged overboard through the water overboard line.	returned to the suction end of the MOL pump through oily water pumps.
MLB	Primary separation of bulk fluids is achieved by the production separators.	The water stream generated from the separator is directed to hydrocyclones. Treated water generated from the hydrocyclones is either passed through a degasser vessel or discharged overboard through the water overboard line.	Reject oily water from the deoiler hydrocyclones is sent to the skimmer vessel for further separation before being reinjected into the oil pipeline.

Table 2-8 Bass Strait Operations – PFW discharge pipe depth

Platform	PFW Discharge pipe depth (m below MSL)
HLA	11.0
CBA	27.7
WKF	16.0
TNA	28.8
SNA	8.2
MLB	11.0

2.4.1.2 Subsea Facility Operation

The West Barracouta (BTW), Seahorse and Tarwhine (SHA and TWA) subsea facilities are located within the ATBA, whilst Kipper (KPA) and Blackback (BKA) are located outside. In lieu of AMSA approval to extend the ATBA, subsea coolers are positioned at KPA to assist in protecting the manifold and flowbases from fishing snag loads. Locations and details of subsea facilities are described in Appendix A and are shown in the schematic in Figure 2-2.

Subsea facilities are complex systems designed to transfer hydrocarbons from subsea wells to the platform or pipeline. The subsea facilities are typically made up of a combination of the following infrastructure:

- **Subsea Trees**: used to control well conditions temperature/ pressure and supply chemicals if required
- **Subsea Control Modules (SCMs)**: electrical and hydraulic systems that control the flow of hydrocarbons and chemicals through the subsea facility
- **Electric and hydraulic jumpers**: connect the subsea infrastructure and used to communicate hydraulic and electric communications
- **Flowlines/ spools**: Transport hydrocarbons from wells to the pipelines or platform risers
- **Flowline End Manifolds (FLEM)** that connect flowlines to jumpers
- **Pipeline Terminal Assemblies (PTA)** – again for connecting flowlines or pipelines to jumper
- **Flowbases:** where well heads and trees are located
- **Subsea coolers:** Cooling systems on the subsea floor to cool down process fluids
- **Umbilicals:** Transport electric and hydraulic signals between the platform and the SCM/subsea trees. May also have chemical lines to supply chemicals to the wells and pipelines.

- **Risers:** Transport hydrocarbons for the seabed to the platforms

The subsea facilities are 'hosted' from a platform and controlled via hydraulic and electrical umbilicals. Hydraulically actuated subsea tree, wellhead and subsurface safety valves are remotely operated from the host platform. A small volume of production chemicals such as hydraulic fluid (approx. 1000 L per week), are released to the marine environment at each subsea tree valve operation.

Chemicals for corrosion inhibition and hydrate inhibition (e.g. Monoethylene Glycol (MEG) and methanol) are injected into the subsea wells via a chemical umbilical from the host platform.

2.4.1.3 Pipeline Operation

All pipelines (with the exception of part of the WTN350 (North & South), MKA-BKA65 and BKA – MKA200, and the PCA – Shore300 and Shore – PCA100) are located within the ATBA.

Locations and details of pipelines are described in Appendix A. Offshore pipelines are laid on the seabed between platforms, between platforms and subsea facilities and between platforms and shore, as shown in the schematic in Figure 2-2. Many pipelines are either fully or partially self-buried. In addition to having concrete weight coating some are stabilised with concrete or grout mattresses to provide resistance to pipeline movement.

External pipeline surfaces are coated to prevent corrosion and external corrosion protection is further augmented via cathodic protection (impressed current local to the host platform and sacrificial anodes along the pipe). Both oil and gas pipelines are pigged to remove potential obstructions and pooled water and injected with corrosion inhibitor. MEG and/or methanol is injected into the gas streams at each platform to inhibit the formation of hydrates.

The only routine planned discharge from pipelines is from valve actuation and involves small (<10 L) intermittent discharges of hydraulic fluid.

2.4.2 Wellwork

2.4.2.1 Wireline / Workover Activities (general)

Wellwork activities include any work performed on or in the subsurface part of an existing wellbore.

Wellwork activities can include completions, productivity improvement workovers, well servicing workovers and plug and abandon workovers. Wellwork can be completed via conventional workovers, concentric workovers, wireline workovers or rigless workovers.

- **Conventional workovers**: When the production Christmas tree is removed and BOP equipment is installed on top of the tubing head or wellhead flange.
- **Concentric workovers**: When small diameter pipe is used, with or without removing the Christmas tree. BOP equipment is installed above the Christmas tree. This also applies to wellwork involving coiled tubing equipment.
- **Wireline workovers**: When slick, braided, or conductor line is used through the tubing string, with or without removing the Christmas tree. Wireline BOP equipment is installed above the existing Christmas tree.
- **Rigless workovers**: When WellWork Execution operations are being conducted without the use of any type of rig. These could involve high pressure pumping operations (acidizing), well circulations, and so forth.

Conventional and concentric workovers require a workover rig to be assembled on the platform. Workover rigs used on Bass Strait platforms sit on the platform main deck. All rigs have a power generation source and pumps with the ability to pump fluids into the well. Wireline workovers use a workover spread which consists of an A-frame, BOP/pressure-control equipment, line units, and pump.

Prior to completing wellwork activities, the well and topsides must be depressured. Returns during depressuring are directed to the platform's production system as far as practicable (until at equal pressure with the system). Final depressuring to atmospheric pressure requires residual gas to be vented and liquids directed to the drain system.

All workovers use workover fluids as part of the workover operations. This includes brines, barite, and additives such as baracarb and other salts, corrosion inhibitor, biocide, oxygen scavenger, friction reducers, viscosifying agents, solvent and/or surfactant spacers, gels, polymer and cement. Fluid returns are directed to tanks or shakers prior to discharge to allow for settling of solids and/or monitoring of hydrocarbons. If hydrocarbon liquids are detected, returns are diverted to the platform's pipeline without discharge to the environment.

In some cases, milling is required to cut and remove material from equipment or tools located in the wellbore. Following milling, circulated fluids may bring up milled material from the wellbore, which is captured and disposed on shore.

In some cases, wellwork can include the removal and replacement of the production tubing string after the well has been killed and a workover rig has been placed on location.

Well logging is undertaken to determine rock and fluid properties of the targets. The well may be evaluated using Logging While Drilling (LWD) techniques and mud logging. Nuclear, Electric or Acoustic measurement tools can be used to identify different rock types down the well.

As part of Wellwork operations, formation samples can be collected to determine the presence of oil or gas. At the same time, reservoir pressure can be measured, using a down-hole pressure gauge to determine aquifer and hydrocarbon pressures.

Restrictions to wellwork operations on the Moonfish reservoir are in place to manage the risk of loss of well control during wellwork operations due to the unique properties of Moonfish Crude. Refer to Section 7.7.2 for further details.

2.4.2.2 Well Decommissioning

Esso has an ongoing well abandonment programme. The Esso Bass Strait Well Operations Management Plan (WOMP) includes a current list of wells within the Gippsland Basin and their status. Where a suspended well is P&A'd and/or fully abandoned, the WOMP is updated to reflect the revised well status. A list of all wells relevant to this EP and their status at time of writing is provided in Appendix A.

2.4.2.3 Cementing

Remedial cementing consists of operations performed to repair a well or to alter its configuration. This usually involves the placement of small volumes of cement to seal perforations or defects in the primary cement sheath or to set cement plugs to isolate all or part of the wellbore.

The type of cement, cement additives and volume required for cementing operations is dependent on a number of factors such as the type of completion, the age of the well, the type of fluid in the wellbore, and the depth of the workover operation. Additives may be added to cement to alter the characteristics to meet technical requirements. Key considerations for cement type are the weighting and the time to set.

2.4.2.4 Conductor cutting and pulling

Conductor cutting and pulling will occur when well casing is removed. Wells are plugged and abandoned prior to cutting and pulling conductors. Flowback between the flowline and casing annulus will occur, with limited discharge of interface fluids to the marine environment during the final cut.

2.4.2.5 Conductor clean out

Conductor clean-out operations involve cleaning the conductor of seabed sediment before a hole is cased. A pump transports mobilised sand and brine inside the conductor up-hole and overflows the conductor directly to sea.

2.4.2.6 Sandwash

Sandwash operations involve cleaning of the casing inside the cased hole to gain access to reservoir zones deeper than the well hang-up depth. The well will be killed, or appropriate pressure control equipment used, prior to sandwash operations, meaning that there will be no hydrocarbons in the well. A pump transports mobilised sand and brine inside the casing up-hole to a hose that discharges into a drum that collects the sand deposits and allows the fluid to overflow the drum and overboard. The sand is captured and sent onshore for disposal. In some cases, a gel pill will be used to provide additional mobilisation / flow of sand.

2.4.3 Support Operations

2.4.3.1 Vessel Operations

Vessels are used to support offshore activities. Types of vessels include: platform supply vessels; support vessels; installation support vessels, dive support vessels and multipurpose support vessels.

Platform supply vessels are used for loading and unloading of a variety of materials to and from the platform. This includes moving materials via the platform crane, bulk transfer of fluids, such as glycol, methanol, drilling fluids, brine, and some solid powders (such as cement, barite), and waste transfer.

Other vessels are used for underwater inspections, drilling, and specialised services. These vessels operate on an as-needs basis from onshore terminals. Typical subsea support vessels use DP to manoeuvre and to avoid anchoring when undertaking works near subsea infrastructure. Various support vessels are used (depending on type of work, schedules and availability) for activities.

The specifications for the Skandi Feistein are listed in Table 2-9 as a typical subsea support vessel.

Table 2-9 Indicative vessel specifications (Skandi Feistein)

Specification	Details
Length overall	87.9 m
Breadth	419 m
Draft	6.6 m
Deadweight tonnage	4,700 tonnes
DP System	DP-2
Fuel capacity	1070 m^3

Vessels are operated in accordance with International and Australian regulatory requirements and are subject to a marine assurance program.

All vessels supporting the offshore activities will be specified and operated in accordance with International and Australian regulatory requirements. All vessels will be subject to ExxonMobil's Marine Quality Assurance Best Practice and will be certified as being in compliance with international maritime legislative requirements by a Classification Society registered with International Association of Classification Societies (IACS) or by the Australian Maritime Safety Authority (AMSA).

DNV Clean class vessels (DNVGL-RU-SHIP) are used preferentially. These are constructed to provide environmental protection and pollution control.

2.4.3.2 Helicopter Operations

A fleet of aircraft operate out of the Longford heliport on a scheduled basis to support operations. In addition to transporting personnel, the helicopters carry urgent freight and critical spares for the operation of the facilities in Bass Strait. The number, type, and frequency of helicopters available depends upon the planned operations.

Helicopter operations are performed in accordance with Civil Aviation Safety Authority (CASA) regulations. Helicopter type, suitability, and performance criteria are contractually controlled, as are minimum flight and engineering crew qualifications and experience levels. Non-emergency helicopter flights are limited to daylight hours.

2.4.3.3 ROV Operations

Subsea inspection, maintenance and repair may be undertaken by ROV or divers (either platform or vessel-based deployment).

ROVs and divers are linked to the vessel typically by umbilical cable and a tether management system (TMS). Most ROVs and divers are equipped with at least a video camera and lights. Additional equipment may include sonars, magnetometers, a still camera, a manipulator or cutting arm, water samplers, and instruments that measure water clarity, water temperature, water density, sound velocity, light penetration and temperature.

2.4.4 Inspection, Maintenance and Repair (IMR)

Inspection, maintenance and repair is undertaken regularly on all platforms (Facility IMR – 2.4.3.1) and on pipelines and subsea structures (Pipeline and Subsea IMR – Section 2.4.4.2). Subsea is the term used for all infrastructure found below the waterline, e.g. riser, platform legs, pipelines and subsea components.

2.4.4.1 Facility IMR

Facility IMR activities are required to ensure platform wells and topside equipment are maintained in good repair to perform their intended function and in order to prepare facilities for decommissioning. An inspection regime as defined by the relevant Facility Integrity Management System (FIMS) program is in place to identify faults before they become health, safety or environmental issues. Facility IMR consists of a wide variety of mechanical, electrical and structural activities which fall into two categories:

- Preventative maintenance, which is planned, and;
- Repairs as a result of an unplanned failure of equipment or identification through inspection.

A number of activities may be undertaken to prepare equipment for IMR, including:

- Air freeing;
- Hydrocarbon freeing (potential small volumes of venting);
- Breaking containment;
- Pigging;
- Piping modifications;
- Isolation and depressuring; and
- Cleaning / flushing and the removal of hydrocarbons.
- Handling of fluids via reinjection to existing wells or discharge overboard in accordance with discharge limits

Full platform facility shutdowns may be required during IMR activities. Once maintenance and repair activities are completed the platform is re-started.

Inspection Methods

The primary inspection methods during Facility IMR are listed in Table 2-10. An estimation of the durations and frequency of the inspection activities have been included, however these may vary when faults or maintenance is required, additional maintenance beyond the defined FIMS program elements is required, or equipment is taken out of service (e.g. for non-producing facilities).

Table 2-10 Inspection methods during Facility IMR

Activity	Purpose	Frequency	Duration
Non-destructive testing	Non-destructive testing (NDT) is a non-invasive technique for evaluating the properties of a material. Various FIMS programs complete extensive NDT across platforms to evaluate fitness for service.	NDT completed continuously, crews rotate between platforms	~1-3 month campaigns per platform per year

Activity	Purpose	Frequency	Duration
Leak and pressure testing	Leak and pressure testing can be completed prior to or following maintenance work to test the integrity of equipment and identify required maintenance.	Majority of leak testing is completed following annual shutdown, however ad-hoc testing is completed to support maintenance jobs throughout the year as required	Majority of shutdown pressure testing is for 1-4 days following annual shutdown
Deluge testing	The deluge system is designed to supply firewater simultaneously to one deluge area and two hose reels, using one firewater pump.	Deluge testing is conducted twice annually.	Testing of pumps typically lasts 30 mins.

Note: This table is not an exhaustive list of inspection activities. Activities may be adapted or added to accommodate specific scope requirements.

Maintenance and Repair Activities

Periodic preventative maintenance activities are undertaken regularly on all platforms. Maintenance intervals are defined by the Facility Integrity Management System (FIMS), and are based on a predetermined schedule which is updated based on the outcome of inspections.

Abrasive blasting involves the use of sand, grit or hydro gritting/ultra-high pressure water for surface preparation including rust and paint removal, and can be undertaken on surface pipework and production vessels (internal and external). Blasting is also undertaken during recoating programs during which the original coating/paint is removed to ensure a clean surface remains for the new protective coating, such as passive fire protection (PFP). The majority of blasting is completed during shutdowns, some external painting campaigns take place on platforms as required.

Hot work may be required to complete maintenance activities. Hot Work includes; welding, cutting, burning, use of open flame, grinding, and any work activity generating sparks or slag. The majority of hot work is completed during annual platform shutdowns but some ad-hoc work outside of shutdowns for maintenance work may be completed as required.

Maintenance may involve regular activities such as:

- Maintenance and calibration of instrumentation;
- Function testing;
- De-sanding;
- Pump, compressor and generator servicing;
- Greasing of equipment; and
- Structural maintenance.
- Flushing pipework or vessels with water treated with chemicals to aid cleaning of the system

The majority of general maintenance activities occur either in platform campaigns throughout the year or during platform shutdowns.

For larger turbine equipment, maintenance could involve:

- Filter changes (oil filters, fuel gas filters) which involves draining oil/diesel from turbine generators;
- Oil changes which involves draining of old oil and replacement with new oil; and
- Washing of engines which involves pumping water (sometimes with a cleaning agent) into engines to assist in cleaning.

The frequency of these activities range from every 12 months (filter changes) to 4 – 6 years for oil changes.

Platform well maintenance activities may include:

- Valve maintenance: Consists of greasing and functioning the valves to ensure integrity and working correctly; Valves on gas platforms are greased every 12 months and on oil platforms every 18 months. Valves are functioned every 6 months for active wells and every 12 months for plug and secured wells
- Well interventions, which are undertaken if a well is not functioning correctly and may include the following activities: change out of valves, trees and chokes; chemical squeezes, as well as slickline interventions, installation of valves, perforating wells. Well interventions are undertaken when a failure of a barrier occurs in a well in order to make the well safe and reinstate two barriers wherever possible. Barriers are independently tested every 6 months for active wells and every 12 months for plug and secured wells. Typical operations to reinstate a second barrier in a well are;
    - changing out a failed gas lift valve,
    - isolating a tubing leak by plugging and securing the well,
    - isolating a production casing leak by plugging and securing the well,
    - changing out of failed tree valves,
    - remediating wellhead leaks via chemical squeezes,
    - replacing failed WR-SSSV's,
    - locking out failed TR-SSSV's and installing WR-SSSV's,
    - installing casing plugs to isolate packer failures.
- Well unloading and clean up. Well clean-up and unloading may be required for either maintenance of wells to handle oil in water or to clean the remaining fluid from a newly drilled or perforated well. Well unloading occurs; after a well has been unplugged and secured to unload inhibited seawater from the well, unloading completion brine from a well after drilling a well or performing a tubing pull workover. Well clean-up occurs when plugging and securing a well to clean up hydrocarbon from the well and replace with inhibited seawater, completing a P&A of a well to clean up annuli prior to conducting a cement job.

Repairs may be identified through an inspection or surveillance program. Repair activities may include:

- Spooling wraps, clamps or replacements;
- Repair or replacement of valves;
- Pump repair and replacement;
- Electrical repairs; and
- Repairs to turbine equipment such as generators, MOL pumps, gas compressors.
- Repair or replace tertiary structural equipment such as grating and handrails.

Repairs are undertaken as required and identified during inspections, majority of repair work is timed to coincide with annual platform shutdowns (2-4 weeks/year), however some ad-hoc work is completed outside of shutdowns. Temporary equipment and/or temporary re-configuration / alteration of a system flow path may be utilised to enable the repair activity to be undertaken.

2.4.4.2 Pipeline and Subsea Facility IMR

Inspection, Maintenance and Repair is completed on subsea assets including pipelines, piled steel jackets, concrete gravity base structures and subsea facilities. Subsea and pipeline IMR activities require a subsea support vessel and the specifications for a typical vessel are provide in Table 2-9.

Inspection methods

Inspection is the process of physical verification to detect differences from previous or baseline inspections. Inspections are undertaken throughout the life of the field and can be used to determine changes in subsea infrastructure or existing environment. Results of inspections are used to inform FIMS assessments and prioritise subsea and pipeline maintenance and repair activities.

The primary inspection methods during pipeline and subsea facility IMR are listed in Table 2-11. The duration and frequency of activities have been estimated for the next 5 years, the activities associated with preparing facilities for decommissioning have also been included as required

Subsea inspections generally do not cause seabed disturbance with the exception of environmental surveys (e.g. seabed sampling, seabed survey, geophysical scopes). Environmental surveys may require sediment samples and extend further than the PSZ, to gather data for the reference or background case.

Table 2-11 Inspection Methods during Pipeline and Subsea IMR

Activity	Purpose	Typical Frequency	Typical Duration
Visual Inspections	Inspect infrastructure for integrity and for corrosion.	Pipelines and subsea inspections are typically undertaken 3 or 6 years.	Approximately 1 month for pipelines Approximately 1 month for subsea
		Riser inspections below water are undertaken every 5 years	Approximately 1 day
		As required for pipeline and subsea infrastructure, 2 per 5 years.	Approximately 12 days
Side Scan Sonar (SSS) / Multibeam Sonar (MBES)	Used to identify pipeline alignment and location (free spans, pipeline crossings, supports exposure/burial) and subsea features (debris etc.)	Undertaken 3 or 6 years for pipelines and subsea	This is typically undertaken in conjunction with Visual surveys
		As required, 2 per 5 years.	This is typically undertaken in conjunction with Visual surveys
		As required per facility	Approximately 3 days
Sub bottom profiling	Generates shallow depth profile of the seabed	Included as part of visual inspections and MBES/SSS	Included as part of visual inspections and MBES/SSS
Non-destructive Testing	Use of technologies (e.g. ultra-sonic, eddy current, time of flight detection (TOFD), x-ray, radioactive) to evaluate material properties and test for defects	As required subsea, riser and pipeline	Up to 5 days
Flooded member Detection	Used to inspect subsea platform structural members for through wall defects	As required	5 days per platform
Environmental Surveys	Sediment, water and environmental sampling and characterisation of the marine biota.	Environmental surveys may be undertaken as required	Approximately 5 days
		Environmental baseline surveys	Approximately 14 days per campaign.
Pigging / intelligent pigging	Internal integrity inspection and / or cleaning of pipelines	Pipelines typically batch pigged monthly.	Batch pigging: 1-3 days per pig.
		Intelligent pigging completed 4, 8 or 10 yearly.	Intelligent pigging 1-3 days per pig; same time as batch pigging. 2-3 batch pigs required prior for oil pipelines

Activity	Purpose	Typical Frequency	Typical Duration
		As required pigging campaigns	Pigging operations may range in durations from 5-20 days.
Cathodic Protection Potentials Measurement	Verification of cathodic protection effectiveness of structures and pipelines using a CP probe	Included as part of visual inspections.	Included as part of visual inspections.

Note: This table is not an exhaustive list of inspection activities. Activities may be adapted or added to accommodate specific scope requirements. Frequency subject to change based on inspection findings

Maintenance Activities

Maintenance activities (Table 2-12) are undertaken at regular scheduled intervals to prevent deterioration and maintain performance of subsea equipment. The duration and frequency of activities have been estimated for the next 5 years, the activities associated with preparation of facilities for decommissioning have also been included as required.

Subsea maintenance activities generally occur within close proximity to existing infrastructure. ROVs may require tool basket to be positioned on the seabed, these typically have a seabed footprint of approximately 15 m^2.

Table 2-12 Typical Maintenance Activities

Activity	Purpose	Methods	Typical Frequency	Typical Duration
Debris clearance	Access subsea infrastructure	ROV / divers	As required following visual inspection / MBES.	Approximately 2 days.
Marine growth removal	To remove excess marine growth to allow access to subsea infrastructure	ROV water jetting, brush systems or acid to dissolve calcium deposits.	As required following visual inspection / MBES.	Approximately 2-5 days for external depending on amount.
Sediment relocation	Access subsea infrastructure	Suction pump / dredging unit typically mounted on an ROV.	As required following visual inspection / MBES.	Approximately 1-2 days.
Flushing	To remove internal obstructions/ hydrocarbons and minimise long term internal corrosion	Internal pigging of pipelines or pumping of fluids Drive fluids down pipelines at pressure	As required per platform/pipeline	Approximately 1-2 days
Hydrate inhibition	To prevent formation of hydrates in gas pipelines.	Glycol or methanol injected into gas pipelines to inhibit formation of hydrates in pipework, pipelines and associated fittings. Pipelines may require depressurisation.	Continuous with gas production.	N/A.
Leak detection	To identify location of the leak.	Flush infrastructure with dye to detect leak.	As required following visual inspection / MBES or other identification of leaks (process monitoring / aerial surveillance)	Approximately 1 day.

Activity	Purpose	Methods	Typical Frequency	Typical Duration
Installation of sleeves / clamps	Protect pipeline, prevent corrosion, prevent leaks	Installation of sleeves/clamps on subsea infrastructure by ROVs	As required following leak detection	Approximately 1-2 days.
Grinding	To remove rusted bolts/materials/ equipment from subsea infrastructure	Grinder tool typically mounted on ROV	As required per platform.	Can range between 1-10 days per platform activity.
Installation of grout bags	Span rectification, protection and stabilisation	Bags are placed on the seabed and filled with grout or rocks installed on the seabed through a downline from a vessel.	As required following visual inspection / MBES.	Approximately 1 day per span.
Installation of concrete mattresses	Scour control, span rectification, protection and stabilisation	Installed on the seabed from a vessel.	As required following visual inspection / MBES.	Approximately 1-2 days per mattress.
Rock placement	Span rectification, protection and stabilisation	Placement of rock on the seabed from a vessel.	As required following visual inspection / MBES.	Approximately 1-2 days
Underwater cutting/drilling of equipment	To cut pipelines, spools, flexibles, umbilicals in preparation for platform decommissioning. Drill holes in risers to secure risers.	Cutting and drilling tools typically installed by and operated via ROV. HP water blaster may be required for removing coatings. Hydraulically operated shears may be used for underwater cuts (ROV assisted).	As required per platform.	Can range between 1-10 days per platform activity.
Plugging or capping of pipelines	Install plugs or blinded end connectors or caps on pipelines	Installed with an ROV	As required per pipeline.	Approximately 3 days
Temporary storage	Store subsea infrastructure and/equipment on the seabed until final decommissioning.	Placement of equipment /infrastructure on the seabed using ROV /divers	Project based.	
Corrosion protection	Protect subsea infrastructure from corrosion	Installation of anodes or corrosion resistant material. Injection of corrosion inhibitor.	As required following visual inspection / CP stabs.	Approximately 1 day per anode.
Installation of subsea rigging	Temporary dropped object mitigations	Manipulation and installation of subsea rigging using ROV friendly slings/tools	As required per platform.	Approximately 1-3 days. Undertaken as part of grinding activity or cutting activity.

Activity	Purpose	Methods	Typical Frequency	Typical Duration
Pipeline depressurisation	Suspend or preserve for safety reasons as part of maintenance	Pipeline and wells may be depressured to the flare system.	As required per platform.	Approximately 1-2 days. Dependent on length of pipeline.
Redundant equipment and facilities removal	To remove spare and redundant equipment and facilities from facility topsides	Typical construction and maintenance methods e.g. cutting, grinding, unbolting, lifting and transportation	As required per platform	1-10 days per activity

Note:

This table is not an exhaustive list of maintenance activities. Activities may be adapted or added to accommodate specific scope requirements. Frequency subject to change based on inspection findings.

Note: A number of these maintenance activities may occur together as part of a repair / replacement / suspension scope

Repair / Replacement Activities

Repair or replacement activities are required when infrastructure is damaged or deteriorating to a level outside acceptance limits and poses an elevated risk to safety, health, production reliability or ability to remove. These activities require the use of specialist vessels, equipment (ROVs) and potentially divers. The following subsea infrastructure may require repairs and/or replacements: Subsea valves, spools, subsea control modules, caisson, electric / chemical / hydraulic distribution, umbilicals, subsea trees, trawl-protection frames, concrete mattresses and/or grout bags, pipeline crossings, pipelines, risers and riser clamps.

The IMR activities required to replace subsea infrastructure typically follow the same general sequence:

- As found inspection: Using ROVs to take video footage of the infrastructure and surrounding area.
- Cleaning and removing any marine growth: Generally undertaken using ROV with specialist equipment such as brushes or jetting equipment. Chemicals (e.g. acids) may be used to aid the cleaning process
- Sediment relocation: Generally undertaken with ROV with specialist equipment to allow access to subsea infrastructure (pipelines)
- Flushing: Typically flushing cleans the infrastructure using chemicals (such as corrosion inhibitors and oxygen scavengers) at high pressures to clear the lines of more toxic chemicals or hydrocarbons.
- Isolation: To ensure equipment is safely isolated from the remaining subsea infrastructure and can be done through mechanically (ROV) or hydraulically.
- Repair or replacement/ installation: using a specialist vessel with ROVs with specialist tools, such as cutting tools to either repair or perform lifts and installation.
- Leak/ Pressure Tests: Are performed to ensure equipment is correctly installed and hold pressure prior to commissioning. Dye may be used.

A repair activity varies in length and is dependent on the equipment to be repaired. Generally the preparation of a repair activity will consist of a number of activities detailed in Table 2-11 and Table 2-12, the recovery and replacement of infrastructure will depend on the size of equipment. Subsea repair activities occur in close proximity to existing infrastructure. ROVs may require tool basket to be positioned on the seabed, these typically have a seabed footprint of approximately 15 m^2.

2.4.4.3 Overview of Compliance with Section 572

In accordance with Section 572 (3) of the OPGGS Act 2006 a titleholder must remove from the title area all structures that are, and all equipment and other property that is neither used nor to be used in connection with the operations. Removal of all property is the "base case" for all offshore activities.

However, Section 572 (7) of the OPGGS Act 2006 outlines that the obligation to fully remove all property is subject to other provisions of the OPGGS Act, the regulations, directions and other applicable laws. Hence there is a mechanism for titleholders to demonstrate that deviations from the complete removal of property are acceptable. These proposed deviations are presented to NOPSEMA for assessment in an EP, along with appropriate justification. An indicative timeline for key regulatory submissions for Gippsland Basin decommissioning activities is provided in Section 3.3.

Section 572 (2) of the OPGGS Act 2006 requires that a titleholder must maintain property in good condition and repair from the point the property is brought onto the title area until the property is removed. This requirement relates to maintenance that ensures property is fit for purpose and is able to be removed when neither used, nor to be used, in connection with the operations.

The following sections provide an overview of how Esso maintains compliance with Section 572 requirements while planning for decommissioning is ongoing.

Deviation from immediate removal of property

In accordance with the definitions provided in Table 1-1, facilities and pipelines are considered to be not in use, nor to be used, when 'Stasis Mode' has been reached. The property status provided in the inventory in Volume 2, Appendix A can be summarised as show in Table 2-13:

Table 2-13 Summary of Property Status

	Status as at Dec 2020		Status as at Dec 2025	
	In use	Not in use	In use	Not in use
Facilities (platforms)	19	0	12	7
Facilities (subsea)	1[2]	3[1]	2	3[1]
Pipelines (primary)	33	6	21	18
Pipelines (secondary)	8	0	4	4
Umbilicals	8[2]	4	8	5
Debris	Detailed in Subsea Material Register (refer to Section 'Ongoing Property Removal' below)			

Note 1: Subsea trees at SHA, TWA and BKA have been removed.

Note 2: BTW and the BTA to BTW umbilical is scheduled to be operational in 2021 hence is not included in this count.

Additional facilities and pipelines are likely to also transition to a status of 'not in use' during the 5 year timeframe of this EP. It should be noted that property within Esso title areas that is listed in Volume 2, Appendix A with a status of 'CoP' is still categorised as 'in use' because it is either being prepared for decommissioning, supporting decommissioning activities, or supporting facilities that are still producing.

The current status of all of the Gippsland Basin wells is included in Appendix A, Section 4.3. The plug and abandonment of wells will continue to be managed as per the WOMP.

The marine vessels that are already servicing Esso's Bass Strait operations may be capable of retrieving smaller items of equipment (for example items of debris) but are not capable of recovering larger items for which the current planning basis is removal as part of a Heavy Lift Vessel (HLV) campaign. A process is being implemented to assess the removal of smaller items using existing Esso support vessels on an ongoing basis, which will commence in 2021.

The environmental impacts and risks of the temporary storage of not in use equipment continue to be reviewed. The mobilization of dedicated vessels solely to accelerate the removal of property and the associated resources required to manage risks of this work in accordance with Esso's Operations Integrity Management System (OIMS) is currently considered by Esso to be disproportionate to any potential reduction in environmental risks and impacts that may be achieved by their earlier removal.

This EP therefore requests a temporary deviation from immediate removal for the subset of property listed in Volume 2, Appendix A that is currently *not in use, nor to be used* until such time as permissioning documents detailing the proposed end states for this property are submitted in accordance with the indicative timelines provided in Section 3.2.

This temporary deviation is requested to allow for:

- detailed planning, studies and preparatory work in order to manage the operations integrity risks associated with a large project interfacing with ongoing operations to be carried out prior to the complete removal of property;
- property to be removed in a carefully planned, cost effective and efficient manner via a 'decommissioning campaign' (refer to Section 3.1.1);
- investigations to be undertaken with third parties as to the potential re-use of some offshore property (pipelines and facilities); and
- the preparation, submission and assessment of proposed deviations from complete removal where the provisional end state for property in Volume 2, Appendix A is partial or full decommissioning in place.

Section 3 of this EP provides further detail on the proposed approach to decommissioning, including provisional end states and justified timeframes.

As detailed planning for the complete removal of property and approvals for any deviations are being undertaken, Esso will:

- ensure property is maintained so as not to preclude its future removal (see Section *Maintenance of property* and Volume 2, Appendix B for further detail);
- ensure property that does not require the use of a HLV or specialist equipment to be removed continues to be assessed for removal on an ongoing basis (See Section *Ongoing property removal*);
- ensure that environmental risks and impacts related to the property not in use are assessed and continue to be reduced to ALARP and acceptable levels (See Section *Assessment of ALARP and acceptability*);
- ensure planning reflects that, until any deviation to the complete removal of property is accepted by NOPSEMA in a future EP, complete removal of all property that is neither used, nor to be used in connection with the operations is the expectation (Section *Planning for full removal*).

Maintenance of property

The Esso Facility Integrity Management System (FIMS) continues to be used to manage the maintenance of equipment (excluding wells, which is managed by WIMS) on a risk basis (regardless of producing or non-producing status). Further detail on FIMS is provided in Volume 4, Section 2.3 of this EP. Changes in the status of a platform from producing to non-producing does not alter the fundamental approach to the maintenance of equipment within FIMS. However, as facilities progress through the stages of decommissioning and the underlying risk profile changes, it is expected that many pieces of equipment will represent a reduced SSHE risk, and subsequently their maintenance requirements will change and may be reduced.

A Section 572(2) Maintenance Review mechanism is being planned and developed as part of the initial activities undertaken as a facility begins to approach CoP. This process is intended to review, on a facility basis, the critical inspection and maintenance controls which are needed to ensure that decommissioning outcomes, up to and including full removal, are preserved. The critical maintenance and inspection controls will continue to be managed via the electronic maintenance management system, IPES (International Production Enterprise System).

Volume 2, Appendix B includes an overview of maintenance philosophies for property throughout the CoP and Stasis Mode stages for the purposes of Section 572(2). The Section 572(2) Maintenance

Review will be undertaken to ensure critical inspection and maintenance controls are appropriate for the facility/facilities in question and that they are implemented.

This process will be triggered as part of the MOC process of transitioning a producing facility into CoP.

The Section 572(2) Maintenance Review process has been developed and will be adopted for all facilities moving into CoP from 1Q 2021. A review of critical inspection and maintenance controls for facilities already in CoP has commenced and is anticipated to be completed for all facilities currently in CoP by 1Q, 2022. Facilities that have been in the CoP stage for the longest period of time (i.e. WTA and PCA/DPA) have been prioritised for the completion of this review.

Until such time that a Section 572 (2) Maintenance Review is undertaken, equipment will continue to be managed in accordance with existing FIMS processes, regardless of operating status.

Ongoing property removal

While decommissioning campaigns are planned to remove property which requires the use of specialist equipment (including a HLV), Esso has and is continuing to assess and remove other items of property. These ongoing removal activities include the plug and abandonment of wells (in accordance with the indicative schedules provided in Table 3-2 and Figure 3-1), the subsequent removal of wellheads and the removal of smaller items of subsea property as suitable vessels are available.

To facilitate planning for the ongoing removal of smaller items of subsea property, Esso has undertaken an analysis of existing electronic GIS data and historical hard copy records to consolidate relevant details on all subsea property (including known debris) into a Subsea Material Register (SMR). The SMR is intended to be utilised as the principal register for all subsea property, including its associated status.

The SMR will act as the basis for planning removal operations for property which does not require the use of a HLV or specialist removal equipment.

The SMR includes details on the estimated weight, depth and location of the subsea property. Using this information, Esso will assess the potential for the recovery of the item against current and future scheduled vessel activities. When vessels are contracted, a review of the SMR will be completed to identify whether an opportunity exists for the removal of subsea property within the operational capability of the vessel.

Considerations for recovering items during a vessel campaign will include vessel availability (weather etc.), vessel capability (lifting equipment type/capacity etc.), material location (depth, proximity to other infrastructure etc.) and recovery methodology. This information will assist in determining the practicability of recovery and assessment of any potential additional risks in accordance with the Esso Work Management System (WMS) and associated interface documentation. The SMR will be evergreen and updated as property is recovered and in the event other items such as debris are identified.

Assessment of ALARP and acceptability

The existing Environmental Management of Change process as detailed in Volume 4, Section 2.7.1 is the mechanism used to manage permanent or temporary changes during operations and ensure that additional environmental impacts and risks are not introduced by these changes.

The Environmental Management of Change process includes a ‘Temporary Storage Assessment’ which is completed when the requirement to store property on the seabed temporarily as planning for its removal is being undertaken, or a proposed deviation to complete removal is being prepared or assessed.

This assessment includes consideration of environmental aspects and impacts related to the temporary storage of property and will be adopted for all facilities moving into CoP from 1Q 2021. The process of undertaking Temporary Storage Assessments for facilities and property already in CoP is underway. This process will be closely integrated with the Section 572(2) Maintenance Review as IMR activities are fundamental in ensuring environmental risks and impacts continue to be reduced to ALARP and acceptable levels.

Until such time as Temporary Storage Assessments are finalised for all property currently in CoP, Esso has assessed that the environmental impacts and risks associated with the temporary storage of this property continues to be reduced to ALARP and acceptable levels for the following reasons:

- IMR activities for all facilities currently in CoP continue in accordance with the processes detailed in Volume 4 of this EP, until such time as the Section 572 (2) Maintenance Review is completed to define critical inspection and maintenance controls for the CoP and Stasis stages;
- A number of facilities (5 of 10) listed as being in the CoP stage in Volume 2, Appendix A have recently transitioned to CoP (in the past 18 months). Given that these facilities continue to be managed in accordance with the processes and controls detailed in this EP for facilities still in the production stage (where relevant), the environmental impacts and risks are anticipated to be unchanged i.e. it is not considered there is an increase in risk caused by the transition from a producing facility to a non-producing facility;
- Facilities that have been in CoP for the longest duration (i.e. WTA and PCA/DPA) have been prioritised for both the Section 572 (2) Maintenance Review and the Temporary Storage Assessment.

If the outcome of a Temporary Storage Assessment concludes that an activity or environmental impact or risk is not provided for in the current EP, a revision to this EP will be submitted to NOPSEMA for assessment in accordance with the Management of Change process.

Figure 2-5 provides a summary and indicative schedule of the activities Esso is undertaking to maintain compliance with Section 572 (2) requirements while planning for decommissioning is ongoing.

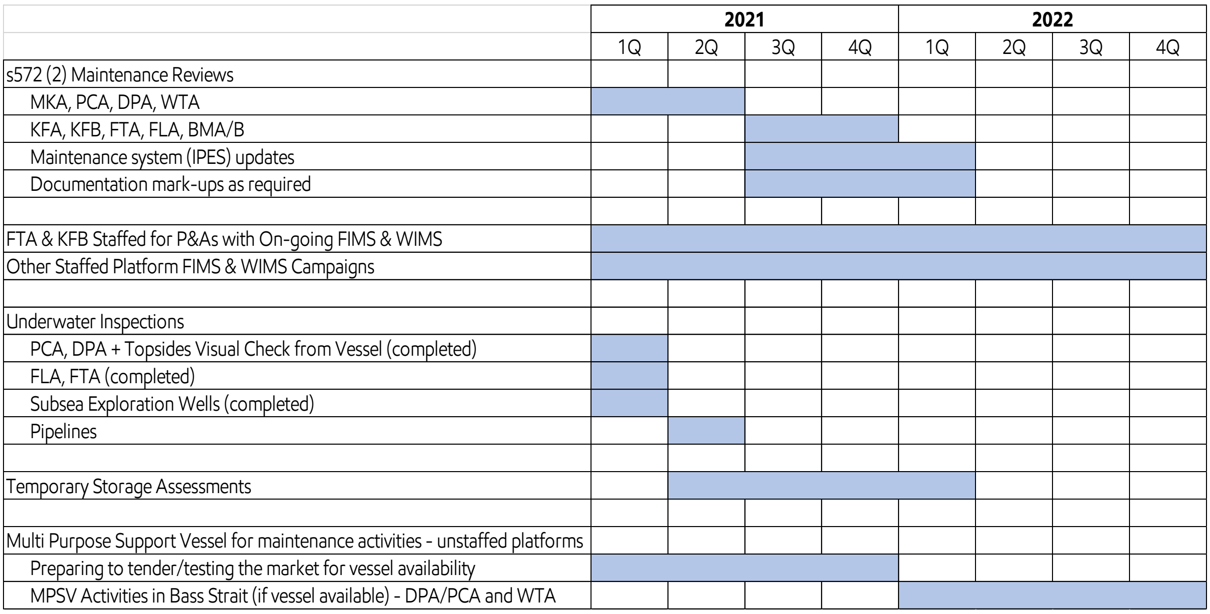


Figure 2-5 Summary of Maintenance Activities

Planning for full removal

As stated in Section 2.4.4.3 above, removal of all property is the “base case” required for all offshore activities. Esso is continuing to plan for the full removal of all property in parallel with planning for the provisional end states presented in Table 3-3, in the event the justifications for the provisional end states (where these differ from full removal) are not accepted by NOPSEMA. This planning includes:

- incorporating considerations such as the timing of third party contracting in relation to EP(s) seeking deviations from the full removal of property;
- the development of a shortlist of capable contractors that can execute the broadest range of possible removal scope and methods;

- ensuring HLV scope definition, early engagement with contractors and concept development reflects consideration of both the provisional end state and full removal; and
- undertaking technical feasibility/concept studies to inform the removal of concrete gravity structures and pipelines.

3 Future Planning

3.1 Decommissioning – Approach and Timing

3.1.1 Decommissioning of Property via Heavy Lift Vessel (HLV) Campaigns

Decommissioning of facilities is planned to be carried out via decommissioning 'campaigns' utilising heavy lift vessel (HLV) capability. For a decommissioning scope the size of the Gippsland Basin facilities, the aggregation of facilities into campaigns for decommissioning is the chosen approach as:

- One or two carefully planned campaigns are expected to deliver better safety outcomes. Planning per OIMS process for project activity (OIMS 3-1) ensures that all aspects of risk are managed when embarking on a major activity requiring specialist skillsets (OIMS 2-1, OIMS 6-1), training of personnel (OIMS 5-1), specialist equipment and competent contractors (OIMS 8-1), integrated plans with operating facilities (OIMS 6-4) and key input from stakeholders (OIMS 4-2, OIMS 10-1);
- The interconnectedness of facilities and varying CoP timing throughout the Gippsland Basin makes it important to ensure that the disconnection of non- producing facilities for decommissioning is carefully planned with limited impact to operating facilities, hence ensuring energy reliability;
- The approach seeks to capitalise on the expertise and competence of specialists with the most appropriate technology and equipment for large scale facility decommissioning;
- A campaign ensures there is sufficient workscope to attract international and competitive tenders from contractors with the appropriate experience and competencies for decommissioning activities of this scale and complexity.
- The remote geographical location and sea conditions of the Gippsland Basin also limits the availability of vessels with suitable size and capability to undertake a work program of this scale.
- A well planned campaign allows time for consideration of all options for onshore reception and demolition centres, noting that the establishment of an Australian centre would require extensive planning to become operational with the appropriate infrastructure and labour and available for Esso's use.
- Execution benefits are achieved by allowing the most efficient use of the significant HLV spread mobilisation and demobilisation costs to Bass Strait (which are currently estimated to be in excess of tens of millions of dollars).
- Campaigns are also expected to result in better environmental outcomes by aggregating work and minimising prolonged and repeated environmental disturbances.

3.1.2 HLV Campaign Timing Justification

The current planning basis is for the first HLV campaign to commence from approximately 2027. This start timing is subject to change based on a number of factors including, but not limited to, suitable specialist contractor and HLV availability. This section and Section 2.4.4.3 provide justification as to why this timeframe is the planning basis for commencement of the first HLV campaign. The length of the HLV campaign is not known at this stage as it is dependent on the type of specialist equipment to be used and detailed execution planning outcomes. This will be defined during engagement with potential HLV contractors.

Planning activities are currently focused on what is required to execute HLV Campaign #1 and this forms the basis of the information presented in this Section.

The Decommissioning Project Management System (DMPS), environmental and technical studies undertaken as part of this planning and lessons learned will be applicable to the planning of future decommissioning campaigns. While timings for the P&A campaigns for facilities not included in the first HLV campaign are still to be finalised (and will be driven by CoP of the facilities), the Bass Strait P&A program will be ongoing and lessons learnt from current P&A activities are being incorporated into planning for these future campaigns. Planning for future campaigns will flow on from planning from the first decommissioning campaign and in some instances (such as planning for P&A campaigns), planning will occur in parallel.

The preliminary timing of, and selection of infrastructure for inclusion into, the first HLV campaign has been based on detailed analysis and planning which has taken into account:

- The actual and predicted CoP timing for facilities, which varies across the Gippsland Basin;
- The completion of well P&A and preparation of facilities for decommissioning;
- Aggregating a sufficient number of facilities for decommissioning prior to arrival of a HLV and its fleet of support vessels, most likely from an overseas location;
- The degree of interconnectedness of the Gippsland Basin facilities and pipelines, hence planning for decommissioning whilst minimising the impact on producing facilities;
- The range of technical feasibility and safety studies and detailed execution planning required to successfully and safely execute a decommissioning program of this nature and scale with a high degree of complexity, due to the interconnectedness of facilities and also facilities that are all unique due to their construction, age and the modifications that have been made over their producing life;
- Information (i.e. vessel specifications, mob/demob details, execution opportunities and vulnerabilities) gathered from potential HLV contractors via an early Expression of Interest (EOI) process that has been completed;
- The environmental studies, research, approvals and stakeholder engagement required to facilitate the proposed decommissioning activities to ensure that all relevant aspects and potential impacts are appropriately understood;
- Retaining an option to establish an onshore demolition, disposal and recycling centre that is sufficiently equipped with necessary infrastructure to safely receive and process facilities brought in from offshore. Sites and requirements for this centre are still being evaluated for both Australian and overseas locations. Depending on the location, site specific regulatory approvals/licensing may need to be completed.

The indicative and preliminary timeframes referenced in this EP will be revisited throughout the planning process.

It should be noted that no comparable decommissioning program to the Esso Bass Strait facilities has been undertaken in Australia to date. Esso has compared the proposed timeframe of the HLV campaign to two examples of recent decommissioning projects that ExxonMobil have recently been involved in as shown in Table 3-1.

Table 3-1 Summary Comparison of Decommissioning Programs

Decommissioning Scope	Operator	Overview of infrastructure	Timeframe from planning to completion (approximate)
Esso Bass Strait (Campaign #1 only)	Esso	14 facilities, 3 subsea facilities, 31 pipelines, approx. 260 wells	8-10 years (well P&A execution 7 years)
Sable Offshore Energy Project, Canada1	ExxonMobil Canada	7 facilities, 5 pipelines, 22 wells.	> 8 years (still ongoing) Well P&A activities 2 years
Brent Field, UK2	Shell UK (50% ExxonMobil)	4 facilities, 3 substructures, 28 pipelines, 146 wells	20 years (10 years of studies, well P&A activities 12 years)

[1] https://soep.com/about-the-project/timeline/index.html .
[2] Brent Field Decommissioning Programmes as submitted to UK Department for Business, Energy and Industrial Strategy by Shell UK, February 2017

A summary of decommissioning activities planned during each year from 2020 until the approximate commencement of HLV campaign #1 has been provided in Table 3-2 below.

Table 3-2 Decommissioning Activity Breakdown – Preliminary Planning Basis for HLV Campaign #1

	2020	2021	2022	2023	2024	2025	2026	2027	2028
INDICATIVE TECHNICAL STUDIES to evaluate and define execution concepts and risk management strategies	Environmental survey – contracting and scoping Review of existing ROV footage Engineering / dismantling studies - scoping Waste disposal studies - scoping	Environmental survey - Phase 1 sample collection and analysis Engineering /dismantling studies Waste disposal studies	Environment survey – Phase 2 sample collection and analysis Engineering / dismantling studies Waste disposal studies	Engineering / dismantling studies Waste disposal studies	Engineering / dismantling studies	Engineering / dismantling studies	Engineering / dismantling studies	-	
STAKEHOLDER INPUT	Stakeholder engagement	Comparative Assessments Stakeholder engagement	Comparative Assessments Stakeholder engagement	Ongoing Stakeholder engagement					
OFFSHORE REGULATORY SUBMISSIONS AND APPROVALS	Bass Strait EP revision Safety case revisions / submissions	Safety case revisions / submissions Bass Strait EP revision or new EP submission for MPSV activities.	Safety case revisions / submissions	EP/s submission for deviation from full removal EPBC / Sea Dumping Applications Safety case revisions / submissions	Bass Strait EP revision – 5 yearly review (preparation) EP/s submission for JUR/MODU P&A campaign Safety case revisions / submissions	Bass Strait EP revision – 5 yearly review (submission) EP submission for campaign #1 execution Safety case revisions / submissions	Safety case revisions / submissions	Safety case revisions / submissions	-
HLV CAMPAIGN #1 WELL RISK MANAGEMENT									
Well decommissioning activities	P&A MKA wells P&A WTA wells P&A SHA, TWA wells P&S KFB, FTA wells	P&A FTA wells P&A KFB wells P&S FLA, BMA, wells Pull MKA conductors	P&A FTA wells P&A KFB wells P&A BMA wells P&A FLA wells P&S PCA wells	P&A BMA wells P&A FLA wells P&S BMB, CBA, HLA, WKF wells Pull FTA conductors	P&A BMA wells P&A WKF wells P&A KFA wells Pull BMA conductors	P&A WKF wells P&A HLA wells P&A KFA wells P&A CBA wells	P&A HLA wells P&A BTA wells P&A CBA wells	Pull BTA conductors	-

	2020	2021	2022	2023	2024	2025	2026	2027	2028
			Pull KFB conductors	Pull FLA conductors		P&A PCA, DPA wells P&S BTA wells Pull WKF conductors Pull KFA conductors	P&A BMB wells Pull HLA conductors Pull CBA conductors		
Active well fronts	4 2 platform rigs 1 jack up rig 1 wireline	4 2 platform rigs 1 conductor pull unit 1 wireline	5 2 platform rigs 1 Multi Purpose Support Vessel 1 conductor pull unit 1 wireline	5 2 platform rigs 1 Multi Purpose Support Vessel 1 conductor pull unit 1 wireline	4 2 platform rigs 1 conductor pull unit 1 wireline	5 2 platform rigs 1 jack up rig 1 conductor pull unit 1 wireline	5 2 platform rigs 1 jack up rig 1 conductor pull unit 1 wireline	1 1 conductor pull unit	-
Approx. wells plugged in year1,2	15	30	40	45	40	45	45	- -	
Approx. wells plugged, cumulative 1,2	15	45	85	130	170	215	260	-	
ONGOING REMOVAL OF PROPERTY	Development of Subsea Material Register (SMR)	Removal of property that does not require a HLV using existing Esso marine vessels.							
ONSHORE DISMANTLEMENT AND DISPOSAL SITE	Early planning and options assessment			Possible sites – options assessment to match contracted HLV methodology	Selected site preparation – regulatory approvals, site design and modifications, etc. (as required)				
HLV CONTRACTING	End of Field Life Strategy	Contracting strategy Early contractor engagement	Develop contracting scope	Assess contractor vessel availability and proposals	Award contract(s) Removal methodology optimisation	Removal methodology optimisation	Final execution planning	Removal execution – HLV Campaign #1	

- The number of wells plugged in each year is a preliminary estimate subject to further refinement: the actual numbers in any particular year will depend on the order of wells to be plugged, the time taken to plug each particular well and other real-time logistical drivers.
- The number of wells does not include the plugging and abandonment of exploration wells (Gudgeon, Terakihi, East Pilchard, Mulloway, Whiptail, and HLA-1).

3.1.3 Decommissioning – Preparation of Facilities

An indicative decommissioning sequence for platforms, pipelines and subsea equipment has been provided in Figure 3-1 to illustrate the physical preparation work that must be completed prior to execution of the HLV campaign.

The basis for the timing and duration of the stages included in Figure 3-1 is explained in the following sections.

Well Plug and Abandonment program

Campaigns to plug and abandon wells on non-producing facilities are underway. Learnings from previous abandonment operations (Mackerel, Whiting, Seahorse, Tarwhine and Blackback) have been applied when developing the Bass Strait abandonment activity schedule presented in Figure 3-1. A risk based approach drives the well abandonment priority, hence why some facilities that are currently in CoP are not scheduled for immediate P&A. For example, based on this risk based approach, P&A has been completed for BKA & WTA.

The plug and abandonment schedule in Figure 3-1 has been based on two parallel platform based Hydraulic Workover Rigs and ongoing wireline activities operating on normally staffed facilities. Jackup/MODU rig campaigns and operations supported by a 'walk to work' multi-purpose support vessel (MPSV) are planned to be used for normally unstaffed or subsea facilities and exploration wells. This activity level, in addition to Esso's existing wireline operations, will be planned, managed and supervised by Esso and supported by Esso's logistics infrastructure (marine, helicopters) along with third party service companies. The pace of these activities represents a challenge to ensuring safe operations and the provision of appropriately trained personnel is a key focus area. The schedule aims to minimise the time that plugged and secured wells are awaiting final abandonment within the bounds of the multi activity schedule and high-graded by well risk. Depending on the condition of the wells, following inspection and plug and secure operations at PCA and BMB (scheduled to be carried out in 2022), BMB well cementing operations are planned to be undertaken to further reduce any risks from these wells prior to final abandonment. PCA and DPA wells will also be evaluated for well cementing operations prior to final abandonment.This program of work will provide more information on the well status thereby supporting further planning for abandonment of these wells in accordance with the indicative P&A sequence in Figure 3-1.

In accordance with this proposed schedule, Esso is already ramping up from one platform based P&A rig to two. This has required the addition of the following:

- Competent and appropriately experienced Wellwork supervisors
- Competent and appropriately experienced Wells engineers
- Rig refurbishment, substructure manufacture, pipe deck manufacture , stair tower manufacture
- Rig support equipment – seawater lift pump
- Suitable third party equipment and competent personnel – cementing, wireline, fishing (back to back plus coverage for leave)
- Competent and experienced platform Care & Preservation crew and camp staff to support operations (back to back plus coverage for leave)
- Boat time and BBMT logistics to support operations
- Helicopters to support operations

As shown in Table 3-2, the proposed two platform rig schedule (in combination with the other well decommissioning activities) is forecast to plug and abandon approximately 260 wells by the end of 2026, which is approximately 65% of the approximately 400 wells currently operated by Esso in Bass Strait. The remaining approximately 140 wells will still be operational at this time.

Esso has investigated three additional options for undertaking the platform based P&A program.

The first alternative option considered was introducing a third platform based P&A rig. In terms of planning time, it would take approximately eighteen months to be ready for a third rig. Esso would need to source, contract and mobilise a hydraulic workover rig or alternatively manufacture significant equipment to allow operations of a platform rig that is currently only partially complete, as well as plan for operations to be safely executed in accordance with Safety Cases and OIMS processes. Esso would also need to build up well engineering and wellwork supervisor teams and expedite planning the abandonments of each well which requires detailed analysis of the well's current state, history and the local geology.

Additional rig lines take a significant number of additional personnel to support. Esso has seen historically that the introduction of a large number of new personnel in a short space of time can challenge an organisation's ability to provide sufficient, experienced supervision so as to ensure workplace competencies are satisfied. Steady continuous operations with a stable, experienced workforce has been demonstrated to be a better way of ensuring the ability to safely supervise new personnel, and ensure workplace competencies are satisfied.

Adding a third platform rig to the proposed two rig P&A program will not expedite the planned commencement of the Heavy Lift Vessel (HLV) campaign, hence this alternative was not considered further.

The second alternative option considered was replacing the proposed two platform based P&A rigs with a larger package rig. Esso's platform based well abandonment campaign is focused on normally staffed oil block platforms which have ceased production, namely MKA, KFB, FTA, FLA, KFA, BMA. Rig availability and a smaller rig footprint are two leading factors which have driven the selection of the Superior Energy Hydraulic Workover Units for this work scope. A rig tender conducted in 2019 failed to identify any other suitable rigs which would fit on the smaller first generation platforms. Locally sourced rigs also provide flexibility for batch operations which allow for increased operational efficiency and the monitoring of reservoir plugs between batch operations - practices recommended by the NOPSEMA Well Integrity team. Further, replacing the two smaller platform based rigs with a larger package rig will not expedite the planned commencement of the Heavy Lift Vessel (HLV) campaign, hence this alternative was not considered further.

The third alternative option considered was using a jack-up rig to complete P&A of the platform based wells. Whilst some Bass Strait normally staffed platforms could be accessed with a jack-up rig for the purposes of abandonment, others are unsuitable due to soil subsidence concerns and well accessibility. Further, rig rates for Hydraulic Workover rig packages are in the order of 1/6th of the cost of a jack-up rig, leading to a cost effective abandonment solution. In terms of planning time, it is expected that it would take approximately two years to source, contract and gain the necessary approvals for a jack-up rig to undertake platform based P&A activities. Additionally, jack-up rigs are predominately staffed by international crews which creates operational challenges and the potential for downtime in the current operating environment impacted by COVID-19 . For these reasons this alternative was not considered further.

Whilst awaiting abandonment, well monitoring and barrier verification will continue to be conducted as per Esso's Well Integrity Management System (WIMS) and any changes in well status will be addressed under existing processes as outlined in the Well Operations Management Plan.

Facility Preparation

Following P&A, the facility is prepared for decommissioning, which includes further topside draining and flushing, relocation of equipment, isolation of piping and pipelines, installation of module lifting apparatus, removal of loose objects, structural works and shutdown of remaining systems and living quarters. The planning assumption is for preparation activities to be undertaken by two teams working in parallel on offshore platforms, with current timing estimates at up to 18 months per facility depending on the complexity of the facility and the chosen topsides removal methodology. Esso is still in the process of determining the topsides removal methodology which will guide the level of activity required to facilitate HLV activities.

Once activities to prepare the facility or pipeline for decommissioning are complete, a facility may enter a period of stasis mode until a decommissioning HLV campaign commences. The majority of steel pile jacket (SPJ) platforms utilise an impressed current cathodic protection (ICCP) system to manage corrosion to the facility sub-structure. Others have sacrificial anode systems.

Figure 3-1 provides an indicative potential sequence which is subject to change as Esso continues to plan for and optimise the decommissioning program. In particular, the CoP timings outlined for facilities such as CBA, HLA, WKF and BTA are dependent on considerations such as reservoir performance and depletion, oil and gas pricing and ongoing production costs, hence these timings are estimates based on a series of different scenarios. Further, production from the BTW subsea wells is dependent on the BTA platform.

Figure 3-1 shows facilities proposed for decommissioning prior to or as part of HLV Campaign #1. Facilities not listed in Figure 3-1 (MLA/MLB, SNA, TNA, WTN, KPA, BTW) are still producing. Over the remaining production life of these platforms, topside equipment may need to be modified, upgraded or replaced in order to optimise hydrocarbon production as production and reservoir parameters change. The timing for decommissioning of these facilities is dependant on their CoP.

While Volume 2, Appendix A states that the SNA and MLA wells are anticipated to be at CoP by 2025, these two facilities are not able to be removed in the first HLV campaign as MLA is required to provide staffing for ongoing production at MLB which has no accommodation facilities and SNA is required to support ongoing production at KPA via the gas pathway from KPA to shore (through the MLB450 pipeline).

The wells associated with MLA/MLB, SNA, TNA, WTN, KPA, BTW will be plugged and abandoned as part of future P&A programs following CoP. The timing of the P&A of these wells is not anticipated to have a bearing on the timing of the first HLV campaign.

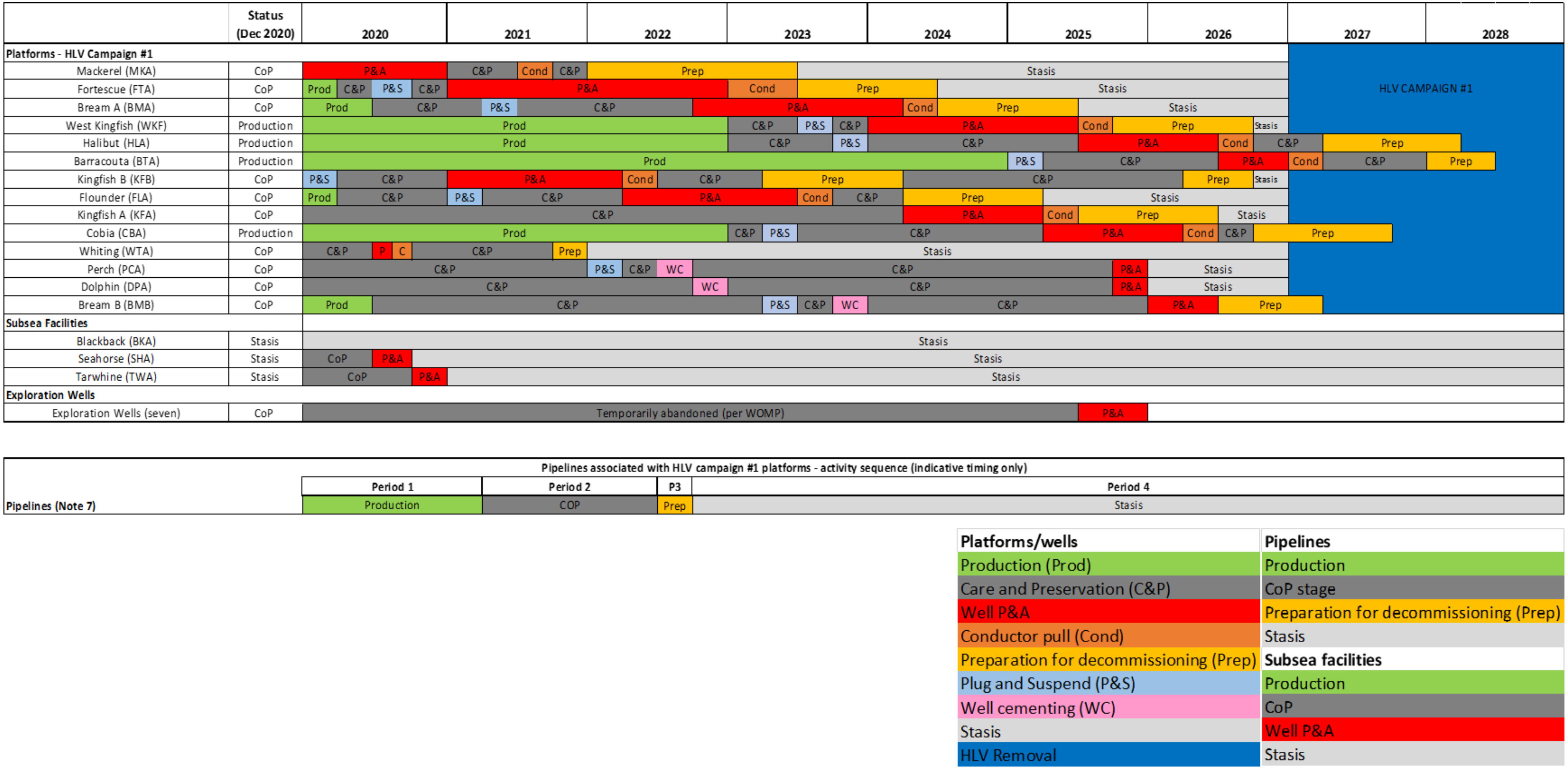


Figure 3-1 Indicative Decommissioning Sequence

3.1.4 Decommissioning – Planning for Execution

The following sections provide an overview of the activities underway and planned in order to ensure decommissioning of the Gippsland Basin facilities is executed successfully, in accordance with OIMS and results in environmental and safety impacts and risks that are reduced to ALARP and acceptable levels.

3.1.5 Overview of decommissioning project management

The ExxonMobil Capital Project Management System (EMCAPS) is applied to large capital projects to ensure a disciplined and consistent approach to project planning and execution throughout the Company. The decommissioning project will follow a specialised Decommissioning Project Management System (DPMS) based on EMCAPS principles. The DPMS has been enhanced to address specific objectives associated with a decommissioning project while many investment, technical quality and operability requirements in EMCAPS have been streamlined, as these are not applicable to decommissioning.

The DPMS includes 5 stages of project evolution covering End of Field Life (EoFL) to Surrender of Petroleum License or Titles. It is designed such that the project scope definition and execution plans mature in alignment with Company's objectives through each stage. Figure 3-2 below provides an overview of the DPMS stages and objectives associated with each stage.

Stage 1 End of Field Life	Stage 2 Select	Stage 3 Define	Stage 4 Execute		Stage 5 Closeout
End of Field Life Strategy, Cessation of Production and External Alignment	Concept Definition, Early Execution and Contracting Plans, Studies, Stakeholder Engagement and Regulatory alignment.	FEED/FEEP, Execution Planning, Contract bids assessed and removal methodology optimized, regulatory submissions (for deviations from full removal)	Design, Procurement and Preparation of facilities and pipelines for removal. award contracts, regulatory submissions (for execution), establish disposal yard	Facilities Removal, Transportation and Disposal	Surrender of Petroleum License/Title
	Gate 1 (2021)	Gate 2 (2023)	Gate 3 (2024)		Check Point

The gate timings shown in Figure 3-2 are indicative timings and subject to change.

Figure 3-2 Overview of the Decommissioning Project Management System (DPMS)

A 'gate' system is used by the Company to ensure that the project has achieved the objectives of the preceding stage and the deliverables of each stage are assessed and planned to move to the next 'gate'. Senior management reviews are typically associated with the passage of each gate. The DPMS is independent of the scope of the project. It describes the Gates and deliverables for each stage of the project. If the project scope is changed (for example in the event that proposed deviations are not accepted by NOPSEMA) the same process is applied to the changed scope. This process will also leverage project progress to date.

It should be noted that Esso will continue well Plug and Abandonment (P&A) activities and facilities Care and Preservation (C&P) activities independent of, but in close coordination of the DPMS. This allows P&A and C&P activities to progress as stand-alone decisions based on their readiness to proceed and not be dependent on total decommissioning project readiness.

3.1.6 DPMS – Planning for Execution

The extent of detailed planning and technical, execution and environmental studies required to safely execute a decommissioning campaign of this nature and scale is significant. Given the complexity and extent of the activities outlined below and in Figure 3-2, it is currently estimated that the early planning stages will take approximately 6-7 years to complete. During this time decommissioning activities such as the P&A of wells and removal of smaller items of property (as discussed in Section 2.4.4.3) will be ongoing.

During the early planning phases, contracting strategies are being developed, the market is being explored as to the availability, suitability and cost of potential HLV's, removal concepts are being developed and refined and, given other facilities in the Gippsland Basin must continue to supply reliable energy, interfaces with operations and logistics teams and simultaneous operations must be carefully planned for and managed.

Decommissioning concept definition and engagement with potential HLV and other contractors to define and optimise removal methodologies is critical during these stages to ensure facility and pipeline decommissioning preparation activities are undertaken as required per the chosen methodology, so that removal operations can be executed successfully. A wide range of technical studies are being (and will be) conducted to properly evaluate and determine the most feasible, safe, and efficient removal methodology(ies) for each platform. Specific removal methodology definition will subsequently drive the nature and magnitude of preparatory works required to be completed prior to the arrival of a HLV. Once execution plans are refined for preparatory works (including careful consideration of any impacts to ongoing production), a formal commercial tendering process will be completed with the HLV market to secure the specialist equipment and to confirm the HLV campaign window.

Esso is undertaking/planning to undertake a range of technical, environmental, socioeconomic, safety and cost studies during these stages. A number of these are research based and scientific in nature and will involve partnerships with tertiary academic institutions, specialist technical companies, other industry members and independent and internal subject matter experts. Extensive community and stakeholder engagement is also required to be undertaken.

The key environmental studies being undertaken to ensure a robust understanding of the potential environmental impacts from decommissioning in the Gippsland Basin are:

- Ecological analysis of historical ROV inspection footage
  - The objective of this study is to identify the marine organisms associated with the platforms, pipelines and subsea facilities using footage obtained from past ROV inspections. Taxonomic identification of marine species is the fundamental building block to characterise the ecological conditions at facilities in the operation area. Deakin University and the Australian Institute of Marine Science (AIMS) are currently reviewing over 1000 hours of ROV footage in order to identify footage suitable for taxonomic identification. Qualitative to quantitative assessment of common ecological indices will then be performed where feasible and the study will be used to inform the scope of the environment survey discussed below and future regulatory submissions.
- Gippsland Basin Environmental Survey
  - Esso is planning an offshore environmental survey to assess the potential impacts on marine ecology and sediments as a result of decommissioning activities. The three main components of the offshore environmental survey are:
  - An assessment of marine biota – this component builds upon the ecological analysis of historical ROV inspection footage discussed above. Data will be collected pertaining to marine biota associated with the Gippsland Basin facilities in order to clarify the ecological role provided by the facilities to general biodiversity and key commercial fisheries species; and to evaluate the condition of the marine organisms associated with the facilities (and at control locations).
  - Contaminants – sediments will be sampled from within the operations area and compared to control locations.
  - The marine biota and contaminant data will inform modelling and further assessment to evaluate the potential short and long term impacts from a range of potential decommissioning options.

The offshore environment survey is anticipated to be undertaken as multiple offshore deployments spanning approximately two years to ensure robust, seasonal and comprehensive data. Data and interpretation from this study will inform future regulatory submissions as well as provide information to assist with meeting the requirements of Section 270 (3) of the OPGGS Act regarding title surrender.

3.2 Decommissioning – Provisional Property End States

In order to guide planning for decommissioning, Esso has identified 'provisional end states' for the Gippsland Basin infrastructure groups (platforms, subsea facilities, pipelines and wells), which are provided in Table 3-3 and Appendix B.

Esso is not seeking acceptance for any deviations from complete removal of property in this EP, apart from temporary deviations for the subset of property currently not in use, as outlined in Section 2.4.4.3. NOPSEMA acceptance of any proposed deviation from the complete removal of property will be sought via future EPs, with the first of these expected to be submitted in approximately 2023. Section 3.3 provides further information on the basis for the timing of regulatory submissions.

As Esso is currently in the early stages of planning for decommissioning in the Gippsland Basin, the provisional property end states presented in Table 3-3 have not yet been subject to detailed environmental, safety and socioeconomic studies and assessment against EP acceptance criteria, such as demonstration that the environmental impacts and risks as a result of these provisional end states are ALARP and acceptable. Engagement with relevant stakeholders including commercial fishers and other users of the sea in accordance with the processes outlined in Volume 4, Section 10 of this EP and a decommissioning specific Stakeholder Engagement Plan is also yet to be undertaken and input from these stakeholders may result in a different approach.

As such, the provisional end states outlined in Appendix B and Table 3-3 are provisional only, subject to change and have been provided in this EP for the purpose of demonstrating Esso's planning basis for compliance with the expectations of Section 572 (3) and (7) of the OPGGS Act 2006.

Where deviation from complete removal has been provisionally outlined in Table 3-3, Esso is required to demonstrate in a future EP that the proposed deviations deliver equal or better environmental outcomes as compared to the complete removal of property. The EP must also meet the criteria for acceptance as outlined in Regulation 10A of the OPGGS (Environment) Regulations 2009.

Hence these end states remain 'provisional' until such time as the necessary studies and assessments, coupled with appropriate stakeholder engagement and consideration of issues raised, has been undertaken and this demonstration has been included within an EP (or EPs) for NOPSEMA's formal assessment.

If future EP/s are accepted by NOPSEMA, 'provisional end states' will become 'approved end states'.

Where deviation from complete removal has been outlined, this has been based on consideration of global practice, international guidelines and standards[1], the technical feasibility of removal works and available literature and studies on the anticipated environmental outcomes of decommissioning options.

An overview of the infrastructure groups and the provisional end states is provided in Table 3-3 below. Further detail is provided in Appendix B.

[1] International Maritime Organisation, Guidelines and Standards for the Removal of Offshore Installations and Structures.

Table 3-3 Overview of Provisional End States

Infrastructure Group	Provisional End State	Base Case End State expected under Section 572(3) of the OPGGS Act 2006
Platforms - Steel Pile Jackets shallow water – 9 of 16.	Topsides fully removed. Substructures fully removed to seabed.	Topsides fully removed. Substructures fully removed to seabed.
Platforms - Steel Pile Jackets deeper water – 7 of 16.	Topsides fully removed Substructures cut at approx. 55m below mean sea level and top section removed. Lower section of jacket left in place.	Topsides fully removed Substructures fully removed to seabed.
Platforms - Concrete Gravity Structures	Topsides fully removed. Substructure left in place.	Topsides fully removed Substructure fully removed
Platforms - monopods	Fully removed	Fully removed
Subsea production systems (excluding pipelines and umbilicals which are covered below)	Fully removed	Fully removed
Offshore pipelines, umbilicals and associated infrastructure	Left in place (some ancillary items, as detailed in Volume 2, Appendix B, removed)	Fully removed
Other property (i.e. debris)	Fully removed	Fully removed
Production wells	Wells plugged and abandoned. Conductors/subsea wellheads removed	Wells plugged and abandoned. Conductors/subsea wellheads removed
Exploration and appraisal wells	Wells plugged and abandoned. Subsea wellheads removed	Wells plugged and abandoned. Subsea wellheads removed.

3.3 Decommissioning – Regulatory Submissions and Approvals

Permissioning documents for decommissioning will be submitted once the detailed research and studies have been undertaken to allow assessment of the decommissioning execution works and the provisional end states outlined in Table 3-3 and Volume 2, Appendix B. A timeline outlining the key regulatory submissions and anticipated timelines for submission has been provided in Figure 3-3.

The timeline provided is indicative, based on early knowledge to date and subject to change as planning for decommissioning progresses. A detailed Permits, Consents, Notifications and Approvals matrix for decommissioning is in development to ensure all regulatory requirements are documented and understood.

The indicative timeline indicates submission of EP/s to seek deviation from complete removal will be submitted in approximately 2023. This is based on the inclusion of data from environmental surveys and studies as outlined in Section 3.1.6. Further discussion on the scope and basis of these EP/s will be held with NOPSEMA to determine if submission of these deviation EP/s could be achieved earlier (i.e. by basing EP’s on data obtained from publically available literature).

EP/s for HLV campaign #1 execution activities are targeted for submission in approximately 2025.

Approximate timing for EP submissions required for well P&A activities that will utilise a JUR/MODU campaign (PCA, DPA, BMB and exploration wells) and decommissioning activities utilising an MPSV are included in Figure 3-3.

Platform based well P&A and activities to be undertaken utilising a vessel are covered in this Bass Strait Operations EP (which will be reviewed and revised as required to ensure all activities are addressed).

Decommissioning activities using a MPSV (preparation at WTA/PCA/DPA/BMB) will be reviewed against this Bass Strait Operations EP as the scope of these activities is defined further (expected in early 2021). This review will determine if a new EP is required for these activities or these can be covered by a revision to this Bass Strait Operations EP. Hence this potential EP has been depicted in Figure 3-3 with a dashed box.

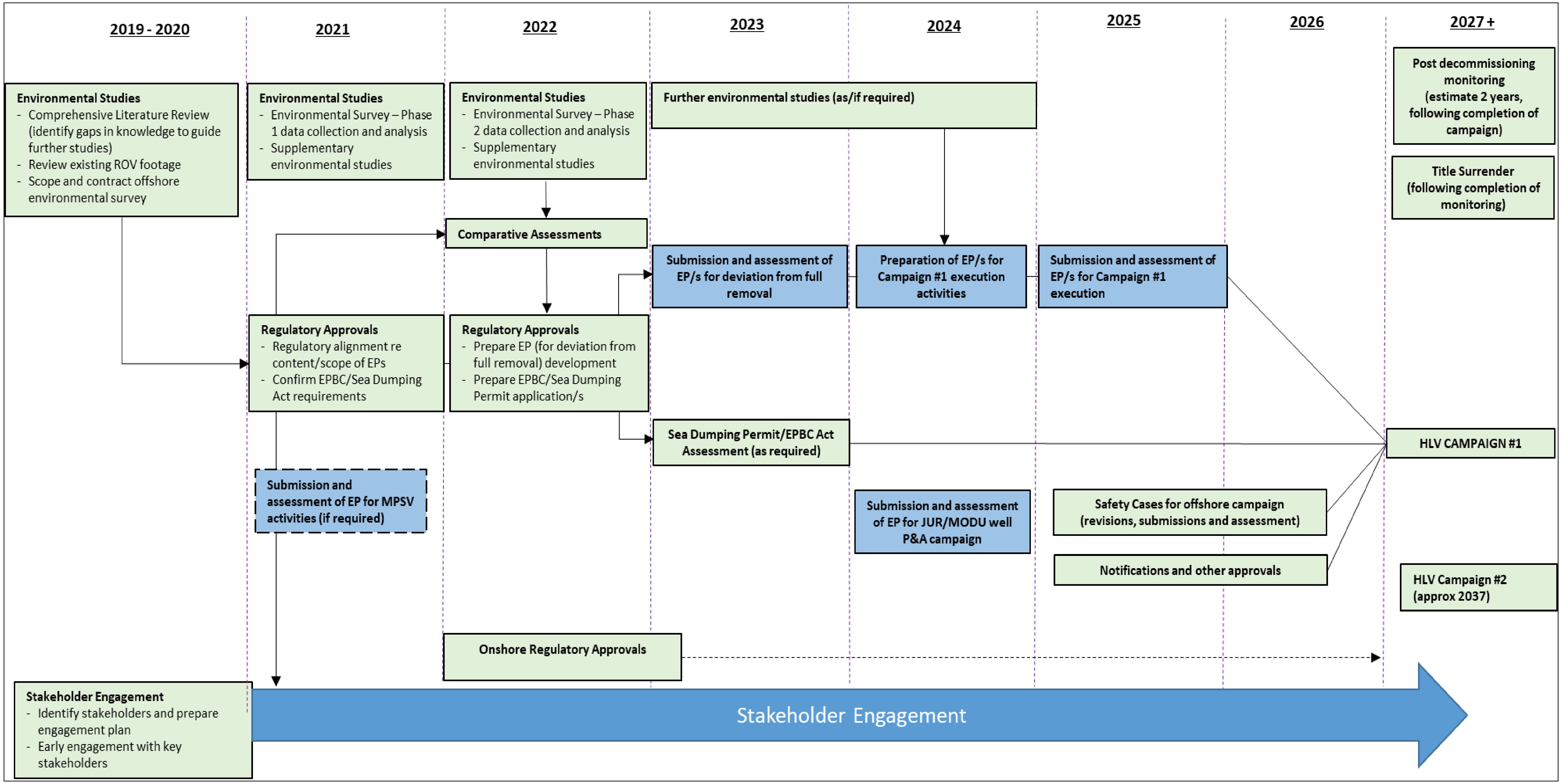


Figure 3-3 Indicative Gippsland Basin Decommissioning Regulatory Roadmap

4 Environmental Impact and Risk Assessment Methodology

4.1 Overview

Environmental Impact Assessment is concerned with assessing the impacts resulting from activities that are reasonably certain to occur (such as planned discharges to the air or water), while Environmental Risk Assessment is concerned with assessing the risks resulting from unplanned events that may possibly occur (such as hydrocarbon spills, introductions of marine pests, loss of waste overboard).

Environmental Impacts result from activities that are an inherent part of the petroleum activity and will result in a change to the environment or a component of the environment, whether adverse or beneficial. For example, discharge of produced formation water to the marine environment is an impact on the environment that cannot be avoided for the activity to achieve its aims.

Environmental Risks result from unplanned activities where a change to the environment or component of the environment may occur (i.e. there may be impacts if the event actually occurs). Risk is a combination of the impact or consequence of an event and the associated likelihood of the event occurring. For example, a hydrocarbon spill may occur if a support vessel's fuel tank is punctured by a collision during the activity. The risk of this event is determined by assessing the consequence or environmental impact (using factors such as the type and volume of fuel and the nature of the receiving environment) and the likelihood of this event happening (which may be determined qualitatively or quantitatively).

Impacts and risks associated with the petroleum activity have been identified in accordance with ExxonMobil's Environmental Aspects Guide (2012). This ExxonMobil Guide is designed to support the implementation of environmental management expectations of OIMS with special emphasis on, and linkage with ISO 14001 Environmental Management System specification.

4.2 Definitions

Table 4-1 Definitions

Term	Definition
Activity	An activity refers to a component or task within a project which results in one or more environmental aspects.
Aspect	An environmental aspect is an element or characteristic of an activity, product, or service that interacts or can interact with the environment. Environmental aspects can cause environmental impacts.
Impact (HB203:2012)	Any change to the environment or a component of the environment, whether adverse or beneficial, wholly or partly resulting from an organisation's environmental aspects.
Risk (HB203:2012)	The effect of uncertainty on objectives. The level of risk can be expressed in terms of a combination of the consequences and the likelihoods of those consequences occurring.
Direct impact	A direct impact occurs through direct interaction of an activity with the existing environment.
Indirect impact	An indirect impact is those which are not a direct impact but are the result of a complex impact pathway. These are often referred to as secondary impacts or risks.
Cumulative impact	Cumulative impacts occur when the incremental impact of the activity is combined with the cumulative effects of other past, present and reasonably foreseeable future projects.
Receptor	The term receptor refers to a feature of the natural and human surroundings that can potentially be impacted. This includes air, water, land, flora, and fauna including people.
Consequence	The consequence of an impact is the outcome of the event on affected receptors. Consequence can be positive or negative.
Likelihood	The likelihood of an impact is the chance (probability) of the impact occurring.

4.3 Identification and Characterisation of Environmental Aspects

In order to undertake meaningful impact and risk assessment, a clear understanding of the context of the assessment is required, through defining the activity and the receiving environment, and understanding any requirements (legislative or other) which are relevant to either the activity or the environment.

All components of the petroleum activity have been identified and described in Section 2 of this EP. The existing environment in the region is described in Volume 1, and a summary of environmental receptors in the receiving environment within the Operational Area and Potentially Exposed Area (PEA) is provided in Section 5 of this Volume (Volume 2).

In order to assess cumulative impacts, the spatial and temporal boundaries of the assessment must be set. For this EP, the following have been considered:

- Spatial – this is designed to capture all possible aspect interactions. The spatial boundaries for the assessment are described in Section 5.1.
- Temporal – this considered past, present and future activities and environments. The temporal boundary for this assessment is the duration of this EP validity i.e. 5 years.

4.4 Impact and Risk Identification

Once the context was established, an assessment was carried out to identify potential interactions between the petroleum activity and the receiving environment by considering impact pathways, known as environmental aspects. The relationships between activities and aspects is shown in Table 4-2.

Based upon an understanding of the environmental aspects, impacts or risks were defined and ecological and social receptors identified enabling a systematic evaluation to be undertaken.

Esso held a series of risk workshops (11 – 17 December 2018, 6 and 11 – 12 February 2019) focussed on validating the petroleum activity-specific impacts and risks and associated control measures.

Table 4-2 Activity – Aspect Relationships

	Physical Presence	Seabed Disturbance	Underwater Sound Emissions	Light Emissions	Emissions to Air	Planned Discharge - Brine	Planned Discharge - Cooling Water	Planned Discharge - Deck Drainage & Bilge	Planned Discharge - Sewage and Greywater	Planned Discharge - Food waste	Planned Discharge - Operational Fluids	Planned Release – Gas (subsea)	Planned Discharge - Cement	Planned Discharge – Solids	Physical Presence - NORM	Produced Water Discharge	Unplanned Interaction with Fauna	Unplanned Introduction of IMS	Accidental Release - Dropped Objects	Accidental Release - Cement	Accidental Release - LOC (chemicals / hydraulic fluids)	Accidental Release - Waste	Accidental Release - Bulk Transfer	Accidental Release - LOC (pipelines)	Accidental Release - LOC (bulk storage)	Accidental Release - LOC (vessels)	Accidental Release - Hydrocarbon from the piles	Accidental Release - Loss of Well Integrity / Loss of Well Control
Operations																												
Platform Operations	✓		✓	✓	✓	✓			✓	✓	✓					✓			✓		✓	✓	✓		✓		✓	✓
Subsea facilities operation											✓										✓							✓
Pipeline Operations	✓																				✓			✓				
Wellwork																												
Wireline / Workover Activities (general)					✓						✓								✓		✓							✓
Cementing													✓							✓								
Conductor cutting and pulling		✓									✓								✓									
Conductor Clean-out											✓			✓														
Sandwash											✓			✓														
Inspection, Maintenance and Repair (IMR)																												
Facility IMR					✓						✓			✓			✓		✓		✓							
Pipeline and Subsea IMR	✓	✓			✓						✓	✓		✓	✓				✓	✓	✓							
Support Operations																												
Vessel Operations	✓		✓	✓	✓	✓	✓	✓	✓	✓							✓	✓	✓		✓	✓				✓		
ROV Operations		✓		✓															✓		✓							
Helicopter Operations	✓		✓																									

4.5 Environmental Impact Assessment

The severity of an impact from a planned event, referred to as environmental consequence, can be evaluated in terms of the degree of the effects and the sensitivity of the environment. Esso evaluates three effect dimensions (scale, duration, and intensity) (Table 4-3) and three environmental sensitivity dimensions (irreplaceability, vulnerability, and influence) (Table 4-4).

The determination of impact severity involves evaluating each dimension as lower, moderate, or higher based on qualitative descriptions. Once each dimension is evaluated, results for effect and sensitivity are compared against interpretive criteria to define the overall environmental and public impact consequence level (Table 4-5).

Table 4-3 Evaluation of environmental effect dimensions

Effect Dimension	Value	Description
Duration	Short-term (Lower)	Hours to days; effects highly transitory
	Medium-term (Moderate)	Weeks to months. Trigger/cause is temporary; effects decline over time. For chemicals, consider persistence, breakdown product, and bioaccumulation potential in determining effects duration.
	Long-term (Higher)	Years; effects are ongoing. For chemicals, consider persistence or bioaccumulation potential in determining effects duration.
Size/Scale	Localised (Lower)	Within or near an operational site, facility, etc.; affecting an area similar to or smaller than a typical operational site (for small and/or mobile sources); effects are physically contained/controlled; not a significant portion of any sensitive area.
	Moderate	Affecting an area significantly larger than a typical operational site, facility, etc.; a significant portion of a *habitat*, watershed or single ecological area; a significant portion of the range or occurrence of a population of a species.
	Widespread (Higher)	Encompassing entire *ecosystems*, watersheds, or bioregions (landscape-scale); affecting most of the global range or occurrence of a species; having a noticeable impact on corporate-level *environmental performance* reporting.
Intensity	Minor (Lower)	Minor changes to wildlife, *habitat*, water occurrence/drainage, or vegetation; low density. For chemical effects: low concentration or hazard* potential.
	Moderate	Moderate or partial changes to *habitat*, water occurrence/flow, ground cover, ground stability, vegetation or wildlife. For chemicals, moderate concentrations, bioaccumulation or hazard* potential; sub-lethal, non-reproductive direct or indirect effects on organisms.
	Significant (Higher)	Notable changes to, fragmentation of, or elimination of *habitat*, water drainage/features, ground cover, ground stability, vegetation, and/or wildlife; for chemicals, high concentrations, bioaccumulation, or hazard* potential. Significant direct or indirect survival and/or reproductive effects on organisms.

* *Chemical hazard generically includes radioactivity, reactivity, toxicity, carcinogenicity, mutagenicity, pathogenicity, reproductive effects potential, etc.*

Table 4-4 Evaluation of sensitivity dimensions

Sensitivity Dimension	Value	Description (applies to species, *ecosystem*, and/or *ecosystem* features/ functions/ services, all at same scale as Consequence)
Irreplaceability	Lower	Common, plentiful
	Moderate	Less common or plentiful, but not rare or unique
	Higher	Unique or rare
Vulnerability	Lower	Healthy, resilient, unthreatened, undamaged, or no remaining natural elements (such as some industrial settings)

Sensitivity Dimension	Value	Description (applies to species, *ecosystem*, and/or *ecosystem* features/ functions/ services, all at same scale as Consequence)
	Moderate	Moderately resilient, existing stress or damage not significantly impairing function. Sustainable demand on resources/services
	Higher	Not resilient or capable of recovery, highly stressed, threatened and/or endangered, functions/ services failing (such as collapsing fishery)
Influence	Lower	Providing few or no services (supporting, regulating, provisioning, cultural)
	Moderate	Considered moderately important, providing a range of ecological, cultural, social, or commercial services for humans and biodiversity
	Higher	Highly productive and/or bio diverse, critical for human well-being (such as subsistence), functions/services provide critical support for key human/biological communities (such as clean water), considered highly important by public

Table 4-5 Determination of environmental and public impact consequence

Consequence Level	Environmental Impact	Public Impact	Interpretative Examples of Environmental Consequence Dimension Considerations
I	Potential Widespread, Long Term, Significant Adverse Effects	Extended (> 3 Months) National or International Media Coverage; Large Community Disruption or Evacuation (> 1,000 people); Closure of Major Transportation Route > 24 hrs	Sensitivity of receptors are higher; Effects are longer term and widespread and / or of a higher intensity.
II	Potential Localised, Medium Term, Significant Adverse Effects	National Media Coverage; Medium Community Disruption or Evacuation (100–1,000 people); Closure of Major Transportation < 24 hrs.	Sensitivity of receptors are moderate or higher; Effects are medium to long term and / or have a moderate to higher intensity.
III	Potential Short Term, Minor Adverse Effects	Public Complaints; Small Community Impact (< 100 people); Closure of Secondary Transportation Route < 24 Hours; Tier 1 Process Safety Event (PSE)	Sensitivity of receptors are lower to moderate; Effects are medium term and/or moderate intensity. OR Sensitivity of receptors is lower, but Effects are longer term / higher intensity. OR Effects are localised, short-term and / or low intensity, regardless of receptor sensitivity.
IV	Inconsequential or No Adverse Effects	Public Complaint; Temporary Closure of Minor Transportation Route; Minor Inconvenience	Sensitivity of receptors are lower; Effects are generally short term, localised and of low to moderate intensity.

4.6 Environmental Risk Assessment

4.6.1 Determination of Consequence

When assessing the consequence of an unplanned event, the same methodology is used as for determining the consequence of a planned event (as described in Section 4.5 Environmental Impact Assessment).

4.6.2 Determination of Probability

Once the most severe environmental consequence of an unplanned event is assessed, the probability of the unplanned event occurring is assessed. This is done by assessing the probability for each failure, event, or condition necessary to produce the impact.

In order to ensure that the highest possible risk is identified, scenarios with a lower severity consequence but higher probability and potentially a higher overall risk are also considered.

The five categories of probability are as shown in Table 4-6.

Table 4-6 Probability categories

Probability Range	Qualitative Interpretation Guidance	Quantitative Interpretation Guidance (probability of occurring per year of exposure)
A	**Very Likely** • Similar event has occurred once or more at Site in the last 10 yrs. • Has happened several times at Site or many times in Company	**0.1 to 1**
B	**Somewhat Likely** • Has happened once before at Site or several times in Company	**0.01 to 0.1**
C	**Unlikely** • Has not happened before at Site or has happened a few times in Company	**0.001 to 0.01**
D	**Very Unlikely** • Have been isolated occurrences in Company or has happened several times in industry	**0.0001 to 0.001**
E	**Very Highly Unlikely** • Has happened once or not at all in Company • Has happened a few times or not at all in industry	**<0.0001**

4.6.3 Determining Significance of Risk

The combination of consequence severity and probability of occurrence determines the level of risk. ExxonMobil's risk framework considers existing controls when determining risk. The overall risk category is given on the basis of the likelihood of the consequence occurring after application of the control measures. The effectiveness of control measures was considered when determining the likelihood of events with control measures in place, i.e. factors such as functionality, availability, reliability, survivability, independence and compatibility of control measures, were considered.

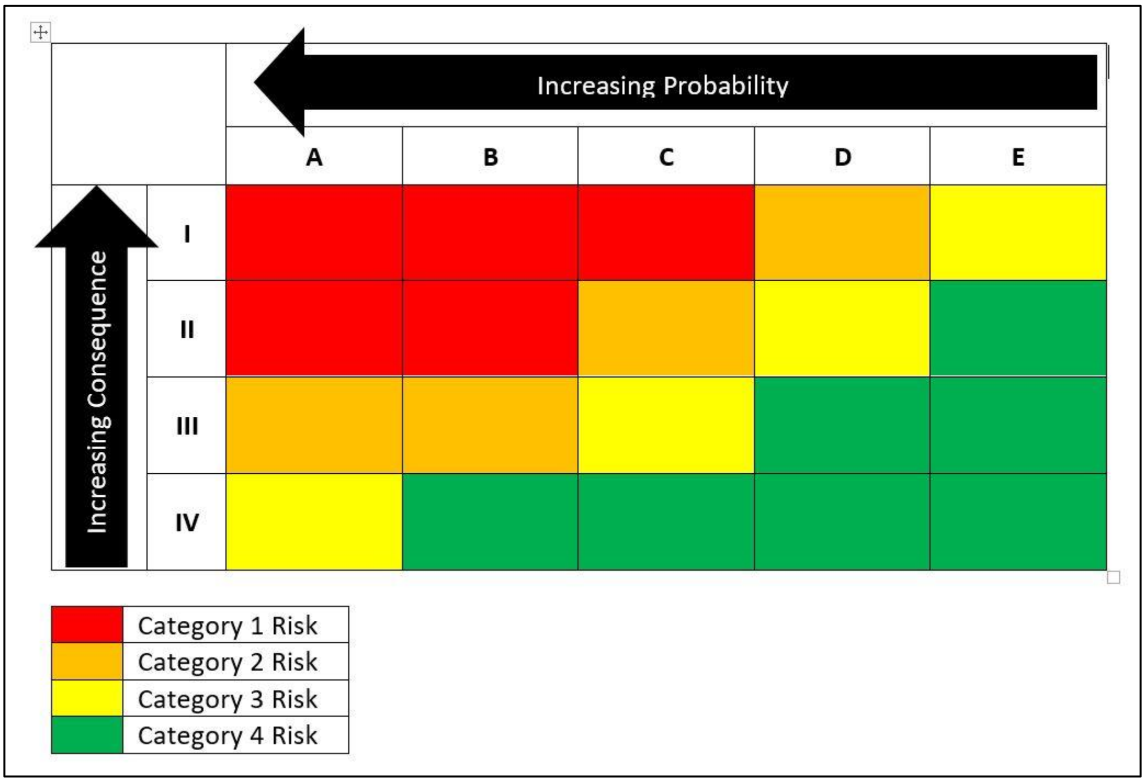


Figure 4-1 Risk Matrix

ExxonMobil classifies risk into four categories as follows:

Category 1: A higher risk that should have specific controls established in the short term and be reduced as soon as possible.

Category 2: A medium risk that should be reduced unless it is not "reasonably practicable" to do so. Reasonably practicable is:

- The level of resource expenditure is not significantly disproportionate in relation to the resulting decrease of risk.

Category 3: A medium risk that should be reduced if "lower cost" options exist to do so. Lower cost denotes follow-up work that can be completed without:

- Allocating extensive engineering, technical, and operations manpower, or;
- The need for unit shutdowns or activities which may introduce other risks or use resources that may be more appropriately used to address higher risk category items.

Category 4: A lower risk that is expected to be effectively managed in base OIMS practices

- Typically requires "No Further Action."
- Risk mitigation measures that are in place to manage the risk to Category 4 should be continued.

4.7 Demonstration of ALARP

Control measures are selected to reduce either the consequence of an impact or risk, or the likelihood of an unplanned event occurring. Control measures that are required by legislation are considered ‘Good Practice’ within the oil and gas or offshore industry and are therefore adopted regardless of the evaluated impact or risk level. In some cases, the risk or impact level will be so low that no control measures will be identified which can reduce the consequence or likelihood.

The OPGGS(E)R 13(5)(c) requires that the EP detail how the control measures will be used to reduce the impacts and risks of the activity to as low as reasonably practicable (ALARP) and to an acceptable level.

ALARP is achieved if the cost involved in reducing the risk further would be grossly disproportionate to the benefit gained. The ALARP principle arises from the fact that infinite time, effort and money could be spent attempting to reduce a risk or impact to zero. Where good practice controls measures do not sufficiently reduce the risk or impact level, consideration of additional control measures may be required, including undertaking a comparative assessment of impacts or risks, costs and environmental benefits for identified control measures.

NOPSEMA's Environment Plan Decision Making Guideline (GL1721, Rev 5, and June 2018) 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.

There is no universally accepted guidance to applying the ALARP principle to environmental assessments. In alignment with NOPSEMA's ALARP Guidance Note (N-04300-GN0166, Rev 6, June 2015), Esso has 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 4-2).

Specifically, the framework considers impact severity and several guiding factors:

- Activity type
- Risk and uncertainty
- Stakeholder influence.

Good practice is considered sufficient demonstration of ALARP in cases where the risk is relatively well understood, the potential impacts are low, activities are well practised, and there are no conflicts with company values nor significant media interest. This is referred to as a Type A Decision.

An engineering risk assessment is required to demonstrate ALARP in cases where there is greater uncertainty or complexity around the activity and/or risk, the potential impact is moderate, it may attract local media attention and some persons may object. This is referred to as a Type B Decision.

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, engineering risk assessment is required, and the precautionary approach applied for those controls that only have a marginal cost benefit.

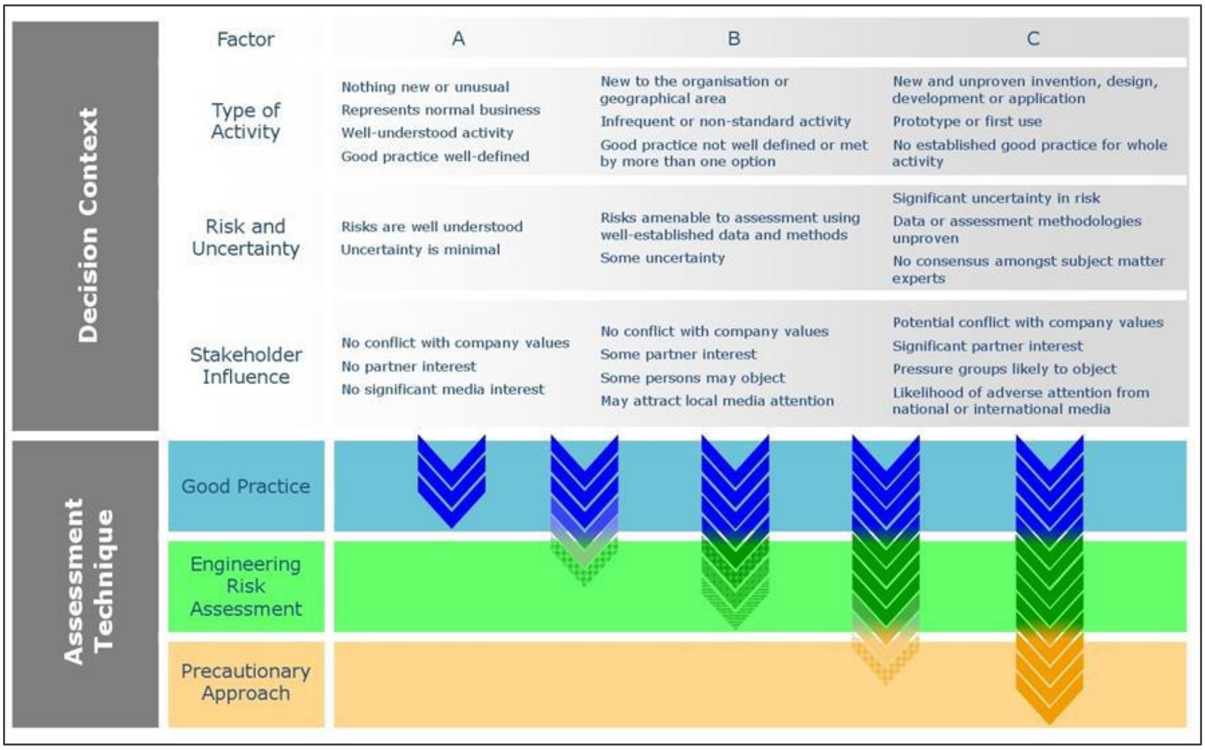


Figure 4-2 ALARP Decision Support Framework

This decision-making context has been applied to each aspect in Section 4.

The assessment techniques considered include:

- Good practice
- Engineering risk assessment
- Precautionary approach.

4.7.1 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
- 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.

4.7.2 Engineering Risk Assessment

All impacts and risks that require further assessment are subject to an 'Engineering Risk Assessment' in which a comparative assessment of risks, costs, and environmental benefit is conducted (OGUK, 2014). The cost–benefit analysis shows the balance between the environmental benefit and the cost of implementing the identified measure.

4.7.3 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 hazard management is needed.

A precautionary approach will mean that environmental considerations are expected to take precedence over economic considerations, and a control measure that may reduce environmental impact is more likely to be implemented.

4.8 Demonstration of Acceptable Level

One of the objects of the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (regulations) is to ensure that any petroleum activity carried out in an offshore area is carried out in a manner by which the environmental impacts and risks of the activity will be of an acceptable level. This is also one of the key criteria for acceptance of an environment plan.

The acceptable level of environmental impact and risk for each receptor needs to be defined before the environmental performance outcomes (EPOs) can be decided and the evaluation of those impacts and risks can take place.

An 'Acceptable level' is the specified amount of environmental impact and risk that the activity may have which would not be inconsistent with relevant principles, and not compromise management / conservation / protection objectives or the attainment of stakeholder / wider-community views in defining acceptable levels.

Esso considers a range of factors when evaluating the acceptability of environmental impacts or risks associated with its activities. This evaluation is based on several factors, as outlined in Table 4-7 and is based on NOPSEMA's Guidance Notes for Environment Plan Content Requirements (N04750-GN1344, Rev 3, April 2016) and guidance issued in Decision-making – Criterion 10A(c) Acceptable Level (N-04750-GL1637, Rev B, Nov 2016). The acceptability evaluation for each aspect associated with this activity is undertaken in accordance with Table 4-7. These factors are used to demonstrate acceptability in Sections 6 and 7.

Table 4-7 Demonstration of acceptability test

Factor	Demonstration of acceptability	
Risk Assessment Process for Unplanned Event	The level of environmental risk is either Category 2, 3 or 4.	
Consequence Assessment for Planned Event	The level of environmental consequence is 3 or below.	
Principles of Ecologically Sustainable Development (ESD)	*Principles of Ecologically Sustainable Development as per EPBC Act Section 3A*	*Applicability to this EP*
	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 assessment process. This principle is not considered separately for each acceptability evaluation.
	If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should	An evaluation is completed to determine if the activity will result in serious or irreversible environmental

Factor	Demonstration of acceptability	
	not be used as a reason for postponing measures to prevent environmental degradation.	damage. Where the activity has the potential to result in serious or irreversible environmental damage, further assessment is undertaken to determine if there is significant uncertainty in the evaluation.
	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.	Where the potential impacts and risk are determined to be serious or irreversible the precautionary principle is implemented to ensure the environment is maintained for the benefit of future generations
	The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making.	Impact assessment determines there are no significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved.
	Improved valuation, pricing and incentive mechanisms should be promoted	Not relevant to this EP.
Legislative and Other Requirements	All good practice control measures have been identified for the aspect. Acceptable levels identified in relevant EPBC listed species recovery plans or approved conservation advices as described in Table 4-8 below have been considered.	
Internal Context	All Esso management system standards and impact or risk control processes have been identified for the aspect.	
External Context	Stakeholder concerns have been considered / addressed through the consultation process.	

Table 4-8 Acceptable levels listed in relevant EPBC listed species recovery plans or approved conservation advices

Receptor / Value and Sensitivity	Acceptable Level	Source
Commonwealth marine area	Undertake the activity in a manner that will not result in a known or potential pest species becoming established.	MNES Significant guidelines for Commonwealth Marine Waters
Physical Conditions		
Ambient water quality	<u>Normal discharges:</u> Undertake the activity in a manner that will not result in a substantial change in water quality which may adversely impact on biodiversity, ecological integrity, social amenity or human health. <u>Persistent or harmful chemicals:</u> Undertake the activity in a manner that will not result in persistent organic chemicals, heavy metals, or other potentially harmful chemicals accumulating in the marine environment such that biodiversity, ecological integrity, social amenity or human health may be adversely affected.	MNES Significant guidelines for Commonwealth Marine Waters
Ambient sediment quality	Undertake the activity in a manner that will not result in a substantial change in sediment quality which may adversely impact on biodiversity, ecological integrity, social amenity or human health.	MNES Significant guidelines for Commonwealth Marine Waters

Receptor / Value and Sensitivity	Acceptable Level	Source
Air quality	Undertake the activity in a manner that will not result in a substantial change in air quality which may adversely impact on biodiversity, ecological integrity; social amenity or human health.	MNES Significant guidelines for Commonwealth Marine Waters
Climate	Undertake the activity in a manner that will not result in a substantial change in climate which may adversely impact on biodiversity, ecological integrity; social amenity or human health.	MNES Significant guidelines for Commonwealth Marine Waters
Ambient noise	Undertake the activity in a manner that will not result in a substantial change in ambient noise which may modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity results.	MNES Significant guidelines for Commonwealth Marine Waters
Ambient light	Undertake the activity in a manner that will not result in a substantial change in ambient light which may modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity results.	MNES Significant guidelines for Commonwealth Marine Waters
Ecological Receptors		
Listed threatened and migratory Species	Undertake the activity in a manner that will not lead to a long-term decrease in the size of a threatened or migratory listed species population.	For listed threatened and migratory species, EPBC Significant Impact Guideline 1.1 has been used to identify the relevant significant impact criteria.
Threatened albatross and giant petrel species	Undertake the activity in a manner that will not impact the long term survival and recovery of albatross and giant petrel populations breeding and foraging in Australian jurisdiction.	National Recovery Plan for threatened albatrosses and giant petrels 2011 – 2016
White Shark	Undertake the activity in a manner that will not hinder the recovery of white shark in the near future, or impact on the conservation status of the species in the future.	Recovery Plan for the White Shark (*Carcharodon carcharias*) (2013)
Benthic habitats and communities	Undertake the activity in a manner that will not modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity in a Commonwealth marine area results.	MNES Significant guidelines for Commonwealth Marine Waters
Coastal habitats and communities		
Marine species that are not protected (i.e. not listed threatened or migratory species	Undertake the activity in a manner that will not have a substantial adverse effect on a population of a marine species including its life cycle (for example, breeding, feeding, migration behaviour, life expectancy) and spatial distribution.	MNES Significant guidelines for Commonwealth Marine Waters
Wetlands	Undertake the activity in a manner that will not result in a substantial and measurable change in the water quality of the wetland which may adversely impact on biodiversity, ecological integrity, social amenity or human health.	Significant impact criteria for Wetlands of International Importance relevant to water quality.
Key Ecological Feature	Undertake the activity in a manner that will not result in modification, destruction, fragmentation, isolation or disturbance of an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity in a Commonwealth marine area.	MNES Significant guidelines for Commonwealth Marine Waters

Receptor / Value and Sensitivity	Acceptable Level	Source
Economic, Cultural and Social Receptors		
Commercial fisheries Recreational users Commercial users Shipping Oil and Gas Activities	Undertake the activity in a manner that will not interfere with other marine users to a greater extent than is necessary for the reasonable exercise of right conferred by the titles granted.	The OPGGS Act Section 280

5 Description of the Environment

5.1 Project Areas

Project Areas relevant to this EP include:

Operational Area – the area where petroleum activities will take place. The Operational Area for this EP is defined as the area within a 500 m PSZ around the facilities listed in Appendix A, and a 200m operational zone along the secondary lines connecting the facilities and the petroleum pipelines in Commonwealth waters (>3 NM from shore), as defined in the "Bass Strait Pipeline Network Safety Case" (BSPNSC).

Potentially Exposed Area (PEA) - the outer edge of all simulations in stochastic modelling, using all worst case discharge scenarios (WCDSs) and the lowest relevant thresholds per Table 7-2, for the furthest reaching fate of hydrocarbons. While modelling carries some inherent uncertainty, the PEA as defined:

- Represents the area that could be affected by any oil spill; and
- Is conservative, as the lowest threshold relevant to any receptor is used.

Figure 5-1 shows the PEA for Bass Strait Operations, stochastic modelling of instantaneous contact at lowest hydrocarbon thresholds (10 ppb instantaneous entrained).

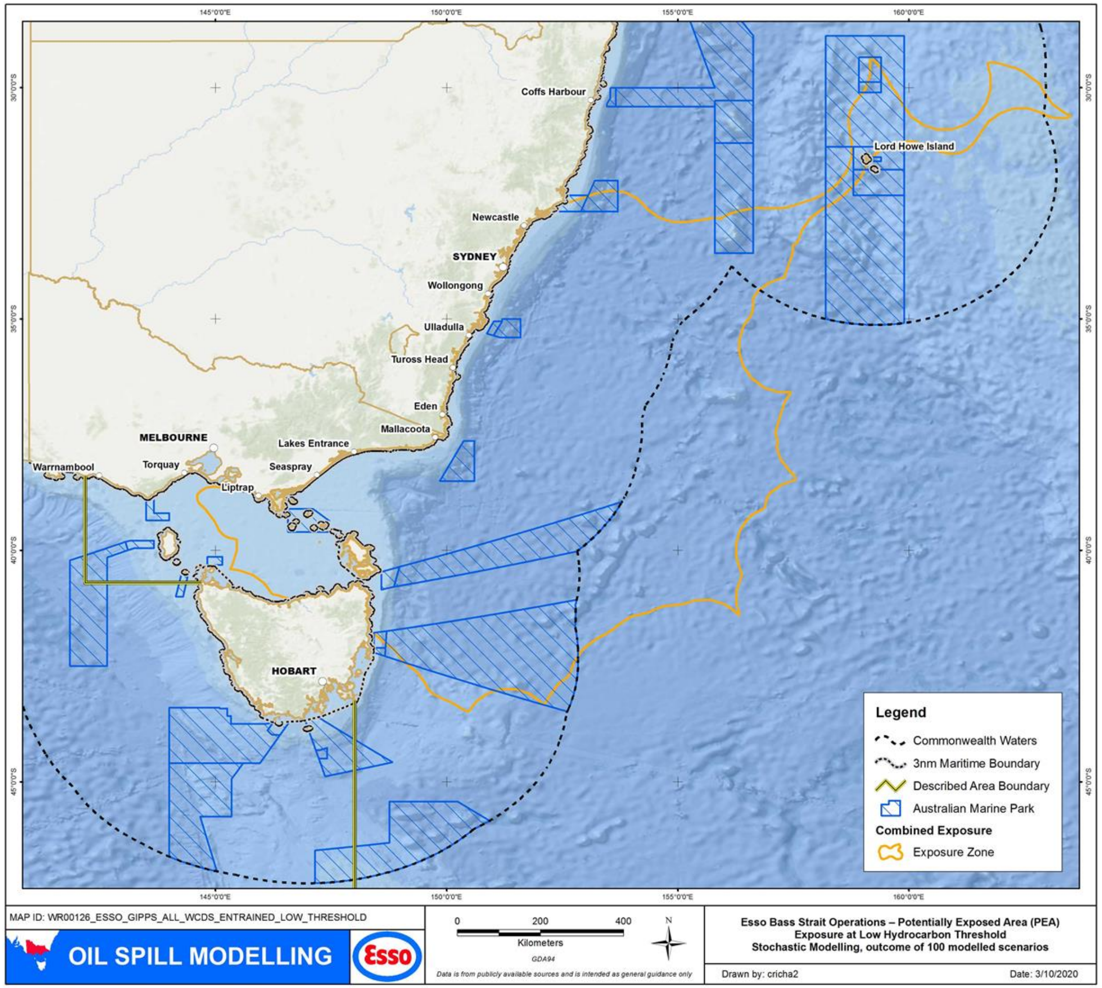


Figure 5-1 **Potentially Exposed Area – Worst Case Discharge Modelling. Stochastic modelling (combined outcome of 100 modelled scenarios) showing instantaneous contact at lowest hydrocarbon thresholds (10ppb instantaneous entrained).**

5.2 Receptors within the Operational and Potentially Exposed Areas

In order to set the environmental context required to assess impacts and risks associated with the Esso Bass Strait Operations, receptors found within both the Operational Area and PEA need to be described. Volume 1 of this Environment Plan includes a detailed description of the existing environment within the Described Area, which encompasses the Operational Area and the PEA. Presence / absence of receptors within the Operational Area and PEA are summarised in Table 5-1, with detailed descriptions of receptors found in Volume 1 of the EP. Figure 5-2 shows the facilities in Bass Strait with their proximity to marine protected areas.

Values and sensitivities associated with each of the receptors have been included in the tables. These values and sensitivities have been identified based on:

- Presence of listed threatened or migratory species or threatened ecological communities identified in the EPBC Protected Matter searches.
- Presence of BIAs and habitats critical to the survival of the species.
- Presence of important behaviours (e.g. foraging, roosting or breeding) by fauna, including those identified in the EPBC Protected Matter searches.
- The link they provide to other receptors (e.g. nursery habitat, food source, commercial species).
- The human benefit they provide (e.g. recreation and tourism, aesthetics, economic benefit).

The EPBC Protected Matters Search Tool results are presented in Appendix C.

Additional description of the environment in the Operational Area is provided in Section 5.2.1.1 below.

Table 5-1 Summary of the Values and Sensitivities in the existing environment within the Operational Area and PEA related to the EP

Receptor Group	Receptor	Receptor Description	Values and Sensitivities		Operational Area		Potentially Exposed Area (PEA)
Regional							
Regional Context	Commonwealth Marine Region	Seawaters of the Marine bioregion	• South-west Marine Region • Temperate East Marine Region	✓	**Present** The Operational Area lies entirely within the South-west Marine Region.	✓	**Present** The PEA lies within the South-west Marine Region and the Temperate East Marine Region.
Ecological Environment							
Marine Fauna	Fish	Fish (bony)	• Commercial and recreational species	✓	**Present** Commercial and recreational fish species occur within the Operational Area. Commercial fishing effort occurs in Commonwealth waters along the continental shelf and the upper continental slope. Most recreational fishing occurs in nearshore coastal waters & within bay and estuaries.	✓	**Present** The main commercial Commonwealth fisheries in the PEA are the Southern and Eastern Scalefish and Shark Fishery. Primary target species include Blue grenadier, Tiger flathead, Silver warehou, Gummy shark, Pink ling. Moderate to high recreational use along the majority of the coast. Common recreational fish species include Tiger flathead, bream, snapper, Australian Salmon, and lobster. Offshore catches can include mackerel, tuna, groper and shark.
			• Listed Marine Species • BIA	✓	**Present** 26 listed marine species (or species habitat) of fish may be found in the Operational Area. No important behaviours or BIAs have been identified.	✓	**Present** Pipefishes, seahorses and seadragons are associated with vegetation in sheltered to moderately exposed reef areas at a range of depths from 0 to 50m, depending on the species, but usually at depths of between 5 and 25 m 55 syngnathid species (or species habitat) may occur within the PEA. No

Receptor Group	Receptor	Receptor Description	Values and Sensitivities	Operational Area		Potentially Exposed Area (PEA)	
							important behaviours or BIAs have been identified.
			• Threatened Species	-	**Not Present** One listed threatened species (or species habitat), the Australian Grayling, may occur within the Operational Area. The Australian Grayling typically inhibits estuarine waters and coastal seas and is therefore not expected to be present within the Operational Area.	✓	**Present** Two species listed as 'critically endangered', the Spotted handfish and the Red handfish, may occur within the PEA. Two other fish species potentially occurring within the PEA are listed as 'vulnerable' under the EPBC Act; the Australian grayling and the Black rock cod.
		Fish (cartilaginous)	• Threatened Species • Migratory Species • BIA	✓	**Present** Two listed threatened shark species (or species habitat) may occur within the Operational Area: • White shark (breeding known to occur within the area) • Whale shark Two additional listed migratory species (mako shark and porbeagle shark) may occur within the Operational Area. The Operational Area is within a distribution BIA for the great white shark.	✓	**Present** There are five shark and two ray species (or species habitat) that may occur within the PEA; this includes species classified as threatened and migratory. • Grey nurse shark • White shark • Mako shark • Porbeagle shark • Whale shark • Giant manta ray • Reef manta ray Only one species (great white shark) has an important behaviour (breeding) identified in the PEA. Habitat critical for the survival of the grey nurse shark have been identified within the PEA.

Receptor Group	Receptor	Receptor Description	Values and Sensitivities	Operational Area		Potentially Exposed Area (PEA)	
	Birds	Seabirds and Shorebirds - live or frequent the coast or ocean	• Listed Marine Species • Threatened Species • Migratory Species • BIA	✓	**Present** 31 seabird and shorebird species (or species habitat), including 24 listed threatened species, may occur within the Operational Area. The Operational Area intersects foraging BIAs for: Antipodean albatross, black-browed albatross, Buller's albatross, Campbell albatross, Indian yellow-nosed albatross, shy albatross, wandering albatross, white-capped albatross, common diving-petrel, white-faced storm-petrel, flesh-footed shearwater and short-tailed shearwaters. Anecdotally, short-tailed shearwaters are commonly seen on and around platforms. Other listed sea birds are not commonly observed.	✓	**Present** There are 114 seabird and shorebird species (or species habitat) that may occur within the PEA; this includes species classified as threatened and migratory. The type of presence varies between species, and includes important behaviours (e.g. foraging, roosting, breeding) for some species.
	Marine Mammals	Cetaceans	• Listed Marine Species • Threatened Species • Migratory species • BIA	✓	**Present** 27 cetacean species or species habitats, including 5 listed threatened (Sei, Blue, Fin, Southern Right and Humpback whales), may occur within the Operational Area. Sei whale and fin whale are listed within the EPBC PMST as having foraging, feeding or related behaviours likely to occur within the Operational Area. The Operational Area intersects a distribution and a migration BIA for the southern right whale, a foraging and distribution BIA for the pygmy blue whale and a migration BIA for the humpback whale. Esso's seaward platforms regularly observe migrating humpback whales with peak numbers seen in March and October. On	✓	**Present** 25 whale and 12 dolphin species (or species habitat) that may occur within the PEA; this includes species classified as threatened and migratory. The type of presence varies between species, and includes important behaviours (e.g. foraging, breeding) for some species.

Receptor Group	Receptor	Receptor Description	Values and Sensitivities	Operational Area		Potentially Exposed Area (PEA)	
					occasion they have delivered playful displays close to the platforms and have even been observed rubbing / scratching themselves on the platform legs. Southern right whales and blue pygmy whales are rarely observed. Dolphins have also been observed from Esso platforms.		
		Pinnipeds	• Listed Marine Species • Threatened Species	✓	**Present** 2 pinniped species or species habitats may occur within the Operational Area: New Zealand fur-seal, Australian fur-seal. Seals are plentiful around Esso platforms and are often observed resting on platform structures and swimming in the surrounding sea. Anecdotal observation indicates that Australian fur seals appear to be the most common.	✓	**Present** 3 pinniped species (or species habitat) may occur within the PEA: New Zealand fur-seal, Australian fur-seal, Australian sealion (threatened). The type of presence varies between species and includes important behaviours (e.g. breeding) for some species. Breeding is restricted to islands in the Bass Strait – six in Victorian waters and four in Tasmanian waters.
			• BIA	-	**Not present**	-	**Not present**
		Sirenia	• Listed Marine Species • Migratory Species • BIA	-	**Not present** Dugongs primarily occur in coastal and inland waters and are not likely to occur in the Operational Area. No BIAs occur in the Operational Area.	✓	**Present** Dugongs (or species habitat) may occur in the north-eastern region of the PEA. No BIAs occur in the PEA.
	Marine Reptiles	Turtles	• Listed Marine Species • Threatened Species • Migratory Species	✓	**Present** 3 listed threatened marine reptiles have species (or species habitat) which may occur within the Operational Area: • Loggerhead turtle • Green turtle	✓	**Present** 5 marine turtle species (or species habitat) may occur within the PEA: • Loggerhead turtle • Green turtle

Receptor Group	Receptor	Receptor Description	Values and Sensitivities	Operational Area		Potentially Exposed Area (PEA)	
			• BIA or critical habitat		• Leatherback turtle. No BIAs or habitat critical to the survival of these species occur within the Operational Area. There have been no reports of turtle sightings near Esso's platforms throughout the history of operation.		• Leatherback turtle • Hawksbill turtle • Flatback turtle No BIAs or habitat critical to the survival of these species occur within the PEA.
		Snakes	• Listed Marine Species	-	**Not Present** Seasnakes are not expected to be found within the Operational Area and have not been listed within the EPBC PMST search results.	✓	**Present** 2 species of seasnakes (or species habitat) may occur within the PEA: Elegant Seasnake Yellow-bellied sea snake No BIAs occur within the PEA.
Plankton	Phytoplankton and zooplankton		• Food Source (e.g. fish, whales, turtles)	✓	**Present** Phytoplankton and zooplankton are widespread throughout oceanic environments and are expected to occur in the Operational Area.	✓	**Present** Phytoplankton and zooplankton are widespread throughout oceanic environments; however increased abundance and productivity can occur in areas of upwelling e.g. Upwelling East of Eden KEF (refer to KEFs below).
Benthic Habitat	Bare Substrate	Predominantly unvegetated soft sediment substrates	• Key habitat (e.g. benthic invertebrates)	✓	**Present** The Operational Area is located on the flat outer shelf plain of the Twofold Shelf and overlaps an area of inshore soft sediment habitat. The benthic habitat within the Operational Area is expected to include predominantly lightly muddy, gravelly sand substrate. Benthic infauna such as crustaceans and polychaete worms also occur.	✓	**Present** Unvegetated soft sediments are a widespread habitat in both intertidal and subtidal areas, particularly in areas beyond the photic zone. The Gippsland Basin is composed of a series of large sediment flats, interspersed with small patches of reef, bedrock and consolidated sediment.

Receptor Group	Receptor	Receptor Description	Values and Sensitivities	Operational Area		Potentially Exposed Area (PEA)	
					Where hard substrate or points of attachment (facilities) are present, colonisation by epifauna occurs mostly in the form of sessile, invertebrate, filter feeders. The degree of colonisation varies between platforms however sponge beds have only been detected at BMB.		
	Seagrass	Seagrass meadows in intertidal and shallow subtidal waters	• Nursery habitat (e.g. crustaceans, fish) • Food source (e.g. fish, turtles) • Trap and stabilise sediments	-	**Not present** The Operational Area does not include intertidal and shallow subtidal waters	✓	**Present** Areas of seagrass can be found within the PEA include Corner Inlet and Lakes Entrance in Victoria, and numerous inlets and estuaries along the NSW coast.
	Subtidal Rocky Reefs	Extensions of intertidal rocky shores or isolated offshore rocky reefs – substrate composed of rock, boulders, cobbles and patches of sand veneer	• Provides habitat for a wide range of flora and fauna	✓	**Present** South-east Reef, an isolated offshore rocky reef, is mapped to exist in the VIC/L5 area, including beneath the CBA platform, however the reef has not been detected in any of the survey work conducted for the Gippsland activities. The Operational Area does not include intertidal waters.	✓	**Present** Subtidal rocky reefs occur either as extensions of intertidal rocky shores or as isolated offshore reefs and are always submerged. Scattered along the Gippsland shore, including; Bastion Point, Quarry Beach, Little Rame Head, Long Reef, Wingan Point, The Skerries Special Management Area, Rame Head, Petrel Point, Thurra River, Point Hicks Marine National Park, Pearl Point, Yeerung River Estuary (Intermittently open), Cape Conran (East Cape, Cowrie Bay, Flat Rocks), Beware Reef, Point Ricardo, Ricardo Beach, New Zealand Star Bank.

Receptor Group	Receptor	Receptor Description	Values and Sensitivities	Operational Area		Potentially Exposed Area (PEA)	
							An example of an isolated offshore reef is the South-east Reef, thought to be located in the vicinity of VIC/L5.
	Macroalgae	Rocky substrates within nearshore intertidal and shallow subtidal zones	• Nursery habitat (e.g. crustaceans, fish) • Food source (e.g. birds, fish)	-	**Not present** The Operational Area does not include nearshore intertidal and tidal zones where macroalgal communities may be present.	✓	**May Occur** Macroalgae are not a common dominant habitat within the PEA, however known areas include around Gabo Island and within the Bemm River estuary. The 'Giant Kelp Marine Forests of South East Australia' is listed as an endangered TEC under the EPBC Act and may occur within the PEA. The ecological community is characterised by a closed to semi-closed surface or subsurface canopy of *Macrocystis pyrifera*. This ecological community occurs on rocky substrate; some patches may occur in Victoria or northern Tasmania
	Coral	Hard coral communities generally <50m of water and soft coral at most depths (throughout the continental shelf, slope and offslope regions)	• Nursery habitat (e.g. crustaceans, fish) • Breeding habitat (e.g. fish)	✓	**May Occur** The Operational Area includes deeper waters throughout the continental shelf, slope and off-slope regions where soft corals may occur. Soft corals (e.g. sea fans, sea whips) typically occur as part of mixed reef environments in waters along the coast and are only expected to be near platforms closest to the shoreline.	✓	**Present** Soft corals can be found at most depths throughout the continental shelf, slope and off the slope regions, to well below the limit of light penetration. Soft corals (e.g. sea fans, sea whips) occur as part of mixed reef environments in waters along the coast.
	Submarine Canyons	Abundant features along continental and oceanic island margins connecting continental shelves to deep ocean basins – variety of environmental	• High productivity • Aggregations of marine life	-	**Not present** The Operational Area does not include water depths associated with submarine canyons. Closest is Bass Canyon System closest to BKA facility, within approximately 50 km.	✓	**Present** Submarine canyons are abundant features along continental and oceanic island margins that connect continental shelves to deep ocean basins.

Receptor Group	Receptor	Receptor Description	Values and Sensitivities	Operational Area		Potentially Exposed Area (PEA)	
		and physical characteristics					The Bass Canyon System is located within the PEA. Refer to Bass Canyon System KEF below
	Seamounts	Key ecological feature – comprised hard and/or soft substrate	• Area of high productivity and aggregations of marine life	-	**Not present** Seamounts do not occur within the Operational Area. Closest are the Seamounts off the South and East of Tasmania over 400kms away	✓	**Present** Seamounts of South and East Tasmania occur in the PEA.
Coastal Habitat	Shoreline (Sandy)	Beaches dominated by sand-sized (0.063–2 mm) particles	• Foraging habitat (e.g. birds) • Nesting or Breeding habitat (e.g. birds, pinnipeds, turtles) • Haul-out sites (e.g. pinnipeds)	-	**Not present** The Operational Area does not include coastal or nearshore environments.	✓	**Present** Sandy shorelines are the most common shoreline type along the entire Victorian coast, including popular locations such as Ninety Mile Beach (East Gippsland, Victoria) and Squeaky Beach (Wilsons Promontory, Victoria).
	Shoreline (Rocky)	Hard and soft rocky shores, including bedrock outcrops, platforms, low cliffs (less than five metres in height), and scarps	• Foraging habitat (e.g. birds) • Nesting or Breeding habitat (e.g. birds, pinnipeds, turtles) • Haul-out sites (e.g. pinnipeds)	-	**Not present** The Operational Area does not include coastal or nearshore environments.	✓	**Present** Sheltered intertidal flats occur at Corner Inlet and Nooramunga Marine and Coastal Parks. Bare sediment occurs at Mallacoota Inlet, Wingan Inlet, Sydenham Inlet - Bemm River and Mud Lake
	Shoreline (Cliff)	Steep (>300) slope, and narrow width within the intertidal zone	• Habitat for sessile invertebrates	-	**Not present** The Operational Area does not include the coastal or nearshore environment	✓	**Present** Occurs behind Betka Beach and Secret Beach through to Little Rame Head, Sandpatch Point, Wingan Point, The Skerries, Rame Head, Petrel Point, Point

Receptor Group	Receptor	Receptor Description	Values and Sensitivities	Operational Area		Potentially Exposed Area (PEA)	
			• Foraging habitat (e.g. birds)				Hicks, Clinton Rocks, Tamboon Inlet, Pearl Point, Cape Conran (Needle Rocks, Irvine Rocks, Quincy Rocks Salmon Rocks), and at Ricardo Point
	Muddy – Sheltered Intertidal Flats and Bare Sediment	Predominantly mud-sized (<0.063 mm) particles with mixed sediments (e.g. sands, shell or gravel) – associated with mangrove & saltmarsh environments	• Habitat for sessile invertebrates • Foraging habitat (e.g. birds) • Nursery habitat (e.g. crustaceans, fish) • Highly productive	-	**Not present** The Operational Area does not include the coastal or nearshore environment	✓	**Present** Occur at Corner Inlet and Nooramunga Marine and Coastal Parks. Bare sediment occurs at Mallacoota Inlet, Wingan Inlet, Sydenham Inlet - Bemm River and Mud Lake
	Saltmarsh	Upper-intertidal zone comprised of dense stands of halophytic plants such as herbs, grasses and low shrubs	• Nursery habitat (e.g. crustaceans, fish) • Breeding habitat (e.g. fish)	-	**Not present** The Operational Area does not include coastal or nearshore environments. Closest point where Giant Kelps (may occur Volume 1, Section 2.2.4.1) are at Cape Conran, ~40 kms from KPA. Subtropical and Temperate Coastal Saltmarsh (Volume 1, Section 2.2.4.3) occur along the coastline, closest facilities are SHA at ~15kms to shoreline and SNA at ~34kms to Lakes Entrance.	✓	**Present** Saltmarshes occur along the coast throughout the Planning Area although is most extensive behind the sand dunes of Ninety Mile Beach in Gippsland. 'Subtropical and Temperate Coastal Saltmarsh' is listed as a vulnerable Threatened Ecological Community (TEC) and its known distribution includes the southern and eastern coasts of Australia
	Coastal Vine Thicket	Littoral Rainforest and coastal vine thickets	• Provides habitat for flora and fauna • Coastal buffer against erosion	-	**Not present** The Operational Area does not include coastal or nearshore environments.	✓	**Present** 'Littoral Rainforest and Coastal Vine Thickets of Eastern Australia' is listed as a critically endangered TEC.

Receptor Group	Receptor	Receptor Description	Values and Sensitivities	Operational Area		Potentially Exposed Area (PEA)	
					Littoral Rainforest (Volume 1, Section 2.2.4.2) occur along the coastline, closest facilities are SHA at ~15kms to shoreline and SNA at ~34kms to Lakes Entrance.		
	Wetlands	Wetlands of International Importance	• Wetlands of international importance	-	**Not present** The Operational Area does not include coastal or nearshore environments. Closest is Gippsland Lakes RAMSAR site (Volume 1 Section 2.2.3.1), approximately 34 kms to the SNA facility.	✓	**Present** Two RAMSAR wetlands are located in the nearshore area directly adjacent to the Operational Area, and several others are located within the PEA. These include: • Gippsland Lakes Ramsar Site • Corner Inlet Ramsar Site • Logan Lagoon Ramsar Site • East Coast Cape Barren Island Lagoons Ramsar Site • Floor Plain Lower Ringarooma • Moulting Lagoon Ramsar Site • Apsley Marshes Ramsar Site • Western Port Ramsar Site • Little Waterhouse Lake Ramsar Site • Lavinia Ramsar Site • Myall Lakes Ramsar Site • Hunter Estuary Wetlands Ramsar Site • Towra Point Nature Reserve Ramsar Site
Economic Environment							
Fishing		Commonwealth-managed	Economic benefit	✓	**Present**	✓	**Present**

Receptor Group	Receptor	Receptor Description	Values and Sensitivities	Operational Area		Potentially Exposed Area (PEA)	
	Commercial Fisheries				Six Commonwealth-managed fisheries have management areas that intersect the Operational Area of the pipelines (commercial fishing is not permitted within the platform petroleum safety zone which is equivalent to the area of the OA): • Bass Strait Central Zone Scallop • Eastern Tuna and Billfish Fishery • Small Pelagic Fishery • Southern and Easter Scalefish and Shark Fishery • Southern Bluefin Tuna Fishery, and • Southern Squid Jig Fishery		Six Commonwealth-managed fisheries have management areas that intersect with the PEA: • Bass Strait Central Zone Scallop • Eastern Tuna and Billfish Fishery • Small Pelagic Fishery • Southern and Easter Scalefish and Shark Fishery • Southern Bluefin Tuna Fishery, and • Southern Squid Jig Fishery
		State-managed	Economic benefit	✓	**Present** There are three Victorian state-managed fisheries with management areas which extend into Commonwealth waters. Given the water depth in the Operational Area, the only commercial fisheries which may be present within the Operational Area of the pipelines (commercial fishing is not permitted within the platform petroleum safety zone which is equivalent to the area of the OA) are: • Giant crab fishery • Rock lobster fishery • Octopus Fishery	✓	**Present** There are seven Victorian and eight New South Wales state-managed commercial fisheries with management areas that intersect with the PEA.
	Commercial Aquaculture	State-managed	Economic benefit	-	**Not present** There are no state-managed aquaculture sites within the Operational Area.	✓	**Present** The Sydney rock oyster commercial aquaculture occurs in 41 estuaries

Receptor Group	Receptor	Receptor Description	Values and Sensitivities	Operational Area		Potentially Exposed Area (PEA)	
							between Eden in the south to the Tweed River in the north.
Industry	Oil & Gas	Offshore oil and gas exploration and production activities	Economic benefit	-	**Not present** Esso facilities and activities are the only oil & gas activities undertaken within the Operational Area.	✓	**Present** Exploration and production activities are undertaken in the Otway and Gippsland Basins.
	Shipping	Commercial shipping	Economic benefit	✓	**Present** A shipping exclusion zone ('area to be avoided') exists around the operating oil and gas platforms in the Gippsland Basin, whereby unauthorised vessels larger than 200 gross tonnes are excluded from entry.	✓	**Present** The south-eastern coast is one of Australia's busiest in terms of shipping activity and volumes. Bass Strait is one of Australia's busiest shipping areas, with more than 3,000 vessels passing through Bass Strait each year. A shipping exclusion zone ('area to be avoided') exists around the operating oil and gas platforms in the Gippsland Basin, whereby unauthorised vessels larger than 200 gross tonnes are excluded from entry. Two traffic separation schemes have been implemented to enhance safety of navigation around the 'Area to be Avoided' by separating shipping into one-direction lanes for vessels heading north eastwards and those heading south westwards. One separation area is located south of Wilson's Promontory, and the other south of the Kingfish B platform.
	Defence	Offshore defence activities	Training and research activities	-	**Not present** No defence activities occur within the Operational Area.	✓	**Present** The Australian Defence Force conducts a range of training, research activities, and

Receptor Group	Receptor	Receptor Description	Values and Sensitivities		Operational Area		Potentially Exposed Area (PEA)
							preparatory operations in Australian waters. Defence activities within the PEA include a defence base at Twofold Bay, and training within the East Australia Exercise Area. Mine fields are located south and east of Wilson's Promontory.
	Tourism	Offshore and nearshore tourism	Economic benefit	-	**Not present** No tourism activities are expected within the Operational Area.	✓	**Present** The Australian coast and marine waters provide a diverse range of recreation and tourism opportunities, including scuba diving, charter boat cruises, cruise shipping, whale and wildlife watching, sailing, snorkelling, surfing, and kayaking.
Cultural Environment							
Commonwealth Heritage	World Heritage	World Heritage listings	Cultural heritage	-	**Not Present** There are no World Heritage sites within the Operational Area. Closest is Darlington Probation Station, in Tasmania (Volume 1 Section 2.2.1.1), over 400km from the Operational Area.	✓	**Present** Three World Heritage listings are located within the PEA: • Darlington Probation Station • Port Arthur Historic Site • Lord Howe Island Group
	National and Commonwealth Heritage	Natural Heritage	Natural heritage	-	**Not Present** There are no natural listed places or sites within the Operational Area.	✓	**Present** The following natural heritage sites are within the PEA: • Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves

Receptor Group	Receptor	Receptor Description	Values and Sensitivities		Operational Area		Potentially Exposed Area (PEA)
					Closest is Port Arthur Historic Site, Tasmania (Volume 1 Section 2.2.1.2) over 500 km from the Operational Area.		• Royal National Park and Garawarra State Conservation Area Four sites are listed for natural heritage on the Commonwealth Heritage List within the PEA: • Point Wilson • Beecrofy Peninsula • Malabar Headland • Tasmania Seamounts Area
		Indigenous Heritage	Cultural heritage	-	**Not present** There are no indigenous listed places or sites within the Operational Area. Closest are located at Flinders Island (Volume 1, Section 2.5.1), ~120kms south west of WKF	✓	**Present** No indigenous places are listed on the National Heritage List or Commonwealth Heritage List within the PEA. Indigenous Protected Areas occur on and around Flinders Island in Tasmania. At the time of writing a Native Title Claimant Application was registered by the Gunai-Kurnai People for an area covering the Wilsons Promontory area.
		Historic Heritage	Historic heritage Shipwrecks	–	**Not present** There are no historic listed places or sites within the Operational Area. Historic shipwrecks between ~5-10kms of facilities (Volume 1, Section 2.2.4.1): Struan Sailing Vessel (BMA), Favourite Sailing Vessel (WTA), Talark (HLA) and Leven Lass (TNA)	✓	**Present** The following sites listed on the National Heritage List are within the PEA: • The Great Ocean Road and Scenic Environs • North Head • Bondi Beach • Kurnell Peninsula Headland

Receptor Group	Receptor	Receptor Description	Values and Sensitivities	Operational Area		Potentially Exposed Area (PEA)	
							• Kamay Botany Bay: botanical collection sites No historic places are listed on the Commonwealth Heritage List within the PEA. The National Shipwrecks Database records 969 shipwrecks within the PEA. The three World Heritage listings above are also listed on Australia's National Heritage List under the historic classification.
Conservation	Australian Marine Parks (AMPs)	Established in Commonwealth Waters	Australian Marine Parks	-	**Not present** There are no AMPs within the Operational Area. Closest is Beagle Marine Park (Volume 1 Section 2.2.6.2) to PCA facility, ~62kms. To the southeast, East Gippsland Marine Park is ~120km from nearest facility (BKA)	✓	**Present** The following AMPs are located within the PEA: • East Gippsland Marine Park • Beagle Marine Park • Flinders Marine Park • Freycinet Marine Park • Boags Marine Park • Apollo Marine Park • Zeehan Marine Park • Franklin Marine Park • Huon Marine Park • Lord Howe Marine Park • Central Eastern Marine Park • Hunter Marine Park • Jervis Marine Park

Receptor Group	Receptor	Receptor Description	Values and Sensitivities	Operational Area		Potentially Exposed Area (PEA)	
							• South Tasman Rise Marine Park
	Key Ecological Features (KEFs)	Elements of Commonwealth Marine environment of regional importance	KEFs	-	**Not Present** The Upwelling East of Eden overlaps the OA of the MLA/WTN/TNA/KPA and FLA facilities. The non-spatially defined KEF the Bass Cascade (Volume 1 Section 2.2.7.4) is likely to be strongest at the area close to the head of the Bass Canyon, i.e. near BKA, but could have lesser effect at the other facilities. The non-spatially defined KEF Shelf rocky reefs and hard substrates (South-East Marine Region) (Volume 1 Section 2.2.7.6) is known to exist within 50 m to 150–220 m water depth on the continental shelf, including Bass Strait hence may underlay or exist near facilities. The South East Reef, an isolated offshore rocky reef, is mapped to exist in the VIC/L5 area, including beneath CBA facility, however the reef has not been detected in any of the survey work conducted for the Gippsland activities. The non-spatially defined KEF the East Tasmania subtropical convergence zone (Volume 1 Section 2.2.7.3) is not likely to occur at any facilities within the OA.	✓	**Present** The following spatially defined KEFs are found in the PEA: • Big Horseshoe Canyon • Upwelling East of Eden • Seamounts south and east of Tasmania • West Tasmania Canyons • Tasmantid Seamount Chain • Lord Howe Seamount Chain • Tasman Front and eddy field • Shelf rocky reefs and hard substrates (Temperate East Marine Region) • Canyons on the eastern continental slope The following non-spatially defined KEFs are found in the PEA: • Bass Cascade • Shelf rocky reefs and hard substrates (South East Marine Region) • The following non-spatially defined KEF may be found in the PEA: • East Tasmania subtropical convergence zone
	National Parks and Reserves	Protected under state legislation	National Parks and Reserves	-	**Not present**	✓	**Present**

Receptor Group	Receptor	Receptor Description	Values and Sensitivities	Operational Area		Potentially Exposed Area (PEA)	
					There are no National Parks and Reserves within the Operational Area. Closest is Ninety Mile Beach MNP (Volume 1 Section 2.2.8.10) to DPA facility ~ 15kms. To the east, the closest is Point Hicks MNP (Volume 1 Section 2.2.8.6) to KPA facility ~67Km and ~42 km to Beware Reef Marine Sanctuary (Volume 1 Section 2.2.8.7)		National Parks and Reserves within the PEA are located in Victoria, Tasmania and NSW jurisdiction.
Social Environment							
Recreational Activities	Recreational Fisheries	State-managed	• Community • Recreation	✓	**Present** Recreational fishing may occur within the Operational Area. Most recreational fishing typically occurs in nearshore coastal waters (shore or inshore vessels) and within bays and estuaries. Recreational fishing activity is expected to be minimal in the Operational Area.	✓	**Present** Most recreational fishing typically occurs in nearshore coastal waters, and within bays and estuaries; offshore (>5 km) fishing only accounts for approximately 4% of recreational fishing activity in Australia. There is moderate to high recreational use along the whole coastline adjacent to the PEA.
	Recreational Boating and Leisure Activities	Various human activities and interaction	• Community • Recreation • Economic benefit	✓	**Present** Marine-based recreation and tourism is unlikely to occur within the Operational Area due to the distance from shore and lack of seabed features; however, presence is possible.	✓	**Present** Popular coastal destinations are located across the coastline of the DA

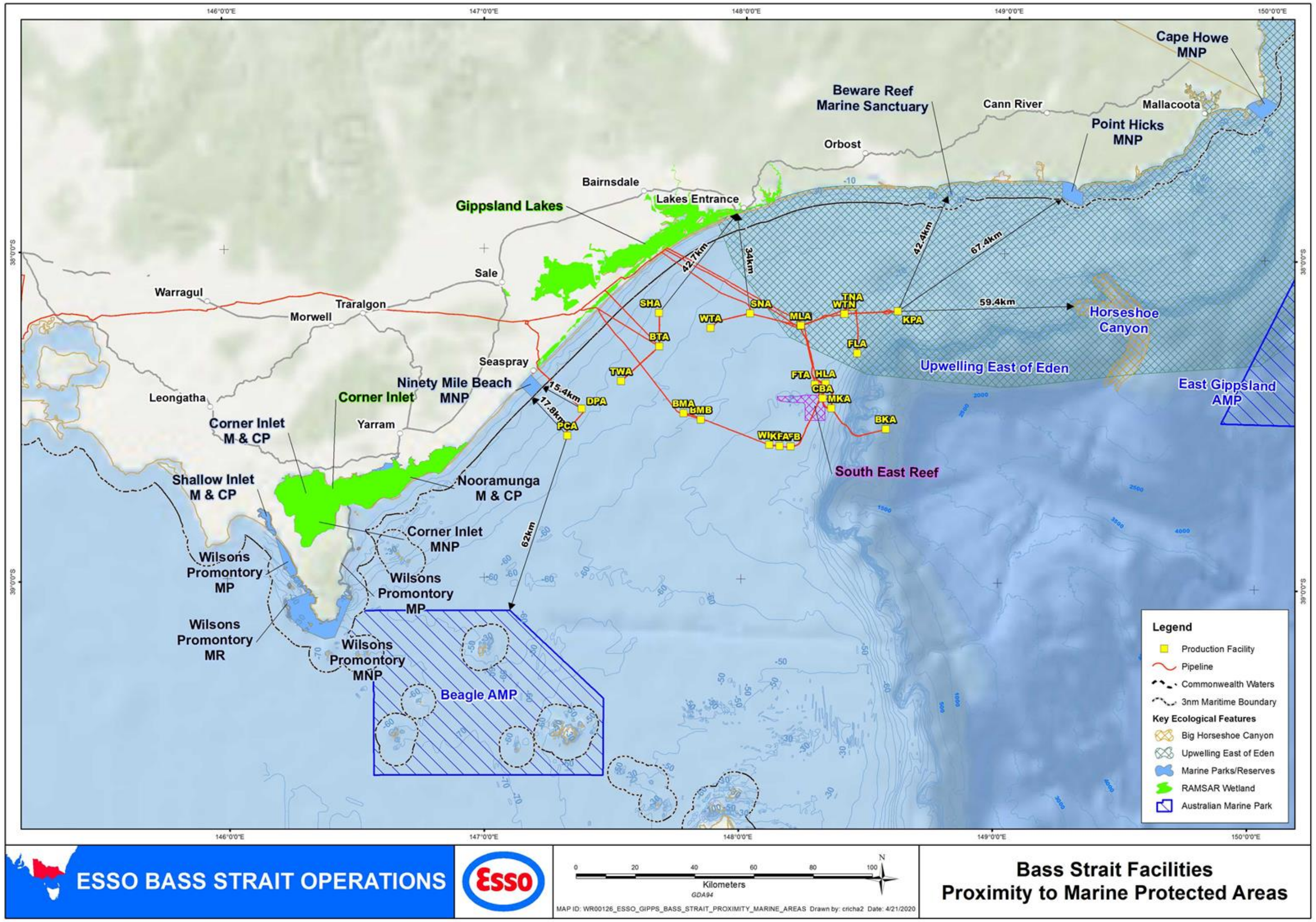


Figure 5-2 Bass Strait Facilities, proximity to Marine Protected Areas

5.2.1.1 Operational Area

EPBC Act Listed Species

As described in Section 2.3.1 the activity includes operation of 19 separate facilities. This section provides additional information of the environment around each facility. 13 EPBC searches were conducted to represent the OAs of the 19 facilities. These were chosen based on water depth and distance to one another. The results of the searches and corresponding EPBC search reports are provided in Appendix D. The results show that where variation in the protected species between facilities exists, it is primarily based on water depth.

For bony fish, all species identified occur consistently across all OAs except for the vulnerable Australian Grayling which only occur in the shallower waters <50 m depth. Of the cartilaginous fish, the vulnerable Great White shark has known breeding areas in shallower waters around the PCA/DPA/SHA/TWA/BTA and BTW areas and is known to occur out to the facilities in deeper waters >50 m depth.

8 species of vulnerable albatross and 2 endangered albatross species forage or feed up to water depths of approximately 60 m, and therefore are likely to be within the OAs of the facilities closer to shore mentioned above, as well as WTA/SNA/BMA/BMB/TNA/WTA and KPA. Following similar patterns as the albatross, the vulnerable Australian Fairy Tern is known to forage or feed up to water depths of approximately 60m. The vulnerable Hooded Plover is only found near coastal waters and thus may occur in the OA of SHA.

Six whale species occur uniformly across all the OAs including the Endangered Blue Whale and Southern Right Whale. Three other species including the vulnerable Sei Whale and Fin Whale are not known to occur in shallower waters and are only expected to occur at facilities in waters beyond approximately 50 m depth. In the Blackback OA (now plugged and abandoned) which is in approximately 400 m water depth (all other facilities are in waters of <100 m) , the likelihood of occurrence of whale species increases significantly with an additional 12 species of cetaceans listed as may occur in the OA.

The endangered Loggerhead Turtle and Leatherback Turtle are likely to occur uniformly across all facilities and the vulnerable Green Turtle is known to occur across all facility OAs.

Additional information on receptors within the OA is provided in Table 5-2.

Table 5-2 Receptors within the Operational Area by facility

Facility	Perch	Dolphin	West Barracouta	Barracouta	Tarwhine	Seahorse	Bream A	Bream B	West Kingfish	Kingfish A	Kingfish B	Halibut	Fortescue	Cobia	Mackerel	Blackback	Marlin Complex	West Tuna	Tuna	Kipper	Flounder	Snapper	Whiting	Moonfish
Receptor																								
Physical Environment																								
Climate & Meteorology	On an average scale no variation between facilities. Variation will always occur between facilities during any one time due to the large area spanned by the operations																							
Oceanography – Currents and tides	Generally - Shelf break – Bass Strait Water Cascade. Warmer, nutrient rich surface waters Offshore – cooler waters The factors influencing the currents and tides of the region are the same across all facilities (Volume 1 Section 2.1.2.1). Variation will always occur between facilities during any one time due to the large area spanned by the operations. Platform specific data, generated using sophisticated models that use hindcast current data and satellite measured tidal data, is used to predict oil spill modelling (Refer Volume 1, Appendix D). Similarly, PFW modelling has been conducted using platform specific conditions (Refer Volume 2, Section 5.3)																							
Oceanography – water temperature and density stratification	The factors influencing the water temperature and density stratification of the region are the same across all facilities (Volume 1 Section 2.1.2.2). Variation will always occur between facilities during any one time due to the large area spanned by the operations.																							
Oceanography – waves	The factors influencing the waves of the region are the same across all facilities (Volume 1 Section 2.1.2.3). Variation will always occur between facilities during any one time due to the large area spanned by the operations.																							
Bathymetry																								
Distance from coastline (km)	24	21	22	23	22	12	46	51	72	77	77	62-68	62-68	62-68	68	87	43	45	43	41	58	32	34	
Water depth (m)	42	38	46	46	43	42	59	61	76	77	78	73	69	78	93	402	59	61	59	95	93	55	54	
Values and Sensitivities																								
World Heritage	Outside of Operational Areas - closest Darlington Probation Station, Tasmania (Volume 1 Section 2.2.1.1)																							
National Heritage	Outside of Operational Areas - closest Port Arthur Historic Site, Tasmania (Volume 1 Section 2.2.1.2)																							
Wetlands	Outside of Operational Areas – closest Gippsland Lakes RAMSAR site (Volume 1 Section 2.2.3.1) to SNA facility																							
TECs	Outside of Operational Area – closest point where Giant Kelps (Volume 1, Section 2.2.4.1) may occur are at Cape Conran, ~40 kms from KPA. Littoral Rainforest (Volume 1, Section 2.2.4.2) and Subtropical and Temperate Coastal Saltmarsh (Volume 1, Section 2.2.4.3) occur along the coastline, closest facilities are SHA at ~15kms to shoreline and SNA at ~34kms to Lakes Entrance.																							
Commonwealth Marine Areas	All facilities within South-east Marine Region																							
Australian Marine Parks (AMPs)	None within Operational Areas – closest is Beagle Marine Park (Volume 1 Section 2.2.6.2) to PCA facility, ~50kms. To the east, East Gippsland Marine Park is ~120km from nearest facility (BKA)																							
KEFs																Bass Cascade	Upwelling East of Eden	Upwelling East of Eden	Upwelling East of Eden	Upwelling East of Eden	Upwelling East of Eden			
	Non spatially defined KEFs such as the East Tasmania Subtropical Convergence Zone (Volume 1 Section 2.2.7.3) not expected to overlap the facilities in the OA. The Bass Cascade (Volume 1 Section 2.2.7.4) may overlap these facilities, particularly BKA. Shelf Rocky Reef occurs across continental shelf in Bass Strait, South East Reef mapped existence in VIC/L5 area, including under CBA platform, however has not been observed through Gippsland activities. Closest facility to Horseshoe Canyon (Volume 1 Section 2.2.7.1) is KPA ~60kms																							
Marine National Parks	None within Operational Areas – Closest is Ninety Mile Beach MNP (Volume 1 Section 2.2.8.10) to DPA facility ~ 15kms. To the east the closest is Point Hicks MNP (Volume 1 Section 2.2.8.6) to KPA facility ~67Km and ~42 km to Beware Reef Marine Sanctuary (Volume 1 Section 2.2.8.7)																							
Ecological Environment																								
	Refer EPBC searches (Volume 2, Appendix D) 13 EPBC searches conducted representative of the locations of the facilities. Tables identify the similarities in listed species which may occur in the area. The differences identified to threatened species are highlighted below and can be attributed to proximity to shore and water depth.																							
Fauna – Fish (bony)	One threatened species only: V – Australian grayling., shown as 'may occur' in near shore facilities (PCA/BTA/SHA) however these are generally found in estuarine and fresh water environments and therefore not expected in OA when minimum distance to closest facility (SHA) is 12 kms																							
Fauna – Fish (cartilaginous)	V -Great White Shark – known to occur in continental shelf and coastal waters spanning all facilities. BIA (breeding) along coastline and overlaps facilities in shallower waters: PCA/DPA/BTA/SHA/TWA, distribution BIA at other facilities V – Whale shark – may occur in areas spanning all facilities																							
Fauna – Birds	Many of the Albatross are known to forage in shallower waters PCA/DPA/BTA/SHA/TWA/BMA/WTA/SNA/TNA. All Albatross are threatened species. The Northern Royal Albatross is endangered and the only one that has known foraging BIA around the facilities indicated here. The Chatham Albatross is also endangered and its BIA for foraging spans the SNA/WTA/TNA and KPA facilities The Australian Fairy Tern (V) is also known to forage in shallower waters with its BIA spanning the PCA/DPA/BTA/SHA/TWA/BMA/WTA/SNA/TNA/MLA and FLA facilities.																							
Fauna – MM (cetaceans)	5 species of whales occur across all the facilities and the Sei and Fin Whales in the deeper Waters only (i.e. not at PCA/DPA/BTA/SHA/TWA facilities), not listed for the PCA/DPA/BTA/SHA/TWA facilities. Foraging BIA for endangered Blue Whale, distribution BIA for endangered Southern Right Whale may span all facilities as identified in the SE Marine Region Bioregional plan.																							
Fauna – MM (pinnipeds)	The New Zealand Fur Seal and the Australian Fur Seal may occur in the OA of all facilities.																							
Fauna – MM (sirenians)	None listed as occurring in OAs																							
Fauna – MR (turtles)	Of the 3 turtles known to occur in the OAs, the Green Turtle (V) is known to occur in all OAs and the Loggerhead and Leatherback turtles(both E) are likely to occur in the OAs																							
Fauna – MM (snakes)	None listed as occurring in OAs																							

<table>
<tr><th>Facility</th><th>Perch</th><th>Dolphin</th><th>West Barracouta</th><th>Barracouta</th><th>Tarwhine</th><th>Seahorse</th><th>Bream A</th><th>Bream B</th><th>West Kingfish</th><th>Kingfish A</th><th>Kingfish B</th><th>Halibut</th><th>Fortescue</th><th>Cobia</th><th>Mackerel</th><th>Blackback</th><th>Marlin Complex</th><th>West Tuna</th><th>Tuna</th><th>Kipper</th><th>Flounder</th><th>Snapper</th><th>Whiting</th><th>Moonfish</th></tr>
<tr><td>Plankton</td><td colspan="23">Decrease in biomass with depth, but differences between platforms / facilities not expected to be significant.</td></tr>
<tr><td rowspan="2">Benthic Habitat – Bare Substrate</td><td colspan="23">Seabed predominantly muddy gravelly sand and featureless. No areas of rocky reef observed. Where hard substrate or points of attachment (facilities) are present, colonisation by epifauna occurs mostly in the form of sessile, invertebrate, filter feeders. The degree of colonisation varies between platforms however sponge beds have only been detected at BMB. Recent studies show that infaunal taxa are similar across the Bass Strait but the contribution of each to the assemblage varies.</td></tr>
<tr><td colspan="23">New Zealand screw shell (IMS) known to form beds up to 80 m isobaths – specific locations are not known, however were identified during the MLA survey (see below)
Presence not expected beyond the 80 m.</td></tr>
<tr><td>Benthic habitat – seagrass</td><td colspan="23">Not expected in OA. Occur in Intertidal and shallow waters. Closest known seagrasses occur at Lakes Entrance, ~34kms from SNA</td></tr>
<tr><td>Benthic habitat – Subtidal rocky reefs</td><td colspan="23">Scattered throughout the DA.
South-East Reef (Volume 1 Section 2.3.3.3) mapped presence within VIC/L05 and beneath CBA platform, though has not been observed during Gippsland activities</td></tr>
<tr><td>Benthic habitat – Macroalgae</td><td colspan="23">Nearshore. Closest known areas of macroalgae are in Bemm River (Volume 1 Section 2.2.3.4), approximately 45 kms from nearest facility (TNA)</td></tr>
<tr><td>Benthic habitat – Coral</td><td colspan="23">Presence possible in OA</td></tr>
<tr><td>Benthic habitat – Submarine canyons</td><td colspan="23">Canyon systems outside of OA – Closest is Bass Canyon System (Volume 1 Section 2.3.3.6) closest to BKA facility, within approximately 50 km. Big Horseshoe Canyon (KEF) (Volume 1 Section 2.2.7.1) to the east is ~75kms from KPA facility</td></tr>
<tr><td>Benthic habitat – seamounts</td><td colspan="23">None present within OA –Closest are the Seamounts off the South and East of Tasmania (Volume 1 Section 2.2.1.2) over 400kms away</td></tr>
<tr><td>Coastal Habitat</td><td colspan="23">All outside OA – closest facility is SHA ~12 km</td></tr>
<tr><td colspan="24">Economic Environment</td></tr>
<tr><td rowspan="3">Fishing – Commercial (commonwealth)</td><td colspan="23">Bass Strait Central Zone Scallop Fishery likely (<70 m deep)
Bass Strait Central Zone Scallop Fishery unlikely (>70 m deep)</td></tr>
<tr><td colspan="23">Small Pelagic Fishery – likely present throughout OA
Southern and Eastern Scalefish and Shark Fishery - likely present throughout OA
Danish-seine vessels and 21 scalefish hook vessels - likely present throughout OA
Wrasse Fishery - likely present throughout OA
Southern Bluefin Tuna - likely outside the OA
East Tuna and Billfish Fishery – likely outside OA</td></tr>
<tr><td colspan="23">Southern Squid Jig Fishery – 60-120 m – area includes OA however the intensity of fishing is low</td></tr>
<tr><td>Fishing – Commercial (state)</td><td colspan="23">n/a - Platforms in Commonwealth waters. For state fisheries which extend into Commonwealth waters (Rock Lobster, Giant Crab, Abalone (Volume 1, Section 2.4.1.10)), none are likely to intersect the OAs</td></tr>
<tr><td>Fishing – Commercial Aquaculture</td><td colspan="23">Coastal only. Not present within OA</td></tr>
<tr><td>Oil & Gas</td><td colspan="23">n/a</td></tr>
<tr><td>Shipping</td><td colspan="23">All platforms within ATBA except for PCA/DPA , KPA and BKA which have the 500m exclusion zone</td></tr>
<tr><td>Defence</td><td colspan="23">Defence activities could occur in any area in Bass Strait, not expected within the OAs</td></tr>
<tr><td>Tourism</td><td colspan="23">Not expected offshore / within OA</td></tr>
<tr><td colspan="24">Cultural Heritage</td></tr>
<tr><td>Indigenous</td><td colspan="23">None within DA – Closest are located at Flinders Island (Volume 1, Section 2.5.1), ~120 kms south west of WKF</td></tr>
<tr><td colspan="24">Natural Heritage</td></tr>
<tr><td>Commonwealth</td><td colspan="23">None within DA – Point Wilson in Western Port Bay (Volume 1, Section 2.5.2) is the closest natural heritage place to the operational area.</td></tr>
<tr><td>Maritime</td><td colspan="23">Historic shipwrecks between ~5-10 kms of facilities (Volume 1, Section 2.2.4.1): Struan Sailing Vessel (BMA), Favourite Sailing Vessel (WTA), Talark (HLA) and Leven Lass (TNA)</td></tr>
<tr><td colspan="24">Social Environment</td></tr>
<tr><td>Recreational Fishing</td><td colspan="23">Not expected within OA due to distance offshore</td></tr>
<tr><td>Recreational Boating and leisure</td><td colspan="23">Not expected within OA due to distance offshore</td></tr>
</table>

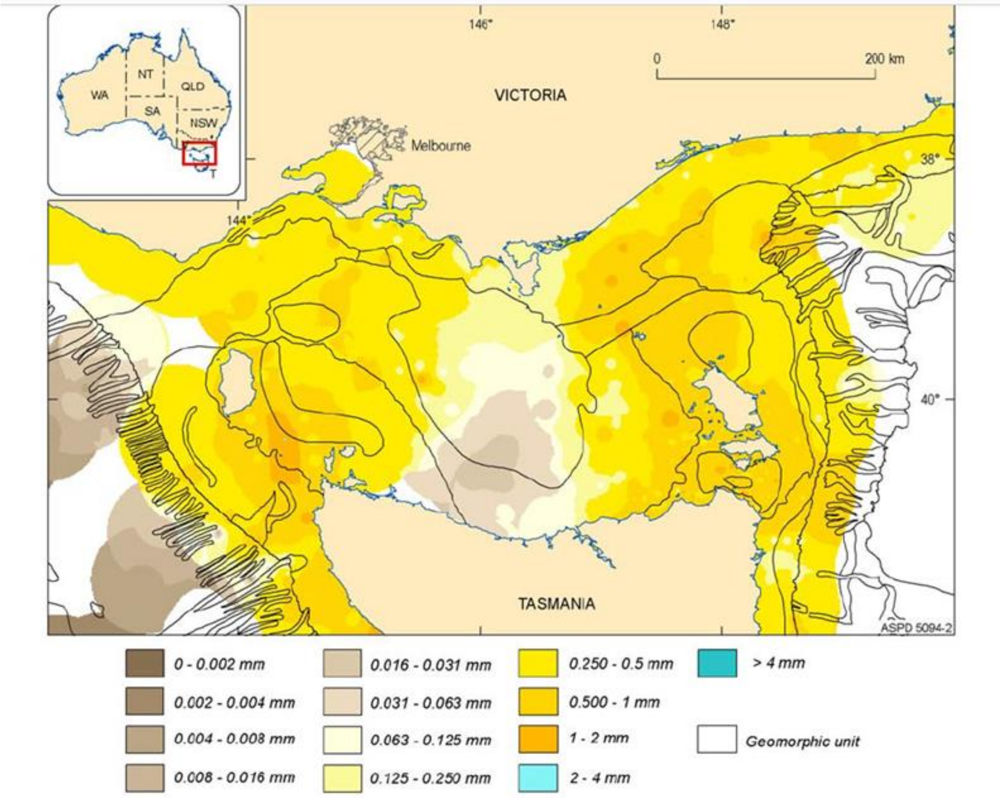
Table 5-3 Esso benthic survey data summary

Benthic survey data summary	**West Barracouta** (Marine Solutions, 2018)	**West Kingfish** (Cardno, 2018)	**Marlin Complex** ROV survey (Marine Solutions, 2015)	**Tuna** (Cardno, 2018**)**	**Snapper** (Coffey, 2010)
Infauna	Dominant taxa throughout the survey area included annelids (polychaetes), crustaceans (amphipoda, isopoda and decapoda) and molluscs (gastropods and bivalves;	Polychaetes, crustaceans and molluscs	No data	Polychaetes, crustaceans and molluscs	Small burrows and bioturbation mounds within the soft sediment, which have been created by benthic infauna such as crustaceans and polychaete worms.
Sediment size	Sediment at all sites were dominated by coarse size fractions, with all sites (with the exception of one site – SQ1) containing more than 50% of sediments over 1 mm.	Sand was the dominant sediment class at each platform slightly muddy, gravelly sand (WKF generally had higher proportion of sand than gravel)	Hard compact sand with shell grit, overlaid with fine sand ripples	Sand was the dominant sediment class at each platform lightly muddy (<0.06mm~2%), gravelly (>2mm~23%) sand (0.6mm – 2mm - ~75%)	The natural substrate was observed as unconsolidated, dark, fine to medium grained silt/sediment.
Features	A mosaic of bioturbated coarse sand, overlaid with patchy unconsolidated bivalve beds containing erect sponges, dead scallops with calcification, fragmented dead shells and a mixture of live and dead bivalves		Low-relief compacted soft sediments Hard natural substrate was absent from the surveyed area. Sponge growth was prolific on a number of pipelines laying on the seabed.		Given the lack of hard substrate, there was little to no colonisation of the seabed by benthic marine invertebrates such as bryzoans, ascidians and poriferans. Instead, there were a large number of small burrows and bioturbation mounds within the soft sediment, which have been created by benthic infauna such as crustaceans and polychaete worms.

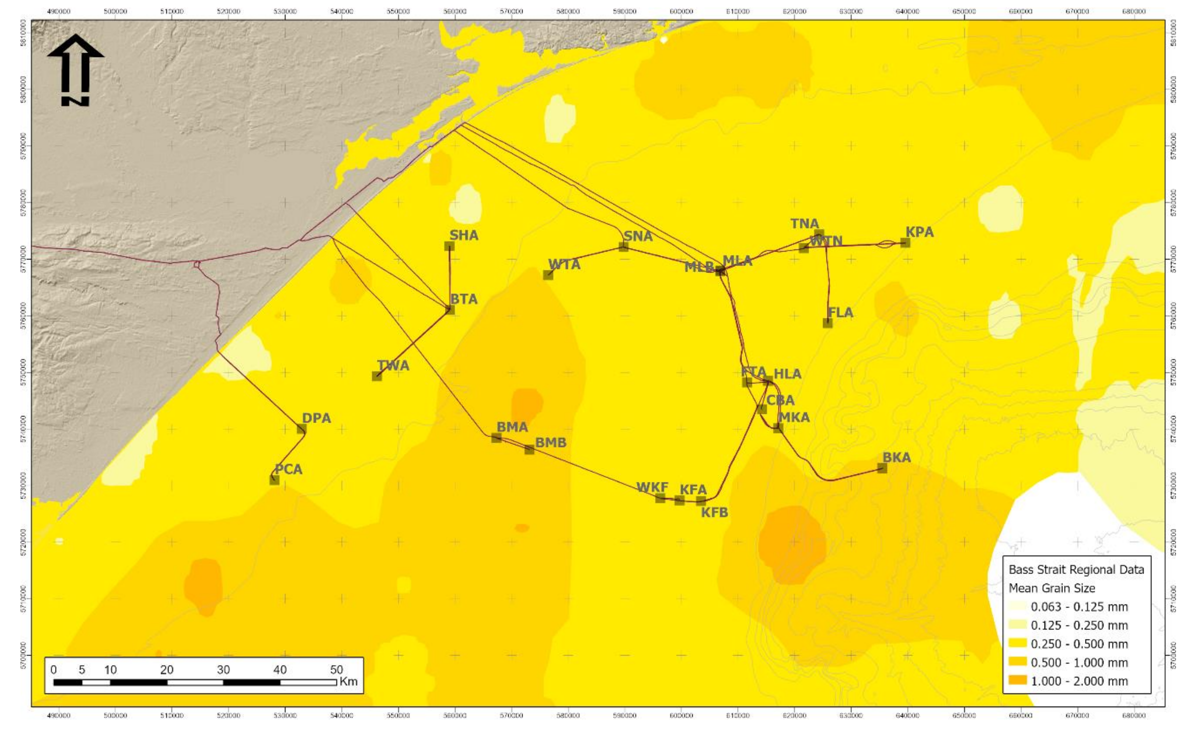
Benthic Habitat

Volume 1 provides a description of the benthic habitat of Bass Strait based on research that has been conducted and is supported by Esso specific surveys. The Esso surveys provide information on the environment around five facilities (BTW, WKF, MLA, TNA and SNA) and describe the type of sediment, infauna composition (not provided in MLA ROV survey where samples were not collected for analysis) and features. Figure 5-3 summarises the findings of the surveys.

Past studies that have mapped grain size provide a Bass Strait wide view (refer Figure 5-2) and show the area around the facilities to have a mean grain size of between 0.25 – 0.5 mm with the exception of the BMA and BMB facilities which have a mean grain size of 0.5-1 mm. These align with Esso survey findings which tell us that sand is the dominant sediment class at the platforms which were surveyed with low proportions of light mud (<0.06 mm, generally <5%), and generally about 25% of gravel (>2 mm~23%).



(a)



(b)

Figure 5-3 (a) Mean sediment grain size in Bass Strait; (b) Closer view showing regional sediment grain size overlaid with Esso Bass Strait platforms.

Grain size is one of the factors which is considered to contribute to presence/abundance of benthic fauna. Similarly, the presence of hard substrate can provide anchor points for benthic marine invertebrates such as bryozoans, ascidians and poriferans. The Shelf Rocky Reef, non-spatially defined KEF is known to occur in South East Marine Bioregion (Volume 1, Section 2.2.7.6) and known areas of reef in eastern Bass Strait are shown in Volume 1, Section 2.3, Figure 2-42. The South East Reef, mapped through the research conducted on habitat and fisheries productivity in the South East Fishery ecosystem (Bax & Williams, 2000) is shown in Figure 5-2 (based on the Bax & Williams mapping), placing it beneath CBA platform and extending to the south and west. The reef is described as a mostly flat bottomed, low relief reef, likely to have a sandstone/limestone composition which is predominantly sediment-covered (1-5 cm of sediment coverage) with occasional signs of exposed hard substrate (~40 cm in height). The exposed substrate provides attachment for intermittent patches of intermediate to dense covers of finger and cup sponges.

Changes to currents locally due to the presence of fixed structures may affect sediment grain size locally around the platform, for which certain benthic organisms prefer to habituate, and hence the proportion of different benthic organisms may differ near the platform.

The occurrence of sponges in Bass Strait is known, however the distribution of sessile faunal assemblages, including whether or not they occur in dense aggregations that would merit the term “sponge beds” are unknown. Between 1979 and 1983 Museum Victoria conducted surveys to assess the marine biodiversity of Bass Strait and reported large collections of sponges in southern central Bass Strait and other areas leading to sponge beds being identified as one of the unique marine areas for conservation (Butler et. al., 2002). Whereas some survey work occurred, further significant surveys for sponges have not occurred since the Museum Victoria work and further assessment was requested by the Commonwealth government in 2001 to determine the biodiversity values of sponge beds in Bass Strait. Desktop analysis conducted by CSIRO (Butler et. al., 2002) of available survey data determined that

- Collected sponges were unsorted and unidentified

- The survey was conducted over a number of widely separated sampling points.
- No surveys since the Museum Victoria surveys have ascertained the condition of these beds or whether these exist.
- In order to establish distribution of sponge beds across Bass Strait purpose designed surveys to establish spatial distribution would be required.
- The knowledge base around sponge bed species in South East Australia (octocorals, bryozoans and ascidians) is poor
- Bass Strait is the meeting of two provinces: Flindersian and Peronian, and therefore likely to result in high diversity of species
- There is no suggestion that the area is unique as there are areas like it throughout southern Australia.
- The complex structure of taxa forming the sponge beds result in an important habitat which influences the presence and or distribution of other seafloor fauna, including commercial fishing species.

The various studies conducted to understand the Bass Strait environment (benthic fauna and grain size discussed above (and summarised for Bass Strait in Volume 1, Section 2.3.3), bathymetry, oceanography, climate and meteorology (refer platform specific data used for PFW consequence evaluation, Oil Spill Modelling Sections 7.2.1.1 and summarised for Bass Strait in Volume 1, Section 2.1) provide specific data of the study areas. In some cases the characteristics can be described and applied broadly (e.g., climate and meteorology) however even then local factors can have a significant influence and thereby differ from broader description. This is demonstrated through a comparison of the theoretical stochastic spill modelling outputs of the WTA and BTW wells where similar oil types and volumes predicted significantly different size contours even though the facilities were in similar water depths and within 20km of one another (refer Esso, 2020). The differences were a result of the local variations in wind and current direction and speeds which predicted a significant variance in the distribution of the theoretically modelled spills.

Given the vast area covered by Bass Strait and in an effort to get a better understanding of the drivers influencing marine benthic fauna in Bass Strait, researchers have analysed the existing research data to see if any correlations can be drawn from the results which could provide an effective means of assessing biodiversity which can be extrapolated to other areas. The analyses looked at sediments and seafloor characterisation, fauna collected and the sampling/collection/identification techniques (Passlow *et.al*., 2006).

The analyses showed that Bass Strait supports particularly diverse benthic fauna and that overall, the similarity between samples is very low and a large degree of small scale variations exists. This is seen in the Esso survey results of WTN and TNA where there is variation in the rank order of major taxa on adjacent platforms (approximately 4 kms apart). This is seen more broadly across the Esso surveys where the overall groupings of phyla are similar but the class and order vary.

The analyses further suggest that the numerous environmental variables influence the composition of benthic assemblages and no one factor dominated the analysis. There was sufficient similarity between some samples to form recognisable clusters. But overall the primary clusters did not have a recognisable regional, water depth or sediment profile. The biotic pattern for Bass Strait is not strongly related to sediment composition as has been suggested. For benthic assemblages, the most significant correlation was seen with longitude. Overall it is not possible to classify the biological assemblages into a scheme that can be mapped across the area that was analysed (Passlow *et.al.,* 2006).

This data supports the need for specific, uniform and targeted analysis across all OAs to further describe the environment in the OAs. Previous studies such as the New Zealand Star Bank (GA Survey 233 in Passlow *et.al.,* 2006) have identified the importance of video camera visualisation in providing a coarse scale assessment of the environment and some quantification of abundance and diversity. Footage from Esso's log of inspections has been used to expand the knowledge of the environment in the OAs. Images have been tabularised and are shown in Appendix E.

The presence and abundance of biota appears to be linked to the presence of infrastructure. Sessile filter feeders largely require hard substrate as anchor/attachment points. Esso's facilities are providing this and biota can be seen growing on infrastructure across the facilities. The degree to which this is occurring varies. The abundance of biota appear to be greatest around platforms and decreasing with distance away from the platform or away from fixed structures such as pipelines or debris. DPA, TWA, SHA, SNA , FTA and HLA (Appendix E, Fig A, Fig B and Fig E) clearly show presence of sessile invertebrates on platforms structures and subsea infrastructure like risers, wellheads with comparatively low numbers of stands on the adjacent seabed.

- Other clear examples which link abundance of biota to the presence of infrastructure are the pipelines where the presence of sessile benthic invertebrates are seen attached to pipelines on what appear to be an otherwise bare seabed. Example of this are seen at MLA (MLA 150 pipeline to WKF, Appendix E Fig E &G), CBA (CBA 300 oil pipeline, Appendix e, Fig E) and the BKA 200 Oil pipeline (Appendix E, Fig D). This does not exclude the presence of benthic infauna which cannot be seen on video images. In some images bioturbation is more evident supporting the presence of infauna (FTA, Appendix E Fig E). This is supported by the Esso surveys which identify the presence of infauna in all places where samples were taken (Refer Table 5-3).

These images are recognised as being indicative of the environment that is directly in view and it is known that other areas which are not depicted may vary. The images also are only representative of the area at the time they were taken, therefore, potential changes due to seasonality, natural variation or other factors will not be represented. Even so, this consistent trend is seen across the facilities in Bass Strait where the presence of biota is around infrastructure and whilst communities are being formed, they would not typically be described as occurring in significant numbers nor be described as sponge beds.

An exception to this trend is evident at BMB platform (Appendix E, Fig I) and to a far lesser extent at BMA platform (Appendix E, Fig H). Platform inspections of BMA and BMB conducted in 2017-18 included seabed ROV survey transects beginning from each side of the platform and radiating out to 50 m (Diveworks, 2017-42). The trend of decreasing abundance from the platform to the 50 m radius is clearly evident at BMB and transects in all directions (north, south east and west). The difference from the other Esso Bass Strait facilities is in the abundance of the marine biota in this area. Significant assemblages forming what would be likely considered as sponge beds are seen up to 9 and 15 metres from the platform. There are also various species of large and small fish present in the images. From 20 m out to 40 m the abundance visibly decreases to patchy areas and individual stands. BMB is an example of complex sponge beds which, through their provision of shelter and/or food, have influenced the distribution of other mobile fauna and are likely hosting associated species such as small crustaceans, molluscs and worms as was found by O'Hara (2002). The only known variation in this area versus the other facilities is that the mean sediment grain size is larger than in other areas and may be contributing to the differences. The neighbouring BMA platform shows similarities but to a far lesser extent. This may lend support to the theory that grain size may be correlated to abundance. If we consider the finding by Passlow et al., (2006) that the most significant correlation with assemblages was seen with longitude and compare the images at WTA platform to the north of BMB (Appendix E, Fig B), we see a similarities in seabed type to BMA, with uniform spread of marine invertebrates on the seabed, however the abundance is not evident given the limited footage available from WTA.

The images around CBA are consistent with the trends seen at other platforms. The mapped presence of South East Reef in the area including beneath the platform does not appear to coincide with increased abundance of biota in the area. This may be due to the layer of sediment coverage over the hard substrate or the lack of extrusions/elevations, either naturally or due to seafloor disturbance such as through overfishing. Observations are consistent with fishing data of the area which note that large catches were taken from South East Reef in the 1970's through to the 1990's however no commercial catches were taken in late 1990's despite continued efforts (Bax & Williams, 2000). Bax & Williams speculate through discussion with the fisheries that the plausible reasons for the change include habitat modification due to stock overfishing and seismic testing.

The area to the south west of BTA, surveyed in 2018, was primarily a mosaic of bioturbated coarse sand, overlaid with patchy unconsolidated bivalve beds containing erect sponge stands, dead scallops with calcification, fragmented dead shells and a mixture of live and dead bivalves (Marine Solutions, 2018) (Appendix E, Fig A). This extent of calcified beds was only seen at this location however similar habitat, in much lesser abundance may also occur at WTA, MLA, WTN and TNA (Appendix E, Figs B and C).

5.3 Recovery Plans, Threat Abatement Plans and Species Conservation Advice Relevant to the Operational Area

The Description of the Environment (Volume 1) describes the key threats and management actions relevant to species which may occur within the Described Area. Based on the EPBC PMST searches and the summary provided in Section 5.2, the conservation advice and recovery plans relevant to species or species habitats which may occur within the Operational Area include:

Fish:

- Recovery Plan for the White Shark (Carcharodon carcharias)

Birds:

- National Recovery Plan for Threatened Albatrosses and Giant Petrels, 2011-2016
- Approved Conservation Advice for Thalassarche chrysostoma (Grey-headed Albatross)
- Approved Conservation Advice for Halobaena caerulea (Blue Petrel)
- Gould’s Petrel (Pterodroma leucoptera leucoptera) Recovery Plan
- Approved Conservation Advice for Calidris canutus (Red Knot)
- Wildlife conservation plan for migratory shorebirds
- Approved Conservation Advice for Numenius madagascariensis (Eastern Curlew)
- Approved Conservation Advice for Pachyptila turtur subantartica (Fairy Prion Southern)

Marine mammals:

- Approved Conservation Advice for Balaenoptera borealis (Sei Whale)
- Conservation Management Plan for the Blue Whale, 2015-2025
- Approved Conservation Advice for Balaenoptera physalus (Fin Whale)
- Conservation Management Plan for the Southern Right Whale, 2011-2021
- Approved Conservation Advice for Megaptera novaeangliae (Humpback Whale)

Marine reptiles:

- Recovery Plan for Marine Turtles in Australia, 2017-2027
- Approved Conservation Advice for Dermochelys coriacea (Leatherback Turtle)
- In addition, the following Threat Abatement Plans have been considered:
- Threat abatement plan for the impacts of marine debris on the vertebrate wildlife of Australia’s coasts and oceans (2018).
- These plans and management actions have been considered in the definition of acceptable levels of impacts described in Section 4.8.

6 Environmental Impact Assessment

6.1 Overview

The purpose of the environmental impact assessment is to ensure that all impacts associated with the petroleum activity are identified and evaluated, and the resulting impacts are demonstrated to be ALARP and Acceptable according to the Esso impact and risk assessment methodology (Section 0).

The assessment of impacts has been undertaken in two stages:

- Impact Scoping (Section 6.2)
- Detailed Evaluation (Section 6.3)

6.2 Impact Scoping

Scoping of the impacts relevant to the activity ensures that a systematic assessment can be undertaken. The context of the impact assessment has been set through the description of the activity (Section 2.4) and identification of potential environmental receptors within the Operational Area and the PEA (Section 2.4.4.3). By considering the relationship between environmental aspects and the activity (Table 4-2), Esso has identified all impacts to receptors which could potentially occur as a result of the petroleum activity.

The assessment of planned impacts has considered direct, indirect and cumulative impacts, as defined in Section 4.2.

A series of workshops were held to identify environmental impacts and risks associated with the petroleum activity and assess controls to ensure impacts and risks are managed to ALARP and an acceptable level. The workshops were attended by environment and asset personnel. Impacts and risks were evaluated using the impact assessment methodology (Section 0) to determine consequence to receptors and ALARP decision context, and for risks to determine likelihood and residual level of risk. Control measures were identified, and an assessment of acceptability was undertaken against the Esso Acceptability Criteria and the defined acceptable levels of environmental performance (Table 4-2).

For most impacts identified, the workshop was able to determine that the adopted controls lowered impacts to ALARP and to an acceptable level. These impacts, and the outcomes of the assessment, are described in Table 6-1, Table 6-2, Table 6-3 and Table 6-4

In some cases, it was not possible to finalise the impact evaluation during the workshops. This was typically due to the need for either modelling outcomes or an in-depth literature review to support the evaluation and assessment of potential impacts to receptors. In these cases, a detailed evaluation has been provided as follows:

- Produced Formation Water (Section 6.3)
- Operational Fluids (Section 5.4)

For all impacts, control measures have been considered as described in Section 4.7. Controls are applied where a reduction in the consequence of the impact will occur as a result of their adoption. They may also be required by legislation, or by internal Esso requirements. Where the assessment of the impact identified that there were no suitable Good Practice control measures, and additional controls considered would not lower the impact assessment outcomes, no controls have been adopted. This is identified in the table and assessed as part of the demonstration of acceptability.

Environmental Performance Outcomes and Standards relevant to impacts associated with the petroleum activity are provided in Volume 4.

6.2.1 Operations Activities

Table 6-1 Operations Activities – Impact Scoping

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
Platform Operations Pipeline Operations Subsea facility operations	Physical Presence - Interference with Other Marine Users Presence of platform and pipeline operations can lead to interference with other marine users.	Change to the function, interests or activities of other users Change to the function, interests or activities of other users could occur through disruption of commercial and recreational activities. Disruption to activities includes: • exclusion of vessels to areas around the activity; • damage to fishing equipment; and • loss of commercial fish catch.	Commercial Fisheries	There are six Commonwealth-managed fisheries and three Victorian State-managed fisheries which may undertake fishing activities within the Operational Area. Presence of fisheries varies between platforms, typically due to water depth determining the location of prey species. Fisheries effort data, however, shows that relatively small numbers of vessels are likely to be encountered within the Operational Area. The physical presence of the platform operations, specifically the 500m Petroleum Safety Zone (PSZ) around each facility, results in the exclusion of commercial fishing vessels from parts of the fisheries management area and may result in vessels making minor deviations around the PSZ while transiting through the area. Impacts are limited to the Operational Area and will have little to no adverse effects. Impacts are limited to the Operational Area and, given the extensive operating area utilised by Commonwealth and State fisheries, will have inconsequential or no adverse effects.	IV	A	**CM6:** Temporary Storage Assessment **CM70:** The Subsea Material Register (SMR) will be reviewed by the Marine Group against the scope, location and operational capability of each vessel as they become available. **CM1:** Maintenance activities for facilities already at CoP are implemented in accordance with s572 (2) requirements. **CM1a:** Post CoP maintenance activities are implemented for facilities as they are assessed prior to reaching CoP stage in accordance with s572 (2) requirements	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage • Good practice control measures have been defined and implemented. • Control measures are consistent with Esso's Environment Policy • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	Acceptable
			Shipping	With the exception of PCA and DPA, all platforms are located within the ATBA. Shipping activity is limited within the ATBA, as vessels in excess of 200 gross tonnage are prohibited from unauthorised entry. Given this, the presence of surface infrastructure within the established PSZs (500 m extending from each platform) will not result in further impacts to shipping. Physical presence of subsea facilities and pipelines will not impact shipping.	No impacts expected						
			Recreational Activities	Recreational activities may occur within the Operational Area such as recreational fishing, recreational boating and leisure activities. However, given the distance from shore and the existing PSZs, no interaction with recreational activities is expected.	No impacts expected						

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
Platform Operations	<u>Underwater Sound Emissions</u> Normal platform operations generate sound at 162 dB RMS (Hannay, et al. 2004).	<u>Change in ambient noise</u> Underwater sound emissions generated by normal platform operations will result in a change in ambient noise.	Ambient noise	Based on spherical spreading (Richardson et al., 1995), platform generated noise will reduce to background noise levels of 120 dB RMS within 130m of the platform, indicating that impacts will be highly localised. Platform generated noise will be continuous throughout the life of the platform. Impacts are highly localised and will not result in a permanent change to ambient noise levels following completion of operations, therefore impacts will have no adverse effects.	IV	A	None identified	None	ALARP	Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage • Activity will not impact the long term survival and recovery of listed and threatened marine mammals or marine reptiles and will be undertaken in accordance with all applicable management actions • No control measures identified which can further lower the impact consequence • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	Acceptable
		<u>Change in fauna behaviour</u> Underwater sound emissions generated by routine platform operations may result in a change in fauna behaviour	Fish	Based on levels adopted by NOAA Fisheries, the US Fish and Wildlife Services, and Canadian Science Advisory Secretariat (DFO, 2004), a conservative threshold level of 130 dB RMS for behavioural changes in fish has been adopted. Based on spherical spreading (Richardson et al., 1995), platform generated sound levels will reduce to below this level within 50m of the platform. Any impacts will be limited to within this localised area. Limited research has been conducted on shark responses to noise, however studies indicate that sharks will move suddenly away from sounds of more than 20 dB re 1µPa above broadband ambient SPL when approaching within 10m of the source (Myrberg, 1978). The Operational Area is within a distribution BIA for great white shark; however, no threats have been identified in the Recovery Plan for the White Shark (*Carcharodon carcharias*). Impacts to fish are expected to be highly localised (i.e. within 50m of the sound source), and short-term (behavioural changes will cease once the noise subsides). Any impacts will be inconsequential or have no adverse effect.	IV						
			Marine Reptile	Using the limited information available, it has been reported that behavioural changes and impairment of hearing sensitivity in marine turtles are likely to occur at levels above 120 dB re 1 µPa (SVT Engineering Consultants 2009). Based on spherical spreading (Richardson et al., 1985), sound levels will be reduced to below 120 dB RMS within 1300m of the source. Any impacts will be limited to within this localised area. Five listed / threatened species of marine turtle may occur within the Operational Area, although there are no BIAs or critical habitats located within the PEA and all marine turtles are known to have a more northerly distribution. The Recovery Plan for Marine Turtles in	III						

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
				Australia, 2017-2027, lists noise interference as a key threat. Impacts to marine turtles are expected to be localised (i.e. within 1300m of the sound source), and short-term (behavioural changes will cease once the noise subsides). Any behavioural impacts resulting from underwater sound emissions will not impact the long term survival and recovery of threatened marine turtles. Given the receptor sensitivity to environmental impacts, potential short-term, minor adverse effects are possible.							
			Marine Mammals	Cetaceans and pinnipeds are known to experience temporary threshold shift (TTS) and behavioural responses to underwater sound emissions. Behavioural responses range from subtle changes in surfacing and breathing patterns, to cessation of vocalizations, to active avoidance or escape from the area of insonification. Using the National Marine Fisheries Service (NMFS) guidance for non-pulsed sound a behavioural disturbance limit of 120 dB RMS is adopted (NMFS, 2016). Richardson et al. (1995) and Southall et al. (2007) indicate that behavioural avoidance by baleen whales may onset from 140 to 160 dB re1µPa or possibly higher. Based on spherical spreading (Richardson et al., 1985), sound levels will be reduced to below 120 dB RMS within 130m of the source. Any impacts will be limited to within this localised area. The Operational Area is within the following BIAs: southern right whale (distribution), pygmy blue whale (foraging, distribution), and several other threatened species of marine mammals may be present within the Operational Area. Anthropogenic noise is listed as a threat in the Conservation Management Plan for the Southern Right Whale, 2011-2021 and Conservation Management Plan for the Blue Whale, 2015-2025. Impacts to marine mammals are expected to be localised (i.e. within 1300m of the sound source), and short-term (behavioural changes will cease once the noise subsides). Any behavioural impacts resulting from underwater sound emissions will not impact the long term survival and recovery of threatened marine mammals. Given the presence of BIAs within the Operational Area, potential short-term, minor adverse effects are possible.							

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
Platform Operations	Light Emissions Navigational and safety lights used during normal platform operations will result in light emissions. Light emissions will also be generated during flaring, with rates varying between platforms and activities.	Change in ambient light A change in ambient light levels could result in a localised light glow.	Ambient light	Modelling conducted by ERM (2010) on navigational and safety lighting from a MODU showed that light intensity reduced to 0.1 Lux (equivalent to ambient light at full moon to twilight) within 800 m of the source and to 0.01 Lux (equivalent to ambient light at quarter moon) within 1.2 km. Outside 1.2 km, light from the facility would only be detected during a new moon or if the moon is not visible. Although light from the facility may be visible within 1.2 km, the intensity of the light and any associated sky glow will decrease with distance from the source. The only platforms located within 1.2 km are MLA and MLB. MLA and MLB are bridge -linked, meaning that although MLB is normally unstaffed the lighting levels may not be reduced as a result. Given this, MLA and MLB are assessed as a complex, and light levels are expected to decrease within the same distance. The impacts on ambient light from cumulative effects from MLA and MLB are not expected to be greater than the impacts from a single platform source. The consequences of a change in ambient light will be localised and low intensity, and impacts are expected to be inconsequential or have no adverse effect on ambient light.	IV	A	None identified	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage • Activity will not impact the long term survival and recovery of listed and threatened marine reptiles and will be undertaken in accordance with all applicable management actions. • No control measures identified which can further lower the impact consequence • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	Acceptable
		Change in fauna behaviour A change in ambient light levels could lead to changes in fauna behaviour, through: • Attraction of light-sensitive species such as seabirds, squid and zooplankton in turn affecting predator-prey dynamics; and • Alteration of behaviour that may affect species during breeding periods (e.g. shearwaters, turtle hatchlings).	Fish	Fish, squid and zooplankton may be directly or indirectly attracted to lights at distances of up to 5 km (Shell, 2010), leading to aggregation at the surface and increased predation. These organisms' distributions are driven by oceanographic conditions, with seasonal and diurnal movements. For fish and squid, it is expected that any potential impact of increased predation would be undetectable at a population level and only affect transient individual fish and squid. The proportion of zooplankton exposed and subjected to higher predation rates within the platform light fields is negligible. In the event that deck or navigational lighting results as an attractant to an occasional seabird, it is not expected that this will permanently impact on migration or other behaviours. Most platforms are located more than 5 km from another operating platform, however WTN	IV					•	•

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
				and TNA are located approximately 4 km apart. At this location the area of impact to fish may overlap, resulting in a larger impact area. As light intensity will be significantly decreased at the overlap, however, no cumulative impacts are expected. The Operational Area is within a distribution BIA for great white shark; however, no threats have been identified in the Recovery Plan for the White Shark (*Carcharodon carcharias*). Impacts to fish are expected to be localised (i.e. within 5km of the light source), and short-term (behavioural changes will cease once the light ceases). Any impacts will be inconsequential or have no adverse effect.							
			Birds	High levels of offshore lighting can attract and disorient seabird species resulting in behavioural changes (e.g. circling light sources leading to exhaustion or disrupted foraging), injury or mortality near the light source. Artificial light can cause significant impacts on burrow-nesting petrels and shearwaters. Fledglings often become disoriented and grounded because of artificial light adjacent to rookeries as they attempt to make their first flight to sea, a phenomenon known as 'fallout'. Rodrigez at al. (2014) investigated the effects of artificial lighting from road lighting on short-tailed shearwater fledglings. The study established that, by removing the light source from nesting areas, there was a decrease in grounded fledglings and a corresponding reduction in bird fatalities. The Operational Area is within foraging BIAs for black browed albatross, Campbell albatross, Indian yellow nosed albatross and wandering albatross, antipodean albatross, Buller's albatross, shy albatross, common diving petrel, white-faced storm petrel, and short-tailed shearwater. Light emissions are not identified as a threat in conservation advice or recovery plans for any of these species. Any impacts to birds from light emissions will be localised and have little / no adverse effect.	IV					•	•
			Marine Reptiles	Light pollution can be an issue along, or adjacent to, turtle nesting beaches where emerging hatchlings orient to, and head towards, the low light of the horizon unless distracted by other lights which disorient and affect their passage from the beach to the sea (EA, 2003). Pendoley (2000) discovered that in the absence of illumination from the moon, glow	IV					•	•

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
				from tower flares may influence the orientation of turtles at close range (30–100 m). Five listed / threatened species of marine turtle may occur within the Operational Area, although there are no BIAs or critical habitats located within the PEA and all marine turtles are known to have a more northerly distribution. The Recovery Plan for Marine Turtles in Australia, 2017-2027, lists light pollution as a key threat, however this relates specifically to turtle hatchlings and nesting sites. There are no nesting sites within 5 km of the Operational Area, therefore any impacts will be inconsequential or have no adverse effect.							
Platform Operations	<u>Emissions to Air</u> Combustion of gaseous and liquid fuels and fugitive emissions vented will occur during platform operations, leading to emissions to air.	<u>Change in air quality</u> The release of combusted and un-combusted hydrocarbons into the atmosphere can lead to a change in air quality, cause atmospheric pollution and contribute to greenhouse gases.	Air Quality	Atmospheric emissions will be generated from platform, sources include emissions from internal combustion engines (including all equipment and generators), flares, fugitives and process vents. Emissions generated during platform operations include NOx, CO, SO_2, VOC's (benzene, xylenes, toluene, ethylbenzene), non-VOC's, particulate matter, CO_2, N_2O, CH_4, SF_6, HFCs and PFCs. The presence of these emissions will lead to a localised decline in air quality. Impacts to air quality from emissions to air will be localised to the source and quickly dissipated in the offshore environment. Any impacts will be inconsequential or have no adverse effect.	IV	A	**CM2:** Flaring occurs in accordance with Flare system procedures and Critical Depressuring and Draining procedure.	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage • Activity will not impact the long term survival and recovery of listed and threatened bird species and will be undertaken in accordance with all applicable management actions. • Good practice control measures have been defined and implemented. • Control measures are consistent with Esso's Environment Policy • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • Esso meets the regulatory requirement to report GHG emissions to the Clean Energy Regulator	Acceptable
			Climate	Global greenhouse gas (GHG) generated by Esso operations in the Bass Strait are reported under the NGER Scheme. Data publish by NGER (2019) demonstrates that oil & gas activities contribute significantly less to state and country-wide GHG emissions than electricity supply and mining industries. Esso is not listed as a top-contributor for Scope 1 or Scope 2 emissions, therefore contribution to GHG emissions (and subsequent change in climate) is considered to be low. Based on this, the primary action (i.e. Esso operations in the Bass Strait) does not represent a 'substantial case; of the circumstance (climate change). Therefore, climate change is not considered an indirect consequence of Esso operations in the Bass Strait for the purposes of Section 527E of the EPBC Act (DSEWPaC 2013a). Impacts to climate from production operations emissions will be localised and will quickly dissipate on completion of flaring or venting	IV						

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
				event. Any impacts will be inconsequential / have no adverse effect.						• No stakeholder objections or claims have been raised	
		Injury / mortality to fauna Generation of atmospheric emissions has the potential to result in chronic effects to fauna from localised and temporary decrease in air quality.	Birds	Models of combustion emissions from MODU operations (e.g. BP, 2013) indicate that non-GHG emissions such as NO_2 will reduce to below polluting concentrations within 10 km of the source. It is expected that production operations will generate less emissions than MODU operations, therefore the impact area is expected to be reduced. Any venting required during Platform Operations will be small volumes and infrequent discharges. Emissions will quickly dissipate to below detectable levels, and any impacts will be minor and restricted to the immediate vicinity of the vent. In some cases, gas will be directed to the flare during Platform Operations. Flared gas will be burned as efficiently as possible to limit fall-out. Emissions from flaring contain greenhouse gases and could therefore contribute to greenhouse gas emissions. However, volumes of gases released will be low, and given the high energy offshore environment any changes in air quality are expected to be below detectable levels and restricted to the immediate vicinity of the flare. The Operational Area is within foraging BIAs for black browed albatross, Campbell albatross, Indian Yellow nosed albatross and Wandering albatross, Antipodean albatross, Buller's albatross, shy albatross, common diving petrel, white-faced storm petrel, and short-tailed shearwater. Atmospheric emissions or reduction in air quality are not identified as a threat the conservation advice or recovery plans for any of these species. There is a high density of platforms within the Operational Area, therefore it is possible that cumulative effects to birds could occur. Platforms within 10 km of another platform may lead to an accumulation of atmospheric emissions resulting, however these areas of higher impacts are isolated and will not result in population or ecosystem level effects. Birds are sighted at all platforms within the Operational Area, indicating that a change in air quality is not leading to injury or mortality in bird species observed. Considering this, and the potential for sensitive life stages to be present, impacts are expected to have potential short term, minor adverse consequences.	IV						

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
Platform Operations	Planned Discharge – Brine Brine is created by the onboard desalination system, via Reverse Osmosis (RO). Discharges will be continuous.	Change in water quality Planned discharges of brine will lead to a change in water quality through: • Increased salinity • Chemical exposure	Ambient water quality	Reject water discharges from the RO system will have an elevated salinity. The discharges will be quickly dispersed by ocean currents and rapidly mixed with the surrounding marine waters, meaning that any potential impacts are limited to the source of the discharge where concentrations are highest (Azis et.al, 2003). Scale inhibitors and biocides are used in RO systems and will therefore be present in the discharged brine. However, chemicals are used at trace concentrations that would be suitable for human consumption, therefore no impacts to fauna from chemical exposure are expected.	IV	A	None identified	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage • No control measures identified which can further lower the impact consequence • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	Acceptable
		Injury / mortality to fauna	Plankton	Elevated salinity can affect plankton. Plankton are known to have high levels of natural mortality and a rapid replacement rate (UNEP 1985), therefore recovery from disturbance is typically quick. As such, the activity will not result in serious or irreversible damage to organisms at population level which would affect ecological diversity or productivity within Commonwealth marine areas. Any impacts will be highly localised and temporary, and the consequence will be inconsequential or have no adverse effect.	IV						
Platform Operations	Planned Discharge - Sewage and Grey water Staffing levels vary between platforms, however normally staffed platforms discharge approximately 60-150 m^3 of sewage and grey water per day, depending on staffing levels. Discharge point remains stationary.	Change in water quality Change in water quality can occur through: • Nutrient loading (e.g. ammonia, nitrite, nitrate and orthophosphate). • Chemical exposure (organics and inorganics) • Turbidity / sedimentation of particulate matter	Ambient water quality	Nutrient loading can lead to increased growth in primary producers (such as plankton), followed by oxygen depletion. For discharge volumes up to 150 m^3/day the discharges are expected to remain within the nominal mixing zone boundary of 500 m around fixed facilities. The composition of sewage and grey water may include chemicals including organics (e.g. volatile and semi-volatile organic compounds, oil and grease, phenols, endocrine disrupting compounds) and inorganics (e.g. hydrogen sulphide, metals and metalloids, surfactants, phthalates, residual chlorine). There is also the potential for biological pathogens, such as bacteria, viruses, protozoa, parasites, etc. Organic chemicals are expected to degrade; however, some persistence may occur within sediments. In open water environments such as the Bass Strait, discharges are rapidly dispersed, and any nutrient enrichment, chemical exposure or increase in turbidity will be short-term and localised with no accumulation of impacts expected. Impacts will be inconsequential or have no adverse effect.	IV	A	None identified	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage • No control measures identified which can further lower the impact consequence • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives	Acceptable

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
		Injury / mortality to fauna	Plankton	Plankton communities have a naturally patchy distribution in both space and time (ITOPF, 2011). They are known to have naturally high mortality rates (primarily through predation), however in favourable conditions (e.g. supply of nutrients), plankton populations can rapidly increase. Once the favourable conditions cease, plankton populations will collapse and/or return to previous conditions. Plankton populations have evolved to respond to these environmental perturbations by copious production within short generation times (ITOPF, 2011). However, any potential change in phytoplankton or zooplankton abundance and composition is expected to be localised, typically returning to background conditions within tens to a few hundred metres of the discharge location (e.g. Abdellatif, 1993; Axelrad et al., 1981; Parnell, 2003). Effects on environmental receptors along the food chain, namely, fish, reptiles, birds and cetaceans are therefore not expected beyond the immediate vicinity of the discharge in deep open waters. In open water environments such as the Bass Strait, discharges are rapidly dispersed, and any nutrient enrichment, chemical exposure or increase in turbidity will be short-term and localised with no accumulation of impacts expected. Impacts will be inconsequential or have no adverse effect.	IV					• No stakeholder objections or claims have been raised	
			Commercial Fisheries	There are six Commonwealth-managed fisheries and three Victorian State-managed fisheries which may undertake fishing activities within the Operational Area. Fisheries effort data shows that relatively small numbers of vessels are likely to be encountered within the Operational Area. It is possible that seafood fished within the immediate vicinity of the discharge may not be safe for human consumption or may be tainted due to the presence of chemicals that bioaccumulate. In open water environments such as the Bass Strait, discharges will be rapidly dispersed, and chemical toxicity will be localised with no lasting impacts expected. Any impacts are expected to be limited to the Operational Area and, given the extensive operating area utilised by Commonwealth and State fisheries and that vessels will be excluded from the Operational Area by the PSZ, will have inconsequential or no adverse effects.	IV						

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
		<u>Change in aesthetic value</u> Solids found in sewage can affect the aesthetic value of an area such as ambient water colour, the presence of surface slicks/sheens and odour.	Tourism	Changes in water quality can lead to a change in aesthetic value. As described above, the intermittent discharge and high-energy marine environment means that discharges are expected to be quickly dissipated, with impacts restricted to the localised area around the discharge. Given the distance of the Operational Area from the nearest tourist site, and the low likelihood of tourism or recreation vessels within the Operational Area due to the distance from shore, presence of PSZ and lack of tourist features, no impacts to tourism from changes in aesthetic value are expected.	No impacts expected						
Platform Operations	<u>Planned Discharge – Food waste</u> 1-2kg of food waste will be discharged per person per day. Discharge point remains stationary.	<u>Change in fauna behaviour</u> Increased scavenging behaviour.	Fish Birds	The long-term discharge of food waste from fixed platforms can result in increased scavenging behaviour around the discharge point. In the high energy marine environment of the Bass Strait any discharges will be rapidly dispersed, therefore impacts will be limited to the Operational Area. In addition, the rapid consumption of this food waste by scavenging fauna, and physical and microbial breakdown, ensures that the impacts of food waste discharges are limited to the discharge point. The Operational Area is within a distribution BIA for the great white shark; however, no threats have been identified in the Recovery Plan for the White Shark (*Carcharodon carcharias*). The Operational Area is within foraging BIAs for black browed albatross, Campbell albatross, Indian yellow nosed albatross and wandering albatross, antipodean albatross, Buller's albatross, shy albatross, common diving petrel, white-faced storm petrel, and short-tailed shearwater. Changes to predator / prey dynamics are not identified as a threat in the conservation advice or recovery plans for any of these species. Impacts to fish and birds from the planned discharge of food waste are expected to be highly localised (due to the high energy marine environment, intermittent discharge and rapid consumption) and temporary (behavioural changes will cease once water quality returns to background levels). Any impacts will be inconsequential or have no adverse effect.	IV	A	None identified	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage • Activity will not impact the long term survival and recovery of listed and threatened birds or fish and will be undertaken in accordance with all applicable management actions. • No control measures identified which can further lower the impact consequence • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	Acceptable
Platform Operations	<u>Planned Discharge - Operational Fluids</u>	• See Section 6.4 for more details									

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
Subsea facilities operations											
Platform Operations	Planned Discharge – Produced Formation Water	• See Section 6.3 for more details.									

6.2.2 Wellwork Activities

Table 6-2 Wellwork Activities – Impact Scoping

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
Conductor cutting and pulling	<u>Seabed Disturbance</u> Conductor cutting and pulling can lead to seabed disturbance in the immediate vicinity of the well.	<u>Change in water quality</u> Seabed disturbance can lead to increased turbidity, which affects water quality.	Ambient water quality	Water quality change occurs when seabed sediments enter the water column (turbidity). After a period, the suspended sediments settle and the turbidity in the water column returns to pre disturbance levels. Any impacts will be highly localised and temporary. Wellwork activities are intermittent, and ambient water quality will return to background levels following seabed disturbance. Impacts will have inconsequential or no adverse effects on ambient water quality, and no impacts to ecological, economic, cultural or social receptors are expected as a result of a change in water quality.	IV	A	None identified	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage • No control measures identified which can further lower the impact consequence • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	Acceptable
		<u>Change in habitat</u> Seabed disturbance could lead to a change in habitat for benthic organisms. Impacts are restricted to the Operational Area.	Benthic habitats and communities	Smothering and alteration to benthic habitats can occur as a result of seabed disturbance. The type of damage that could be sustained due to smothering may include destruction of habitat. Benthic habitats and communities within the Bass Strait show natural small scale variation, however the area is mostly considered homogenous. Studies conducted by Esso (Cardno, 2019) demonstrate similarities in taxa but variation in composition between different sites. High rates of disturbance to benthic communities, such as long term disturbance from dredging or trawl fishing, can lead to reduced habitat structure. This results in homogenous, low diversity communities and loss of large and long-lived sedentary species that create habitat structure and leads to reductions in primary production and ecosystem function (Handley et al., 2014). Disturbance from IMR activities is not expected to result in high rates of disturbance at this scale, however it is possible that small scale disturbance will lead to similar outcomes. Seabed disturbance from wellwork activities will be limited to close proximity to existing infrastructure, and typically in areas which have previously been disturbed during installation of infrastructure. Benthic habitats and communities within the Operational Area show natural small scale variation, however, are mostly homogenous, with no particular areas of value or sensitivity. It is possible that activities will produce a slight alteration of the local habitat and community structure due to the small amount of changed substrate in an area of uniform soft sediments; however the naturally homogenous nature of the habitats and communities in the Operational Area will result in quick recovery, and no long-term changes to ecosystem are expected. Any impacts will be inconsequential or have no adverse effects.	IV						

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
Wireline / Workover Activities (general)	<u>Emissions to Air</u> Non-routine flaring and venting will occur during depressurisation prior to wellwork activities. Non-routine flaring will occur during production start-up.	<u>Change in air quality</u> The release of combusted and un-combusted hydrocarbons into the atmosphere can lead to a change in air quality, cause atmospheric pollution and contribute to greenhouse gases.	Air quality	Atmospheric emissions will be generated from venting and flaring during workover operations and will lead to a localised decline in air quality. Volumes of venting / flaring during workover operations will be small. Larger volumes could occur during production start-up, however this will be an isolated event. Impacts to air quality from emissions to air will be localised to the source and quickly dissipated in the offshore environment. Any impacts will be inconsequential or have no adverse effect.	IV	A	**CM4:** Wireline / Workover work scope or plan.	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage • Activity will not impact the long term survival and recovery of listed and threatened bird species and will be undertaken in accordance with all applicable management actions • Good practice control measures have been defined and implemented • Control measures are consistent with Esso's Environment Policy • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • Esso meets the regulatory requirement to report GHG emissions to the Clean Energy Regulator • No stakeholder objections or claims have been raised	Acceptable
			Climate	Global greenhouse gas (GHG) generated by Esso operations in the Bass Strait are reported under the NGER Scheme. Data publish by NGER (2019) demonstrates that oil & gas activities contribute significantly less to state and country-wide GHG emissions than electricity supply and mining industries. Esso is not listed as a top-contributor for Scope 1 or Scope 2 emissions, therefore contribution to GHG emissions (and subsequent change in climate) is considered to be low. Based on this, the primary action (i.e. Esso operations in the Bass Strait) does not represent a 'substantial case; of the circumstance (climate change). Therefore, climate change is not considered an indirect consequence of Esso operations in the Bass Strait for the purposes of Section 527E of the EPBC Act (DSEWPaC 2013a). Impacts to climate from wellwork operations emissions will be localised and will quickly dissipate on completion of activities. Any impacts will be inconsequential / have no adverse effect.	IV						
		<u>Injury / mortality to fauna</u> Generation of atmospheric emissions has the potential to result in chronic effects to fauna from localised and temporary decrease in air quality.	Birds	Any venting required during wireline / workover activities will be small volumes and infrequent discharges. Emissions will quickly dissipate to below detectable levels, and any impacts will be minor and restricted to the immediate vicinity of the vent. In some cases, gas will be directed to the flare during wireline / workover activities. Flared gas will be burned as efficiently as possible to limit fall-out. Emissions from flaring contain greenhouse gases and could therefore contribute to greenhouse gas emissions. However, volumes of gases released will be low, and given the high energy offshore environment any changes in air quality are expected to be below detectable levels and restricted to the immediate vicinity of the flare. The Operational Area is within foraging BIAs for black browed albatross, Campbell albatross, Indian Yellow nosed albatross and Wandering albatross, Antipodean albatross, Buller's albatross, shy albatross, common diving petrel, white-faced storm petrel, and short-tailed shearwater. Atmospheric emissions or reduction in air quality are not identified	IV						

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
				as a threat the conservation advice or recovery plans for any of these species. Impacts will be highly localised and temporary, ceasing once the workover operations are complete. Any impacts will be inconsequential or have no adverse effect.							
Wireline /workover Activities (general) Conductor cutting and pulling Conductor Clean-out Sandwash	Planned Discharge – Operational Fluids Fluids contained within the well will be discharged during sandwash and clean-out. Residual fluids may be discharged in the final stages of conductor cutting. Residual production fluids as well as chemicals dosed into the production system will be discharged into the drains during wellwork operations.	• See Section 6.4 for more details									
Cementing	Planned Discharge – Cement Cementing during wellwork will result in a discharge of dry and mixed cement. After wellwork activities, dry cement may be discharged from the facility. Impacts are restricted to the Operational Area.	Change in water quality	Ambient water quality	Cement released from the surface (mixed and dry cement) and the seabed (mixed cement) will result in increased turbidity in close proximity to the release. Modelling of larger cement surface discharges (e.g. 18 m^3 of cement wash modelled by de Campos et al., 2017) shows an average deposition of 0.05 mg/m^2 of material on the seabed; with particulate matter deposited within the three-day simulation period. Any impacts from cementing during wellwork will be greatly reduced from these spatial estimates. Chemical toxicity results from chemical additives added to the dry cement when mixing, therefore changes in water quality through chemical exposure are expected to be restricted to discharges of mixed cement. Low toxicity additives will be selected, and discharges are expected to be highly localised. Once hardened, toxic effects will cease (Terrens et al., 1998; CIN, 2005). Impacts to ambient water quality from planned discharge of cement will be highly localised and temporary, with turbidity and chemical toxicity impacts quickly ceasing following discharge. Any impacts will be inconsequential or have no adverse effect, and impacts to pelagic organisms (such as plankton, fish, marine fauna) are not expected.	IV	A	**CM3:** Chemical Discharge Assessment Process	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage • Good practice control measures have been defined and implemented • Control measures are consistent with Esso's Environment Policy • Control measures are consistent with Esso's Environment Policy • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	Acceptable
		Change in sediment quality	Ambient sediment quality	Cement has the potential to smother or alter the benthic substrate, resulting in a permanent change in sediment quality. Chevron (2014) indicated that planned cement discharges from overflow during drilling operations, which would be higher in volume than cementing during wellwork, may affect the seabed around the well to a radius of ~10 m–50 m.	IV						

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
				Once cement has hardened, the sediment quality will be permanently changed. Wellwork will be undertaken at existing wells where cement discharges have already occurred, therefore no further changes to sediment quality are expected as a result of cementing during wellwork. Any impacts to ambient sediment quality will be inconsequential or have no adverse effect and impacts to benthic habitats and communities are not expected.							
Conductor Clean-out Sandwash	Planned Discharge – Solids Clean-out and sandwash will result in solids from inside the well bore being discharged to the seabed.	Change in water quality Solids discharged to the marine environment have the potential to change water quality. Impacts are restricted to the Operational Area.	Ambient water quality	Solids from the reservoir (e.g. sand) may exit the well with the workover brine during wellwork operations. There solids are captured as waste where possible, however in some cases capture is not feasible and solids will be discharged, for example during conductor clean-out operations where the discharge of returns run over the conductor lip. A typical sand discharge during conductor clean-up operations is 100 bbls of entrained sand in brine. The discharge of brine containing solids can result in increased turbidity in the water column. Volumes will be small, and discharges will be infrequent due to the sporadic nature of wellwork activities. Any discharges will be quickly dissipated in the high energy marine environment, with impacts restricted to close proximity to the discharge location. Impacts will be inconsequential or have no adverse effect, and no impacts to fauna are expected.	IV	A	**CM5:** Collection and onshore disposal of solids.	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage • Good practice control measures have been defined and implemented • Control measures are consistent with Esso's Environment Policy • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	Acceptable

6.2.3 IMR Activities

Table 6-3 IMR Activities – Impact Scoping

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
Pipeline and Subsea IMR	<u>Physical Presence - Interference with Other Marine Users</u> Equipment or infrastructure temporary stored on the seabed may lead to interference to other marine users.	<u>Change to the function, interests or activities of other users</u> Change to the function, interests or activities of other users could occur through disruption of commercial and recreational activities. Disruption to activities includes: exclusion of vessels to areas around the activity; damage to fishing equipment; and loss of commercial fish catch. Impacts are restricted to other marine users which interact with the seabed within the Operational Area. No impacts to shipping are expected.	Commercial Fisheries	There are six Commonwealth-managed fisheries and three Victorian State-managed fisheries which may undertake fishing activities within the Operational Area. Presence of fisheries varies between platforms, typically due to water depth determining the location of prey species. Fisheries effort data, however, shows that relatively small numbers of vessels are likely to be encountered within the Operational Area. Temporary storage would be short-term and would occur within the PSZ of a facility or subsea infrastructure or within the 200 m operational zone around a pipeline. Any impacts are expected to be limited to the Operational Area and, given the extensive operating area utilised by Commonwealth and State fisheries and the low number of vessels likely to be operating within the Operational Area, will have inconsequential or no adverse effects.	IV	A	**CM31:** Temporary storage will occur within an existing PSZ or 200m operational zone around pipelines **CM36:** Pre start notifications to JRCC to enable AMSA to distribute an AUSCOAST warning. Stakeholders notified of programme of works each quarter and one week prior to commencement.	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage • Good practice control measures have been defined and implemented • Control measures are consistent with Esso's Environment Policy • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	Acceptable
			Recreational Activities	Recreational activities may occur within the Operational Area such as recreational fisheries and recreational boating and leisure activities. However, given the distance from shore and that impacts are limited to the seabed, no interaction with recreational activities is expected.	No impacts expected						
Pipeline and Subsea IMR	<u>Physical Presence – NORM</u> Naturally occurring radioactive material (NORM) can accumulate in the form of scale on the internal surfaces of equipment which is in contact with the production fluids. NORM could be released as a result of temporary storage.	<u>Change in habitat</u> Radioactivity derived from natural sources is normally present in the open ocean, particularly at the seabed. Dissolved radium isotopes could be present in NORM scale, potentially increasing the radioactivity levels in close proximity to the scale. If NORM scale is contained in the flowlines it can emit radiation in the form of higher energy α and γ rays	Plankton	The pathways for exposure of NORM to marine species are through external γ radiation from radium-226, absorption (e.g. by phytoplankton) or through intake from water or food of either radium-226 or radium-228. Once absorbed, radium follows potassium in organisms and is primarily deposited in shell and bone tissue. Secretion from these is very slow and in general the deposited radium will remain there throughout the organism's lifetime (Norse Decom, 2003). There is little knowledge about the effects of deposited NORM on marine organisms, however studies indicate that there is no increased accumulative of radium-226 or	IV	A	**CM6:** Temporary Storage Assessment	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage	Acceptable

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
		from radium-226 or low energy β rays from radium-228 (APPEA, 2002).		radium-228 in marine organisms due to exposure to NORM (Hylland & Eriksen, 2013), and there is little upward transport through bioaccumulation (Norse Decom, 2003). Early lifestages of fish (embryos, larvae) and other plankton would be most susceptible to NORM exposure, as they are less mobile and therefore can become exposed to the highest concentration of radiation. However, these are expected to rapidly recover, as they have high levels of natural mortality and a rapid replacement rate UNEP (1985). As studies indicate that there is limited upward transport of radiation through the food chain, fauna which rely on plankton as prey are not expected to be impacted. As such, exposure of planktonic communities is not considered to result in significant impacts on population level of organisms that would affect ecological diversity or productivity within Commonwealth marine areas and therefore is considered to result in an undetectable or limited local degradation of the environment, rapidly returning to original state by natural action.						• Good practise control measures have been defined and implemented • Control measures are consistent with Esso's Environment Policy • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	
Pipeline and Subsea IMR	Seabed Disturbance Physical disturbance to the seabed can occur during IMR activities such as dredging, cutting and temporary storage.	Change in water quality Seabed disturbance can lead to increased turbidity, which affects water quality.	Ambient water quality	Water quality change occurs when seabed sediments enter the water column (turbidity). After a period, the suspended sediments settle and the turbidity in the water column returns to pre disturbance levels. Any impacts will be highly localised and temporary. IMR activities are intermittent, and ambient water quality will return to background levels following seabed disturbance. Impacts will have inconsequential or no adverse effects on ambient water quality, and no impacts to ecological, economic, cultural or social receptors are expected as a result of a change in water quality.	IV	A	None identified	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage • No control measures identified which can further lower the impact consequence • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	Acceptable
		Change in habitat Seabed disturbance could lead to a change in habitat for benthic organisms. Impacts are restricted to the Operational Area.	Benthic habitats and communities	Smothering and alteration to benthic habitats can occur as a result of seabed disturbance. The type of damage that could be sustained due to smothering may include destruction of habitat. Benthic habitats and communities within the Bass Strait show natural small scale variation, however the area is mostly considered homogenous. Studies conducted by Esso (Cardno, 2019) demonstrate similarities in taxa but variation in composition between different sites. High rates of disturbance to benthic communities, such as long term disturbance from dredging or trawl fishing, can lead to reduced habitat structure. This results in	IV	A	**CMP37:** Post campaign ROV inspection to check that temporary equipment has been recovered and dropped objects recovered where practicable				

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP: ALARP Decision Context	Demonstration of ALARP: Good Practice Control Measures	Demonstration of ALARP: Additional Control Measures Considered	Demonstration of ALARP: ALARP Outcome	Demonstration of Acceptability: Acceptability Assessment	Demonstration of Acceptability: Acceptability Outcome
				homogenous, low diversity communities and loss of large and long-lived sedentary species that create habitat structure and leads to reductions in primary production and ecosystem function (Handley et al., 2014). Disturbance from IMR activities is not expected to result in high rates of disturbance at this scale, however it is possible that small scale disturbance will lead to similar outcomes. Seabed disturbance from IMR activities will be limited to close proximity to existing infrastructure, and typically in areas which have previously been disturbed during installation of infrastructure. Benthic habitats and communities within the Operational Area show natural small scale variation, however, are mostly homogenous, with no particular areas of value or sensitivity. It is possible that activities will produce a slight alteration of the local habitat and community structure due to the small amount of changed substrate in an area of uniform soft sediments; however the naturally homogenous nature of the habitats and communities in the Operational Area will result in quick recovery, and no long-term changes to ecosystem are expected. Any impacts will be inconsequential or have no adverse effects.							
Facility IMR Pipeline and Subsea IMR	Emissions to Air Non-routine or safety flaring or venting will occur during facility IMR. Depressuring or pipelines and subsea facilities directs vapours to the flare.	Change in air quality The release of combusted and un-combusted hydrocarbons into the atmosphere can lead to a change in air quality, cause atmospheric pollution and contribute to greenhouse gases.	Air quality	Atmospheric emissions will be generated from venting and non-routine flaring during Facility, subsea and pipeline IMR operations. The presence of these emissions will lead to a localised decline in air quality. Volumes of venting / non-routine flaring during Facility IMR operations will be small. Impacts to air quality from emissions to air will be localised to the source and quickly dissipated in the offshore environment. Any impacts will be inconsequential or have no adverse effect.	IV	A	None identified	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved • Activity will not result in serious or irreversible damage • Activity will not impact the long term survival and recovery of listed and threatened bird species and will be undertaken in accordance with all applicable management actions. • No control measures identified which can further lower the impact consequence	Acceptable
			Climate	Global greenhouse gas (GHG) generated by Esso operations in the Bass Strait are reported under the NGER Scheme. Data publish by NGER (2019) demonstrates that oil & gas activities contribute significantly less to state and country-wide GHG emissions than electricity supply and mining industries. Esso is not listed as a top-contributor for Scope 1 or Scope 2 emissions, therefore contribution to GHG emissions (and subsequent change in climate) is considered to be low. Based on this, the primary action (i.e. Esso operations in the Bass Strait) does not represent a 'substantial case; of the circumstance (climate change). Therefore, climate change is not considered an indirect consequence of Esso	IV						

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
				operations in the Bass Strait for the purposes of Section 527E of the EPBC Act (DSEWPaC 2013a). Impacts to climate from IMR emissions will be localised and will quickly dissipate on completion of flaring or venting event. Any impacts will be inconsequential / have no adverse effect.						• The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • Esso meets the regulatory requirement to report GHG emissions to the Clean Energy Regulator • No stakeholder objections or claims have been raised	
		Injury / mortality to birds Generation of atmospheric emissions has the potential to result in chronic effects to fauna from localised and temporary decrease in air quality.	Birds	Any venting required during Facility IMR activities will be small volumes and infrequent. Emissions will quickly dissipate to below detectable levels, and any impacts will be minor and restricted to the immediate vicinity of the vent. In some cases, gas will be directed to the flare during Facility IMR activities. Flared gas will be burned as efficiently as possible to limit fall-out. Emissions from flaring contain greenhouse gases and could therefore contribute to greenhouse gas emissions. However, volumes of gases released will be low, and given the high energy offshore environment any changes in air quality are expected to be below detectable levels and restricted to the immediate vicinity of the flare. The Operational Area is within foraging BIAs for black browed albatross, Campbell albatross, Indian Yellow nosed albatross and Wandering albatross, Antipodean albatross, Buller's albatross, shy albatross, common diving petrel, white-faced storm petrel, and short-tailed shearwater. Atmospheric emissions or reduction in air quality are not identified as a threat the conservation advice or recovery plans for any of these species. Impacts will be highly localised and temporary, ceasing once the Facility IMR operations are complete. Any impacts will be inconsequential or have no adverse effect.	IV						
Facility IMR Pipeline and Subsea IMR	Planned Discharge - Operational Fluids Residual production fluids as well as chemicals dosed into the production system will be discharged during IMR activities. Volumes typically 80 L. Separator maintenance or pigging at Marlin Complex and WTN platforms may results in trace amounts of mercury in fluids.	See Section 6.4 for more details									

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
	No routine discharge of Mercury occurs.										
Pipeline and Subsea IMR	Planned Discharge – Gas (subsea) During IMR activities there may be planned gas releases associated with depressurisation, flushing, isolations or valve operational activities.	Change in water quality Methane-consuming microbes (methano-trophic bacteria) may exhaust oxygen supply in the water column, resulting in a change in water quality.	Ambient water quality	Release of gas into the marine environment can lead to a bloom in methano-trophic bacteria, which will increase the biological oxygen demand (BOD) in the surrounding waters and quickly reduce the oxygen available for marine organisms such as plankton. In deep water (i.e. greater than 1,000m) there is potential for ocean stratification to concentrate the effects of methano-trophic bacteria to pockets within the water column, leading to 'dead zones' of oxygen poor waters. Stratification and resulting 'dead zones' are not likely to occur in the Operational Area as the waters are too shallow and hydrodynamics ensure that waters are well mixed. In addition, gas released subsea would quickly reach the surface and dissipate in prevailing winds, reducing the volume of gas in the water column available to methano-trophic bacteria, with oxygen levels in the water column expected to return to normal rapidly through natural processes. Any changes in water quality from a subsea release of gas will be limited to the Operational Area. Water quality will quickly return to ambient levels, due to the shallow water depth and high energy marine environment. Any impacts will be inconsequential or have no adverse effects on ambient water quality, and no impacts to ecological, economic, cultural or social receptors are expected as a result of a change in water quality.	IV	A	None identified	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage • No control measures identified which can further lower the impact consequence • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	Acceptable
Facility IMR Pipeline and Subsea IMR	Planned Discharge – Solids IMR methods such as cleaning, abrasive blasting, hot work, repairs and maintenance will result in discharges of solids and fines either from the drains or at the seabed	Change in water quality Incidental discharge of sand blasting, weld/paint residue, coatings, cement, grit or other small solid debris to the marine environment has the potential to change water quality.	Ambient water quality	Surface discharges of solids can lead to a change in water quality. Discharges will be small and infrequent and will be quickly dissipated in the high energy marine environment therefore impacts are restricted to the Operational Area. Solids and fines will be captured on the facility where possible, reducing the volume. Discharges made at the seabed could result in short-term increase in turbidity localised to the discharge location, however seabed currents and the high energy marine environment will result in any discharges being quickly dissipated, with background levels of water quality rapidly returning. It is not possible to capture solids during subsea IMR activities. Impacts will have inconsequential or no adverse effects on ambient water quality, and no impacts to ecological, economic, cultural or social	IV	A	Facility IMR **CM7:** Abrasive blasting SWP 50.101 Pipeline and Subsea IMR None identified	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage • Good practice control measures have been defined and implemented.	Acceptable

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
				receptors are expected as a result of a change in water quality.						• Control measures are consistent with Esso's Environment Policy • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	

6.2.4 Support Operations

Table 6-4 Support Operations Activities – Impact Scoping

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
Vessel Operations Helicopter Operations	Physical Presence - Interference with Other Marine Users	<u>Change to the function, interests or activities of other users</u> Change to the function, interests or activities of other users could occur through disruption of commercial and recreational activities. Disruption to activities includes: • exclusion of vessels to areas around the activity; • damage to fishing equipment; and • loss of commercial fish catch.	Commercial Fisheries	There are six Commonwealth-managed fisheries and three Victorian State-managed fisheries which may undertake fishing activities within the Operational Area. Presence of fisheries varies between platforms, typically due to water depth determining the location of prey species. Fisheries effort data, however, shows that relatively small numbers of vessels are likely to be encountered within the Operational Area. Project vessels and helicopters operating within the Operational Area may disrupt activities being undertaken by commercial fishing vessels. However, most activities undertaken by project vessels will be within the 500m Petroleum Safety Zone (PSZ) around each platform and subsea facility, therefore impacts to fishing vessels will be greatly reduced. Impacts are limited to the Operational Area and, given the extensive operating area utilised by Commonwealth and State fisheries and the low number of vessels likely to be operating within the Operational Area, will have inconsequential or no adverse effects.	IV	A	None identified	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage • No control measures identified which can further lower the impact consequence • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	Acceptable
			Shipping	With the exception of PCA and DPA, all platforms are located within the ATBA. Shipping activity is limited within the ATBA, as vessels in excess of 200 gross tonnage are prohibited from unauthorised entry. Given this, the presence of vessels within the established PSZs (500 m extending from each platform) will not result in further impacts to shipping.	No impacts expected						
			Recreational Activities	Recreational activities may occur within the Operational Area such as recreational fishing, recreational boating and leisure activities. However, given the distance from shore and the existing PSZs, no interaction with recreational activities is expected.	No impacts expected						
ROV Operations	<u>Seabed Disturbance</u> ROV operations typically take place above the seabed however, operations close to and on the seabed can	<u>Change in water quality</u> Seabed disturbance can lead to increased turbidity, which affects water quality.	Ambient water quality	Water quality change occurs when seabed sediments enter the water column (turbidity). After a period, the suspended sediments settle and the turbidity in the water column returns to pre disturbance levels. Any impacts will be highly localised and temporary. ROV Operations are intermittent, and ambient water quality will quickly return to background levels following seabed disturbance. Impacts will have inconsequential or no adverse effects on ambient water quality, and no impacts to ecological, economic, cultural or social receptors are expected as a result of a change in water quality.	IV	A	None identified	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved.	Acceptable

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
	lead to seabed disturbance.									• Activity will not result in serious or irreversible damage • No control measures identified which can further lower the impact consequence • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	
Vessel Operations Helicopter Operations	<u>Underwater Sound Emissions</u>	<u>Change in ambient noise</u>	Ambient noise	Vessels holding position generate sound of up to 182 dB re 1 µPa, with levels of 120 dB re 1 µPa recorded at 3–4 km (McCauley, 1998). Sound emitted from helicopter operations is typically of a low frequency, below 500 Hz (Richardson et al., 1995). Ambient noise levels increase in close proximity to shipping traffic. Given the proximity of the Operational Area to busy shipping lanes, 120 dB re 1 µPa is considered a conservative estimate of ambient noise levels. Any impacts to ambient noise will therefore be highly localised (within 3-4km of the source) and temporary, with ambient levels returning once the source moves away from an area. Impacts will be inconsequential or have no adverse effects.	IV	A	**CM8:** Vessel Master **CMP4**: Helicopter Pilot	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage • Activity will not impact the long term survival and recovery of listed and threatened fish, marine mammals or marine reptiles and will be undertaken in accordance with all applicable management actions and be consistent with conservation management plans. • Good practice control measures have been defined and implemented • Control measures are consistent with Esso's Environment Policy • The activity meets ExxonMobil Environmental Standards	Acceptable
		<u>Change in fauna behaviour</u> Underwater sound emissions generated by vessel and helicopter operations can result in a change in fauna behaviour.	Fish	Sound generated by vessel operations will be below the recoverable injury threshold for fish (~207 dB re1µPa; Popper et al. 2014), and below the levels that strong 'startle' response has been observed (185 - 190 dB RMS; Pearson et al. 1992; Wardle et al. 2001). Limited research has been conducted on shark responses to noise, however studies indicate that sharks will move suddenly away from sounds of more than 20 dB re 1µPa above broadband ambient SPL when approaching within 10m of the source (Myrberg, 1978). Based on levels adopted by NOAA Fisheries, the US Fish and Wildlife Services, and Canadian Science Advisory Secretariat (DFO, 2004), a conservative threshold level of 130 dB RMS for behavioural changes in fish has been adopted. Based on spherical spreading (Richardson et al., 1995), sound levels will reduce to below this level within approximately 400m of the vessel. Any impacts will be limited to within this localised area. The frequency of helicopter noise is at the lower end of typical fish hearing range, however sensitivity varies between different species due to, for example, the presence / absence of a swim bladder. Studies (e.g. Greene and Moore 1995) indicate that, although sound generated by helicopters can be detected underwater, it will likely be masked by other noise sources such as platform noise, and no direct impacts from helicopter noise are therefore expected. The Operational Area is within a distribution BIA for the great white shark; however, no threats have been identified in the Recovery Plan for the White Shark (*Carcharodon carcharias*). Impacts to fish are expected to be highly localised (i.e. within 400m of the sound source), and short-term (behavioural changes will cease once the noise subsides). There is likely to be multiple vessels operating at any one	IV						

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP: ALARP Decision Context	Demonstration of ALARP: Good Practice Control Measures	Demonstration of ALARP: Additional Control Measures Considered	Demonstration of ALARP: ALARP Outcome	Demonstration of Acceptability: Acceptability Assessment	Demonstration of Acceptability: Acceptability Outcome
				time within the Operational Area, therefore it is possible that cumulative effects could occur (from multiple vessels and from combination of vessel and platform emissions). Areas of higher activity, such platform complexes, or periods of higher activity, such as IMR activities using vessels, will be isolated and will not result in population or ecosystem level effects. Any impacts will be inconsequential or have no adverse effect.						and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	
			Marine Reptiles	Using the limited information available, it has been reported that behavioural changes and impairment of hearing sensitivity in marine turtles are likely to occur at levels above 120 dB re 1 µPa (SVT Engineering Consultants 2009). Based on spherical spreading (Richardson et al., 1995), sound levels will be reduced to below 120 dB RMS within 1300m of the source. Any impacts will be limited to within this localised area. Five listed / threatened species of marine turtle may occur within the Operational Area, although there are no BIAs or critical habitats located within the PEA and all marine turtles are known to have a more northerly distribution. The Recovery Plan for Marine Turtles in Australia, 2017-2027, lists noise interference as a key threat. Impacts to marine turtles are expected to be localised (i.e. within 1300m of the sound source), and short-term (behavioural changes will cease once the noise subsides). Any behavioural impacts resulting from underwater sound emissions will not impact the long term survival and recovery of threatened marine turtles. There is likely to be multiple vessels operating at any one time within the Operational Area, therefore it is possible that cumulative effects could occur (from multiple vessels and from combination of vessel and platform emissions). Areas of higher activity, such platform complexes, or periods of higher activity, such as IMR activities using vessels, will be isolated and will not result in population or ecosystem level effects. Given the receptor sensitivity to environmental impacts, potential short-term, minor adverse effects are possible.	III	A					
		Injury, harm or interference with marine mammals	Marine Mammals	Cetaceans and pinnipeds can experience permanent (PTS) and temporary threshold shift (TTS) and behavioural responses to underwater sound emissions. Behavioural responses range from subtle changes in surfacing and breathing patterns, to cessation of vocalisations, to active avoidance or escape from the area of insonification. Using the National Marine Fisheries Service (NMFS) guidance for non-pulsed sound, such as vessel noise, a behavioural disturbance limit of 120 dB RMS is adopted (NFMS, 2016). Richardson et al. (1995) and Southall et al. (2007) indicate that behavioural avoidance by baleen whales may onset from 140 to 160 dB re1µPa or possibly higher. Based on spherical spreading (Richardson et al., 1995), calculated that sound levels will be reduced to below 120 dB RMS within 1300m of the source in those conditions. Any impacts will be limited to within this localised area. The Operational Area is within the following BIAs: southern right whale (distribution), pygmy blue whale (foraging, distribution), and several other threatened species of marine mammals may be present within the Operational Area. Anthropogenic noise is listed as a threat in the Conservation Management Plan for the Southern Right Whale, 2011-2021 (CMPSRW) (DSEWPAC, 2012c) and Conservation Management Plan for the Blue Whale, 2015-2025. May to October is the peak season for Southern right whales (SRW) in Australia. The BIA for migration and resting on migration for SRW (coastal BIA) includes the coastline from NSW around to the SA coast, part of which is adjacent to the Bass Strait facilities with whales preferentially occupying water less than 10 metres deep (DSEWPAC, 2012a). While it is	III	B	**CM8**: Vessel Master **CMP4**: Helicopter Pilot **CMP33**: Noise Management **CMP26**: Fauna Observations				

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						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
				not known which path SRWs take to travel to and from the coast, it is possible they may traverse the operational areas in Bass Strait, where if higher noise activity is occurring (e.g., combination of cutting, grinding, vessel on DP) which exceeds the thresholds for Low Frequency cetaceans [PTS (199 SELcum 24 hr^{-1}) or TTS (179 SELcum 24 hr^{-1}) or behavioural change (120 dB RMS)] then this may interfere with migrating SRWs. Noise modelling was conducted for the Esso SHA P&A campaign (Jasco 2020) which had a jack-up rig, a standby vessel (at 1km) and another vessel (on DP) next to the rig operating an ROV doing underwater cutting. The model showed that at no point did sound pressure levels reach the 179 or 199 dB re 1 µPa. When considering 24hr cumulative sound exposure, PTS thresholds were predicted within 30m of the source and TTS out to 1.4km from the source. Behavioural thresholds of 120 dB re 1 µPa were predicted to 4.5km from the source. PTS and TTS values do not incorporate animal movement and therefore it is highly unlikely an animal would be exposed within these ranges over a continuous 24hr period. It is also unlikely for the noise to be maintained constantly at the high rate as operations (and corresponding noise levels) vary over a 24 hr period (e.g., platform resupply generally takes ~3-4 hrs and cutting in the SHA P&A campaign took ~4-6 hrs). The closest operating facility in Bass Strait from the coastal BIA where SRWs are most likely to be resting (and remain stationary) if present, is over 15km away. A combination of 4 noise sources occurring simultaneously would also be unlikely during routine operations. Given these factors, the risk of PTS or TTS is not considered credible. Behavioural impacts to marine mammals are expected to be localised when high noise sources are occurring simultaneously (dependent on activity), and short-term, behavioural changes will cease once the noise subsides. Any behavioural impacts resulting from underwater sound emissions will not impact the long term survival and recovery of threatened marine mammals. There is likely to be multiple vessels operating at any one time within the Bass Strait Operational Area, therefore it is possible that cumulative effects could occur (from multiple vessels and from combination of vessel and platform emissions) depending on the location and types of activities. Areas of higher activity, such as platform complexes, or periods of higher activity, such as IMR activities using vessels, will be isolated and managed through noise control measures in peak SRW period between May and October inclusive and will not result in population or ecosystem level effects for SRW. This is consistent with the requirements of the recovery plan in the CMPSRW.							
Vessel Operations ROV Operations	<u>Light Emissions</u> Navigational and safety lights used during normal vessel operations will result in light emissions. Light from ROVs may attract fish and marine fauna.	<u>Change in ambient light</u>	Ambient Light	Light emissions from vessel operations and ROVs will result in a change in ambient light. Light glow from the vessel is likely to be limited to the operational area and temporary in nature as the vessel moves through the water. As vessels will operated predominantly within the PSZ of existing platforms, vessel light is unlikely to be detectable within the existing light glow. Where vessels are operating at subsea facilities or pipelines, impacts will be inconsequential or have no adverse effect.	IV	A	**CMP30**: Vessel Lighting will be limited to that needed for safe work and navigation	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage • Activity will not impact the long term survival and recovery of listed and	Acceptable
		<u>Change in fauna behaviour</u> A change in ambient light levels could result in a localised light glow. This can lead to changes in fauna behaviour.	Fish	Fish, squid and zooplankton may be directly or indirectly attracted to lights at distances of up to 5 km (Shell, 2010), leading to aggregation at the surface and increased predation. These organisms' distributions are driven by oceanographic conditions, with seasonal and diurnal movements. For fish and squid, it is expected that any potential impact of increased predation would be undetectable at a population level and only affect transient individual fish and squid. The proportion of zooplankton exposed and subjected to higher predation rates within the vessel light fields is negligible. In the event that deck or navigational lighting results as an attractant to an occasional	IV						

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP: ALARP Decision Context	Demonstration of ALARP: Good Practice Control Measures	Demonstration of ALARP: Additional Control Measures Considered	Demonstration of ALARP: ALARP Outcome	Demonstration of Acceptability: Acceptability Assessment	Demonstration of Acceptability: Acceptability Outcome
				seabird, it is not expected that this will permanently impact on migration or other behaviours. The Operational Area is within a distribution BIA for the great white shark; however, no threats have been identified in the Recovery Plan for the White Shark (*Carcharodon carcharias*). Impacts to fish are expected to be localised (i.e. within 5km of the light source), and short-term (behavioural changes will cease once the light ceases). Any impacts will be inconsequential or have no adverse effect.						threatened fish, birds or marine reptiles and will be undertaken in accordance with all applicable management actions. • No control measures identified which can further lower the impact consequence • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	
			Birds	High levels of offshore lighting can attract and disorient seabird species resulting in behavioural changes (e.g. circling light sources leading to exhaustion or disrupted foraging), injury or mortality near the light source. Artificial light can cause significant impacts on burrow-nesting petrels and shearwaters. Fledglings often become disoriented and grounded because of artificial light adjacent to rookeries as they attempt to make their first flight to sea, a phenomenon known as 'fallout'. Rodrigez at al. (2014) investigated the effects of artificial lighting from road lighting on short-tailed shearwater fledglings. The study established that, by removing the light source from nesting areas, there was a decrease in grounded fledglings and a corresponding reduction in bird fatalities. The Operational Area is within foraging BIAs for black browed albatross, Campbell albatross, Indian yellow nosed albatross and wandering albatross, antipodean albatross, Buller's albatross, shy albatross, common diving petrel, white-faced storm petrel, and short-tailed shearwater. Light emissions are not identified as a threat in conservation advice or recovery plans for any of these species. Any impacts to birds from light emissions will be localised and have little / no adverse effect.	IV						
			Marine Reptiles	Light pollution can be an issue along, or adjacent to, turtle nesting beaches where emerging hatchlings orient to, and head towards, the low light of the horizon unless distracted by other lights which disorient and affect their passage from the beach to the sea (EA, 2003). Pendoley (2000) discovered that in the absence of illumination from the moon, glow from tower flares may influence the orientation of turtles at close range (30–100 m). Five listed / threatened species of marine turtle may occur within the Operational Area, although there are no BIAs or critical habitats located within the PEA and all marine turtles are known to have a more northerly distribution. The Recovery Plan for Marine Turtles in Australia, 2017-2027, lists light pollution as a key threat, however this relates specifically to turtle hatchlings and nesting sites. There are no nesting sites within 5 km of the Operational Area, therefore any impacts will be inconsequential or have no adverse effect.	IV						
Vessel Operations	<u>Emissions to Air</u> Vessels are powered via the use of on-board generators. The operation of these (fuelled by	<u>Change in air quality</u> The release of combusted and un-combusted hydrocarbons into the atmosphere can lead to a decline in air quality, cause atmospheric pollution	Air quality	Atmospheric emissions will be generated from combustion during vessel operations. The presence of these emissions in the air will lead to a localised decline in air quality. Impacts to air quality from emissions to air will be localised to the source and quickly dissipated in the offshore environment. Any impacts will be inconsequential or have no adverse effect.	IV	A	**CM9:** Class certification	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and	Acceptable
			Climate	Global greenhouse gas (GHG) generated by Esso operations in the Bass Strait are reported under the NGER Scheme. Data publish by NGER (2019) demonstrates that oil & gas activities contribute significantly less to state and	IV						

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
	MDO) will result in combustion emissions.	and contribute to greenhouse gases.		country-wide GHG emissions than electricity supply and mining industries. Esso is not listed as a top-contributor for Scope 1 or Scope 2 emissions, therefore contribution to GHG emissions (and subsequent change in climate) is considered to be low. Based on this, the primary action (i.e. Esso operations in the Bass Strait) does not represent a 'substantial case; of the circumstance (climate change). Therefore, climate change is not considered an indirect consequence of Esso operations in the Bass Strait for the purposes of Section 527E of the EPBC Act (DSEWPaC 2013a). Impacts to climate from vessel operations emissions will be localised and will quickly dissipate in the high energy marine environment. Any impacts will be inconsequential / have no adverse effect.						ecological integrity is conserved. • Activity will not result in serious or irreversible damage • Activity will not impact the long term survival and recovery of listed and threatened bird species and will be undertaken in accordance with all applicable management actions. • Good practice control measures have been defined and implemented • Control measures are consistent with Esso's Environment Policy • Class certification ensures that vessels adhere to the rules of an IACS Member society, such as MARPOL requirements and Marine Orders. • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	
		<u>Injury / mortality to fauna</u> Generation of atmospheric emissions has the potential to result in chronic effects to fauna from localised and temporary decrease in air quality.	Birds	Models of combustion emissions from MODU operations (e.g. BP, 2013) indicate that non-GHG emissions such as NO_2 will reduce to below polluting concentrations within 10 km of the source. It is expected that vessel operations will generate less emissions than MODU operations, therefore the impact area is expected to be reduced. The Operational Area is within foraging BIAs for black browed albatross, Campbell albatross, Indian Yellow nosed albatross and Wandering albatross, Antipodean albatross, Buller's albatross, shy albatross, common diving petrel, white-faced storm petrel, and short-tailed shearwater. Atmospheric emissions or reduction in air quality are not identified as a threat in the conservation advice or recovery plans for any of these species. There is likely to be multiple vessels operating at any one time within the Operational Area, therefore it is possible that cumulative effects to birds could occur (from multiple vessels and from combination of vessel and platform emissions). Areas of higher activity, such platform complexes, or periods of higher activity, such as IMR activities using vessels, will be isolated and will not result in population or ecosystem level effects. Birds are sighted at all platforms within the Operational Area, indicating that a change in air quality is not leading to injury or mortality in bird species observed. Considering this, and the potential for sensitive life stages to be present, impacts are expected to have potential short term, minor adverse consequences.	III						
Vessel Operations	<u>Planned Discharge – Brine</u> Brine is created by the onboard desalination system, via Reverse Osmosis (RO). It will be discharged intermittently, during vessel movement.	<u>Change in water quality</u> Planned discharges of brine will lead to a change in water quality through: • Increased salinity • Chemical exposure	Ambient Water quality	Modelling of brine discharges from a vessel (Frick et al., 2001) assuming no ocean current predict salinity levels would return to ambient levels within 4m of the discharge point. Scale inhibitors and biocides are used in RO systems and will therefore be present in the discharged brine. However, chemicals are used at trace concentrations that would be suitable for human consumption, therefore no impacts to plankton from chemical exposure are expected. Impacts to ambient water quality will be localised (within 4m of the discharge point) and temporary, with any discharges quickly dissipated in the high energy marine environment. Any impacts will be inconsequential or have no adverse effect. Given the small impact area and short-term nature of the impact, no impacts to ecological, economic, cultural or social receptors will occur.	IV	A	None identified	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage • No control measures identified which can	Acceptable

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
										further lower the impact consequence • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	
Vessel Operations	Planned Discharge - Cooling Water	Change in water quality Discharges of cooling water can lead to changes in water quality through: • Increased temperature • Chemical exposure	Ambient Water quality	Discharges of cooling water from vessels will lead to a change in water quality. Volumes will vary with vessel size, however the maximum expected discharge is approximately 50 m³/d. Vessels requiring cooling water may discharge water continuously, however vessel presence within the Operational Area varies and continuous discharge of cooling water in a single location is not expected. Once a vessel moves away from an area, the high energy marine environment is expected to result in the change in water quality quickly dissipating, and ambient water quality will be quickly restored. Impacts will be localised and short-term. Cumulative impacts are not expected. Any impacts will be inconsequential or have no adverse effects on ambient water quality.	IV	A	None identified	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage • Activity will not impact the long term survival and recovery of listed and threatened fish, marine mammals or marine reptiles and will be undertaken in accordance with all applicable management actions. • No control measures identified which can further lower the impact consequence • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	Acceptable
		Injury / mortality to fauna	Plankton	Early lifestages of fish (embryos, larvae) and other plankton would be most susceptible to the toxic exposure from chemicals in the vessel cooling water discharges, as they are less mobile and therefore can become exposed to the plume at the outfall. However, these are expected to rapidly recover once the activity ceases, as they are known to have high levels of natural mortality and a rapid replacement rate (UNEP, 1985). As such, exposure of planktonic communities to cooling water discharge is not considered to result in significant impacts on population level of organisms that would affect ecological diversity or productivity within Commonwealth marine areas. Rather it is considered to result in an undetectable or limited local degradation of the environment, rapidly returning to original state by natural action. Any impacts will be inconsequential or have no adverse effects.	IV						
			Fish	Modelling of continuous wastewater discharges (including cooling water) found that the temperature of the discharge decreases quickly as the discharge stream mixes with the receiving waters, with the temperature being <1 °C above ambient within 100 m (horizontally) of the discharge point, and 10 m vertically (WEL, 2014). Note that this study was undertaken at a facility and not from a vessel, therefore is considered conservative. Fish passing through the area will be able to actively avoid entrainment in any heated plume (Langford, 1990). Acclimation of test organisms at 15, 20 and 25°C allowed them to tolerate temperature increments of 8-9°C without damage (UNEP, 1985). The Operational Area is within a distribution BIA for the great white shark; however, no threats have been identified in the Recovery Plan for the White Shark (*Carcharodon carcharias*). Impacts to fish are expected to be highly localised (i.e. 100m of the discharge stream), and short-term (high-energy marine environment will dissipate the	IV						

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
				discharge stream quickly, no long-term continuous discharges expected). Any impacts will be inconsequential or have no adverse effect.							
			Marine Mammals	Similar to fish, marine mammals passing through the area will be able to actively avoid any heated plume (Langford, 1990). Acclimation of test organisms at 15, 20 and 25°C allowed them to tolerate temperature increments of 8-9°C without damage (UNEP, 1985). The Operational Area is within the following BIAs: southern right whale (distribution), pygmy blue whale (foraging, distribution), and several other threatened species of marine mammals may be present within the Operational Area. A change or reduction in water quality has not been identified as a threat in any of the relevant conservation advice or management / recovery plans for these species. Impacts to marine mammals are expected to be highly localised (i.e. 100m of the discharge stream), and short-term (high-energy marine environment will dissipate the discharge stream quickly, no long-term continuous discharges expected). Any impacts will be inconsequential or have no adverse effect.	IV						
			Marine Reptiles	Marine reptiles would be expected to behave in a similar way to fish and marine mammals and would actively avoid a heated plume (Langford, 1990). Acclimation of test organisms at 15, 20 and 25°C allowed them to tolerate temperature increments of 8-9°C without damage (UNEP, 1985). Five listed / threatened species of marine turtle may occur within the Operational Area, although there are no BIAs or critical habitats located within the PEA and all marine turtles are known to have a more northerly distribution. The Recovery Plan for Marine Turtles in Australia, 2017-2027, lists chemical discharge as a key threat, specifically long term exposure to anthropogenic contaminants. Biocides and scale inhibitors typically released with cooling water discharges will be of low concentration and have a low level of bioavailability meaning they will not accumulate within the food chain. Impacts to marine turtles are expected to be highly localised (i.e. 100m of the discharge stream), and short-term (high-energy marine environment will dissipate the discharge stream quickly, no long-term continuous discharges expected). Impacts are not expected to impact the long term survival and recovery of threatened marine turtles. Any impacts will be inconsequential or have no adverse effect.	IV						
Vessel Operations	<u>Planned Discharge - Deck Drainage & Bilge</u> Deck drainage and bilge water can be contaminated with hydrocarbons, oil, detergents, hydraulic oil, and chemicals. Bilge water is treated onboard using an oily water	<u>Change in water quality</u> A discharge of contaminated deck drainage or bilge water can lead to a change in water quality.	Ambient water quality	Discharges of deck drainage and bilge during vessel operations will lead to a change in water quality through increased turbidity and chemical toxicity. Deck drainage water and bilge water generally consists of a mixture of fresh water, sea water, oil, sludge, chemicals and various other fluids. Discharges will be highly localised and infrequent with high dilution and dispersion rates due to wave and ocean currents. Therefore, decreased turbidity is expected to be very short term, hours rather than days. Bilge water will be treated prior to discharge via an oil in water separator (OWS) with a maximum concentration of 15 ppm oil-in-water being achieved prior to discharge. The remaining oil residue will be retained onboard for onshore disposal. Modelling (Shell, 2010) indicates that chemicals and hydrocarbon discharges will disperse rapidly to below the Predicted No Effect Concentration (PNEC) within 70 m, with no long-term impacts expected. Impacts will be localised to the discharge location. As discharges will be intermittent and vessels will be moving around the operational area, impacts are expected to be short-term with water quality quickly returning to ambient levels. Cumulative impacts are not expected. Any impacts will be	IV	A	**CM9:** Class certification	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage	Acceptable

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
	separator (OWS).			inconsequential or have no adverse effect, and no impacts to ecological, economic, cultural or social receptors are expected.						• Good practice control measures have been defined and implemented • Control measures are consistent with Esso's Environment Policy • Class certification ensures that vessels adhere to the rules of an IACS Member society, such as MARPOL requirements and Marine Orders. • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	
Vessel Operations	<u>Planned Discharge - Sewage and Grey water</u> Vessels typically generate around 5-15 m^3 of wastewater (consisting of sewage and grey water) per day. Discharges will be made while in transit.	<u>Change in water quality</u> Change in water quality can occur through: • Nutrient loading (e.g. ammonia, nitrite, nitrate and orthophosphate). • Chemical exposure (organics and inorganics) • Turbidity / sedimentation of particulate matter	Ambient water quality	Nutrient loading can lead to increased growth in primary producers (such as plankton), followed by oxygen depletion. Modelling (Woodside, 2008) of a 10m^3 discharge from a stationary source over a 24 hour period shows that sewage was reduced to approximately 1% of the original concentration within 50m of the discharge. Discharges from vessels will likely be made during transit, greatly decreasing the impact area. The composition of sewage and grey water may include chemicals including organics (e.g. volatile and semi-volatile organic compounds, oil and grease, phenols, endocrine disrupting compounds) and inorganics (e.g. hydrogen sulphide, metals and metalloids, surfactants, phthalates, residual chlorine). There is also the potential for biological pathogens, such as bacteria, viruses, protozoa, parasites, etc. Organic chemicals are expected to degrade; however, some persistence may occur within sediments. In open water environments such as the Bass Strait, discharges are rapidly dispersed, and any nutrient enrichment, chemical exposure or increase in turbidity will be short-term and localised with no accumulation of impacts expected. Cumulative impacts are not expected. Impacts will be inconsequential or have no adverse effect.	IV	A	**CM9:** Class certification	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage • Good practice control measures have been defined and implemented • Control measures are consistent with Esso's Environment Policy • Class certification ensures that vessels adhere to the rules of an IACS Member society, such as MARPOL requirements and Marine Orders.	Acceptable
		<u>Injury / mortality to fauna</u> A change in water quality caused by sewage and greywater discharges could result in injury or mortality to fauna.	Plankton	Plankton communities have a naturally patchy distribution in both space and time (ITOPF, 2011). They are known to have naturally high mortality rates (primarily through predation); however, in favourable conditions (e.g. supply of nutrients), plankton populations can rapidly increase. Once the favourable conditions cease, plankton populations will collapse and/or return to previous conditions. Plankton populations have evolved to respond to these environmental perturbations by copious production within short generation times (ITOPF, 2011). However, any potential change in phytoplankton or zooplankton abundance and composition is expected to be localised, typically returning to background conditions within tens to a few hundred metres of the discharge location (e.g. Abdellatif, 1993; Axelrad et al., 1981; Parnell, 2003).	IV						

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP: ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Demonstration of Acceptability: Acceptability Assessment	Acceptability Outcome
				Effects on environmental receptors along the food chain, namely, fish, reptiles, birds and cetaceans are therefore not expected beyond the immediate vicinity of the discharge in open waters. In open water environments such as the Bass Strait, discharges are rapidly dispersed, and any nutrient enrichment, chemical exposure or increase in turbidity will be short-term and localised with no lasting impacts expected. Any impacts will be inconsequential or have no adverse effects.						• The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	
			Commercial Fisheries	There are six Commonwealth-managed fisheries and three Victorian State-managed fisheries which may undertake fishing activities within the Operational Area. Fisheries effort data shows that relatively small numbers of vessels are likely to be encountered within the Operational Area. It is possible that seafood fished within the immediate vicinity of the discharge may not be safe for human consumption or may be tainted due to the presence of chemicals that bioaccumulate. In open water environments such as the Bass Strait, discharges will be rapidly dispersed, and chemical toxicity will be short-term and localised with no lasting impacts expected. Any impacts are expected to be limited to the Operational Area and, given the extensive operating area utilised by Commonwealth and State fisheries and the low number of vessels likely to be operating within the Operational Area, will have inconsequential or no adverse effects.	IV						
		<u>Change in aesthetic value</u> Solids found in sewage can affect the aesthetic value of an area such as ambient water colour, the presence of surface slicks/sheens and odour.	Tourism	Changes in water quality can lead to a change in aesthetic value. As described above, the intermittent discharge and high-energy marine environment means that discharges are expected to be quickly dissipated, with impacts restricted to the localised area around the discharge. Given the distance of the Operational Area from the nearest tourist site, and the low likelihood of tourism or recreation vessels within the Operational Area due to the distance from shore, presence of PSZ and lack of tourist features, no impacts to tourism from changes in aesthetic value are expected.	No impacts expected						
Vessel Operations	<u>Planned Discharge – Food waste</u> 1-2kg of food waste will be discharged per person per day. Discharges will be made while in transit.	<u>Change in fauna behaviour</u> Increased scavenging behaviour.	Fish Birds	Discharge of food waste from moving vessels may result in a localised, temporary increase in scavenging behaviour by fish and birds. In the high energy marine environment of the Bass Strait any discharges will be rapidly dispersed, therefore impacts will be limited to the Operational Area. In addition, the rapid consumption of this food waste by scavenging fauna, and physical and microbial breakdown, ensure that the impacts of food waste discharges are limited to the discharge point. The Operational Area is within a distribution BIA for the great white shark; however, no threats have been identified in the Recovery Plan for the White Shark (*Carcharodon carcharias*). The Operational Area is within foraging BIAs for black browed albatross, Campbell albatross, Indian yellow nosed albatross and wandering albatross, antipodean albatross, Buller's albatross, shy albatross, common diving petrel, white-faced storm petrel, and short-tailed shearwater. Changes to predator / prey dynamics are not identified as a threat in the conservation advice or recovery plans for any of these species. Impacts to fish and birds from the planned discharge of food waste are expected to be highly localised (due to the high energy marine environment, intermittent discharge and rapid consumption) and temporary (behavioural changes will cease once water quality returns to background levels).	IV	A	**CM9:** Class certification	None	ALARP	• Impact is Consequence III or less • Impact is well understood • Principals of ESD met: • No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved. • Activity will not result in serious or irreversible damage • Activity will not impact the long term survival and recovery of listed and threatened birds or fish and will be undertaken in accordance with all	Acceptable

Activity	Aspect	Impact	Affected Receptor	Consequence Evaluation	Consequence Level	Demonstration of ALARP				Demonstration of Acceptability	
						ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
				Cumulative impacts are not expected Any impacts will be inconsequential or have no adverse effect.						applicable management actions. • Good practice control measures have been defined and implemented • Control measures are consistent with Esso's Environment Policy • Class certification ensures that vessels adhere to the rules of an IACS Member society, such as MARPOL requirements and Marine Orders. • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	

6.3 Planned Discharge - Produced Formation Water

6.3.1 Produced Formation Water Discharges

Formation water is naturally occurring water found within formations of the reservoir. During platform operations, wells bring water to the surface alongside the oil and gas, then the produced formation water (PFW) is separated and treated to remove hydrocarbons prior to discharge. Separation of formation water from reservoir fluids is not completely effective, and separated PFW often contains small amounts of naturally occurring substances including dispersed oil, dissolved organic compounds (aliphatic and aromatic hydrocarbons, organic acids and phenols), inorganic compounds (e.g. soluble inorganic chemicals, dissolved metals) and residual process chemicals. A description of the existing PFW system is provided in Section 2.4.1.1.

6.3.2 Monitoring and Management Framework

This section outlines the monitoring and management framework which Esso have developed to support the monitoring of PFW discharges from offshore assets. For a full description of the monitoring and management framework refer to Volume 4, Section 2.6.5.

Environmental values are defined as particular values or uses of the environment that are important for a healthy ecosystem or for public benefit, welfare, safety or health, and which require protection from the effects of pollution, waste discharges and deposits (Australian and New Zealand Environment Conservation Council (ANZECC)/Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) 2000a). The environmental values considered relevant are:

- Aquatic ecosystem integrity – maintaining ecosystem processes (primary production, food chains) and the quality of water, biota and sediment
- Cultural and spiritual – including commercial and recreational fisheries

Key elements to maintain ecosystem integrity have been identified as water quality, sediment quality and biological indicators (biota). By limiting the changes to these key elements to an acceptable level there is high confidence ecosystem integrity is maintained. For each element an indicator has been identified and monitoring designed to identify change. Monitoring change in water quality and sediment quality (at representative facilities) as well as investigating potential toxicity via Whole Effluent Toxicity (WET) testing and implementing management to maintain acceptable level of change is standard industry practice in Commonwealth waters. The relevant indicators to understand change in key elements and, therefore, potential for impact to ecosystem integrity, are physio-chemical stressors, toxicants in water, biological indicators and toxicants in sediment. A number of trigger values for each indicator have been defined and are monitored to detect change. Trigger values serve as an early warning that potential changes beyond the acceptable limits may occur. The acceptable limits of change from PFW discharge within and beyond the mixing zone (the mixing zone boundary for each platform is outlined in Table 6-5) are:

- no significant impacts to MNES (per Significant Impact Guidelines [DOE, 2013])
- no direct impact to benthic habitat
- no taint of fisheries stock
- no seafood is unsafe for human consumption
- no interference with commercial fishing operations

To determine if acceptable limits have been exceeded, routine monitoring of trigger values is undertaken. An approved mixing zone protects 99% of species, as calculated using the Warne et al (2018) statistical distribution methodology on the results of direct toxicity assessment using sub-lethal chronic endpoints. The protection of 99% of species maintains a high level of ecological protection and represents no detectable change from natural variation (as per ANZG (2018)).

For each platform that discharges produced formation water, the following is discussed:

- Discharge regime (i.e. Volume flow rate of the discharge),
- Composition (physical and chemical make-up including chemical additives, constituents of potential concern, ecotoxicology),
- Potentially impacted area and receptors (movement, dispersion and dilution of discharge, and in-situ research findings)
- Potential impacts to receptors within the mixing zone, considering:
- Presence/distance to sensitive receptors (exposure assessment)
- Likely impacts to sensitive receptors including any cumulative impacts, considering
- Fate and behaviour of PFW, possible impact pathways to receptors
- Composition (physical and chemical make-up including chemical additives, constituents of potential concern, ecotoxicology of the platform's whole effluent discharge).

A summary of the PFW discharge characteristics is presented for all the platforms in Table 6-5.

Table 6-5 PFW discharge characteristics per platform

Platform	Discharge depth (m)	Water depth (m)	Discharge orientation	Discharge rate (kL/d)	Meets all ANZECC 95% water quality criteria	Meets all ANZECC 99% water quality criteria	Hydrocarbons dilution*	Trend	PAH dilution*	Trend	Metals dilution*	Trend	Meets all ANZECC shellfish taint criteria	Meets whole effluent ecotoxicology 95% species protection criteria	Meets whole effluent ecotoxicology 99% species protection criteria	Meets background TOC and hydrogen sulphide levels	Mixing zone extent (m)
HLA	11	73	vertically downward	6000 - 10000	<4.3 m	<4.3 m	8 x	Stable	8 x	Stable	16 x	Stable	<4.3 m	<47 m	<160 m	<150 m	**160 m**
CBA	28	78	vertically downward	8000 - 12000	<10 m	<10 m	7 x	Stable	7 x	Stable	12 x	Stable	0.9 m	<60 m	60 m	<160 m	**160 m**
WKF	16	76	vertically downward	7000 - 10000	<17 m	<160 m #	7 x	Stable	7 x	Stable	414 x #	Stable	<17 m	<28 m	<42 m	<160 m	**160 m**
TNA	29	59	vertically downward	2500 - 4000	<19.4 m	<19.4 m	16 x	Stable	16 x	Stable	47 x	Stable	<12.5 m	<130 m	<140 m	<130 m	**140 m**
SNA	8.2	55	vertically downward	1500 - 2000	<80 m	<230 m	30 x ^	Stable	30 x ^	Stable	3286 x #	Stable	<8 m	<80 m	<110 m	<120 m	**230 m**
MLB	11	59	vertically downward	1000 - 2450	<12 m	<12 m	16 x	N/A	16 x	N/A	47 x	N/A	<7.8 m	<90 m	<140 m	< 90 m	**140 m**

Trend taken from 2014-20 data. Note that WET testing was completed on all currently discharging platforms in 2020, however only data for CBA and WKF is available at the time of writing.

Mixing zone extents are based on the maximum of four criteria relative to the maximum detected chemical constituent in PFW– (1) distance to ANZECC 99% water quality criteria, (2) distance to ANZECC shellfish taint criteria, (3) distance to whole effluent ecotoxicity 99% species protection levels, (4) distance to background TOC (proxy for naphthenic acids) and hydrogen sulphide levels. Distance is calculated using the results from a dispersion model for each platform's discharge.

For more details, see Appendix F: PFW Data file. For MLB, TNA has been used as an analogue for chemical characterisation.

*Dilution as the number of times the maximum detected result (2014-20 sampling rounds) is above ANZECC 99% water quality criteria. 'Hydrocarbons' is inclusive of Benzene, 1,2,4-trichloro benzene, Naphthalene, Phenol, Pentachlorophenol, 1,1,2-trichloroethane. 'Metals' is inclusive of Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Silver, Vanadium and Zinc. 'PAHs' is Naphthalene.

These are due to the presence of [Total] Chromium in WKF and SNA discharge, which has been assumed to be the most toxic form (CrVI) to give a conservative estimate. These would be reduced to 8 times and 600 times for WKF and SNA respectively assuming that Chromium is of a lower toxicity form (CrIII).

^ Due to one sample from 2014. Results since have shown around half this value for Naphthalene as the upper 95% confidence level. Benzene is the next highest dilution factor at 18 x.

To understand potential impacts from PFW discharges, we have undertaken a suite of comprehensive testing and sampling related to PFW discharges from each relevant offshore production facility. The details of this testing and resultant understanding of potential environmental impacts from any given platform's PFW discharge are outlined below. Note: If no PFW is discharged, this impact and associated EP requirements would cease.

6.3.3 Tuna platform

6.3.3.1 Volume

A summary of historic and five-year-projected PFW discharge volume from the platform is provided in Figure 6-1 and Figure 6-2 respectively. The maximum capacity of the system is 6000 kL/d, however based on historical discharge rates the platform is expected to discharge produced water at a much lower rate of approximately 3000 kL/d until the oil system is shut in in approximately 2022/2023.

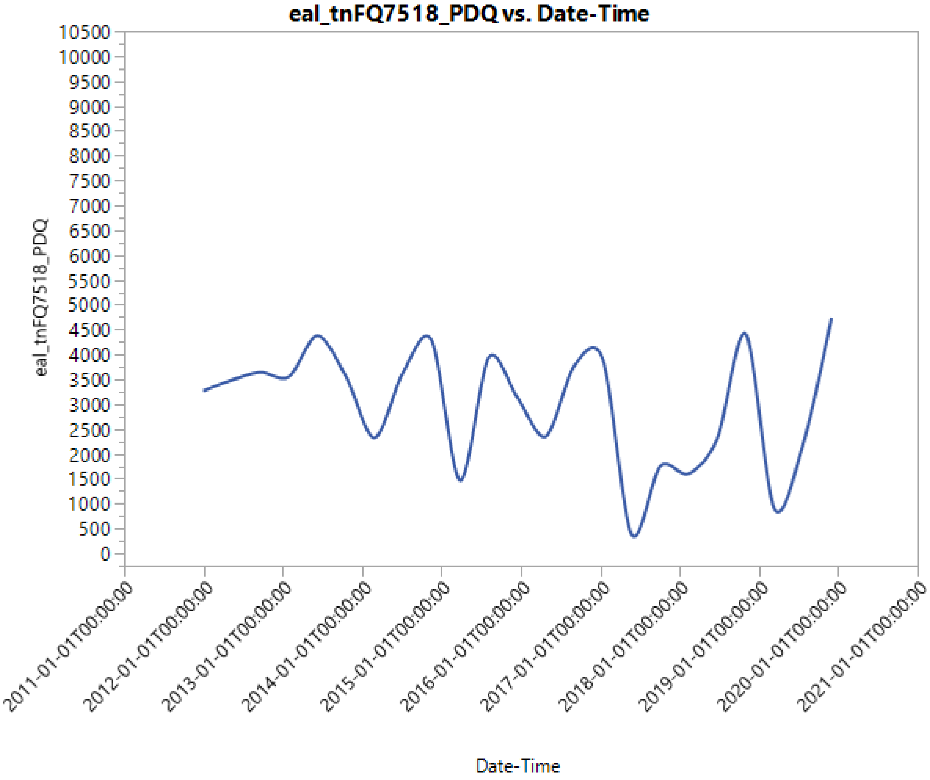


Figure 6-1 Historic TNA smoothed overboard PFW discharge volume (kL/d) (2012-2019)

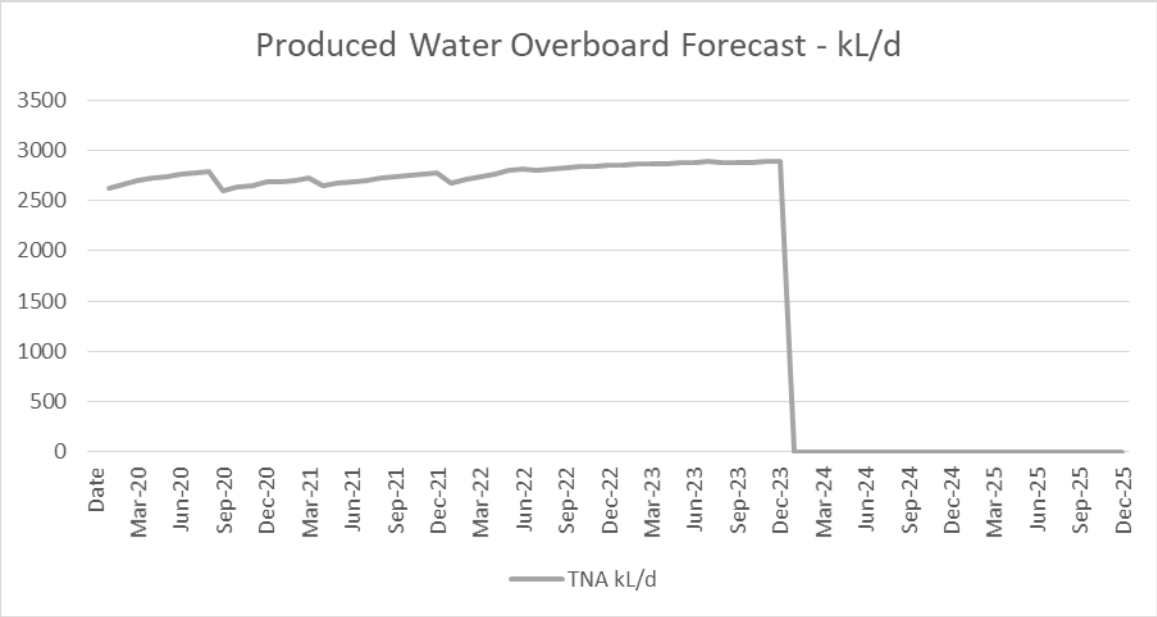


Figure 6-2 Five-year-projected maximum TNA PFW discharge volumes, kL/d.

6.3.3.2 Composition

Physical and chemical make-up

Physical and chemical make-up of TNA PFW is shown in Appendix F – PFW Data file.

Chemical additives

Chemicals in Table 6-6 are added to the platform's water handling system in order to aid oil in water treatment. Chemicals in Table 6-7 are added into the process on the platform for other reasons and could remain at residual levels in the water handling system.

Table 6-6 Chemicals added to Tuna water handling system.

Description	Predominant phase solubility	Additive injection point	Potentially present in PFW discharge
Clarifier (e.g. Baker-Hughes RBW24122)	Oil phase	V-600 and V610 Production Oil Separators Inlet	Yes

Table 6-7 Chemicals added to Tuna process that could remain at residual levels in the water handling system.

Description	Predominant phase solubility	Additive injection point	Potentially present in PFW discharge
Gas lift corrosion inhibitor (e.g. Baker-Hughes CGW24013)	Water phase	Gas lift into wells, upstream of water handling system	Yes

Oil in water monitoring results

Oil in water concentrations are measured on the platform using a continuous online monitor that determines the levels of oil using the way the PFW scatters light under UV fluorescence.

Data is provided in Appendix F for the platform's daily average overboard discharge levels of oil in water (in mg/L) and oil load (kg/d) since 1 Jan 2020 (reflecting the period following the NOPSEMA General Direction 740 in late 2019 where changes were made to the reporting and recording of oil in water).

Data is also provided for the same period showing the cross-check of platform online monitor readings with routine laboratory tests of oil and grease, with the alignment within a +/- 6 mg/L offset.

6.3.3.3 Ecotoxicology

To determine toxicity of the PFW discharge, whole effluent toxicity (WET) testing was performed in 2014 and 2020 across six tests (five chronic, one acute) and eight tests (seven chronic, one acute) respectively across at least 5 different species representing at least four different taxonomic groups. Further details of the ecotoxicology testing can be found in Appendix G.4 – Breakout Box 4. Chemical composition samples were taken at the same time as the samples for WET testing. Chemical additives added at the time of sampling and ecotoxicology testing on Tuna in 2014 and 2020 were Baker-Hughes RBW24122.

Summarised results of the WET testing are shown in Appendix F.

A Burrlioz model has been run with the results from the 2014 WET testing (following Warne, 2018) and modelling using ssdtools was run with the results from the 2020 WET testing with the 95% and 99% species protection level of effluent shown in Appendix F. See Appendix G.4 – Breakout Box 4 for an explanation of the model selection.

6.3.3.4 Movement, dispersion and dilution

A dispersion model was designed and calibrated to show the movement dispersion and dilution of the PFW discharge around the platform. Appendix G.6 – Breakout Box 6 shows the setup and calibration details for the model. Dispersion model inputs and outputs are summarized in Appendix G.

6.3.3.5 Fate and transport of Tuna PFW

The fate and transport of PFW in the environment are influenced by natural processes (outlined in Figure 6-3, adapted from Lee et al, 2005 and schematic from McAllister, 1997). Primarily, we deal with the potential for contaminants in the produced water to interact with the water column and water column biota through the process of dilution, dispersion and dissolution from entrained oil droplets into the water column, and the potential for contaminants in the produced water to interact with the sediment and sediment biota through the process of particulate adsorption or precipitation, followed by settling deposition onto the seabed. Biological uptake (i.e. bioaccumulation) by biota is also discussed. The remainder of transport pathways either act to reduce potential impacts on water column or sediment biota (i.e. volatilisation, photo-oxidation, degradation, dissolution in sediments) or occur in minor amounts so as to be negligible to overall impacts (i.e. solids sedimentation, particle desorption, resuspension).

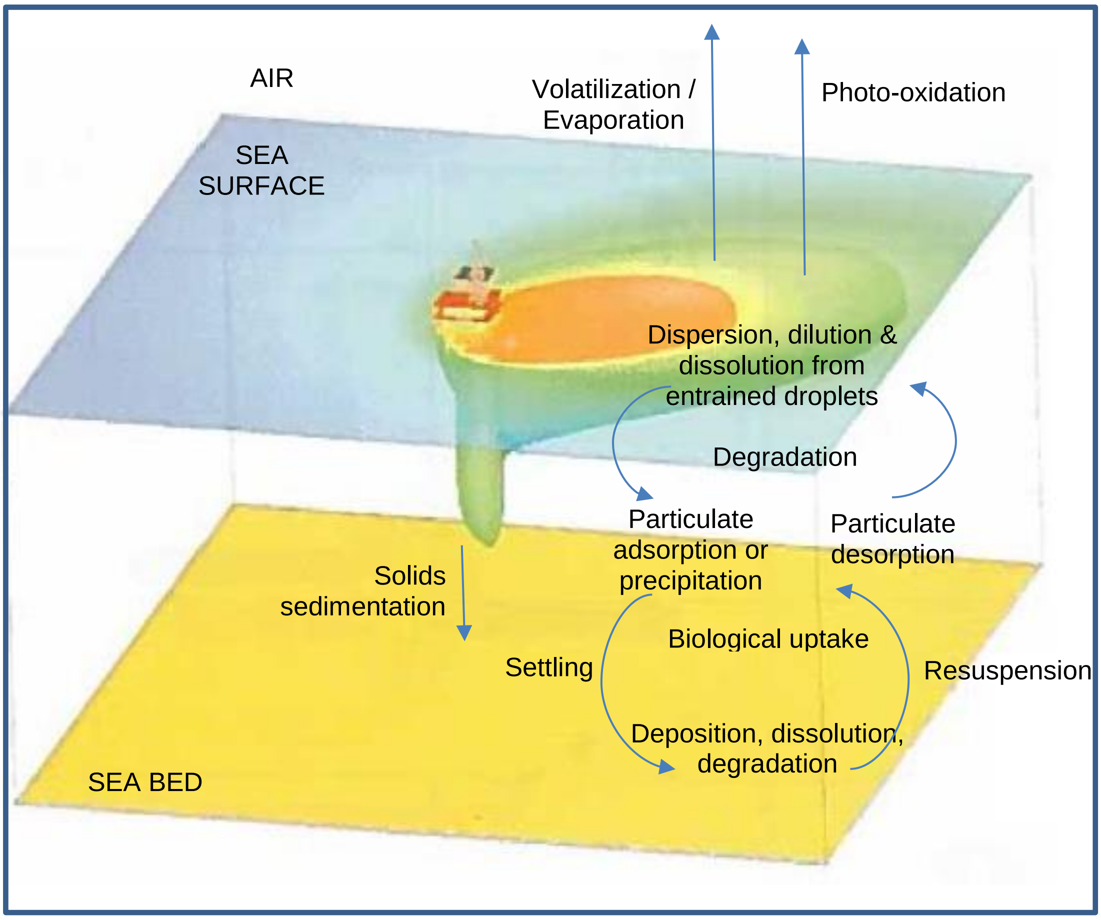


Figure 6-3 Natural processes affecting fate and transport of produced water effluent in the environment. Note: vertical scale of the initial plunge of the PFW plume is elongated for visualisation purposes.

6.3.3.6 Receptors at Tuna platform

PFW discharged to the marine environment has the potential to result in the following impacts:

- Change in water quality;
- Change in sediment quality;

As a result of change in water quality, change in sediment quality and / or habitat, further impacts may occur which include:

- Injury to fauna;
- Change in habitat;
- Change to the function, interests or activities of other users.

Receptors that could be credibly affected by the discharge of PFW are identified in Table 6-8 and Figure 6-4, with reference made to specific receptors or receptor groups per Table 5-2.

Table 6-8 Receptors affected by impacts associated with discharges of TNA PFW

Receptors	Impacts				
	Change in water quality	Change in sediment quality	Injury to fauna	Change in habitat	Change to the function, interests or activities of other users
Water quality	✓ Open ocean, high energy environment, cool waters, 59 m water depth				
Sediment quality		✓ Sandy sea floor with some gravel			
Benthic habitats and communities			✓ Polychaetes, crustaceans and mollusc infauna; possible sponge, soft coral, other invertebrate filter-feeder epifauna		
Plankton			✓ Open ocean phyto- and zoo-plankton		
Fish			✓ Bony & cartilaginous fish, two vulnerable species (Great White and Whale sharks), overlaps distribution BIA for Great White shark, 29 km from Great White shark breeding BIA		
Marine Mammals - Seals			✓ Listed species the New Zealand Fur Seal and the Australian Fur Seal known to rest on the platform and swim alongside		
Marine Mammals - Cetaceans			✓ 27 cetacean species or species habitats occur, of which 5 species are listed (Sei, Blue, Fin, Southern Right and Humpback whales), facility overlaps foraging BIA for Blue whale and		

Receptors	Impacts				
	Change in water quality	Change in sediment quality	Injury to fauna	Change in habitat	Change to the function, interests or activities of other users
			distribution BIA for Southern Right whale, 33 km from Southern Right Whale migration BIA		
Australian Marine Parks and National Parks				✓ Ninety Mile Beach MNP (108 km), Point Hicks MNP (79 km), Gippsland Lakes NP (44 km)	
KEFs				✓ Overlaps with Shelf Rocky Reefs (but 26 km from South East Reef) and Upwelling East of Eden. 30 km to the Bass Cascade, 75 km to Big Horseshoe Canyon	
Commercial and recreational fisheries					✓ Likely fisheries are Bass Strait Central Zone Scallop, Small pelagic, Southern and Eastern Scalefish & Shark, Danish-seine and scalefish hook, Wrasse, and Southern Squid Jig (low intensity) Fisheries

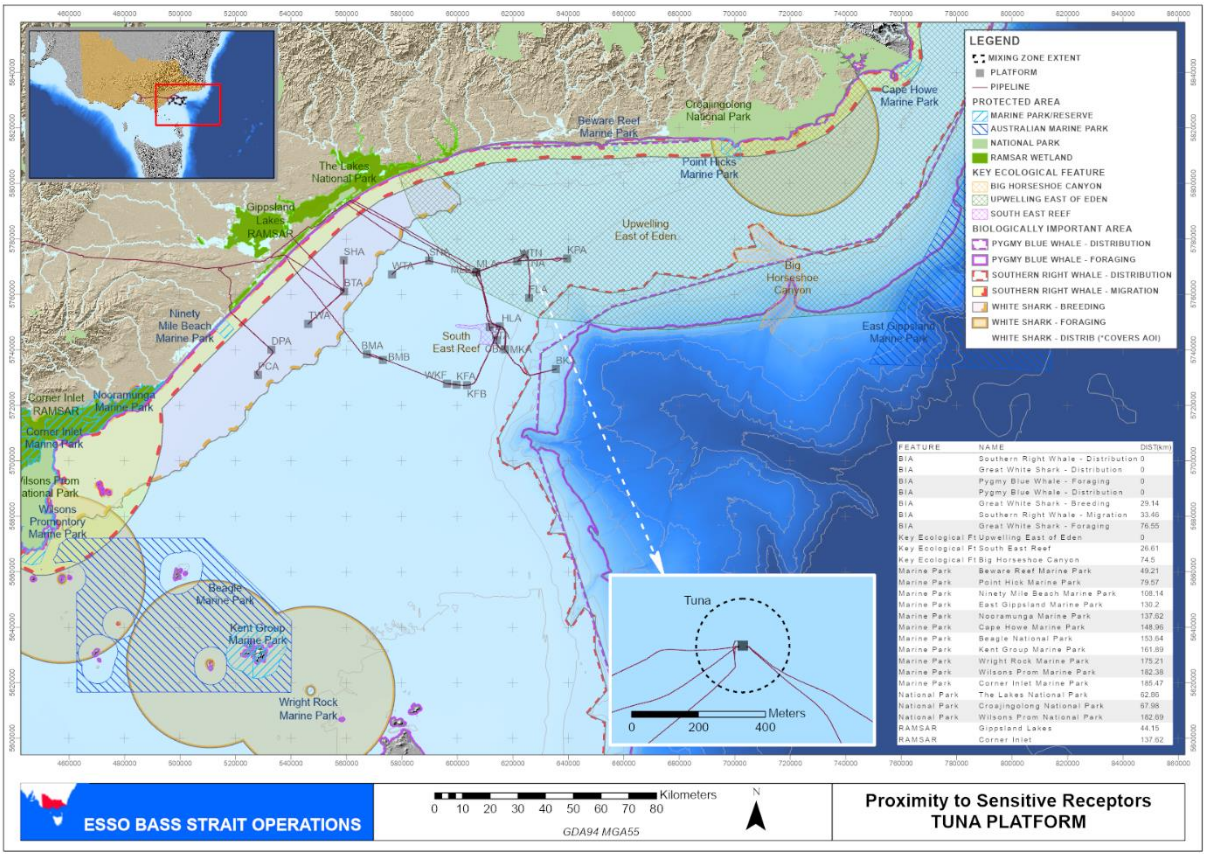


Figure 6-4 140 m mixing zone around TNA platform in relation to other environmental receptors

6.3.3.7 Tuna PFW impact assessment

Impacts to water quality

Physical properties of seawater are established within 10 m of the discharge point. Temperature changes using the RPS APASA (2016) model found that due to the turbulent mixing caused by the initial plunge and then buoyant rise of the effluent, in all cases the average temperature of the produced water plume returns to within 3°C above ambient temperatures within 10 m of the discharge location.

Chemical contaminants in PFW dilute quickly on the initial plunge, then more slowly with dispersion in the current around the platform. PFW is discharged at 16 times the ANZECC 99% species protection water quality criteria for hydrocarbons, 47 times for metals, and 91 times for inorganics; dilutes rapidly on its initial plunge to 10 times within 1 m and 50 times within 12.5 m. It reaches ANZECC 95% species protection water quality criteria within 19.4 m and ANZECC 99% species protection water quality criteria within 19.4 m of the discharge point.

PFW is discharged at between 7 and 56 times the background levels for hydrogen sulphide and up to 370 times the background levels of TOC (see Appendix F.1 – PFW data file), and gradually reduces to background levels with distance from the platform, reaching background levels within 130 m of the discharge point.

An in-situ water monitoring study found that all valid samples taken from the water column indicating the presence of the PFW plume were less than ANZECC 99% species protection water quality criteria at 59 m from the platform and beyond (see Appendix G.7 – Breakout Box 7).

Anions such as sodium, calcium, magnesium and potassium, and cations such as chloride, sulphate, bromide and bicarbonate are found in PFW however these ions (and their associated salts) are also commonly found in seawater and hence will not be discussed further (Pillard et al. 1996).

Potential Naturally Occurring Radioactive Materials (NORM) are not expected to occur in quantities that may result in significant environmental impacts and are therefore not discussed further.

Impacts to sediment quality

Some of the constituents in PFW, such as metals and hydrocarbons, may also become adsorbed onto the surface of suspended solids present in the PFW or in the receiving environment.

Accumulation of contaminants in sediments depends primarily on the volume/concentration of particulates in discharges or constituents that adsorb onto seawater particulates, the area over which those particulates could settle onto the seabed (dominated by current speeds and water depths). and the Actions of resuspension, bioturbation and microbial decay of those particulates in the water column and on the seabed will further reduce the concentration of settled sediments. Since the PFW plume is highly buoyant, and Bass Strait is a high energy environment, currents are likely to mobilise and disperse sediments around the platform, leading to lower overall concentrations in any one area.

TNA PFW contains the following chemicals which could impact marine sediments and an ANZECC (2000) or ANZECC (2013) interim sediment quality guideline value exists:

- Low molecular weight PAHs: Naphthalene, 2-methylnaphthalene, and to a lesser extent (lower number of detections): Acenapthene, Flourene, Phenanthrene
- High molecular weight PAHs: to a lesser extent (lower number of detections): Flouranthene and Pyrene
- Metals/Metalloids: Arsenic, Copper, Nickel and Zinc.

There is no physical interaction of the plume with the seabed and hence no direct exposure of the constituents of PFW with the sediment (see Appendix F – PFW Data file). There is a potential pathway for impacts to sediment through settling of constituents in the PFW plume.

An analysis of the TNA PFW discharge found that 96.2% of particles are ≤63 µm (clay or silt). Per Breakout Box 10, this silt and clay fraction (≤63 µm) is usually cited as the chemically active fraction which is associated with potential contaminants of concern (UNEP/WHO 1996). While there is potential for settling of particles in the TNA PFW plume, it is the larger particles (>63 µm) that may settle which are composed primarily of stable inorganic materials and are generally not associated with contaminants of concern (see Appendix G.10 – Breakout Box 10).

Monitoring results for offshore facilities generally show that natural dispersion processes appear to control the concentrations of potential contaminants from PFW in sediments to slightly above background concentrations (Neff et al. 2011). The results from in-situ sediment monitoring confirm this, since around TNA no PAHs were detected; and occurrences of metals/metalloids were isolated, levels remained low and detections above reference locations remained localised despite there being evidence of some gradients away from the platform (see Appendix G.8 – Breakout Box 8).

Given that at the TNA platform;

- sampling results indicate that less than 4% of particles in PFW may settle (due to their size)
- particles that settle are likely to be stable inorganic materials
- there were isolated observations of contaminants in PFW in sediments around TNA platform above ISQG “low” guideline values
- levels of contamination of copper and zinc in a gradient away from the platform remain of very low level and within a small radius

the PFW discharge is expected to have negligible impacts on sediment.

Impacts to biota

Potential impacts of PFW to biota have been assessed through WET testing and dilution modelling to establish a mixing zone. Marine biota inside the mixing zone may be exposed to chronic exposure to contaminants in PFW, however, the mixing zone is limited to a localised extent around the plume discharge point only.

Process chemicals are discharged to the sea in residual amounts if they partition into the PFW and are not removed via the available treatment processes. As WET testing was performed with samples that contained chemical additives, the WET testing results are indicative of the routinely discharged PFW and account for any potential biological impacts that could be incurred by the PFW including any chemical additives. In addition, the ecotoxicological impacts of process chemicals in PFW discharges was comprehensively investigated in a study by Henderson et al. (1999). The study tested 11 commonly used process chemicals (including biocides, corrosion inhibitors and demulsifiers) for their acute toxicity to marine bacterium, both directly in aqueous preparations and following their partitioning between oil and water phases. The study results indicated that toxicity of the PFW was not significantly altered by the presence of most process chemicals used in typical concentrations. A review of the study by Schmeichel (2017) notes that process chemicals make a small contribution to the overall acute toxicity profile of PFW discharges.

Relevant to all receptor types (ecotoxicity pathways) are the TNA WET testing results. 95% species protection criteria based on WET testing is met within 130 m of the discharge point (Appendix F – PFW data file). At this distance, 95% species will be protected from adverse ecotoxicity effects of the discharge, and water quality is reflective of 'ecosystems in which aquatic biological diversity may have been adversely affected to a relatively small but measurable degree by human activity. The biological communities remain in a healthy condition and ecosystem integrity is largely retained' (ANZECC, 2000, p3.1-10). 99% species protection criteria based on WET testing is met within 140 m of the discharge point (Appendix F – PFW data file). At this distance, 99% species will be protected from adverse ecotoxicity effects of the discharge, and water quality is reflective of an 'effectively unmodified, high conservation-value ecosystem' (ANZECC, 2000, p3.1-10). Outside 140 m contaminants in PFW will continue to reduce to background seawater concentrations. At these levels they are not expected to have any impact to biota.

Impacts to benthic communities and habitat

There are two pathways for potential impacts to benthic communities and habitats:

- Benthos feeding on sediments near the discharge could be subject to exposure to toxic effects of potentially higher-level contaminants of PAHs or metals if they are directly exposed to PFW for long periods; accumulate in sediments.
- Benthic Marine animals near a produced water discharge may bio-accumulate metals, phenols, and hydrocarbons from the ambient water, their food, or bottom sediments.

Direct exposure - chemical ecotoxicity effects

TNA whole effluent toxicity results (2014) show that the amphipod *Allorchestes compressa* was affected by direct exposure to more than 50% raw effluent (acute endpoint). This is unlikely to occur anywhere within the mixing zone except immediately at the point of discharge. Hence no effect is expected on *Allorchestes compressa* since TNA effluent is diluted 10 times within 1 m of the discharge point. The sea urchin *Heliocidaris tuberculate* was affected by exposure to more than 12.5% raw effluent (chronic endpoint). This is unlikely to occur anywhere within the mixing zone except immediately at the point of discharge. Hence no effect is expected on *Heliocidaris tuberculate* since TNA effluent is diluted 10 times within 1 m of the discharge point. The mussel *Mytilus galloprovincialis* was affected by exposure to more than 6.3% raw effluent (chronic endpoint). This is unlikely to occur anywhere within the mixing zone except immediately at the point of discharge and possibly out to 12.5 m from the discharge point. Hence the only effect expected on *Mytilus galloprovincialis* is highly localised to within 1-12.5 m since TNA effluent is diluted by 50 times within 12.5 m of the discharge point.

Impacts from direct exposure to PAHs in PFW on fauna such as scallops, crustaceans and other molluscs within 140 m of the discharge could pose chronic developmental or growth impacts, such as reduced survival of juveniles and reduced size, such as was found during a study of PFW effluent exposure to sea scallops of greater than 10% raw effluent (Querbach et al. 2005, in Armsworthy et al., 2005). PFW discharge can also affect larvae viability (abalone, Raimondi and Schmitt, 1992). These effects are highly unlikely to occur at TNA since effluent is diluted by 10 times within 1 m of the discharge point. Also since the PFW plume is positively buoyant and does not contact the sea floor, it is expected that only fauna on the platform structure itself could be exposed and those on the sea floor are protected from direct exposure.

The range of marine acute LC50 values for arsenic (V) in water was 230-9600 µg/L for crustaceans and 330- 800 000 µg/L for molluscs (Vaughan 1996). In general, early life stages were more sensitive to arsenic than adults. The maximum arsenic level recorded in TNA undiluted PFW was 1 µg/L in one of the 7 years tested and non-detect in other years (Appendix F). Hence direct exposure to arsenic in TNA PFW is unlikely to have an impact on crustaceans or molluscs.

Sponges and soft corals localised to the discharge point could experience reduced ability to settle and metamorphose, such as was found in Luter et al (2019) on larvae of the sponge *R. odorabile* when exposed to hydrocarbons in water. This effect could be felt by encrusting organisms on the structure (to 140 m horizontal radius of the discharge) but not seafloor organisms due to the positive buoyancy of the plume.

Bioaccumulation

A large study for the Gulf of Mexico Offshore Operators Committee examined bioaccumulation in tissues of mollusc, crustacean, and three fish species in and around 11 platforms in the Gulf of Mexico discharging over 1000 kL/d (Continental Shelf Associates, 1997). The study examined bioaccumulation of five metals (As, Cd, Hg, 226Ra and 228Ra); three volatile monocyclic aromatic hydrocarbons (MAH), benzene, toluene, and ethylbenzene; and four semi-volatile organic chemicals, phenol, fluorene, benzo(a)pyrene, and di (2-ethylhexyl) phthalate. They concluded that there is no relationship between the proximity of marine animals to offshore PFW discharges and concentrations in their edible tissues of the chemical constituents.

Additional MAH (m-, p-, and o-xylenes) and a full suite of 40 parent and alkyl-PAH and dibenzothiophenes were also analysed by Neff et al. (2011). There was no evidence of MAH or phenol being bioconcentrated. All MAH and phenol were either not detected (>95% of tissue samples) or were present at trace concentrations in all invertebrate and fish tissue samples. Concentrations of several petrogenic PAHs, including alkyl naphthalenes and alkyl dibenzothiophenes, were slightly, but significantly higher in some bivalve molluscs but not fish, from discharging than from non-discharging facilities. These PAH could have been derived from PFW discharges or from tar balls or small fuel spills. Concentrations of individual and total PAH in mollusc, crab and fish tissues were well below concentrations that might be harmful to marine animals (Neff et. al. 2011).

Effects from bioaccumulation has been primarily associated with low-molecular weight PAHs. Both BTEX and hydrogen sulphide are not bioaccumulative (Neff 2002, ANZECC, 2000 respectively). PAHs were not observed in either waters or sediments around TNA above relevant guideline criteria as part of the 2018 in-situ monitoring program, and hence the potential for bioaccumulation is low.

There were no significant differences in benthic infauna distributions observed in an in-situ study around Tuna in 2018. This study found that at both near and far zones around the platform and at reference sites, crustaceans dominated the benthic infauna, followed by polychaetes. For less than 15% of the total number of taxa, infauna abundance significantly decreased with distance from the platform, owing mostly to re-distribution of coarser sediments around the platform due to the platform presence (Appendix G.9 – Breakout Box). The change in abundance could not be correlated with increased sediment contaminants found in PFW. This is consistent with the findings in Neff et al. (1992) where distributions of benthic communities around the platform (in 8 m water depth) were explained in large part by the influence of sediment grain size on benthic community structure; and there was no correlation between faunal density and the concentration of total hydrocarbons in sediments.

Studies have found that provided the water depth is greater than the discharge depth, benthic organisms will not be affected by PFW, as the concentration of any oil or adhered/adsorbed components will be extremely low (Furuholt, 1996). Studies that have reported changes to benthic distributions were in shallow, moderate-to-poorly flushed waters of 1-8 m or continental shelf waters of up to 12 m (e.g. Osenberg et al (1992) and Rabalais et al. (1992)). It can be expected that in deeper, well-mixed ocean environments (such as at TNA) the potential for impacts to benthic infauna would be even lower.

Copper is readily accumulated by plants and animals; bioconcentration factors ranging from 100 to 26000 have been recorded for various species of phytoplankton, zooplankton, macrophytes, macroinvertebrates and fish (Spear & Pierce 1979). Toxic effects of metals occur when the rate of uptake exceeds the rates of physiological or biochemical detoxification and excretion (Rainbow 1996, in ANZECC 2000). For benthic organisms, effects of copper on crustaceans was published as ranging between 8.5 µg/L (Callianassa australiensis, 10-14 day EC50) to 42 µg/L (Mysidiopsis bahia, from 29-

51 d MATC, reproduction) and on molluscs between 0.4 µg/L (Mytilus edulis, from 30-d EC50, reproduction of 2 µg/L) to 20000 µg/L (Ostrea edulis, 5-d LC50) (ANZECC 2000). TNA PFW copper concentrations were 14 µg/L in one of the 7 years tested and non-detect in other years (Appendix F). As TNA PFW is diluted 10 times within 1 m of the discharge, any effects on molluscs or crustaceans from exposure to or bioaccumulation of copper in PFW would be limited to organisms within 1 m of the discharge.

In general, marine invertebrates are more sensitive to nickel than vertebrates (ANZECC 2000). Chronic effects of nickel on crustaceans was published as ranging between 141 µg/L (36-d chronic mortality, Mysidopsis bahia, Gentile et al. 1982) and 160 µg/L (Portunus pelagicus: from 42d MATC growth of 320 µg/L) to 6000 µg/L from 5-8 d LC50. Effects on echinoderms published as 2600 µg/L (Asteria forbesi from 7-d LC50) molluscs between 240 (Crassostrea virginica; from 12-d LC50 of 1200 µg/L) to 450000 µg/L from 7-12 d LC50; and algae: 1 sp, Nitzschia closterium 50 µg/L, from 5-d EC50 growth (Australian data) (all from ANZECC 2000). TNA PFW nickel concentrations were 18 µg/L or less in 5 of the 8 tests and non-detect in other years (Appendix F). Hence no impacts to benthic organisms from bioaccumulation of nickel in TNA PFW is expected.

Zinc is adsorbed by suspended material. Zinc was found to bioaccumulate in freshwater animal tissues 50 to 1130 times but bioaccumulation is not generally considered a problem for zinc (ANZECC 2000). For benthic organisms, zinc effects on crustaceans ranged from 15 µg/L (Acanthomysis sp, growth) to 2100 µg/L (8–28 d NOEC), echinoderms (Asterias forbesi), 460 µg/L (from 7-d LC50) and molluscs: 5 spp, 7–11 d NOEC (from LC50), 15 µg/L (Crassostrea gigas) to 27500 µg/L (ANZECC 2000). Algae were affected at between 13 µg/L (Nitzschia closterium) to 796 µg/L. (Skeletonema sp) (5–10 d NOEC). TNA PFW zinc concentrations were 13 µg/L and 2 µg/L in two of the 7 years tested and non-detect in other years (Appendix F). Hence there are no effects on benthic animals or plants expected as a result of the levels of zinc in TNA PFW discharge.

Some aquatic organisms may accumulate cobalt, particularly some aquatic plants and benthic organisms (Cole & Carson 1981 in ANZECC 2000). For crustaceans, published ranges of effect concentrations were 9-d LC50, 45 µg/L (Palaemon serratus) to 45 400 µg/L (Carcinus maenas). The lowest geometric mean for converted NOEC was 9 µg/L. Homarus vulgaris also had a low g.m. for NOECs of 65 µg/L; nematode Monhystera sp, 4-d LC50, 94 000 µg/L; and algae 4-5 d EC50, growth, 300 µg/L (Dytilum sp) to 23 600 µg/L (Phaeodactylium sp) (ANZECC 2000). TNA PFW cobalt concentrations were 0.14 µg/L in one of the 8 tests and non-detect in other years (Appendix F). Hence there are no effects on benthic animals or plants expected as a result of the levels of cobalt in TNA PFW discharge.

Effects on benthic flora and fauna are primarily attributed either to uptake of contaminants from water or the presence of accumulated hydrocarbons (such as PAH) in sediments. Ecotoxicity impacts to biota from metals in sediment is more complicated, owing to the many forms that metals can take, reduction-oxidation states and overall bioavailability of the metal. While there have been a large number of studies where the chemical concentrations of contaminants have been measured in sediments, very few have been related to biological effects, either in the nature of descriptions of the natural benthic populations or laboratory-based bioassays (ANZECC 2000, p8.4-26). The results from the TNA in-situ sediment monitoring that found occurrences of metals/metalloids were isolated, levels remained low (for the most part, well below sediment guideline criteria) and detections above reference locations remained localised (see Appendix G.8 – Breakout Box 8), effects on benthos from accumulated metals in sediments is unlikely.

Given the above, benthic biota around TNA platform are highly unlikely to be affected by the PFW discharge. Any effects would be confined to chronic impacts (such as changes in growth, metamorphosis or reproduction) for flora and fauna such as sponges and crustaceans on the platform structure within 140 m of the discharge point. As the area and depth ranges of a potential, but highly unlikely impact, are small and localised, effects at a population level are not credible.

The exposure of biota to in-water contaminants is expected to be low, due to the high initial dilution of the plume, and even lower for mobile biota, accounting for multiple exposures of PFW to the same animal, that would be necessary for bioaccumulation. Filter feeders on the seafloor will experience levels of in-water contaminants well below ANZECC water quality guidelines.

Literature also supports the finding that per Neff (2011), “in well-mixed estuarine and offshore waters, elevated concentrations of saturated hydrocarbons and PAH in surficial sediments sometimes are observed out to a few hundred meters from a high-volume produced water discharge.

There were no PAHs accumulated in sediments around West Kingfish PFW discharges despite the highest naphthalene flow- and suspended sediment-weighted PFW load in Bass Strait.

There were no heavy metal toxicants systematically observed above the ANZECC sediment guideline criteria in sediments around Tuna or West Kingfish in the 2018 study despite the high metals flow-weighted load across all Bass Strait discharging platforms, and observations of sediment toxicant levels above the sediment guideline criteria around these platforms were isolated, most likely from corroding debris or structures rather than PFW, and likely to have little overall effect on benthic environments.

BTEX is known to be toxic to marine organisms and has been shown to result in developmental defects (Fucik et al. 1995) but does not significantly bio-accumulate. As such, potential bioaccumulative impacts from the decrease in water quality due to BTEX are expected to be insignificant.

Hydrogen sulphide is a by-product rapidly produced by organisms but it is non-bioaccumulative.

Impacts to plankton

There are three pathways for potential impacts to plankton:

- Exposure to temperature effects on direct exposure
- Stimulatory effects of nutrients in the plume, leading to eutrophication of waters
- Exposure to toxic effects of chemical constituents of PFW if plankton are directly exposed for long periods (i.e. directly in the plume)

Direct exposure – temperature effects

As the average temperature of the produced water plume returns to within 3°C above ambient temperatures within 10 m of the discharge location, potential temperature effects on plankton are not credible.

Stimulatory effects from nutrients in the plume

Discharges of nutrients and hydrocarbons in the PFW plume can increase the localised abundance of plankton. For example, ammonia may elicit inhibitory (toxic) and/or stimulatory (e.g. eutrophication) responses from resident biota (Neff, 2011). Plankton could be attracted to localised higher concentrations of these constituents within the mixing zone and as a result plankton populations can rapidly increase. However, increased planktonic activity and turnover mass rates within the mixing zone is not expected to have any marked change on the water quality due to the high levels of movement of water around the platform from the action of currents and waves. Levels of nitrate and phosphates are low (not unlike other produced waters, Neff, 2011) and hence are not likely to cause eutrophication. Supporting this there is anecdotal evidence that no phytoplankton blooms have ever been recorded at a Bass Strait Esso facility.

Direct exposure – chemical ecotoxicity effects

Phytoplankton are among the most sensitive organisms to both forms of arsenic. The Australian diatom Nitzschia closterium is highly sensitive to arsenic (III), with a 72-h EC50 for growth inhibition of 7 µg/L (Florence & Stauber 1991), compared to >2000 µg/L for arsenic (V). An Environmental Concern Level (ECL, see Section 8.3.4.5) of 2.3 µg/L was derived for As (III) in marine waters, using an AF of 100 (ANZECC 2000). TNA PFW arsenic concentrations were 1 µg/L in one of the 7 years tested and non-detect in other years (Appendix F). Hence there are no impacts to plankton anticipated from arsenic in TNA PFW.

Plankton have high levels of natural mortality and a rapid replacement rate (UNEP 1985). Any impacts as a result of direct exposure of planktonic communities to PFW are expected to be confined to the 140 m zone to 99% species protection. Direct exposure of planktonic communities to PFW within the 140 m zone (to 99% species protection criteria based on WET testing) is not considered to result in significant impacts at the population level of organisms that could affect broader ecological diversity or productivity of the area surrounding the facility.

Impacts to fish

There are three pathways for potential impacts to fish:

- Exposure to temperature effects on direct exposure
- Exposure to toxic effects of chemical constituents of PFW if fish are directly exposed for long periods (i.e. directly in the plume)
- Exposure to toxic effects of chemical constituents of PFW if fish are directly exposed to contaminated sediments

Direct exposure – temperature effects

As the average temperature of the produced water plume returns to within 3°C above ambient temperatures within 10 m of the discharge location, potential temperature effects on fish are not credible.

Direct exposure – chemical ecotoxicity effects

Early lifestages of fish (embryos, larvae) within the 140 m zone to 99% species protection criteria would be most susceptible to the exposure from chemical constituents in the PFW discharge, as they are less mobile and therefore can become exposed to the plume at the outfall. These effects can range from no effects (Mathieu et al 2011), to gill damage (turbot larvae, Brown et al. 1998). Hormonal effects could be experienced (cod, Meier et al, 2002), however this occurs at very high exposure concentration or where immune systems are already compromised by other stressors (Hamoutene et al, 2011; Burridge et al, 2011) which is not likely to be the case at TNA. Larvae entrained in the outfall may only be exposed to higher concentrations for a short period relative to the buoyancy of the organism (Querbach, et al. 2005). Outside the 140 m radius, early lifestages of fish are not expected to be affected at all.

Effects from copper in water on fish was published as ranging between 30 µg/L (2 spp, from 12-14 d EC50, hatch & mortality) to 260 µg/L (Menidia menidia, 11-d EC50, hatch) (ANZECC 2000). TNA PFW copper concentrations were 14 µg/L in one of the 7 years tested and non-detect in other years (Appendix F). Hence there are no effects on fish expected as a result of the levels of copper in TNA PFW.

Effects from zinc in water on fish was published as 10 400 µg/L (Fundulus heteroclitus, 7-d NOEC of from LC50) (ANZECC 2000). TNA PFW zinc concentrations were 13 µg/L and 2 µg/L in two of the 7 years tested and non-detect in other years (Appendix F). Hence there are no effects on fish expected as a result of the levels of zinc in TNA PFW.

Effects from cobalt in water on fish was published as 52 500-227 000 µg/L (from 4-9 d LC50) (ANZECC 2000). TNA PFW cobalt concentrations were 0.14 µg/L in one of the 3 tests and non-detect in other years (Appendix F). Hence there are no effects on fish expected as a result of the levels of cobalt in TNA PFW.

Levels of nickel (max detected 11 µg/L) in the TNA discharge are well below the concentrations that could have effects on fish (Fundulus heteroclitus, 30 000 µg/L from 7-d LC50; from ANZECC 2000).

Later-life pelagic species are generally highly mobile and as such are not likely to be exposed at concentrations that would lead to chronic effects due to their patterns of movement. Fish also exhibit a strong avoidance reaction to hydrogen sulphide (USEPA 1986 in ANZECC 2000).

BTEX is known to be toxic to fish and invertebrate eggs and larvae and has been shown to result in developmental defects (Fucik et al. 1995). However, due to the compound's volatility, the residence time in waters is brief; rapid active and passive excretion of these compounds from tissues will also limit in-tissue concentrations in the field; and BTEX does not bio-accumulate (Neff et al., 1996). The dilution ratio for TNA PFW to ANZECC 99% species protection water criteria for Benzene is 12, and TNA PFW is diluted 10 times within 1 m and 50 times within 12.5 m, hence BTEX is not expected to have any toxic effects beyond 12.5 m. Many fish species can metabolise hydrocarbons, which reduces the risk of bioaccumulation (NRDA, 2012).

Whole effluent ecotoxicity data from TNA PFW shows that the barramundi fish *Lates calcarifier* experienced effects above 50% raw effluent exposure (chronic endpoint). This is unlikely to occur anywhere in the mixing zone except directly at the discharge point itself. Whilst this species is not local to Bass Strait, no effect is expected on fish similar to *Lates calcarifier* since TNA effluent is diluted by 10 times within 1 m of the discharge point.

Exposure to contaminated sediments – chemical ecotoxicity effects

Effects from fish directly exposed to contaminated sediments above 22 mg/kg PAH could result in gill hyperplasia, reduced phagocytic activity of macrophages and pancreatic necrosis (spot, Hinkle-Conn et al., 1998). However this is highly unlikely to be the case as the highest level of PAHs in sediment around TNA was 0.004 mg/kg.

The mixing zone overlaps the distribution BIA for the Great White Shark; however, given the localised area of impact and that sharks are transiting the area, no impacts are expected. The discharge does not constitute a threat listed in the recovery plan of the White Shark, and the discharge activity is not inconsistent with that plan.

In summary as the PFW plume is dynamic and moving constantly depending on the tides, currents, winds and internal waves, transient fish such as great white sharks, are unlikely to be exposed to elevated contaminant concentrations for extended durations. Indirect impacts, such as altered prey abundance or ingestion of bioaccumulated toxic compounds is considered to be of no effect given the localised area predicted to be impacted by PFW and the nature and scale of impacts to the marine ecosystem within the PFW discharge plume (i.e. slight impacts to food sources such as plankton and pelagic fish species). Given the potential absence of impacts to fish, the limited spatial extent of the water quality (130 m radius), the predicted intermittent and short interaction duration (i.e. minutes at a time) with the PFW plume, it is considered that there will not be a significant impact on fish particularly the great white shark from PFW discharges when assessed against the relevant criteria in the Matters of National Environmental Significance. Significant impact guidelines 1.1. (DoE, 2013), including that there will be no long-term decrease in the size of the population, the area of occupancy of the species or an important population, the existing population will not be fragmented into two or more populations, there will be no adverse effect on habitat critical to the survival of a species, there will be no disruption to the breeding cycle of an important population, the availability or quality of habitat will not be destroyed, removed, isolated or decreased to the extent that the species is likely to decline and the recovery of the species will not be substantially interfered with.

Impacts to seals

There are three pathways for potential impacts to seals:

- Exposure to toxic effects of chemical constituents of PFW if seals are directly exposed for long periods (i.e. directly in the plume)
- Effects from inhalation of hydrocarbon vapours from PFW sheens
- Irritation effects from physical contact with hydrocarbons in PFW
- Bioaccumulation through the ingestion of impacted food sources

Produced water plumes predominantly result in dissolved contaminants and they rarely cause a defined layer on the sea surface (silvery sheen is the lowest level according to the Bonn agreement and usually patchy if at all present from the PFW discharge). Hence potential impact pathways through contact of hydrocarbons with seal fur and ingestion are not credible.

Direct exposure – chemical ecotoxicity effects

Seals do not spend all their time in the water, and when they do, they are highly active, travel great distances and forage at various depths (Arnould et al., 2005). As such, it is highly unlikely that these potential impact pathways will be significant. In addition, pinnipeds have been found to have the enzyme systems necessary to convert absorbed hydrocarbons into polar metabolites, which can be excreted in urine (Engelhardt, 1982; Addison & Brodie, 1984; Addison et al., 1986).

Effects from inhalation of hydrocarbon vapours from PFW sheens

Inhalation of hydrocarbon vapours could cause toxic effects. However, the level of oil on water (i.e. sheens) from produced water plumes rarely cause silvery sheens (the lowest level according to the Bonn agreement), and hence will have extremely low levels of vapour. Seals are highly mobile and active animals and do not spend all their time at the water surface, as such, it is highly unlikely that this potential impact pathways will be significant.

Irritation effects from physical contact with hydrocarbons in PFW

Exposure to on-sea hydrocarbons could cause irritation to the eyes and oral cavity. However seals are unlikely to remain swimming within the discharge plume for long periods as they are highly active animals, travel great distances and forage at various depths. As such, it is highly unlikely that this potential impact pathways will be significant so as to not have any chronic impacts to seals.

Bioaccumulation through ingestion of impacted food sources

As impacts to the predominant seal food source of fish are of very low likelihood (as above), bioaccumulation through ingestion of impacted food sources is unlikely to have any impact on seals.

Listed Australian Fur Seals and New Zealand Fur Seals occur at the platform, however no seal breeding occurs on or around the platform, and the area is not identified as critical habitat or BIA. According to IUCN, the Australian Fur Seal is listed as Least Concern and its population is increasing (IUCN, 2015).

There is no relevant Conservation Advice or Threat Abatement Plan for Australian Fur Seals or New Zealand Fur Seals.

In summary as the PFW plume is dynamic and moving constantly depending on the tides, currents, winds and internal waves, coupled with seals being highly mobile active animals who do not spend all their time in the water or at the water surface, seals are unlikely to be exposed to elevated contamination concentrations for extended durations. Indirect impacts, such as altered prey abundance or ingestion of bioaccumulated toxic compounds is considered to be of no effect given the localised area predicted to be impacted by PFW and the nature and scale of impacts to the marine ecosystem within the PFW discharge plume (i.e. slight impacts to food sources such as pelagic fish species). Given the potential absence of impacts to seals, the limited spatial extent of the water quality (130 m radius) the predicted short interaction duration (i.e. minutes at a time) with the PFW plume, and that breeding does not occur within the OA it is considered that there will not be a significant impact on seals from PFW discharges when assessed against the relevant criteria from the Matters of National Environmental Significance. Significant impact guidelines 1.1. (DoE, 2013), including that there will be no long-term decrease in the size of the population, the area of occupancy of the species or an important population, the existing population will not be fragmented into two or more populations, there will be no adverse effect on habitat critical to the survival of a species, there will be no disruption to the breeding cycle of an important population, the availability or quality of habitat will not be destroyed, removed, isolated or decreased to the extent that the species is likely to decline and the recovery of the species will not be substantially interfered with.

Impacts to cetaceans

There are four pathways for potential impacts to cetaceans:

- Exposure to toxic effects of chemical constituents of PFW if cetaceans are directly exposed for long periods (i.e. directly in the plume)
- Effects from inhalation of hydrocarbon vapours from PFW sheens
- Irritation effects from physical contact with hydrocarbons in PFW
- Bioaccumulation through the ingestion of impacted food sources

Direct exposure – chemical ecotoxicity effects

Cetaceans are highly mobile and transitory animals, as such, it is highly unlikely that this potential impact pathways will be significant. Note also, many marine mammals appear to have the necessary liver enzymes to metabolise hydrocarbons and excrete them as polar derivatives (Ball and Truskewycz, 2013).

Effects from inhalation of hydrocarbon vapours from PFW sheens

As a result of inhaling volatile compounds when surfacing, cetaceans can experience lung congestion (Geraci & St. Aubin 1990); or irritation or damage to mucous membranes or airways (Helm et al., 2015). However, the level of oil on water (i.e. sheens) from produced water plumes rarely cause silvery sheens (the lowest level according to the Bonn agreement), and hence will have extremely low levels of vapour. Cetaceans are highly mobile and only transit the area, as such, it is highly unlikely that this potential impact pathway will be significant.

Irritation effects from physical contact with hydrocarbons in PFW

Cetaceans can be exposed through direct contact with the eyes, potentially leading to inflammation (Geraci & St. Aubin 1990). Cetaceans are highly mobile and only transit the area, as such, it is highly unlikely that this potential impact pathway will be significant.

Bioaccumulation through ingestion of impacted food sources

As impacts to cetacean food source predominantly of fish and plankton is of very low likelihood (as above), and the area does not represent a large proportion of the overall cetacean feeding area therefore it is unlikely to have any impact on cetaceans.

The mixing zone overlaps the foraging BIA for the blue whale and distribution BIA for the Southern Right Whale; however, given the localised area of impact and that whales are transiting the area, no impacts are expected. The discharge does not constitute a threat listed in the Conservation Management Plan of either the Blue Whale or Southern Right Whale and the discharge activity is not inconsistent with those plans.

In summary as the PFW plume is dynamic and moving constantly depending on the tides, currents, winds and internal waves, transient cetaceans such as migrating whales, are unlikely to be exposed to elevated contaminant concentrations for extended durations. Indirect impacts, such as altered prey abundance or ingestion of bioaccumulated toxic compounds is considered to be of no effect given the localised area predicted to be impacted by PFW and the nature and scale of impacts to the marine ecosystem within the PFW discharge plume (i.e. slight impacts to food sources such as plankton and pelagic fish species). Given the potential absence of impacts to cetaceans, the limited spatial extent of the water quality (130 m radius) the predicted intermittent and short interaction duration (i.e. minutes at a time) with the PFW plume, it is considered that there will not be a significant impact on cetaceans from PFW discharges when assessed against the relevant criteria from the Matters of National Environmental Significance. Significant impact guidelines 1.1. (DoE, 2013), including that there will be no long-term decrease in the size of the population, the area of occupancy of the species or an important population, the existing population will not be fragmented into two or more populations, there will be no adverse effect on habitat critical to the survival of a species, there will be no disruption to the breeding cycle of an important population, the availability or quality of habitat will not be destroyed, removed, isolated or decreased to the extent that the species is likely to decline and the recovery of the species will not be substantially interfered with.

Impacts to Fisheries – Commercial and Recreational

There are three potential impact pathways for fisheries:

- Tainting (hydrocarbon odour in caught fish) due to tissue accumulation of hydrocarbons in PFW
- Impacts to the safety of humans through the consumption of target species tissues that are impacted by PFW.
- Reduction of fisheries stocks, through the direct impact of PFW on target species and nurseries

Tainting

Per Appendix F, ANZECC seafood taint criteria is reached within 12.5 m of the discharge point. (Note: Appendix G.3 – Breakout Box 3 applies to the detection of other phenols under the seafood taint guidelines). The total area represented by a 12.5 m radius at TNA is 490 m^2 (1/20th of a hectare), and cumulative area across all Bass Strait platform PFW discharges is <2000 m^2 (1/5th of a hectare), representing an extremely small proportion of the total fisheries area. Hence the discharge is highly unlikely to cause taint in fisheries-caught fish.

Impacts to seafood safety for humans

Since fish or shellfish are not harvested around the PFW plume or mixing zone out to at least 500 m from the platform, and the zone in which 99% species protection criteria is reached extends to only 140 m from the platform, there is no effect of the PFW discharge on humans through consumption.

Impacts to fisheries stocks

Individual fish and other non-fish target species, (i.e. invertebrates of value, including squid, crustaceans (rock lobster, crabs) and molluscs (scallops, abalone), where they are directly present in the PFW plume (within 140 m radius), may be exposed to chronic sub-lethal impacts (see above) however due to the small range and depths that this applies, population level impacts are considered highly unlikely. Whilst offshore structures may play a role in enhancing fish stocks due to the presence of hard substrate and the level of protection from fishing that they provide, fish nurseries known to be notable prolific producers are close to shore (such as Gippsland Lakes RAMSAR site) and these are expected to contribute to fisheries stocks in much greater numbers. Therefore there are no anticipated impacts to fisheries stocks.

Stakeholder feedback confirmed that although fishers had been able to see discharges from the Bass Strait platforms from beyond the 500 m exclusion zone, the discharge did not have any effect on fisheries or fisheries equipment, or amenity for the fishers. There is general acknowledgement among fishers that Esso’s facilities provide safe habitat for juvenile fisheries species, and there have been no complaints or issues raised to date about taint, food safety or reduction of fisheries stocks due to the platform discharges. Ongoing dialogue with fishing communities is part of Esso’s stakeholder engagement plan.

Impacts to other receptors

Australian Marine Parks, National Parks and Reserves

Given the distance of marine parks, national parks and reserves from the mixing zone, impacts to these receptors are not considered credible.

Key Ecological Features

Upwelling East of Eden: Nutrient-rich sediment turnover is highest in areas of upwelling, and hence discharge of any additional nutrients also naturally found on the sea floor in PFW is therefore even less likely to have impacts on the KEF. The discharge of other contaminants in PFW is not relevant to the values of this KEF.

The Bass Cascade: Given the distance from the mixing zone to the likely location of this KEF, impacts are not anticipated.

Shelf rocky reefs and hard substrates (South-East Marine Region), including the South East Reef: The same assessment as Benthic habitats and communities applies to this KEF as described above. Given the distance from the PFW mixing zone to the reported location of the South East Reef, impacts on this reef are not anticipated.

Cumulative impacts to water from multiple discharges

Discharges of PFW from nearby platforms were modelled and shown not to interact with the PFW mixing zone (Appendix G.4 – Breakout Box 4). WTN platform is not and will not be discharging PFW over the life of this EP and hence there are no other PFW plumes within 3 km of the TNA discharge.

Other continuous discharges from the same platform are limited to discharges from pile subsea windows. These discharge at 38.5 m (ODSP) and 52.1 m (CDSP) below sea level (Table 2-5), deeper than the produced water effluent pipe depth at 28.8 m below sea level. Piles are expected to be exchanging predominantly sea water, hence any discharge from the piles will be close to neutrally buoyant at the subsea window. Discharges of water containing chemicals (at discharge, all chemicals are CHARM Gold/Silver or OCNS D/E (Table 6-22)) or dissolved hydrocarbons from the pile will be intermittent or infrequent, and of small volumes which will disperse rapidly in the open ocean currents within the operational area. It is therefore expected that any exposure will be limited in duration.

Dispersion modelling for TNA PFW shows the maximum plunge depth from the discharge point under all current speeds is to 34 m below sea level, hence any cumulative impacts from the interaction with the produced water effluent plume within the mixing zone is considered unlikely.

Other non-continuous discharges (such as desalination brine, sewage, grey water, food waste, liquid discharges from vessel operations, and wellwork discharges) could overlap with the PFW but are short in duration and hence any cumulative impacts are unlikely to occur.

Any suspended solids in the pile contents will settle out within the pile, or if finer and suspended in the pile, then they will gradually settle out at far distances from the platform as they are carried by the current and result in no noticeable impacts to sediments. Hence any cumulative impact of the pile discharges to sediment is considered highly unlikely.

Historical activities such as discharging muds and cuttings during drilling may have resulted in changes to the sea floor sediment chemical characterisation above background levels. This includes the discharge of water based muds and barite containing barium, an inert metal; and the discharge of cuttings from natural rock formations encountered during drilling, together with small amounts of residual drilling muds on cuttings. Any changes to sediment quality from historical impacts from background will be considered as part of the surrender of title process. The last drilling program on TNA was in approximately 2005, hence discharged fluids or solids from the drilling program is expected to have at least partially been dispersed or bioremediated. There is not expected to be a significant cumulative impact to sediment quality from the additive effect of discharging PFW to sediments containing higher levels of barium or residual drilling mud constituents.

Given the varying buoyancy of the plumes, the mobile nature of marine mammals and the tendency of fish to avoid plumes cumulative impacts on marine fauna is unlikely.

As fishing is not carried out within 500 m of the platform, which is beyond the mixing zone of 140 m no cumulative impacts from multiple discharges is likely on commercial and recreational fishing.

Given the distance to other sensitive receptors (Table 5-2) cumulative impacts from multiple discharges are highly unlikely.

6.3.3.8 Tuna Consequence Evaluation

Impacts from TNA PFW are limited to a localised mixing zone around the discharge point, with negligible impacts to sediment. Potential impacts to biota, including benthic habitats and communities, plankton, fish, seals and cetaceans, including through bioaccumulation, is localised in nature to the mixing zone or negligible and is not considered significant (per Significant Impact Guidelines [DOE, 2013]).

Effects could be ongoing, including through bioaccumulation of PAHs and persistent chemicals, but effects are confined to some biota on the platform structure itself (e.g. crustaceans) or dispersed in a small radius around the platform water and sediments at low and safe concentrations. Within the mixing zone, there could be sub-lethal, direct or indirect effects on organisms, but this would likely only apply to non-mobile receptors, such as fish embryos/juveniles, and would not apply at a population level. The environment is highly endemic, with few endangered and rare species present, but is generally strong and resilient, and provides some ecosystem services (e.g. fisheries).

The consequence level is therefore assessed as **Consequence Level III.**

To ensure continuing confidence in the consequence level the Monitoring and Management Framework will be implemented. If routine monitoring was to detect levels in PFW above the trigger values and there was the potential to impact the ecosystem integrity, an ALARP/Acceptability study is required to determine what additional controls can be implemented to ensure the impacts are not realised. A sampling plan to demonstrate compliance with the approved mixing zone boundary will be developed for the sediment survey. The sampling plan outlines and justifies sampling locations and when concentration and bioavailability testing occur.

6.3.4 West Kingfish platform

6.3.4.1 Volume

A summary of historic and five-year-projected PFW discharge volume from the platform is provided in Figure 6-5 and Figure 6-6 respectively. The maximum capacity of the system is 17390 kL/d, however based on historical discharge rates the platform is expected to discharge produced water at a much lower rate of approximately 8000-10000 kL/d until oil shutdown in approximately 2022-2023.

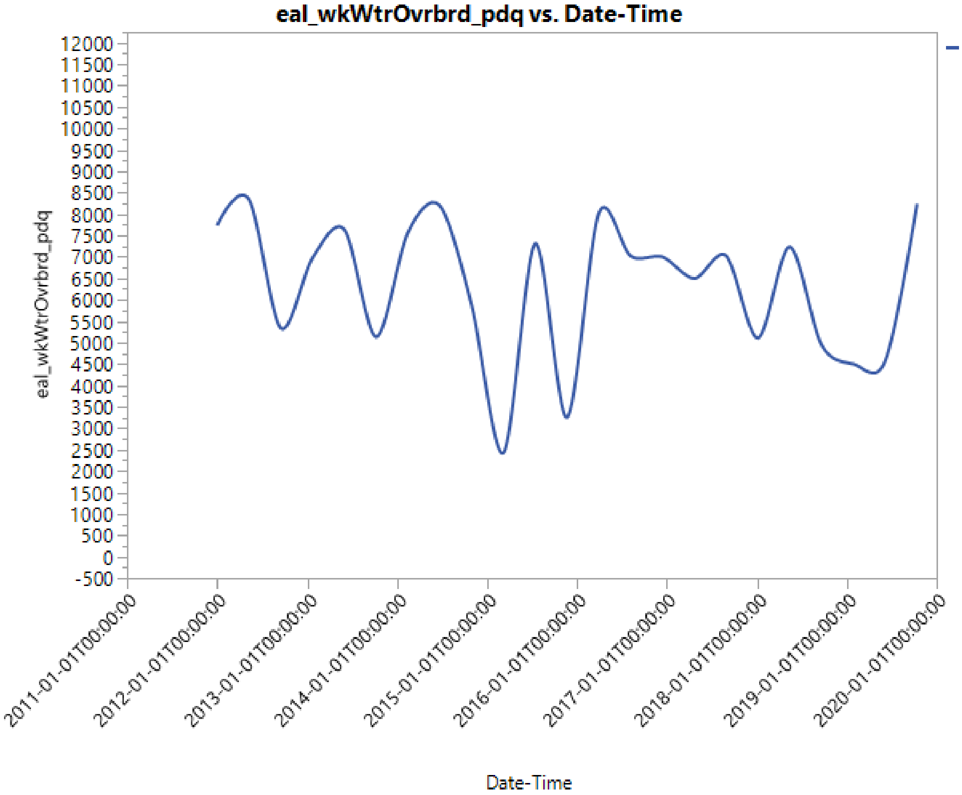


Figure 6-5 Historic smoothed overboard discharge volume (kL/d) (2012-2019)

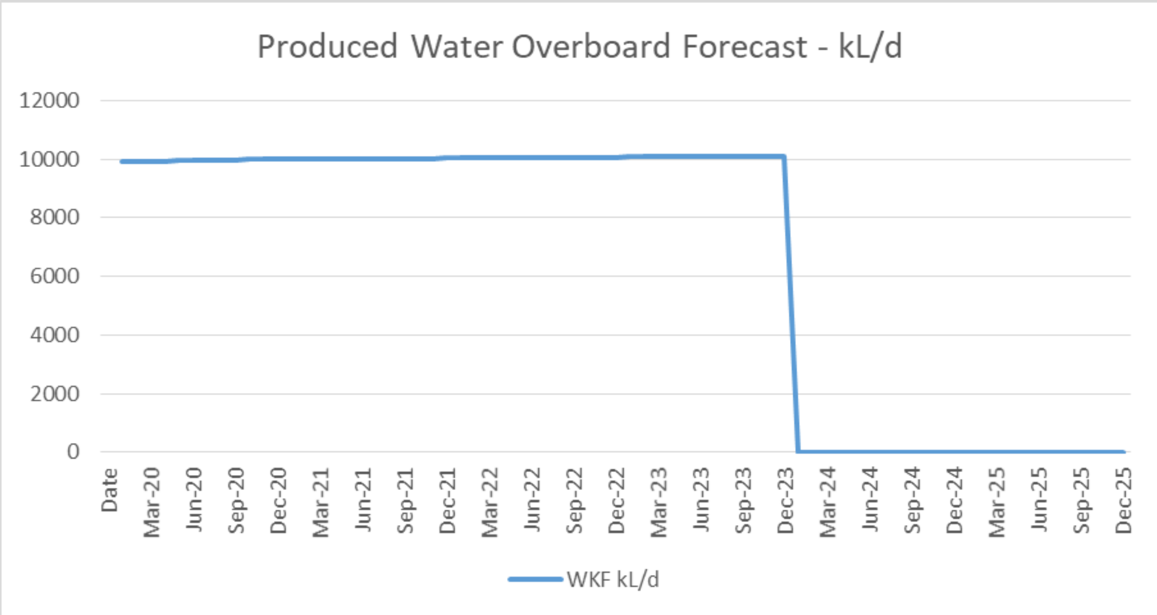


Figure 6-6 Five-year-projected maximum PFW discharge volumes, kL/d.

6.3.4.2 Composition

Physical and chemical make-up

Physical and chemical make-up of PFW is shown in Appendix F – PFW Data file.

Chemical additives

Chemicals in Table 6-9 are added to the platform's water handling system in order to aid oil in water treatment. Chemicals in Table 6-10 are added into the process on the platform for other reasons and could remain at residual levels in the water handling system.

Table 6-9 Chemicals added to West Kingfish water handling system.

Description	Predominant phase solubility	Additive injection point	Potentially present in PFW discharge
None	N/A	N/A	N/A

Table 6-10 Chemicals added to West Kingfish process that could remain at residual levels in the water handling system.

Description	Predominant phase solubility	Additive injection point	Potentially present in PFW discharge
Gas lift corrosion inhibitor (e.g. Baker-Hughes CGW24013)	Water phase	Gas lift into wells, upstream of water handling system	Yes

Oil in water monitoring results

Oil in water concentrations are measured on the platform using a continuous online monitor that determines the levels of oil using the way the PFW scatters light under UV fluorescence.

Data is provided in Appendix F for the platform's daily average overboard discharge levels of oil in water (in mg/L) and oil load (kg/d) since 1 Jan 2020 (reflecting the period following the NOPSEMA General Direction 740 in late 2019 where changes were made to the reporting and recording of oil in water).

Data is also provided for the same period showing the cross-check of platform online monitor readings with routine laboratory tests of oil and grease, with the alignment within a +/- 6 mg/L offset.

6.3.4.3 Ecotoxicology

To determine toxicity of the PFW discharge, whole effluent toxicity (WET) testing was performed in 2014 and 2020 across six tests (five chronic, one acute) and eight tests (seven chronic, one acute) respectively across at least 5 different species representing at least four different taxonomic groups. Further details of the ecotoxicology testing can be found in Appendix G.4 – Breakout Box 4. Chemical composition samples were taken at the same time as the samples for WET testing.

Chemical additives added at the time of sampling and ecotoxicology testing on West Kingfish in 2014 and 2020 were Baker-Hughes CGW24013.

Summarised results of the WET testing are shown in Appendix F.

A Burrlioz model has been run with the results from the WET testing (following Warne, 2018) with the 95% and 99% species protection level of effluent shown in Appendix F.

6.3.4.4 Movement, dispersion and dilution

A dispersion model was designed and calibrated to show the movement dispersion and dilution of the PFW discharge around the platform. Appendix G.6 – Breakout Box 6 shows the setup and calibration details for the model. Dispersion model inputs and outputs are summarized in Appendix F.

6.3.4.5 Fate and transport of West Kingfish PFW

Fate and transport of WKF PFW is no different to TNA PFW as outlined in Section 5.3.2.5.

6.3.4.6 Receptors at West Kingfish platform

PFW discharged to the marine environment has the potential to result in the following impacts:

- Change in water quality;
- Change in sediment quality;

As a result of change in water quality, change in sediment quality and / or habitat, further impacts may occur which include:

- Injury to fauna;
- Change in habitat;
- Change to the function, interests or activities of other users.

Receptors that could be credibly affected by the discharge of PFW are identified in Table 6-11 and Figure 6-7, with reference made to specific receptors or receptor groups per Table 5-2

Table 6-11 Receptors affected by impacts associated with discharges of WKF PFW

Receptors	Impacts				
	Change in water quality	Change in sediment quality	Injury to fauna	Change in habitat	Change to the function, interests or activities of other users
Water quality	✓ Open ocean, high energy environment, cool waters, 73 m water depth				

Receptors	Impacts				
	Change in water quality	Change in sediment quality	Injury to fauna	Change in habitat	Change to the function, interests or activities of other users
Sediment quality		✓ Sandy sea floor with some gravel, possibly higher percentage of coarser-grained sand or gravel			
Benthic habitats and communities			✓ Polychaetes, crustaceans and mollusc infauna; possible sponge, soft coral, other invertebrate filter-feeder epifauna		
Plankton			✓ Open ocean phyto- and zoo-plankton		
Fish			✓ Bony & cartilaginous fish, two vulnerable species (Great White and Whale sharks), distribution BIA for Great White shark, 42 km from Great White shark breeding BIA, 66 km from Southern Right Whale migration BIA		
Marine Mammals - Seals			✓ Listed species the New Zealand Fur Seal and the Australian Fur Seal known to rest on the platform and swim alongside		
Marine Mammals - Cetaceans			✓ 27 cetacean species or species habitats occur, of which 5 species are listed (Sei, Blue, Fin, Southern Right and Humpback whales), facility overlaps foraging BIA for Blue whale and distribution BIA		

Receptors	Impacts				
	Change in water quality	Change in sediment quality	Injury to fauna	Change in habitat	Change to the function, interests or activities of other users
			for Southern Right whale		
Australian Marine National Parks and National Parks				✓ Ninety Mile Beach MNP (79 km), Point Hicks MNP (129 km), Beagle MNP (101 km), Gippsland Lakes NP (74 km)	
KEFs				✓ Overlaps with Shelf Rocky Reefs (18 km to South East Reef), 35 km to Upwelling East of Eden, 30km+ to Bass Cascade, 112 km to Big Horseshoe Canyon	
Commercial and recreational fisheries					✓ Likely fisheries are Small pelagic, Southern and Eastern Scalefish & Shark, Danish-seine and scalefish hook, Wrasse, and Southern Squid Jig (low intensity) Fisheries

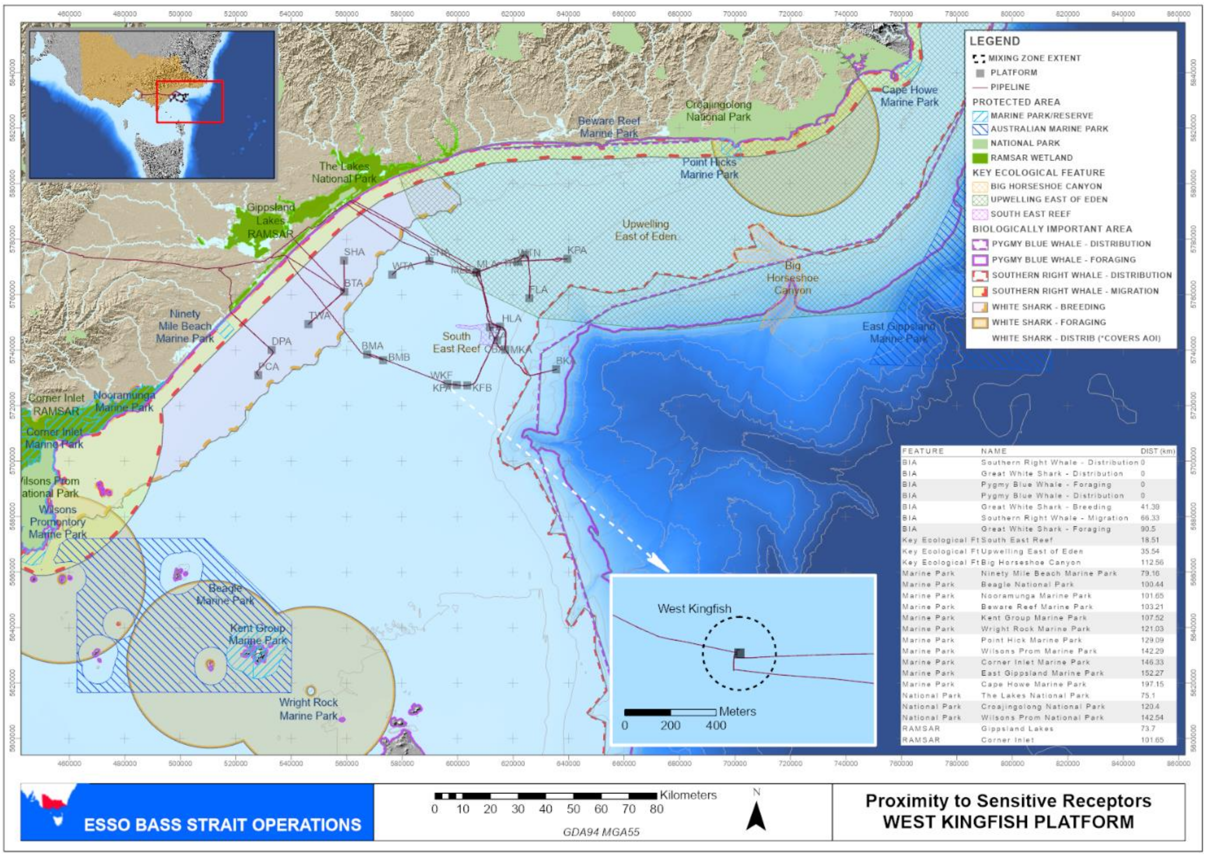


Figure 6-7 **160 m mixing zone around WKF platform in relation to other environmental receptors**

6.3.4.7 West Kingfish PFW impact assessment

Impacts to water quality

Physical properties of seawater are established within 10 m of the discharge point. Temperature changes using the RPS APASA (2016) model found that due to the turbulent mixing caused by the initial plunge and then buoyant rise of the effluent, in all cases the average temperature of the produced water plume returns to within 3°C above ambient temperatures within 10 m of the discharge location.

Chemical contaminants in PFW dilute quickly on the initial plunge, then more slowly with dispersion in the current around the platform. PFW is discharged at 7 times the ANZECC 99% species protection water quality criteria for hydrocarbons, 414 times for metals (due to Chromium where levels of Total Chromium is assumed to be all Chromium-VI, otherwise 8 times if assuming that Chromium is of a lower toxicity form (CrIII)), and 38 times for inorganics; dilutes rapidly on its initial descent, and reaches ANZECC 95% water quality criteria within 17 m; and ANZECC 99% water quality criteria within 160 m (if levels of Total Chromium is assumed to be all Chromium-VI, otherwise within 17 m).

PFW is discharged at between 28 and 224 times the background levels for hydrogen sulphide and up to 740 times the background levels of TOC (see Appendix F.4 – PFW data file) and gradually reduces to background levels with distance from the platform, reaching background levels within 160 m of the discharge point and defining the extent of the mixing zone for WKF platform.

Anions such as sodium, calcium, magnesium and potassium, and cations such as chloride, sulphate, bromide and bicarbonate are found in PFW however these ions (and their associated salts) are also commonly found in seawater and hence will not be discussed further (Pillard et al. 1996).

Potential Naturally Occurring Radioactive Materials (NORM) are not expected to occur in quantities that may result in significant environmental impacts and are therefore not discussed further.

Impacts to sediment quality

WKF PFW contains the following chemicals which could impact marine sediments and an ANZECC (2000) or ANZECC (2013) interim sediment quality guideline value exists:

- Low molecular weight PAHs: Naphthalene, 2-methylnaphthalene, and to a lesser extent (lower number of detections): Flourene, Phenanthrene
- High molecular weight PAHs: None
- Metals/Metalloids: Chromium, Copper, Nickel and Arsenic.

There is no physical interaction of the plume with the seabed and hence no direct exposure of the constituents of PFW with the sediment (see Appendix F – PFW Data file). There is a potential pathway for impacts to sediment through settling of constituents in the PFW plume.

An analysis of the WKF PFW discharge found that 99.7% of particles are ≤63 µm (clay or silt). Per Breakout Box 10, this silt and clay fraction (≤63 µm) is usually cited as the chemically active fraction which is associated with potential contaminants of concern (UNEP/WHO 1996). While there is potential for settling of particles in the WKF PFW plume, it is the larger particles (>63 µm) that may settle which are composed primarily of stable inorganic materials and are generally not associated with contaminants of concern (see Appendix G.10 – Breakout Box 10).

Monitoring results for offshore facilities generally show that natural dispersion processes appear to control the concentrations of potential contaminants from PFW in sediments to slightly above background concentrations (Neff et al. 2011). The results from in-situ sediment monitoring confirm this, and around WKF found no valid samples for PAHs, chromium, or nickel above the ANZECC (2013) ISQG "low" criteria (see Appendix G.8 – Breakout Box 8). Occurrences of metals/metalloids were isolated, levels remained low and detections above reference locations remained localised despite there being evidence of some gradients away from the platform (see Appendix G.8 – Breakout Box 8).

Given that at the WKF platform;

- sampling results indicate that less than 1% of particles in PFW may settle (due to their size)
- particles that settle are likely to be stable inorganic materials
- there were no valid observations of contaminants in PFW in sediments around WKF platform above ISQG "low" guideline values
- levels of contamination of nickel in a gradient away from the platform remains of very low level and within a small radius

the PFW discharge is expected to have negligible impacts on sediment.

Impacts to biota

Potential impacts of PFW to biota have been assessed through WET testing and dilution modelling to establish a mixing zone. Marine biota inside the mixing zone may be exposed to chronic exposure to contaminants in PFW, however, the mixing zone is limited to a localised extent around the plume discharge point only.

Process chemicals are discharged to the sea in residual amounts if they partition into the PFW and are not removed via the available treatment processes. As WET testing was performed with samples that contained chemical additives, the WET testing results are indicative of the routinely discharged PFW and account for any potential biological impacts that could be incurred by the PFW including any chemical additives. In addition, the ecotoxicological impacts of process chemicals in PFW discharges was comprehensively investigated in a study by Henderson et al. (1999). The study tested 11 commonly used process chemicals (including biocides, corrosion inhibitors and demulsifiers) for their acute toxicity to marine bacterium, both directly in aqueous preparations and following their partitioning between oil and water phases. The study results indicated that toxicity of the PFW was not significantly altered by the presence of most process chemicals used in typical concentrations. A review of the study by Schmeichel (2017) notes that process chemicals make a small contribution to the overall acute toxicity profile of PFW discharges.

Relevant to all receptor types (ecotoxicity pathways) are the WKF WET testing results. 95% species protection criteria based on WET testing is met within less than 28 m of the discharge point (Appendix F – PFW data file). At this distance, 95% species will be protected from adverse ecotoxicity effects of the discharge, and water quality is reflective of ‘ecosystems in which aquatic biological diversity may have been adversely affected to a relatively small but measurable degree by human activity. The biological communities remain in a healthy condition and ecosystem integrity is largely retained’ (ANZECC, 2000, p3.1-10). 99% species protection criteria based on WET testing is met within less than 42 m of the discharge point (Appendix F – PFW data file). At this distance, 99% species will be protected from adverse ecotoxicity effects of the discharge, and water quality is reflective of an ‘effectively unmodified, high conservation-value ecosystem’ (ANZECC, 2000, p3.1-10). Outside 42 m to the remainder of the boundary of the mixing zone, contaminants in PFW will continue to reduce to background seawater concentrations. At these levels they are not expected to have any impact to biota.

Impacts to benthic communities and habitat

There are two pathways for potential impacts to benthic communities and habitats:

- Benthos near the discharge could be subject to exposure to toxic effects of PAHs or metals if they are directly exposed to PFW for long periods;
- Benthic animals near a produced water discharge may bio-accumulate metals, phenols, and hydrocarbons from the ambient water, their food, or bottom sediments.

Direct exposure - chemical ecotoxicity effects

WKF whole effluent toxicity results (2014) show that the amphipod *Allorchestes compressa* was affected by exposure to more than 50% raw effluent (acute endpoint). This is unlikely to occur anywhere within the mixing zone except immediately at the point of discharge. Hence no effect is expected on *Allorchestes compressa* since WKF effluent is diluted 10 times within 1 m of the discharge point. The sea urchin *Heliocidaris tuberculate* was affected by exposure to more than 12.5% raw effluent (chronic endpoint). This is unlikely to occur anywhere within the mixing zone except immediately at the point of discharge. Hence no effect is expected on *Heliocidaris tuberculate* since WKF effluent is diluted 10 times within 1 m of the discharge point. The mussel *Mytilus galloprovincialis* was affected by exposure to more than 6.3% raw effluent (chronic endpoint). This is unlikely to occur anywhere within the mixing zone except immediately at the point of discharge and possibly out to 17 m from the discharge point. Hence the only effect expected on *Mytilus galloprovincialis* is highly localised to within 1-17 m since WKF effluent is diluted by 50 times within 17 m of the discharge point.

Impacts from PAHs in PFW on fauna such as scallops, crustaceans and other molluscs within 42 m of the discharge could pose chronic developmental or growth impacts, such as reduced survival of juveniles and reduced size, such as was found during a study of PFW effluent exposure of greater than 10% to sea scallops (Querbach et al. 2005, in Armsworthy et al., 2005). PFW discharge can also affect larvae viability (abalone, Raimondi and Schmitt, 1992). These effects are highly unlikely to occur at WKF since effluent is diluted 10 times within 1 m of the discharge point. Additionally, the PFW plume is positively buoyant and does not contact the sea floor, it is expected that only fauna on the platform structure itself could be exposed and those on the sea floor are protected from direct exposure.

The range of marine acute LC50 values for arsenic (V) in water was 230-9600 µg/L for crustaceans and 330- 800 000 µg/L for molluscs (Vaughan 1996). In general, early life stages were more sensitive to arsenic than adults. The maximum arsenic level recorded in WKF undiluted PFW was 110 µg/L in 2017 with several years where arsenic was not detected and other arsenic levels detected between 3 µg/L and 10 µg/L (Appendix F). Factoring in the dilution described above, concentrations of arsenic are unlikely to have an impact on crustaceans or molluscs,

Sponges and soft corals localised to the discharge point could experience reduced ability to settle and metamorphose, such as was found in Luter et al (2019) on larvae of the sponge *R. odorabile* when exposed to hydrocarbons in water. This effect could be felt by encrusting organisms on the structure (to 42 m horizontal radius of the discharge) but not seafloor organisms due to the positive buoyancy of the plume.

Bioaccumulation

A large study for the Gulf of Mexico Offshore Operators Committee examined bioaccumulation in tissues of mollusc, crustacean, and three fish species in and around 11 platforms in the Gulf of Mexico discharging over 1000 kL/d (Continental Shelf Associates, 1997). The study examined bioaccumulation of five metals (As, Cd, Hg, 226Ra and 228Ra); three volatile monocyclic aromatic hydrocarbons (MAH), benzene, toluene, and ethylbenzene; and four semi-volatile organic chemicals, phenol, fluorene, benzo(a)pyrene, and di (2-ethylhexyl) phthalate. They concluded that there is no relationship between the proximity of marine animals to offshore PFW discharges and concentrations in their edible tissues of the chemical constituents.

Additional MAH (m-, p-, and o-xylenes) and a full suite of 40 parent and alkyl-PAH and dibenzothiophenes were also analysed by Neff et al. (2011). There was no evidence of MAH or phenol being bioconcentrated. All MAH and phenol were either not detected (>95% of tissue samples) or were present at trace concentrations in all invertebrate and fish tissue samples. Concentrations of several petrogenic PAHs, including alkyl naphthalenes and alkyl dibenzothiophenes, were slightly, but significantly higher in some bivalve molluscs but not fish, from discharging than from non-discharging facilities. These PAH could have been derived from PFW discharges or from tar balls or small fuel spills. Concentrations of individual and total PAH in mollusc, crab and fish tissues were well below concentrations that might be harmful to the marine animals (Neff et. al. 2011).

Effects from bioaccumulation has been primarily associated with low-molecular weight PAHs. Both BTEX and hydrogen sulphide are not bioaccumulative (Neff 2002, ANZECC, 2000 respectively). PAHs are discharged in WKF PFW with a dilution factor of 7 for Naphthalene above the ANZECC 99% species protection level. WKF PFW is diluted 10 times within 1 m of the discharge, hence the potential for bioaccumulation from water is low. PAHs were not observed in sediments around WKF above relevant guideline criteria as part of the 2018 in-situ monitoring program, and hence the potential for bioaccumulation from sediments is low.

There were no significant differences in benthic infauna distributions observed in an in-situ study around West Kingfish in 2018. This study found that at both near and far zones around the platform and at reference sites, crustaceans dominated the benthic infauna, followed by polychaetes. For less than 12% of the total number of taxa, infauna abundance significantly increased with distance from the platform, owing mostly to the presence of barium (a major constituent of drilling muds) and re-distribution of coarser sediments around the platform (Appendix G.9 – Breakout Box). The increase at WKF with distance away from the platform for this minor percentage of taxa (rather than a decrease at TNA with distance for a majority separate fraction of taxa) can be explained by different hydrodynamic conditions present at WKF (water depth, etc.) resulting in the presence of a different set of taxa within the major taxonomic groups (only five taxa showing a distinct correlation with distance from the platform were present at both platforms, and only two of these showed a counter-gradient with distance from each platform) and the presence of barium (a major constituent of drilling muds) in a stronger gradient around the platform at WKF than at TNA, expected to be resultant from the fact that drilling on WKF was conducted more recently than at TNA The change in abundance could not be correlated with increased sediment contaminants found in PFW. This is consistent with the findings in Neff et al. (1992) where distributions of benthic communities around the platform (in 8 m water depth) were explained in large part by the influence of sediment grain size on benthic community structure; and there was no correlation between faunal density and the concentration of total hydrocarbons in sediments.

Studies have found that provided the water depth is greater than the discharge depth, benthic organisms will not be affected by PFW, as the concentration of any oil or adhered/adsorbed components will be extremely low (Furuholt, 1996). Studies that have reported changes to benthic distributions were in shallow, moderate-to-poorly flushed waters of 1-8 m or continental shelf waters of up to 12 m (e.g. Osenberg et al (1992) and Rabalais et al. (1992)). It can be expected that in deeper, well-mixed ocean environments (such as at WKF) the potential for impacts to benthic infauna would be even lower.

For benthic organisms, effects of chromium on crustaceans was published as ranging between 4 µg/L (Cancer anthonyi, from 7-d LOEC, hatch) to 3090 µg/L (Rhithanopanopeus sp, from 20-d LC50) (ANZECC 2000). Effects on echinoderms was 2000 µg/L (from 7-d LC50, Asterias forbesi) and molluscs at 1600 µg/L (Mya arenaria, from 7-d LC50) to 10 000 µg/L (Macoma balthica, from 8-16 d LC50). WKF PFW chromium concentrations were 58 µg/L, 3 µg/L, 6 µg/L and 2 µg/L in 4 of the 8 tests and non-detect in other years (Appendix F). As WKF PFW is diluted 10 times within 1 m of the discharge and 50 times within 17 m of the discharge, any effects on molluscs or crustaceans from bioaccumulation of chromium in PFW would be limited to organisms within 17 m of the discharge. It should also be noted that in marine and estuarine conditions, the high sulphate concentrations make chromium toxicity unlikely (ANZECC 2000).

Copper is readily accumulated by plants and animals; bioconcentration factors ranging from 100 to 26000 have been recorded for various species of phytoplankton, zooplankton, macrophytes, macroinvertebrates and fish (Spear & Pierce 1979). Toxic effects of metals occur when the rate of uptake exceeds the rates of physiological or biochemical detoxification and excretion (Rainbow 1996, in ANZECC 2000). For benthic organisms, effects of copper on crustaceans was published as ranging between 8.5 µg/L (Callianassa australiensis, 10-14 day EC50) to 42 µg/L (Mysidiopsis bahia, from 29-51 d MATC, reproduction) and on molluscs between 0.4 µg/L (Mytilus edulis, from 30-d EC50, reproduction of 2 µg/L) to 20000 µg/L (Ostrea edulis, 5-d LC50) (ANZECC 2000). WKF PFW copper concentrations were 0.3 µg/L in one of the 8 tests and non-detect in other years (Appendix F). Hence no impacts to benthic organisms from bioaccumulation of copper in WKF PFW is expected.

In general, marine invertebrates are more sensitive to nickel than vertebrates (ANZECC 2000). Chronic effects of nickel on crustaceans was published as ranging between 141 µg/L (36-d chronic mortality, Mysidopsis bahia, Gentile et al. 1982) and 160 µg/L (Portunus pelagicus: from 42d MATC growth of 320 µg/L) to 6000 µg/L from 5-8 d LC50. Effects on echinoderms published as 2600 µg/L (Asteria forbesi from 7-d LC50) molluscs between 240 (Crassostrea virginica; from 12-d LC50 of 1200 µg/L) to 450 000 µg/L from 7-12 d LC50; and algae: 1 sp, Nitzschia closterium 50 µg/L, from 5-d EC50 growth (Australian data) (all from ANZECC 2000). WKF PFW nickel concentrations were 11 µg/L and 4 µg/L in two of the 7 years tested and non-detect in other years (Appendix F). Hence no impacts to benthic organisms from bioaccumulation of nickel in WKF PFW is expected.

Effects on benthic flora and fauna are primarily attributed either to uptake of contaminants from water or the presence of accumulated hydrocarbons (such as PAH) in sediments. Ecotoxicity impacts to biota from metals in sediment is more complicated, owing to the many forms that metals can take, reduction-oxidation states and overall bioavailability of the metal. While there have been a large number of studies where the chemical concentrations of contaminants have been measured in sediments, very few have been related to biological effects, either in the nature of descriptions of the natural benthic populations or laboratory-based bioassays (ANZECC 2000, p8.4-26). Given the results from the WKF in-situ sediment monitoring that found occurrences of metals/metalloids were isolated, levels remained low (for the most part, well below sediment guideline criteria) and detections above reference locations remained localised (see Appendix G.8 – Breakout Box 8), effects on benthos from accumulated metals in sediments is unlikely.

Given the above, benthic biota around WKF platform are highly unlikely to be affected by the PFW discharge. Any effects would be confined to chronic impacts (such as changes in growth, metamorphosis or reproduction) for flora and fauna such as sponges and crustaceans on the platform structure within 42 m of the discharge point, within the mixing zone of 160 m. As the area and depth ranges of a potential, but highly unlikely impact, are small and localised, effects at a population level are not credible.

Impacts to plankton

There are three pathways for potential impacts to plankton:

- Exposure to temperature effects on direct exposure
- Stimulatory effects of nutrients in the plume, leading to eutrophication of waters
- Exposure to toxic effects of chemical constituents of PFW if plankton are directly exposed for long periods (i.e. directly in the plume)

Direct exposure – temperature effects

As the average temperature of the produced water plume returns to within 3°C above ambient temperatures within 10 m of the discharge location, potential temperature effects on plankton are not credible.

Stimulatory effects from nutrients in the plume

Discharges of nutrients and hydrocarbons in the PFW plume can increase the localised abundance of plankton. For example, ammonia may elicit inhibitory (toxic) and/or stimulatory (e.g. eutrophication) responses from resident biota (Neff, 2011). Plankton could be attracted to localised higher concentrations of these constituents within the mixing zone and as a result plankton populations can rapidly increase. However, increased planktonic activity and turnover mass rates within the mixing zone is not expected to have any marked change on the water quality due to the high levels of movement of water around the platform from the action of currents and waves. Levels of nitrate and phosphates are low (not unlike other produced waters, Neff, 2011) and hence are not likely to cause eutrophication. Supporting this there is anecdotal evidence that no phytoplankton blooms have ever been recorded at a Bass Strait Esso facility.

Direct exposure – chemical ecotoxicity effects

Phytoplankton are among the most sensitive organisms to both forms of arsenic. The Australian diatom Nitzschia closterium is highly sensitive to arsenic (III), with a 72-h EC50 for growth inhibition of 7 µg/L (Florence & Stauber 1991), compared to >2000 µg/L for arsenic (V). An Environmental Concern Level (ECL, see Section 8.3.4.5) of 2.3 µg/L was derived for As (III) in marine waters, using an AF of 100 (ANZECC 2000). WKF PFW arsenic concentrations were 3 µg/L, 3.2 µg/L, 10 µg/L and 110 µg/L and non-detects in the remaining years tested (Appendix F). WKF PFW dilutes 50 times within 17 m of the discharge. Hence the effects on plankton are limited to those within a 17 m radius of the discharge as a result of the levels of arsenic in WKF PFW discharge.

Plankton have high levels of natural mortality and a rapid replacement rate (UNEP 1985). Any impacts as a result of direct exposure of planktonic communities to PFW are expected to be confined to the 42 m zone to 99% species protection, which sits within the extent of the mixing zone. Direct exposure of planktonic communities to PFW within the 42 m zone (to 99% species protection criteria based on WET testing) is not considered to result in significant impacts at the population level of organisms that could affect broader ecological diversity or productivity of the area surrounding the facility.

Impacts to fish

There are three pathways for potential impacts to fish:

- Exposure to temperature effects on direct exposure
- Exposure to toxic effects of chemical constituents of PFW if fish are directly exposed for long periods (i.e. directly in the plume)
- Exposure to toxic effects of chemical constituents of PFW if fish are directly exposed to contaminated sediments

Direct exposure – temperature effects

As the average temperature of the produced water plume returns to within 3°C above ambient temperatures within 10 m of the discharge location, potential temperature effects on fish are not credible.

Direct exposure – chemical ecotoxicity effects

Early lifestages of fish (embryos, larvae) within the 42 m zone to where 99% species protection criteria are met would be most susceptible to the exposure from chemical constituents in the PFW discharge, as they are less mobile and therefore can become exposed to the plume at the outfall. These effects can range from no effects (Mathieu et al 2011), to gill damage (turbot larvae, Brown et al. 1998). Hormonal effects could be experienced without liver function damage (cod, Meier et al, 2002), however this occurs at very high exposure concentration or where immune systems are already compromised by other stressors (Hamoutene et al, 2011; Burridge et al, 2011) which is not likely to be the case at WKF. Larvae entrained in the outfall may only be exposed to higher concentrations for a short period relative to the buoyancy of the organism (Querbach, et al. 2005). Outside the 42 m radius, early lifestages of fish are not expected to be affected at all.

Later-life pelagic species are generally highly mobile and as such are not likely to be exposed at concentrations that would lead to chronic effects due to their patterns of movement. Fish also exhibit a strong avoidance reaction to hydrogen sulphide (USEPA 1986 in ANZECC 2000).

BTEX is known to be toxic to fish and invertebrate eggs and larvae and has been shown to result in developmental defects (Fucik et al. 1995). However, due to the compound's volatility, the residence time in waters is brief; rapid active and passive excretion of these compounds from tissues will also limit in-tissue concentrations in the field; and BTEX does not bio-accumulate (Neff et al., 1996). The dilution ratio for WKF PFW to ANZECC 99% species protection water criteria for Benzene is 2, and WKF PFW is diluted 10 times within 1 m, hence BTEX is not expected to have any toxic effects outside of 1 m from the discharge point.

Levels of chromium (max detected 58 µg/L) and nickel (max detected 11 µg/L) in the WKF discharge are well below the concentrations that could have effects on fish (Chromium 776 µg/L (Citharichthys sp, from 14-21 d LC50) to 14 125 µg/L (Cyprinodon variegatus, from NOEC, growth) and Nickel Fundulus heteroclitus, 30 000 µg/L from 7-d LC50; from ANZECC 2000).

Effects from copper in water on fish was published as ranging between 30 µg/L (2 spp, from 12-14 d EC50, hatch & mortality) to 260 µg/L (Menidia menidia, 11-d EC50, hatch) (ANZECC 2000). The WKF PFW copper concentration was 0.3 µg/L in one of the 8 tests and non-detect in other years (Appendix F). Hence there are no effects on fish expected as a result of the levels of copper in WKF PFW.

Whole effluent ecotoxicity data from WKF PFW shows that the barramundi fish *Lates calcarifier* experienced effects above 50% raw effluent exposure (chronic endpoint). This is unlikely to occur anywhere in the mixing zone except directly at the discharge point itself. Whilst this species is not local to Bass Strait, no effect is expected on fish similar to *Lates calcarifier* since WKF effluent is diluted by more than 10 times within 1 m of the discharge point.

Exposure to contaminated sediments – chemical ecotoxicity effects

Effects from fish directly exposed to contaminated sediments above 22 mg/kg PAH could result in gill hyperplasia, reduced phagocytic activity of macrophages and pancreatic necrosis (spot, Hinkle-Conn et al., 1998). However this is highly unlikely to be the case as PAHs were not detected in sediment around WKF.

The mixing zone overlaps the distribution BIA for the Great White Shark; however, given the localised area of impact and that sharks are transiting the area, no impacts are expected. The discharge does not constitute a threat listed in the recovery plan of the White Shark, and the discharge activity is not inconsistent with that plan.

In summary as the PFW plume is dynamic and moving constantly depending on the tides, currents, winds and internal waves, transient fish such as great white sharks, are unlikely to be exposed to elevated contaminant concentrations for extended durations. Indirect impacts, such as altered prey abundance or ingestion of bioaccumulated toxic compounds is considered to be of no effect given the localised area predicted to be impacted by PFW and the nature and scale of impacts to the marine ecosystem within the PFW discharge plume (i.e. slight impacts to food sources such as plankton and pelagic fish species). Given the potential absence of impacts to fish, the limited spatial extent of the water quality (160 m radius) the predicted intermittent and short interaction duration (i.e. minutes at a time) with the PFW plume, it is considered that there will not be a significant impact on fish particularly the great white shark from PFW discharges when assessed against the relevant criteria in the Matters of National Environmental Significance. Significant impact guidelines 1.1. (DoE, 2013), including that there will be no long-term decrease in the size of the population, the area of occupancy of the species or an important population, the existing population will not be fragmented into two or more populations, there will be no adverse effect on habitat critical to the survival of a species, there will be no disruption to the breeding cycle of an important population, the availability or quality of habitat will not be destroyed, removed, isolated or decreased to the extent that the species is likely to decline and the recovery of the species will not be substantially interfered with.

Impacts to seals

There are four pathways for potential impacts to seals:

- Exposure to toxic effects of chemical constituents of PFW if seals are directly exposed for long periods (i.e. directly in the plume)
- Effects from inhalation of hydrocarbon vapours from PFW sheens
- Irritation effects from physical contact with hydrocarbons in PFW
- Bioaccumulation through the ingestion of impacted food sources

Produced water plumes predominantly result in dissolved contaminants and they rarely cause a defined layer on the sea surface (silvery sheen is the lowest level according to the Bonn agreement and usually patchy if at all present from the PFW discharge). Hence potential impact pathways through contact of hydrocarbons with seal fur and ingestion are not credible.

Direct exposure – chemical ecotoxicity effects

Seals do not spend all their time in the water, and when they do, they are highly active, travel great distances and forage at various depths (Arnould et al., 2005). As such, it is highly unlikely that these potential impact pathways will be significant. In addition, pinnipeds have been found to have the enzyme systems necessary to convert absorbed hydrocarbons into polar metabolites, which can be excreted in urine (Engelhardt, 1982; Addison & Brodie, 1984; Addison et al., 1986).

Effects from inhalation of hydrocarbon vapours from PFW sheens

Inhalation of hydrocarbon vapours could cause toxic effects. However, the level of oil on water (i.e. sheens) from produced water plumes rarely cause silvery sheens (the lowest level according to the Bonn agreement), and hence will have extremely low levels of vapour. Seals are highly mobile and active animals and do not spend all their time at the water surface, as such, it is highly unlikely that this potential impact pathways will be significant.

Irritation effects from physical contact with hydrocarbons in PFW

Exposure to on-sea hydrocarbons could cause irritation to the eyes and oral cavity. However seals are unlikely to remain swimming within the discharge plume for long periods as they are highly active animals, travel great distances and forage at various depths. As such, it is highly unlikely that this potential impact pathways will be significant so as to not have any chronic impacts to seals.

Bioaccumulation through ingestion of impacted food sources

As impacts to the predominant seal food source of fish are of very low likelihood (as above), bioaccumulation through ingestion of impacted food sources is unlikely to have any impact on seals.

Listed Australian Fur Seals and New Zealand Fur Seals occur at the platform, however no seal breeding occurs on or around the platform, and the area is not identified as critical habitat or BIA. According to IUCN, the Australian Fur Seal is listed as Least Concern and its population is increasing (IUCN, 2015).

There is no relevant Conservation Advice or Threat Abatement Plan for Australian Fur Seals or New Zealand Fur Seals.

In summary as the PFW plume is dynamic and moving constantly depending on the tides, currents, winds and internal waves, coupled with seals being highly mobile active animals who do not spend all their time in the water or at the water surface, seals are unlikely to be exposed to elevated contamination concentrations for extended durations. Indirect impacts, such as altered prey abundance or ingestion of bioaccumulated toxic compounds is considered to be of no effect given the localised area predicted to be impacted by PFW and the nature and scale of impacts to the marine ecosystem within the PFW discharge plume (i.e. slight impacts to food sources such as pelagic fish species). Given the potential absence of impacts to seals, the limited spatial extent of the water quality (160 m radius) the predicted short interaction duration (i.e. minutes at a time) with the PFW plume, and that breeding does not occur within the OA it is considered that there will not be a significant impact on seals from PFW discharges when assessed against the relevant criteria from the Matters of National Environmental Significance. Significant impact guidelines 1.1. (DoE, 2013), including that there will be no long-term decrease in the size of the population, the area of occupancy of the species or an important population, the existing population will not be fragmented into two or more populations, there will be no adverse effect on habitat critical to the survival of a species, there will be no disruption to the breeding cycle of an important population, the availability or quality of habitat will not be destroyed, removed, isolated or decreased to the extent that the species is likely to decline and the recovery of the species will not be substantially interfered with.

Impacts to cetaceans

There are four pathways for potential impacts to cetaceans:

- Exposure to toxic effects of chemical constituents of PFW if cetaceans are directly exposed for long periods (i.e. directly in the plume)
- Effects from inhalation of hydrocarbon vapours from PFW sheens

- Irritation effects from physical contact with hydrocarbons in PFW
- Bioaccumulation through the ingestion of impacted food sources

Direct exposure – chemical ecotoxicity effects

Cetaceans are highly mobile and transitory animals, as such, it is highly unlikely that this potential impact pathways will be significant. Note also, many marine mammals appear to have the necessary liver enzymes to metabolise hydrocarbons and excrete them as polar derivatives (Ball and Truskewycz, 2013).

Effects from inhalation of hydrocarbon vapours from PFW sheens

As a result of inhaling volatile compounds when surfacing, cetaceans can experience lung congestion (Geraci & St. Aubin 1990); or irritation or damage to mucous membranes or airways (Helm et al., 2015). However, the level of oil on water (i.e. sheens) from produced water plumes rarely cause silvery sheens (the lowest level according to the Bonn agreement), and hence will have extremely low levels of vapour. Cetaceans are highly mobile and only transit the area, as such, it is highly unlikely that this potential impact pathway will be significant.

Irritation effects from physical contact with hydrocarbons in PFW

Cetaceans can be exposed through direct contact with the eyes, potentially leading to inflammation (Geraci & St. Aubin 1990). Cetaceans are highly mobile and only transit the area, as such, it is highly unlikely that this potential impact pathway will be significant.

Bioaccumulation through ingestion of impacted food sources

As impacts to cetacean food source predominantly of fish and plankton is of very low likelihood (as above), and the area does not represent a large proportion of the overall cetacean feeding area therefore it is unlikely to have any impact on cetaceans.

The mixing zone overlaps the foraging BIA for the blue whale and distribution BIA for the Southern Right Whale; however, given the localised area of impact and that whales are transiting the area, no impacts are expected. The discharge does not constitute a threat listed in the Conservation Management Plan of either the Blue Whale or Southern Right Whale and the discharge activity is not inconsistent with those plans.

In summary as the PFW plume is dynamic and moving constantly depending on the tides, currents, winds and internal waves, transient cetaceans such as migrating whales, are unlikely to be exposed to elevated contaminant concentrations for extended durations. Indirect impacts, such as altered prey abundance or ingestion of bioaccumulated toxic compounds is considered to be of no effect given the localised area predicted to be impacted by PFW and the nature and scale of impacts to the marine ecosystem within the PFW discharge plume (i.e. slight impacts to food sources such as plankton and pelagic fish species). Given the potential absence of impacts to cetaceans, the limited spatial extent of the water quality (160 m radius) the predicted intermittent and short interaction duration (i.e. minutes at a time) with the PFW plume, it is considered that there will not be a significant impact on cetaceans from PFW discharges when assessed against the relevant criteria from the Matters of National Environmental Significance. Significant impact guidelines 1.1. (DoE, 2013), including that there will be no long-term decrease in the size of the population, the area of occupancy of the species or an important population, the existing population will not be fragmented into two or more populations, there will be no adverse effect on habitat critical to the survival of a species, there will be no disruption to the breeding cycle of an important population, the availability or quality of habitat will not be destroyed, removed, isolated or decreased to the extent that the species is likely to decline and the recovery of the species will not be substantially interfered with.

Impacts to Fisheries – Commercial and Recreational

There are three potential impact pathways for fisheries:

- Tainting (hydrocarbon odour in caught fish) due to tissue accumulation of hydrocarbons in PFW
- Impacts to the safety of humans through the consumption of target species tissues that are impacted by PFW.

- Reduction of fisheries stocks, through the direct impact of PFW on target species and nurseries

Tainting

Per Appendix F, ANZECC seafood taint criteria is reached within 17 m of the discharge point. (Note: Appendix G.3 – Breakout Box 3 applies to the detection of other phenols under the seafood taint guidelines). The total area represented by a 17 m radius at WKF is 908 m^2 (1/10th of a hectare), and cumulative area across all Bass Strait platform PFW discharges is <2000 m^2 (1/5th of a hectare) representing an extremely small proportion of the total fisheries area. Hence the discharge is highly unlikely to cause taint in fisheries-caught fish.

Impacts to seafood safety for humans

Since fish or shellfish are not harvested around the PFW plume or mixing zone out to at least 500 m from the platform, and the zone in which 99% species protection criteria is reached extends to only 42 m from the platform, there is no effect of the PFW discharge on humans through consumption.

Impacts to fisheries stocks

Individual fish and other non-fish target species, (i.e. invertebrates of value, including squid, crustaceans (rock lobster, crabs) and molluscs (scallops, abalone), where they are directly present in the PFW plume (within 42 m radius), may be exposed to chronic sub-lethal impacts (see above) however due to the small range and depths that this applies, population level impacts are considered highly unlikely. Whilst offshore structures may play a role in enhancing fish stocks due to the presence of hard substrate and the level of protection from fishing that they provide, fish nurseries known to be notable prolific producers are close to shore (such as Gippsland Lakes RAMSAR site) and these are expected to contribute to fisheries stocks in much greater numbers. Therefore there are no anticipated impacts to fisheries stocks.

Stakeholder feedback confirmed that although fishers had been able to see discharges from the Bass Strait platforms from beyond the 500 m exclusion zone, the discharge did not have any effect on fisheries or fisheries equipment, or amenity for the fishers. There is general acknowledgement among fishers that Esso's facilities provide safe habitat for juvenile fisheries species. There were no complaints or issues brought up by fishers regarding PFW discharge. Ongoing dialogue with fishing communities is part of Esso's stakeholder engagement plan.

Impacts to other receptors

Australian Marine Parks, National Parks and Reserves

Given the distance of marine parks, national parks and reserves from the mixing zone, impacts to these receptors are not considered credible.

Key Ecological Features

Upwelling East of Eden: Given the distance from the mixing zone to the likely location of this KEF, impacts are not anticipated.

The Bass Cascade: Given the distance from the mixing zone to the likely location of this KEF, impacts are not anticipated.

Shelf rocky reefs and hard substrates (South-East Marine Region), including the South East Reef: The same assessment as benthic habitats and communities applies to this KEF as described above. Given the distance from the PFW mixing zone to the reported location of the South East Reef, impacts on this reef are not anticipated.

Cumulative impacts from multiple discharges

Neither KFA or KFB platforms are discharging PFW and hence there are no other PFW plumes within 3 km of the WKF discharge.

Other continuous discharges from the same platform are limited to discharges from pile subsea windows. These discharge at 67 m (ODSP) and 69.5 m (CDSP) below sea level, deeper than the produced water effluent pipe depth at 16 m below sea level. Piles are expected to be exchanging predominantly sea water, hence any discharge from the piles will be close to neutrally buoyant at the subsea window (Section 6.4.1.1). Discharges of water containing chemicals (at discharge all chemicals are CHARM Gold/Silver or OCNS D/E (Table 6-22)) or dissolved hydrocarbons from the pile will be intermittent or infrequent, and of small volumes which will disperse rapidly in the open ocean currents within the operational area. It is therefore expected that any exposure will be limited in duration.

Dispersion modelling for WKF PFW shows the maximum plunge depth from the discharge point under all current speeds is to 20 m below sea level, hence any cumulative impacts from the interaction with the produced water effluent plume within the mixing zone is considered unlikely to occur.

Other non-continuous discharges (such as desalination brine, sewage, grey water, food waste, liquid discharges from vessel operations, and wellwork discharges) could overlap with the PFW plume but are short in duration and hence any cumulative impacts are unlikely to occur.

Any suspended solids in the pile contents will settle out within the pile, or if finer and suspended in the pile, then they will gradually settle out at far distances from the platform as they are carried by the current and result in no noticeable impacts to sediments. Hence any cumulative impact of the pile discharges to sediment is considered highly unlikely.

Historical activities such as discharging muds and cuttings during drilling may have resulted in changes to the sea floor sediment chemical characterisation above background levels. This includes the discharge of water based muds and barite containing barium, an inert metal; and the discharge of cuttings from natural rock formations encountered during drilling, together with small amounts of residual drilling muds on cuttings. Any changes to sediment quality from historical impacts from background will be considered as part of the surrender of title process. The last drilling program on WKF was in approximately 2010, hence discharged fluids or solids from the drilling program is expected to have at least partially been dispersed or bioremediated. There is not expected to be a significant cumulative impact to sediment quality from the additive effect of discharging PFW to sediments containing higher levels of barium or residual drilling mud constituents.

Given the varying buoyancy of the plumes, the mobile nature of marine mammals and the tendency of fish to avoid plumes, cumulative impacts on marine fauna is unlikely.

As fishing is not carried out within 500 m of the platform, which is beyond the mixing zone of 160 m no cumulative impacts from multiple discharges is likely on commercial and recreational fishing.

Given the distance to other sensitive receptors (Table 5-2) cumulative impacts from multiple discharges are highly unlikely.

6.3.4.8 West Kingfish PFW consequence evaluation

Impacts from WKF PFW are limited to a localised mixing zone around the discharge point, with negligible impacts to sediment. Potential impacts to biota, including benthic habitats and communities, plankton, fish, and seals and cetaceans, including through bioaccumulation, is localised in nature to the mixing zone or negligible and is not considered significant (per Significant Impact Guidelines [DOE, 2013]).

Effects could be ongoing, including through bioaccumulation of PAHs and persistent chemicals, but effects are confined to some biota on the platform structure itself (e.g. crustaceans) or dispersed in a small radius around the platform water and sediments at low and safe concentrations. Within the mixing zone, there could be sub-lethal, direct or indirect effects on organisms, but this would likely only apply to non-mobile receptors, such as fish embryos/juveniles, and would not apply at a population level. The environment is highly endemic, with few endangered and rare species present, but is generally strong and resilient, and provides some ecosystem services (predominantly fisheries).

The consequence level is therefore assessed as **Consequence Level III.**

To ensure continuing confidence in the consequence level the Monitoring and Management Framework will be implemented. If routine monitoring was to detect levels in PFW above the trigger values and there was the potential to impact the ecosystem integrity, an ALARP/Acceptability study is required to determine what additional controls can be implemented to ensure the impacts are not realised. A sampling plan to demonstrate compliance with the approved mixing zone boundary will be developed for the sediment survey. The sampling plan outlines and justifies sampling locations and when concentration and bioavailability testing occur.

6.3.5 Halibut platform

6.3.5.1 Volume

A summary of historic and five-year-projected PFW discharge volume from the platform is provided in Figure 6-8 and Figure 6-9 respectively. The maximum capacity of the system is 13000 kL/d, however based on historical discharge rates the platform is expected to discharge produced water at a much lower rate of approximately 10000 kL/d until oil shutdown in approximately 2022/2023.

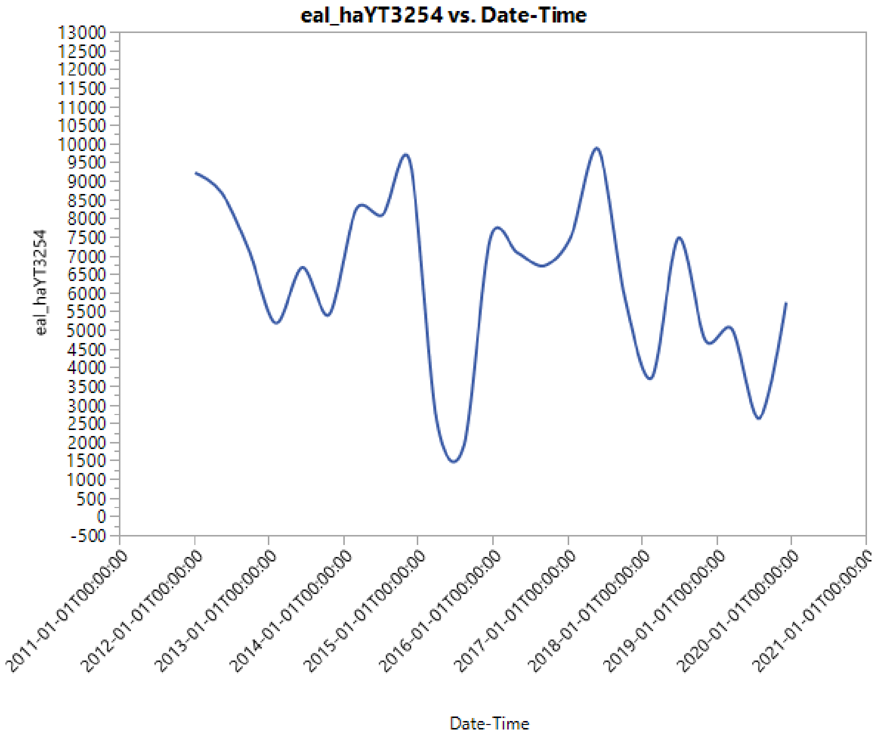


Figure 6-8 Historic HLA smoothed PFW overboard discharge volume (kL/d) (2012-2019)

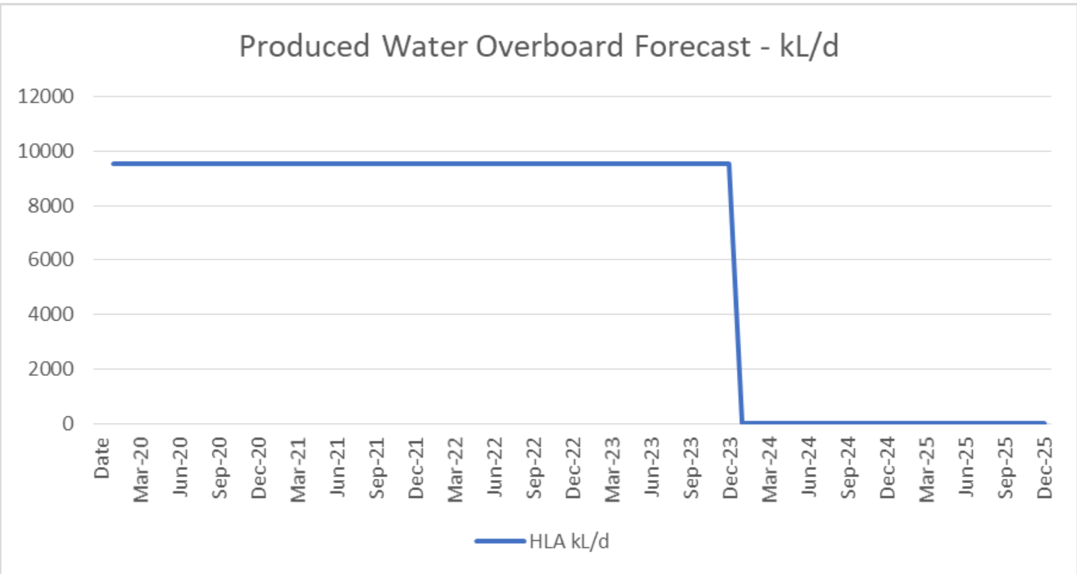


Figure 6-9 Five-year-projected maximum HLA PFW discharge volumes, kL/d.

6.3.5.2 Composition

Physical and chemical make-up

Physical and chemical make-up of PFW is shown in Appendix F – PFW Data file.

Chemical additives

Chemicals in Table 6-12 are added to the platform's water handling system in order to aid oil in water treatment. Chemicals in Table 6-13 are added into the process on the platform for other reasons and could remain at residual levels in the water handling system.

Table 6-12 Chemicals added to Halibut water handling system.

Description	Predominant phase solubility	Additive injection point	Potentially present in PFW discharge
Clarifier (e.g. Baker-Hughes RBW24980)	Water phase	V-260 and V-270 Production Oil Separators Inlet and Outlet	Yes

Table 6-13 Chemicals added to Halibut process that could remain at residual levels in the water handling system.

Description	Predominant phase solubility	Additive injection point	Potentially present in PFW discharge
Gas lift corrosion inhibitor (e.g. Baker-Hughes CGW24013)	Water phase	Gas lift into wells, upstream of water handling system	Yes

Oil in water monitoring results

Oil in water concentrations are measured on the platform using a continuous online monitor that determines the levels of oil using the way the PFW scatters light under UV fluorescence.

Data is provided in Appendix F for the platform's daily average overboard discharge levels of oil in water (in mg/L) and oil load (kg/d) since 1 Jan 2020 (reflecting the period following the NOPSEMA General Direction 740 in late 2019 where changes were made to the reporting and recording of oil in water).

Data is also provided for the same period showing the cross-check of platform online monitor readings with routine laboratory tests of oil and grease, with the alignment within a +/- 6 mg/L offset.

6.3.5.3 Ecotoxicology

To determine toxicity of the PFW discharge, whole effluent toxicity (WET) testing was performed in 2014 and 2020 across six tests (five chronic, one acute) and eight tests (seven chronic, one acute) respectively across at least 5 different species representing at least four different taxonomic groups. Further details of the ecotoxicology testing can be found in Appendix G.4 – Breakout Box 4. Chemical composition samples were taken at the same time as the samples for WET testing.

Chemical additives added at the time of sampling and ecotoxicology testing on Halibut in 2014 and 2020 were Baker-Hughes RBW24980.

Summarised results of the WET testing are shown in Appendix F.

A Burrlioz model has been run with the results from the WET testing (following Warne, 2018) with the 95% and 99% species protection level of effluent shown in Appendix F.

6.3.5.4 Movement, dispersion and dilution

A dispersion model was designed and calibrated to show the movement dispersion and dilution of the PFW discharge around the platform. Appendix G.6 – Breakout Box 6 shows the setup and calibration details for the model. Dispersion model inputs and outputs are summarized in Appendix F.

6.3.5.5 Fate and transport of Halibut PFW

Fate and transport of HLA PFW is no different to TNA PFW as outlined in Section 5.3.2.5.

6.3.5.6 Receptors at Halibut platform

PFW discharged to the marine environment has the potential to result in the following impacts:

- Change in water quality;
- Change in sediment quality;

As a result of change in water quality, change in sediment quality and / or habitat, further impacts may occur which include:

- Injury to fauna;
- Change in habitat;
- Change to the function, interests or activities of other users.

Receptors that could be credibly affected by the discharge of PFW are identified in Table 6-14 and Figure 6-10, with reference made to specific receptors or receptor groups per Table 5-2.

Table 6-14 Receptors affected by impacts associated with discharges of HLA PFW

Receptors	Impacts				
	Change in water quality	Change in sediment quality	Injury to fauna	Change in habitat	Change to the function, interests or activities of other users
Water quality	✓ Open ocean, high energy environment, cool waters, 73 m water depth				
Sediment quality		✓ Sandy sea floor with some gravel			
Benthic habitats and communities			✓ Likely polychaetes, crustaceans and mollusc infauna; possible sponge, soft coral, other invertebrate filter-feeder epifauna		
Plankton			✓ Open ocean phyto- and zoo-plankton		
Fish			✓ Bony & cartilaginous fish, two vulnerable species (Great White and Whale sharks), distribution BIA for Great White shark, 44 km from Great White shark breeding		

Receptors	Impacts				
	Change in water quality	Change in sediment quality	Injury to fauna	Change in habitat	Change to the function, interests or activities of other users
			BIA, 57 km from Southern Right Whale migration BIA		
Marine Mammals - Seals			✓ Listed species the New Zealand Fur Seal and the Australian Fur Seal known to rest on the platform and swim alongside		
Marine Mammals - Cetaceans			✓ 27 cetacean species or species habitats occur, of which 5 species are listed (Sei, Blue, Fin, Southern Right and Humpback whales), facility overlaps foraging BIA for Blue whale and distribution BIA for Southern Right whale		
Australian Marine National Parks and National Parks				✓ Ninety Mile Beach MNP (95 km), Point Hicks MNP (101 km), Beagle MNP (108 km), Gippsland Lakes NP (63 km)	
KEFs				✓ Overlaps with Shelf Rocky Reefs (0.1 km to South East Reef), 9 km to Upwelling East of Eden, 20 km+ to Bass Cascade, 87 km to Big Horseshoe Canyon	
Commercial and recreational fisheries					✓ Likely fisheries are Small pelagic, Southern and Eastern Scalefish & Shark, Danish-

Receptors	Impacts				
	Change in water quality	Change in sediment quality	Injury to fauna	Change in habitat	Change to the function, interests or activities of other users
					seine and scalefish hook, Wrasse, and Southern Squid Jig (low intensity) Fisheries

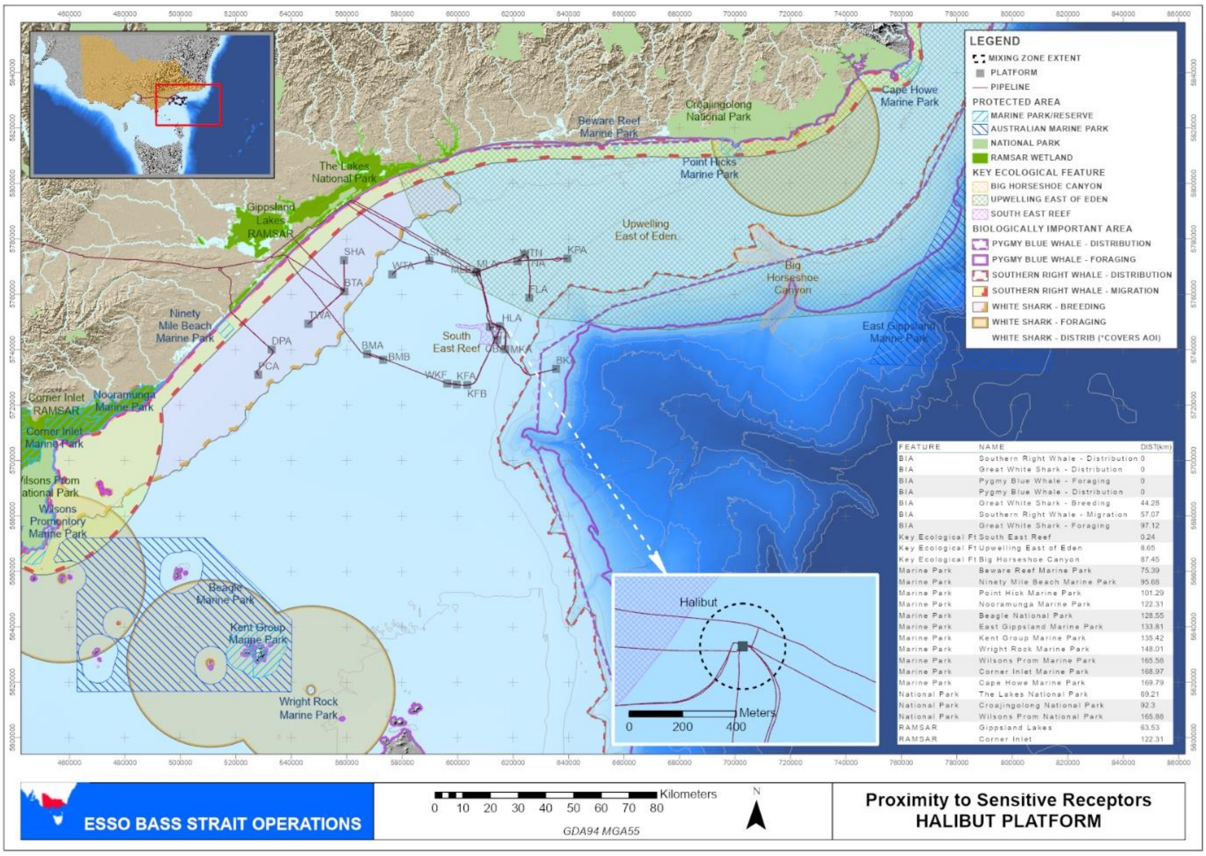


Figure 6-10 160 m mixing zone around HLA platform in relation to other environmental receptors

6.3.5.7 Halibut PFW impact assessment

Impacts to water quality

Physical properties of seawater are established within 10 m of the discharge point. Temperature changes using the RPS APASA (2016) model found that due to the turbulent mixing caused by the initial plunge and then buoyant rise of the effluent, in all cases the average temperature of the produced water plume returns to within 3°C above ambient temperatures within 10 m of the discharge location.

Chemical contaminants in PFW dilute quickly on the initial plunge, then more slowly with dispersion in the current around the platform. PFW is discharged at 8 times the ANZECC 99% species protection criteria for hydrocarbons, 16 times for metals, and 26 times for inorganics; dilutes rapidly on its initial descent, and reaches ANZECC 95% and ANZECC 99% water quality criteria within 4.3 m.

PFW is discharged at between 33 and 269 times the background levels for hydrogen sulphide and up to 78 times the background levels of TOC (see Appendix F.2 – PFW data file) and gradually reduces to background levels with distance from the platform, reaching background levels within 150 m of the discharge point.

Anions such as sodium, calcium, magnesium and potassium, and cations such as chloride, sulphate, bromide and bicarbonate are found in PFW however these ions (and their associated salts) are also commonly found in seawater and hence will not be discussed further (Pillard et al. 1996).

Potential Naturally Occurring Radioactive Materials (NORM) are not expected to occur in quantities that may result in significant environmental impacts and are therefore not discussed further.

Impacts to sediment quality

HLA PFW contains the following chemicals which could impact marine sediments and an ANZECC (2000) or ANZECC (2013) interim sediment quality guideline value exists:

- Low molecular weight PAHs: Naphthalene, 2-methylnaphthalene, and to a lesser extent (lower number of detections): Flourene, Phenanthrene and acenapthene
- High molecular weight PAHs: None
- Metals/Metalloids: Arsenic and Zinc.

There is no physical interaction of the plume with the seabed and hence no direct exposure of the constituents of PFW with the sediment (see Appendix F – PFW Data file). There is a potential pathway for impacts to sediment through settling of constituents in the PFW plume.

Particle size data is not available for HLA, however comparisons of the particle size distribution (PSD) in the produced water from TNA, WKF, CBA and SNA showed that at least 96% of the particles are very small, of the size of clay or silt (≤63 µm) This fraction is usually cited as the chemically active fraction which is associated with potential contaminants of concern (UNEP/WHO 1996). Assuming the PSD from the other platforms in Bass Strait are representative of the HLA PFW PSD, there may be potential for settling of particles in the HLA PFW plume. However, it is expected that there will be minimal larger particles (>63 µm) that may settle and these are likely composed primarily of stable inorganic materials and are generally not associated with contaminants of concern (see Appendix G.10 – Breakout Box 10). Particle size in HLA PFW will be monitored and managed in accordance with the Monitoring and Management Framework (see Volume 4 Section 2.6.5).

Monitoring results for offshore facilities generally show that natural dispersion processes appear to control the concentrations of potential contaminants from PFW in sediments to slightly above background concentrations (Neff et al. 2011). The results from in-situ sediment monitoring of a nearby platform with similar discharge characteristics (WKF) confirms this.

Around WKF the study found no valid samples for PAHs or metals that co-occur in the platform's PFW discharge above the ANZECC (2013) ISQG "low" criteria. (see Appendix G.8 – Breakout Box 8). Occurrences of metals/metalloids were isolated, levels remained low and detections above reference locations remained localised despite there being evidence of some gradients away from the platform (see Appendix G.8 – Breakout Box 8).

WKF is a suitable proxy for predicting the potential for sediment contamination around HLA as the PFW discharge rate, water depth, discharge depth, and range of contaminants in PFW is similar (Table 6-5). In addition, WKF has higher suspended solid loads than HLA (Appendix F – PFW data file), meaning that if metals were to precipitate, they would be more likely to do so in the WKF PFW plume than in the HLA PFW plume and be observed in the sediments close to the discharge point.

As a result the HLA PFW discharge is not expected to have significant impacts on sediment.

Impacts to biota

Potential impacts of PFW to biota have been assessed through WET testing and dilution modelling to establish a mixing zone. Marine biota inside the mixing zone may be exposed to chronic exposure to contaminants in PFW, however, the mixing zone is limited to a localised extent around the plume discharge point only.

Process chemicals are discharged to the sea in residual amounts if they partition into the PFW and are not removed via the available treatment processes. As WET testing was performed with samples that contained chemical additives, the WET testing results are indicative of the routinely discharged PFW and account for any potential biological impacts that could be incurred by the PFW including any chemical additives. In addition, the ecotoxicological impacts of process chemicals in PFW discharges was comprehensively investigated in a study by Henderson et al. (1999). The study tested 11 commonly used process chemicals (including biocides, corrosion inhibitors and demulsifiers) for their acute toxicity to marine bacterium, both directly in aqueous preparations and following their partitioning between oil and water phases. The study results indicated that toxicity of the PFW was not significantly altered by the presence of most process chemicals used in typical concentrations. A review of the study by Schmeichel (2017) notes that process chemicals make a small contribution to the overall acute toxicity profile of PFW discharges.

Relevant to all receptor types (ecotoxicity pathways) are the HLA WET testing results. 95% species protection criteria based on WET testing are met within 47 m of the discharge point (Appendix F – PFW data file). At this distance, 95% species will be protected from adverse ecotoxicity effects of the discharge, and water quality is reflective of 'ecosystems in which aquatic biological diversity may have been adversely affected to a relatively small but measurable degree by human activity. The biological communities remain in a healthy condition and ecosystem integrity is largely retained' (ANZECC, 2000, p3.1-10). 99% species protection criteria based on WET testing are met within 160 m of the discharge point (Appendix F – PFW data file). At this distance, 99% species will be protected from adverse ecotoxicity effects of the discharge, and water quality is reflective of an 'effectively unmodified, high conservation-value ecosystem' (ANZECC, 2000, p3.1-10). Outside 160 m contaminants in PFW will continue to reduce to background seawater concentrations. At these levels they are not expected to have any impact to biota.

Impacts to benthic communities and habitat

There are two pathways for potential impacts to benthic communities and habitats:

- Benthos near the discharge could be subject to exposure to toxic effects of PAHs or metals if they are directly exposed to PFW for long periods;
- Benthic animals near a produced water discharge may bio-accumulate metals, phenols, and hydrocarbons from the ambient water, their food, or bottom sediments.

Direct exposure - chemical ecotoxicity effects

HLA whole effluent toxicity results (2014) show that the amphipod *Allorchestes compressa* was affected by exposure to more than 12.5% raw effluent (acute endpoint). This is unlikely to occur anywhere within the mixing zone except immediately at the point of discharge. Hence no effect is expected on *Allorchestes compressa* since HLA effluent is diluted by 10 times within 0.6 m of the discharge point. The sea urchin *Heliocidaris tuberculate* was affected by exposure to more than 12.5% raw effluent (chronic endpoint). This is unlikely to occur anywhere within the mixing zone except immediately at the point of discharge. Hence no effect is expected on *Heliocidaris tuberculate* since HLA effluent is diluted by 10 times within 0.6 m of the discharge point. The mussel *Mytilus galloprovincialis* was affected by exposure to more than 12.5% raw effluent (chronic endpoint). This is unlikely to occur anywhere within the mixing zone except immediately at the point of discharge. Hence no effect is expected on *Mytilus galloprovincialis* since HLA effluent is diluted by 10 times within 0.6 m of the discharge point.

Impacts from PAHs in PFW on fauna such as scallops, crustaceans and other molluscs within 160 m of the discharge could pose chronic developmental or growth impacts, such as reduced survival of juveniles and reduced size, as was found during a study of PFW effluent exposure to sea scallops of greater than 10% (Querbach et al. 2005, in Armsworthy et al., 2005). PFW discharge can also affect larvae viability (abalone, Raimondi and Schmitt, 1992). These effects are highly unlikely to occur at HLA since effluent is diluted by 10 times within 0.6 m of the discharge point. Also since the PFW plume is positively buoyant and does not contact the sea floor, it is expected that only fauna on the platform structure itself could be exposed and those on the sea floor are protected from direct exposure.

The range of marine acute LC50 values for arsenic (V) in water was 230-9600 µg/L for crustaceans and 330- 800 000 µg/L for molluscs (Vaughan 1996). In general, early life stages were more sensitive to arsenic than adults. The maximum arsenic level recorded in HLA undiluted PFW was 1 µg/L in one of the 7 years tested and non-detect in other years (Appendix F). Hence direct exposure to arsenic in HLA PFW is unlikely to have an impact on crustaceans or molluscs, Sponges and soft corals localised to the discharge point could experience reduced ability to settle and metamorphose, such as was found in Luter et al (2019) on larvae of the sponge *R. odorabile* when exposed to hydrocarbons in water. This effect could be felt by encrusting organisms on the structure (to 160 m horizontal radius of the discharge) but not seafloor organisms due to the positive buoyancy of the plume.

Bioaccumulation

A large study for the Gulf of Mexico Offshore Operators Committee examined bioaccumulation in tissues of mollusc, crustacean, and three fish species in and around 11 platforms in the Gulf of Mexico discharging over 1000 kL/d (Continental Shelf Associates, 1997). The study examined bioaccumulation of five metals (As, Cd, Hg, 226Ra and 228Ra); three volatile monocyclic aromatic hydrocarbons (MAH), benzene, toluene, and ethylbenzene; and four semi-volatile organic chemicals, phenol, fluorene, benzo(a)pyrene, and di (2-ethylhexyl) phthalate. They concluded that there is no relationship between the proximity of marine animals to offshore PFW discharges and concentrations in their edible tissues of the chemical constituents.

Additional MAH (m-, p-, and o-xylenes) and a full suite of 40 parent and alkyl-PAH and dibenzothiophenes were also analysed by Neff et al. (2011). There was no evidence of MAH or phenol being bioconcentrated. All MAH and phenol were either not detected (>95% of tissue samples) or were present at trace concentrations in all invertebrate and fish tissue samples. Concentrations of several petrogenic PAHs, including alkyl naphthalenes and alkyl dibenzothiophenes, were slightly, but significantly higher in some bivalve molluscs but not fish, from discharging than from non-discharging facilities. These PAH could have been derived from PFW discharges or from tar balls or small fuel spills. Concentrations of individual and total PAH in mollusc, crab and fish tissues were well below concentrations that might be harmful to the marine animals (Neff et. al. 2011).

Effects from bioaccumulation has been primarily associated with low-molecular weight PAHs. Both BTEX and hydrogen sulphide are not bioaccumulative (Neff 2002, ANZECC, 2000 respectively). PAHs are discharged in HLA PFW with a dilution factor of 8 for Naphthalene above the ANZECC 99% species protection level. HLA PFW is diluted 10 times within 0.6 m of the discharge, hence the potential for bioaccumulation from water is low. PAHs were not observed in sediments around WKF above relevant guideline criteria as part of the 2018 in-situ monitoring program, and hence the potential for bioaccumulation is low.

The potential for bioaccumulation in benthic organisms around HLA can be predicted from the WKF in-situ monitoring results, as the PFW discharge rate, water depth, discharge depth, and range of contaminants in PFW is similar (Table 6-5). In addition, the sediment profile around HLA is similar to WKF (Figure 5-3).

There were no significant differences in benthic infauna distributions observed in an in-situ study around WKF in 2018. This study found that at both near and far zones around the platform and at reference sites, crustaceans dominated the benthic infauna, followed by polychaetes. For less than 12% of the total number of taxa, infauna abundance significantly increased with distance from the platform, owing mostly to the presence of barium (a major constituent of drilling muds) and re-distribution of coarser sediments around the platform (Appendix G.9 – Breakout Box). The change in abundance could not be correlated with increased sediment contaminants found in PFW. This is consistent with the findings in Neff et al. (1992) where distributions of benthic communities around the platform (in 8 m water depth) were explained in large part by the influence of sediment grain size on benthic community structure; and there was no correlation between faunal density and the concentration of total hydrocarbons in sediments.

Studies have found that provided the water depth is greater than the discharge depth, benthic organisms will not be affected by PFW, as the concentration of any oil or adhered/adsorbed components will be extremely low (Furuholt, 1996). Studies that have reported changes to benthic distributions were in shallow, moderate-to-poorly flushed waters of 1-8 m or continental shelf waters of up to 12 m (e.g. Osenberg et al (1992) and Rabalais et al. (1992)). It can be expected that in deeper, well-mixed ocean environments (such as at HLA) the potential for impacts to benthic infauna would be even lower.

Zinc is adsorbed by suspended material. Zinc was found to bioaccumulate in freshwater animal tissues 50 to 1130 times but bioaccumulation is not generally considered a problem for zinc (ANZECC 2000). For benthic organisms, zinc effects on crustaceans ranged from 15 µg/L (Acanthomysis sp, growth) to

2100 µg/L (8–28 d NOEC), echinoderms (Asterias forbesi), 460 µg/L (from 7-d LC50) and molluscs: 5 spp, 7–11 d NOEC (from LC50), 15 µg/L (Crassostrea gigas) to 27500 µg/L (ANZECC 2000). Algae were affected at between 13 µg/L (Nitzschia closterium) to 796 µg/L. (Skeletonema sp) (5–10 d NOEC). HLA PFW zinc concentrations were 110 µg/L or lower in 6 of the 8 tests and non-detect in other years (Appendix F). As HLA PFW is diluted to 10 times within 0.6 m of the discharge, there are no effects on benthic animals or plants expected as a result of the levels of zinc in HLA PFW discharge.

Effects on benthic flora and fauna are primarily attributed either to uptake of contaminants from water or the presence of accumulated hydrocarbons (such as PAH) in sediments. Ecotoxicity impacts to biota from metals in sediment is more complicated, owing to the many forms that metals can take, reduction-oxidation states and overall bioavailability of the metal. While there have been a large number of studies where the chemical concentrations of contaminants have been measured in sediments, very few have been related to biological effects, either in the nature of descriptions of the natural benthic populations or laboratory-based bioassays (ANZECC 2000, p8.4-26). Given the results from the WKF in-situ sediment monitoring that found occurrences of metals/metalloids were isolated, levels remained low (for the most part, well below sediment guideline criteria) and detections above reference locations remained localised (see Appendix G.8 – Breakout Box 8), effects on benthos from accumulated metals in sediments around HLA (if present) is unlikely.

Given the above, benthic biota around HLA platform are highly unlikely to be affected by the PFW discharge. Any effects would be confined to chronic impacts (such as changes in growth, metamorphosis or reproduction) for flora and fauna such as sponges and crustaceans on the platform structure within 160 m of the discharge point. As the area and depth ranges of a potential, but highly unlikely impact, are small and localised, effects at a population level are not credible.

Impacts to plankton

There are three pathways for potential impacts to plankton:

- Exposure to temperature effects on direct exposure
- Stimulatory effects of nutrients in the plume, leading to eutrophication of waters
- Exposure to toxic effects of chemical constituents of PFW if plankton are directly exposed for long periods (i.e. directly in the plume)

Direct exposure – temperature effects

As the average temperature of the produced water plume returns to within 3°C above ambient temperatures within 10 m of the discharge location, potential temperature effects on plankton are not credible.

Stimulatory effects from nutrients in the plume

Discharges of nutrients and hydrocarbons in the PFW plume can increase the localised abundance of plankton. For example, ammonia may elicit inhibitory (toxic) and/or stimulatory (e.g. eutrophication) responses from resident biota (Neff, 2011). Plankton could be attracted to localised higher concentrations of these constituents within the mixing zone and as a result plankton populations can rapidly increase. However, increased planktonic activity and turnover mass rates within the mixing zone is not expected to have any marked change on the water quality due to the high levels of movement of water around the platform from the action of currents and waves. Levels of nitrate and phosphates are low (not unlike other produced waters, Neff, 2011) and hence are not likely to cause eutrophication. Supporting this there is anecdotal evidence that no phytoplankton blooms have ever been recorded at a Bass Strait Esso facility.

Direct exposure – chemical ecotoxicity effects

Phytoplankton are among the most sensitive organisms to both forms of arsenic. The Australian diatom Nitzschia closterium is highly sensitive to arsenic (III), with a 72-h EC50 for growth inhibition of 7 µg/L (Florence & Stauber 1991), compared to >2000 µg/L for arsenic (V). An Environmental Concern Level (ECL, see Section 8.3.4.5) of 2.3 µg/L was derived for As (III) in marine waters, using an AF of 100 (ANZECC 2000). HLA PFW arsenic concentrations were 1 µg/L in one of the 7 years tested and non-detect in other years (Appendix F). Hence there are no impacts to plankton anticipated from arsenic in HLA PFW.

Plankton have high levels of natural mortality and a rapid replacement rate (UNEP 1985). Any impacts as a result of direct exposure of planktonic communities to PFW are expected to be confined to the 160 m zone to 99% species protection. Direct exposure of planktonic communities to PFW within the 160 m zone (to 99% species protection criteria based on WET testing) is not considered to result in significant impacts at the population level of organisms that could affect broader ecological diversity or productivity of the area surrounding the facility.

Impacts to fish

There are three pathways for potential impacts to fish:

- Exposure to temperature effects on direct exposure
- Exposure to toxic effects of chemical constituents of PFW if fish are directly exposed for long periods (i.e. directly in the plume)
- Exposure to toxic effects of chemical constituents of PFW if fish are directly exposed to contaminated sediments

Direct exposure – temperature effects

As the average temperature of the produced water plume returns to within 3°C above ambient temperatures within 10 m of the discharge location, potential temperature effects on fish are not credible.

Direct exposure – chemical ecotoxicity effects

Early lifestages of fish (embryos, larvae) within the 160 m zone to 99% species protection criteria would be most susceptible to the exposure from chemical constituents in the PFW discharge, as they are less mobile and therefore can become exposed to the plume at the outfall. These effects can range from no effects (Mathieu et al 2011), to gill damage (turbot larvae, Brown et al. 1998). Hormonal effects could be experienced without liver function damage (cod, Meier et al, 2002), however this occurs at very high exposure concentration or where immune systems are already compromised by other stressors (Hamoutene et al, 2011; Burridge et al, 2011) which is not likely to be the case at HLA. Larvae entrained in the outfall may only be exposed to higher concentrations for a short period relative to the buoyancy of the organism (Querbach, et al. 2005). Outside the 160 m radius, early lifestages of fish are not expected to be affected at all.

Effects from zinc in water on fish was published as 10 400 µg/L (Fundulus heteroclitus, 7-d NOEC of from LC50) (ANZECC 2000). HLA PFW zinc concentrations were 110 µg/L in one of the 7 years tested and non-detect in other years (Appendix F). Hence there are no effects on fish expected as a result of the levels of zinc in HLA PFW.

Later-life pelagic species are generally highly mobile and as such are not likely to be exposed at concentrations that would lead to chronic effects due to their patterns of movement. Fish also exhibit a strong avoidance reaction to hydrogen sulphide (USEPA 1986 in ANZECC 2000).

BTEX is known to be toxic to fish and invertebrate eggs and larvae and has been shown to result in developmental defects (Fucik et al. 1995). However, due to the compound's volatility, the residence time in waters is brief; rapid active and passive excretion of these compounds from tissues will also limit in-tissue concentrations in the field; and BTEX does not bio-accumulate (Neff et al., 1996). The dilution ratio for HLA PFW to ANZECC 99% species protection water criteria for Benzene is 3, and HLA PFW is diluted 10 times within 0.6 m, hence BTEX is not expected to have any toxic effects.

Whole effluent ecotoxicity data from HLA PFW shows that the barramundi fish *Lates calcarifier* experienced effects above 50% raw effluent exposure (chronic endpoint). This is unlikely to occur anywhere in the mixing zone except directly at the discharge point itself. Whilst this species is not local to Bass Strait, no effect is expected on fish similar to *Lates calcarifier* since HLA effluent is diluted by more than 10 times within 0.6 m of the discharge point.

Exposure to contaminated sediments – chemical ecotoxicity effects

Effects from fish directly exposed to contaminated sediments above 22 mg/kg PAH could result in gill hyperplasia, reduced phagocytic activity of macrophages and pancreatic necrosis (spot, Hinkle-Conn et al., 1998). However this is highly unlikely to be the case as PAHs were not detected in sediment around WKF.

The mixing zone overlaps the distribution BIA for the Great White Shark; however, given the localised area of impact and that sharks are transiting the area, no impacts are expected. The discharge does not constitute a threat listed in the recovery plan of the White Shark, and the discharge activity is not inconsistent with that plan.

In summary as the PFW plume is dynamic and moving constantly depending on the tides, currents, winds and internal waves, transient fish such as great white sharks, are unlikely to be exposed to elevated contaminant concentrations for extended durations. Indirect impacts, such as altered prey abundance or ingestion of bioaccumulated toxic compounds is considered to be of no effect given the localised area predicted to be impacted by PFW and the nature and scale of impacts to the marine ecosystem within the PFW discharge plume (i.e. slight impacts to food sources such as plankton and pelagic fish species). Given the potential absence of impacts to fish, the limited spatial extent of the water quality (150 m radius) the predicted intermittent and short interaction duration (i.e. minutes at a time) with the PFW plume, it is considered that there will not be a significant impact on fish particularly the great white shark from PFW discharges when assessed against the relevant criteria in the Matters of National Environmental Significance. Significant impact guidelines 1.1. (DoE, 2013), including that there will be no long-term decrease in the size of the population, the area of occupancy of the species or an important population, the existing population will not be fragmented into two or more populations, there will be no adverse effect on habitat critical to the survival of a species, there will be no disruption to the breeding cycle of an important population, the availability or quality of habitat will not be destroyed, removed, isolated or decreased to the extent that the species is likely to decline and the recovery of the species will not be substantially interfered with.

Impacts to seals

There are three pathways for potential impacts to seals:

- Exposure to toxic effects of chemical constituents of PFW if seals are directly exposed for long periods (i.e. directly in the plume)
- Effects from inhalation of hydrocarbon vapours from PFW sheens
- Irritation effects from physical contact with hydrocarbons in PFW
- Bioaccumulation through the ingestion of impacted food sources

Produced water plumes predominantly result in dissolved contaminants and they rarely cause a defined layer on the sea surface (silvery sheen is the lowest level according to the Bonn agreement and usually patchy if at all present from the PFW discharge). Hence potential impact pathways through contact of hydrocarbons with seal fur and ingestion are not credible.

Direct exposure – chemical ecotoxicity effects

Seals do not spend all their time in the water, and when they do, they are highly active, travel great distances and forage at various depths (Arnould et al., 2005). As such, it is highly unlikely that these potential impact pathways will be significant. In addition, pinnipeds have been found to have the enzyme systems necessary to convert absorbed hydrocarbons into polar metabolites, which can be excreted in urine (Engelhardt, 1982; Addison & Brodie, 1984; Addison et al., 1986).

Effects from inhalation of hydrocarbon vapours from PFW sheens

Inhalation of hydrocarbon vapours could cause toxic effects. However, the level of oil on water (i.e. sheens) from produced water plumes rarely cause silvery sheens (the lowest level according to the Bonn agreement), and hence will have extremely low levels of vapour. Seals are highly mobile and active animals and do not spend all their time at the water surface, as such, it is highly unlikely that this potential impact pathways will be significant.

Irritation effects from physical contact with hydrocarbons in PFW

Exposure to on-sea hydrocarbons could cause irritation to the eyes and oral cavity. However seals are unlikely to remain swimming within the discharge plume for long periods as they are highly active animals, travel great distances and forage at various depths. As such, it is highly unlikely that this potential impact pathways will be significant so as to not have any chronic impacts to seals.

Bioaccumulation through ingestion of impacted food sources

As impacts to the predominant seal food source of fish are of very low likelihood (as above), bioaccumulation through ingestion of impacted food sources is unlikely to have any impact on seals.

Listed Australian Fur Seals and New Zealand Fur Seals occur at the platform, however no seal breeding occurs on or around the platform, and the area is not identified as critical habitat or BIA. According to IUCN, the Australian Fur Seal is listed as Least Concern and its population is increasing (IUCN, 2015).

There is no relevant Conservation Advice or Threat Abatement Plan for Australian Fur Seals or New Zealand Fur Seals.

In summary as the PFW plume is dynamic and moving constantly depending on the tides, currents, winds and internal waves, coupled with seals being highly mobile active animals who do not spend all their time in the water or at the water surface, seals are unlikely to be exposed to elevated contamination concentrations for extended durations. Indirect impacts, such as altered prey abundance or ingestion of bioaccumulated toxic compounds is considered to be of no effect given the localised area predicted to be impacted by PFW and the nature and scale of impacts to the marine ecosystem within the PFW discharge plume (i.e. slight impacts to food sources such as pelagic fish species). Given the potential absence of impacts to seals, the limited spatial extent of the water quality (150 m radius) the predicted short interaction duration (i.e. minutes at a time) with the PFW plume, and that breeding does not occur within the OA it is considered that there will not be a significant impact on seals from PFW discharges when assessed against the relevant criteria from the Matters of National Environmental Significance. Significant impact guidelines 1.1. (DoE, 2013), including that there will be no long-term decrease in the size of the population, the area of occupancy of the species or an important population, the existing population will not be fragmented into two or more populations, there will be no adverse effect on habitat critical to the survival of a species, there will be no disruption to the breeding cycle of an important population, destroy, the availability or quality of habitat will not be destroyed, removed, isolated or decreased to the extent that the species is likely to decline and the recovery of the species will not be substantially interfered with.

Impacts to cetaceans

There are four pathways for potential impacts to cetaceans:

- Exposure to toxic effects of chemical constituents of PFW if cetaceans are directly exposed for long periods (i.e. directly in the plume)
- Effects from inhalation of hydrocarbon vapours from PFW sheens
- Irritation effects from physical contact with hydrocarbons in PFW
- Bioaccumulation through the ingestion of impacted food sources

Direct exposure – chemical ecotoxicity effects

Cetaceans are highly mobile and transitory animals, as such, it is highly unlikely that this potential impact pathways will be significant. Note also, many marine mammals appear to have the necessary liver enzymes to metabolise hydrocarbons and excrete them as polar derivatives (Ball and Truskewycz, 2013).

Effects from inhalation of hydrocarbon vapours from PFW sheens

As a result of inhaling volatile compounds when surfacing, cetaceans can experience lung congestion (Geraci & St. Aubin 1990); or irritation or damage to mucous membranes or airways (Helm et al., 2015). However, the level of oil on water (i.e. sheens) from produced water plumes rarely cause silvery sheens (the lowest level according to the Bonn agreement), and hence will have extremely low levels of vapour. Cetaceans are highly mobile and only transit the area, as such, it is highly unlikely that this potential impact pathway will be significant.

Irritation effects from physical contact with hydrocarbons in PFW

Cetaceans can be exposed through direct contact with the eyes, potentially leading to inflammation (Geraci & St. Aubin 1990). Cetaceans are highly mobile and only transit the area, as such, it is highly unlikely that this potential impact pathway will be significant.

Bioaccumulation through ingestion of impacted food sources

As impacts to cetacean food source predominantly of fish and plankton is of very low likelihood (as above), and the area does not represent a large proportion of the overall cetacean feeding area therefore it is unlikely to have any impact on cetaceans.

The mixing zone overlaps the foraging BIA for the blue whale and distribution BIA for the Southern Right Whale; however, given the localised area of impact and that whales are transiting the area, no impacts are expected. The discharge does not constitute a threat listed in the Conservation Management Plan of either the Blue Whale or Southern Right Whale and the discharge activity is not inconsistent with those plans.

In summary as the PFW plume is dynamic and moving constantly depending on the tides, currents, winds and internal waves, transient cetaceans such as migrating whales, are unlikely to be exposed to elevated contaminant concentrations for extended durations. Indirect impacts, such as altered prey abundance or ingestion of bioaccumulated toxic compounds is considered to be of no effect given the localised area predicted to be impacted by PFW and the nature and scale of impacts to the marine ecosystem within the PFW discharge plume (i.e. slight impacts to food sources such as plankton and pelagic fish species). Given the potential absence of impacts to cetaceans, the limited spatial extent of the water quality (150 m radius) the predicted intermittent and short interaction duration (i.e. minutes at a time) with the PFW plume, it is considered that there will not be a significant impact on cetaceans from PFW discharges when assessed against the relevant criteria from the Matters of National Environmental Significance. Significant impact guidelines 1.1. (DoE, 2013), including that there will be no long-term decrease in the size of the population, the area of occupancy of the species or an important population, the existing population will not be fragmented into two or more populations, there will be no adverse effect on habitat critical to the survival of a species, there will be no disruption to the breeding cycle of an important population, destroy, the availability or quality of habitat will not be destroyed, removed, isolated or decreased to the extent that the species is likely to decline and the recovery of the species will not be substantially interfered with.

Impacts to Fisheries – Commercial and Recreational

There are three potential impact pathways for fisheries:

- Tainting (hydrocarbon odour in caught fish) due to tissue accumulation of hydrocarbons in PFW
- Impacts to the safety of humans through the consumption of target species tissues that are impacted by PFW.
- Reduction of fisheries stocks, through the direct impact of PFW on target species and nurseries

Tainting

Per Appendix F, ANZECC seafood taint criteria is reached within 4.3 m of the discharge point. (Note: Appendix G.3 – Breakout Box 3 applies to the detection of other phenols under the seafood taint guidelines). The total area represented by a 4.3 m radius at HLA is 58 m^2 (<1/100th of a hectare), and cumulative area across all Bass Strait platform PFW discharges is <2000 m^2 (1/5th of a hectare), representing an extremely small proportion of the total fisheries area. Hence the discharge is highly unlikely to cause taint in fisheries-caught fish.

Impacts to seafood safety for humans

Since fish or shellfish are not harvested around the PFW plume or mixing zone out to at least 500 m from the platform, and the zone in which 99% species protection criteria is reached extends to only 160 m from the platform, there is no effect of the PFW discharge on humans through consumption.

Impacts to fisheries stocks

Individual fish and other non-fish target species, (i.e. invertebrates of value, including squid, crustaceans (rock lobster, crabs) and molluscs (scallops, abalone), where they are directly present in the PFW plume (within 160 m radius), may be exposed to chronic sub-lethal impacts (see above) however due to the small range and depths that this applies, population level impacts are considered highly unlikely. Whilst offshore structures may play a role in enhancing fish stocks due to the presence of hard substrate and the level of protection from fishing that they provide, fish nurseries known to be notable prolific producers are close to shore (such as Gippsland Lakes RAMSAR site) and these are expected to contribute to fisheries stocks in much greater numbers. Therefore there are no anticipated impacts to fisheries stocks.

Stakeholder feedback confirmed that although fishers had been able to see discharges from the Bass Strait platforms from beyond the 500 m exclusion zone, the discharge did not have any effect on fisheries or fisheries equipment, or amenity for the fishers. There is general acknowledgement among fishers that Esso's facilities provide safe habitat for juvenile fisheries species. There were no complaints or issues brought up by fishers regarding PFW discharge. Ongoing dialogue with fishing communities is part of Esso's stakeholder engagement plan.

Impacts to other receptors

Australian Marine Parks, National Parks and Reserves

Given the distance of marine parks, national parks and reserves from the mixing zone, impacts to these receptors are not considered credible.

Key Ecological Features

Upwelling East of Eden: Given the distance from the mixing zone to the likely location of this KEF, impacts are not anticipated.

The Bass Cascade: Given the distance from the mixing zone to the likely location of this KEF, impacts are not anticipated.

Shelf rocky reefs and hard substrates (South-East Marine Region), including the South East Reef: The same assessment as benthic habitats and communities applies to this KEF as described above. The platform's PFW mixing zone extends approximately to the edge of the reported location of the South-East Reef. Any impacts are limited to the mixing zone. If ANZECC 99% water quality criteria at the edge of the mixing zone are not exceeded (i.e. criteria suitable for high conservation value systems), there can be high confidence that ecological protection is achieved at the KEF.

Cumulative impacts from multiple discharges

Neither MKA or FTA platforms are discharging PFW and hence there are no other PFW plumes within 3 km of the HLA discharge. The next closest discharge is at CBA which is 5 km away from the HLA discharge point and the plumes are not expected to overlap (see Appendix G.6 – Breakout Box 6).

Other continuous discharges from the same platform are limited to discharges from pile subsea windows. These discharge at 46.5 m (ODSP) and 50 m (CDSP) below sea level, deeper than the produced water effluent pipe depth at 11 m below sea level. Piles are expected to be exchanging predominantly sea water, hence any discharge from the piles will be close to neutrally buoyant at the subsea window (Section 6.4.1.1). Discharges of water containing chemicals (at discharge all chemicals are CHARM Gold/Silver or OCNS D/E (Table 6-22)) or dissolved hydrocarbons from the pile will be intermittent or infrequent, and of small volumes which will disperse rapidly in the open ocean currents within the operational area. It is therefore expected that any exposure will be limited in duration.

Dispersion modelling for HLA PFW shows the maximum plunge depth from the discharge point under all current speeds is to 22.6 m below sea level, hence any cumulative impacts from the interaction with the produced water effluent plume within the mixing zone is considered unlikely.

Other non-continuous discharges (such as desalination brine, sewage, grey water, food waste, liquid discharges from vessel operations, and wellwork discharges) could overlap with the PFW plume but are short in duration and hence any cumulative impacts are unlikely to occur.

Any suspended solids in the pile contents will settle out within the pile, or if finer and suspended in the pile, then they will gradually settle out at far distances from the platform as they are carried by the current and result in no noticeable impacts to sediments. Hence any cumulative impact of the pile discharges to sediment is considered highly unlikely.

Historical activities such as discharging muds and cuttings during drilling may have resulted in changes to the sea floor sediment chemical characterisation above background levels. This includes the discharge of water based muds and barite containing barium, an inert metal; and the discharge of cuttings from natural rock formations encountered during drilling, together with small amounts of residual drilling muds on cuttings. Any changes to sediment quality from historical impacts from background will be considered as part of the surrender of title process. The last drilling program on HLA was in approximately 2007, hence discharged fluids or solids from the drilling program is expected to have at least partially been dispersed or bioremediated. There is not expected to be a significant cumulative impact to sediment quality from the additive effect of discharging PFW to sediments containing higher levels of barium or residual drilling mud constituents.

Given the varying buoyancy of the plumes, the mobile nature of marine mammals and the tendency of fish to avoid plumes cumulative impacts on marine fauna is unlikely.

As fishing is not carried out within 500 m of the platform, which is beyond the mixing zone of 160 m no cumulative impacts from multiple discharges is likely on commercial and recreational fishing.

Given the distance to other sensitive receptors (Table 5-2) cumulative impacts from multiple discharges are highly unlikely.

6.3.5.8 Halibut PFW consequence evaluation

Impacts from HLA PFW are limited to a localised mixing zone around the discharge point, with negligible impacts to sediment. Potential impacts to biota, including benthic habitats and communities, plankton, fish, and seals and cetaceans, including through bioaccumulation, is localised in nature to the mixing zone or negligible and is not considered significant (per Significant Impact Guidelines [DOE, 2013]).

Effects could be ongoing, including through bioaccumulation of PAHs and persistent chemicals, but effects are confined to some biota on the platform structure itself (e.g. crustaceans) or dispersed in a small radius around the platform water and sediments at low and safe concentrations. Within the mixing zone, there could be sub-lethal, direct or indirect effects on organisms, but this would likely only apply to non-mobile receptors, such as fish embryos/juveniles, and would not apply at a population level. The environment is highly endemic, with few endangered and rare species present, but is generally strong and resilient, and provides some ecosystem services (predominantly fisheries).

The consequence level is therefore assessed as **Consequence Level III.**

To ensure continuing confidence in the consequence level the Monitoring and Management Framework will be implemented. If routine monitoring was to detect levels in PFW above the trigger values and there was the potential to impact the ecosystem integrity, an ALARP/Acceptability study is required to determine what additional controls can be implemented to ensure the impacts are not realised. A sampling plan to demonstrate compliance with the approved mixing zone boundary will be developed for the sediment survey. The sampling plan outlines and justifies sampling locations and when concentration and bioavailability testing occur.

6.3.6 Cobia platform

6.3.6.1 Volume

A summary of historic and five-year-projected PFW discharge volume from the platform is provided in Figure 6-11 and Figure 6-12 respectively. In late 2014 the platform was shut in for replacement of the main oil pipeline. The maximum capacity of the system is 13000 kL/d, and based on historical discharge rates the platform is expected to discharge produced water at around 12000 kL/d or less until oil shutdown in approximately 2022-2023.

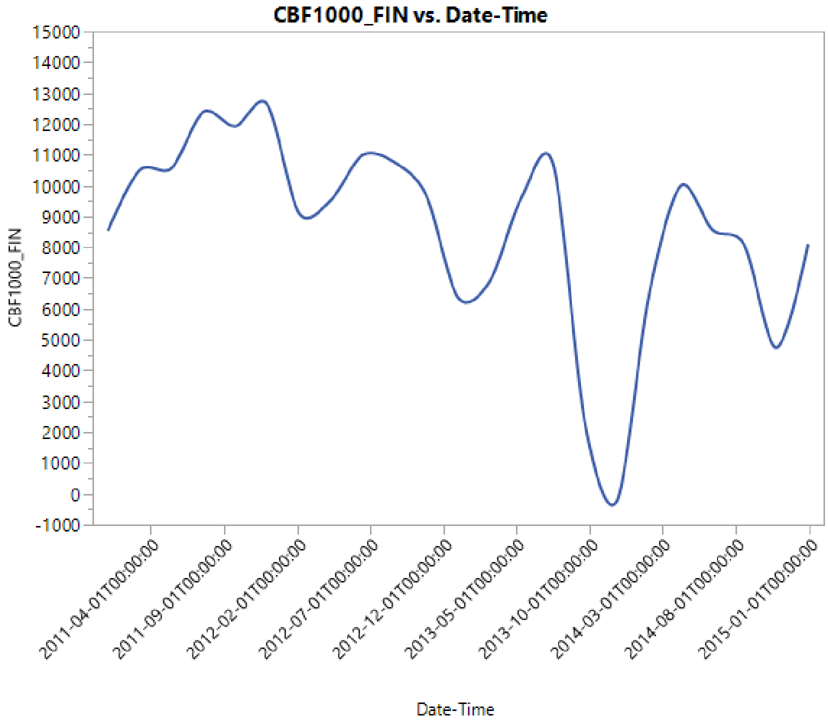


Figure 6-11 Historic CBA smoothed overboard PFW discharge volume (kL/d) (2012-2019)

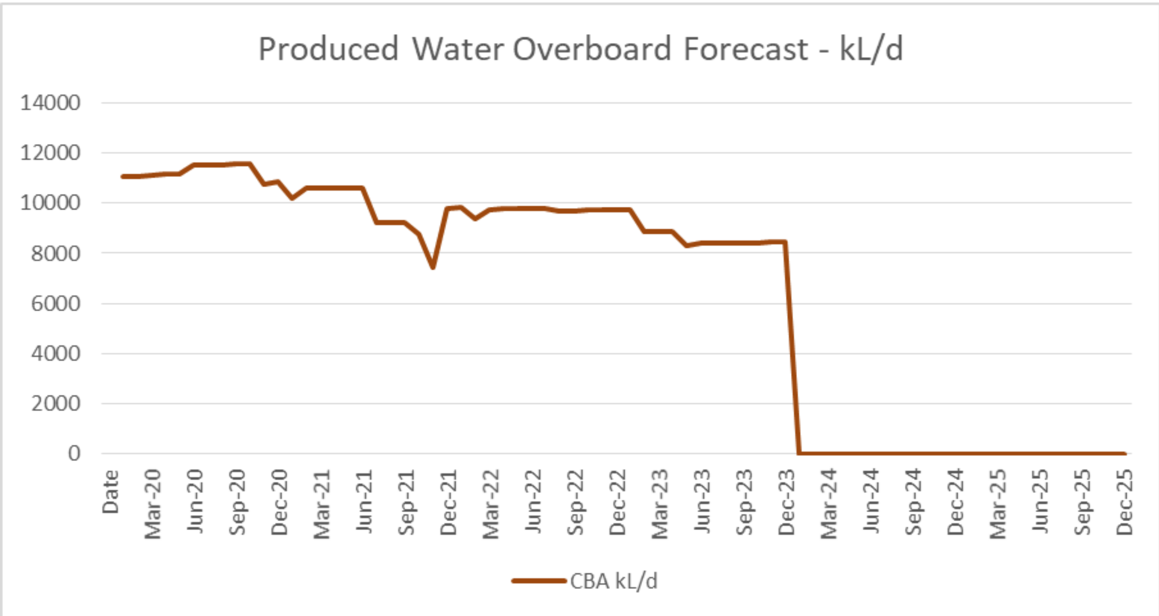


Figure 6-12 Five-year-projected maximum CBA PFW discharge volumes, kL/d.

6.3.6.2 Composition

Physical and chemical make-up

Physical and chemical make-up of PFW is shown in Appendix F – PFW Data file.

Chemical additives

Chemicals in Table 6-15 are added to the platform's water handling system in order to aid oil in water treatment. Chemicals in Table 6-16 are added into the process on the platform for other reasons and could remain at residual levels in the water handling system.

Table 6-15 Chemicals added to Cobia water handling system.

Description	Predominant phase solubility	Additive injection point	Potentially present in PFW discharge
Demulsifier (e.g. Baker-Hughes DMO24586)	Oil phase	V-600 and V-620 Production Oil Separators Inlet	Yes

Table 6-16 Chemicals added to Cobia process that could remain at residual levels in the water handling system.

Description	Predominant phase solubility	Additive injection point	Potentially present in PFW discharge
Gas lift corrosion inhibitor (e.g. Baker-Hughes CGW24013)	Water phase	Gas lift into wells, upstream of water handling system	Yes

Oil in water monitoring results

Oil in water concentrations are measured on the platform using a continuous online monitor that determines the levels of oil using the way the PFW scatters light under UV fluorescence.

Data is provided in Appendix F for the platform's daily average overboard discharge levels of oil in water (in mg/L) and oil load (kg/d) since 1 Jan 2020 (reflecting the period following the NOPSEMA General Direction 740 in late 2019 where changes were made to the reporting and recording of oil in water).

Data is also provided for the same period showing the cross-check of platform online monitor readings with routine laboratory tests of oil and grease, with the alignment within a +/- 6 mg/L offset.

6.3.6.3 Ecotoxicology

To determine toxicity of the PFW discharge, whole effluent toxicity (WET) testing was performed in 2014 and 2020 across six tests (five chronic, one acute) and eight tests (seven chronic, one acute) respectively across at least 5 different species representing at least four different taxonomic groups. Further details of the ecotoxicology testing can be found in Appendix G.4 – Breakout Box 4. Chemical composition samples were taken at the same time as the samples for WET testing.

Chemical additives added at the time of sampling and ecotoxicology testing on Cobia in 2014 were Baker-Hughes CRO24506 and Baker-Hughes DMO24586 in 2020.

Summarised results of the WET testing are shown in Appendix F.

A Burrlioz model has been run with the results from the WET testing (following Warne, 2018) with the 95% and 99% species protection level of effluent shown in Appendix F.

6.3.6.4 Movement, dispersion and dilution

A dispersion model was designed and calibrated to show the movement dispersion and dilution of the PFW discharge around the platform. Appendix G.6 – Breakout Box 6 shows the setup and calibration details for the model. Dispersion model inputs and outputs are summarized in Appendix F.

6.3.6.5 Fate and transport of Cobia PFW

Fate and transport of CBA PFW is no different to TNA PFW as outlined in Section 5.3.2.5.

6.3.6.6 Receptors at Cobia platform

PFW discharged to the marine environment has the potential to result in the following impacts:

- Change in water quality;
- Change in sediment quality;

As a result of change in water quality, change in sediment quality and / or habitat, further impacts may occur which include:

- Injury to fauna;
- Change in habitat;
- Change to the function, interests or activities of other users.

Receptors that could be credibly affected by the discharge of PFW are identified in Table 6-17 and Figure 6-13, with reference made to specific receptors or receptor groups per Table 5-2.

Table 6-17 Receptors affected by impacts associated with discharges of CBA PFW

Receptors	**Impacts**				
	Change in water quality	Change in sediment quality	Injury to fauna	Change in habitat	Change to the function, interests or activities of other users
Water quality	✓ Open ocean, high energy environment, cool waters, 78 m water depth				
Sediment quality		✓ Sandy sea floor with some gravel			
Benthic habitats and communities			✓ Likely polychaetes, crustaceans and mollusc infauna; possible sponge, soft coral, other invertebrate filter-feeder epifauna		
Plankton			✓ Open ocean phyto- and zoo-plankton		
Fish			✓ Bony & cartilaginous fish, two vulnerable species (Great White and Whale sharks), distribution BIA for Great White shark, 49 km from Great White shark breeding BIA, 82 km from Southern Right Whale migration BIA		

Receptors	Impacts				
	Change in water quality	Change in sediment quality	Injury to fauna	Change in habitat	Change to the function, interests or activities of other users
Marine Mammals - Seals			✓ Listed species the New Zealand Fur Seal and the Australian Fur Seal known to rest on the platform and swim alongside		
Marine Mammals - Cetaceans			✓ 27 cetacean species or species habitats occur, of which 5 species are listed (Sei, Blue, Fin, Southern Right and Humpback whales), facility overlaps foraging BIA for Blue whale and distribution BIA for Southern Right whale		
Australian Marine National Parks and National Parks				✓ Ninety Mile Beach MNP (95 km), Point Hicks MNP (105 km), Beagle MNP (124 km), Gippsland Lakes NP (68 km)	
KEFs				✓ Overlaps with Shelf Rocky Reefs (0.1 km to South East Reef), 14 km to Upwelling East of Eden, 20 km+ to Bass Cascade, 90 km to Big Horseshoe Canyon	
Commercial and recreational fisheries					✓ Likely fisheries are Small pelagic, Southern and Eastern Scalefish & Shark, Danish-seine and scalefish hook, Wrasse, and Southern Squid

Receptors	Impacts				
	Change in water quality	Change in sediment quality	Injury to fauna	Change in habitat	Change to the function, interests or activities of other users
					Jig (low intensity) Fisheries

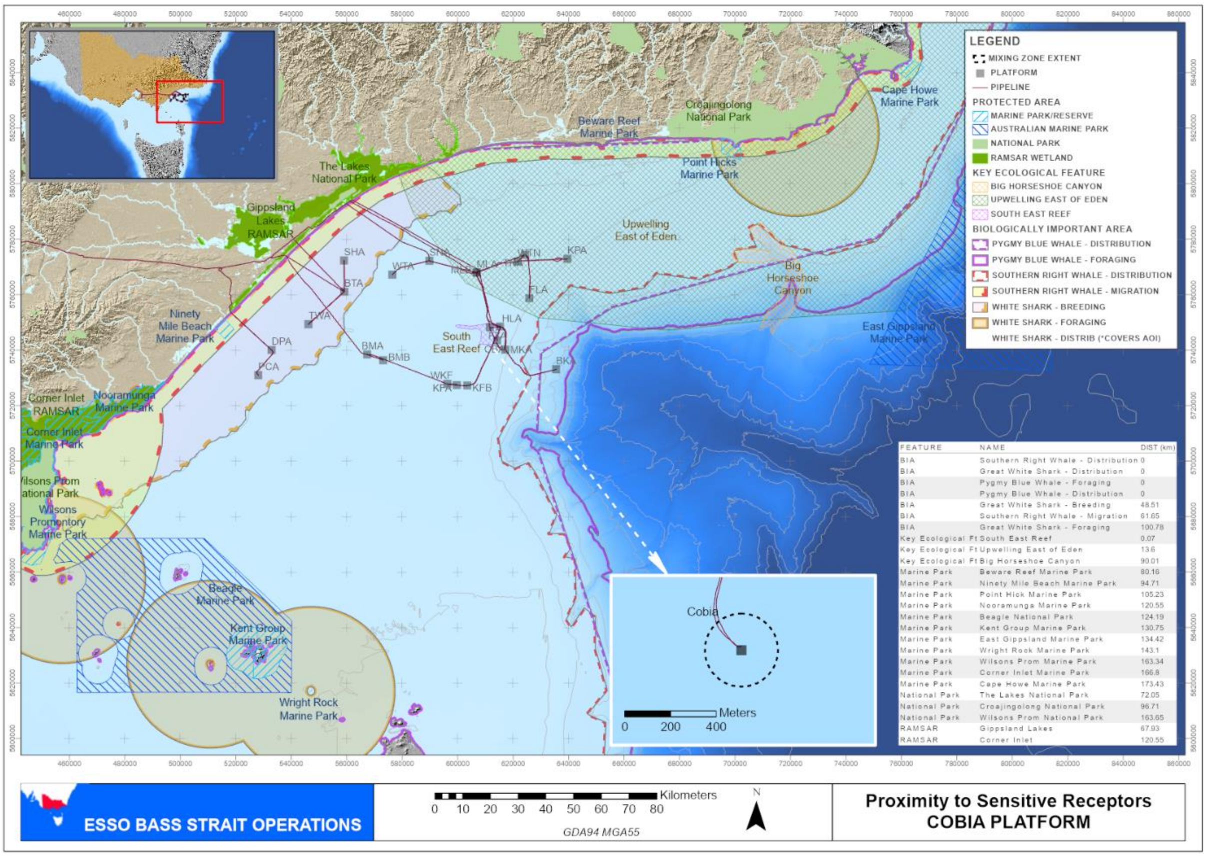


Figure 6-13 160 m mixing zone around CBA platform in relation to other environmental receptors

6.3.6.7 Cobia PFW impact assessment

Impacts to water quality

Physical properties of seawater are established within 10 m of the discharge point. Temperature changes using the RPS APASA (2016) model found that due to the turbulent mixing caused by the initial plunge and then buoyant rise of the effluent, in all cases the average temperature of the produced water plume returns to within 3°C above ambient temperatures within 10 m of the discharge location.

Chemical contaminants in PFW dilute quickly on the initial plunge, then more slowly with dispersion in the current around the platform. PFW is discharged at 7 times the ANZECC 99% species protection criteria for hydrocarbons, 12 times for metals, and 28 times for inorganics; dilutes rapidly on its initial descent, and reaches ANZECC 95% water quality criteria within 10 m; and ANZECC 99% water quality criteria within 10 m.

PFW is discharged at between 33 and 269 times the background levels for hydrogen sulphide and up to 170 times the background levels of TOC (see Appendix F.5 – PFW data file) and gradually reduces to background levels with distance from the platform, reaching background levels within 160 m of the discharge point and defining the extent of the mixing zone for CBA platform.

Anions such as sodium, calcium, magnesium and potassium, and cations such as chloride, sulphate, bromide and bicarbonate are found in PFW however these ions (and their associated salts) are also commonly found in seawater and hence will not be discussed further (Pillard et al. 1996).

Potential Naturally Occurring Radioactive Materials (NORM) are not expected to occur in quantities that may result in significant environmental impacts and are therefore not discussed further.

Impacts to sediment quality

CBA PFW contains the following chemicals which could impact marine sediments and an ANZECC (2000) or ANZECC (2013) interim sediment quality guideline value exists:

- Low molecular weight PAHs: Naphthalene, 2-methylnaphthalene, Flourene, and Phenanthrene
- High molecular weight PAHs: None
- Metals/Metalloids: Chromium, Copper, Nickel and Zinc.

There is no physical interaction of the plume with the seabed and hence no direct exposure of the constituents of PFW with the sediment (see Appendix F – PFW Data file). There is a potential pathway for impacts to sediment through settling of constituents in the PFW plume.

An analysis of the CBA PFW discharge found that 100% of particles are ≤63 µm (clay or silt). Per Breakout Box 10, this silt and clay fraction (≤63 µm) is usually cited as the chemically active fraction which is associated with potential contaminants of concern (UNEP/WHO 1996). It is unlikely that there will be settling of particles in the CBA PFW plume as it is the larger particles (>63 µm) that typically settle.

Monitoring results for offshore facilities generally show that natural dispersion processes appear to control the concentrations of potential contaminants from PFW in sediments to slightly above background concentrations (Neff et al. 2011). The results from in-situ sediment monitoring of a nearby platform with similar discharge characteristics (WKF) confirms this.

Around WKF the study found no valid samples for PAHs, or metals that co-occur in the platform's PFW discharge above the ANZECC (2013) ISQG "low" criteria. (see Appendix G.8 – Breakout Box 8). Occurrences of metals/metalloids were isolated, levels remained low and detections above reference locations remained localised despite there being evidence of some gradients away from the platform (see Appendix G.8 – Breakout Box 8).

WKF is a suitable proxy for predicting the potential for sediment contamination around CBA as the PFW discharge rate, water depth, discharge depth, and range of contaminants in PFW is similar (Table 6-5). In addition, WKF has higher suspended solid loads than CBA (Appendix E – PFW data file), meaning that if metals were to precipitate, they would be more likely to do so in the WKF PFW plume than in the CBA PFW plume and be observed in the sediments close to the discharge point.

Given that;

- sampling results at CBA indicate that a negligible portion of particles in PFW may settle (due to 100% of particles being smaller than 63 µm)
- any larger particles that do settle are likely to be stable inorganic materials
- there were no valid observations of contaminants in PFW in sediments around WKF platform (which is a suitable proxy for CBA) above ISQG "low" guideline values
- levels of contamination of nickel in a gradient away from WKF platform (which is a suitable proxy for CBA) remains of very low level and within a small radius

the PFW discharge is expected to have negligible impacts on sediment.

Impacts to biota

Potential impacts of PFW to biota have been assessed through WET testing and dilution modelling to establish a mixing zone. Marine biota inside the mixing zone may be exposed to chronic exposure to contaminants in PFW, however, the mixing zone is limited to a localised extent around the plume discharge point only.

Process chemicals are discharged to the sea in residual amounts if they partition into the PFW and are not removed via the available treatment processes. As WET testing was performed with samples that contained chemical additives, the WET testing results are indicative of the routinely discharged PFW and account for any potential biological impacts that could be incurred by the PFW including any chemical additives. In addition, the ecotoxicological impacts of process chemicals in PFW discharges was comprehensively investigated in a study by Henderson et al. (1999). The study tested 11 commonly used process chemicals (including biocides, corrosion inhibitors and demulsifiers) for their acute toxicity to marine bacterium, both directly in aqueous preparations and following their partitioning between oil and water phases. The study results indicated that toxicity of the PFW was not significantly altered by the presence of most process chemicals used in typical concentrations. A review of the study by Schmeichel (2017) notes that process chemicals make a small contribution to the overall acute toxicity profile of PFW discharges.

Relevant to all receptor types (ecotoxicity pathways) are the CBA WET testing results. 95% species protection criteria based on WET testing is met within less than 60 m of the discharge point (Appendix F – PFW data file). At this distance, 95% species will be protected from adverse ecotoxicity effects of the discharge, and water quality is reflective of 'ecosystems in which aquatic biological diversity may have been adversely affected to a relatively small but measurable degree by human activity. The biological communities remain in a healthy condition and ecosystem integrity is largely retained' (ANZECC, 2000, p3.1-10). 99% species protection criteria based on WET testing is met within 60 m of the discharge point (Appendix F – PFW data file). At this distance, 99% species will be protected from adverse ecotoxicity effects of the discharge, and water quality is reflective of an 'effectively unmodified, high conservation-value ecosystem' (ANZECC, 2000, p3.1-10). Outside 60 m to the remainder of the boundary of the mixing zone, contaminants in PFW will continue to reduce to background seawater concentrations. At these levels they are not expected to have any impact to biota.

Impacts to benthic communities and habitat

There are two pathways for potential impacts to benthic communities and habitats:

- Benthos near the discharge could be subject to exposure to toxic effects of PAHs or metals if they are directly exposed to PFW for long periods;
- Benthic animals near a produced water discharge may bio-accumulate metals, phenols, and hydrocarbons from the ambient water, their food, or bottom sediments.

Direct exposure - chemical ecotoxicity effects

CBA whole effluent toxicity results (2014) show that the amphipod *Allorchestes compressa* was affected by exposure to more than 25% raw effluent (acute endpoint). This is unlikely to occur anywhere within the mixing zone except immediately at the point of discharge. Hence no effect is expected on *Allorchestes compressa* since CBA effluent is diluted by 10 times within 0.9 m of the discharge point. The sea urchin *Heliocidaris tuberculate* was affected by exposure to more than 3.1% raw effluent (chronic endpoint). This is unlikely to occur anywhere within the mixing zone except immediately at the point of discharge. Hence no effect is expected on *Heliocidaris tuberculate* since CBA effluent is diluted by 50 times within 10 m of the discharge point. The mussel *Mytilus galloprovincialis* was affected by exposure to more than 12.5% raw effluent (chronic endpoint). This is unlikely to occur anywhere within the mixing zone except immediately at the point of discharge. Hence no effect is expected on *Mytilus galloprovincialis* since CBA effluent is diluted by 10 times within 0.9 m of the discharge point.

Impacts from PAHs in PFW on fauna such as scallops, crustaceans and other molluscs within 60 m of the discharge could pose chronic developmental or growth impacts, such as reduced survival of juveniles and reduced size, such as was found during a study of PFW effluent exposure to sea scallops of greater than 10% (Querbach et al. 2005, in Armsworthy et al., 2005). PFW discharge can also affect larvae viability (abalone, Raimondi and Schmitt, 1992). These effects are highly unlikely to occur at CBA since effluent is diluted by 10 times within 0.9 m of the discharge point. Also since the PFW plume is positively buoyant and does not contact the sea floor, it is expected that only fauna on the platform structure itself could be exposed and those on the sea floor are protected from direct exposure.

Sponges and soft corals localised to the discharge point could experience reduced ability to settle and metamorphose, such as was found in Luter et al (2019) on larvae of the sponge *R. odorabile* when exposed to hydrocarbons in water. This effect could be felt by encrusting organisms on the structure (to 60 m horizontal radius of the discharge) but not seafloor organisms due to the positive buoyancy of the plume.

Bioaccumulation

A large study for the Gulf of Mexico Offshore Operators Committee examined bioaccumulation in tissues of mollusc, crustacean, and three fish species in and around 11 platforms in the Gulf of Mexico discharging over 1000 kL/d (Continental Shelf Associates, 1997). The study examined bioaccumulation of five metals (As, Cd, Hg, 226Ra and 228Ra); three volatile monocyclic aromatic hydrocarbons (MAH), benzene, toluene, and ethylbenzene; and four semi-volatile organic chemicals, phenol, fluorene, benzo(a)pyrene, and di (2-ethylhexyl) phthalate. They concluded that there is no relationship between the proximity of marine animals to offshore PFW discharges and concentrations in their edible tissues of the chemical constituents.

Additional MAH (m-, p-, and o-xylenes) and a full suite of 40 parent and alkyl-PAH and dibenzothiophenes were also analysed by Neff et al. (2011). There was no evidence of MAH or phenol being bioconcentrated. All MAH and phenol were either not detected (>95% of tissue samples) or were present at trace concentrations in all invertebrate and fish tissue samples. Concentrations of several petrogenic PAHs, including alkyl naphthalenes and alkyl dibenzothiophenes, were slightly, but significantly higher in some bivalve molluscs but not fish, from discharging than from non-discharging facilities. These PAH could have been derived from PW discharges or from tar balls or small fuel spills. Concentrations of individual and total PAH in mollusc, crab and fish tissues were well below concentrations that might be harmful to the marine animals (Neff et. al. 2011).

Effects from bioaccumulation has been primarily associated with low-molecular weight PAHs. Both BTEX and hydrogen sulphide are not bioaccumulative (Neff 2002, ANZECC, 2000 respectively). The level of PAHs in CBA PFW were 7 times higher than ANZECC 99% criteria (Naphthalene) and the CBA PFW effluent dilutes 10 times within 0.9 m from the discharge point. In addition, PAHs were not observed in sediments around WKF above relevant guideline criteria as part of the 2018 in-situ monitoring program. Hence the potential for bioaccumulation is low.

The potential for bioaccumulation in benthic organisms around CBA can be predicted from the WKF in-situ monitoring results, as as the PFW discharge rate, water depth, discharge depth, and range of contaminants in PFW is similar (Table 6-5). In addition, the sediment profile around CBA is similar to WKF (Figure 5-3).

There were no significant differences in benthic infauna distributions observed in an in-situ study around WKF in 2018. This study found that at both near and far zones around the platform and at reference sites, crustaceans dominated the benthic infauna, followed by polychaetes. For less than 12% of the total number of taxa, infauna abundance significantly increased with distance from the platform, owing mostly to the presence of barium (a major constituent of drilling muds) and re-distribution of coarser sediments around the platform (Appendix G.9 – Breakout Box 9). The change in abundance could not be correlated with increased sediment contaminants found in PFW. This is consistent with the findings in Neff et al. (1992) where distributions of benthic communities around the platform (in 8 m water depth) were explained in large part by the influence of sediment grain size on benthic community structure; and there was no correlation between faunal density and the concentration of total hydrocarbons in sediments.

Studies have found that provided the water depth is greater than the discharge depth, benthic organisms will not be affected by PFW, as the concentration of any oil or adhered/adsorbed components will be extremely low (Furuholt, 1996). Studies that have reported changes to benthic distributions were in shallow, moderate-to-poorly flushed waters of 1-8 m or continental shelf waters of up to 12 m (e.g. Osenberg et al (1992) and Rabalais et al. (1992)). It can be expected that in deeper, well-mixed ocean environments (such as at CBA) the potential for impacts to benthic infauna would be even lower.

For benthic organisms, effects of chromium on crustaceans was published as ranging between 4 µg/L (Cancer anthonyi, from 7-d LOEC, hatch) to 3090 µg/L (Rhithanopanopeus sp, from 20-d LC50) (ANZECC 2000). Effects on echinoderms was 2000 µg/L (from 7-d LC50, Asterias forbesi) and molluscs at 1600 µg/L (Mya arenaria, from 7-d LC50) to 10 000 µg/L (Macoma balthica, from 8-16 d LC50). CBA

PFW chromium concentrations were 0.6 µg/L in one of the 3 tests and non-detect in the remaining tests (Appendix F). Hence no impacts to benthic organisms from bioaccumulation of chromium in CBA PFW is expected. It should also be noted that in marine and estuarine conditions, the high sulphate concentrations make chromium toxicity unlikely (ANZECC 2000).

Copper is readily accumulated by plants and animals; bioconcentration factors ranging from 100 to 26000 have been recorded for various species of phytoplankton, zooplankton, macrophytes, macroinvertebrates and fish (Spear & Pierce 1979). Toxic effects of metals occur when the rate of uptake exceeds the rates of physiological or biochemical detoxification and excretion (Rainbow 1996, in ANZECC 2000). For benthic organisms, effects of copper on crustaceans was published as ranging between 8.5 µg/L (Callianassa australiensis, 10-14 day EC50) to 42 µg/L (Mysidiopsis bahia, from 29-51 d MATC, reproduction) and on molluscs between 0.4 µg/L (Mytilus edulis, from 30-d EC50, reproduction of 2 µg/L) to 20000 µg/L (Ostrea edulis, 5-d LC50) (ANZECC 2000). CBA PFW copper concentrations were 0.3 µg/L in one of the 3 tests and non-detect in other years (Appendix F). Hence no impacts to benthic organisms from bioaccumulation of copper in CBA PFW is expected.

In general, marine invertebrates are more sensitive to nickel than vertebrates (ANZECC 2000). Chronic effects of nickel on crustaceans was published as ranging between 141 µg/L (36-d chronic mortality, Mysidopsis bahia, Gentile et al. 1982) and 160 µg/L (Portunus pelagicus: from 42d MATC growth of 320 µg/L) to 6000 µg/L from 5-8 d LC50. Effects on echinoderms published as 2600 µg/L (Asteria forbesi from 7-d LC50) molluscs between 240 (Crassostrea virginica; from 12-d LC50 of 1200 µg/L) to 450 000 µg/L from 7-12 d LC50; and algae: 1 sp, Nitzschia closterium 50 µg/L, from 5-d EC50 growth (Australian data) (all from ANZECC 2000). CBA PFW nickel concentrations were 1.9 µg/L in one of the 3 tests and non-detect in other years (Appendix F). Hence no impacts to benthic organisms from bioaccumulation of nickel in CBA PFW is expected.

Zinc is adsorbed by suspended material. Zinc was found to bioaccumulate in freshwater animal tissues 50 to 1130 times but bioaccumulation is not generally considered a problem for zinc (ANZECC 2000). For benthic organisms, zinc effects on crustaceans ranged from 15 µg/L (Acanthomysis sp, growth) to 2100 µg/L (8–28 d NOEC), echinoderms (Asterias forbesi), 460 µg/L (from 7-d LC50) and molluscs: 5 spp, 7–11 d NOEC (from LC50), 15 µg/L (Crassostrea gigas) to 27500 µg/L (ANZECC 2000). Algae were affected at between 13 µg/L (Nitzschia closterium) to 796 µg/L. (Skeletonema sp) (5–10 d NOEC). CBA PFW zinc concentrations were 1 µg/L in one of the 3 tests and non-detect in other years (Appendix F) and hence is not expected to result in any impacts to benthic organisms.

Some aquatic organisms may accumulate cobalt, particularly some aquatic plants and benthic organisms (Cole & Carson 1981 in ANZECC 2000). For crustaceans, published ranges of effect concentrations were 9-d LC50, 45 µg/L (Palaemon serratus) to 45 400 µg/L (Carcinus maenas). The lowest geometric mean for converted NOEC was 9 µg/L. Homarus vulgaris also had a low g.m. for NOECs of 65 µg/L; nematode Monhystera sp, 4-d LC50, 94 000 µg/L; and algae 4-5 d EC50, growth, 300 µg/L (Dytilum sp) to 23 600 µg/L (Phaeodactylium sp) (ANZECC 2000). CBA PFW cobalt concentrations were 0.06 µg/L in one of the 3 tests and non-detect in other years (Appendix F). Hence there are no effects on benthic animals or plants expected as a result of the levels of cobalt in CBA PFW discharge.

Effects on benthic flora and fauna are primarily attributed either to uptake of contaminants from water or the presence of accumulated hydrocarbons (such as PAH) in sediments. Ecotoxicity impacts to biota from metals in sediment is more complicated, owing to the many forms that metals can take, reduction-oxidation states and overall bioavailability of the metal. While there have been a large number of studies where the chemical concentrations of contaminants have been measured in sediments, very few have been related to biological effects, either in the nature of descriptions of the natural benthic populations or laboratory-based bioassays (ANZECC 2000, p8.4-26). Given the results from the WKF in-situ sediment monitoring that found occurrences of metals/metalloids were isolated, levels remained low (for the most part, well below sediment guideline criteria) and detections above reference locations remained localised (see Appendix G.8 – Breakout Box 8), effects on benthos from accumulated metals in sediments is unlikely.

Given the above, benthic biota around CBA platform are highly unlikely to be affected by the PFW discharge. Any effects would be confined to chronic impacts (such as changes in growth, metamorphosis or reproduction) for flora and fauna such as sponges and crustaceans on the platform structure within 60 m of the discharge point, within the mixing zone extent of 160 m. As the area and depth ranges of a potential, but highly unlikely impact, are small and localised, effects at a population level are not credible.

Impacts to plankton

There are three pathways for potential impacts to plankton:

- Exposure to temperature effects on direct exposure
- Stimulatory effects of nutrients in the plume, leading to eutrophication of waters
- Exposure to toxic effects of chemical constituents of PFW if plankton are directly exposed for long periods (i.e. directly in the plume)

Direct exposure – temperature effects

As the average temperature of the produced water plume returns to within 3°C above ambient temperatures within 10 m of the discharge location, potential temperature effects on plankton are not credible.

Stimulatory effects from nutrients in the plume

Discharges of nutrients and hydrocarbons in the PFW plume can increase the localised abundance of plankton. For example, ammonia may elicit inhibitory (toxic) and/or stimulatory (e.g. eutrophication) responses from resident biota (Neff, 2011). Plankton could be attracted to localised higher concentrations of these constituents within the mixing zone and as a result plankton populations can rapidly increase. However, increased planktonic activity and turnover mass rates within the mixing zone is not expected to have any marked change on the water quality due to the high levels of movement of water around the platform from the action of currents and waves. Levels of nitrate and phosphates are low (not unlike other produced waters, Neff, 2011) and hence are not likely to cause eutrophication. Supporting this there is anecdotal evidence that no phytoplankton blooms have ever been recorded at a Bass Strait Esso facility.

Direct exposure – chemical ecotoxicity effects

Plankton have high levels of natural mortality and a rapid replacement rate (UNEP 1985). Any impacts as a result of direct exposure of planktonic communities to PFW are expected to be confined to the 60 m zone to 99% species protection, which sits within the extent of the mixing zone. Direct exposure of planktonic communities to PFW within the 60 m zone (to 99% species protection criteria based on WET testing) is not considered to result in significant impacts at the population level of organisms that could affect broader ecological diversity or productivity of the area surrounding the facility.

Impacts to fish

There are three pathways for potential impacts to fish:

- Exposure to temperature effects on direct exposure
- Exposure to toxic effects of chemical constituents of PFW if fish are directly exposed for long periods (i.e. directly in the plume)
- Exposure to toxic effects of chemical constituents of PFW if fish are directly exposed to contaminated sediments

Direct exposure – temperature effects

As the average temperature of the produced water plume returns to within 3°C above ambient temperatures within 10 m of the discharge location, potential temperature effects on fish are not credible.

Direct exposure – chemical ecotoxicity effects

Early lifestages of fish (embryos, larvae) within the 60 m zone to where 99% species protection criteria is met would be most susceptible to the exposure from chemical constituents in the PFW discharge, as they are less mobile and therefore can become exposed to the plume at the outfall. These effects can range from no effects (Mathieu et al 2011), to gill damage (turbot larvae, Brown et al. 1998). Hormonal effects could be experienced without liver function damage (cod, Meier et al, 2002), however this occurs at very high exposure concentration or where immune systems are already compromised by other stressors (Hamoutene et al, 2011; Burridge et al, 2011) which is not likely to be the case at CBA. Larvae entrained in the outfall may only be exposed to higher concentrations for a short period relative to the buoyancy of the organism (Querbach, et al. 2005). Outside the 60 m radius, early lifestages of fish are not expected to be affected at all.

Effects from zinc in water on fish was published as 10 400 µg/L (Fundulus heteroclitus, 7-d NOEC of from LC50) (ANZECC 2000). CBA PFW zinc concentrations were 1 µg/L in one of the 3 tests and non-detect in other years (Appendix F). Hence there are no effects on fish expected as a result of the levels of zinc in CBA PFW.

Effects from cobalt in water on fish was published as 52 500-227 000 µg/L (from 4-9 d LC50) (ANZECC 2000). CBA PFW cobalt concentrations were 0.06 µg/L in one of the 3 tests and non-detect in other years (Appendix F). Hence there are no effects on fish expected as a result of the levels of cobalt in CBA PFW.

Levels of chromium (max detected 0.6 µg/L) and nickel (max detected 1.9 µg/L) in the CBA discharge are well below the concentrations that could have effects on fish (Chromium 776 µg/L (Citharichthys sp, from 14-21 d LC50) to 14 125 µg/L (Cyprinodon variegatus, from NOEC, growth) and Nickel Fundulus heteroclitus, 30 000 µg/L from 7-d LC50; from ANZECC 2000).

Effects from copper in water on fish was published as ranging between 30 µg/L (2 spp, from 12-14 d EC50, hatch & mortality) to 260 µg/L (Menidia menidia, 11-d EC50, hatch) (ANZECC 2000). The CBA PFW copper concentration was 0.3 µg/L in one of the 3 tests and non-detect in other years (Appendix F). Hence there are no effects on fish expected as a result of the levels of copper in CBA PFW.

Later-life pelagic species are generally highly mobile and as such are not likely to be exposed at concentrations that would lead to chronic effects due to their patterns of movement. Fish also exhibit a strong avoidance reaction to hydrogen sulphide (USEPA 1986 in ANZECC 2000).

BTEX is known to be toxic to fish and invertebrate eggs and larvae and has been shown to result in developmental defects (Fucik et al. 1995). However, due to the compound's volatility, the residence time in waters is brief; rapid active and passive excretion of these compounds from tissues will also limit in-tissue concentrations in the field; and BTEX does not bio-accumulate (Neff et al., 1996). The dilution ratio for CBA PFW to ANZECC 99% species protection water criteria for Benzene is 2, and CBA PFW is diluted 10 times within 0.9 m, hence BTEX is not expected to have any toxic effects. Whole effluent ecotoxicity data from CBA PFW shows that the barramundi fish *Lates calcarifier* experienced effects above 50% raw effluent exposure (chronic endpoint). This is unlikely to occur anywhere in the mixing zone except directly at the discharge point itself. Whilst this species is not local to Bass Strait, no effect is expected on fish similar to *Lates calcarifier* since CBA effluent is diluted by more than 10 times within 0.9 m of the discharge point.

Exposure to contaminated sediments – chemical ecotoxicity effects

Effects from fish directly exposed to contaminated sediments above 22 mg/kg PAH could result in gill hyperplasia, reduced phagocytic activity of macrophages and pancreatic necrosis (spot, Hinkle-Conn et al., 1998). However this is highly unlikely to be the case as the PAHs were not detected in sediment around WKF.

The mixing zone overlaps the distribution BIA for the Great White Shark; however, given the localised area of impact and that sharks are transiting the area, no impacts are expected. The discharge does not constitute a threat listed in the recovery plan of the White Shark, and the discharge activity is not inconsistent with that plan.

In summary as the PFW plume is dynamic and moving constantly depending on the tides, currents, winds and internal waves, transient fish such as great white sharks, are unlikely to be exposed to elevated contaminant concentrations for extended durations. Indirect impacts, such as altered prey abundance or ingestion of bioaccumulated toxic compounds is considered to be of no effect given the localised area predicted to be impacted by PFW and the nature and scale of impacts to the marine ecosystem within the PFW discharge plume (i.e. slight impacts to food sources such as plankton and pelagic fish species). Given the potential absence of impacts to fish, the limited spatial extent of the water quality (160 m radius) the predicted intermittent and short interaction duration (i.e. minutes at a time) with the PFW plume, it is considered that there will not be a significant impact on fish particularly the great white shark from PFW discharges when assessed against the relevant criteria in the Matters of National Environmental Significance. Significant impact guidelines 1.1. (DoE, 2013), including that there will be no long-term decrease in the size of the population, the area of occupancy of the species or an important population, the existing population will not be fragmented into two or more populations, there will be no adverse effect on habitat critical to the survival of a species, there will be no disruption to the breeding cycle of an important population, the availability or quality of habitat will not be destroyed, removed, isolated or decreased to the extent that the species is likely to decline and the recovery of the species will not be substantially interfered with.

Impacts to seals

There are three pathways for potential impacts to seals:

- Exposure to toxic effects of chemical constituents of PFW if seals are directly exposed for long periods (i.e. directly in the plume)
- Effects from inhalation of hydrocarbon vapours from PFW sheens
- Irritation effects from physical contact with hydrocarbons in PFW
- Bioaccumulation through the ingestion of impacted food sources

Produced water plumes predominantly result in dissolved contaminants and they rarely cause a defined layer on the sea surface (silvery sheen is the lowest level according to the Bonn agreement and usually patchy if at all present from the PFW discharge). Hence potential impact pathways through contact of hydrocarbons with seal fur and ingestion are not credible.

Direct exposure – chemical ecotoxicity effects

Seals do not spend all their time in the water, and when they do, they are highly active, travel great distances and forage at various depths (Arnould et al., 2005). As such, it is highly unlikely that these potential impact pathways will be significant. In addition, pinnipeds have been found to have the enzyme systems necessary to convert absorbed hydrocarbons into polar metabolites, which can be excreted in urine (Engelhardt, 1982; Addison & Brodie, 1984; Addison et al., 1986).

Effects from inhalation of hydrocarbon vapours from PFW sheens

Inhalation of hydrocarbon vapours could cause toxic effects. However, the level of oil on water (i.e. sheens) from produced water plumes rarely cause silvery sheens (the lowest level according to the Bonn agreement), and hence will have extremely low levels of vapour. Seals are highly mobile and active animals and do not spend all their time at the water surface, as such, it is highly unlikely that this potential impact pathways will be significant.

Irritation effects from physical contact with hydrocarbons in PFW

Exposure to on-sea hydrocarbons could cause irritation to the eyes and oral cavity. However seals are unlikely to remain swimming within the discharge plume for long periods as they are highly active animals, travel great distances and forage at various depths. As such, it is highly unlikely that this potential impact pathways will be significant so as to not have any chronic impacts to seals.

Bioaccumulation through ingestion of impacted food sources

As impacts to the predominant seal food source of fish are of very low likelihood (as above), bioaccumulation through ingestion of impacted food sources is unlikely to have any impact on seals.

Listed Australian Fur Seals and New Zealand Fur Seals occur at the platform, however no seal breeding occurs on or around the platform, and the area is not identified as critical habitat or BIA. According to IUCN, the Australian Fur Seal is listed as Least Concern and its population is increasing (IUCN, 2015).

There is no relevant Conservation Advice or Threat Abatement Plan for Australian Fur Seals or New Zealand Fur Seals.

In summary as the PFW plume is dynamic and moving constantly depending on the tides, currents, winds and internal waves, coupled with seals being highly mobile active animals who do not spend all their time in the water or at the water surface, seals are unlikely to be exposed to elevated contamination concentrations for extended durations. Indirect impacts, such as altered prey abundance or ingestion of bioaccumulated toxic compounds is considered to be of no effect given the localised area predicted to be impacted by PFW and the nature and scale of impacts to the marine ecosystem within the PFW discharge plume (i.e. slight impacts to food sources such as pelagic fish species). Given the potential absence of impacts to seals, the limited spatial extent of the water quality (160 m radius) the predicted short interaction duration (i.e. minutes at a time) with the PFW plume, and that breeding does not occur within the OA it is considered that there will not be a significant impact on seals from PFW discharges when assessed against the relevant criteria from the Matters of National Environmental Significance. Significant impact guidelines 1.1. (DoE, 2013), including that there will be no long-term decrease in the size of the population, the area of occupancy of the species or an important population, the existing population will not be fragmented into two or more populations, there will be no adverse effect on habitat critical to the survival of a species, there will be no disruption to the breeding cycle of an important population, the availability or quality of habitat will not be destroyed, removed, isolated or decreased to the extent that the species is likely to decline and the recovery of the species will not be substantially interfered with.

Impacts to cetaceans

There are four pathways for potential impacts to cetaceans:

- Exposure to toxic effects of chemical constituents of PFW if cetaceans are directly exposed for long periods (i.e. directly in the plume)
- Effects from inhalation of hydrocarbon vapours from PFW sheens
- Irritation effects from physical contact with hydrocarbons in PFW
- Bioaccumulation through the ingestion of impacted food sources

Direct exposure – chemical ecotoxicity effects

Cetaceans are highly mobile and transitory animals, as such, it is highly unlikely that this potential impact pathways will be significant. Note also, many marine mammals appear to have the necessary liver enzymes to metabolise hydrocarbons and excrete them as polar derivatives (Ball and Truskewycz, 2013).

Effects from inhalation of hydrocarbon vapours from PFW sheens

As a result of inhaling volatile compounds when surfacing, cetaceans can experience lung congestion (Geraci & St. Aubin 1990); or irritation or damage to mucous membranes or airways (Helm et al., 2015). However, the level of oil on water (i.e. sheens) from produced water plumes rarely cause silvery sheens (the lowest level according to the Bonn agreement), and hence will have extremely low levels of vapour. Cetaceans are highly mobile and only transit the area, as such, it is highly unlikely that this potential impact pathway will be significant.

Irritation effects from physical contact with hydrocarbons in PFW

Cetaceans can be exposed through direct contact with the eyes, potentially leading to inflammation (Geraci & St. Aubin 1990). Cetaceans are highly mobile and only transit the area, as such, it is highly unlikely that this potential impact pathway will be significant.

Bioaccumulation through ingestion of impacted food sources

As impacts to cetacean food source predominantly of fish and plankton is of very low likelihood (as above), and the area does not represent a large proportion of the overall cetacean feeding area therefore it is unlikely to have any impact on cetaceans.

The mixing zone overlaps the foraging BIA for the blue whale and distribution BIA for the Southern Right Whale; however, given the localised area of impact and that whales are transiting the area, no impacts are expected. The discharge does not constitute a threat listed in the Conservation Management Plan of either the Blue Whale or Southern Right Whale and the discharge activity is not inconsistent with those plans.

In summary as the PFW plume is dynamic and moving constantly depending on the tides, currents, winds and internal waves, transient cetaceans such as migrating whales, are unlikely to be exposed to elevated contaminant concentrations for extended durations. Indirect impacts, such as altered prey abundance or ingestion of bioaccumulated toxic compounds is considered to be of no effect given the localised area predicted to be impacted by PFW and the nature and scale of impacts to the marine ecosystem within the PFW discharge plume (i.e. slight impacts to food sources such as plankton and pelagic fish species). Given the potential absence of impacts to cetaceans, the limited spatial extent of the water quality (160 m radius) the predicted intermittent and short interaction duration (i.e. minutes at a time) with the PFW plume, it is considered that there will not be a significant impact on cetaceans from PFW discharges when assessed against the relevant criteria from the Matters of National Environmental Significance. Significant impact guidelines 1.1. (DoE, 2013), including that there will be no long-term decrease in the size of the population, the area of occupancy of the species or an important population, the existing population will not be fragmented into two or more populations, there will be no adverse effect on habitat critical to the survival of a species, there will be no disruption to the breeding cycle of an important population, the availability or quality of habitat will not be destroyed, removed, isolated or decreased to the extent that the species is likely to decline and the recovery of the species will not be substantially interfered with.

Impacts to Fisheries – Commercial and Recreational

There are three potential impact pathways for fisheries:

- Tainting (hydrocarbon odour in caught fish) due to tissue accumulation of hydrocarbons in PFW
- Impacts to the safety of humans through the consumption of target species tissues that are impacted by PFW.
- Reduction of fisheries stocks, through the direct impact of PFW on target species and nurseries

Tainting

Per Appendix F, ANZECC seafood taint criteria is reached within 0.9 m of the discharge point. (Note: Appendix G.3 – Breakout Box 3 applies to the detection of other phenols under the seafood taint guidelines). The total area represented by a 0.9 m radius at CBA is 3 m^2 (1/300th of a hectare), and cumulative area across all Bass Strait platform PFW discharges is <2000 m^2 (1/5th of a hectare), representing an extremely small proportion of the total fisheries area. Hence the discharge is highly unlikely to cause taint in fisheries-caught fish.

Impacts to seafood safety for humans

Since fish or shellfish are not harvested around the PFW plume or mixing zone out to at least 500 m from the platform, and the zone in which 99% species protection criteria is reached extends to only 60 m from the platform, there is no effect of the PFW discharge on humans through consumption.

Impacts to fisheries stocks

Individual fish and other non-fish target species, (i.e. invertebrates of value, including squid, crustaceans (rock lobster, crabs) and molluscs (scallops, abalone), where they are directly present in the PFW plume (within 60 m radius), may be exposed to chronic sub-lethal impacts (see above) however due to the small range and depths that this applies, population level impacts are considered highly unlikely. Whilst offshore structures may play a role in enhancing fish stocks due to the presence of hard substrate and the level of protection from fishing that they provide, fish nurseries known to be notable prolific producers are close to shore (such as Gippsland Lakes RAMSAR site) and these are expected to contribute to fisheries stocks in much greater numbers. Therefore there are no anticipated impacts to fisheries stocks.

Stakeholder feedback confirmed that although fishers had been able to see discharges from the Bass Strait platforms from beyond the 500 m exclusion zone, the discharge did not have any effect on fisheries or fisheries equipment, or amenity for the fishers. There is general acknowledgement among fishers that Esso's facilities provide safe habitat for juvenile fisheries species. There were no complaints or issues brought up by fishers regarding PFW discharge. Ongoing dialogue with fishing communities is part of Esso's stakeholder engagement plan.

Impacts to other receptors

Australian Marine Parks, National Parks and Reserves

Given the distance of marine parks, national parks and reserves from the mixing zone, impacts to these receptors are not considered credible.

Key Ecological Features

Upwelling East of Eden: Given the distance from the mixing zone to the likely location of this KEF, impacts are not anticipated.

The Bass Cascade: Given the distance from the mixing zone to the likely location of this KEF, impacts are not anticipated.

Shelf rocky reefs and hard substrates (South-East Marine Region), including the South East Reef: The same assessment as benthic habitats and communities applies to this KEF as described above. The platform's PFW mixing zone extends approximately to the edge of the reported location of the South-East Reef. Any impacts are limited to the mixing zone. If ANZECC 99% water quality criteria at the edge of the mixing zone are not exceeded (i.e. criteria suitable for high conservation value systems), there can be high confidence that ecological protection is achieved at the KEF.

Cumulative impacts from multiple discharges

Neither MKA or FTA platforms are discharging PFW and hence there are no other PFW plumes within 3 km of the CBA discharge. The next closest discharge is at HLA which is 5 km away from the HLA discharge point and the plumes are not expected to overlap (see Appendix G.6 – Breakout Box 6).

Other continuous discharges from the same platform are limited to discharges from pile subsea windows. These discharge at 56.7 m (ODSP) and 56.7 m (CDSP) below sea level, deeper than the produced water effluent pipe depth at 27.7 m below sea level. Piles are expected to be exchanging predominantly sea water, hence any discharge from the piles will be close to neutrally buoyant at the subsea window (Section 6.4.1.1). Discharges of water containing chemicals (at discharge all chemicals are CHARM Gold/Silver or OCNS D/E (Table 6-22) or dissolved hydrocarbons from the pile will be intermittent or infrequent, and of small volumes which will disperse rapidly in the open ocean currents within the operational area. It is therefore expected that any exposure will be limited in duration.

Dispersion modelling for CBA PFW shows the maximum plunge depth from the discharge point under all current speeds is to 36.4 m below sea level, hence any cumulative impacts from the interaction with the produced water effluent plume within the mixing zone is considered unlikely.

Other non-continuous discharges (such as desalination brine, sewage, grey water, food waste, liquid discharges from vessel operations, and wellwork discharges) could overlap with the PFW plume but are short in duration and hence any cumulative impacts are unlikely to occur.

Any suspended solids in the pile contents will settle out within the pile, or if finer and suspended in the pile, then they will gradually settle out at far distances from the platform as they are carried by the current and result in no noticeable impacts to sediments. Hence any cumulative impact of the pile discharges to sediment is considered highly unlikely.

Historical activities such as discharging muds and cuttings during drilling may have resulted in changes to the sea floor sediment chemical characterisation above background levels. This includes the discharge of water based muds and barite containing barium, an inert metal; and the discharge of cuttings from natural rock formations encountered during drilling, together with small amounts of residual drilling muds on cuttings. Any changes to sediment quality from historical impacts from background will be considered as part of the surrender of title process. The last drilling program on CBA was in approximately 2009, hence discharged fluids or solids from the drilling program is expected to have at least partially been dispersed or bioremediated. There is not expected to be a significant cumulative impact to sediment quality from the additive effect of discharging PFW to sediments containing higher levels of barium or residual drilling mud constituents.

Given the varying buoyancy of the plumes, the mobile nature of marine mammals and the tendency of fish to avoid plumes cumulative impacts on marine fauna is unlikely.

As fishing is not carried out within 500 m of the platform, which is beyond the mixing zone of 160 m no cumulative impacts from multiple discharges is likely on commercial and recreational fishing.

Given the distance to other sensitive receptors (Table 5-2) cumulative impacts from multiple discharges are highly unlikely.

6.3.6.8 CBA PFW Consequence Evaluation

Impacts from CBA PFW are limited to a localised mixing zone around the discharge point, with negligible impacts to sediment. Potential impacts to biota, including benthic habitats and communities, plankton, fish, and seals and cetaceans, including through bioaccumulation, is localised in nature to the mixing zone or negligible and is not considered significant (per Significant Impact Guidelines [DOE, 2013]).

Effects could be ongoing, including through bioaccumulation of PAHs and persistent chemicals, but effects are confined to some biota on the platform structure itself (e.g. crustaceans) or dispersed in a small radius around the platform water and sediments at low and safe concentrations. Within the mixing zone, there could be sub-lethal, direct or indirect effects on organisms, but this would likely only apply to non-mobile receptors, such as fish embryos/juveniles, and would not apply at a population level. The environment is highly endemic, with few endangered and rare species present, but is generally strong and resilient, and provides some ecosystem services (predominantly fisheries).

The consequence level is therefore assessed as **Consequence Level III.**

To ensure continuing confidence in the consequence level the Monitoring and Management Framework will be implemented. If routine monitoring was to detect levels in PFW above the trigger values and there was the potential to impact the ecosystem integrity, an ALARP/Acceptability study is required to determine what additional controls can be implemented to ensure the impacts are not realised. A sampling plan to demonstrate compliance with the approved mixing zone boundary will be developed for the sediment survey. The sampling plan outlines and justifies sampling locations and when concentration and bioavailability testing occur.

6.3.7 Snapper platform

6.3.7.1 Volume

A summary of historic and five-year-projected PFW discharge volume from the platform is provided in Figure 6-14 and Figure 6-15 respectively. The maximum capacity of the system is 3500kL/d, however based on historical discharge rates the platform is expected to discharge produced water at a much lower rate of approximately 1500-2000kL/d until oil shutdown in approximately 2022-2023.

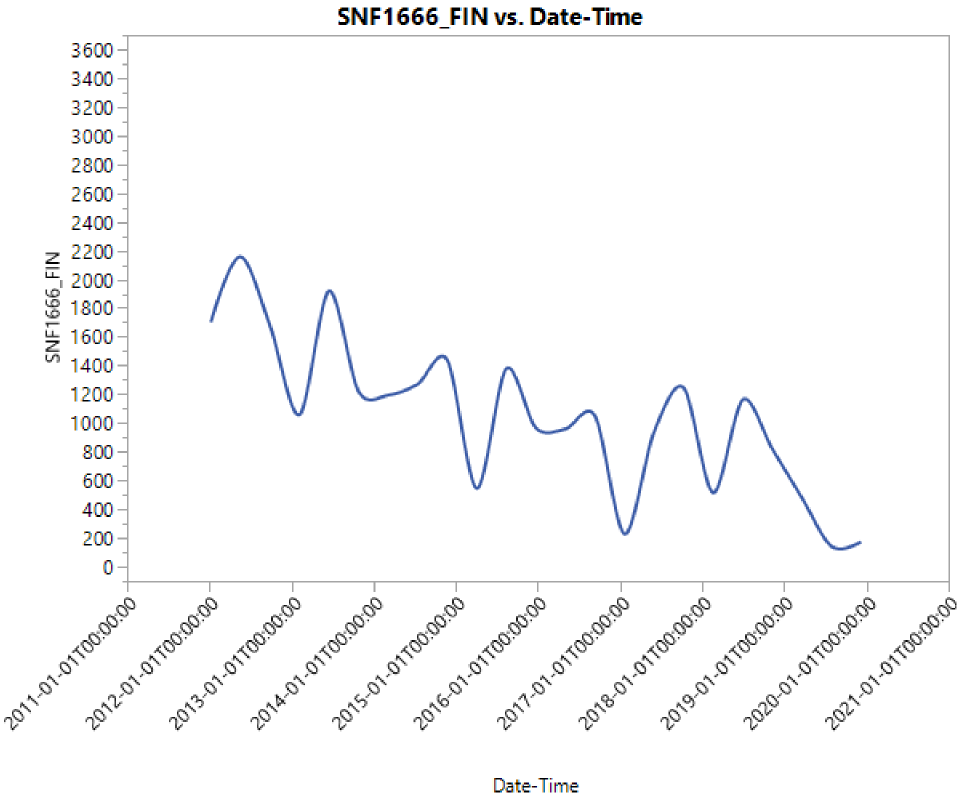


Figure 6-14 Historic smoothed SNA overboard PFW discharge volume (kL/d) (2012-2019)

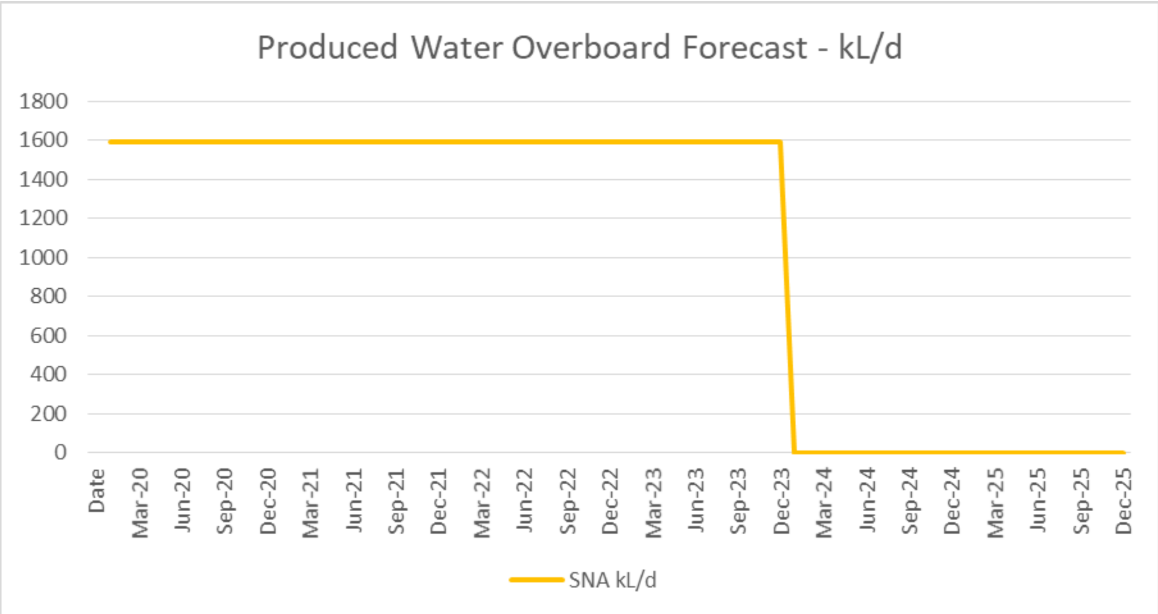


Figure 6-15 Five-year-projected maximum SNA PFW discharge volumes, kL/d.

6.3.7.2 Composition

Physical and chemical make-up

Physical and chemical make-up of PFW is shown in Appendix F – PFW Data file.

Chemical additives

Chemicals in Table 6-18 are added to the platform's water handling system in order to aid oil in water treatment. Chemicals in Table 6-19 are added into the process on the platform for other reasons and could remain at residual levels in the water handling system.

Table 6-18 Chemicals added to Snapper water handling system.

Description	Predominant phase solubility	Additive injection point	Potentially present in PFW discharge
Demulsifier (e.g. Baker-Hughes DMO24586)	Oil phase	V-805 Production Oil Separator Inlet	Yes

Table 6-19 Chemicals added to Snapper process that could remain at residual levels in the water handling system.

Description	Predominant phase solubility	Additive injection point	Potentially present in PFW discharge
Gas lift corrosion inhibitor (e.g. Baker-Hughes CGW24013)	Water phase	Gas lift into wells, upstream of water handling system	Yes
Gas well corrosion inhibitor (e.g. Baker-Hughes CRO24014)	Oil phase	Gas wells, upstream of water handling system	Yes

Oil in water monitoring results

Oil in water concentrations are measured on the platform using a continuous online monitor that determines the levels of oil using the way the PFW scatters light under UV fluorescence.

Data is provided in Appendix E for the platform's daily average overboard discharge levels of oil in water (in mg/L) and oil load (kg/d) since 1 Jan 2020 (reflecting the period following the NOPSEMA General Direction 740 in late 2019 where changes were made to the reporting and recording of oil in water).

Data is also provided for the same period showing the cross-check of platform online monitor readings with routine laboratory tests of oil and grease, with the alignment within a +/- 6 mg/L offset.

6.3.7.3 Ecotoxicology

To determine toxicity of the PFW discharge, whole effluent toxicity (WET) testing was performed in 2014 and 2020 across six tests (five chronic, one acute) and eight tests (seven chronic, one acute) respectively across at least 5 different species representing at least four different taxonomic groups. Further details of the ecotoxicology testing can be found in Appendix G.4 - Breakout Box 4. Chemical composition samples were taken at the same time as the samples for WET testing.

Chemical additives added at the time of sampling and ecotoxicology testing on Snapper in 2014 were Baker-Hughes SCW24050 and Baker-Hughes DMO24586 and in 2020 were Baker-Hughes SCW24050, Baker-Hughes DMO24586 and Baker-Hughes CGW24013.

Summarised results of the WET testing are shown in Appendix F.

A Burrlioz model has been run with the results from the 2014 WET testing (following Warne, 2018) and modelling using ssdtools was run with the results from the 2020 WET testing with the 95% and 99% species protection level of effluent shown in Appendix F. See Appendix G.4 – Breakout Box 4 for an explanation of the model selection.

6.3.7.4 Movement, dispersion and dilution

A dispersion model was designed and calibrated to show the movement dispersion and dilution of the PFW discharge around the platform. Appendix G.6 – Breakout Box 6 shows the setup and calibration details for the model. Dispersion model inputs and outputs are summarized in Appendix F.

6.3.7.5 Fate and transport of Snapper PFW

Fate and transport of SNA PFW is no different to TNA PFW as outlined in Section 5.3.2.5.

6.3.7.6 Receptors at Snapper platform

PFW discharged to the marine environment has the potential to result in the following impacts:

- Change in water quality;
- Change in sediment quality;

As a result of change in water quality, change in sediment quality and / or habitat, further impacts may occur which include:

- Injury to fauna;
- Change in habitat;
- Change to the function, interests or activities of other users.

Receptors that could be credibly affected by the discharge of PFW are identified in Table 6-20 and Figure 6-16, with reference made to specific receptors or receptor groups per Table 5-2.

Table 6-20 Receptors affected by impacts associated with discharges of SNA PFW

Receptors	Impacts				
	Change in water quality	Change in sediment quality	Injury to fauna	Change in habitat	Change to the function, interests or activities of other users
Water quality	✓ Open ocean, high energy environment, cool waters, 55 m water depth				
Sediment quality		✓ Sandy sea floor with some gravel			
Benthic habitats and communities			✓ Likely polychaetes, crustaceans and mollusc infauna; possible sponge, soft coral, other invertebrate filter-feeder epifauna		
Plankton			✓ Open ocean phyto- and zoo-plankton		
Fish			✓ Bony & cartilaginous fish, two vulnerable species (Great White and Whale sharks), distribution BIA for Great White shark, 13 km from Great White shark breeding		

Receptors	Impacts				
	Change in water quality	Change in sediment quality	Injury to fauna	Change in habitat	Change to the function, interests or activities of other users
			BIA, 27 km from Southern Right Whale migration BIA		
Marine Mammals - Seals			✓ Listed species the New Zealand Fur Seal and the Australian Fur Seal known to rest on the platform and swim alongside		
Marine Mammals - Cetaceans			✓ 27 cetacean species or species habitats occur, of which 5 species are listed (Sei, Blue, Fin, Southern Right and Humpback whales), facility overlaps foraging BIA for Blue whale and distribution BIA for Southern Right whale		
Australian Marine Parks and National Parks				✓ Ninety Mile Beach MNP (74 km), Point Hicks MNP (112 km), Gippsland Lakes NP (33 km)	
KEFs				✓ Overlaps with Shelf Rocky Reefs (25 km to South East Reef), 6 km to Upwelling East of Eden, 40 km+ to Bass Cascade, 109 km to Big Horseshoe Canyon	
Commercial and recreational fisheries					✓ Likely fisheries are Bass Strait Central Zone Scallop, Small pelagic, Southern and Eastern Scalefish &

Receptors	Impacts				
	Change in water quality	Change in sediment quality	Injury to fauna	Change in habitat	Change to the function, interests or activities of other users
					Shark, Danish-seine and scalefish hook, Wrasse, and Southern Squid Jig (low intensity) Fisheries

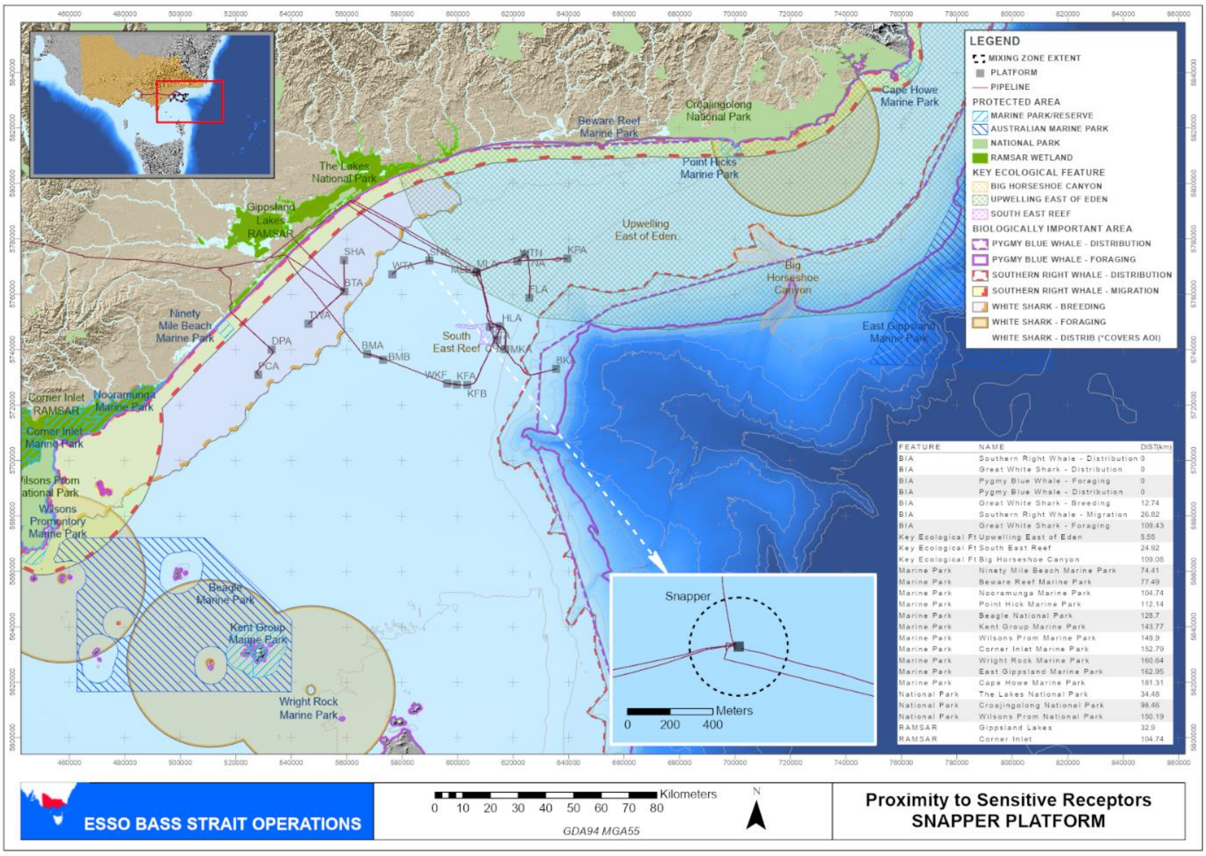


Figure 6-16 230 m mixing zone around SNA platform in relation to other environmental receptors

6.3.7.7 Snapper PFW impact assessment

Impacts to water quality

Physical properties of seawater are established within 10 m of the discharge point. Temperature changes using the RPS APASA (2016) model found that due to the turbulent mixing caused by the initial plunge and then buoyant rise of the effluent, in all cases the average temperature of the produced water plume returns to within 3°C above ambient temperatures within 10 m of the discharge location.

Chemical contaminants in PFW dilute quickly on the initial plunge, then more slowly with dispersion in the current around the platform. PFW is discharged at 30 times the ANZECC 99% species protection criteria for hydrocarbons, 3286 times for metals, and 82 times for inorganics; dilutes rapidly on its initial descent, and reaches ANZECC 95% water quality criteria within 80 m; and ANZECC 99% water quality criteria within 230 m which defines the extent of the mixing zone for the SNA platform. The large dilution factor for metals is driven by the 2019 sampling which indicated the presence of a number of metals that had not been detected before (or detected in very small concentrations) including Cadmium, Chromium, Cobalt, Copper, Nickel and Silver. In the 2020 samples taken roughly 6 months later (with the same well mix plus one additional well), none of these metals were detected. It is suspected that the 2019 results are an outlier, however SNA PFW compositional results will continue to be monitored and managed through the Monitoring and Management Framework (see Volume 4 Section 2.6.5).

PFW is discharged at between 39 and 314 times the background levels for hydrogen sulphide and up to 820 times the background levels of TOC (see Appendix F.3 – PFW data file) and gradually reduces to background levels with distance from the platform, reaching background levels within 120 m of the discharge point.

Anions such as sodium, calcium, magnesium and potassium, and cations such as chloride, sulphate, bromide and bicarbonate are found in PFW however these ions (and their associated salts) are also commonly found in seawater and hence will not be discussed further (Pillard et al. 1996).

Potential Naturally Occurring Radioactive Materials (NORM) are not expected to occur in quantities that may result in significant environmental impacts and are therefore not discussed further.

Impacts to sediment quality

SNA PFW contains the following chemicals which could impact marine sediments and an ANZECC (2000) or ANZECC (2013) interim sediment quality guideline value exists:

- Low molecular weight PAHs: Naphthalene, 2-methylnaphthalene, Fluorene, Phenanthrene and to a lesser extent (lower number of detections): Acenapthene
- High molecular weight PAHs: None
- Metals/Metalloids: Chromium, Cobalt, Copper, Silver, Zinc, Nickel and Arsenic.

There is no physical interaction of the plume with the seabed and hence no direct exposure of the constituents of PFW with the sediment (see Appendix F – PFW Data file). There is a potential pathway for impacts to sediment through settling of constituents in the PFW plume.

An analysis of the SNA PFW discharge found that 97.9% of particles are ≤63 µm (clay or silt). Per Breakout Box 10, this silt and clay fraction (≤63 µm) is usually cited as the chemically active fraction which is associated with potential contaminants of concern (UNEP/WHO 1996). While there is potential for settling of particles in the SNA PFW plume, it is the larger particles (>63 µm) that may settle which are composed primarily of stable inorganic materials and are generally not associated with contaminants of concern (see Appendix G.10 – Breakout Box 10).

Monitoring results for offshore facilities generally show that natural dispersion processes appear to control the concentrations of potential contaminants from PFW in sediments to slightly above background concentrations (Neff et al. 2011). The results from in-situ sediment monitoring of a nearby platform with similar discharge characteristics (TNA) confirms this. Around TNA the study found no valid samples for PAHs, or metals that co-occur in the platform's PFW discharge above the ANZECC (2013) ISQG "low" criteria. (see Appendix G.8 – Breakout Box 8). Occurrences of metals/metalloids were isolated, levels remained low and detections above reference locations remained localised despite there being evidence of some gradients away from the platform (see Appendix G.8 – Breakout Box 8).

TNA is a suitable proxy for predicting the potential for sediment contamination around SNA as the PFW discharge rate, discharge depth, and range of contaminants in PFW is similar (Table 6-5). The water depth at TNA is greater, allowing more chance for metals to precipitate as they move through the water column, and hence precipitation rates at SNA should be lower. In addition, TNA has higher suspended solid loads than SNA (Appendix F – PFW data file), meaning that if metals were to precipitate, they would be more likely to do so in the TNA PFW plume than in the SNA PFW plume and be observed in the sediments close to the discharge point.

Given that;

- sampling results at SNA indicate that less than 3% of particles in PFW may settle (due to their size)
- particles that settle are likely to be stable inorganic materials
- there were no valid observations of contaminants in PFW in sediments around WKF platform (which is a suitable proxy for CBA) above ISQG "low" guideline values

- levels of contamination of nickel in a gradient away from WKF platform (which is a suitable proxy for CBA) remains of very low level and within a small radius

the PFW discharge is expected to have negligible impacts on sediment.

Impacts to biota

Potential impacts of PFW to biota have been assessed through WET testing and dilution modelling to establish a mixing zone. Marine biota inside the mixing zone may be exposed to chronic exposure to contaminants in PFW, however, the mixing zone is limited to a localised extent around the plume discharge point only.

Process chemicals are discharged to the sea in residual amounts if they partition into the PFW and are not removed via the available treatment processes. As WET testing was performed with samples that contained chemical additives, the WET testing results are indicative of the routinely discharged PFW and account for any potential biological impacts that could be incurred by the PFW including any chemical additives. In addition, the ecotoxicological impacts of process chemicals in PFW discharges was comprehensively investigated in a study by Henderson et al. (1999). The study tested 11 commonly used process chemicals (including biocides, corrosion inhibitors and demulsifiers) for their acute toxicity to marine bacterium, both directly in aqueous preparations and following their partitioning between oil and water phases. The study results indicated that toxicity of the PFW was not significantly altered by the presence of most process chemicals used in typical concentrations. A review of the study by Schmeichel (2017) notes that process chemicals make a small contribution to the overall acute toxicity profile of PFW discharges.

Relevant to all receptor types (ecotoxicity pathways) are the SNA WET testing results. 95% species protection criteria based on WET testing occurs within 80 m of the discharge point (Appendix F – PFW data file). At this distance, 95% species will be protected from adverse ecotoxicity effects of the discharge, and water quality is reflective of 'ecosystems in which aquatic biological diversity may have been adversely affected to a relatively small but measurable degree by human activity. The biological communities remain in a healthy condition and ecosystem integrity is largely retained' (ANZECC, 2000, p3.1-10). 99% species protection criteria based on WET testing is met within 110 m of the discharge point (Appendix F – PFW data file). At this distance, 99% species will be protected from adverse ecotoxicity effects of the discharge, and water quality is reflective of an 'effectively unmodified, high conservation-value ecosystem' (ANZECC, 2000, p3.1-10). Outside 110 m to the remainder of the boundary of the mixing zone, contaminants in PFW will continue to reduce to background seawater concentrations. At these levels they are not expected to have any impact to biota.

Impacts to benthic communities and habitat

There are two pathways for potential impacts to benthic communities and habitats:

- Benthos near the discharge could be subject to exposure to toxic effects of PAHs or metals if they are directly exposed to PFW for long periods;
- Benthic animals near a produced water discharge may bio-accumulate metals, phenols, and hydrocarbons from the ambient water, their food, or bottom sediments.

Direct exposure - chemical ecotoxicity effects

SNA whole effluent toxicity results (2014) show that the amphipod *Allorchestes compressa* was affected by exposure to more than 12.5% raw effluent (acute endpoint). This is unlikely to occur anywhere within the mixing zone except immediately at the point of discharge. Hence no effect is expected on *Allorchestes compressa* since SNA effluent is diluted by 10 times within 1.6 m of the discharge point. The sea urchin *Heliocidaris tuberculate* was affected by exposure to more than 3.1% raw effluent (chronic endpoint). This is unlikely to occur anywhere within the mixing zone except immediately at the point of discharge. Hence no effect is expected on *Heliocidaris tuberculate* since SNA effluent is diluted by 50 times within 5 m of the discharge point. The mussel *Mytilus galloprovincialis* was affected by exposure to more than 6.3% raw effluent (chronic endpoint). This is unlikely to occur anywhere within the mixing zone except immediately at the point of discharge. Hence no effect is expected on *Mytilus galloprovincialis* since SNA effluent is diluted by 50 times within 5 m of the discharge point.

Impacts from PAHs in PFW on fauna such as scallops, crustaceans and other molluscs within 110 m of the discharge could pose chronic developmental or growth impacts, such as reduced survival of juveniles and reduced size, such as was found during a study of PFW effluent exposure to sea scallops of greater than 10% (Querbach et al. 2005, in Armsworthy et al., 2005). PFW discharge can also affect larvae viability (abalone, Raimondi and Schmitt, 1992). These effects are highly unlikely to occur at SNA since effluent is diluted by 10 times within 1.6 m of the discharge point. Also since the PFW plume is positively buoyant and does not contact the sea floor, it is expected that only fauna on the platform structure itself could be exposed and those on the sea floor are protected from direct exposure.

The range of marine acute LC50 values for arsenic (V) in water was 230-9600 µg/L for crustaceans and 330- 800 000 µg/L for molluscs (Vaughan 1996). In general, early life stages were more sensitive to arsenic than adults. The maximum arsenic level recorded in SNA undiluted PFW was 3 µg/L in one of the 7 years tested and non-detect in other years (Appendix F). Hence direct exposure to arsenic in SNA PFW is unlikely to have an impact on crustaceans or molluscs,

Sponges and soft corals localised to the discharge point could experience reduced ability to settle and metamorphose, such as was found in Luter et al (2019) on larvae of the sponge *R. odorabile* when exposed to hydrocarbons in water. This effect could be felt by encrusting organisms on the structure (to 110 m horizontal radius of the discharge) but not seafloor organisms due to the positive buoyancy of the plume.

Bioaccumulation

A large study for the Gulf of Mexico Offshore Operators Committee examined bioaccumulation in tissues of mollusc, crustacean, and three fish species in and around 11 platforms in the Gulf of Mexico discharging over 1000 kL/d (Continental Shelf Associates, 1997). The study examined bioaccumulation of five metals (As, Cd, Hg, 226Ra and 228Ra); three volatile monocyclic aromatic hydrocarbons (MAH), benzene, toluene, and ethylbenzene; and four semi-volatile organic chemicals, phenol, fluorene, benzo(a)pyrene, and di (2-ethylhexyl) phthalate. They concluded that there is no relationship between the proximity of marine animals to offshore PFW discharges and concentrations in their edible tissues of the chemical constituents.

Additional MAH (m-, p-, and o-xylenes) and a full suite of 40 parent and alkyl-PAH and dibenzothiophenes were also analysed by Neff et al. (2011). There was no evidence of MAH or phenol being bioconcentrated. All MAH and phenol were either not detected (>95% of tissue samples) or were present at trace concentrations in all invertebrate and fish tissue samples. Concentrations of several petrogenic PAHs, including alkyl naphthalenes and alkyl dibenzothiophenes, were slightly, but significantly higher in some bivalve molluscs but not fish, from discharging than from non-discharging facilities. These PAH could have been derived from PFW discharges or from tar balls or small fuel spills. Concentrations of individual and total PAH in mollusc, crab and fish tissues were well below concentrations that might be harmful to the marine animals (Neff et. al. 2011).

Effects from bioaccumulation has been primarily associated with low-molecular weight PAHs. Both BTEX and hydrogen sulphide are not bioaccumulative (Neff 2002, ANZECC, 2000 respectively). PAHs are discharged in SNA PFW with a dilution factor of 30 for Naphthalene above the ANZECC 99% species protection level. SNA PFW is diluted 50 times within 5 m of the discharge, hence the potential for bioaccumulation from water is low. PAHs were not observed in sediments around TNA above relevant guideline criteria as part of the 2018 in-situ monitoring program, and hence the potential for bioaccumulation from sediments is low.

There were no significant differences in benthic infauna distributions observed in an in-situ study around Tuna in 2018. This study found that at both near and far zones around the platform and at reference sites, crustaceans dominated the benthic infauna, followed by polychaetes. For less than 15% of the total number of taxa, infauna abundance significantly decreased with distance from the platform, owing mostly to re-distribution of coarser sediments around the platform due to the platform presence (Appendix G.9 – Breakout Box). The change in abundance could not be correlated with increased sediment contaminants found in PFW. This is consistent with the findings in Neff et al. (1992) where distributions of benthic communities around the platform (in 8 m water depth) were explained in large part by the influence of sediment grain size on benthic community structure; and there was no correlation between faunal density and the concentration of total hydrocarbons in sediments.

The potential for bioaccumulation in benthic organisms around SNA can be predicted from the TNA in-situ monitoring results, as as the PFW discharge rate, discharge depth, and range of contaminants in PFW is similar (Table 6-5). The water depth at TNA is greater than SNA which would favour greater chance for precipitation of potential contaminants. In addition, the sediment profile around SNA is similar to TNA (Figure 5-3).

Studies have found that provided the water depth is greater than the discharge depth, benthic organisms will not be affected by PFW, as the concentration of any oil or adhered/adsorbed components will be extremely low (Furuholt, 1996). Studies that have reported changes to benthic distributions were in shallow, moderate-to-poorly flushed waters of 1-8 m or continental shelf waters of up to 12 m (e.g. Osenberg et al (1992) and Rabalais et al. (1992)). It can be expected that in deeper, well-mixed ocean environments (such as at SNA) the potential for impacts to benthic infauna would be even lower.

Copper is readily accumulated by plants and animals; bioconcentration factors ranging from 100 to 26000 have been recorded for various species of phytoplankton, zooplankton, macrophytes, macroinvertebrates and fish (Spear & Pierce 1979). Toxic effects of metals occur when the rate of uptake exceeds the rates of physiological or biochemical detoxification and excretion (Rainbow 1996, in ANZECC 2000). For benthic organisms, effects of copper on crustaceans was published as ranging between 8.5 µg/L (Callianassa australiensis, 10-14 day EC50) to 42 µg/L (Mysidiopsis bahia, from 29-51 d MATC, reproduction) and on molluscs between 0.4 µg/L (Mytilus edulis, from 30-d EC50, reproduction of 2 µg/L) to 20000 µg/L (Ostrea edulis, 5-d LC50) (ANZECC 2000). SNA PFW copper concentrations were 2 µg/L in one of the 7 years tested and non-detect in other years (Appendix F). As SNA PFW is diluted 10 times within 1.6 m of the discharge, any effects on molluscs or crustaceans from exposure to or bioaccumulation of copper in PFW would be limited to organisms within 1.6 m of the discharge.

Zinc is adsorbed by suspended material. Zinc was found to bioaccumulate in freshwater animal tissues 50 to 1130 times but bioaccumulation is not generally considered a problem for zinc (ANZECC 2000). For benthic organisms, zinc effects on crustaceans ranged from 15 µg/L (Acanthomysis sp, growth) to 2100 µg/L (8–28 d NOEC), echinoderms (Asterias forbesi), 460 µg/L (from 7-d LC50) and molluscs: 5 spp, 7–11 d NOEC (from LC50), 15 µg/L (Crassostrea gigas) to 27500 µg/L (ANZECC 2000). Algae were affected at between 13 µg/L (Nitzschia closterium) to 796 µg/L. (Skeletonema sp) (5–10 d NOEC). SNA PFW zinc concentrations were 18 µg/L, 5 µg/L and 2 µg/L in three of the 7 years tested and non-detect in other years (Appendix F). SNA PFW dilutes 10 times within 1.6 m of the discharge. Hence there are effects on benthic animals or plants are limited to those within a 1.6 m radius of the discharge as a result of the levels of zinc in SNA PFW discharge.

Some aquatic organisms may accumulate cobalt, particularly some aquatic plants and benthic organisms (Cole & Carson 1981 in ANZECC 2000). For crustaceans, published ranges of effect concentrations were 9-d LC50, 45 µg/L (Palaemon serratus) to 45 400 µg/L (Carcinus maenas). The lowest geometric mean for converted NOEC was 9 µg/L. Homarus vulgaris also had a low g.m. for NOECs of 65 µg/L; nematode Monhystera sp, 4-d LC50, 94 000 µg/L; and algae 4-5 d EC50, growth, 300 µg/L (Dytilum sp) to 23 600 µg/L (Phaeodactylium sp) (ANZECC 2000). SNA PFW cobalt concentrations were 3 µg/L in one of the 7 years tested and non-detect in other years (Appendix F). Hence there are no effects on benthic animals or plants expected as a result of the levels of cobalt in SNA PFW discharge.

Silver is one of the most toxic metals to aquatic life in laboratory experiments. However, it is important to note that in the natural environment, silver is often found in less bioavailable complexes with chloride, dissolved organic carbon and sulphur-containing ligands and hence laboratory data may overestimate the toxicity of silver (Gorsuch & Purcell 1999 in ANZECC 2000). For crustaceans, the published ecotoxicity data is 2.5-42 µg/L (Mysidopsis bahia, 28-38 d NOEC, from MATC, reproduction and mortality); for molluscs it is 5-42 µg/L (8-28 d NOEC from LC50 and MATC, growth, reproduction) (ANZECC 2000). Effect concentrations for alga are 0.8-3.5 µg/L (5-14 d NOEC Champia parvula (red macroalgae) and Ditylum (diatom), from MATC, reproduction and LC50, growth) (ANZECC 2000). SNA PFW silver concentrations were 17 µg/L in one of the 7 years tested and non-detect in other years (Appendix F). SNA PFW dilutes 10 times in approximately 1.6 m and 50 times in 5 m from the discharge point. Hence any effects on benthic animals or plants expected as a result of the levels of silver in SNA PFW discharge are limited to within 5 m of the discharge.

For benthic organisms, effects of chromium on crustaceans was published as ranging between 4 µg/L (Cancer anthonyi, from 7-d LOEC, hatch) to 3090 µg/L (Rhithanopanopeus sp, from 20-d LC50) (ANZECC 2000). Effects on echinoderms was 2000 µg/L (from 7-d LC50, Asterias forbesi) and molluscs at 1600 µg/L (Mya arenaria, from 7-d LC50) to 10 000 µg/L (Macoma balthica, from 8-16 d LC50). SNA PFW chromium concentrations were 460 µg/L in one year and 1 µg/L in another, out of the 7 years tested and non-detect in other years (Appendix F). As SNA PFW is diluted 10 times within 1.6 m, 50 times within 5 m and 100 times within 8 m of the discharge, any effects on molluscs or crustaceans from bioaccumulation of chromium in PFW would be limited to organisms within 8 m of the discharge. It should also be noted that In marine and estuarine conditions, the high sulphate concentrations make chromium toxicity unlikely (ANZECC 2000).

In general, marine invertebrates are more sensitive to nickel than vertebrates (ANZECC 2000). Chronic effects of nickel on crustaceans was published as ranging between 141 µg/L (36-d chronic mortality, Mysidopsis bahia, Gentile et al. 1982) and 160 µg/L (Portunus pelagicus: from 42d MATC growth of 320 µg/L) to 6000 µg/L from 5-8 d LC50. Effects on echinoderms published as 2600 µg/L (Asteria forbesi from 7-d LC50) molluscs between 240 (Crassostrea virginica; from 12-d LC50 of 1200 µg/L) to 450 000 µg/L from 7-12 d LC50; and algae: 1 sp, Nitzschia closterium 50 µg/L, from 5-d EC50 growth (Australian data) (all from ANZECC 2000). SNA PFW nickel concentrations were 140 µg/L in one of the 7 years tested and non-detect in other years (Appendix F). Hence no impacts to benthic organisms from bioaccumulation of nickel in SNA PFW is expected.

Effects on benthic flora and fauna are primarily attributed either to uptake of contaminants from water or the presence of accumulated hydrocarbons (such as PAH) in sediments. Ecotoxicity impacts to biota from metals in sediment is more complicated, owing to the many forms that metals can take, reduction-oxidation states and overall bioavailability of the metal. While there have been a large number of studies where the chemical concentrations of contaminants have been measured in sediments, very few have been related to biological effects, either in the nature of descriptions of the natural benthic populations or laboratory-based bioassays (ANZECC 2000, p8.4-26). Given the results from the TNA in-situ sediment monitoring that found occurrences of metals/metalloids were isolated, levels remained low (for the most part, well below sediment guideline criteria) and detections above reference locations remained localised (see Appendix G.8 – Breakout Box 8), effects on benthos from accumulated metals in sediments is unlikely.

Given the above, benthic biota around SNA platform are highly unlikely to be affected by the PFW discharge. Any effects would be confined to chronic impacts (such as changes in growth, metamorphosis or reproduction) for flora and fauna such as sponges and crustaceans on the platform structure within 110 m of the discharge point, within the mixing zone extent of 230 m. As the area and depth ranges of a potential, but highly unlikely impact, are small and localised, effects at a population level are not credible.

Impacts to plankton

There are three pathways for potential impacts to plankton:

- Exposure to temperature effects on direct exposure
- Stimulatory effects of nutrients in the plume, leading to eutrophication of waters
- Exposure to toxic effects of chemical constituents of PFW if plankton are directly exposed for long periods (i.e. directly in the plume)

Direct exposure – temperature effects

As the average temperature of the produced water plume returns to within 3°C above ambient temperatures within 10 m of the discharge location, potential temperature effects on plankton are not credible.

Stimulatory effects from nutrients in the plume

Discharges of nutrients and hydrocarbons in the PFW plume can increase the localised abundance of plankton. For example, ammonia may elicit inhibitory (toxic) and/or stimulatory (e.g. eutrophication) responses from resident biota (Neff, 2011). Plankton could be attracted to localised higher concentrations of these constituents within the mixing zone and as a result plankton populations can rapidly increase. However, increased planktonic activity and turnover mass rates within the mixing zone is not expected to have any marked change on the water quality due to the high levels of movement of water around the platform from the action of currents and waves. Levels of nitrate and phosphates are low (not unlike other produced waters, Neff, 2011) and hence are not likely to cause eutrophication. Supporting this there is anecdotal evidence that no phytoplankton blooms have ever been recorded at a Bass Strait Esso facility.

Direct exposure – chemical ecotoxicity effects

Phytoplankton are among the most sensitive organisms to both forms of arsenic. The Australian diatom Nitzschia closterium is highly sensitive to arsenic (III), with a 72-h EC50 for growth inhibition of 7 µg/L (Florence & Stauber 1991), compared to >2000 µg/L for arsenic (V). An Environmental Concern Level (ECL, see Section 8.3.4.5) of 2.3 µg/L was derived for As (III) in marine waters, using an AF of 100 (ANZECC 2000). SNA PFW arsenic concentrations were 3 µg/L in one of the 7 years tested and non-detect in other years (Appendix F). Hence there are no impacts to plankton anticipated from arsenic in SNA PFW.

Plankton have high levels of natural mortality and a rapid replacement rate (UNEP 1985). Any impacts as a result of direct exposure of planktonic communities to PFW are expected to be confined to the 110 m zone to 99% species protection, which sits within the extent of the mixing zone. Direct exposure of planktonic communities to PFW within the 110 m zone (to 99% species protection criteria based on WET testing) is not considered to result in significant impacts at the population level of organisms that could affect broader ecological diversity or productivity of the area surrounding the facility.

Impacts to fish

There are three pathways for potential impacts to fish:

- Exposure to temperature effects on direct exposure
- Exposure to toxic effects of chemical constituents of PFW if fish are directly exposed for long periods (i.e. directly in the plume)
- Exposure to toxic effects of chemical constituents of PFW if fish are directly exposed to contaminated sediments

Direct exposure – temperature effects

As the average temperature of the produced water plume returns to within 3°C above ambient temperatures within 10 m of the discharge location, potential temperature effects on fish are not credible.

Direct exposure – chemical ecotoxicity effects

Early lifestages of fish (embryos, larvae) within the 110 m zone to where 99% species protection criteria are met would be most susceptible to the exposure from chemical constituents in the PFW discharge, as they are less mobile and therefore can become exposed to the plume at the outfall. These effects can range from no effects (Mathieu et al 2011), to gill damage (turbot larvae, Brown et al. 1998). Hormonal effects could be experienced without liver function damage (cod, Meier et al, 2002), however this occurs at very high exposure concentration or where immune systems are already compromised by other stressors (Hamoutene et al, 2011; Burridge et al, 2011) which is not likely to be the case at HLA. Larvae entrained in the outfall may only be exposed to higher concentrations for a short period relative to the buoyancy of the organism (Querbach, et al. 2005). Outside the 110 m radius, early lifestages of fish are not expected to be affected at all.

Effects from copper in water on fish was published as ranging between 30 µg/L (2 spp, from 12-14 d EC50, hatch & mortality) to 260 µg/L (Menidia menidia, 11-d EC50, hatch) (ANZECC 2000). SNA PFW copper concentrations were 2 µg/L in one of the 7 years tested and non-detect in other years (Appendix F). Hence there are no effects on fish expected as a result of the levels of copper in SNA PFW.

Effects from zinc in water on fish was published as 10 400 µg/L (Fundulus heteroclitus, 7-d NOEC of from LC50) (ANZECC 2000). SNA PFW zinc concentrations were 18 µg/L or less in three of the 7 years tested and non-detect in other years (Appendix F). Hence there are no effects on fish expected as a result of the levels of zinc in SNA PFW.

Effects from cobalt in water on fish was published as 52 500-227 000 µg/L (from 4-9 d LC50) (ANZECC 2000). SNA PFW cobalt concentrations were 3 µg/L in one of the 7 years tested and non-detect in other years (Appendix F). Hence there are no effects on fish expected as a result of the levels of cobalt in SNA PFW.

Levels of chromium (max detected 460 µg/L) and nickel (max detected 140 µg/L) in the SNA discharge are well below the concentrations that could have effects on fish (Chromium 776 µg/L (Citharichthys sp, from 14-21 d LC50) to 14 125 µg/L (Cyprinodon variegatus, from NOEC, growth) and Nickel Fundulus heteroclitus, 30 000 µg/L from 7-d LC50; from ANZECC 2000).

Salinity and organic carbon in marine waters tend to reduce toxicity to silver versus freshwaters and laboratory conditions. The acute toxicity of silver to marine fish was published as 330–2700 µg/L (96-h LC50), and no chronic test results were published in ANZECC 2000. SNA PFW silver concentrations were 17 µg/L in one of the 7 years tested and non-detect in other years (Appendix F). Hence there are no effects on fish expected as a result of the levels of silver in SNA PFW.

Later-life pelagic species are generally highly mobile and as such are not likely to be exposed at concentrations that would lead to chronic effects due to their patterns of movement. Fish also exhibit a strong avoidance reaction to hydrogen sulphide (USEPA 1986 in ANZECC 2000).

BTEX is known to be toxic to fish and invertebrate eggs and larvae and has been shown to result in developmental defects (Fucik et al. 1995). However, due to the compound's volatility, the residence time in waters is brief; rapid active and passive excretion of these compounds from tissues will also limit in-tissue concentrations in the field; and BTEX does not bio-accumulate (Neff et al., 1996). The dilution ratio for SNA PFW to ANZECC 99% species protection water criteria for Benzene is 18, and SNA PFW is diluted 50 times within 5 m, hence BTEX is not expected to have any toxic effects beyond a 5 m radius from the discharge point.

Whole effluent ecotoxicity data from SNA PFW shows that the barramundi fish *Lates calcarifier* experienced effects above 12.5% raw effluent exposure (chronic endpoint). This is unlikely to occur anywhere in the mixing zone except directly at the discharge point itself. Whilst this species is not local to Bass Strait, no effect is expected on fish similar to *Lates calcarifier* since SNA effluent is diluted by more than 10 times within 1.6 m of the discharge point.

Exposure to contaminated sediments – chemical ecotoxicity effects

Effects from fish directly exposed to contaminated sediments above 22 mg/kg PAH could result in gill hyperplasia, reduced phagocytic activity of macrophages and pancreatic necrosis (spot, Hinkle-Conn et al., 1998). However this is highly unlikely to be the case as the highest level of PAHs in sediment around TNA was 0.004 mg/kg.

The mixing zone overlaps the distribution BIA for the Great White Shark; however, given the localised area of impact and that sharks are transiting the area, no impacts are expected. The discharge does not constitute a threat listed in the recovery plan of the White Shark, and the discharge activity is not inconsistent with that plan.

In summary as the PFW plume is dynamic and moving constantly depending on the tides, currents, winds and internal waves, transient fish such as great white sharks, are unlikely to be exposed to elevated contaminant concentrations for extended durations. Indirect impacts, such as altered prey abundance or ingestion of bioaccumulated toxic compounds is considered to be of no effect given the localised area predicted to be impacted by PFW and the nature and scale of impacts to the marine ecosystem within the PFW discharge plume (i.e. slight impacts to food sources such as plankton and pelagic fish species). Given the potential absence of impacts to fish, the limited spatial extent of the water quality (230 m radius) the predicted intermittent and short interaction duration (i.e. minutes at a time) with the PFW plume, it is considered that there will not be a significant impact on fish particularly the great white shark from PFW discharges when assessed against the relevant criteria in the Matters of National Environmental Significance. Significant impact guidelines 1.1. (DoE, 2013), including that there will be no long-term decrease in the size of the population, the area of occupancy of the species or an important population, the existing population will not be fragmented into two or more populations, there will be no adverse effect on habitat critical to the survival of a species, there will be no disruption to the breeding cycle of an important population, the availability or quality of habitat will not be destroyed, removed, isolated or decreased to the extent that the species is likely to decline and the recovery of the species will not be substantially interfered with.

Impacts to seals

There are three pathways for potential impacts to seals:

- Exposure to toxic effects of chemical constituents of PFW if seals are directly exposed for long periods (i.e. directly in the plume)
- Effects from inhalation of hydrocarbon vapours from PFW sheens
- Irritation effects from physical contact with hydrocarbons in PFW
- Bioaccumulation through the ingestion of impacted food sources

Produced water plumes predominantly result in dissolved contaminants and they rarely cause a defined layer on the sea surface (silvery sheen is the lowest level according to the Bonn agreement and usually patchy if at all present from the PFW discharge). Hence potential impact pathways through contact of hydrocarbons with seal fur and ingestion are not credible.

Direct exposure – chemical ecotoxicity effects

Seals do not spend all their time in the water, and when they do, they are highly active, travel great distances and forage at various depths (Arnould et al., 2005). As such, it is highly unlikely that these potential impact pathways will be significant. In addition, pinnipeds have been found to have the enzyme systems necessary to convert absorbed hydrocarbons into polar metabolites, which can be excreted in urine (Engelhardt, 1982; Addison & Brodie, 1984; Addison et al., 1986).

Effects from inhalation of hydrocarbon vapours from PFW sheens

Inhalation of hydrocarbon vapours could cause toxic effects. However, the level of oil on water (i.e. sheens) from produced water plumes rarely cause silvery sheens (the lowest level according to the Bonn agreement), and hence will have extremely low levels of vapour. Seals are highly mobile and active animals and do not spend all their time at the water surface, as such, it is highly unlikely that this potential impact pathways will be significant.

Irritation effects from physical contact with hydrocarbons in PFW

Exposure to on-sea hydrocarbons could cause irritation to the eyes and oral cavity. However seals are unlikely to remain swimming within the discharge plume for long periods as they are highly active animals, travel great distances and forage at various depths. As such, it is highly unlikely that this potential impact pathways will be significant so as to not have any chronic impacts to seals.

Bioaccumulation through ingestion of impacted food sources

As impacts to the predominant seal food source of fish are of very low likelihood (as above), bioaccumulation through ingestion of impacted food sources is unlikely to have any impact on seals.

Listed Australian Fur Seals and New Zealand Fur Seals occur at the platform, however no seal breeding occurs on or around the platform, and the area is not identified as critical habitat or BIA. According to IUCN, the Australian Fur Seal is listed as Least Concern and its population is increasing (IUCN, 2015).

There is no relevant Conservation Advice or Threat Abatement Plan for Australian Fur Seals or New Zealand Fur Seals.

In summary as the PFW plume is dynamic and moving constantly depending on the tides, currents, winds and internal waves, coupled with seals being highly mobile active animals who do not spend all their time in the water or at the water surface, seals are unlikely to be exposed to elevated contamination concentrations for extended durations. Indirect impacts, such as altered prey abundance or ingestion of bioaccumulated toxic compounds is considered to be of no effect given the localised area predicted to be impacted by PFW and the nature and scale of impacts to the marine ecosystem within the PFW discharge plume (i.e. slight impacts to food sources such as pelagic fish species). Given the potential absence of impacts to seals, the limited spatial extent of the water quality (230 m radius) the predicted short interaction duration (i.e. minutes at a time) with the PFW plume, and that breeding does not occur within the OA it is considered that there will not be a significant impact on seals from PFW discharges when assessed against the relevant criteria from the Matters of National Environmental Significance.

Significant impact guidelines 1.1. (DoE, 2013), including that there will be no long-term decrease in the size of the population, the area of occupancy of the species or an important population, the existing population will not be fragmented into two or more populations, there will be no adverse effect on habitat critical to the survival of a species, there will be no disruption to the breeding cycle of an important population, the availability or quality of habitat will not be destroyed, removed, isolated or decreased to the extent that the species is likely to decline and the recovery of the species will not be substantially interfered with.

Impacts to cetaceans

There are four pathways for potential impacts to cetaceans:

- Exposure to toxic effects of chemical constituents of PFW if cetaceans are directly exposed for long periods (i.e. directly in the plume)
- Effects from inhalation of hydrocarbon vapours from PFW sheens
- Irritation effects from physical contact with hydrocarbons in PFW
- Bioaccumulation through the ingestion of impacted food sources

Direct exposure – chemical ecotoxicity effects

Cetaceans are highly mobile and transitory animals, as such, it is highly unlikely that this potential impact pathways will be significant. Note also, many marine mammals appear to have the necessary liver enzymes to metabolise hydrocarbons and excrete them as polar derivatives (Ball and Truskewycz, 2013).

Effects from inhalation of hydrocarbon vapours from PFW sheens

As a result of inhaling volatile compounds when surfacing, cetaceans can experience lung congestion (Geraci & St. Aubin 1990); or irritation or damage to mucous membranes or airways (Helm et al., 2015). However, the level of oil on water (i.e. sheens) from produced water plumes rarely cause silvery sheens (the lowest level according to the Bonn agreement), and hence will have extremely low levels of vapour. Cetaceans are highly mobile and only transit the area, as such, it is highly unlikely that this potential impact pathway will be significant.

Irritation effects from physical contact with hydrocarbons in PFW

Cetaceans can be exposed through direct contact with the eyes, potentially leading to inflammation (Geraci & St. Aubin 1990). Cetaceans are highly mobile and only transit the area, as such, it is highly unlikely that this potential impact pathway will be significant.

Bioaccumulation through ingestion of impacted food sources

As impacts to cetacean food source predominantly of fish and plankton is of very low likelihood (as above), and the area does not represent a large proportion of the overall cetacean feeding area therefore it is unlikely to have any impact on cetaceans.

The mixing zone overlaps the foraging BIA for the blue whale and distribution BIA for the Southern Right Whale; however, given the localised area of impact and that whales are transiting the area, no impacts are expected. The discharge does not constitute a threat listed in the Conservation Management Plan of either the Blue Whale or Southern Right Whale and the discharge activity is not inconsistent with those plans.

In summary as the PFW plume is dynamic and moving constantly depending on the tides, currents, winds and internal waves, transient cetaceans such as migrating whales, are unlikely to be exposed to elevated contaminant concentrations for extended durations. Indirect impacts, such as altered prey abundance or ingestion of bioaccumulated toxic compounds is considered to be of no effect given the localised area predicted to be impacted by PFW and the nature and scale of impacts to the marine ecosystem within the PFW discharge plume (i.e. slight impacts to food sources such as plankton and pelagic fish species). Given the potential absence of impacts to cetaceans, the limited spatial extent of the water quality (230 m radius) the predicted intermittent and short interaction duration (i.e. minutes at a time) with the PFW plume, it is considered that there will not be a significant impact on cetaceans from PFW discharges when assessed against the relevant criteria from the Matters of National Environmental Significance. Significant impact guidelines 1.1. (DoE, 2013), including that there will be no long-term decrease in the size of the population, the area of occupancy of the species or an important population, the existing population will not be fragmented into two or more populations, there will be no adverse effect on habitat critical to the survival of a species, there will be no disruption to the breeding cycle of an important population, the availability or quality of habitat will not be destroyed, removed, isolated or decreased to the extent that the species is likely to decline and the recovery of the species will not be substantially interfered with.

Impacts to Fisheries – Commercial and Recreational

There are three potential impact pathways for fisheries:

- Tainting (hydrocarbon odour in caught fish) due to tissue accumulation of hydrocarbons in PFW
- Impacts to the safety of humans through the consumption of target species tissues that are impacted by PFW.
- Reduction of fisheries stocks, through the direct impact of PFW on target species and nurseries

Tainting

Per Appendix F, ANZECC seafood taint criteria is reached within 8 m of the discharge point. (Note: Appendix G.3 – Breakout Box 3 applies to the detection of other phenols under the seafood taint guidelines). The total area represented by a 8 m radius at SNA is 201 m^2 (1/50th of a hectare), and cumulative area across all Bass Strait platform PFW discharges is <2000 m^2 (1/5th of a hectare), representing an extremely small proportion of the total fisheries area. Hence the discharge is highly unlikely to cause taint in fisheries-caught fish.

Impacts to seafood safety for humans

Since fish or shellfish are not harvested around the PFW plume or mixing zone out to at least 500 m from the platform, and the zone in which 99% species protection criteria is reached extends to only 110 m from the platform, there is no effect of the PFW discharge on humans through consumption.

Impacts to fisheries stocks

Individual fish and other non-fish target species, (i.e. invertebrates of value, including squid, crustaceans (rock lobster, crabs) and molluscs (scallops, abalone), where they are directly present in the PFW plume (within 110 m radius), may be exposed to chronic sub-lethal impacts (see above) however due to the small range and depths that this applies, population level impacts are considered highly unlikely. Whilst offshore structures may play a role in enhancing fish stocks due to the presence of hard substrate and the level of protection from fishing that they provide, fish nurseries known to be notable prolific producers are close to shore (such as Gippsland Lakes RAMSAR site) and these are expected to contribute to fisheries stocks in much greater numbers. Therefore there are no anticipated impacts to fisheries stocks.

Stakeholder feedback confirmed that although fishers had been able to see discharges from the Bass Strait platforms from beyond the 500 m exclusion zone, the discharge did not have any effect on fisheries or fisheries equipment, or amenity for the fishers. There is general acknowledgement among fishers that Esso's facilities provide safe habitat for juvenile fisheries species. There were no complaints or issues brought up by fishers regarding PFW discharge. Ongoing dialogue with fishing communities is part of Esso's stakeholder engagement plan.

Impacts to other receptors

Australian Marine Parks, National Parks and Reserves

Given the distance of marine parks, national parks and reserves from the mixing zone, impacts to these receptors are not considered credible.

Key Ecological Features

Upwelling East of Eden: Given the distance from the mixing zone to the likely location of this KEF, impacts are not anticipated.

The Bass Cascade: Given the distance from the mixing zone to the likely location of this KEF, impacts are not anticipated.

Shelf rocky reefs and hard substrates (South-East Marine Region), including the South East Reef: The same assessment as Benthic habitats and communities applies to this KEF as described above. Given the distance from the PFW mixing zone to the reported location of the South East Reef, impacts on this reef are not anticipated.

Cumulative impacts from multiple discharges

There are no other PFW plumes within 3 km of the SNA discharge. The next closest discharge is at TNA which is over 10 km away from the SNA discharge point and the plumes do not overlap (see Appendix G.6 – Breakout Box 6).

Other continuous discharges from the same platform are limited to discharges from pile subsea windows. These discharge at 35.8 m (ODSP) and 49 m (CDSP) below sea level, deeper than the produced water effluent pipe depth at 8.2 m below sea level. Piles are expected to be exchanging predominantly sea water, hence any discharge from the piles will be close to neutrally buoyant at the subsea window (Section 6.4.1.1). Discharges of water containing chemicals (at discharge all chemicals are CHARM Gold/Silver or OCNS D/E (Table 6-22) or dissolved hydrocarbons from the pile will be intermittent or infrequent, and of small volumes which will disperse rapidly in the open ocean currents within the operational area. It is therefore expected that any exposure will be limited in duration.

Dispersion modelling for SNA PFW shows the maximum plunge depth from the discharge point under all current speeds is to 8.6 m below sea level, hence any cumulative impacts from the interaction with the produced water effluent plume within the mixing zone is considered unlikely.

Other non-continuous discharges (such as desalination brine, sewage, grey water, food waste, liquid discharges from vessel operations, and wellwork discharges) could overlap with the PFW plume but are short in duration and hence any cumulative impacts are unlikely to occur.

Any suspended solids in the pile contents will settle out within the pile, or if finer and suspended in the pile, then they will gradually settle out at far distances from the platform as they are carried by the current and result in no noticeable impacts to sediments. Hence any cumulative impact of the pile discharges to sediment is considered highly unlikely.

Historical activities such as discharging muds and cuttings during drilling may have resulted in changes to the sea floor sediment chemical characterisation above background levels. This includes the discharge of water based muds and barite containing barium, an inert metal; and the discharge of cuttings from natural rock formations encountered during drilling, together with small amounts of residual drilling muds on cuttings. Any changes to sediment quality from historical impacts from background will be considered as part of the surrender of title process. The last drilling program on SNA was in approximately 2010, hence discharged fluids or solids from the drilling program is expected to have at least partially been dispersed or bioremediated. There is not expected to be a significant cumulative impact to sediment quality from the additive effect of discharging PFW to sediments containing higher levels of barium or residual drilling mud constituents.

Given the varying buoyancy of the plumes, the mobile nature of marine mammals and the tendency of fish to avoid plumes cumulative impacts on marine fauna is unlikely.

As fishing is not carried out within 500 m of the platform, which is beyond the mixing zone of 230 m no cumulative impacts from multiple discharges is likely on commercial and recreational fishing.

Given the distance to other sensitive receptors (Table 5-2) cumulative impacts from multiple discharges are highly unlikely.

6.3.7.8 Snapper PFW consequence evaluation

Impacts from SNA PFW are limited to a localised mixing zone around the discharge point, with negligible impacts to sediment. Potential impacts to biota, including benthic habitats and communities, plankton, fish, and seals and cetaceans, including through bioaccumulation, is localised in nature to the mixing zone or negligible and is not considered significant (per Significant Impact Guidelines [DOE, 2013]).

Effects could be ongoing, including through bioaccumulation of PAHs and persistent chemicals, but effects are confined to some biota on the platform structure itself (e.g. crustaceans) or dispersed in a small radius around the platform water and sediments at low and safe concentrations. Within the mixing zone, there could be sub-lethal, direct or indirect effects on organisms, but this would likely only apply to non-mobile receptors, such as fish embryos/juveniles, and would not apply at a population level. The environment is highly endemic, with few endangered and rare species present, but is generally strong and resilient, and provides some ecosystem services (e.g. fisheries).

The consequence level is therefore assessed as **Consequence Level III.**

To ensure continuing confidence in the consequence level the Monitoring and Management Framework will be implemented. If routine monitoring was to detect levels in PFW above the trigger values and there was the potential to impact the ecosystem integrity, an ALARP/Acceptability study is required to determine what additional controls can be implemented to ensure the impacts are not realised. A sampling plan to demonstrate compliance with the approved mixing zone boundary will be developed for the sediment survey. The sampling plan outlines and justifies sampling locations and when concentration and bioavailability testing occur.

6.3.8 Marlin B platform

6.3.8.1 Volume

MLB is expected to discharge PFW overboard in approximately 2022. The maximum capacity of the system is 2450 kL/d.

6.3.8.2 Composition

There are no samples available at the present time in order to characterise the physical and chemical make-up of PFW from MLB. However, it is expected that an analogue for composition is the TNA platform discharge.

Chemical additives to the water handling system are currently unknown and will depend on the results from commissioning the equipment, and may involve a water clarifier or demulsifier chemical. Chemicals added to the MLB process that could remain at residual levels in the water handling system will likely be gaslift corrosion inhibitor (e.g. Baker-Hughes CGW24013, water soluble) and fin-fan corrosion inhibitor (e.g. Baker-Hughes CRO24037, oil soluble).

Oil in water concentrations will be measured on the platform using an online monitor that determines the levels of oil using the way the PFW scatters light under UV fluorescence.

6.3.8.3 Ecotoxicology

There are no results available currently for the ecotoxicology of MLB PFW. However, it is expected that an analogue for composition and therefore ecotoxicology is the TNA platform discharge.

6.3.8.4 Movement, dispersion and dilution

A dispersion model was designed and calibrated to show the movement dispersion and dilution of the PFW discharge around the platform. . Appendix G.6 – Breakout Box 6 shows the setup and calibration details for the model. Dispersion model inputs and outputs are summarized in Appendix F.

6.3.8.5 Fate and transport of Marlin B PFW

Fate and transport of WKF PFW is no different to TNA PFW as outlined in Section 5.3.2.5.

6.3.8.6 Receptors at Marlin B platform

PFW discharged to the marine environment has the potential to result in the following impacts:

- Change in water quality;
- Change in sediment quality;

As a result of change in water quality, change in sediment quality and / or habitat, further impacts may occur which include:

- Injury to fauna;
- Change in habitat;
- Change to the function, interests or activities of other users.

Receptors that could be credibly affected by the discharge of PFW are identified in Table 6-21, and Figure 6-17, with reference made to specific receptors or receptor groups per Table 5-2.

Table 6-21 Receptors affected by impacts associated with discharges of MLB PFW

Receptors	Impacts				
	Change in water quality	Change in sediment quality	Injury to fauna	Change in habitat	Change to the function, interests or activities of other users
Water quality	✓ Open ocean, high energy environment, cool waters, 59 m water depth				
Sediment quality		✓ Sandy sea floor with some gravel, possible calcified scallop beds			
Benthic habitats and communities			✓ Likely polychaetes, crustaceans and mollusc infauna; possible sponge, soft coral, other invertebrate filter-feeder epifauna		
Plankton			✓ Open ocean phyto- and zoo-plankton		
Fish			✓ Bony & cartilaginous fish, two vulnerable species (Great White and Whale sharks), distribution BIA for Great White shark, 23 km from Great White shark breeding BIA, 36 km from Southern Right Whale migration BIA		
Marine Mammals - Seals			✓ Listed species the New Zealand Fur Seal and the Australian Fur Seal known to rest on the		

Receptors	Impacts				
	Change in water quality	Change in sediment quality	Injury to fauna	Change in habitat	Change to the function, interests or activities of other users
			platform and swim alongside		
Marine Mammals - Cetaceans			✓ 27 cetacean species or species habitats occur, of which 5 species are listed (Sei, Blue, Fin, Southern Right and Humpback whales), facility overlaps foraging BIA for Blue whale and distribution BIA for Southern Right whale		
Australian Marine Parks and National Parks				✓ Ninety Mile Beach MNP (90 km), Point Hicks MNP (98 km), Gippsland Lakes NP (42 km)	
KEFs				✓ Overlaps with Shelf Rocky Reefs (19 km to South East Reef), and Upwelling East of Eden, 40 km+ to Bass Cascade, 92 km to Big Horseshoe Canyon	
Commercial and recreational fisheries					✓ Likely fisheries are Bass Strait Central Zone Scallop, Small pelagic, Southern and Eastern Scalefish & Shark, Danish-seine and scalefish hook, Wrasse, and Southern Squid Jig (low intensity) Fisheries

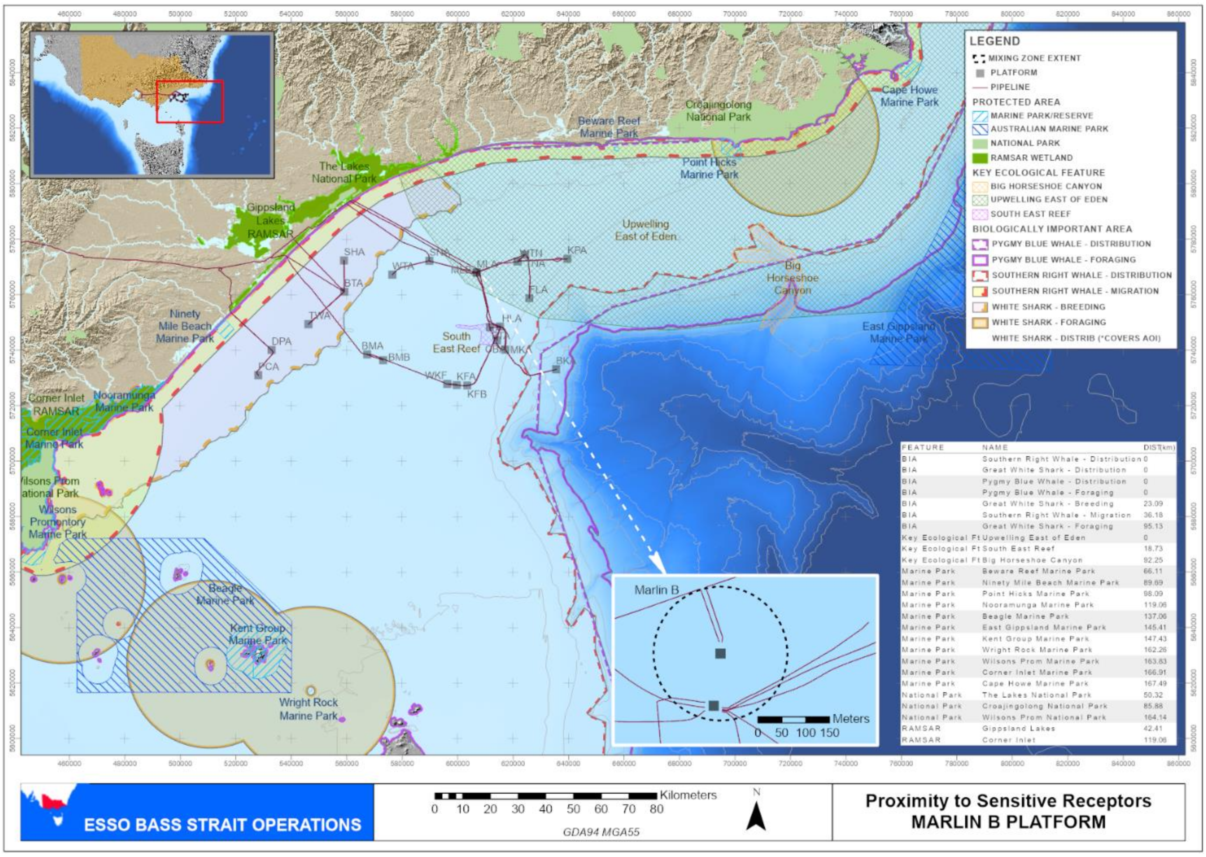


Figure 6-17 140 m mixing zone around MLB platform in relation to other environmental receptors

6.3.8.7 Marlin B PFW impact assessment

This section assumes an analogue for composition and ecotoxicology of the discharge is TNA platform PFW discharge, with dispersion occurring at MLB in accordance with the dispersion modelling results.

Impacts to water quality

Physical properties of seawater are established within 10 m of the discharge point. Temperature changes using the RPS APASA (2016) model found that due to the turbulent mixing caused by the initial plunge and then buoyant rise of the effluent, in all cases the average temperature of the produced water plume returns to within 3°C above ambient temperatures within 10 m of the discharge location.

Chemical contaminants in PFW dilute quickly on the initial plunge, then more slowly with dispersion in the current around the platform. PFW is discharged at 16 times the ANZECC 99% species protection water quality criteria for hydrocarbons, 47 times for metals, and 91 times for inorganics; dilutes rapidly on its initial plunge to 10 times within 2.4 m and 50 times within 7.8 m. It reaches ANZECC 95% species protection water quality criteria within 12 m and ANZECC 99% species protection water quality criteria within 12 m of the discharge point.

PFW is discharged at between 7 and 56 times the background levels for hydrogen sulphide and up to 370 times the background levels of TOC (see Appendix F.6 – PFW data file), and gradually reduces to background levels with distance from the platform, reaching background levels within 90 m of the discharge point and defining the extent of the mixing zone for TNA platform.

Anions such as sodium, calcium, magnesium and potassium, and cations such as chloride, sulphate, bromide and bicarbonate are found in PFW however these ions (and their associated salts) are also commonly found in seawater and hence will not be discussed further (Pillard et al. 1996).

Potential Naturally Occurring Radioactive Materials (NORM) are not expected to occur in quantities that may result in significant environmental impacts and are therefore not discussed further.

Impacts to sediment quality

TNA PFW in particular contains some PAHs and metals/metalloids that could be chemicals of concern for marine sediments where an ANZECC (2000) interim sediment quality guideline value exists. The precise chemicals of concern and their concentrations found in MLB PFW will be determined as part of the commissioning and start-up of the MLB water handling system.

There is no physical interaction of the plume with the seabed and hence no direct exposure of the constituents of PFW with the sediment (see Appendix F – PFW Data file). There is a potential pathway for impacts to sediment through settling of constituents in the PFW plume.

An analysis of the TNA PFW discharge found that 96.2% of particles are ≤63 µm (clay or silt). Per Breakout Box 10, this silt and clay fraction (≤63 µm) is usually cited as the chemically active fraction which is associated with potential contaminants of concern (UNEP/WHO 1996). While there is potential for settling of particles in the TNA PFW plume, it is the larger particles (>63 µm) that may settle which are composed primarily of stable inorganic materials and are generally not associated with contaminants of concern (see Appendix G.10 – Breakout Box 10).

Monitoring results for offshore facilities generally show that natural dispersion processes appear to control the concentrations of potential contaminants from PFW in sediments to slightly above background concentrations (Neff et al. 2011). The results from in-situ sediment monitoring of a nearby platform with similar discharge characteristics (TNA) confirms this.

Around TNA the study found no valid samples for PAHs, or metals that co-occur in the platform's PFW discharge above the ANZECC (2013) ISQG "low" criteria. (see Appendix G.8 – Breakout Box 8). Occurrences of metals/metalloids were isolated, levels remained low and detections above reference locations remained localised despite there being evidence of some gradients away from the platform (see Appendix G.8 – Breakout Box 8).

TNA is a suitable proxy for predicting the potential for sediment contamination around MLB as the PFW discharge rate, discharge depth, and range of contaminants in PFW is similar (Table 6-5). The water depth at TNA is greater, allowing more chance for metals to precipitate as they move through the water column, and hence precipitation rates at MLB should be lower. As a result the MLB PFW discharge is not expected to have significant impacts on sediment.

Impacts to biota

Potential impacts of PFW to biota have been assessed through WET testing and dilution modelling to establish a mixing zone. Marine biota inside the mixing zone may be exposed to chronic exposure to contaminants in PFW, however, the mixing zone is limited to a localised extent around the plume discharge point only.

Process chemicals are discharged to the sea in residual amounts if they partition into the PFW and are not removed via the available treatment processes. As WET testing was performed with samples that contained chemical additives, the WET testing results are indicative of the routinely discharged PFW and account for any potential biological impacts that could be incurred by the PFW including any chemical additives. In addition, the ecotoxicological impacts of process chemicals in PFW discharges was comprehensively investigated in a study by Henderson et al. (1999). The study tested 11 commonly used process chemicals (including biocides, corrosion inhibitors and demulsifiers) for their acute toxicity to marine bacterium, both directly in aqueous preparations and following their partitioning between oil and water phases. The study results indicated that toxicity of the PFW was not significantly altered by the presence of most process chemicals used in typical concentrations. A review of the study by Schmeichel (2017) notes that process chemicals make a small contribution to the overall acute toxicity profile of PFW discharges.

Relevant to all receptor types (ecotoxicity pathways) are the TNA WET testing results, which can be used as an analogue for the MLB discharge. 95% species protection criteria based on WET testing is met within 90 m of the discharge point at MLB (Appendix F – PFW data file). At this distance, 95% species will be protected from adverse ecotoxicity effects of the discharge, and water quality is reflective of 'ecosystems in which aquatic biological diversity may have been adversely affected to a relatively small but measurable degree by human activity. The biological communities remain in a healthy condition and ecosystem integrity is largely retained' (ANZECC, 2000, p3.1-10). 99% species protection criteria based on WET testing are met within 140 m of the discharge point at MLB (Appendix F – PFW data file). At this distance, 99% species will be protected from adverse ecotoxicity effects of the discharge, and water quality is reflective of an 'effectively unmodified, high conservation-value ecosystem' (ANZECC, 2000, p3.1-10). Outside 140 contaminants in PFW will continue to reduce to background seawater concentrations. At these levels they are not expected to have any impact to biota.

Impacts to benthic communities and habitat

There are two pathways for potential impacts to benthic communities and habitats:

- Benthos near the discharge could be subject to exposure to toxic effects of PAHs or metals if they are directly exposed to PFW for long periods;
- Benthic animals near a produced water discharge may bio-accumulate metals, phenols, and hydrocarbons from the ambient water, their food, or bottom sediments.

Direct exposure - chemical ecotoxicity effects

TNA whole effluent toxicity results (2014) show that the amphipod *Allorchestes compressa* was affected by direct exposure to more than 50% raw effluent (acute endpoint). This is unlikely to occur anywhere within the mixing zone except immediately at the point of discharge. If MLB PFW can be approximated by TNA PFW, no effect is expected on *Allorchestes compressa* since MLB effluent is diluted by more than 10 times within 2.4 m of the discharge point. The sea urchin *Heliocidaris tuberculate* was affected by exposure to more than 12.5% raw TNA PFW effluent (chronic endpoint). This is unlikely to occur anywhere within the mixing zone at MLB except immediately at the point of discharge. Hence no effect is expected on *Heliocidaris tuberculate* since MLB effluent is diluted by more than 10 times within 2.4 m of the discharge point. The mussel *Mytilus galloprovincialis* was affected by exposure to more than 6.3% raw TNA PFW effluent (chronic endpoint). This is unlikely to occur anywhere within the mixing zone at MLB except immediately at the point of discharge and possibly out to 7.8 m from the discharge point. Hence the only effect expected on *Mytilus galloprovincialis* is highly localised to within 1 - 7.8 m since MLB effluent is diluted by 50 times within 7.8 m of the discharge point.

Impacts from direct exposure to PAHs in PFW on fauna such as scallops, crustaceans and other molluscs within 140 m of the discharge could pose chronic developmental or growth impacts, such as reduced survival of juveniles and reduced size, such as was found during a study of PFW effluent exposure to sea scallops of greater than 10% raw effluent (Querbach et al. 2005, in Armsworthy et al., 2005). PFW discharge can also affect larvae viability (abalone, Raimondi and Schmitt, 1992). These effects are highly unlikely to occur at MLB since effluent is diluted by more than 10 times within 2.4 m of the discharge point. Also since the PFW plume is positively buoyant and does not contact the sea floor, it is expected that only fauna on the platform structure itself could be exposed and those on the sea floor are protected from direct exposure.

Sponges and soft corals localised to the discharge point could experience reduced ability to settle and metamorphose, such as was found in Luter et al (2019) on larvae of the sponge *R. odorabile* when exposed to hydrocarbons in water. This effect could be felt by encrusting organisms on the structure (to 140 m horizontal radius of the discharge) but not seafloor organisms due to the positive buoyancy of the plume.

Bioaccumulation

A large study for the Gulf of Mexico Offshore Operators Committee examined bioaccumulation in tissues of mollusc, crustacean, and three fish species in and around 11 platforms in the Gulf of Mexico discharging over 1000 kL/d (Continental Shelf Associates, 1997). The study examined bioaccumulation of five metals (As, Cd, Hg, 226Ra and 228Ra); three volatile monocyclic aromatic hydrocarbons (MAH), benzene, toluene, and ethylbenzene; and four semi-volatile organic chemicals, phenol, fluorene, benzo(a)pyrene, and di (2-ethylhexyl) phthalate. They concluded that there is no relationship between the proximity of marine animals to offshore PFW discharges and concentrations in their edible tissues of the chemical constituents.

Additional MAH (m-, p-, and o-xylenes) and a full suite of 40 parent and alkyl-PAH and dibenzothiophenes were also analysed by Neff et al. (2011). There was no evidence of MAH or phenol being bioconcentrated. All MAH and phenol were either not detected (>95% of tissue samples) or were present at trace concentrations in all invertebrate and fish tissue samples. Concentrations of several petrogenic PAHs, including alkyl naphthalenes and alkyl dibenzothiophenes, were slightly, but significantly higher in some bivalve molluscs but not fish, from discharging than from non-discharging facilities. These PAH could have been derived from PFW discharges or from tar balls or small fuel spills. Concentrations of individual and total PAH in mollusc, crab and fish tissues were well below concentrations that might be harmful to marine animals (Neff et. al. 2011).

Effects from bioaccumulation has been primarily associated with low-molecular weight PAHs. Both BTEX and hydrogen sulphide are not bioaccumulative (Neff 2002, ANZECC, 2000 respectively). PAHs were not observed in either waters or sediments around TNA above relevant guideline criteria as part of the 2018 in-situ monitoring program, and hence the potential for bioaccumulation is low.

There were no significant differences in benthic infauna distributions observed in an in-situ study around Tuna in 2018. This study found that at both near and far zones around the platform and at reference sites, crustaceans dominated the benthic infauna, followed by polychaetes. For less than 15% of the total number of taxa, infauna abundance significantly decreased with distance from the platform, owing mostly to re-distribution of coarser sediments around the platform due to the platform presence (Appendix G.9 – Breakout Box). The change in abundance could not be correlated with increased sediment contaminants found in PFW. This is consistent with the findings in Neff et al. (1992) where distributions of benthic communities around the platform (in 8 m water depth) were explained in large part by the influence of sediment grain size on benthic community structure; and there was no correlation between faunal density and the concentration of total hydrocarbons in sediments.

Studies have found that provided the water depth is greater than the discharge depth, benthic organisms will not be affected by PFW, as the concentration of any oil or adhered/adsorbed components will be extremely low (Furuholt, 1996). Studies that have reported changes to benthic distributions were in shallow, moderate-to-poorly flushed waters of 1-8 m or continental shelf waters of up to 12 m (e.g. Osenberg et al (1992) and Rabalais et al. (1992)). It can be expected that in deeper, well-mixed ocean environments (such as at MLB) the potential for impacts to benthic infauna would be even lower.

Effects on benthic flora and fauna are primarily attributed either to uptake of contaminants from water or the presence of accumulated hydrocarbons (such as PAH) in sediments. Ecotoxicity impacts to biota from metals in sediment is more complicated, owing to the many forms that metals can take, reduction-oxidation states and overall bioavailability of the metal. While there have been a large number of studies where the chemical concentrations of contaminants have been measured in sediments, very few have been related to biological effects, either in the nature of descriptions of the natural benthic populations or laboratory-based bioassays (ANZECC 2000, p8.4-26). Given the results from the TNA in-situ sediment monitoring that found occurrences of metals/metalloids were isolated, levels remained low (for the most part, well below sediment guideline criteria) and detections above reference locations remained localised (see Appendix G.8 – Breakout Box 8), effects on benthos from accumulated metals in sediments is unlikely.

Given the above, benthic biota around MLB platform are highly unlikely to be affected by the PFW discharge. Any effects would be confined to chronic impacts (such as changes in growth, metamorphosis or reproduction) for flora and fauna such as sponges and crustaceans on the platform structure within 140 m of the discharge point. As the area and depth ranges of a potential, but highly unlikely impact, are small and localised, effects at a population level are not credible.

Impacts to plankton

There are three pathways for potential impacts to plankton:

- Exposure to temperature effects on direct exposure
- Stimulatory effects of nutrients in the plume, leading to eutrophication of waters
- Exposure to toxic effects of chemical constituents of PFW if plankton are directly exposed for long periods (i.e. directly in the plume)

Direct exposure – temperature effects

As the average temperature of the produced water plume returns to within 3°C above ambient temperatures within 10 m of the discharge location, potential temperature effects on plankton are not credible.

Stimulatory effects from nutrients in the plume

Discharges of nutrients and hydrocarbons in the PFW plume can increase the localised abundance of plankton. For example, ammonia may elicit inhibitory (toxic) and/or stimulatory (e.g. eutrophication) responses from resident biota (Neff, 2011). Plankton could be attracted to localised higher concentrations of these constituents within the mixing zone and as a result plankton populations can rapidly increase. However, increased planktonic activity and turnover mass rates within the mixing zone is not expected to have any marked change on the water quality due to the high levels of movement of water around the platform from the action of currents and waves. Levels of nitrate and phosphates are low (not unlike other produced waters, Neff, 2011) and hence are not likely to cause eutrophication. Supporting this there is anecdotal evidence that no phytoplankton blooms have ever been recorded at a Bass Strait Esso facility.

Direct exposure – chemical ecotoxicity effects

Plankton have high levels of natural mortality and a rapid replacement rate (UNEP 1985). Any impacts as a result of direct exposure of planktonic communities to PFW are expected to be confined to the 140 m zone to 99% species protection, which sits within the extent of the mixing zone. Direct exposure of planktonic communities to PFW within the 140 m zone (to 99% species protection criteria based on WET testing) is not considered to result in significant impacts at the population level of organisms that could affect broader ecological diversity or productivity of the area surrounding the facility.

Impacts to fish

There are three pathways for potential impacts to fish:

- Exposure to temperature effects on direct exposure
- Exposure to toxic effects of chemical constituents of PFW if fish are directly exposed for long periods (i.e. directly in the plume)
- Exposure to toxic effects of chemical constituents of PFW if fish are directly exposed to contaminated sediments

Direct exposure – temperature effects

As the average temperature of the produced water plume returns to within 3°C above ambient temperatures within 10 m of the discharge location, potential temperature effects on fish are not credible.

Direct exposure – chemical ecotoxicity effects

Early lifestages of fish (embryos, larvae) within the 140 m zone to where 99% species protection criteria are met would be most susceptible to the exposure from chemical constituents in the PFW discharge, as they are less mobile and therefore can become exposed to the plume at the outfall. These effects can range from no effects (Mathieu et al 2011), to gill damage (turbot larvae, Brown et al. 1998). Hormonal effects could be experienced without liver function damage (cod, Meier et al, 2002), however this occurs at very high exposure concentration or where immune systems are already compromised by other stressors (Hamoutene et al, 2011; Burridge et al, 2011) which is not likely to be the case at MLB. Larvae entrained in the outfall may only be exposed to higher concentrations for a short period relative to the buoyancy of the organism (Querbach, et al. 2005). Outside the 140 m radius, early lifestages of fish are not expected to be affected at all.

Later-life pelagic species are generally highly mobile and as such are not likely to be exposed at concentrations that would lead to chronic effects due to their patterns of movement. Fish also exhibit a strong avoidance reaction to hydrogen sulphide (USEPA 1986 in ANZECC 2000).

BTEX is known to be toxic to fish and invertebrate eggs and larvae and has been shown to result in developmental defects (Fucik et al. 1995). However, due to the compound’s volatility, the residence time in waters is brief; rapid active and passive excretion of these compounds from tissues will also limit in-tissue concentrations in the field; and BTEX does not bio-accumulate (Neff et al., 1996). The dilution ratio for TNA PFW to ANZECC 99% species protection water criteria for Benzene is 12, and MLB PFW is diluted 10 times within 2.4 m, hence (using TNA composition as an analogue), BTEX is not expected to have any toxic effects. Many fish species can metabolise hydrocarbons, which reduces the risk of bioaccumulation (NRDA, 2012).

Whole effluent ecotoxicity data from TNA PFW shows that the barramundi fish *Lates calcarifier* experienced effects above 50% raw effluent exposure (chronic endpoint). This is unlikely to occur anywhere in the mixing zone except directly at the discharge point itself. Whilst this species is not local to Bass Strait, no effect is expected on fish similar to *Lates calcarifier* since MLB effluent is diluted by more than 10 times within 2.4 m of the discharge point.

Exposure to contaminated sediments – chemical ecotoxicity effects

Effects from fish directly exposed to contaminated sediments above 22 mg/kg PAH could result in gill hyperplasia, reduced phagocytic activity of macrophages and pancreatic necrosis (spot, Hinkle-Conn et al., 1998). However this is highly unlikely to be the case as the highest PAHs in sediment around TNA was 0.004 mg/kg.

The mixing zone overlaps the distribution BIA for the Great White Shark; however, given the localised area of impact and that sharks are transiting the area, no impacts are expected. The discharge does not constitute a threat listed in the recovery plan of the White Shark, and the discharge activity is not inconsistent with that plan.

In summary as the PFW plume is dynamic and moving constantly depending on the tides, currents, winds and internal waves, transient fish such as great white sharks, are unlikely to be exposed to elevated contaminant concentrations for extended durations. Indirect impacts, such as altered prey abundance or ingestion of bioaccumulated toxic compounds is considered to be of no effect given the localised area predicted to be impacted by PFW and the nature and scale of impacts to the marine ecosystem within the PFW discharge plume (i.e. slight impacts to food sources such as plankton and pelagic fish species). Given the potential absence of impacts to fish, the limited spatial extent of the water quality (90 m radius) the predicted intermittent and short interaction duration (i.e. minutes at a time) with the PFW plume, it is considered that there will not be a significant impact on fish particularly the great white shark from PFW discharges when assessed against the relevant criteria in the Matters of National Environmental Significance. Significant impact guidelines 1.1. (DoE, 2013), including that there will be no long-term decrease in the size of the population, the area of occupancy of the species or an important population, the existing population will not be fragmented into two or more populations, there will be no adverse effect on habitat critical to the survival of a species, there will be no disruption to the breeding cycle of an important population, the availability or quality of habitat will not be destroyed, removed, isolated or decreased to the extent that the species is likely to decline and the recovery of the species will not be substantially interfered with.

Impacts to seals

There are three pathways for potential impacts to seals:

- Exposure to toxic effects of chemical constituents of PFW if seals are directly exposed for long periods (i.e. directly in the plume)
- Effects from inhalation of hydrocarbon vapours from PFW sheens
- Irritation effects from physical contact with hydrocarbons in PFW
- Bioaccumulation through the ingestion of impacted food sources

Produced water plumes predominantly result in dissolved contaminants and they rarely cause a defined layer on the sea surface (silvery sheen is the lowest level according to the Bonn agreement and usually patchy if at all present from the PFW discharge). Hence potential impact pathways through contact of hydrocarbons with seal fur and ingestion are not credible.

Direct exposure – chemical ecotoxicity effects

Seals do not spend all their time in the water, and when they do, they are highly active, travel great distances and forage at various depths (Arnould et al., 2005). As such, it is highly unlikely that these potential impact pathways will be significant. In addition, pinnipeds have been found to have the enzyme systems necessary to convert absorbed hydrocarbons into polar metabolites, which can be excreted in urine (Engelhardt, 1982; Addison & Brodie, 1984; Addison et al., 1986).

Effects from inhalation of hydrocarbon vapours from PFW sheens

Inhalation of hydrocarbon vapours could cause toxic effects. However, the level of oil on water (i.e. sheens) from produced water plumes rarely cause silvery sheens (the lowest level according to the Bonn agreement), and hence will have extremely low levels of vapour. Seals are highly mobile and active animals and do not spend all their time at the water surface, as such, it is highly unlikely that this potential impact pathway will be significant.

Irritation effects from physical contact with hydrocarbons in PFW

Exposure to on-sea hydrocarbons could cause irritation to the eyes and oral cavity. However seals are unlikely to remain swimming within the discharge plume for long periods as they are highly active animals, travel great distances and forage at various depths. As such, it is highly unlikely that this potential impact pathway will be significant so as to not have any chronic impacts to seals.

Bioaccumulation through ingestion of impacted food sources

As impacts to the predominant seal food source of fish are of very low likelihood (as above), bioaccumulation through ingestion of impacted food sources is unlikely to have any impact on seals.

Listed Australian Fur Seals and New Zealand Fur Seals occur at the platform, however no seal breeding occurs on or around the platform, and the area is not identified as critical habitat or BIA. According to IUCN, the Australian Fur Seal is listed as Least Concern and its population is increasing (IUCN, 2015).

There is no relevant Conservation Advice or Threat Abatement Plan for Australian Fur Seals or New Zealand Fur Seals.

In summary as the PFW plume is dynamic and moving constantly depending on the tides, currents, winds and internal waves, coupled with seals being highly mobile active animals who do not spend all their time in the water or at the water surface, seals are unlikely to be exposed to elevated contamination concentrations for extended durations. Indirect impacts, such as altered prey abundance or ingestion of bioaccumulated toxic compounds is considered to be of no effect given the localised area predicted to be impacted by PFW and the nature and scale of impacts to the marine ecosystem within the PFW discharge plume (i.e. slight impacts to food sources such as pelagic fish species). Given the potential absence of impacts to seals, the limited spatial extent of the water quality (90 m radius) the predicted short interaction duration (i.e. minutes at a time) with the PFW plume, and that breeding does not occur within the OA it is considered that there will not be a significant impact on seals from PFW discharges when assessed against the relevant criteria from the Matters of National Environmental Significance. Significant impact guidelines 1.1. (DoE, 2013), including that there will be no long-term decrease in the size of the population, the area of occupancy of the species or an important population, the existing population will not be fragmented into two or more populations, there will be no adverse effect on habitat critical to the survival of a species, there will be no disruption to the breeding cycle of an important population, the availability or quality of habitat will not be destroyed, removed, isolated or decreased to the extent that the species is likely to decline and the recovery of the species will not be substantially interfered with.

Impacts to cetaceans

There are four pathways for potential impacts to cetaceans:

- Exposure to toxic effects of chemical constituents of PFW if cetaceans are directly exposed for long periods (i.e. directly in the plume)
- Effects from inhalation of hydrocarbon vapours from PFW sheens
- Irritation effects from physical contact with hydrocarbons in PFW
- Bioaccumulation through the ingestion of impacted food sources

Direct exposure – chemical ecotoxicity effects

Cetaceans are highly mobile and transitory animals, as such, it is highly unlikely that this potential impact pathways will be significant. Note also, many marine mammals appear to have the necessary liver enzymes to metabolise hydrocarbons and excrete them as polar derivatives (Ball and Truskewycz, 2013).

Effects from inhalation of hydrocarbon vapours from PFW sheens

As a result of inhaling volatile compounds when surfacing, cetaceans can experience lung congestion (Geraci & St. Aubin 1990); or irritation or damage to mucous membranes or airways (Helm et al., 2015). However, the level of oil on water (i.e. sheens) from produced water plumes rarely cause silvery sheens (the lowest level according to the Bonn agreement), and hence will have extremely low levels of vapour. Cetaceans are highly mobile and only transit the area, as such, it is highly unlikely that this potential impact pathway will be significant.

Irritation effects from physical contact with hydrocarbons in PFW

Cetaceans can be exposed through direct contact with the eyes, potentially leading to inflammation (Geraci & St. Aubin 1990). Cetaceans are highly mobile and only transit the area, as such, it is highly unlikely that this potential impact pathway will be significant.

Bioaccumulation through ingestion of impacted food sources

As impacts to cetacean food source predominantly of fish and plankton is of very low likelihood (as above), and the area does not represent a large proportion of the overall cetacean feeding area therefore it is unlikely to have any impact on cetaceans.

The mixing zone overlaps the foraging BIA for the blue whale and distribution BIA for the Southern Right Whale; however, given the localised area of impact and that whales are transiting the area, no impacts are expected. The discharge does not constitute a threat listed in the Conservation Management Plan of either the Blue Whale or Southern Right Whale and the discharge activity is not inconsistent with those plans.

In summary as the PFW plume is dynamic and moving constantly depending on the tides, currents, winds and internal waves, transient cetaceans such as migrating whales, are unlikely to be exposed to elevated contaminant concentrations for extended durations. Indirect impacts, such as altered prey abundance or ingestion of bioaccumulated toxic compounds is considered to be of no effect given the localised area predicted to be impacted by PFW and the nature and scale of impacts to the marine ecosystem within the PFW discharge plume (i.e. slight impacts to food sources such as plankton and pelagic fish species). Given the potential absence of impacts to cetaceans, the limited spatial extent of the water quality (90 m radius) the predicted intermittent and short interaction duration (i.e. minutes at a time) with the PFW plume, it is considered that there will not be a significant impact on cetaceans from PFW discharges when assessed against the relevant criteria from the Matters of National Environmental Significance. Significant impact guidelines 1.1. (DoE, 2013), including that there will be no long-term decrease in the size of the population, the area of occupancy of the species or an important population, the existing population will not be fragmented into two or more populations, there will be no adverse effect on habitat critical to the survival of a species, there will be no disruption to the breeding cycle of an important population, the availability or quality of habitat will not be destroyed, removed, isolated or decreased to the extent that the species is likely to decline and the recovery of the species will not be substantially interfered with.

Impacts to Fisheries – Commercial and Recreational

There are three potential impact pathways for fisheries:

- Tainting (hydrocarbon odour in caught fish) due to tissue accumulation of hydrocarbons in PFW
- Impacts to the safety of humans through the consumption of target species tissues that are impacted by PFW.
- Reduction of fisheries stocks, through the direct impact of PFW on target species and nurseries

Tainting

Per Appendix F, ANZECC seafood taint criteria of MLB PFW (using TNA composition as an analogue) is expected to be reached within 7.8 m of the discharge point. (Note: Appendix G.3 – Breakout Box 3 applies to the detection of other phenols under the seafood taint guidelines). The total area represented by a 7.8 m radius at MLB is 191 m^2 (1/50th of a hectare), and cumulative area across all Bass Strait platform PFW discharges is <2000 m^2 (1/5th of a hectare), representing an extremely small proportion of the total fisheries area. Hence, if TNA is used as an analogue for the MLB PFW discharge, the discharge is highly unlikely to cause taint in fisheries-caught fish.

Impacts to seafood safety for humans

Since fish or shellfish are not harvested around the PFW plume or mixing zone out to at least 500 m from the platform, and the zone in which 99% species protection criteria are reached extends to only 140 m from the platform, there is no effect of the PFW discharge on humans through consumption.

Impacts to fisheries stocks

Individual fish and other non-fish target species, (i.e. invertebrates of value, including squid, crustaceans (rock lobster, crabs) and molluscs (scallops, abalone), where they are directly present in the PFW plume (within 140 m radius), may be exposed to chronic sub-lethal impacts (see above) however due to the small range and depths that this applies, population level impacts are considered highly unlikely. Whilst offshore structures may play a role in enhancing fish stocks due to the presence of hard substrate and the level of protection from fishing that they provide, fish nurseries known to be notable prolific producers are close to shore (such as Gippsland Lakes RAMSAR site) and these are expected to contribute to fisheries stocks in much greater numbers. Therefore there are no anticipated impacts to fisheries stocks.

Stakeholder feedback confirmed that although fishers had been able to see discharges from the Bass Strait platforms from beyond the 500 m exclusion zone, the discharge did not have any effect on fisheries or fisheries equipment, or amenity for the fishers. There is general acknowledgement among fishers that Esso's facilities provide safe habitat for juvenile fisheries species, and there have been no complaints or issues raised to date about taint, food safety or reduction of fisheries stocks due to the platform discharges. Ongoing dialogue with fishing communities is part of Esso's stakeholder engagement plan.

Impacts to other receptors

Australian Marine Parks, National Parks and Reserves

Given the distance of marine parks, national parks and reserves from the mixing zone, impacts to these receptors are not considered credible.

Key Ecological Features

Upwelling East of Eden: Given the distance from the mixing zone to the likely location of this KEF, impacts are not anticipated.

The Bass Cascade: Given the distance from the mixing zone to the likely location of this KEF, impacts are not anticipated.

Shelf rocky reefs and hard substrates (South-East Marine Region), including the South East Reef: The same assessment as Benthic habitats and communities applies to this KEF as described above. Given the distance from the PFW mixing zone to the reported location of the South East Reef, impacts on this reef are not anticipated.

Cumulative impacts from multiple discharges

There are no other PFW plumes within 3 km of the MLB discharge.

Other continuous discharges from the same platform are limited to discharges from pile subsea windows. These discharge at 16.9 m (ODSP) and 16.9 m (CDSP) below sea level (Table 2-5), deeper than the produced water effluent pipe depth at 11 m below sea level. Piles are expected to be exchanging predominantly sea water, hence any discharge from the piles will be close to neutrally buoyant at the subsea window (Section 6.4.1.1). Discharges of water containing chemicals (at discharge all chemicals are OCNS Gold or Silver (Table 6-22) or dissolved hydrocarbons from the pile will be intermittent or infrequent, and of small volumes which will disperse rapidly in the open ocean currents within the operational area. It is therefore expected that any exposure will be limited in duration.

Dispersion modelling for MLB PFW shows the maximum plunge depth from the discharge point under all current speeds is to 12.5 m below sea level, hence any cumulative impacts from the interaction with the produced water effluent plume within the mixing zone is considered unlikely.

Other non-continuous discharges (such as desalination brine, sewage, grey water, food waste, liquid discharges from vessel operations, and wellwork discharges) could overlap with the PFW plume but are short in duration and hence any cumulative impacts are unlikely to occur.

Any suspended solids in the pile contents will settle out within the pile, or if finer and suspended in the pile, then they will gradually settle out at far distances from the platform as they are carried by the current and result in no noticeable impacts to sediments. Hence any cumulative impact of the pile discharges to sediment is considered highly unlikely.

Historical activities such as discharging muds and cuttings during drilling may have resulted in changes to the sea floor sediment chemical characterisation above background levels. This includes the discharge of water based muds and barite containing barium, an inert metal; and the discharge of cuttings from natural rock formations encountered during drilling, together with small amounts of residual drilling muds on cuttings. Any changes to sediment quality from historical impacts from background will be considered as part of the surrender of title process. The last drilling program on MLB was in approximately 2014, hence discharged fluids or solids from the drilling program is expected to have at least partially been dispersed or bioremediated. There is not expected to be a significant cumulative impact to sediment quality from the additive effect of discharging PFW to sediments containing higher levels of barium or residual drilling mud constituents.

Given the varying buoyancy of the plumes, the mobile nature of marine mammals and the tendency of fish to avoid plumes cumulative impacts on marine fauna is unlikely.

As fishing is not carried out within 500 m of the platform, which is beyond the mixing zone of 140 m no cumulative impacts from multiple discharges is likely on commercial and recreational fishing.

Given the distance to other sensitive receptors (Table 5-2) cumulative impacts from multiple discharges are highly unlikely.

6.3.8.8 Marlin B Consequence Evaluation

Impacts from MLB PFW are limited to a localised mixing zone around the discharge point, with negligible impacts to sediment. Potential impacts to biota, including benthic habitats and communities, plankton, fish, seals and cetaceans, including through bioaccumulation, is localised in nature to the mixing zone or negligible and is not considered significant (per Significant Impact Guidelines [DOE, 2013]).

Effects could be ongoing, including through bioaccumulation of PAHs and persistent chemicals, but effects are confined to some biota on the platform structure itself (e.g. crustaceans) or dispersed in a small radius around the platform water and sediments at low and safe concentrations. Within the mixing zone, there could be sub-lethal, direct or indirect effects on organisms, but this would likely only apply to non-mobile receptors, such as fish embryos/juveniles, and would not apply at a population level. The environment is highly endemic, with few endangered and rare species present, but is generally strong and resilient, and provides some ecosystem services (e.g. fisheries).

The consequence level is therefore assessed as **Consequence Level III.**

Should PFW discharge commence on MLB, the Monitoring and Management Framework will be implemented to ensure continuing confidence in the consequence level. If routine monitoring was to detect levels in PFW above the trigger values and there was the potential to impact the ecosystem integrity, an ALARP/Acceptability study is required to determine what additional controls can be implemented to ensure the impacts are not realised. Should PFW discharge commence on MLB, a sampling plan to demonstrate compliance with the approved mixing zone boundary will be developed for the sediment survey. The sampling plan outlines and justifies sampling locations and when concentration and bioavailability testing occur.

6.3.9 Controls

Good Practice	Adopted	Control	Rationale
Secondary separation treatment	✓	**CM43:** PFW processed though secondary separation equipment	Crude/water separation equipment is online and maintained.
	✓	**CM67:** Surveillance of the treatment system	Surveillance of water handling trends and abnormalities. This allows for response actions taken to address abnormalities as required, as well as potential improvement opportunities.
Chemical injection to aid separation	✓	**CM3:** Chemical Discharge Assessment Process	Chemicals can change the surface tension of molecules at the oil-water interface to aid separation. Pre-use assessment of a chemical additive ensures that the chemical is approved prior to adding to the water handling system.
Oil content in discharged PFW is monitored using ultraviolet fluorescence	✓	**CM10a:** The discharge stream is continuously monitored and maintained at concentrations below 30mg/L daily average.	Monitoring identifies the absolute level of oil in water and trends on the platform on a continuous basis. Early warning triggers help flag when close to the daily limit for mitigative action.
	✓	**CM10b:** Online monitor is calibrated	Maintenance and calibration is performed to ensure readings are accurate.
	✓	**CM10c:** Online monitor is serviced	
Alarms and shutdowns prevent off-spec discharge of PFW	✓	**CM38:** Sigrist alarm and shutdown functionality is tested	Alarms are functional in order to initiate water handling shutdown if required based on the OIW monitor reading.
During startup, oil in water content is carefully handled	✓	**CM10d:** Discharge of water on start-up is controlled	Operators establish control of the process on the platform during start-up of the water handling system.
Changes to the chemical content and ecotoxicity of PFW is monitored and corrective actions put in place if they exceed specified limits	✓	**CM11:** Apply the PFW monitoring and management framework procedure	Regular detailed compositional samples are collected and analysed in order to understand each individual platform's PFW composition and its potential for ecotoxicity. Results that exceed certain trigger points have specific corresponding corrective actions.

6.3.10 Demonstration of ALARP

ALARP Decision Context and Justification	**Decision Context B** The planned discharge of PFW to the marine environment is a well understood and practised activity both nationally and internationally. The impacts associated with planned PFW discharges are well managed via control measures that are considered industry best practice. These are well understood and implemented by the industry. The consequence of any impact associated with these discharges was assessed as **Level III**. Esso acknowledges that the consequence assessment of PFW to the marine environment is based on multiple lines of evidence, each with some inherent uncertainty (i.e. full composition is not available at all times over the discharge, WET testing is not available across all years, dispersion models have inherent assumptions built-in). However, risks from PFW are well-established and similar methods are generally applied (such as dispersion modelling) in order to establish the impact of the discharge. ExxonMobil has been involved in PFW impact assessment in Bass Strait since the early 1990's and has published several journal papers on the topic. Fishing stakeholders noted that they could occasionally see produced water discharges but that it did not interfere with their fishing activities. No specific stakeholder objections or claims were raised concerning PFW discharges, and it has never generated media interest to date despite Esso's long operating history in Bass Strait; nor has this type of discharge in particular generated media interest or stakeholder objection across Australia. Hence Esso believes **ALARP Decision Context B** should apply. An 'Engineering Risk Assessment' has been undertaken to ensure that any additional controls meriting additional environmental benefits have been identified and evaluated.

Engineering Risk Assessment			
Additional, Alternative, Improved Controls	**Benefit**	**Cost / Feasibility**	**Adopted**
Disposal of PFW onshore via pipelines	Eliminate disposal of produced formation water offshore.	- Increased water to pipe could have implications for equipment and pipeline integrity (corrosion management) and therefore water limitations may change - Increased water to oil pipeline can cause operability issues at LFD. Water settling in the pipeline gets pushed through causing large water slugs during pigging. As these come through it is common for vapour compression to fail which increases LFD air and greenhouse emissions - All water received at LFD needs to be heated from ambient conditions to ~100°C which involves the use of fuel and greenhouse/air emissions and increases safety concerns during operation of heaters. - Water discharges from LFD to a water processing plant are limited and constraints for that discharge itself may change over time. There would be major restrictions on crude and condensate production into pipelines should additional PFW be	Not adopted

Engineering Risk Assessment			
Additional, Alternative, Improved Controls	**Benefit**	**Cost / Feasibility**	**Adopted**
		transported to shore, and hence large financial losses would be imposed. Hence other than as decided on a day-to-day basis where LFD operations approves the pipeline transport of PFW from particular platforms (for example, during process upsets), the risks of blanket PFW piping onshore outweigh the benefits.	
Reinjection of PFW	Eliminate disposal of produced formation water offshore.	PFW reinjection into productive or disused wells has been trialled but was unsuccessful on a number of platforms due to technical difficulties, such as insufficient reservoir drink rate and blockages across the reservoir perforations due to sand.	Not adopted
Redesign of clean-up line to accept full PFW stream when results show discharge OIW greater than 30mg/L	Reduce likelihood of disposal of produced formation water offshore with higher than acceptable OIW	Clean up line rates are limited in order to minimise the amount of disturbance within the closed pile. By accommodating the full PFW rates, the inventory of the pile will increase in cases up to 10 times or higher. This increases the probability of pushing hydrocarbons out of the pile window. Hence the overall environmental outcome of such a modification would be worse than the existing PFW discharge.	Not adopted
Storage and re-treatment of off-spec PFW prior to discharge	Reduce likelihood of disposal of produced formation water offshore with higher than acceptable OIW	If a platform is producing 10ML/D of water then it would fill a typical platform vessel within 2-3 mins (i.e. inflow rate is 7 m^3/min into vessel volume of ~15 m^3). Given the fast inflow it is likely it would need a new separate vent line up the flare boom. In addition to space constraints on the platform, the cost implications of a separate vent line as well as a large new vessel are grossly disproportionate to the environmental benefit gained.	Not adopted
Install additional separation equipment or technologies, e.g. membranes	Reduce oil in discharged PFW	A detailed review of current offshore water handling processes with findings summarised from the reviews of each platform was performed in December 2019. On TNA, it concluded the system was operating within design. On HLA, SNA and WKF, it concluded the system could experience marginal subpar performance, all of which can be addressed by optimisation of existing systems. On no platforms did it conclude that the system was ineffective for treating PFW, or that	Not adopted

Engineering Risk Assessment			
Additional, Alternative, Improved Controls	**Benefit**	**Cost / Feasibility**	**Adopted**
		additional equipment or large-scale performance improvement was required in order to have a functional water handling system. The cost of retrofitting additional separation equipment as well as the lack of sufficient deck space limits the feasibility and cost-effectiveness of this alternative. Surveillance and optimisation of existing systems is a control measure for the continuous reduction of potential impacts from PFW to ALARP levels.	
Install additional/ change oil in water monitoring equipment or technologies Use of other oil-in-water measurements versus UV fluorescence methods, such as Total Recoverable Hydrocarbons (TRH)	Enhanced oil in water monitoring accuracy, reliability, or certification of results	All Esso platforms are either fitted with a Sigrist Oil Guard online oil in water analyser (TNA, SNA) whilst others have a Sigrist Sipro online oil in water analyser installed. Quantitative GCMS analysis showed the oil in Fortescue produced water contained more aromatic than aliphatic hydrocarbon compounds to which the Sigrist will respond accordingly to its calibration. The fluorescence response of the Sigrist for OIW below 100 ppm is within the linear range of the detector. A detailed assessment was completed of the current OIW monitor against other technologies using laser-induced fluorescence and an alternative UV-fluorescence based technology. The Sigrist was confirmed as a valid continuous measure of OIW on the platform, and hence the installation of new equipment poses additional costs that do not have proportional benefits. Recommendations for improving operation of these units to achieve more reliable OIW measurement results, and recommendations to improve measurement methods to ensure that they are accurately recorded were summarised in a detailed report in December 2019 and have been incorporated as adopted controls. TRH is not the same measure as oil in water using UV fluorescence and would not be appropriate to equate the two or use TRH<30 mg/L as a standard, given:	Not adopted

Engineering Risk Assessment			
Additional, Alternative, Improved Controls	**Benefit**	**Cost / Feasibility**	**Adopted**
		OIW analysis using UV fluorescence and not TRH/TPH is the one deployed around the world which is acknowledged in the 'standard' of 30 mg/L oil in PFW discharge. Sigrist technology was shown in GD report to be technology suitable to analyse oil in water for oils with certain aromatic/aliphatic balance that is present in Bass Strait; TRH without silica gel clean up also picks up naturally occurring non-petroleum hydrocarbon substances such as organic acids, as with TOC (see for example, NEPM 2013) TRH is not directly relevant to impact assessment as are certain analytes/fractions (e.g. Benzene, Naphthalene) (see for example, API Manual 4709). It is not possible to continuously monitor TRH/TPH with silica gel clean up. TPH/TRH is monitored annually during chemical characterisation.	
Reduce daily average OIW limit from 30 mg/L per day and/or reducing daily oil load from 330 kg/day	Reduced oil content to sea	The achievement of 30 mg/L oil-in-water is consistent with industry standards as well as Australian and international practice. The 30 mg/L limit proposed is a legacy of the former OPGGS Environment Regulations 29 and 29A repealed in 2014, and is consistent with monthly average regulatory standards applied globally (Neff et. al, 2011). It also exceeds the performance recommended by the IFC EHS guidelines for Offshore Oil and Gas Development (2015) where discharge to sea is allowed if oil and grease content does not exceed 42 mg/L daily maximum, i.e. mean level for any given day in the month assessed does not exceed 42 mg/L. The current infrastructure on the platforms was designed to meet what was limits of the time. Daily oil load limits are implemented to minimise total oil discharged to ocean and are highly dependent on volumes of PFW discharged. As a result of this, daily oil load limits have been determined on a platform by platform basis to reflect the wide range of predicted discharge volumes across Bass Strait. The daily oil loads (shown	Partially adopted

Engineering Risk Assessment			
Additional, Alternative, Improved Controls	**Benefit**	**Cost / Feasibility**	**Adopted**
		in Appendix F.7) have been determined based on the 30 mg/L OIW discharge limit and the maximum predicted discharge volumes for each platform which has resulted in significant reductions for some facilities. As demonstrated in Figure 3-1, platforms WKF, CBA and HLA are expected to cease production by 2022 when PFW discharge will cease. On other facilities, there is limited space on the platforms to allow for retrofitting further treatment infrastructure and high capital cost associated with lowering the limit. Hence, further reductions in daily oil load limits are not practicable.	
More frequent routine WET testing	Greater frequency to assess and potentially determine if a trigger point has been reached	Routine WET testing is proposed to be conducted on a 3 yearly basis. The frequency of WET testing is guided by ANZECC (2000) Section 8.3.6.8, which states, “If the discharge is known to be of constant composition, and the receiving water characteristics are well documented and understood, one-off testing may be appropriate. Alternatively, if the discharge composition varies considerably and unpredictably, testing will be required on a more frequent basis (e.g. monthly). If a discharge varies according to the process being undertaken, but is constant within that process, or if the receiving water varies seasonally, but is relatively constant within seasons, testing can be carried out whenever such a change is known to occur.” The composition of PFW for platforms in Bass Strait is relatively constant, as demonstrated by similar toxicants being detected in sampling over time, and the development of an established mean (see Appendix F - PFW Data File). Each discharge is known to vary depending on the degree of treatment through the water handling system, however with surveillance and optimisation this is bounded within operational limits. A further potential drawback of WET testing is the lower relative precision of PFW toxicity tests compared to routine chemical analysis and the larger volumes of samples that need to be collected and shipped from offshore facilities for WET testing, for which,	Partially adopted. Frequency reduced from 5 yearly to 3 yearly. **CM11**: Apply the PFW monitoring and management framework procedure

Engineering Risk Assessment			
Additional, Alternative, Improved Controls	**Benefit**	**Cost / Feasibility**	**Adopted**
		detailed compositional analysis and theoretical calculation of toxicity can be substituted for actual WET testing as an initial screening tool. Therefore, one-off to periodic (multiple-year) WET testing frequency is deemed appropriate. ANZECC also states, “water managers would only resort to DTA in cases where there is a complex mixture of chemicals entering the specific waterbody and where either the resultant toxicity cannot be easily estimated or the prediction of toxicity needs to be checked” (ANZECC 2000, Vol. 8, p185). The chemicals in PFW are well understood and stable, with more than 5 years of analytical chemistry and toxicity of the mixture has also been validated through WET testing in 2014 and 2020, hence water managers would be opting for ongoing monitoring without the need for more frequent WET testing. The time and cost of more frequent routine WET testing, and the frequent use and death of test animals and financial costs, does not outweigh the potential for only minor additional environmental information being gained by more frequent routine testing. Additionally, non-routine WET testing may be triggered outside of the 3 yearly cycle in accordance with the PFW Adaptive Monitoring and Management Framework, described in Section 2.7.5.1 of Volume 4, where there is uncertainty about the toxicity of the PFW discharge.	
Sediment and water sampling around other platforms than TNA/WKF	Greater certainty about contaminant levels in sediment around other platforms Greater certainty regarding levels of contaminants in sediments and water around other platforms and their potential to affect biota Possible finer distinction of a cause for contaminant	A multiple lines of evidence approach has been considered for the potential impacts from PFW discharge. That is, multi-year composition sampling, a dispersion model that has used actual current measurements to set up and been validated against prior models and in-sea dye monitoring; as well as in-sea water monitoring, WET testing, and finally multiple in-sea water testing monitoring programs (first conducted in 1994 and last of which was in 2018) and sediment testing (2018), all designed to determine the potential for impact to the environment from PFW. The 2018 in-sea monitoring program was conducted around Tuna and West	Adopted **CM68**: Environmental Sampling

Engineering Risk Assessment			
Additional, Alternative, Improved Controls	**Benefit**	**Cost / Feasibility**	**Adopted**
	gradients around the platform	Kingfish as these platforms had the highest weighted potential for contamination from PFW around the platform (combination of discharge volume, together with TOC, suspended sediments load and PAH and metals levels). The potential for contaminants from PFW entering the water column and seabed sediments has been critically evaluated for all platforms including their receiving environments, using this data where applicable and relevant, and noting assumptions. Further, particle size distribution samples indicated the majority of particles in PFW discharge are small and unlikely to settle into sediment. The results from these monitoring programs has indicated that the likelihood for significant adverse environmental impacts from such discharges, when managed with on-board treatment systems, is low. The use of ANZECC (2000) criteria in the assessment of impacts from the PFW discharge provide suitable guidance of the levels of protection needed based on the environmental values to be protected. By monitoring and managing to the 99% species protection levels at the edge of and beyond the mixing zone (high level of ecological protection, suitable application to unmodified environments), there can be high confidence that any potential for impacts is mitigated. Esso has also used maximum toxicant levels observed in PFW in order to reduce the level of uncertainty over the total possible extent of potential impacts from the discharge. In addition, in-sea and other types of non-routine monitoring or modelling, are proposed to be triggered if required, based on certain trigger factors (see Volume 4 Section 2.6.5). Despite evidence and literature to suggest that impacts to sediment and seawater are likely to be negligible, in field verification of these assumptions have not been completed. Therefore, environmental sampling will be undertaken to verify that discharge	

Engineering Risk Assessment			
Additional, Alternative, Improved Controls	**Benefit**	**Cost / Feasibility**	**Adopted**
		from facilities is low as described in this Environment Plan. To gain further confidence that PFW discharges are not having a significant adverse environmental impact, a sediment and water sampling and analysis programme will be completed. Sampling will occur within 2 years from acceptance of this Environment Plan at the following facilities: • HLA • CBA • SNA Sampling will occur within 2 years from commissioning of the water handling system at the following facilities: • MLB	

6.3.11 Demonstration of Acceptability

Factor	Demonstration Criteria	Criteria Met	Rationale
Impact Consequence level	Impact is Consequence III or less	✓	
Principles of Ecologically Sustainable Development (ESD)	No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved.	✓	The potential impact associated with this aspect is limited to a localised impact within a designated mixing zone. The mixing zone is small in scale, limited to the immediate area of the platform discharge out to within a radius encompassed by the existing petroleum safety zone (i.e. < 500 m), an area already gazetted in law for the rights of the petroleum industry to conduct operations. The impacts of PFW may be longer-term acting (as it is generally an ongoing discharge, and contains low levels of bioaccumulative PAHs and some metals) however its effects are limited predominantly to the water and biota in immediate proximity to the discharge (e.g. living on or near the platform structure), and possibly the sediment in immediate proximity to the discharge. Habitat and biota that could be impacted does not represent a large proportion of the biota that could make up a species or a food source. While there are some listed species in the operating area, these are all mobile, and for mobile biota, the discharge does

Factor	Demonstration Criteria	Criteria Met	Rationale
			not represent a large proportion of the overall environment (the discharge is quickly diluted due to the large dispersion rates in the Bass Strait high energy environment). The PFW discharge is considered as not resulting in a substantial change that could have a significant adverse impact on biodiversity, ecological integrity, social amenity or human health.
	Activity does not have the potential to result in serious or irreversible environmental damage.	✓	The activities were evaluated as having the potential to result in a Level III consequence thus are not considered as having the potential to result in serious or irreversible environmental damage.
Legislative and Other Requirements	Legislative and other requirements have been identified and met.	✓	As above, the discharge does not result in a substantial change to water quality or sediment quality that could have a significant adverse impact on biodiversity, ecological integrity, social amenity or human health. The PFW discharge is not expected to result in the significant accumulation of potentially harmful chemicals, nor expected to have any significant adverse effect on threatened or migratory listed species nor hinder the recovery of White Shark. The PFW discharge is expected to have a negligible effect at the population level of any marine species, nor any broader impacts on habitat since the mixing zone is highly localised. An adaptive monitoring and management program has been developed for liquid discharges as described in Volume 2 Section 6.3. This program will seek to demonstrate that the actual levels of recorded impacts for key discharges do not exceed those which were predicted within the impact assessment presented in this EP. If recorded impact levels do exceed those described, this would trigger the adaptive management process including an ALARP/Acceptability study.
Internal Context	Consistent with Esso's Environment Policy.	✓	Proposed activities are consistent with Esso's Environment Policy, in particular, to "comply with all applicable environmental laws and regulations and apply responsible standards where laws and regulations do not exist"
	Meets ExxonMobil Environmental Standards	✓	There is no standard related to the discharge of PFW, but the activities proposed meet the strategic objectives of the Upstream Environmental Standards.
	Meets ExxonMobil Operations Integrity Management System (OIMS) Objectives	✓	Proposed activities meet: • OIMS System 6-5 objective to identify and assess environmental aspects; significant aspects are addressed and controlled consistent with policy and regulatory requirements;

Factor	Demonstration Criteria	Criteria Met	Rationale
			• OIMS System 7-1 objective to evaluate change against an established set of criteria and establish endorsement / approval levels; and • OIMS System 8-1 objective to clearly define and communicate operations integrity requirements to contractors.
External Context	Stakeholder concerns have been considered / addressed through the consultation process.	✓	Fishing stakeholders noted that they could occasionally see produced water discharges but that it did not interfere with their fishing activities. No other specific stakeholder concerns have been raised concerning PFW discharges.

6.4 Planned Discharge – Operational Fluids

6.4.1 Causes of Planned Discharge – Operational Fluids

Water, residual production fluids and residual chemicals may be discharged to the marine environment during Operations, IMR and Wellwork activities.

6.4.1.1 Pile Discharges

As described in Section 2.4.1.1, residual fluids from platform decks and operation are directed to the drain and pile systems. The pile system acts as a separation vessel allowing hydrocarbons to separate from the water phase. Hydrocarbon vapours and liquids migrate to the top of the pile and settle out on top of the water (see Figure 2-3) and are either recycled to the process or sent to the liquids export pipeline via pile pumps. The water phase of the pile system interfaces with the sea via the pile window. Residual fluids which remain in the water phase may be discharged via the pile windows during operation, wellwork, IMR, care and preservation and decommissioning preparation activities.

As described in Section 2.4.1.1, discharge rates from the pile are estimated to be between 3 m^3 and 8 m^3 per hour during stable production. The majority of product directed to the drain system separates out as hydrocarbon and is recycled to the process via pile pumps. Only low concentrations of water soluble chemicals may separate into the water phase. These are further diluted throughout the large volume of seawater within the pile meaning that any discharges from the pile system will be largely seawater and highly diluted. A list of typical production chemicals that may be discharged from the pile system and their CHARM/OCNS ranking is provided in Table 6-22

Of the fluids directed to the pile system, the following may result in discharges to ocean via the pile window:

- Water soluble chemicals dosed into the production system
- Water containing cleaning detergents;
- Chemicals used during cleaning, flushing, leak detection, hydrate inhibition;
- Chemicals such as corrosion inhibitors, oxygen scavengers;
- Produced water clean-up;

Direct sampling of pile discharges has not been completed however, modelling has been completed to better understand the potential discharges and impacts.

Table 6-22 Typical production chemicals and rankings

Purpose	Chemical	Application	Ranking
Production	CGW24013	Fin Fan Inhibitor Gaslift Corrosion Inhibitor Fuel Gas Pipeline Inhibitor	CHARM Silver
Production	CLW24242	General Purpose Rig Wash	CHARM Silver
Production	CRO24037	Fin-Fan Corrosion Inhibitor	CHARM Gold
Production	CRW24266	Fuel Gas Heater Inhibitor	CHARM Gold
Production	CRW24340	Oxy Scavenger/ Biocide/ Corrosion Inhibitor	CHARM Silver
Production	DMO24586	Demulsifier / Pipeline Demulsifier	CHARM Gold
Production	PFR23 MeOH	Hydrate Inhibition/Mitigation	PLONOR
Production	RBW24122	Water Clarifier	CHARM Gold
Production	RBW24980	Upstream and Downstream Water Clarifier	CHARM Gold
Production	SCW24050	Scale Inhibitor	CHARM Gold

Modelling of Discharges from the piles

Modelling of discharges from the West Tuna and Marlin B pile systems was completed in 2013 to understand the rates of dispersion in the environment from pile discharges.

The mixing dilution rate and advection of the discharge plumes was predicted using near-field dispersion modelling. The method predicts the turbulent mixing and dispersion of the plume under the influence of initial momentum of discharge, buoyancy, and the ambient currents. It does not take into account mixing from turbulence in the receiving waters due to waves, decay or speciation of contaminants, or eddy shedding from the platform legs. Thus it is generally conservative, i.e. underestimates actual mixing and over-predicts concentrations.

The methodology adopted for this modelling is that of a highly conservative nature, with parameters defined to simulate a “worst case” scenario. The worst possible scenario for the transport of a concentrated plume away from an outlet has the following features:

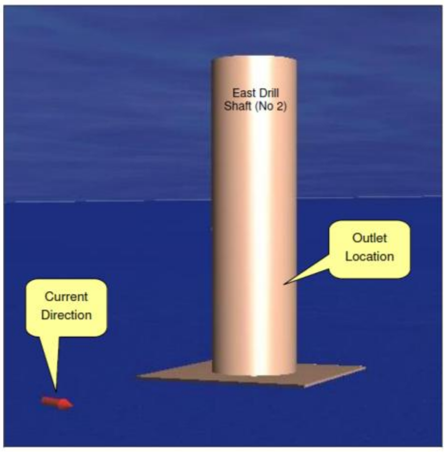
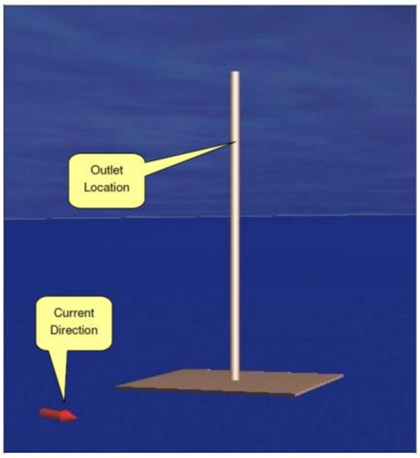
- Current is maintained in a constant direction
- Sensitivity testing to deduce that the current speed that results in the worst case scenario are maximum currents
- A current direction that does not allow for obstacles to interact with plume (Eddy shedding from structures is neglected)
- Presence of a thermocline to trap plume and minimise buoyancy-driven mixing (this occurs mainly in summer)
- Salinity of discharge water assumed to be identical to the receiving waters. This is a strongly conservative assumption as any dilution with fresh water would reduce the density of the discharge and lead to increased buoyancy-driven mixing
- Calm conditions – effect of waves and ambient turbulence is neglected

The following parameters were input to the model and are summarised in Table 6-23.

- The closed skimmer pile discharge has the same value for salinity as the receiving water.
- Discharge temperature is assumed to be similar to receiving water temperature. Three temperatures (10°C, 15°C, and 20°C) were modelled to allow for possible variations.
- The rate of the discharge is 8.2 m^3/hr for West Tuna (WTN) , and 2.7 m^3/hr for Marlin B (MLB)

The near-field model was run for a combination of cases that comprised of the two discharges (WTN and MLB) at three discharge temperatures (10°C, 15°C, 20°C), and receiving waters exhibiting both median and maximum currents.

Table 6-23 Pile Discharge Modelling Parameters (Worley, 2013)

Parameter	WTN Closed Skimmer Pile	MLB Closed Skimmer Pile
Outfall Configuration		
Total Water Depth	61.1 m	60 m
Pipe Diameter	0.45 m	0.25 m
Depth of Discharge	-44.1 m MSL (17.1 m from seabed)	-16.9 m MSL (43.1 m from seabed)
Orientation of Discharge	Horizontal to pile	Facing downwards, parallel to pile
Graphical Representation		
Discharge Properties		
Temperature	10°C 15°C 20°C	10°C 15°C 20°C
Flow Rate	8.2 m^3/hr	2.7 m^3/hr
Salinity	33.2 ppt	33.2 ppt
Receiving Water		
Maximum Current Speed (Surface)	1.4 m/s	
Maximum Current Speed (Seabed)	0.74 m/s	
Medium Current Speed (Surface)	0.27 m/s	
Medium Current Speed (Seabed)	0.16 m/s	
Salinity	33.2 ppt	
Thermocline Depth	30 m	

Parameter	WTN Closed Skimmer Pile	MLB Closed Skimmer Pile
Temperature Above Thermocline	20.9°C	
Temperature Below Thermocline	14.5°C	

Modelling results

The outlet at Marlin B is located at a depth of 16.9 metres, and is therefore in the warmer section of the water column above the thermocline. Discharge temperatures are always lower than the receiving waters and therefore the plume is negatively buoyant and dispersion increases in relation to temperature difference. This is demonstrated in Figure 6-18.

The West Tuna outlet is below the thermocline at a depth of -44.1 metres and located in the deeper, cooler receiving waters. The results show that the when the discharge temperature is similar to the temperatures found in the thermocline (between 14.9 and 20.9) the plume becomes trapped in this layer which inhibits the dispersion. This is demonstrated in Figure 6-19.

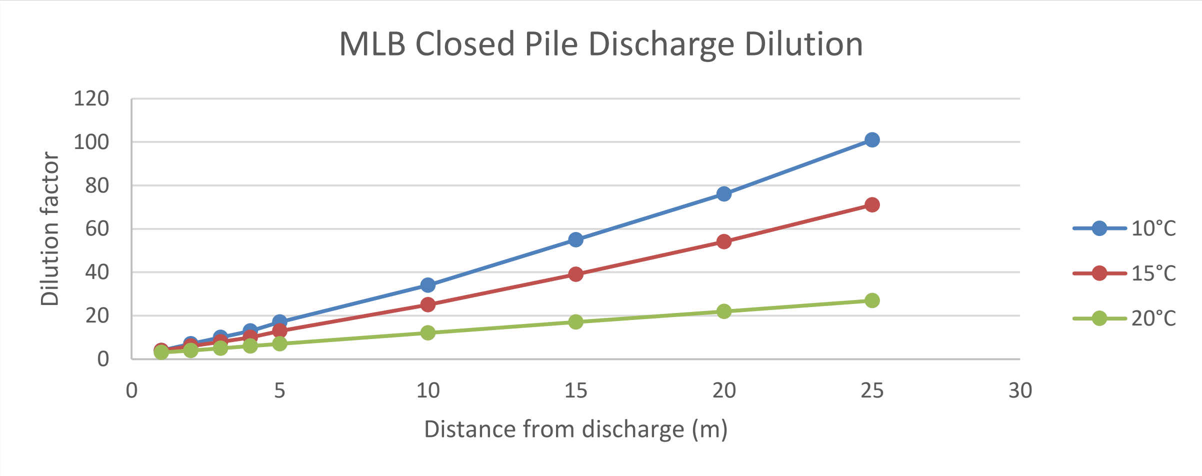


Figure 6-18 MLB Closed Pile Discharge Dilution

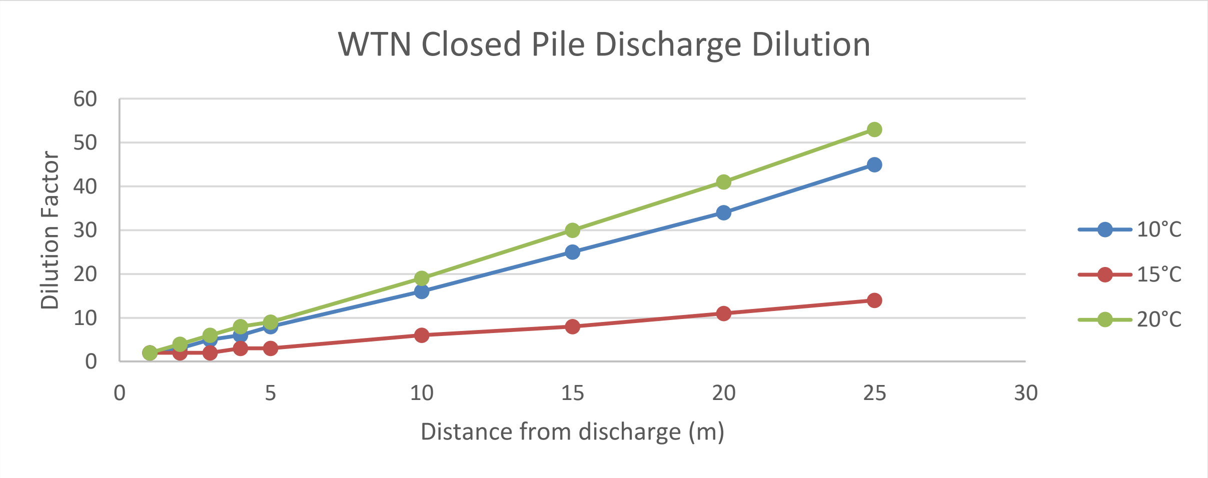


Figure 6-19 WTN Closed Pile Discharge Dilution

Per the information provided in Table 2-4, with the exception of Marlin B, all open and closed pile windows in the Bass Strait discharge deeper than 30 m meaning they discharge below the thermocline which is present during the summer months. Therefore, it has been assumed that the modelling prepared for the WTN closed pile is applicable to these facilities as an indication of dispersion rates from the open and closed pile windows.

Mercury Discharges

During the Kipper Field development drilling in 2010, reservoir sampling results indicated mercury is likely to be present in the KPA reservoir. Detailed analysis and engineering design was undertaken to ensure that mercury present was managed appropriately taking into account workforce health and safety, equipment integrity, protection of the environment and product quality.

As a result, the Kipper production process (located on the WTN Platform) has been designed to direct liquids to shore for further treatment. Kipper process equipment does not routinely direct fluids to the drain system.

Sampling of KPA Gas occurs offshore on a bi-monthly basis, to assist with the detection of mercury as it travels from the reservoir to Longford.

Sampling also occurs at Longford, at the processing plant inlet and outlet. In addition mercury levels of LFD wastewater streams are routinely analysed as part of the EAPL environmental monitoring program. Since the field was started in 2017, mercury testing on WTN and LFD has not detected levels of mercury above the specification of 1 µg/m³.

In the event that a sample records results above specification, then increased sampling protocols, including water, gas and LPG streams, would be enacted, in accordance with the Kipper Mercury Removal Project document.

Although there is no routine discharge of liquids to the drain system, maintenance activities which involve draining or depressuring may result in infrequent volumes of process fluids containing mercury entering the drain system. Examples are provided below:

- As a result of each KPA wells draining activity (approximately once every year or two years), cleaning and inspection of the internals of the Kipper separator, removal of any sand build-up, or from the KPA-WTN pig launcher/receiver vessels, small volumes of liquids (approximately 7 cubic metres, of which approximately 15% is MEG and 85% water) with low mercury concentrations (estimated at 80 ppb) will be infrequently discharged to the closed pile on WTN, then diluted in the pile before being discharged to sea.
- Production from KPA flows over the MLB facility en-route to Longford for onshore processing. The WTN pig receiver could be a pathway for discharge of mercury at the MLB facility. Concentrations at the MLB facility are expected to be orders of magnitude lower than what would be detected at the WTN facility.

Dispersion modelling completed for the WTN platform (Worley, 2013) indicated that mercury concentrations return to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000) ambient water quality guideline for 99% species protection (0.1 ppb) within 1.6 to 5.6 metres of the discharge point with a median current speed (0.27 m/s at surface – 0.16 m/s at seabed) and between 4.6 and 18.2 metres under 'worst case' conditions with a maximum current speed (1.4 m/s at surface - 0.17 m/s at seabed). The initial concentration of mercury in the Kipper separator was conservatively based on the water / MEG being fully saturated with mercury at 80 ppb (mercury solubility in water is 52 ppb) (Sabri et al 2012).

Similarly, modelling completed for the MLB platform indicates that mercury concentrations are expected to return to the ANZECC ambient water quality guideline for 99% species protection (0.1 ppb) within 0.6 to 2.7 metres of the discharge point with a median current speed (0.27 m/s at surface – 0.16 m/s at seabed) and between 1.9 and 8 metres under 'worst case' conditions with a maximum current speed

(1.4 m/s at surface - 0.17 m/s at seabed). The initial concentration of mercury at WTN also assumed a mercury concentration of 80ppb, consistent with WTN.

Downhole sampling and studies indicate that mercury concentrations are not expected to exceed the 80ppm limit modelled by Worley, 2013.

6.4.1.2 Subsea discharges

Fluids that may be routinely discharged during platform and subsea facility operations include those listed in Table 6-24.

- Hydraulic fluids from subsea valve actuation
- Chemicals discharged during production at subsea facilities

In preparation for decommissioning, equipment and pipelines may be flushed to remove residual hydrocarbons or production chemicals and sections of pipelines, pipeline risers, umbilicals and flying leads may be cut. Residual chemicals which meet criteria for discharge may be discharged to ocean in preparation for decommissioning. Table 6-25 lists residual chemicals that be non-routinely discharged during these activities.

Table 6-24 Routine subsea discharges during production

Activity	Nature of discharge	Indicative Volume
Hydraulic fluid from subsea valve actuation	Subsea valves are present at the following locations: • West Kingfish - Fuel gas pipeline SSIV • Kingfish A - Fuel gas pipeline SSIV • Kingfish B - Fuel gas pipeline SSIV • Kipper Subsea facility • West Barracouta Subsea Facility • Bream - BMA350 SSIV • Snapper - MLB450 SSIV	Up to 1000 L of hydraulic fluid could be released per week (on average) due to routine subsea equipment discharges through valve operations and during valve scheduled leak testing. Hydraulic fluid in use is Oceanic HW443R and Aqualink 300, both OCNS Ranking E.
MEG Discharge from KPA A2 well	A fault in the annular access valve (AAV) on the KPA A2 well has resulted in a continuous release of methanol to ocean during stable production.	~5 L per day

Table 6-25 Non routine subsea discharges during COP

Activity	Nature of discharge	Indicative Volume One off discharges unless otherwise noted
Hydraulic fluid from subsea valve actuation	Subsea valves are present at the following locations: • West Kingfish - Fuel gas pipeline SSIV • Kingfish A - Fuel gas pipeline SSIV • Kingfish B - Fuel gas pipeline SSIV • Bream - BMA350 SSIV	Up to 1000 L of hydraulic fluid could be released per week (on average) due to routine subsea equipment discharges through valve operations from CoP facilities. Hydraulic fluid in use is Oceanic HW443R and Aqualink 300, both OCNS Ranking E.

Activity	Nature of discharge	Indicative Volume One off discharges unless otherwise noted
Umbilicals	Umbilicals connect from the surface facility to the subsea development through an Umbilical Termination Assembly (UTA). From the UTA, power, electrical signals and umbilical fluids are often delivered to the various items of subsea equipment via cables and hoses, known as Electrical Flying Leads (EFLs) and Hydraulic Flying Leads (HFLs). Umbilicals which carry both electrical cables and hoses for fluids are called electro-hydraulic umbilicals (EHUs). Umbilicals at the following locations are no longer required for production: • TWA – Tied back to BTA facility. Previously cut subsea near BTA and removed from the BTA J-Tube. • SHA – Tied back to BTA facility. • BKA– Tied back to MKA facility. • CBA2 – Separate electrical and fluids umbilicals originally tied back to MKA facility. Previously cut subsea near MKA platform. Umbilicals are also present at: • KPA – separate electrical and fluids umbilicals are tied back to WTN facility. Expected to remain in operation for the lifetime of this EP. • BTW – tied back to BTA facility. Expected to be installed in 2021 and remain in operation for the lifetime of this EP. • BMB – Electrical umbilical from BMA facility to supply power and communications to BMB facility. • MLA150 subsea UV umbilical at KFB – tied back to KFB facility • MLA150 subsea UV umbilical at KFA – tied back to KFA facility • MLA150 subsea UV umbilical at WKF – tied back to WKF facility • BMA350 SSIV umbilical at BMA – tied back to BMA facility • MLB450 SSIV umbilical at SNA – tied back to SNA facility Wherever possible, fluids within the umbilical will be flushed back to the platform and sent to shore for disposal, normally via the pipeline. However, if flushing is not technically feasible, the contents of the umbilical may be discharged. During preparations for decommissioning, sections of umbilicals no longer required for production may be cut and part of the contents discharged.	BKA EHU – 15 L silicon oil, 50 L hydraulic fluid and 300 L inhibited seawater BMB Elec Umbilical – 20 L silicon oil MLA150 subsea UVs & BMA350 SSIV umbilicals – 200 L hydraulic fluid
Flying leads	Flying leads provide electrical, hydraulic and chemical service to subsea facilities. Flying leads are connected to umbilicals and hence are 'tied back' to platforms where chemical injection and electrical and hydraulic supply is managed and monitored. Once subsea facilities reach cessation of production, services are no longer required and flying leads can be removed. For removal, flying leads may be cut and the contents discharged. Where possible, flying leads will be removed without discharging the contents. However, the length and weight of	40L of silicon oil 110 L hydraulic fluid 150 L methanol 60 L inhibited seawater 25 L of pour point depressant 25 L of corrosion inhibitor

Activity	Nature of discharge	Indicative Volume One off discharges unless otherwise noted
	leads may result in unplanned release of contents during the removal process. Flying leads are located at the Blackback location and are expected to be removed during the lifetime of this EP. Flying leads are also located at BTW and KPA although are expected to remain in use throughout the lifetime of this EP.	
Pipelines	In preparation for decommissioning, pipeline and pipeline riser sections will be cut during the lifetime of this EP. The following pipelines are expected to be cut in order to separate the pipeline from the facility: • MKA • PCA/DPA • WTA • FTA • FLA • BMA • BMB • WKF • KFA • KFB Prior to separation of pipeline from facility, the contents of pipelines will be displaced with inhibited or plain seawater. Displaced pipeline contents will be sent to shore for further processing and disposal. Severing pipelines or pipeline risers will result in the once off release of small volumes of inhibited seawater from each section.	1 – 10 m^3 of inhibited seawater per pipeline

6.4.1.3 Other Surface Discharges

Wellwork

As described in Section 2.4.2, during wellwork, fluids contained within the well such as residual packer fluid, completion brine, residual drilling muds etc. will be circulated out of the well and returned to the platform. Hydrocarbon and solids are separated from the process and returned to shore for discharge. Whole NAF will be returned to shore, whilst the remaining fluid will be discharged to the pile(s). Chemicals may have been added to the well more than 30 years ago, therefore the constituents are mostly unknown.

Operational fluids which have been added to the well during completion / commissioning will also be discharged during production start-up. The use and discharge of these chemicals will be subject to the Esso Chemical Assessment Process. A list of typical production chemicals that may be discharged from the pile system and their CHARM/OCNS ranking is provided in Table 6-28

Table 6-26 Frequency of wellwork activities

Producing platforms	COP platforms
At producing platforms (TNA, WKF, HLA, CBA, SNA, MLA, MLB, BTA, WTN) wellwork activities are expected to take place approximately once per year. Wellwork campaigns last for 1 – 3 months and can involve working ~20 wells during this period.	On COP platforms, P&A activities are expected to take place as per the schedule in Figure 3-1 Platforms are expected to have two wellwork campaigns. One to plug and secure the wells and one to plug and abandon the wells.

Producing platforms	COP platforms
	A plug and secure campaign will last 1 – 3 months and can involve working on up to 20 wells A plug and abandonment campaign will last up to 24 months and will abandon all platform wells (per the number of wells listed in Appendix A, Table 1). Once all wells are plugged and abandoned, no further wellwork activities (and hence, no further wellwork discharges) will occur.

Table 6-27 Surface discharges during wellwork

Activity	Nature of discharge	Indicative Volume
Conductor cutting	The final stages of conductor cutting will result in a once off discharges of the contents of the conductor. If possible, fluids may be directed back to the platform for onshore disposal.	~42bbl inhibited sea water per well
Well circulation	Workover fluids used during well circulation consist of a brine solution (typically seawater) with a dilute concentration of chemical additives and will be discharged as part of workover operations. Fluids with hydrocarbon returns are monitored such that hydrocarbon is not discharged overboard.	From 10 bbl. (e.g. in circulating fluids in a sand-wash operation) up to 100 bbl. (e.g. for a conductor clean-out).per well
Sand washing	Sand discharge during conductor clean-out operations.	100 bbl. of entrained sand in brine per well.

Table 6-28 Typical wellwork chemicals and rankings

Purpose	Chemical	Application	Ranking
Wellwork	Class G cement	Cement	OCNS E
Wellwork	CFR-8L	Additives	CHARM Gold
Wellwork	GasCon 469	Additives	OCNS E
Wellwork	Halad 413L	Additives	CHARM Gold
Wellwork	HR-6L	Additives	OCNS E
Wellwork	NF-6	Additives	CHARM Gold
Wellwork	Barazan D Plus (for high viscosity pills)	Other	CHARM Gold
Wellwork	Baraklean II (surfactant) For Baraklean NS Plus	Other	CHARM Gold
Wellwork	CRW24340 (Inhibitor)	Other	CHARM Silver
Wellwork	SEALMAKER	Other	OCNS E
Wellwork	Vortex A-Liquid	Other	OCNS E
Wellwork	Vortex B-Liquid	Other	OCNS E

6.4.2 Impact Assessment

Planned discharge of operational fluids has the potential to result in effects to marine ecosystems due to:

- Change in water quality
- Change in sediment quality
- Injury / mortality to fauna

Receptors that could be affected by the planned discharge of operational fluids are identified in Table 6-29.

Table 6-29 Receptors potentially affected by impacts associated with planned discharge of operational fluids

Receptors	Impacts				
	Change in water quality	Change in sediment quality	Injury to fauna	Change in habitat	Change to the function, interests or activities of other users
Water quality	✓				
Sediment quality		✓			
Benthic habitats and communities			✓		
Plankton			✓		
Fish			✓		
Marine Mammals - Seals			✓		
Marine Mammals - Cetaceans			✓		
Australian Marine Parks and National Parks				✓	
KEFs				✓	
Commercial and recreational fisheries					✓

Impacts to water quality

Operational fluids discharged during operations, wellwork and IMR activities may contain chemical additives, resulting in a localised change in water quality.

Modelling indicates that discharges from the pile are diluted 5 – 20 times within 10m of the platform (or 12 – 35 times at MLB). Typical chemicals discharges, as listed in Table 6-22, are assessed to be CHARM Gold or Silver or OCNS D or E which are already considered low environmental impact at the point of discharge and are expected to dilute further in close proximity to the platform. In-situ water sampling completed at the TNA platform supports this assumption as it found that all valid samples taken from the water column indicating the presence of platform discharges were less than ANZECC 99% species protection water quality criteria at 59 m from the platform and beyond (see Appendix G.7 – Breakout Box 7).

Other subsea discharges may occur throughout the operational area at locations listed in Section 6.4.1.2 while surface discharges from wellwork may occur intermittently at platforms as described in Section 6.4.1.3. Discharges will be one-off or infrequent, and of small volumes which will disperse rapidly in the open ocean currents within the operational area.

Other surface discharges may have the potential to expose ecological receptors which use the surface water for transit or foraging such as whales, turtles, fish and plankton. The operational area is within a foraging BIA for the Pygmy blue whale. Given the transient nature of these species, any impacts are expected to be localized and short term.

Water-soluble chemical MEG is readily biodegradable in the marine environment in aerobic and anaerobic conditions through microbial action, with studies showing degradation to < 10% of the initial concentration occurring with 1 to 21 days (Staples et al. 2001). MEG will not persist in the environment once discharged. Microbial degradation will account for the fate of almost all MEG discharged. It has been shown to be practically non-toxic (based on US EPA definitions) in relation to aquatic organisms (Staples et al. 2001) and is entirely miscible in water and has low potential to combine with lipids and therefore has very low potential for bioaccumulation (Dobson 2000, Staples et al. 2001). The Oslo Paris Convention (OSPAR) Commission lists MEG as a substance considered to Pose Little Or No Risk to the environment (PLONOR).

Brine water will sink through the water column where it will be rapidly mixed with receiving waters and dispersed by ocean currents. As such, any potential impacts are expected to be limited to the source of the discharge where concentrations are highest. This is confirmed by studies that indicate effects from increased salinity on planktonic communities in areas of high mixing and dispersion are generally limited to the point of discharge only (Azis *et al*., 2003).

The receptors with the potential to be exposed to an increase in salinity include pelagic fish species and plankton found in surface waters within the operational area. Changes in salinity can affect the ecophysiology of marine organisms. Most marine species are able to tolerate short-term fluctuations in salinity in the order of 20% to 30% (Walker and McComb, 1990). However, larval stages, which are crucial transition periods for marine species, are known to be more susceptible to impacts of increased salinity (Neuparth *et al*., 2002). Mobile pelagic species may be subjected to slightly elevated salinity levels (approximately 10-15% higher than seawater) for a very short period which they are expected to be able to tolerate.

Prior to discharge the chemical constituents of all fluids will be assessed using the Esso Chemical Discharge Assessment Procedure (described as part of the Implementation Strategy in Volume 4) which uses the OCNS ranking in conjunction with toxicity, biodegradation and bioaccumulation data to determine potential impacts to the environment and acceptability of planned discharges.

<u>Mercury</u>

As discussed in Section 6.4.1.1, modelling of mercury discharge demonstrates that concentrations in water meet ANZECC 99% species protection criteria within 18.2 m at WTN and 8 m at MLB in worst case scenarios (and less than this in median case scenarios).

Infrequent discharge of small quantities of low concentration mercury-containing fluids via the closed pile does not have the potential for bioaccumulation in marine mammals, seabirds, fish and other marine organisms because the elimination half-life for mercury (worst case as published in the U.S. Department of Health and Human Services, Toxicology Profile for Mercury 1999) is 2 months.

Given the infrequent, small volume, low concentration and short duration discharges, the mercury-containing water will be rapidly dispersed in the high energy Bass Strait marine environment. Consequently the impact of the discharge of mercury-containing water on the receiving environment is considered to be low.

As a result, any impacts from the discharge of brine and other operational fluids will be localised and short-term and the consequence level of increased salinity and potential chemical toxicity are considered to be unlikely and of low impact.

Impacts to sediment quality

Small discharges of solid-laden water were observed exiting the WTN closed pile window in 2017 as the closed pile was being pumped, expected to be reservoir sand or silty scale accumulated in the bottom of the pile (e.g. due to draining of separators or produced water directed to the pile on start-up) that was traversing out the pile window due to small changes in the pile pressure. This can be seen in Figure 6-20 over a 30 second period. While not previously observed elsewhere, this phenomenon is expected to occur at all platform closed piles intermittently.

Since sediment discharges from the pile systems are intermittent and infrequent, and Bass Strait is a high energy environment, currents are likely to mobilise and disperse sediments around the platform, leading to lower overall concentrations in any one area. There were no mounds of sand visible at the base of the pile, and encrusting marine fauna are present at the pile window, hence any smothering is likely to have an overall negligible, temporary, and localised effect.

Figure 6-20 ROV Footage from WTN Closed Pile Window (2017)

(1) 0 sec

(2) +10 sec

(3) +20 sec

(4) +30 sec

In-sea sediment monitoring results conducted to determine potential impacts to sediment at TNA and WKF from PFW and/or all other historical or active discharges (Appendix G.8 – Breakout Box 8) showed that natural dispersion processes appear to control the concentrations of potential contaminants from platforms in sediments to slightly above background concentrations and below levels known to cause deleterious effects (Neff et al. 2011; Barnes et al. 2019).

Given the homogenous seafloor environment within the operational area, comprising soft sediment benthic communities, the small volume of solid discharge which may settle on the seabed is not expected to result in an impact to those communities.

The disturbance may result in the mortality of flora and sessile fauna within this footprint through smothering and potentially the mortality of benthic infauna associated with the habitat. However the area that will be impacted is small compared with the overall extent of this habitat in the region and consequently, there will be no long-term impact on the diversity and abundance of benthic fauna.

Impacts to biota

Marine biota may be exposed to contaminants discharged from the pile. Given the results of modelling provided in Section 6.4.1.1, this is expected to be limited to a localised extent around the plume discharge point only.

Other subsea discharges may occur throughout the operational area at locations listed in Section 6.4.1.2. These discharges will be one-off or infrequent, and of small volumes which will disperse rapidly in the open ocean currents within the operational area.

Mobile invertebrates exposed to operational discharges could experience acute or chronic exposure to toxicants in the discharge. This will be localised to biota within close proximity to the discharge location or growing on the platform structure (such as sponges, corals, and crustaceans) and is unlikely to have population-level effects. Potential bioaccumulation of sediment-derived metals or PAHs in fish biota is considered localised or negligible given hydrocarbons are removed from the discharge streams in the pile through separation prior to discharge.

Prior to discharge the chemical constituents of all fluids will be assessed using the Esso Chemical Discharge Assessment Procedure (described as part of the Implementation Strategy in Volume 4) which uses the OCNS ranking in conjunction with toxicity, biodegradation and bioaccumulation data to determine potential impacts to the environment and acceptability of planned discharges. As a result, species will be protected from adverse ecotoxicity effects of the discharge such that the biological communities are expected to remain in a healthy condition and ecosystem integrity is largely retained.

Impacts to benthic communities and habitat

Studies have found that provided the water depth is greater than the discharge depth, benthic organisms will not be affected by PFW, as the concentration of any oil or adhered/adsorbed components will be extremely low (Furuholt, 1996). Studies that have reported changes to benthic distributions were in shallow, moderate-to-poorly flushed waters of 1-8 m or continental shelf waters of up to 12 m (e.g. Osenberg et al (1992) and Rabalais et al. (1992)). It can be expected that in deeper, well-mixed ocean environments the potential for impacts to benthic infauna would be even lower. All pile and surface discharges will occur above the sea floor which is expected to minimise impacts to benthic fauna from operational discharges. Therefore, it is expected that only fauna on the platform structure itself could be exposed and those on the seafloor are protected from direct exposure.

Impacts from direct exposure to PAHs on fauna such as scallops, crustaceans and other molluscs could pose chronic developmental or growth impacts, such as reduced survival of juveniles and reduced size (Querbach et al. 2005, in Armsworthy et al., 2005). Discharge can also affect larvae viability (abalone, Raimondi and Schmitt, 1992). Sponges and soft corals localised to the discharge point could experience reduced ability to settle and metamorphose, such as was found in Luter et al (2019) on larvae of the sponge *R. odorabile* when exposed to hydrocarbons in water.

With respect to pile discharges, impacts from direct exposure to PAHs are considered highly unlikely as hydrocarbons are separated prior to discharge and any residual chemicals in the discharge are highly diluted within the pile and dispersed further once discharged.

Effects on benthic flora and fauna are primarily attributed either to uptake of contaminants from water or the presence of accumulated hydrocarbons (such as PAH) in sediments. Ecotoxicity impacts to biota from metals in sediment is more complicated, owing to the many forms that metals can take, reduction-oxidation states and overall bioavailability of the metal. While there have been a large number of studies where the chemical concentrations of contaminants have been measured in sediments, very few have been related to biological effects, either in the nature of descriptions of the natural benthic populations or laboratory-based bioassays (ANZECC 2000, p8.4-26). Given the results from the TNA in-situ sediment monitoring that found occurrences of metals/metalloids were isolated, levels remained low (for the most part, well below sediment guideline criteria) and detections above reference locations remained localised (see Appendix G.8 – Breakout Box 8), effects on benthos from accumulated metals in sediments is unlikely.

Given the above, benthic biota around the platforms in Bass Strait are highly unlikely to be affected by the pile and other discharges. Any effects would be confined to chronic impacts (such as changes in growth, metamorphosis or reproduction) for flora and fauna such as sponges and crustaceans on the platform within close proximity to the discharge locations. As the area and depth ranges of a potential, but highly unlikely impact, are small and localised, effects at a population level are not credible.

Impacts to plankton

Plankton could be susceptible to chemicals in the discharges, as they are less mobile and therefore can become exposed to the plume at the discharge point. However, plankton are expected to rapidly recover once the activity ceases, as they are known to have high levels of natural mortality and a rapid replacement rate UNEP (1985). As such, exposure of planktonic communities is not considered to result in significant impacts on population level of organisms that would affect ecological diversity or productivity and therefore is considered to result in an undetectable or limited local degradation of the environment, rapidly returning to original state by natural action.

Impacts to fish

Early lifestages of fish (embryos, larvae) would be most susceptible to the exposure from chemical constituents, as they are less mobile and therefore can become exposed to the plume at the outfall. These effects can range from no effects (Mathieu et al 2011), to gill damage (turbot larvae, Brown et al. 1998). Hormonal effects could be experienced (cod, Meier et al, 2002), however this occurs at very high exposure concentration or where immune systems are already compromised by other stressors (Hamoutene et al, 2011; Burridge et al, 2011). This is unlikely to occur as pile discharges will be highly diluted in the pile and other discharges will be at low concentrations which meet environmental discharges criteria.

Later-life pelagic species are generally highly mobile and as such are not likely to be exposed at concentrations that would lead to chronic effects due to their patterns of movement.

BTEX is known to be toxic to fish and invertebrate eggs and larvae and has been shown to result in developmental defects (Fucik et al. 1995). However, due to the compound's volatility, the residence time in waters is brief; rapid active and passive excretion of these compounds from tissues will also limit in-tissue concentrations in the field; and BTEX does not bio-accumulate (Neff et al., 1996). Many fish species can metabolise hydrocarbons, which reduces the risk of bioaccumulation (NRDA, 2012). Potential impacts from BTEX are further reduced as hydrocarbons are removed from the discharge streams through separation prior to discharge.

The mixing zone overlaps the distribution BIA for the Great White Shark; however, given the localised area of impact and that sharks are transiting the area, no impacts are expected. The discharges do not constitute a threat listed in the recovery plan of the White Shark, and the discharge activity is not inconsistent with that plan.

Impacts to seals

Seals do not spend all their time in the water, and when they do, they are highly active, travel great distances and forage at various depths (Arnould et al., 2005).

Given the depth of pile discharges, it is unlikely that seals would spend extended periods of time in close proximity to the discharge. Therefore, impacts to seals from pile discharges are highly unlikely.

Surface and other discharges will be one-off or infrequent, and of small volumes which will disperse rapidly in the open ocean currents within the operational area. Given the high mobility of seals, it is unlikely they will spend an extended period of time in these one off / intermittent discharges.

As this area potentially exposed to the discharge is small in comparison to the overall distribution of plankton and fish in the area, and the area does not represent a large proportion of the overall marine mammal feeding area (seals) or specifically a feeding area (whales and dolphins), it is unlikely these interactions will have a significant impact on marine mammals. Indirect impacts, such as altered prey abundance or ingestion of bioaccumulated toxic compounds is considered to be of no effect given the localised area predicted to be impacted by discharges and the nature and scale of impacts to the marine ecosystem within the discharge plumes (i.e. slight impacts to food sources such as pelagic fish species).

Listed Australian Fur Seals and New Zealand Fur Seals occur at the platform, however no seal breeding occurs on or around the platform, and the area is not identified as critical habitat or BIA. According to IUCN, the Australian Fur Seal is listed as Least Concern and its population is increasing (IUCN, 2015).

There is no relevant Conservation Advice or Threat Abatement Plan for Australian Fur Seals or New Zealand Fur Seals.

Given the potential absence of impacts to seals, the limited spatial extent of the discharge plumes, the predicted short interaction duration of exposure (i.e. minutes at a time), and that breeding does not occur within the OA it is considered that there will not be a significant impact on seals from operational discharges when assessed against the relevant criteria from the Matters of National Environmental Significance. Significant impact guidelines 1.1. (DoE, 2013), including that there will be no long-term decrease in the size of the population, the area of occupancy of the species or an important population, the existing population will not be fragmented into two or more populations, there will be no adverse effect on habitat critical to the survival of a species, there will be no disruption to the breeding cycle of an important population, the availability or quality of habitat will not be destroyed, removed, isolated or decreased to the extent that the species is likely to decline and the recovery of the species will not be substantially interfered with.

Impacts to cetaceans

Cetaceans are highly mobile and transitory animals, as such, it is highly unlikely that this potential impact pathway will be significant.

Given the depth of pile discharges, it is unlikely that cetaceans would be able to approach the platform close enough to be exposed. Any potential exposures would be for a short duration.

Surface and other discharges will be one-off or infrequent, and of small volumes which will disperse rapidly in the open ocean currents within the operational area. Given the high mobility of cetaceans, it is unlikely they will spend an extended period of time in these one off / intermittent discharges.

As impacts to cetacean food source predominantly of fish and plankton is of very low likelihood (as above), and the area does not represent a large proportion of the overall cetacean feeding area therefore it is unlikely to have any impact on cetaceans.

Indirect impacts, such as altered prey abundance or ingestion of bioaccumulated toxic compounds is considered to be of no effect given the localised area predicted to be impacted by operational discharges.

Given the potential absence of impacts to cetaceans, the limited spatial extent of the water quality the predicted intermittent and short interaction duration of exposure (i.e. minutes at a time), it is considered that there will not be a significant impact on cetaceans from operational discharges when assessed against the relevant criteria from the Matters of National Environmental Significance. Significant impact guidelines 1.1. (DoE, 2013), including that there will be no long-term decrease in the size of the population, the area of occupancy of the species or an important population, the existing population will not be fragmented into two or more populations, there will be no adverse effect on habitat critical to the survival of a species, there will be no disruption to the breeding cycle of an important population, the availability or quality of habitat will not be destroyed, removed, isolated or decreased to the extent that the species is likely to decline and the recovery of the species will not be substantially interfered with.

Impacts to Fisheries – Commercial and Recreational

Since fish or shellfish are not harvested in close proximity to the platform, and modelling suggests that discharge from the piles are dispersed within close proximity to the facility, no impacts to fisheries are expected.

Other subsea discharges may occur throughout the operational area at locations listed in Section 6.4.1.2. These discharges will be one-off or infrequent, and of small volumes which will disperse rapidly in the open ocean currents within the operational area. Notification is provided to local stakeholders when subsea maintenance activities are taking place so fishing does not occur in close proximity to subsea maintenance activities while they are occurring.

Individual fish and other non-fish target species, (i.e. invertebrates of value, including squid, crustaceans (rock lobster, crabs) and molluscs (scallops, abalone)), may be exposed to chronic sub-lethal impacts where they are directly present in the discharge plume. However, due to the small range and depths that this applies, population level impacts are considered highly unlikely. Whilst offshore structures may play a role in enhancing fish stocks due to the presence of hard substrate and the level of protection from fishing that they provide, fish nurseries known to be notable prolific producers are close to shore (such as Gippsland Lakes RAMSAR site) and these are expected to contribute to fisheries stocks in much greater numbers. Therefore there are no anticipated impacts to fisheries stocks.

Impacts to other receptors

Australian Marine Parks, National Parks and Reserves

Given the distance of marine parks, national parks and reserves from the mixing zone, impacts to these receptors are not considered credible.

Key Ecological Features

Upwelling East of Eden: Nutrient-rich sediment turnover is highest in areas of upwelling, and hence discharge of any additional nutrients also naturally found on the sea floor is therefore unlikely to have impacts on the KEF. The discharge of other contaminants is not relevant to the values of this KEF

The Bass Cascade: Given the distance from the facilities to the likely location of this KEF, impacts are not anticipated.

Shelf rocky reefs and hard substrates (South-East Marine Region), including the South East Reef: The same assessment as Benthic habitats and communities applies to this KEF as described above. At the CBA location, the mapped presence of South East Reef in the area including beneath the platform does not appear to coincide with increased abundance of biota in the area and therefore any potential impacts to biota are not expected to impact the South East Reef.

Cumulative impacts with other discharges

Piles are expected to be exchanging predominantly sea water, hence any discharge from the piles will be close to neutrally buoyant at the subsea window.

As described in Table 2-4, all PFW discharge points are located above the depth of the thermocline (30 m). For all platforms (with the exception of MLB) the pile discharge points are located below the thermocline. Therefore, during summer months, discharges are not expected to interact with the pile. See summary in Table 6-30. Dispersion modelling as presented in Section 6.3, shows the maximum PFW plunge depth from the discharge point under all current speeds remains above the depth of pile window discharges, hence any cumulative impacts from the interaction with the produced water effluent plume when the thermocline does not appear is considered unlikely.

On Marlin B, the modelled maximum plunge depth from PFW remains above the pile window depths. Interaction of discharges is considered unlikely, despite both discharges occurring above the thermocline.

Table 6-30 PFW discharge depth compared to pile discharge depths

Platform	PFW Discharge depth (m)	Modelled maximum plunge depth from PFW (m)	Open pile window depth (m)	Closed pile window depth (m)
TNA	29	34	52.1	38.5
WKF	16	20	69.5	67
HLA	11	22.6	50	46.5
CBA	28	36.4	55.7 – 57.7	55.7 – 57.7
SNA	8.2	8.6	49	35.8
MLB	11	12.5	16.9	16.9

Given the varying buoyancy of the plumes, the mobile nature of marine mammals and the tendency of fish to avoid plumes, cumulative impacts on marine fauna is unlikely. As fishing is not carried out within 500 m of the platform, no cumulative impacts from multiple discharges are likely on commercial and recreational fishing.

Plumes from other non-continuous discharges (such as desalination brine, sewage, grey water, food waste, liquid discharges from vessel operations, and wellwork discharges) could overlap with the plume but are short in duration and hence any cumulative impacts are unlikely to occur.

Any suspended solids in the pile contents will settle out within the pile, or if finer and suspended in the pile, then they will gradually settle out at far distances from the platform as they are carried by the current and result in no noticeable impacts to sediments. Hence any cumulative impact of the pile discharges to sediment is considered highly unlikely.

6.4.2.1 Consequence evaluation

In summary

- Modelling suggests that operational discharges are dispersed within close proximity to the discharge location and therefore, impacts will be limited to a localised area close to the discharge location
- Chemicals will be assess to be low environmental impact prior to discharge
- Potential impacts to biota, including benthic habitats and communities, plankton, fish, seals and cetaceans, including through bioaccumulation, is localised in nature to the mixing zone or negligible and is not considered significant (per Significant Impact Guidelines [DOE, 2013]).
- Discharges could result in sub-lethal, direct or indirect effects on organisms, but this would likely only apply to non-mobile receptors, such as fish embryos/juveniles, and would not apply at a population level.
- Mercury concentrations will be monitored, expected to be low and dispersed to ANZECC 99% species protection criteria in close proximity to the platform

Therefore, intermittent and small volumes of ongoing discharge of operational fluids will discharge rapidly in the high energy marine environment and therefore any impacts will be restricted to the Operational Area. Any impacts are expected to be inconsequential and no adverse effects to identified receptors. Any effects will be localised and of low to moderate intensity, resulting in a **Level IV** consequence.

6.4.3 Controls

Good Practice	Adopted	Control	Rationale
Discharge of low impact chemicals	✓	**CM3:** Chemical Discharge Assessment Process	Any chemicals planned to be discharged will be subject to the Chemical Discharge Assessment Process to ensure they are low environmental impact chemical and are approved for discharge. This includes subsea hydraulic fluids, Wellwork chemicals and production chemicals.
Monitoring of chemical use	✓	**CM47:** Monitoring of chemical use in accordance with Corrosion Control & Chemical Injection program	As part of the Corrosion Control & Chemical Injection FIMS program, oil field chemical use is monitored to ensure volumes and concentrations used are optimised. Results of monitoring (including identification of overuse) is monitored and documented in the Oil Field Chemicals Exception Report.
Routine Maintenance and testing	✓	**CM46:** Maintenance and testing of Open and Closed Skimmer Piles	Maintenance and inspection of pile equipment is conducted to ensure equipment is functioning as designed, level readings are accurate and pumps and triggers are operational so as to prevent

Good Practice	Adopted	Control	Rationale
			unplanned discharges caused by equipment failure.
Notification to stakeholders	✓	**CM36:** Pre Start notifications	Notifications to stakeholders are completed prior to subsea maintenance activities which may result in discharges. This aims to minimise impacts to fishers during short term, intermittent discharges until discharges have dispersed.
Validation of assumptions from pile discharge systems	✓	**CM68:** Environmental Sampling	Information about discharges from pile systems is limited. A sediment and water sampling program will be completed to verify impacts from production activities, including the piles.
Kipper Mercury Sampling	✓	**CM69:** Sampling of KPA Gas to monitor mercury concentrations	KPA gas is sampled bi-monthly to monitor mercury concentrations and sample results are below spec. of 1 µg/m³. In the event that a sample records results above specification, then increased sampling protocols, would be enacted to confirm that discharges remain below modelled concentrations (see 6.4.1.1) Should concentrations be measured greater than modelled concentrations (>80ppb), offshore discharge will cease until further analysis and sampling is completed to ensure that future discharges are acceptable and reduced to ALARP.

6.4.4 Demonstration of ALARP

ALARP Decision Context and Justification	Decision Context B		
	Planned discharges from offshore operations are common practice. Discharges are not managed by national regulations however industry best practice has been applied through the application of chemical assessment and selection processes. Given the small volumes, rapid dispersion in the marine environment and controls in place to manage potential impacts, there is potential for Consequence Level IV impacts. Both planned and unplanned discharges were discussed with stakeholders and no stakeholder objections or claims were raised with regards to impacts from planned operational discharges. Facilities in the Bass Strait were designed and constructed prior to the introduction of OPPGS (Environment) Regulations. Engineering design may not reflect current industry best practice. Given the design of the platforms and the opportunity for continual improvement, Esso believes ALARP Decision Context B should apply. Engineering Risk Assessment has been undertaken to assess the costs and benefits associated with additional, alternative and/or improved controls to ensure impacts from planned discharge of operational fluids continue to be reduced to ALARP.		
Engineering Risk Assessment			
Additional, Alternative, Improved Controls	**Benefit**	**Cost / Feasibility**	**Adopted**

Collection of fluids for alternative disposal onshore	Collection and onshore disposal of fluids could minimise the volume of chemicals and operational fluids discharged to the marine environment.	In the pile systems, hydrocarbons are recycled into the process via pile pumps. Collection and onshore disposal of these fluids would reduce the net environmental benefit as recycling would not be able to occur. Directing the drained Kipper well fluids back into the pipeline is not feasible due to the cost of the equipment required to re-pressure the liquids (up to 15,000 kPa). The degree of risk reduction from manual collection of the drained liquids from the separator for treatment and disposal onshore is disproportionately small to the additional safety and environmental risks associated with manual handling, storage and crane transfers of multiple IBC volumes of recovered liquid from platform to vessel and again handling of that volume onshore. Given the increased safety risks and the reduction in net environmental benefit, collection of fluids for onshore disposal is not recommended.	Not Adopted
Re-design and construction of facilities to eliminate discharges	Re-design and construction of new drain and sump systems would eliminate discharges of residual chemicals to the marine environment.	Engineering design and construction is highly expensive and would take many years to execute. Construction activities result in a variety of impacts to the environment and stakeholders. Given the remaining lifespan of the facilities and the low environmental impacts expected from discharges, the extensive cost and net environmental benefit of reconstruction of the drains system is not considered to outweigh the impacts from planned discharges.	Not adopted
Monitor ongoing subsea hydraulic fluid discharges	Subsea hydraulic fluids may be discharged during valve actuation.	Costs associated with vessel hire, ROV and monitoring programs in order to monitor discharges are highly expensive. Fluids intended for subsea discharge are chosen to be of low environmental impact and volumes discharged are infrequent and <10L per event. Given the small volumes released, the plume will be highly localised and is expected to cause little to no adverse effects. Monitoring volume of discharges is not considered to provide any change to the environmental consequence.	Not adopted
Removal of mercury from KPA facility on WTN	Removal of mercury from the Kipper fluids on the platform would prevent the discharge of mercury-containing water from the closed pile	The technology for reliable and consistent removal of mercury from three-phase fluids is not currently available. The installation of additional treatment equipment, a separation plant and three mercury removal skids, is not	Not adopted

		practicable due to platform space constraints. Hazards associated with mercury handling are also able to be better managed onshore, however there are implications and risks associated with transporting the mercury to shore including increased likelihood of vessel collision, transporting spills, and onshore handling and disposal implications. The cost of transporting the small volumes of low concentration mercury to shore is grossly disproportionate to the reduction in risk. Modelling indicates that the small discharge of mercury poses no real impact on the environment. The infrequent, small volume discharges of mercury-containing water will be rapidly dispersed in the high energy marine environment. Consequently the impact of the discharge of mercury-containing water on the receiving environment is considered to be ALARP.	
Ongoing monitoring of fluids discharged to the drain systems	Monitoring of fluids discharged to the drain system could allow for improved management of discharges	Discharges to the open drain systems are predominantly seawater and deck cleaning detergent. Discharges to the closed drain system are predominantly production fluids which are recycled to the process with residual production chemicals. Although the volumes discharged to the closed drain systems are not directly monitored, chemical use (including identification of overuse) of these chemicals is monitored. There are several hundred drainage points on each facility therefore, it is not possible to install flow meters or monitor all the feeds to the drains.	Partially adopted. Chemical use is monitored. **CM47**: Monitoring of chemical use in accordance with Corrosion Control & Chemical Injection program **CM3**: Chemical Discharge Assessment Process
Sampling of pile fluid discharges	Greater certainty about contaminant levels in water around plie windows.	On most platforms, piles are located beneath the main platform structure. The minimum safe distance to platforms available for sampling is 10 m meaning water from the pile window is not able to be sampled. Given these limitations in safely completing water sampling, it is proposed that sediment sampling is completed to better understand the potential impacts to receptors from pile discharges.	Partially adopted **CM68:** Environmental Sampling
Remove flying leads / umbilicals full of product	Removal of flying leads containing product could minimise release of chemicals	Where possible, flying leads and umbilicals will be removed while containing product. However, this may not be possible in all occasions.	Not adopted

	to the environment and reduce potential impacts to receptors.	Due to the length of the flying leads / umbilicals and their weight when containing product, available vessels are unable to remove them without prior draining. Further, due to the weight of the flying leads / umbilicals when containing product, it is likely that they could break upon removal, which would also result in discharge of the contents.	

6.4.5 Demonstration of Acceptability

Factor	Demonstration Criteria	Criteria Met	Rationale
Impact Consequence Level	Impact Consequence is III or less	✓	
Principles of Ecologically Sustainable Development (ESD)	No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved.	✓	The potential impact associated with this aspect is limited to a localised short-term impact, which is not considered as having the potential to affect biological diversity and ecological integrity.
	Activity does not have the potential to result in serious or irreversible environmental damage.	✓	The activities were evaluated as having the potential to result in a Level IV consequence thus are not considered as having the potential to result in serious or irreversible environmental damage.
Legislative and Other Requirements	Legislative and other requirements have been identified and met.	✓	No environmental legislation or other requirements were deemed relevant.
Internal Context	Consistent with Esso's Environment Policy.	✓	Proposed activities are consistent with Esso's Environment Policy, in particular, to "comply with all applicable environmental laws and regulations and apply responsible standards where laws and regulations do not exist"
	Meets ExxonMobil Environmental Standards	✓	The use of piles for management of waste hydrocarbons meets the Upstream Waste Management Standards which calls for consideration of the waste hierarchy. Use of piles allows for waste hydrocarbon to be 'recycled' and returned back to the process. Further, the use of piles meets expectations of the Upstream Water Management Standards and standards for appropriate disposal of uncontaminated deck drainage.
	Meets ExxonMobil Operations Integrity Management System (OIMS) Objectives	✓	Proposed activities meet: OIMS System 6-5 objective to identify and assess environmental aspects; significant aspects are addressed and controlled consistent with policy and regulatory requirements;

Factor	Demonstration Criteria	Criteria Met	Rationale
External Context	Stakeholder concerns have been considered / addressed through the consultation process.	✓	No specific stakeholder concerns have been raised concerning the risk of introduction and establishment of IMS.

7 Environmental Risk Assessment

7.1 Overview

The purpose of the risk assessment is to ensure that all risks associated with the petroleum activity are identified and evaluated, and the resulting risks are demonstrated to be ALARP and Acceptable in accordance with the Esso impact and risk assessment methodology (Section 0).

The assessment of risks been undertaken in two stages:

- Risk Scoping (Section 7.2)
- Detailed Evaluation (Sections 7.3 to 7.6)

7.2 Risk Scoping

Scoping of the risks relevant to the activity ensures that a systematic assessment can be undertaken. The context of the risk assessment has been set through a description of the activity (Section 2.4) and identification of potential environmental receptors within the Operational Area and the PEA (Section 2.4.4.3). By considering the relationship between environmental aspects and the activity (Table 4-2), Esso has identified all risks to affected receptors which could potentially occur as a result of the petroleum activity.

A series of workshops was held to identify environmental impacts and risks associated with the petroleum activity and assess controls to ensure impacts and risks are managed to ALARP and an acceptable level. The workshops were attended by environment and asset personnel. Impacts and risks were evaluated using the impact assessment methodology (Section 4) to determine consequence to receptors, ALARP decision context, and likelihood and residual level of risks. Control measures were identified, and an assessment of acceptability was undertaken against the Esso Acceptability Criteria and the defined acceptable levels of environmental performance (Table 4-8).

For most risks identified, the workshop was able to determine that the adopted controls lowered risks to ALARP and to an acceptable level. These risks, and the outcomes of the assessment, are described in Table 7-3, Table 7-4, Table 7-5 and Table 7-6.

In some cases, it was not possible to finalise the risk evaluation during the workshops. This was typically due to the need for an in-depth literature review to support the evaluation and assessment of potential risks to receptors. Such as that for:

- Unplanned Introduction of IMS (Section 7.3)
- Accidental Release – LOC from drain system (Section 7.4)

Or for discharge scenarios considered as worst case scenarios and hence modelling and further analysis was required;

- Accidental Release – LOC from a vessel (Section 7.5)
- Accidental Release – LOC from a pipeline (Section 7.6)
- Accidental Release – Loss of Well Control (Section 7.6)

For all risks, control measures have been considered as described in Section 4.7. Controls are applied where a reduction in the consequence or the likelihood of the risk will occur as a result of their adoption. They may also be required by legislation, or by internal Esso requirements. Where the assessment of the risk identified that there were no suitable Good Practice control measures, and additional controls considered would not lower the risk assessment outcomes, no controls have been adopted. This is identified in the table and assessed as part of the demonstration of acceptability.

Environmental Performance Outcomes and Standards relevant to risks associated with the petroleum activity are provided in Volume 4.

7.2.1 Worst case discharge scenarios

During the risk workshops, worst case discharge scenarios were considered. These were determined using the AMSA Technical Guideline for contingency planning (AMSA, 2015), the IPIECA Finding 6 - Oil spill risk assessment and response planning for offshore installations (IPIECA & OGP (2013)), and experienced input from environment and asset personnel in attendance.

AMSA (2015) recommends that risk scenarios should consider the worst-case scenarios, the maximum credible case scenario and the most likely case scenario, in order to determine the overall resource levels for response capabilities required. This assessment focuses on two types of risk scenario (definitions from AMSA, 2015):

Worst-case scenario (WCS) - The largest volume that could be spilled as a result of any event or combination of events. The results of a catastrophic event or failure.

Most likely case scenario (MLCS) - The most likely spill over 10 m^3 for the facility or activity. The largest spill likely to occur within the life span of the facility and/or activity.

The worst case scenario for accidental discharge of hydrocarbons was identified in accordance with IPIECA & OGP (2013) and AMSA (2015) as described in Table 7-1.

Modelling of the selected worst case scenarios is used to inform the consequence assessment and establish the overall ranking of the risk.

Further detail about the worst case for each discharge scenario can be found in the relevant Risk Assessment Section.

Table 7-1 Process for determining worst case discharge scenarios

Process	Description
Identify potential discharge scenarios	Potential incidents and discharge scenarios were identified during the development of this Environment Plan. Discharge scenarios were identified based on activities that could result in releases and type of hydrocarbons that could be released. Potential discharge scenarios which could occur as a result of activities described in this Environment Plan were identified to be: • Accidental Release – LOC from vessel (Section 7.5) • Accidental Release – LOC from pipeline (Section 7.6) • Accidental Release – Loss of well control (Section 7.7)
Identification of potential pollutants	For each discharge scenario identified, analysis should include consideration of the composition of hydrocarbons released and their chemical and physical characteristics.
Determine characteristics of the discharge scenario (including the location and calculation of potential spill volumes)	Analysis of scenarios included consideration of flow rates, location, quantity and composition of hydrocarbons released.
Determine likelihood of the discharge scenario	Likelihood of hazardous event was determined in accordance with Section 4.6.2.
Selection of worst case scenarios based on risk	Once potential discharge scenarios have been identified, an assessment should be undertaken to select which scenarios are taken forward to be modelled. The likelihood of an event, and the potential quantity of discharged hydrocarbons, are the two main parameters contributing to the selection of a worst case scenario. At this stage, an initial estimation of the potential environmental consequences can be identified (a detailed assessment of environmental

Process	Description
	consequence is completed once modelling results are available). As a general rule, the closer the release location to sensitive receptors and the greater the persistence of the oil, the higher the potential contribution to the risk from releases. ***<u>Aggregation of worst case discharge scenarios</u>*** Hazardous events may be aggregated to define the oil discharge scenarios. The aggregation process can be necessary to reduce the number of scenarios to be modelled, due to modelling capacity and time restraints. Events that are aggregated should have identical, or very similar, characteristics in terms of: the release location and duration; the quantity of oil released; and the weathering characteristics of the oil. In the case of a qualitative risk assessment, one approach is to use the highest likelihood of the hazardous events representing the single scenario with the highest risk IPIECA & OGP (2013).

7.2.1.1 Oil Spill Modelling

Acknowledging the potential large scale of an oil spill, further analysis is undertaken for unplanned oil spill consequence assessment. Modelling is completed to understand behaviour of the oil and/or chemicals, in particular weathering processes and its potential pathways, travel times, areal distribution and associated volumes under the prevailing climate.

Spill modelling is performed using an advanced three-dimensional trajectory and fates model, SIMAP (Spill Impact Mapping Analysis Program). 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.

The modelling uses:

- a five-year dataset of currents that includes the combined influence of ocean currents and tidal currents;
- high-resolution local winds from the National Centre for Environmental Prediction (NCEP) Climate Forecast System Reanalysis (CFSR) model;
- detailed hydrocarbon characteristics relevant to the risk scenario being modelled;
- hydrocarbon density, viscosity, pour point, distillation curve (volume lost versus temperature) and the aromatic/aliphatic component ratios within given boiling point ranges

The output is a three-dimensional oil spill model (SIMAP) which simulates the drift, spread, weathering and fate of the spilled oil.

As spills can occur during any set of wind and current conditions, modelling is conducted using a stochastic (random or non-deterministic) approach, which involves running 100 spill simulations for the scenario, initiated at random start times. This ensures that each simulation is subject to different wind and current conditions and, in turn, movement and weathering of the oil.

Results from the simulations then are combined and statistically analysed to assist with understanding the potential impacts of an oil spill as discussed below.

Oil spill modelling is used to determine the total area that could be exposed to hydrocarbon, including trace concentrations of oil in the water column, as a result of <u>any</u> spill. This is known as the Potentially Exposed Area (PEA) and is used for planning purposes to ensure that all social and environmental sensitivities are acknowledged, described and considered in the development of the Environment Plan. Thresholds, or exposure levels used to define the PEA are shown in Table 7-2.

Table 7-2 Thresholds used to define the PEA

Exposure Level	Threshold	Description
Surface – Low Exposure	1 g/m^2	Approximates range of socio-economic effects and establishes planning area for scientific monitoring (NOPSEMA 2019)
Shoreline – Low Exposure	10 g/m^2	Predicts potential for some socio-economic impact (NOPSEMA 2019)
In-water (dissolved) – Low Exposure	10 ppb (instantaneous)	Establishes planning area which may be considered for scientific monitoring based on potential for exceedance of water quality triggers (NOPSEMA 2019).
In-water (entrained) – Low Exposure	10 ppb (instantaneous)	Establishes planning area which may be considered for scientific monitoring based on potential for exceedance of water quality triggers (NOPSEMA 2019).

Modelling is also used to inform specific impact assessments by understanding the location and extent of oil at concentrations likely to result in environmental consequences. There is no agreed exposure level below which environmental impacts will not occur, so outputs should not be interpreted as a boundary. However, mapping areas which could be moderately impacted by a spill is a useful tool for impact or consequence assessment.

Note that the modelling does not take into consideration any of the spill prevention, mitigation and response capabilities that might be in place during the operations. The modelling makes no allowance for intervention following a spill to reduce volumes and/or prevent hydrocarbons from reaching sensitive areas.

Fate and weathering characteristics of spilled oil are also useful inputs for impact assessment as these provide insight into which environmental sensitivities are most likely to be affected (e.g. surface oil effects on wildlife vs. water quality effects on aquatic species) as well as the persistence and duration of exposure to oil as it weathers. Prediction of the fate and weathering of spilled oil is completed using deterministic modelling, that is, one of the 100 simulations used to complete stochastic modelling is selected for further analysis. Selection is based on the ‘worst case’ considering the fate of modelled oil.

Oil spill response operations are typically confined to those areas where oil is present in sufficient quantities to enable them to be effective. Spill modelling enables maps to be generated which define these areas to enable effective response planning and capability assessment. Further details can be found in Volume 3 and the OPEP.

Table 7-3 Operations Activities –Risk Scoping

Activity	Aspect	Risk	Affected Receptor	Consequence Evaluation	Consequence Level	Likelihood	Risk Ranking	Demonstration of ALARP				Demonstration of Acceptability	
								ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
Platform Operations	Accidental Release - Dropped Objects Dropped objects can occur from lifting / crane operations.	Change in habitat Dropped objects can change habitat through the presence of a foreign object, and through dragging of equipment across the seabed. Risks are restricted to the Operational Area	Benthic habitats and communities	Alteration to benthic habitats, including destruction of habitat, as a result of a dropped object on the seabed can affect benthic habitats and communities. Benthic habitats and communities within the Bass Strait show natural small scale variation; however, the area is mostly considered homogenous. Studies conducted by Esso (Cardno, 2019) demonstrate similarities in taxa but variation in composition between different sites. High rates of disturbance to benthic communities, such as long term disturbance from dredging or trawl fishing, can lead to reduced habitat structure. This results in homogenous, low diversity communities and loss of large and long-lived sedentary species that create habitat structure and leads to reductions in primary production and ecosystem function (Handley et al., 2014). Disturbance from dropped objects during platform operations is not expected to result in high rates of disturbance at this scale, however it is possible that small scale disturbance will lead to similar outcomes. Change in habitat from dropped objects will be limited to close proximity to existing infrastructure. Benthic habitats and communities within the Operational Area show natural small scale variation, however, are mostly homogenous, with no particular areas of value or sensitivity. It is possible that activities will produce a slight alteration of the local habitat and community structure due to the small amount of changed substrate in an area of uniform soft sediments; however the naturally homogenous nature of the habitats and communities in the Operational Area will result in quick recovery, and no long-term changes to ecosystem are expected. Any impacts will be	IV	C	4	A	**CM41**: Crane maintenance and inspection programs developed and actioned per FIMS process **CM42**: Crane Operations, Maintenance and Inspection Manual (COMI) - Lifting Procedures **CM6:** Temporary Storage Assessment	None	ALARP	• Risk is well understood • Level of Environmental Risk is below 1. • No potential to affect biological diversity or ecological integrity • Activity will not result in serious or irreversible damage • Good practice control measures have been defined and implemented • Control measures are consistent with Esso's Environment Policy • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	Acceptable

Activity	Aspect	Risk	Affected Receptor	Consequence Evaluation	Consequence Level	Likelihood	Risk Ranking	Demonstration of ALARP: ALARP Decision Context	Demonstration of ALARP: Good Practice Control Measures	Demonstration of ALARP: Additional Control Measures Considered	Demonstration of ALARP: ALARP Outcome	Demonstration of Acceptability: Acceptability Assessment	Demonstration of Acceptability: Acceptability Outcome
				inconsequential or have no adverse effects.									
Platform Operations Subsea facilities Operations Pipeline Operations	<u>Accidental Release – LOC (chemicals / hydraulic fluids)</u> Chemical or oil spills resulting from a single-point failure typically occur because of: equipment failure incorrect storage incorrect handling Includes drips and drops, water soluble chemicals released from the piles, oil & chemical storage and handling scenarios, and firefighting foam used during a fire. Volumes typically 80 L.	<u>Change in water quality</u> Accidental release can lead to toxicity impacts near the spill location.	Ambient water quality	Minor spill volumes can lead to a change in water quality through toxicity. The aqueous film forming foam (AFFF) contain some PFAS (per- and poly-fluoroalkyl substances) – based products. A release of AFFF will result in a change in water quality due to chemical toxicity. Due to the high energy marine environment, impacts will be limited to the discharge location and will be quickly dissipated. Any impacts will be inconsequential or have no adverse effects.	IV	B	4	A	**CM66:** PTW system **CM44:** Bunding **CM13:** Platform Induction Process (GreenCard) **CM3:** Chemical Discharge Assessment Process (Fire Fighting Foams) **CM12:** OPEP	None	ALARP	• Risk is well understood • Level of Environmental Risk is below 1. • No potential to affect biological diversity or ecological integrity • Activity will not result in serious or irreversible damage • Activity will not impact the long term survival and recovery of listed and threatened marine mammals, marine reptiles and birds and will be undertaken in accordance with all applicable management actions. • Good practice control measures have been defined and implemented • Control measures are consistent with Esso's Environment Policy • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives which outlines what defines a significant spill. • No stakeholder objections or claims have been raised	Acceptable
		<u>Injury / mortality to fauna</u> Accidental release can lead to toxicity impacts near the spill location, however due to the high-energy nature of the receiving water column, impacts are expected to be localised and temporary.	Plankton	Early lifestages of fish (embryos, larvae) and other plankton would be most susceptible to the toxic exposure from an unplanned release of chemicals / hydraulic fluids, as they are less mobile and therefore can become exposed to the plume at the outfall. Phytoplankton are typically not sensitive to the impacts of oil, though they do accumulate it rapidly, whilst zooplankton are known to be vulnerable to hydrocarbons (Hook et al., 2016). Water column organisms that come into contact with oil risk exposure through ingestion, inhalation and dermal contact (NRDA, 2012), which can cause immediate mortality or declines in egg production and hatching rates along with a decline in swimming speeds (Hook et al., 2016). Firefighting foams are a mixture of chemicals. Fluorochemical containing foams such as AFFF have the potential to cause long lasting (chronic) effects if continuous exposure occurs due to high bioaccumulation potential. Marine fauna known to bioaccumulate fluorochemicals, such as plankton, are the most affected (Klein, 2009). Plankton is generally abundant in the upper layers of the water column and are expected to rapidly recover once									

Activity	Aspect	Risk	Affected Receptor	Consequence Evaluation	Consequence Level	Likelihood	Risk Ranking	Demonstration of ALARP: ALARP Decision Context	Demonstration of ALARP: Good Practice Control Measures	Demonstration of ALARP: Additional Control Measures Considered	Demonstration of ALARP: ALARP Outcome	Demonstration of Acceptability: Acceptability Assessment	Demonstration of Acceptability: Acceptability Outcome
				the releases ceases as they are known to have high levels of natural mortality and a rapid replacement rate (UNEP 1985). Reproduction by survivors or migration from unaffected areas is likely to rapidly replenish losses (Volkman et al., 2004). As such, exposure of planktonic communities to accidental chemical and hydraulic fluid discharges is not considered to result in significant impacts on these organisms at population levels that would affect ecological diversity or productivity within Commonwealth marine areas. Rather it is considered to result in an undetectable or limited local degradation of the environment, rapidly returning to original state by natural action. Once background water quality is re-established, plankton takes weeks to months to recover (ITOPF, 2011). Any impacts will be inconsequential or have no adverse effects.									
			Fish	Toxic exposure from small volumes of released chemicals and hydrocarbons can affect fish in close vicinity to the discharge through dermal contact, ingestion and inhalation. Pelagic species are generally highly mobile and as such are not likely to suffer extended exposure (e.g. >96 hours) at concentrations that would lead to chronic effects due to their patterns of movement. Many fish species can metabolise toxic hydrocarbons, which reduces the risk of bioaccumulation (NRDA, 2012). The Operational Area is within a distribution BIA for the great white shark; however, no threats have been identified in the Recovery Plan for the White Shark (*Carcharodon carcharias*). Fish communities in the Operational Area are typical of the region. Listed threatened species which may occur; however, any impacts will be localised to the release site and temporary, with hydrocarbon /									

Activity	Aspect	Risk	Affected Receptor	Consequence Evaluation	Consequence Level	Likelihood	Risk Ranking	Demonstration of ALARP: ALARP Decision Context	Demonstration of ALARP: Good Practice Control Measures	Demonstration of ALARP: Additional Control Measures Considered	Demonstration of ALARP: ALARP Outcome	Demonstration of Acceptability: Acceptability Assessment	Demonstration of Acceptability: Acceptability Outcome
				chemical releases dissipating quickly in the high energy marine environment and fish species not expected to suffer extended exposure. Impacts are not expected to result in population or ecosystem level effects and will not affect the long-term survival or recovery of listed threatened species. Any impacts will be inconsequential or have no adverse effects.									
Platform Operations	Accidental Release - Waste Non-hazardous waste can be accidentally released through inappropriate storage and handling.	Change in habitat Non-hazardous waste can become marine debris, changing the habitat for marine fauna.	Benthic habitats and communities	Some waste materials released may sink to the seabed in close proximity to the release site. These materials will rest on the seabed, resulting in smothering to benthic fauna and a localised change in habitat. Change in habitat from accidental release of waste will be limited to the Operational Area. Benthic habitats and communities within the Operational Area show natural small scale variation, however, are mostly homogenous, with no particular areas of value or sensitivity. It is possible that activities will produce a slight alteration of the local habitat and community structure due to the small amount of changed substrate in an area of uniform soft sediments; however the naturally homogenous nature of the habitats and communities in the Operational Area will result in quick recovery, and no long-term changes to ecosystem are expected. Any impacts will be inconsequential or have no adverse effects.	IV	B	4	A	**CM13:** Platform induction process (Greencard) **CM45:** Waste Management Manual	None	ALARP	• Risk is well understood • Level of Environmental Risk is below 1. • No potential to affect biological diversity or ecological integrity • Activity will not result in serious or irreversible damage. • Activity will not impact the long term survival and recovery of listed and threatened birds, marine mammals or marine reptiles and will be undertaken in accordance with all applicable management actions. • Good practice control measures have been defined and implemented • Control measures are consistent with Esso's Environment Policy • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	Acceptable
		Injury / mortality to fauna Non-hazardous waste can cause physical harm to marine fauna through ingestion or entanglement.	Birds Marine reptiles Marine mammals	Marine fauna most at risk from marine pollution include marine mammals, marine reptiles and seabirds through ingestion or entanglement. Impact will occur to species on the sea surface or in the surface waters. The ingestion or entanglement of marine fauna has the potential to limit feeding / foraging behaviours and thus can result in mortalities. The Operational Area is within a number of seabird foraging BIAs, and a foraging BIA for pygmy blue									

Activity	Aspect	Risk	Affected Receptor	Consequence Evaluation	Consequence Level	Likelihood	Risk Ranking	Demonstration of ALARP: ALARP Decision Context	Demonstration of ALARP: Good Practice Control Measures	Demonstration of ALARP: Additional Control Measures Considered	Demonstration of ALARP: ALARP Outcome	Demonstration of Acceptability: Acceptability Assessment	Demonstration of Acceptability: Acceptability Outcome
				whale. Marine turtles are not expected to occur regularly within the Operational Area, although their presence is possible. Non-hazardous pollution of this kind is not listed as a threat to any marine fauna. Listed threatened species of marine fauna may occur within the Operational Area; however, any impacts will be localised to the release site and affect individual fauna only. Impacts are not expected to result in population or ecosystem level effects and will not affect the long-term survival or recovery of listed threatened species. Any impacts will be inconsequential or have no adverse effects.									
Platform Operations	<u>Accidental Release - Bulk Transfer</u> Bulk transfer of glycol, methanol, brine, workover fluids or diesel fuel from vessel to platform is conducted using flexible hoses. Accidental release may occur with hose failure. Maximum release <1000 litres.	<u>Injury / mortality to fauna</u> Spills of hydrocarbons and chemicals can lead to toxicity impacts near the spill location.	Plankton	Early lifestages of fish (embryos, larvae) and other plankton would be most susceptible to the toxic exposure from an unplanned release of chemicals / hydrocarbons, as they are less mobile and therefore can become exposed to the plume at the outfall. However, these are expected to rapidly recover once the activity ceases, as they are known to have high levels of natural mortality and a rapid replacement rate (UNEP, 1985). As such, exposure of planktonic communities to accidental chemical and hydrocarbon discharges is not considered to result in significant impacts on these organisms at a population level that would affect ecological diversity or productivity within Commonwealth marine areas. Rather, it is considered to result in an undetectable or limited local degradation of the environment, rapidly returning to original state by natural action. Any impacts will be inconsequential or have no adverse effects.	IV	D	4	A	**CM46:** Equipment strategy for bulk transfer hoses developed per requirements of Pressure Equipment Inspection Program Manual. **CM14:** Procedures for bulk transfer of fluids from supply vessels.	None	ALARP	• Risk is well understood • Level of Environmental Risk is below 1. • No potential to affect biological diversity or ecological integrity • Activity will not result in serious or irreversible damage • Activity will not impact the long term survival and recovery of listed and threatened fish species and will be undertaken in accordance with all applicable management actions. • Good practice control measures have been defined and implemented • Control measures are consistent with Esso's Environment Policy • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives	• Acceptable
			Fish	Toxic exposure can affect fish through dermal contact, ingestion and inhalation.									

Activity	Aspect	Risk	Affected Receptor	Consequence Evaluation	Consequence Level	Likelihood	Risk Ranking	Demonstration of ALARP				Demonstration of Acceptability	
								ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
				Given the maximum release volume, surface and entrained oil concentrations are possible. Fish are at risk from dissolved hydrocarbons and entrained hydrocarbons in the water column. Some fish are attracted to floating objects at sea and may congregate under slicks. Pelagic species are generally highly mobile and as such are not likely to suffer extended exposure (e.g. >96 hours) at concentrations that would lead to chronic effects due to their patterns of movement. Many fish species can metabolise toxic hydrocarbons, which reduces the risk of bioaccumulation (NRDA, 2012). Fish are most vulnerable to water column toxicity in shallow nearshore waters, bays and estuaries, where the toxicity concentration can significantly rise. In the open marine environment, dilution is likely, and impacts are significantly reduced. The Operational Area is within a distribution BIA for great white shark; however, no threats have been identified in the Recovery Plan for the White Shark (*Carcharodon carcharias*). Fish communities in the Operational Area are typical of the region. Listed threatened species may occur; however, any impacts will be localised to the release site and temporary, with hydrocarbon / chemical releases dissipating quickly in the high energy marine environment and fish species are not expected to suffer extended exposure. Impacts are not expected to result in population or ecosystem level effects and will not affect the long-term survival or recovery of listed threatened species. Any impacts will be inconsequential or have no adverse effects.								• No stakeholder objections or claims have been raised	
Pipeline Operations	Accidental Release – LOC (pipeline) •	• Detailed Evaluation in Section 6.5											

Activity	Aspect	Risk	Affected Receptor	Consequence Evaluation	Consequence Level	Likelihood	Risk Ranking	Demonstration of ALARP				Demonstration of Acceptability	
								ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
Platform Operations	<u>Accidental Release - LOC (bulk storage, topside)</u> IBCs located on the main deck store fuel and chemicals. IBC volumes are typically 1250 L. Bulk storage occurs in the jacket legs on several platforms. An accidental release would be a pinhole leak only. An IBC represents the worst-case discharge scenario, and therefore pinhole leaks from jacket bulk storage are not discussed further.	<u>Change in water quality</u> Spills of hydrocarbons and chemicals can lead to toxicity impacts near the spill location.	Ambient water quality	IBCs are typically 1250 Litres in volume. When stored on the main deck, a spill from an IBC would go to the open drain. A release of chemical of hydrocarbons (diesel) from bulk storage via the open drains would lead to a change in water quality through toxicity. Due to the high energy marine environment, impacts will be limited to the discharge location and will be quickly dissipated. Any impacts will be inconsequential or have no adverse effects.	IV	D	4	A	**CM39:** Equipment strategies for pressure equipment developed and actioned per FIMS process **CM54:** Change out of IBC operating procedures **CM12:** OPEP	None	ALARP	• Risk is well understood • Level of Environmental Risk is below 1. • No potential to affect biological diversity or ecological integrity • Activity will not result in serious or irreversible damage • Activity will not impact the long term survival and recovery of listed and threatened fish species and will be undertaken in accordance with all applicable management actions. • Good practice control measures have been defined and implemented • Control measures are consistent with Esso's Environment Policy • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	• Acceptable
		<u>Injury / mortality to fauna</u>	Plankton	Early lifestages of fish (embryos, larvae) and other plankton would be most susceptible to the toxic exposure from an unplanned release of chemicals / hydrocarbons, as they are less mobile and therefore can become exposed to the plume at the outfall. However, these are expected to rapidly recover once the activity ceases, as they are known to have high levels of natural mortality and a rapid replacement rate (UNEP, 1985). As such, exposure of planktonic communities to accidental chemical and hydrocarbon discharges is not considered to result in significant impacts on these organisms at a population level that would affect ecological diversity or productivity within Commonwealth marine areas. Rather, it is considered to result in an undetectable or limited local degradation of the environment, rapidly returning to original state by natural action. Any impacts will be inconsequential or have no adverse effects.									
			Fish	Toxic exposure can affect fish through dermal contact, ingestion and inhalation. Given the maximum release volume, surface and entrained oil concentrations are possible. Fish are at risk from dissolved hydrocarbons and entrained hydrocarbons in the water column. Some fish are attracted to floating									

Activity	Aspect	Risk	Affected Receptor	Consequence Evaluation	Consequence Level	Likelihood	Risk Ranking	Demonstration of ALARP				Demonstration of Acceptability	
								ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
				objects at sea and may congregate under slicks. Pelagic species are generally highly mobile and as such are not likely to suffer extended exposure (e.g. >96 hours) at concentrations that would lead to chronic effects due to their patterns of movement. Many fish species can metabolise toxic hydrocarbons, which reduces the risk of bioaccumulation (NRDA, 2012). Fish are most vulnerable to water column toxicity in shallow nearshore waters, bays and estuaries, where the toxicity concentration can significantly rise. In the open marine environment, dilution is likely, and impacts are significantly reduced. The Operational Area is within a distribution BIA for great white shark; however, no threats have been identified in the Recovery Plan for the White Shark (*Carcharodon carcharias*). Fish communities in the Operational Area are typical of the region. Listed threatened species which may occur; however, any impacts will be localised to the release site and temporary, with hydrocarbon / chemical releases dissipating quickly in the high energy marine environment and fish species not expected to suffer extended exposure. Impacts are not expected to result in population or ecosystem level effects and will not affect the long-term survival or recovery of listed threatened species. Any impacts will be inconsequential or have no adverse effects.									
Platform Operations	Accidental Release – LOC from drain system	**Detailed Evaluation Section 7.4**											
Platform Operations Subsea facilities operations	Accidental Release - Loss of Well Control	**Detailed Evaluation Section 7.6**											

Table 7-4 Wellwork Activities – Risk Scoping

Activity	Aspect	Risk	Affected Receptor	Consequence Evaluation	Consequence Level	Likelihood	Risk Ranking	Demonstration of ALARP				Demonstration of Acceptability	
								ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
Wireline / Workover Activities (general) Conductor cutting and pulling	Accidental Release - Dropped Objects During wellwork activities, objects could be accidentally dropped onto the seabed.	Change in habitat Dropped objects can change habitat through the presence of a foreign object, and through dragging of equipment across the seabed. Risks are restricted to the Operational Area	Benthic habitats and communities	Alteration to benthic habitats, including destruction of habitat, as a result of a dropped object on the seabed can affect benthic habitats and communities. Benthic habitats and communities within the Bass Strait show natural small scale variation; however, the area is mostly considered homogenous. Studies conducted by Esso (Cardno, 2019) demonstrate similarities in taxa but variation in composition between different sites. High rates of disturbance to benthic communities, such as long term disturbance from dredging or trawl fishing, can lead to reduced habitat structure. This results in homogenous, low diversity communities and loss of large and long-lived sedentary species that create habitat structure and leads to reductions in primary production and ecosystem function (Handley et al., 2014). Disturbance from dropped objects during wellwork activities is not expected to result in high rates of disturbance at this scale, however it is possible that small scale disturbance will lead to similar outcomes. Change in habitat from dropped objects will be limited to close proximity to existing infrastructure. Benthic habitats and communities within the Operational Area show natural small scale variation, however, are mostly homogenous, with no particular areas of value or sensitivity. It is possible that activities will produce a slight alteration of the local habitat and community structure due to the small amount of changed substrate in an area of uniform soft sediments; however the naturally homogenous nature of the habitats and communities in the Operational Area will result in quick recovery, and no long-term changes to ecosystem are expected. Any impacts will be inconsequential or have no adverse effects.	IV	C	4	A	**CM41:** Crane maintenance and inspection programs developed and actioned per FIMS process **CM42:** Crane Operations, Maintenance and Inspection Manual (COMI) - Lifting Procedures	None	ALARP	• Risk is well understood • Level of Environmental Risk is below 1. • No potential to affect biological diversity or ecological integrity • Activity will not result in serious or irreversible damage • Good practice control measures have been defined and implemented • Control measures are consistent with Esso's Environment Policy • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	Acceptable
Cementing	Accidental Release – Cement During cementing operations, an	Change in habitat Mixed cement discharged will harden quickly at the discharge	Benthic habitats and communities	Although the discharge of cement is unplanned, impacts to benthic habitats and communities would be the same as those described for a planned release.	IV	C	4	A	None identified	None	ALARP	• Risk is well understood • Level of Environmental Risk is below 1.	Acceptable

Activity	Aspect	Risk	Affected Receptor	Consequence Evaluation	Consequence Level	Likelihood	Risk Ranking	Demonstration of ALARP: ALARP Decision Context	Demonstration of ALARP: Good Practice Control Measures	Demonstration of ALARP: Additional Control Measures Considered	Demonstration of ALARP: ALARP Outcome	Demonstration of Acceptability: Acceptability Assessment	Demonstration of Acceptability: Acceptability Outcome
	accidental release of cement could occur.	location, resulting in a change in habitat.		Benthic habitats and communities within the Operational Area show natural small scale variation, however, are mostly homogenous, with no particular areas of value or sensitivity. It is possible that activities will produce a slight alteration of the local habitat and community structure due to the small amount of changed substrate in an area of uniform soft sediments, however the naturally homogenous nature of the habitats and communities in the Operational Area will result in quick recovery, and no long-term changes to ecosystems are expected. Any impacts will be inconsequential or have no adverse effects.								• No potential to affect biological diversity or ecological integrity • Activity will not result in serious or irreversible damage • No control measures identified which can further lower the impact consequence or reduce the likelihood of occurrence. • Control measures are consistent with Esso's Environment Policy • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	
Wireline / Workover Activities (general)	<u>Accidental Release - LOC (chemicals / hydraulic fluids)</u> Chemical or hydraulic fluid spills resulting from a single-point failure typically occur because of: • equipment failure • incorrect storage • incorrect handling Includes drips and drops, and oil & chemical storage and handling scenarios. Volumes typically 80 L.	<u>Change in water quality</u> Accidental release can lead to toxicity impacts near the spill location.	Ambient water quality	Minor spill volumes can lead to a change in water quality through toxicity. Due to the high energy marine environment, impacts will be limited to the discharge location and will be quickly dissipated. Any impacts will be inconsequential or have no adverse effects.	IV	C	4	A	**CM15:** Preventative Maintenance System	None	ALARP	• Risk is well understood • Level of Environmental Risk is below 1. • No potential to affect biological diversity or ecological integrity • Activity will not result in serious or irreversible damage • Activity will not impact the long term survival and recovery of listed and threatened fish species and will be undertaken in accordance with all applicable management actions. • Good practice control measures have been defined and implemented • Control measures are consistent with Esso's Environment Policy • The activity meets ExxonMobil Environmental	Acceptable
		<u>Injury / mortality to fauna</u> Accidental release can lead to toxicity impacts near the spill location, however due to the high-energy nature of the receiving water column, impacts are expected to be localised and temporary.	Plankton	Early lifestages of fish (embryos, larvae) and other plankton would be most susceptible to the toxic exposure from an unplanned release of chemicals / hydraulic fluids, as they are less mobile and therefore can become exposed to the plume at the outfall. Phytoplankton are typically not sensitive to the impacts of oil, though they do accumulate it rapidly, whilst zooplankton are known to be vulnerable to hydrocarbons (Hook et al., 2016). Water column organisms that come into contact with oil risk exposure through ingestion, inhalation and dermal contact (NRDA, 2012), which can cause immediate mortality or declines in egg production and hatching rates along with a decline in swimming speeds (Hook et al., 2016). Plankton is generally abundant in the upper layers of the water column and are expected to rapidly recover once the									

Activity	Aspect	Risk	Affected Receptor	Consequence Evaluation	Consequence Level	Likelihood	Risk Ranking	Demonstration of ALARP				Demonstration of Acceptability	
								ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
				releases ceases as they are known to have high levels of natural mortality and a rapid replacement rate (UNEP 1985). Reproduction by survivors or migration from unaffected areas is likely to rapidly replenish losses (Volkman et al., 2004). As such, exposure of planktonic communities to accidental chemical and hydraulic fluid discharges is not considered to result in significant impacts on these organisms at population levels that would affect ecological diversity or productivity within Commonwealth marine areas. Rather it is considered to result in an undetectable or limited local degradation of the environment, rapidly returning to original state by natural action. Once background water quality is re-established, plankton takes weeks to months to recover (ITOPF, 2011). Any impacts will be inconsequential or have no adverse effects.								Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	
			Fish	Toxic exposure from small volumes of released chemicals and hydrocarbons can affect fish in close vicinity to the discharge through dermal contact, ingestion and inhalation. Pelagic species are generally highly mobile and as such are not likely to suffer extended exposure (e.g. >96 hours) at concentrations that would lead to chronic effects due to their patterns of movement. Many fish species can metabolise toxic hydrocarbons, which reduces the risk of bioaccumulation (NRDA, 2012). The Operational Area is within a distribution BIA for the great white shark; however, no threats have been identified in the Recovery Plan for the White Shark (*Carcharodon carcharias*). Fish communities in the Operational Area are typical of the region. Listed threatened species which may occur; however, any impacts will be localised to the release site and temporary, with hydrocarbon / chemical releases dissipating quickly in the high energy marine environment and fish species not expected to suffer extended exposure. Impacts are not expected to result in population or ecosystem level effects and will not affect the long-term survival or recovery of listed threatened species.									

Activity	Aspect	Risk	Affected Receptor	Consequence Evaluation	Consequence Level	Likelihood	Risk Ranking	Demonstration of ALARP				Demonstration of Acceptability	
								ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
				Any impacts will be inconsequential or have no adverse effects.									
Wireline / Workover Activities (general)	Accidental Release - Loss of Well Control	**Detailed Evaluation Section 7.6**											

Table 7-5 IMR Activities – Risk Scoping

Activity	Aspect	Risk	Affected Receptor	Consequence Evaluation	Consequence Level	Likelihood	Risk Ranking	Demonstration of ALARP: ALARP Decision Context	Demonstration of ALARP: Good Practice Control Measures	Demonstration of ALARP: Additional Control Measures Considered	Demonstration of ALARP: ALARP Outcome	Demonstration of Acceptability: Acceptability Assessment	Demonstration of Acceptability: Acceptability Outcome
Facility IMR	<u>Unplanned interaction with fauna</u> Interaction with fauna could occur through: Personnel accessing areas where wildlife is present Dropped objects Use of UAVs / drones. Deliberate harm from personnel acting against Esso policies	<u>Change in fauna behaviour, injury or death</u> Disruption to marine fauna could lead to a change in fauna behaviour, including startle response, injury or death. Risks are restricted to the Operational Area.	Birds	Although birds may use the facility for nesting, they are typically found high up on structures which are unable to be accessed by personnel (such as the flare boom) therefore interactions are unlikely. Birds are able to move freely away from personnel or noisy / moving equipment and startle responses such as flying away from a disturbance are unlikely to be detrimental, and birds will return to their nest / roost once the disturbance has passed. Occasionally, personnel may inadvertently come in contact with birds if they have landed on deck and are unable to fly away (e.g. injured or exhausted), in which case personnel are directed not to interact with the wildlife wherever practicable. Birds may also be disturbed by the use of UAVs. Drones are widely used in ornithological research, allowing data collection with minimal disturbance. Approach studies (e.g. Vas *et al.,* 2015) demonstrated that no visible change in behaviour occurred within 4 m of approach. The Operational Area is within foraging BIAs for black browed albatross, Campbell albatross, Indian yellow nosed albatross and wandering albatross, antipodean albatross, Buller's albatross, shy albatross, common diving petrel, white-faced storm petrel, and short-tailed shearwater. There are no specific areas of roosting or nesting within the Operational Area. Disturbance / disruption during roosting or nesting is not identified as a threat in the conservation advice or recovery plans for any of these species. Impacts will be short-term and temporary, with individuals returning to natural behaviours following disturbance. Any impacts will be inconsequential or have no adverse effects.	IV	B	4	B	**CM13:** Platform Induction Process (Greencard) **CM16:** SWP 50.139.A1 – Drone Operation Offshore **CM17:** SWP 50.313 – Sea Deck Access **CM53:** Onboarding process	NOT ADOPTED: Restricting access to all areas of the platform. Restricting access to all areas of the platform could minimise potential for personnel to come in contact with or interact with wildlife when not completing work activities, and hence, reduce the likelihood of deliberate or accidental harm to wildlife occurring on the platform. Access to all areas of the platform is required for safe operation of the platform, emergency escape routes, and safe access around the platform. Certain areas of the platform are restricted such as the helideck, sea deck, WTN RAT, MLB. It is not practical or realistic to confine personnel to the quarters for anything other than work based activities. NOT ADOPTED: Constant surveillance of all personnel. Constant surveillance may reduce the likelihood of personnel acting unlawfully on platforms and hence, reduce the likelihood of deliberate or accidental harm to wildlife occurring on the platform. Constant surveillance of personnel is not considered practical or reasonable. Screening of personnel prior to travelling offshore is considered sufficient to	ALARP	• Risk is well understood • Level of Environmental Risk is below 1. • No potential to affect biological diversity or ecological integrity • Activity will not result in serious or irreversible damage • Activity will not impact the long term survival and recovery of listed and threatened bird or marine mammal species and will be undertaken in accordance with all applicable management actions. • Good practice control measures have been defined and implemented • Control measures are consistent with Esso's Environment Policy • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • Stakeholder concerns were raised following an incident on a platform in 2018, these have been taken into account by Esso and have been addressed through the incident investigation and actions taken in response.	Acceptable
			Marine mammals	Marine mammals are known to occur within the Operational Area. Pinnipeds, specifically fur seal, have been sighted using the lower level sea deck as a haul-out site for resting. If an interaction occurs, pinnipeds are likely to startle quickly, moving away from the disturbance, therefore limiting impacts. Disturbance will be limited where possible i.e. through avoidance of areas where fauna is known to be resting. Seals may be inadvertently disturbed by personnel needing to go to sea deck for maintenance and inspections. Access to sea deck does not occur regularly and is restricted. Approval from the platform supervisor must be sought prior to accessing the area and the usual practice is for work to be deferred if seals are present in the work area. Personnel are generally not required to work in areas where seals are present and as a result the opportunity for personnel to intentionally interact with, or harm, seals is limited.									

Activity	Aspect	Risk	Affected Receptor	Consequence Evaluation	Consequence Level	Likelihood	Risk Ranking	Demonstration of ALARP: ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Demonstration of Acceptability: Acceptability Assessment	Acceptability Outcome
				Occasionally objects may be accidentally dropped from the platform subsequently resulting in inadvertent injury of seals hauled out on lower decks or in the waters around the platform. Potential impacts of dropped objects and the associated controls are discussed further below in Accidental Release – Dropped Objects. Marine mammals can be affected by UAVs in two ways: noise disturbance, and disturbance of visual cues caused by the UAV shadow. Recordings of in-water noise from UAVs indicate that they will only be detected above background noise levels up to 1 m below the surface and will likely be undetected against vessel / platform noise (Christiansen *et al.*, 2016). Evidence suggests that marine mammals residing near the sea surface do not typically display changes in behaviour in response to close flying UAVs (Christiansen *et al.,* 2016). Conversely, evidence suggests that pinnipeds in-air may be disturbed by UAVs. Studies show various reactions to UAV presence, with pinnipeds often returning to the water from haul-out sites as a result of UAV presence (Pomeroy *et al*., 2015). Returning to the water is a common reaction for pinnipeds, and could be caused by a number of factors, however disturbance from UAV presence cannot be ruled out. Australian and New Zealand fur seals known to be present within the Operational Area, although no BIAs have been identified. If accidental or deliberate harm occurred and resulted in death, it is not expected that it would have a detrimental effect on the overall population. Consequently, the potential consequence level is considered to be Consequence Level IV as this type of event may result in a localised, short-term impact to species of recognised conservation value but is not expected to affect the population or local ecosystem function. Given the limited number of listed species that have been observed on, or around, offshore facilities and the limited opportunities for personnel to interact with these species the likelihood of death or injury of an individual is considered Highly Unlikely (D) however given an incident of similar nature has occurred at site before, the probability of occurrence has been assessed to be Somewhat Likely (B).						manage the risk of criminal incidents occurring offshore. In addition, the Esso Standards of Business Conduct stipulate Esso's Environment and Ethics policies. All staff and contractors are expected to act in accordance with these policies and all applicable laws. Any breach of these policies will be investigated and managed in accordance with Esso's existing incident investigation processes. Persons found to have breached Esso Standards of Business Conduct may face consequences up to and including loss of employment at Esso facilities.			
Facility IMR Pipeline and Subsea IMR	<u>Accidental Release - Dropped Objects</u> Objects may be dropped during mechanical repairs,	<u>Change in habitat</u> Dropped objects can change habitat through the presence of a foreign object, and through	Benthic habitats and communities	Alteration to benthic habitats, including destruction of habitat, as a result of a dropped object on the seabed can affect benthic habitats and communities. Benthic habitats and communities within the Bass Strait show natural small scale variation; however, the area is mostly considered homogenous. Studies conducted by Esso (Cardno, 2019) demonstrate similarities in taxa but variation in composition between different sites.	IV	A	4	A	**CM41**: Crane maintenance and inspection programs developed and actioned per FIMS process	None	ALARP	• Risk is well understood • Level of Environmental Risk is below 1. • No potential to affect biological diversity or ecological integrity	Acceptable

Activity	Aspect	Risk	Affected Receptor	Consequence Evaluation	Consequence Level	Likelihood	Risk Ranking	Demonstration of ALARP				Demonstration of Acceptability	
								ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
	cutting of structures and piles and from vessel during subsea IMR activities.	dragging of equipment across the seabed. Risks are restricted to the Operational Area.		High rates of disturbance to benthic communities, such as long term disturbance from dredging or trawl fishing, can lead to reduced habitat structure. This results in homogenous, low diversity communities and loss of large and long-lived sedentary species that create habitat structure and leads to restrictions in primary production and ecosystem function (Handley et al., 2014). Disturbance from dropped objects during IMR activities is not expected to result in high rates of disturbance at this scale, however it is possible that small scale disturbance will lead to similar outcomes. Change in habitat from dropped objects will be limited to close proximity to existing infrastructure. Benthic habitats and communities within the Operational Area show natural small scale variation, however, are mostly homogenous, with no particular areas of value or sensitivity. It is possible that activities will produce a slight alteration of the local habitat and community structure due to the small amount of changed substrate in an area of uniform soft sediments; however the naturally homogenous nature of the habitats and communities in the Operational Area will result in quick recovery, and no long-term changes to ecosystem are expected. Any impacts will be inconsequential or have no adverse effects.					**CM42:** Crane Operations, Maintenance and Inspection Manual (COMI) - Lifting Procedures			• Activity will not result in serious or irreversible damage • Good practice control measures have been defined and implemented • Control measures are consistent with Esso's Environment Policy • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	
Facility IMR Pipeline and Subsea IMR	<u>Accidental Release – LOC (chemicals / hydraulic fluids)</u> Chemical or hydraulic fluid spills resulting from a single-point failure typically occur because of: equipment failure incorrect storage incorrect handling Includes drips and drops, and oil & chemical storage and handling scenarios.	<u>Change in water quality</u> Minor spill volumes can lead to toxicity impacts near the spill location.	Ambient water quality	Minor spill volumes can lead to a change in water quality through toxicity. Due to the high energy marine environment, impacts will be limited to the discharge location and will be quickly dissipated. Any impacts will be inconsequential or have no adverse effects.	IV	C	4	A	**CM44:** Bunding **CM13:** Platform induction process (Greencard)	None	ALARP	• Risk is well understood • Level of Environmental Risk is below 1. • No potential to affect biological diversity or ecological integrity • Activity will not result in serious or irreversible damage • Activity will not impact the long term survival and recovery of listed and threatened fish species and will be undertaken in accordance with all applicable management actions. • Good practice control measures have been defined and implemented • Control measures are consistent with Esso's Environment Policy • The activity meets ExxonMobil	Acceptable
		<u>Change in habitat</u> Mixed cement discharged will harden quickly at the discharge location, resulting in a change in habitat.	Benthic habitats and communities	Although the discharge of cement is unplanned, impacts to benthic habitats and communities would be the same as those described for a planned release. Benthic habitats and communities within the Operational Area show natural small scale variation, however, are mostly homogenous, with no particular areas of value or sensitivity. It is possible that activities will produce a slight alteration of the local habitat and community structure due to the small amount of changed substrate in an area of uniform soft sediments, however the naturally homogenous nature of the habitats and communities in the Operational Area will result in quick recovery, and no long-term changes to ecosystems are expected. Any impacts will be inconsequential or have no adverse effects.									
		<u>Injury / mortality to fauna</u>	Plankton	Early lifestages of fish (embryos, larvae) and other plankton would be most susceptible to the toxic exposure from an unplanned release of chemicals / hydraulic fluids, as they are less mobile and therefore can become									

Activity	Aspect	Risk	Affected Receptor	Consequence Evaluation	Consequence Level	Likelihood	Risk Ranking	Demonstration of ALARP				Demonstration of Acceptability	
								ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
	Volumes typically 80 L.			exposed to the plume at the outfall. Phytoplankton are typically not sensitive to the impacts of oil, though they do accumulate it rapidly, whilst zooplankton are known to be vulnerable to hydrocarbons (Hook et al., 2016). Water column organisms that come into contact with oil risk exposure through ingestion, inhalation and dermal contact (NRDA, 2012), which can cause immediate mortality or declines in egg production and hatching rates along with a decline in swimming speeds (Hook et al., 2016). Plankton is generally abundant in the upper layers of the water column and are expected to rapidly recover once the releases ceases as they are known to have high levels of natural mortality and a rapid replacement rate (UNEP 1985). Reproduction by survivors or migration from unaffected areas is likely to rapidly replenish losses (Volkman et al., 2004). As such, exposure of planktonic communities to accidental chemical and hydraulic fluid discharges is not considered to result in significant impacts on these organisms at population levels that would affect ecological diversity or productivity within Commonwealth marine areas. Rather it is considered to result in an undetectable or limited local degradation of the environment, rapidly returning to original state by natural action. Once background water quality is re-established, plankton takes weeks to months to recover (ITOPF, 2011). Any impacts will be inconsequential or have no adverse effects.								Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	
			Fish	Toxic exposure from small volumes of released chemicals and hydrocarbons can affect fish in close vicinity to the discharge through dermal contact, ingestion and inhalation. Pelagic species are generally highly mobile and as such are not likely to suffer extended exposure (e.g. >96 hours) at concentrations that would lead to chronic effects due to their patterns of movement. Many fish species can metabolise toxic hydrocarbons, which reduces the risk of bioaccumulation (NRDA, 2012). The Operational Area is within a distribution BIA for the great white shark; however, no threats have been identified in the Recovery Plan for the White Shark (*Carcharodon carcharias*). Fish communities in the Operational Area are typical of the region. Listed threatened species which may occur; however, any impacts will be localised to the release site and temporary, with hydrocarbon / chemical releases dissipating quickly in the high energy marine environment and fish species not expected to suffer extended exposure. Impacts are not expected to result in population or ecosystem level effects and will not affect the long-term survival or recovery of listed threatened species. Any impacts will be inconsequential or have no adverse effects.									

Table 7-6 Support Operations Activities – Risk Scoping

Activity	Aspect	Risk	Affected Receptor	Consequence Evaluation	Consequence Level	Likelihood	Risk Ranking	Demonstration of ALARP: ALARP Decision Context	Demonstration of ALARP: Good Practice Control Measures	Demonstration of ALARP: Additional Control Measures Considered	Demonstration of ALARP: ALARP Outcome	Demonstration of Acceptability: Acceptability Assessment	Demonstration of Acceptability: Acceptability Outcome
Vessel Operations	<u>Unplanned Interaction with Fauna</u> The presence of moving or stationary vessels may result in interaction with marine fauna such as collision	<u>Injury / mortality to fauna</u> Vessel strike can lead to injury or death. Risks are restricted to the Operational Area	Marine mammals - cetaceans	Cetaceans are naturally inquisitive animals that are often attracted to offshore vessels and facilities. Collisions between larger vessels with reduced manoeuvrability and large, slow-moving cetaceans occur more frequently where high vessel traffic and cetacean habitat co-exist (Whale and Dolphin Conservation Society, 2006). Laist et al. (2001) identifies that larger vessels with reduced manoeuvrability moving in excess of 10 knots may cause fatal or severe injuries to cetaceans, with the most severe injuries caused by vessels travelling faster than 14 knots. Vessels typically used to undertake petroleum activities do not have the same limitations on manoeuvrability and would not be moving at these speeds when conducting activities within the scope of this EP, inside the Operational Area. The Operational Area is within a foraging BIA for the pygmy blue whale. Vessel strike is identified as a key threat in the following: • Approved Conservation Advice for Balaenoptera borealis (Sei Whale) • Conservation Management Plan for the Blue Whale, 2015-2025 • Approved Conservation Advice for Balaenoptera physalus (Fin Whale) • Conservation Management Plan for the Southern Right Whale, 2011-2021 • Approved Conservation Advice for Megaptera novaeangliae (Humpback Whale) Given the potential presence of sensitive species, potential short-term, minor adverse effects are possible.	III	D	4	B	**CM8:** Vessel Master **CMP25:** Tunnel thruster guards	NOT ADOPTED (other than for cetaceans): Vessel Masters to implement interaction management actions consistent with Australian National Guidelines for Whale and Dolphin Watching 2017. Although these guidelines are more relevant for tourism activities, they provide a list of requirements that are generally adopted by the oil and gas industry to minimise the risk of cetacean strike occurring. Both the lack of visibility of seals in the water and number of seals in close proximity to oil and gas offshore installations, make applicability of these guidelines to seals impracticable. Furthermore fauna interaction management actions as described in the guidelines will not prevent seals approaching / playing with vessels.	ALARP	• Risk is well understood • Level of Environmental Risk is below 1. • No potential to affect biological diversity or ecological integrity • Activity will not result in serious or irreversible damage • Activity will not impact the long term survival and recovery of listed and threatened fish or marine mammals and will be undertaken in accordance with all applicable management actions. • Good practice control measures have been defined and implemented • No control measures which could further lower the consequence or likelihood have been identified • Control measures are consistent with Esso's Environment Policy • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	Acceptable
			Fish	Large slow-moving marine fauna, such as the whale shark, are most susceptible to vessel strike. There is limited data regarding strikes to whale sharks, possibly due to lack of collisions being noticed and lack of reporting; however, marks observed on animals show that strikes have occurred (Peel *et al*. (2016; cited in DoE, 2015a). The Approved Conservation Advice for Rhincodon typus (Whale Shark) identifies boat strike from large vessels as a threat. Whale sharks inhabit tropical and warm temperate waters, and in Australia occur mainly off the Northern territory, Queensland and northern Western Australia (DoE, 2015a). Only isolated records exist of Whale sharks off NSW, Victoria and South Australia (Last & Stevens, 2009). As the Operational Area is located outside of a BIA, any impacts will be to an individual only with no population or ecosystem-level impacts expected. Any impacts will be inconsequential or have no adverse effects.									

Activity	Aspect	Risk	Affected Receptor	Consequence Evaluation	Consequence Level	Likelihood	Risk Ranking	Demonstration of ALARP: ALARP Decision Context	Demonstration of ALARP: Good Practice Control Measures	Demonstration of ALARP: Additional Control Measures Considered	Demonstration of ALARP: ALARP Outcome	Demonstration of Acceptability: Acceptability Assessment	Demonstration of Acceptability: Acceptability Outcome
			Marine mammals - pinnipeds	Pinnipeds are not listed as a species vulnerable to vessel strike. This is likely due to their high level of activity within the water column, and their highly mobile nature. Peel *et al*. (2016) reviewed vessel strike data (1997-2015) and identified no vessel interaction reports during the period for either the Australian or New Zealand fur seal. There have been incidents of seals being injured by boat propellers around areas where they rest or congregate including oil and gas platform structures, however all indications are rather than 'boat strike' these can be attributed to be the seal interacting/playing with a boat, with experts indicating the incidence of boat strike for seals is very low. Pinnipeds are commonly seen on and around Esso platforms although there have only been 3 incidents reported in the last 10 years relating to interactions with vessels. Any potential impacts to pinnipeds would be on individuals, with no population or ecosystem level impacts expected.									
			Marine reptiles	Marine turtles are vulnerable to vessel collision, although collision is more likely in slow moving vessels (Hazel, 2007). There is limited data regarding marine turtle vessel strikes, however marks observed on animals show that strikes have occurred (Peel *et al*., 2016, cited in Commonwealth of Australia, 2016). Marine turtles are also vulnerable to entrainment in propellers or water intakes. Five listed / threatened species of marine turtle may occur within the Operational Area, however no BIAs or critical habitats have been identified and all marine turtles are known to have a more northerly distribution. Vessel disturbance is listed as a key threat in the Recovery Plan for Marine Turtles in Australia, 2017-2027; however, this is in reference to shallow coastal foraging and nesting sites where there is a high number of commercial and recreational vessels. As the Operational Area is located outside of a BIA / critical habitat, any impacts will be to an individual only with no population or ecosystem-level impacts expected. Any impacts will be inconsequential or have no adverse effects									
Vessel Operations	Unplanned Introduction of IMS	**Detailed Evaluation Section 7.3**											
Vessel Operations ROV Operations	Accidental Release - Dropped Objects Potential dropped objects may include personnel protective	Change in habitat Dropped objects can change habitat through the presence of a foreign object. Risks are restricted to the Operational Area	Benthic habitats and communities	Dropped objects can occur due to ineffective use of handling procedures, or storm / inclement weather conditions. The impact energy of an object free falling overboard as it hits the seafloor is influenced by several factors, including mass, shape of the object, water depth and prevailing currents (Sari et al. 2016). The mass of small objects such as glasses, gloves, hard hats, small tools and hardware fixtures is unlikely to contribute to impact energies with the potential to cause damage to benthic habitat.	IV	E	4	A	**CM18:** Preventative Maintenance System (PMS) **CM19:** Cargo	None	ALARP	• Risk is well understood • Level of Environmental Risk is below 1 • No potential to affect biological diversity or ecological integrity	• Acceptable

Activity	Aspect	Risk	Affected Receptor	Consequence Evaluation	Consequence Level	Likelihood	Risk Ranking	Demonstration of ALARP: ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Demonstration of Acceptability: Acceptability Assessment	Acceptability Outcome
	gear, small tools and hardware fixtures (e.g. clamps).			Where objects are dropped and remain on the seabed, colonisation by epifauna is expected. By providing a hard substrate on bare substrate, this will result in a localised change in biodiversity with fouling communities settling on the object. Dropped objects will eventually degrade but may take years. Change in habitat from dropped objects will be limited to the Operational Area. Benthic habitats and communities within the Operational Area show natural small scale variation, however, are mostly homogenous, with no particular areas of value or sensitivity. It is possible that activities will produce a slight alteration of the local habitat and community structure due to the small amount of changed substrate in an area of uniform soft sediments; however the naturally homogenous nature of the habitats and communities in the Operational Area will result in quick recovery, and no long-term changes to ecosystem are expected. Any impacts will be inconsequential or have no adverse effects.					Securing Manual **CM40**: Flag State lifting requirements			• Activity will not result in serious or irreversible damage • Good practice control measures have been defined and implemented • Control measures are consistent with Esso's Environment Policy • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	
Vessel Operations ROV Operations	<u>Accidental Release – LOC (chemicals / hydraulic fluids)</u> Chemical or hydraulic fluid spills resulting from a single-point failure typically occur because of: equipment failure incorrect storage incorrect handling Includes drips and drops, and oil & chemical storage and handling scenarios. Volumes typically 80 L.	<u>Change in water quality</u> Accidental release can lead to toxicity impacts near the spill location.	Ambient water quality	Minor spill volumes can lead to a change in water quality through toxicity. Due to the high energy marine environment, impacts will be limited to the discharge location and will be quickly dissipated. Any impacts will be inconsequential or have no adverse effects.	IV	C	4	A	<u>Vessel Operations</u> **CM20:** SMPEP <u>ROV Operations</u> **CM21:** ROV pre-post dive checks **CM22:** ROV IMCA Audit	None	ALARP	• Risk is well understood • Level of Environmental Risk is below 1. • No potential to affect biological diversity or ecological integrity • Activity will not result in serious or irreversible damage • Activity will not impact the long term survival and recovery of listed and threatened fish species and will be undertaken in accordance with all applicable management actions. • Good practice control measures have been defined and implemented • Control measures are consistent with	• Acceptable
		<u>Injury / mortality to fauna</u> Minor spill volumes can lead to toxicity impacts near the spill location, however due to the high-energy nature of the receiving water column, impacts are expected to be localised and temporary.	Plankton	Early lifestages of fish (embryos, larvae) and other plankton would be most susceptible to the toxic exposure from an unplanned release of chemicals / hydraulic fluids, as they are less mobile and therefore can become exposed to the plume at the outfall. However, these are expected to rapidly recover once the activity ceases, as they are known to have high levels of natural mortality and a rapid replacement rate (UNEP 1985). As such, exposure of planktonic communities to accidental chemical and hydraulic fluid discharges is not considered to result in significant impacts on these organisms at population levels that would affect ecological diversity or productivity within Commonwealth marine areas. Rather it is considered to result in an undetectable or limited local degradation of the environment, rapidly returning to original state by natural action. Any impacts will be inconsequential or have no adverse effects.									
			Fish	Toxic exposure from small volumes of released chemicals and hydrocarbons can affect fish in close vicinity to the discharge through dermal contact, ingestion and inhalation. Pelagic species are generally highly mobile and as such are not likely to suffer extended exposure (e.g. >96 hours) at concentrations that would lead to chronic effects due to their									

Activity	Aspect	Risk	Affected Receptor	Consequence Evaluation	Consequence Level	Likelihood	Risk Ranking	Demonstration of ALARP				Demonstration of Acceptability	
								ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Acceptability Assessment	Acceptability Outcome
				patterns of movement. Many fish species can metabolise toxic hydrocarbons, which reduces the risk of bioaccumulation (NRDA, 2012). The Operational Area is within a distribution BIA for the great white shark; however, no threats have been identified in the Recovery Plan for the White Shark (*Carcharodon carcharias*). Fish communities in the Operational Area are typical of the region. Listed threatened species which may occur; however, any impacts will be localised to the release site and temporary, with hydrocarbon / chemical releases dissipating quickly in the high energy marine environment and fish species not expected to suffer extended exposure. Impacts are not expected to result in population or ecosystem level effects and will not affect the long-term survival or recovery of listed threatened species. Any impacts will be inconsequential or have no adverse effects.								Esso's Environment Policy • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	
Vessel Operations	<u>Accidental Release - Waste</u> Non-hazardous waste can be accidentally released through inappropriate storage and handling.	<u>Change in habitat</u> Non-hazardous waste can become marine debris, changing the habitat for marine fauna.	Benthic habitats and communities	Some waste materials released may sink to the seabed in close proximity to the release site. These materials will rest on the seabed, resulting in smothering to benthic fauna and a localised change in habitat. Change in habitat from accidental release of waste will be limited to the Operational Area. Benthic habitats and communities within the Operational Area show natural small scale variation, however, are mostly homogenous, with no particular areas of value or sensitivity. It is possible that activities will produce a slight alteration of the local habitat and community structure due to the small amount of changed substrate in an area of uniform soft sediments; however the naturally homogenous nature of the habitats and communities in the Operational Area will result in quick recovery, and no long-term changes to ecosystem are expected. Any impacts will be inconsequential or have no adverse effects.	IV	E	4	A	**CM9:** Class Certification	None	ALARP	• Risk is well understood • Level of Environmental Risk is below 1. • No potential to affect biological diversity or ecological integrity • Activity will not result in serious or irreversible damage • Activity will not impact the long term survival and recovery of listed and threatened birds, marine reptiles or marine mammals and will be undertaken in accordance with all applicable management actions. • Activity will be undertaken in accordance with the management actions provided in the Threat Abatement Plan (2018). • Good practice control measures	• Acceptable
		<u>Injury / mortality to fauna</u> Non-hazardous waste can cause physical harm to marine fauna through ingestion or entanglement.	Birds Marine reptiles Marine mammals	Marine fauna most at risk from marine pollution include marine mammals, marine reptiles and seabirds through ingestion or entanglement. Impact will occur to species on the sea surface or in the surface waters. The ingestion or entanglement of marine fauna has the potential to limit feeding / foraging behaviours and thus can result in mortalities. The Operational Area is within a number of seabird foraging BIAs, and a foraging BIA for pygmy blue whale. Marine turtles are not expected to occur regularly within the Operational Area, although their presence is possible. Non-hazardous pollution of this kind is not listed as a threat to any marine fauna. The Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans (DoEE 2018) lists vessel-sourced, solid, non-biodegradable floating material as a threat to marine fauna.									

Activity	Aspect	Risk	Affected Receptor	Consequence Evaluation	Consequence Level	Likelihood	Risk Ranking	Demonstration of ALARP: ALARP Decision Context	Good Practice Control Measures	Additional Control Measures Considered	ALARP Outcome	Demonstration of Acceptability: Acceptability Assessment	Acceptability Outcome
				Listed threatened species of marine fauna may occur within the Operational Area; however, any impacts will be localised to the release site and affect individual fauna only. Impacts are not expected to result in population or ecosystem level effects and will not affect the long-term survival or recovery of listed threatened species. Any impacts will be inconsequential or have no adverse effects.								have been defined and implemented • Control measures are consistent with Esso's Environment Policy • Class certification ensures that vessels adhere to the rules of an IACS Member society, such as MARPOL requirements and Marine Orders. • The activity meets ExxonMobil Environmental Standards and ExxonMobil OIMS objectives • No stakeholder objections or claims have been raised	
Vessel Operations	Accidental Release - LOC (vessels)	**Detailed Evaluation Section 6.6**											

7.3 Unplanned Introduction of IMS

7.3.1 Causes of introduction of IMS

An invasive marine species (IMS) is a species occurring, as a result of human activities, beyond its accepted normal distribution and which threatens the environment, human health or economic values by the damage it causes (DoEE, 2019). Not all non-indigenous marine species introduced into new environments will cause demonstrable effects and become IMS; some are relatively benign, and few have spread widely beyond ports and harbours.

The following pathways have the potential to result in the introduction of IMS:

- discharge of ballast water from vessels containing IMS; and
- biofouling of the vessel hull and niches (e.g. sea chests, bilges, strainers) Risk Assessment

The translocation and establishment of IMS through biofouling or ballast water discharge has the potential to result in effects to seabed habitat and marine ecosystems due to:

- Changes in ecosystem dynamics.
- Changes in the functions, interests or activities of other users

Receptors that could be affected by the introduction and establishment of IMS are identified in Table 7-7.

Table 7-7 Receptors potentially affected by impacts associated with introduction of IMS

Impacts	Receptors	
	Benthic habitats and communities	Commercial Fisheries
Change in ecosystem dynamics	✓	
Changes in the functions, interests or activities of other users		✓

7.3.1.1 Change in ecosystem dynamics

Successful IMS establishment 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.

It is estimated that there are more than 250 exotic species in the Australian marine environment and that about one in six to one in ten introduced marine species become ‘pests’ (i.e. the effects of the introduced organisms are sufficiently severe) (McDonald, 2008).

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.

The benthic habitat within the PEA is characterised by a soft sediment and shell/rubble seabed, infauna communities, and sparse epibiotic communities (typically sponges). The nearest area of higher value or sensitivity, the Ninety Mile Beach Marine National Park on the Victorian coast, is located between 12 km (Seahorse) and 87 km (Blackback) inshore from the operational area. The Beware Reef Marine Sanctuary and Point Hicks Marine National Park (Figure 7-1) are located more than 40 km inshore from the operational area, with the Kipper and Tuna facilities nearest to these sites of conservation significance.

…

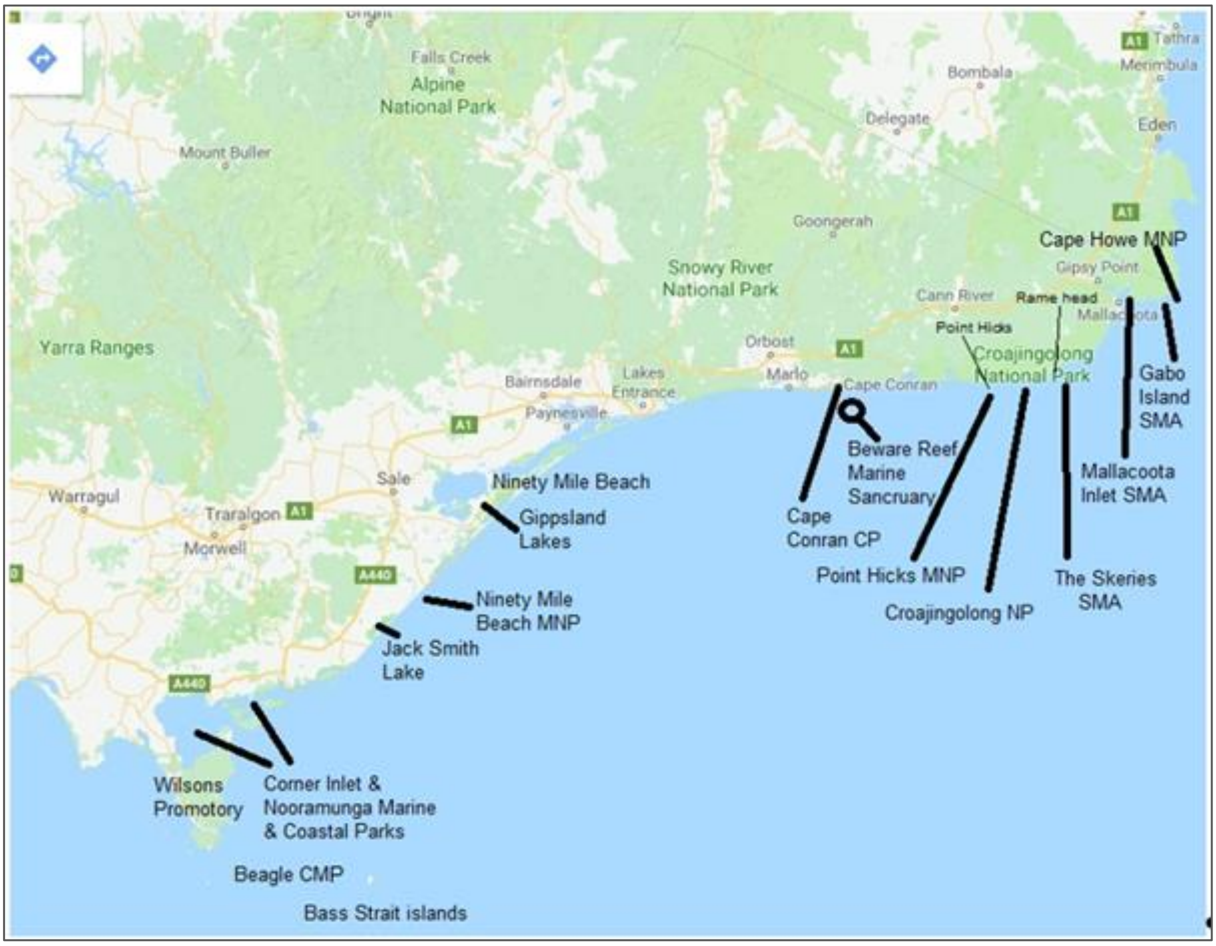


Figure 7-1 Sites of conservation significance along Gippsland Coastline

Once established, some pests can be difficult to eradicate (Hewitt, 2002) and therefore there is 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). Given that the habitat found within the PEA is mostly soft sediment, potential for settlement of IMS within the PEA is limited.

7.3.1.2 Change in the functions, interests or activities of other users

Marine pest species can also deplete fishing grounds and aquaculture stock, with between 10% and 40% of Australia's fishing industry being potentially vulnerable to marine pest incursion. For example, the introduction of the Northern Pacific seastar (*Asterias amurensis*) in Victorian and Tasmanian waters was linked to a decline in scallop fisheries (DSE, 2004). Similarly, the New Zealand screw shell (*Maoricolpus roseus*), thought to have been introduced on dry ballast or through the live oyster trade, may threaten other mollusc species, including scallops. The New Zealand screw shell can densely blanket the sea floor with live and dead shells and faecal pellets and therefore smother other seafloor species (ABC Science, 2000).

Marine pests can also damage marine and industrial infrastructure, such as encrusting jetties and marinas or blocking industrial water intake pipes. By building up on vessel hulls, they can slow the vessels down and increase fuel consumption.

7.3.1.3 Consequence evaluation

If an introduced IMS successfully established within an offshore area, it is expected that any colony would remain fragmented and isolated, and only within the vicinity of the facilities (i.e. it would not be able to propagate to nearshore environments, and protected marine areas present in the wider region). Therefore, there is the potential for a localised, but irreversible, impact to habitat that is not formally managed resulting in a **Level III** consequence.

7.3.1.4 Likelihood evaluation

Vessel movement, including support and supply vessels, workover rigs and well intervention vessels as well as submersible equipment and ROVs (especially those entering the Operational Area from interstate or internationally) may pose a risk of introducing IMS. The introduction of IMS is less likely for submersible equipment and workover rigs that are transported to site out of water, meaning that any biofouling generally dehydrates and dies (and may dislodge) between locations and is therefore less likely to survive in a new location (when the equipment is lowered into the water).

Compliance with regulatory requirements for the management of ballast water and ensuring all vessels are assessed as posing a low biofouling risk in accordance with national guidelines will significantly reduce the likelihood of translocation of an IMS. Successful colonisation in the recipient region would be difficult given the nature of the benthic habitats near the Operational Area (i.e. predominantly bare sands with patchy occurrences of hard substrate) and location outside of coastal waters where the risk of IMS establishment is considered greatest (Australian Government Bureau of Resource Sciences (BRS), 2007).

IMS management areas are typically defined as all nearshore waters, extending from the lowest astronomical tide mark to at least 12 nm from land and in all waters less than 50 m deep. Most platforms and facilities are outside of this management area, however BTA, BTW, SHA and TWA are close to the nearshore boundary and in water depths of less than 50 m. DPA and PCA are also within the potential management area, however vessel traffic is significantly reduced to these locations.

While the 12 nm / 50 metre depth boundary has a very clear legal basis, it also provides a natural buffer area between offshore areas and the nearshore habitats that are susceptible to IMS establishment. Many of the IMS have a planktonic larval stage. By maintaining the 12 nm / 50 m depth criteria, the effects of dispersal and dilution of IMS larvae significantly reduces the risk of successful establishment in susceptible nearshore environments. For example, BRS established that the relative risk of an IMS incursion decreases with distance from the shoreline. It is estimated that for Bass Strait, the IMS risk is reduced to a third at 3 NM from the nearest shore and to about 1% at 24 nm offshore.

For these reasons, it is considered **Very Unlikely (D)** that this activity would result in the introduction and establishment of an IMS and any subsequent impact to receptors.

7.3.2 Risk Ranking

Consequence	Likelihood	Risk Ranking
III	D	4

7.3.3 Controls

Good Practice	Adopted	Control	Rationale
Ballast Water Management	Yes	**CM23:** Ballast Water Management Plan **CM24:** Ballast Water Certificate	The Biosecurity Act 2015 requires that vessels have a Ballast Water Management Certificate (BWMC) and Ballast Water Management Plan (BWMP), and undertake reporting and management of ballast in accordance with the Act. The BWMP must: • be vessel specific (vessel name and International Maritime Organization (IMO) number) • be approved by a survey authority, recognised organisation, or the vessel's flag administration

Good Practice	Adopted	Control	Rationale
			• nominate the rank(s) of the responsible officer and crew • contain the ballast water management method and pumping rates. BWMPs should be consistent with the Ballast Water Convention's Guidelines for Ballast Water Management and Development of Ballast Water Management Plans (G4 Guidelines). A valid BWMC must be issued by either a survey authority, classification society, or the administration of the vessel, and be in accordance with Regulation E-1 of the Ballast Water Convention.
	Yes	**CM8:** Vessel Master	The Vessel Master has responsibility for ensuring these Requirements are followed ensuring Ballast water records show location of ballast water uptake and discharge.
	Yes	**CM25:** Biosecurity clearance when entering Australian territory	Vessels that are intending to discharge internationally sourced ballast water within Australian waters must submit a Ballast Water Report through Maritime Arrivals Reporting System (MARS) at least 12 hours prior to arrival to gain biosecurity clearance. The acceptable area for a ballast water exchange between an offshore oil and gas installation and an Australian port is in areas that are no closer than 500 m from the offshore installation and no closer than 12 NM from the nearest land and in water at least 50 m deep. Ballast tank sediment must be disposed of in an area outside 200 nautical miles from the nearest land, and in at least a depth of 200 metres, or at an approved land-based reception facility.
Biofouling Management	Yes	**CM26**: IMS Risk Assessment Procedure (IMS-RAP).	Biofouling risk is assessed in accordance with the National Biofouling Management Guidelines and documented through the IMS Risk Assessment Procedure (IMS-RAP). The IMS-RAP is to be applied to all contracted non-trading vessels undertaking petroleum activities in the Gippsland Basin. Consistent with the 'best practice' approach set out in the IMO Guidelines for the Management of Ships Biofouling (IMO Guidelines) (IMO, 2012) the risk assessment considers many parameters of the vessel or rig including (where relevant): • Transport method (dry versus wet haulage) • Presence and age of antifouling coating (AFC) • Evidence of in-water inspection by divers or inspection in dry dock and cleaning of hull • Presence and operation of internal seawater treatment systems if applicable • Duration of stay in overseas or interstate coastal waters • Location of operations (operational area), timings and durations. Where the initial indicative assessment (conducted by an IMS Expert and/or via the online Vessel Check portal

Good Practice	Adopted	Control	Rationale
			(www.vessel-check.com)) results in ‘Low Risk’, the risk assessment is provided to the Principal Officer Invasive Marine Species, DJPR. If the Principal Officer is satisfied that no further action is necessary following this consultation the vessel or rig is deemed acceptable for use. If the risk assessment result is uncertain or high risk, or further action is recommended by the Principal Officer, an IMS Expert is consulted to determine whether additional controls can be implemented to reduce the vessel risk status to ‘Low Risk’. Examples of potential control/mitigation measures to reduce risk that may be proposed are consistent with the NBMG and the IMO Guidelines. The control measures proposed must meet the standard of performance described in IMS-RAP. Following implementation of these mitigation measures, the IMS Expert is consulted to reassess the level of risk for the activity and determine whether the level of risk for the activity is ‘Low Risk’ and meets the ALARP and Acceptability criteria (Sections 3.7 and 3.8). If this process still results in an uncertain or high risk then an alternative vessel or rig must be sought for the activity.

7.3.4 Demonstration of ALARP

ALARP Decision Context and Justification	**Decision Context B** The causes resulting in an introduction of IMS from ballast water discharge or biofouling are well understood and well managed by national and international regulations and industry guidance. Esso is experienced in the implementation of industry requirements through their existing ongoing operations. Given the potential for an irreversible effect on the benthic habitat, there is the potential for **Consequence Level III** impacts. No stakeholder objections or claims were raised with regards to the risk of introduction and establishment of IMS. Based on the Level III consequence rating, Esso believes **ALARP Decision Context B** should apply. An Engineering Risk Assessment has been undertaken to assess the costs and benefits associated with additional, alternative and/or improved controls.		
Engineering Risk Assessment			
Additional, Alternative, Improved Controls	**Benefit**	**Cost / Feasibility**	**Adopted**
Use of freshwater ballast	By using freshwater ballast, the likelihood of introducing an IMS can be reduced. However, because the likelihood of the consequence is already low (see above), there is limited environmental benefit associated with implementing this measure.	Costs associated with this measure are high, and disproportionate to the benefit.	Not adopted

Use only support vessels that are currently operating in Bass Strait to reduce the potential for introduction of IMS.	By only using vessels that are currently operating in Bass Strait, the likelihood of introducing an IMS can be reduced. However, because the likelihood of the consequences is already low (see above), there is limited environmental benefit associated with implementing this measure.	Limiting support vessel selection to use of those currently operating in Bass Strait could potentially pose a significant risk in terms of time and duration for sourcing a vessel, as well as the ability of those chosen to perform the required tasks. Likewise, a specialist well intervention vessel would likely be sourced from international markets. This potential cost is grossly disproportionate to the minor environmental gain (of reducing the potential likelihood of IMS introduction) achieved and is not reasonably practicable.	Not adopted
Inspect and clean all vessels	By dry docking and cleaning all wetted surfaces on all vessels the likelihood of a pest relocation is considerably lowered.	Inspection and cleaning require highly specialist facilities and must to be completed at specific locations, immediately prior to vessels commencing work. The risk already has a low likelihood so the substantial cost (and time required) to inspect and clean all vessels outweighs the environmental benefit.	Not adopted

7.3.5 Demonstration of Acceptability

Factor	Demonstration Criteria	Criteria Met	Rationale
Risk Assessment Process for Unplanned Events	The risk ranking is lower than Category 1	✓	The risk ranking is Category 4 (the lowest category) and therefore considered acceptable.
Principles of Ecologically Sustainable Development (ESD)	No potential to affect biological diversity and ecological integrity.	✓	There is potential for a localised, but irreversible, impact to benthic communities resulting in a Level III consequence. This impact is limited in extent (i.e. localised) and is not considered as having the potential to affect biological diversity and ecological integrity.
	Activity does not have the potential to result in serious or irreversible environmental damage.	✓	The habitat with the potential to be impacted is characterised by soft sediment communities which are scarce in the Operational Area. However, in the event that soft sediment communities do occur, there is low potential for serious or irreversible environmental damage. As described in Section 4.8, further evaluation is therefore required against the remaining Principles of ESD, as follows: *Where the activity has the potential to result in serious or irreversible environmental damage, further assessment is undertaken to determine if there is significant uncertainty in the evaluation.* There is little uncertainty associated with this aspect as the activities are well

Factor	Demonstration Criteria	Criteria Met	Rationale
			practised, the cause pathways are well known, and activities are well regulated and managed. It is not considered that there is significant scientific uncertainty associated with this aspect, and Principles of ESD are therefore met.
Legislative and Other Requirements	Legislative and other requirements have been identified and met.	✓	The following legislative and other requirements are considered relevant as they apply to the implementation of the Ballast Water Management Convention in Australia: • Biosecurity Act 2015; and • Australian Ballast Water Management Requirements (DAWR, 2017). Vessel biofouling management aligns with: • Protection of the Sea (Harmful Anti-fouling Systems) Act 2006; and • Marine Order 98 (Marine pollution prevention - anti-fouling systems) 2013. Biofouling risk is assessed, and mitigated, in accordance with the National Biofouling Guidelines for the Petroleum Production and Exploration Industry (DAWR, 2009).
Internal Context	Consistent with Esso's Environment Policy.	✓	Proposed activities are consistent with Esso's Environment Policy, in particular, to "comply with all applicable environmental laws and regulations and apply responsible standards where laws and regulations do not exist"
	Meets ExxonMobil Environmental Standards	✓	There is no specific Environmental Standard which addresses the introduction of IMS but the activities proposed meet the strategic objectives of the Upstream Environmental Standards.
	Meets ExxonMobil Operations Integrity Management System (OIMS) Objectives	✓	Proposed activities meet: • OIMS System 6-5 objective to identify and assess environmental aspects; significant aspects are addressed and controlled consistent with policy and regulatory requirements; and • OIMS System 8-1 objective to qualify, evaluate and select contractors based on their ability to perform work in a safe, secure and environmentally sound manner.
External Context	Stakeholder concerns have been considered / addressed through the consultation process.	✓	No specific stakeholder concerns have been raised concerning the risk of introduction and establishment of IMS.

7.4 Accidental Release – LOC from drain system

7.4.1 Causes of LOC from drain system

Skimmer piles are used to separate hydrocarbons from water in liquids directed to the open and closed drain systems. Hydrocarbon vapours migrate to the top of the pile, hydrocarbon liquids settle out on top of the water in the pile, and water at the very bottom of the pile discharging to sea via the pile window.

Hydrocarbon liquid from the piles is monitored by level monitoring equipment which is connected to alarms which prompt pump out of hydrocarbons back to the process system before hydrocarbons reach the subsea window.

Closed piles have pressure alarms to manage high pressure levels which lead to a platform shutdown. This is both for safety reasons (to manage the risk of backpressure through the drain system) and to manage the risk of pushing hydrocarbons out of the subsea window.

LOC from the drain system could occur if hydrocarbons migrate to the subsea window of the skimmer pile. This could be caused by:

- Formation of emulsion which is not detected by level instrumentation. Emulsions could be formed due to chemicals disposed to the piles or from agitation.
- Failure of pumps to pump out hydrocarbon phase.
- Over pressure of pile
- Excess flow of liquids into pile.

LOC from the drain system could occur at all platforms, apart from BMB, DPA, PCA and WTN which do not have drain systems. Maximum volumes contained within the drain systems range from 13 m^3 (at BTA platform) to 240 m^3 (at platforms CBA and SNA). The subsea window, where discharges occur, are between 18 m (at FTA platform) and 49 m (at SNA platform) below the sea surface.

The volume of hydrocarbon liquid inadvertently released from the drain systems is likely to be less than the volume of the pile system. A highly conservative estimate of loss of containment of 240 m^3 of hydrocarbons has been used to assess the risk of LOC from drain system, based on the complete loss of the largest pile system volume at 100% hydrocarbon content. This volume is an overestimate as level alarms and regular monitoring ensures piles do not operate at 100% hydrocarbon content. In addition, the. Hydrostatic pressure within the pile system would limit the release and restrict the amount lost, and fluid contained within the pile system is unlikely to be 100% hydrocarbon.

7.4.2 Risk Assessment

A loss of containment from the drain system will lead to a change in water quality, which could lead to injury / mortality in fauna.

Receptors that could be affected by a LOC from drain system are identified in Table 7-8.

Table 7-8 Receptors potentially affected by impacts associated with LOC from the drain system

Receptors	Impacts			
	Change in water quality	Injury / mortality to fauna	Change in habitat	Change to the function, interests or activities of other users
Water quality	✓			
Plankton		✓		
Benthic habitats and communities		✓		

Receptors	Impacts			
	Change in water quality	Injury / mortality to fauna	Change in habitat	Change to the function, interests or activities of other users
Water quality	✓			
Fish		✓		
Marine Reptiles - Turtles		✓		
Birds		✓		
Marine Mammals		✓		
Fisheries – Commercial (Commonwealth and State)				✓
Recreation and Tourism				✓

7.4.2.1 Consequence Evaluation

A spill of hydrocarbons to the marine environment can lead to a change in water quality through toxicity. Hydrocarbon in the piles is likely to be mainly diesel, as this is the hydrocarbon type most commonly discharged to the drain system.

The maximum release volume described as the Worst-case scenario is similar to the discharge volumes modelled for the loss of containment due to Vessel Collision (Section 7.5). A detailed description of modelling is provided in Section 7.5.2. Note that modelling scenarios are based on surface release, whereas hydrocarbons from the drain system would be released from the subsea window. Diesel is naturally buoyant and would be expected to rise quickly through the water column to the surface. Modelling undertaken for a surface release is considered appropriate to understand the potential consequences to receptors. Environmental risks to receptors are expected to be similar to those described in Section 7.5.3.

Given the moderate spill area and the potential for impacts to sensitive receptors, a loss of containment from the drain system would have possible minor, short-term effects on receptors, **Consequence Level III.**

7.4.2.2 Likelihood Evaluation

Loss of containment from the drain system is an accidental release event which has happened previously within the Bass Strait Operations. Considering the volume of hydrocarbons associated with a LOC from the drain system, together with the control measures in place, the probability of a LOC from the drain system resulting in the impacts described above is considered **Likely (C).**

7.4.3 Risk Ranking

Consequence	Likelihood	Risk Ranking
III	C	3

7.4.4 Controls

Good Practice	Adopted	Control	Rationale

Pile management system	✓	**CM46:** Maintenance and testing of Open and Closed Skimmer Piles **CM50:** Closed Drain and Open Drain Piles procedures.	Maintenance and inspection of pile equipment is conducted to ensure equipment is functioning as designed, level readings are accurate and pumps and triggers are operational so as to prevent discharges caused by equipment failure. A functional pile pump allows the hydrocarbon phase in the piles to be pumped down on a regular basis. Pumps are maintained as per the applicable OIMS 6-2 FIMS equipment strategy which calls for demonstration that pumps are functional (i.e. are able to pump out the contents of the pile). The equipment strategy also defines the criticality of the equipment. Pile pumps have been defined as criticality A, the highest level. Platforms have at minimum one pump installed. Platforms have access to a contingency pump (in the event that the primary pump is OOS or fails) either on the platform or in the LFD warehouse. Location and access to a spare pile pump is determined using the FIMS risk assessment processes. Level monitoring instrumentation is also maintained as per the applicable OIMS 6-2 FIMS equipment strategy which calls for instrumentation to be cleaned and calibrated on a recurring basis.
	✓	**CM30**: Offshore Technical Monitoring Program	Pile 'health' is monitored regularly to identify and assess abnormalities in pile level trends. Surveillance Engineers monitor pile levels on a quarterly basis against expected level trends. Abnormalities will be assessed for their significance and appropriate action taken to address the cause. This process allows for issues with level instrumentation, pile pumps or general pile health to be identified and managed.
Dosing of piles with emulsion breaker	✓	**CM71:** Dosing of piles with emulsion breaker	Where potential for emulsion in piles is identified (either through Offshore Technical Monitoring Program or Testing of Pile systems), application of emulsion breaker can be implemented to break down emulsions. This can improve accuracy of level instrumentation and assist pump function. Procedure GEN-110-201 is in place to provide guidance on when emulsion breaker should be used and how to safely apply it to open and closed drain systems. GEN-100-201 requires pile levels to be monitored every hour for 4 hours post dosing to monitor effectiveness of emulsion breaker.

7.4.5 Demonstration of ALARP

ALARP Decision Context and Justification	**Decision Context B** Loss of containment of hydrocarbon from the open drain systems can have a number of causes. There is a good understanding of potential spill sources, and the control measures required to manage these. These control measures are not regulated but are guided by OIMS management systems. There is little uncertainty associated with the potential environmental impacts which have been evaluated as **Consequence Level III**. Despite this, the likelihood of LOC from pile systems has assessed to be Likelihood B as it has happened several times at site over the past 10 years. No stakeholder objections or were claims raised during consultation for this campaign. Based on the likelihood rating, Esso believes **ALARP Decision Context B** should apply.
Engineering Risk Assessment	

Additional, Alternative, Improved Controls	Benefit	Cost / Feasibility	Adopted
Install secondary pile pump for redundancy.	Having two pile pumps would allow for contingency should the primary pump fail or be out of service.	Engineering design of piles on HLA, WKF for open piles and BTA, MLA, HLA, KFA, KFB, MKA, TNA, & SNA, for closed piles does not allow for retrospective installation of two pumps. In these cases, significant structural modifications to the pile and the platform would be required.	Adopted on BTA, KFA, KFB, MKA, TNA, SNA, CBA, FLA, FTA, BMA, MLA, MLB & WTN for open piles. Adopted on WKF, CBA, FLA, FTA, BMA, MLB & WTN closed piles. Not adopted on remaining facilities **CM46:** Maintenance and testing of Open and Closed Skimmer Piles
Store spare pile pumps at LFD warehouse.	Storing spare pile pumps at the LFD warehouse enables rapid replacement of faulty pumps.	Warehouse sparing methodology has been developed based on the type of pumps and the commonality of pumps between platforms (i.e. pumps that are common between platforms have more spares available)	Adopted. **CM46:** Maintenance and testing of Open and Closed Skimmer Piles
Dose with emulsion breaking chemicals	Emulsion breakers help to manage pile levels by breaking down emulsions that may form in piles. Use of emulsion breakers has the benefits of: Assisting pumps to function by pumping liquid (not emulsion) Assisting in accuracy of level instrumentation which uses density to differentiate between oil and water. Procedure GEN-110-201 is in place to provide guidance on when emulsion breaker should be used and how to safely apply it to open and closed drain systems.	Only a limited number of emulsion breakers are assessed as suitable for use using the Chemical Selection Assessment Process	Adopted **CM71:** Dosing of piles with emulsion breaker
Alternative disposal options for waste hydrocarbons	Reduced volume of hydrocarbons directed to drains and piles.	Significant safety risks associated with alternative disposal methods. Waste will not be returned to the process (i.e. will not be recycled)	Not adopted

7.4.6 Demonstration of Acceptability

Factor	Demonstration Criteria	Criteria Met	Rationale
Risk Assessment Process for Unplanned Events	The risk ranking is lower than Category 1	✓	The risk ranking is Category 3 and therefore considered acceptable.
Principles of Ecologically Sustainable Development (ESD)	No potential to affect biological diversity and ecological integrity.	✓	The potential impact associated with this aspect is limited to a localised short-term impact, which is not considered as having the potential to affect biological diversity and ecological integrity.
	Activity does not have the potential to result in serious or irreversible environmental damage.	✓	The activities were evaluated as having the potential to result in a Level IV consequence thus are not considered as having the potential to result in serious or irreversible environmental damage.
Legislative and Other Requirements	Legislative and other requirements have been identified and met.	✓	Activity will not impact the long term survival and recovery of listed and threatened fish, marine mammals or marine reptiles and will be undertaken in accordance with all applicable management actions.
Internal Context	Consistent with Esso's Environment Policy.	✓	Proposed control measures are consistent with Esso's Environment Policy, in particular, to "manage business with the goal of preventing incidents and of controlling emissions and wastes to below harmful levels; design, operate, and maintain facilities to this end"
	Meets ExxonMobil Environmental Standards	✓	The use of piles for management of waste hydrocarbons meets the Upstream Waste Management Standards which calls for consideration of the waste hierarchy. Use of piles allows for waste hydrocarbon to be 'recycled' and returned back to the process. Further, the use of piles meets expectations of the Upstream Water Management Standard The Upstream Water Management Standards and standards for appropriate disposal of uncontaminated deck drainage.
	Meets ExxonMobil Operations Integrity Management System (OIMS) Objectives	✓	Proposed control measures meet: OIMS System 6-5 objective to identify and assess environmental aspects; significant aspects are addressed and controlled consistent with policy and regulatory requirements; and OIMS System 6-2 objectives ensure equipment is maintained over the operating life of the equipment preventing or mitigating a significant event that could result in significant and environment consequences.
External Context	Stakeholder concerns have been considered / addressed through the consultation process.	✓	No specific stakeholder concerns have been raised concerning the accidental LOC from pile systems.

7.5 Accidental Release – LOC from a vessel

7.5.1 Causes of LOC from a vessel

Use of vessels will occur frequently as part of Bass Strait Operations (as described in Section 2.4.3) and a loss of containment relating to vessel activities has been considered as a potential discharge scenario.

Table 7-9 Selection of worst case discharge scenario - LOC from a vessel

Process	Description
Identify potential discharge scenarios	During Bass Strait Operations, potential unplanned incidents that could result in a spill include: • Collision with platform that results in tank rupture and marine diesel loss. Vessel drift or powered grounding is not considered credible given the distance from shore of the Operational Area and the lack of emergent features in the Operational Area. Vessel to vessel collisions causing multiple tank rupture during SIMOPS operations are not considered credible for the following reasons Activity Specific Operating Guidelines (ASOG) are required to consider SIMOPS, therefore activity specific procedures control and are used to prevent the possibility of collisions ASOG details include limitations for vessel speed inside the PSZ Vessels operating in close proximity are normally on DP and also have manual controls and emergency stops as backup DNV Clean class vessels (DNVGL-RU-SHIP) or similar, are used preferentially where possible. These are constructed to protect oil tanks on vessels and therefore further limit the risk of tank rupture in the unlikely case of collision
Identification of potential pollutants	Common fuel used in larger vessels servicing the oil and gas industry is Marine Diesel – MDO Group II.
Determine characteristics of the discharge scenario (including calculation of potential spill volumes)	Based on the type of support vessel usually in service, the largest fuel tank volume considered is 280 m^3. * At time of writing the contracted PSV, Skandi Feistein's largest fuel tank was 220 m^3. Largest tank sizes for other vessels types which may be used during operations (refer Section 2.4.3.1) supplied by the same operator (DOF Group) are listed below, supporting that the considered volume is appropriate for the spill scenario: Skandi Singapore DSV – largest capacity FO tank: 166.9 m^3 Skandi Darwin MPSV – largest capacity FO tank: 240 m^3 Skandi Feinstein PSV – largest capacity FO tank: 219.6 m^3 Similarly, the largest tank size for the Subsea Seven – Sea Eagle, construction/dive support vessel contracted for the BTW installation work is 190m^3. The loss of a full tank of fuel is most likely an overestimate as hydrostatic pressure would limit the release and pumping of fuel oil in a ruptured tank to another tank could also restrict the amount lost.
Determine likelihood of the discharge scenario	There have been no incidents of collision leading to tank rupture from PSVs in Bass Strait Operations over the past 10 years.
Selection of worst case scenario based on risk	Given there have been no incidents of vessel collision with platforms leading to tank rupture and LOC, modelling of a spill of MDO has been completed at a selection of facilities. This selection gives a representation of spills:

Process	Description
	• close to shore (BTA, PCA) • furthest north facility (KPA) • furthest south facility (WKF) • central fields facility (HLA)

* Representative spill volumes are based on known vessel tank sizes that have been used for the activity. These are selected for modelling and are used to assess potential impacts to the environment from MDO spills. The volume does not represent a limitation on spill response capability and does not limit the size of vessels that may be used in the future. Subsea IMR works and market availability of vessels may potentially require vessels with larger individual tank sizes to be used.

The NERA Environment Plan Reference Case for consequence analysis of an accidental release of diesel (DIIS, 2018) shows that diesel spills up to 700 m^3 will have surface impacts (10 g/m^2) occur within a 150 km boundary around the petroleum activity and that titleholders describing the environment to that boundary distance are not required to conduct additional spill modelling if their largest diesel tank size is less than 700 m^3. The PEA for this activity scope is defined in Section 5.1 and describes an area well beyond the 150 km boundary.

As demonstrated through Section 7.6 and Section 7.7, impacts of much larger spill volumes from heavier and more persistent hydrocarbons are described beyond the 150 km boundary and the spill response capability is described through volume 3. Therefore if a vessel with a larger individual tank size than 280 m^3 were to be used and in the unlikely event that a collision causing a full tank rupture occurred, the impact would be less than that described in Section 7.6 and 7.7 and spill response capability described in Volume 3 would cover the required response measures.

7.5.2 Spill Modelling

7.5.2.1 Modelling Methodology

To understand the potential consequences of a marine diesel spill and the response preparedness required, stochastic and deterministic modelling was undertaken in accordance with Section 7.2.1.1 (RPS, 2019a). Model inputs and parameters are summarised Table 7-10. The modelling was based on 100 spill simulations and annual analysis (i.e. over all seasons).

Table 7-10 Vessel collision MDO spill modelling inputs and parameters

Parameter	Details				
Release locations (surface release)	West Kingfish (WKF)	Perch (PCA)	Barracouta (BTA)	Kipper (KPA)	Halibut (HLA)
Coordinates (GDA94)	38° 35' 39" S 148° 06' 15" E	38° 34' 15" S 147° 19' 16" E	38° 17' 53" S 147° 40' 28" E	38°10' 53" S 148° 35' 35" E	38°24'15" S 148°19'13" E
Water Depth	76m	42m	46m	94m	73m
Distance to shore	72km	24km	23km	41km	67km
Hydrocarbon type	MDO Group II				
Total spill volume (m^3) / Release rate (m^3/hr)	280 m^3 / 46.7 m^3/hr				220 m^3 / 36.7 m^3/hr
Volume basis	AMSA's guideline for indicative maximum credible spill volumes for other, nonoil tanker, vessel collision (AMSA 2015) is the volume of the largest fuel tank. The loss of a full tank is most likely an overestimate as hydrostatic pressure would limit the release and pumping of oil in a ruptured tank to another tank could also restrict the amount lost. Based on the type of support vessel usually in service, the largest fuel tank volume of 280 m^3 has been used to undertake the impact assessment. The Halibut scenario was based on a pipeline repair vessel with a slightly smaller tank (220 m^3).				
Release duration	6 hours				
Modelled duration	30 days				
MDO Characteristics					
Density	829 kg/m^3 @ 15˚C				

API	37.6
Dynamic Viscosity	4.0 cP @ 25°C
Pour Point	-14 ºC
Oil Property Category	Group II (light persistent oil)
Boiling point (ºC)	
Volatile (<180°C)	6.0 %
Semi-volatile (180 – 265 °C)	34.6 %
Low volatility (265 – 380 °C)	54.4 %
Residual (>380 °C)	5.0 %

7.5.2.2 Modelling Outputs – Weathering and Fate

Marine diesel contains 95% light hydrocarbons (or non-persistent constituents) that are likely to evaporate when available to the atmosphere. The remaining 5% is composed of heavy hydrocarbons (or persistent compounds) that may persist on the sea-surface for extended times.

It is important to note that the viscosity of marine diesel does not change significantly over time and hence has a strong tendency to physically entrain into the upper water column as oil droplets in the presence of waves, where it is subjected to microbial biodegradation (decay) but can refloat to the surface if wave energies abate.

On release to the marine environment, diesel is predicted to be distributed over time into the following components:

- surface;
- water column, consisting of:
- entrained (non-dissolved oil droplets that are physically entrained by wave action) and;
- dissolved (principally the aromatic hydrocarbons);
- evaporated;
- stranded on shoreline; and
- decayed (microbial biodegradation).

Of these components, surface hydrocarbons, dissolved aromatics and oil stranded on shorelines have the most significant impact.

Figure 7-2, Figure 7-3, Figure 7-4 and Figure 7-5 present the fate and weathering graph for modelling of an MDO release at the worst of the four of the modelled locations taking into account

- the largest sweep are of oil on the sea surface
- the largest volume of shoreline loading
- the longest length of shoreline contacted
- the minimum time before exposure to nearshore waters

For the WKF and KPA releases no shoreline contact was predicted so the deterministic trajectory that had the largest swept area of oil on the sea surface of 10 g/m^2 (actionable oil) was considered the 'worst' simulation and selected for weathering and fate analysis.

Figure 7-2 presents the fates and weathering graph for the corresponding single spill trajectory for WKF. At the conclusion of the simulation period, approximately 68% spilled oil was lost to the atmosphere through evaporation. Approximately 17% of the MDO was predicted to have decayed by the end of the simulation, while approximately 15% was predicted to remain within the water column.

Figure 7-5 presents the fates and weathering graph for the 'worst' KPA single spill trajectory. At the conclusion of the simulation period, approximately 89% spilled oil was lost to the atmosphere through evaporation, approximately 5% of the MDO was predicted to have decayed, while approximately 5% was predicted to remain within the water column.

Figure 7-3 presents the fates and weathering graph for the PCA 'worst' single spill trajectory; the deterministic trajectory that had the largest volume of shoreline loading. At the conclusion of the simulation period, approximately 53% spilled oil was lost to the atmosphere through evaporation. Approximately 22% of the MDO was predicted to have decayed by the end of the simulation, while approximately 17% was predicted to remain within the water column and 8% is predicted to arrive ashore.

The deterministic trajectory for BTA MDO modelling that resulted in the largest volume of shoreline loading, the longest length of shoreline contacted above 100 g/m^2 (actionable shoreline oil) and the minimum time before exposure to immediate nearshore waters by visible oil was identified as the 'worst' simulation and was selected for weathering and fate analysis. Figure 7-4 presents the fates and weathering graph for the BTA 'worst' single spill trajectory. At the conclusion of the simulation period, approximately 67% spilled oil was lost to the atmosphere through evaporation, approximately 14% of the MDO was predicted to have decayed, while approximately 12% was predicted to remain within the water column and 8% is predicted to arrive ashore.

The figures clearly show that evaporation is the dominant process contributing for the removal of MDO from the sea surface. Volatile and semi-volatile components of the oil are predicted to evaporate within first 24 hours, with the remaining oil tending to remain within the wave-mixed layer of the water column (3-10 m deep, depending on the conditions).

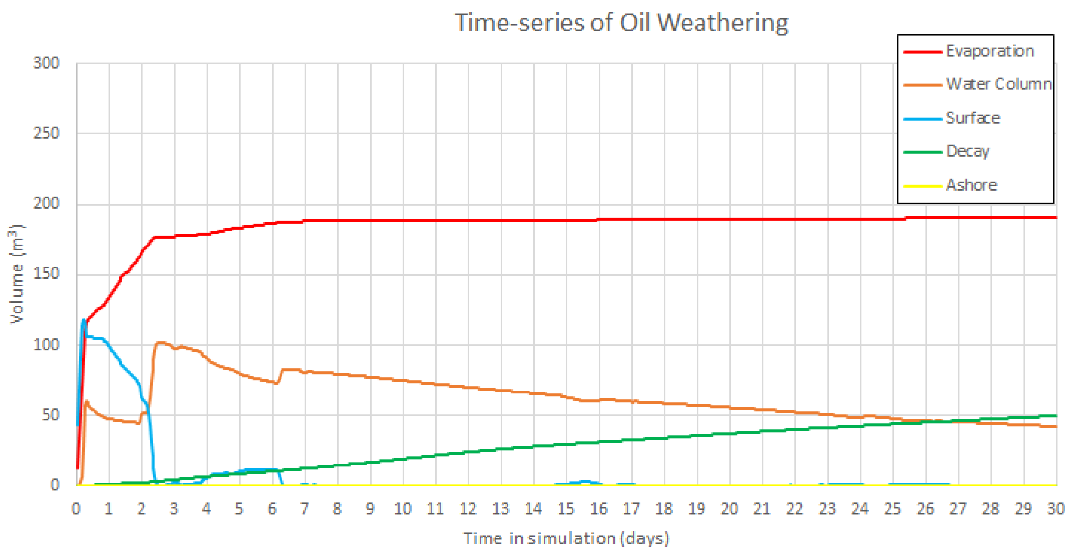


Figure 7-2 Predicted weathering of MDO for the single spill trajectory at WKF with the largest sea surface swept area

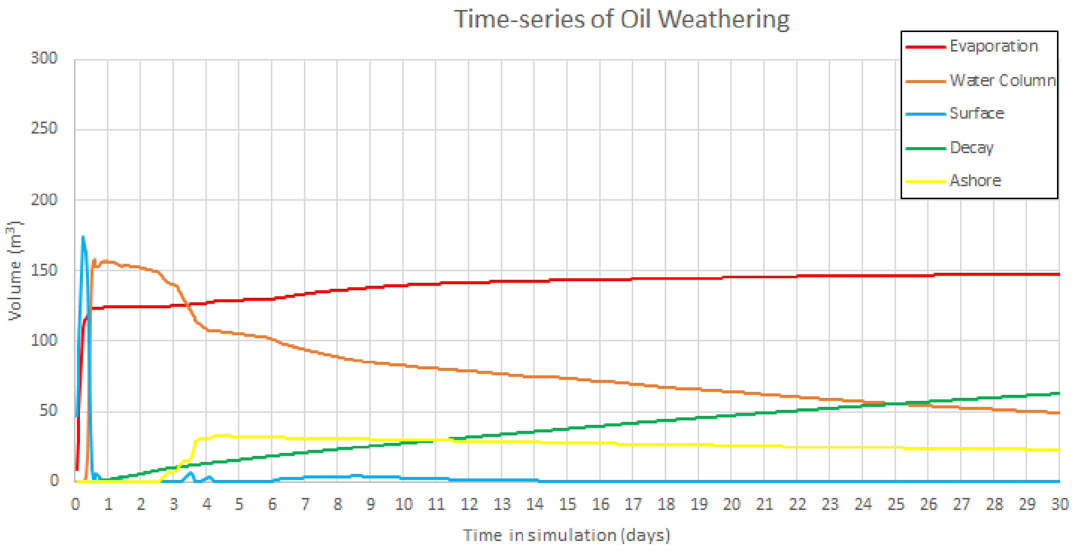


Figure 7-3 Predicted weathering of MDO for the single spill trajectory at PCA with the largest oil volume ashore.

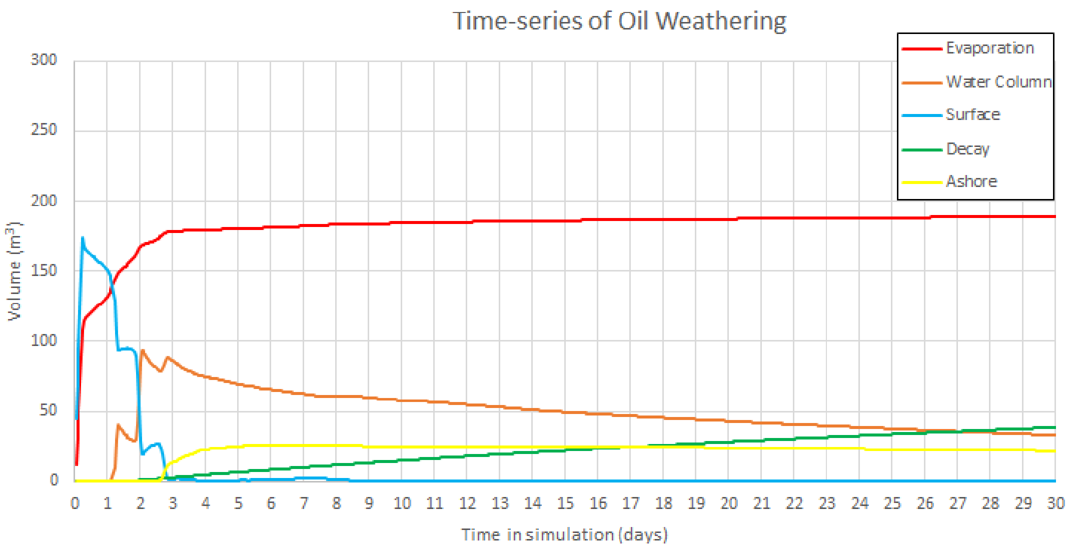


Figure 7-4 Predicted weathering of MDO for the single spill trajectory at BTA with the largest oil volume ashore, longest length of shoreline contacted above the moderate threshold and the minimum time before exposure to immediate nearshore waters by visible oil

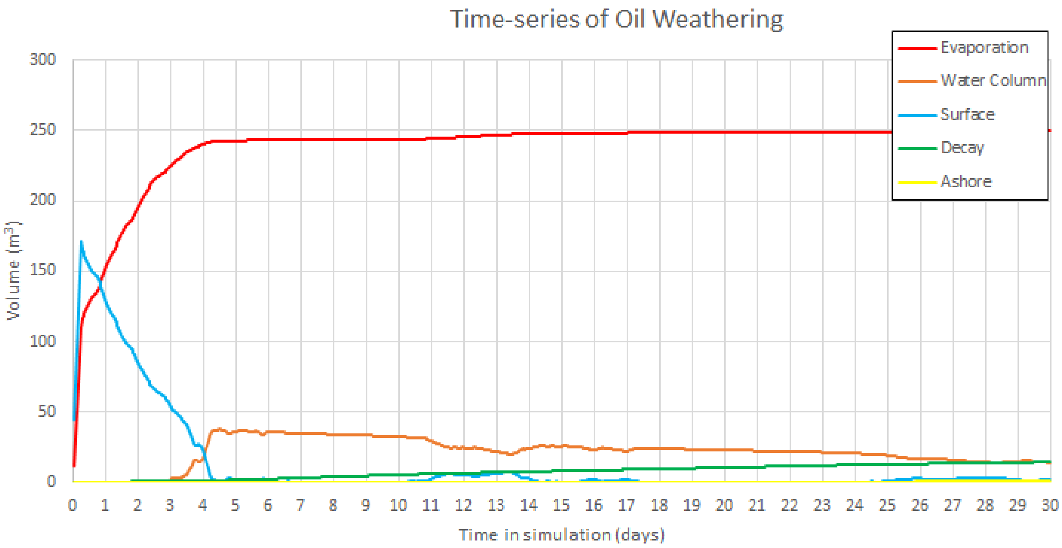


Figure 7-5 Predicted weathering of MDO for the single spill trajectory at KPA with the largest sea surface swept area

7.5.2.3 Modelling Outputs – Stochastic

Oil spill modelling predicts the total area that could be exposed to hydrocarbon, including trace concentrations of oil in the water column, as a result of any spill. This is known as the Potentially Exposed Area (PEA) and is used for planning purposes to ensure that all social and environmental sensitivities are acknowledged, described and considered in the development of the EP.

Modelling is also used to inform specific impact assessments by understanding the location and extent of oil at concentrations likely to result in environmental consequences. There is no agreed exposure level below which environmental impacts will not occur, so outputs should not be interpreted as a boundary. However, mapping areas which could be moderately impacted by a spill is a useful tool for impact or consequence assessment.

The extent of potential moderate hydrocarbon exposure is described in Table 7-11. Other environmental sensitivities outside of the moderately exposed area but within the PEA are identified in Table 7-12.

Table 7-11 Environmental sensitivities with potential moderate exposure from an MDO release

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)				
		LOC at West Kingfish (WKF)	**LOC at Perch (PCA)**	**LOC at Barracouta (BTA)**	**LOC at Kipper (KPA)**	**LOC at Halibut (HLA)**
Surface Exposure	Moderate 10 g/m^2	Maximum distance from release site is approx. 15 km in an ENE direction. The zone of moderate exposure overlaps the following BIAs (92% probability): Birds • Black-browed Albatross - Foraging • Buller's Albatross - Foraging • Campbell Albatross - Foraging • Common Diving-petrel - Foraging • Indian Yellow-nosed Albatross - Foraging • Short-tailed Shearwater - Foraging • Shy Albatross - Foraging • Wandering Albatross – Foraging Marine mammals • Pygmy Blue Whale - Distribution & Foraging • Southern Right Whale – Migration • White Shark – Distribution • Does not extend into State waters or contact any National Parks and Reserves	Maximum distance from the release site is 24 km in a north easterly direction. The zone of moderate exposure overlaps the following foraging BIAs (99% probability): Birds • Black-browed Albatross • Buller's Albatross • Campbell Albatross • Common Diving-petrel • Indian Yellow-nosed Albatross • Short-tailed Shearwater • Shy Albatross • Wandering Albatross Marine mammals • Pygmy Blue Whale - Distribution & Foraging • Southern Right Whale – Migration • White Shark – Breeding & Distribution • Does not extend into State waters or contact any National Parks and Reserves	Maximum distance from the release site is 33 km in a south westerly direction. The zone of moderate exposure overlaps the following foraging BIAs (100% probability): Birds • Black-browed Albatross • Buller's Albatross • Campbell Albatross • Common Diving-petrel • Indian Yellow-nosed Albatross • Shy Albatross • Wandering Albatross • Short-tailed Shearwater (34% probability) Marine mammals • Pygmy Blue Whale - Distribution & Foraging • Southern Right Whale – Migration • White Shark – Breeding & Distribution. • Does not extend into State waters or contact any National Parks and Reserves	Maximum distance from the release site is 17 km in an easterly direction. The zone of moderate exposure overlaps the following foraging BIAs (up to 97% probability): Birds • Antipodean Albatross - Foraging • Black-browed Albatross • Buller's Albatross • Campbell Albatross • Common Diving-petrel • Indian Yellow-nosed Albatross • Shy Albatross • Wandering Albatross • White-faced Storm-petrel Marine mammals • Pygmy Blue Whale - Distribution & Foraging • Southern Right Whale – Migration • White Shark – Distribution. Upwelling East of Eden also has 97% probability of exposure. Does not extend into State waters or contact any National Parks and Reserves	Maximum distance from the release site is ~16 km in an ENE direction. The zone of moderate exposure overlaps the following foraging BIAs (74% probability): Birds • Black-browed Albatross • Buller's Albatross • Campbell Albatross • Common Diving-petrel • Indian Yellow-nosed Albatross • Shy Albatross • Wandering Albatross Marine mammals • Pygmy Blue Whale - Distribution & Foraging • Southern Right Whale – Migration • White Shark – Distribution. Upwelling East of Eden has 1% probability of exposure. Does not extend into State waters or contact any National Parks and Reserves
	High 50 g/m^2	Maximum distance from release site is approx. 5 km in a westerly direction. The zone of moderate exposure overlaps the following BIAs (10% probability): Birds • Black-browed Albatross - Foraging • Buller's Albatross - Foraging • Campbell Albatross - Foraging • Common Diving-petrel - Foraging • Indian Yellow-nosed Albatross - Foraging • Short-tailed Shearwater - Foraging • Shy Albatross - Foraging • Wandering Albatross – Foraging Marine mammals • Pygmy Blue Whale - Distribution & Foraging • Southern Right Whale – Migration • White Shark - Distribution	Maximum distance from the release site is 1 km in a south westerly direction. The zone of moderate exposure overlaps the following foraging BIAs (6% probability): Birds • Black-browed Albatross • Buller's Albatross • Campbell Albatross • Common Diving-petrel • Indian Yellow-nosed Albatross • Short-tailed Shearwater • Shy Albatross • Wandering Albatross Marine mammals • Pygmy Blue Whale - Distribution & Foraging • Southern Right Whale – Migration • White Shark – Breeding & Distribution	Maximum distance from the release site is 10 km in an ENE direction. The zone of moderate exposure overlaps the following foraging BIAs (25% probability): Birds • Black-browed Albatross • Buller's Albatross • Campbell Albatross • Common Diving-petrel • Indian Yellow-nosed Albatross • Shy Albatross • Wandering Albatross Marine mammals • Pygmy Blue Whale - Distribution & Foraging • Southern Right Whale – Migration • White Shark – Breeding & Distribution	Maximum distance from the release site is 2 km in a NNE direction. The zone of moderate exposure overlaps the following foraging BIAs (up to 13% probability): Birds • Antipodean Albatross - Foraging • Black-browed Albatross • Buller's Albatross • Campbell Albatross • Common Diving-petrel • Indian Yellow-nosed Albatross • Shy Albatross • Wandering Albatross Marine mammals • Pygmy Blue Whale - Distribution & Foraging • Southern Right Whale – Migration • White Shark – Distribution.	Maximum distance from the release site is 3 km in an easterly direction. The zone of moderate exposure overlaps the following foraging BIAs (8% probability): Birds • Black-browed Albatross • Buller's Albatross • Campbell Albatross • Common Diving-petrel • Indian Yellow-nosed Albatross • Shy Albatross • Wandering Albatross Marine mammals • Pygmy Blue Whale - Distribution & Foraging • Southern Right Whale – Migration • White Shark – Distribution.

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)				
		LOC at West Kingfish (WKF)	LOC at Perch (PCA)	LOC at Barracouta (BTA)	LOC at Kipper (KPA)	LOC at Halibut (HLA)
					Upwelling East of Eden also has 13% probability of exposure.	
Shoreline Exposure	Moderate 100 g/m^3	No shoreline contact is predicted.	The highest probabilities of shoreline contact: Wellington (2%) and Woodside Beach (1%). Maximum 14 km of shoreline contacted at moderate exposure (average ~ 2km). The minimum time before shoreline accumulation at this threshold is 28 hours.	The highest probabilities of shoreline contact: Wellington (3%), Seaspray (2%) and Ocean Grange (1%). Note: Part of this shoreline is within the Gippsland Lakes Coastal Park. Maximum 9 km of shoreline contacted at moderate exposure (average ~ 4 km). The minimum time before shoreline accumulation at this threshold is 3 days.	No shoreline contact is predicted.	No shoreline contact is predicted.
In-water (dissolved) Exposure	Moderate 50 ppb instantaneous	No moderate in-water (dissolved) exposure predicted.	No moderate in-water (dissolved) exposure predicted.	No moderate in-water (dissolved) exposure predicted.	No moderate in-water (dissolved) exposure predicted.	No moderate in-water (dissolved) exposure predicted.

Table 7-12 Environmental sensitivities outside of the moderately exposed area but within the PEA from an MDO release

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)				
		LOC at West Kingfish (WKF)	LOC at Perch (PCA)	LOC at Barracouta (BTA)	LOC at Kipper (KPA)	LOC at Halibut (HLA)
Surface Exposure	Low 1 g/m^2	Maximum 67 km from release location in a north easterly direction. The BIAs listed as being affected by moderate exposure (described in Table 7-11), have a 100% probability of low surface exposure. In addition, the white-faced storm petrel foraging BIA has an 8% probability of low surface exposure. There is a 5% chance of low surface exposure at Upwelling East of Eden KEF.	Maximum 75 km from release location in an ENE direction. BIAs affected by moderate exposure (described in Table 7-11), will also be affected (100%) by low surface exposure. Victorian waters are predicted to be exposed at 3% probability.	Maximum 74 km from release location. In addition to the BIAs affected by moderate exposure (described in Table 7-11), low surface exposure may occur within the Upwelling East of Eden KEF (13%). Victorian waters are predicted to be exposed at 6% probability, with a 1% probability of exposure of Ninety Mile Beach Marine Park.	Maximum 161 km from release location in an ENE direction. All BIAs affected by moderate exposure (described in Table 7-11), have a 100% probability of being exposed to low levels of surface exposure. In addition, the following BIAs may be exposed: Humpback Whale – Foraging (1%) Wedge-tailed Shearwater – Foraging (1%) Upwelling East of Eden has 100% probability of exposure. Other KEFs, state waters or coastal receptors are not predicted to be exposed.	Maximum ~40 km from release location in a southerly direction. All BIAs affected by moderate exposure (described in Table 7-11), have a 100% probability of being exposed to low levels of surface exposure. In addition, the following BIAs may be exposed: Wedge-tailed Shearwater – Foraging (1%) Upwelling East of Eden has 12% probability of exposure. Other KEFs, state waters or coastal receptors are not predicted to be exposed.
Shoreline Exposure	Low 10g/m^2	No shoreline contact is predicted.	There is a 2% probability of shoreline contact. The minimum time for visible oil to shore 28 hours; maximum volume ashore 28.1 m^3. Wellington and Woodside Beach are predicted to be the first shoreline receptors, after 28 hours. Maximum 24 km of shoreline contacted.	Probability of shoreline contact: 4%. The minimum time for visible oil to shore ~2 days; maximum volume of oil ashore was 25.1 m^3. Wellington, Ocean Grange and Seaspray are predicted to be the first shoreline receptors, after ~2 days (<4% probability). Maximum 16 km of shoreline contacted.	No shoreline contact is predicted.	No shoreline contact is predicted.
In-water (dissolved) Exposure	Low 10ppb instantaneous	Exposure will be confined to the surface 10m of the water column. 0-10m water depth Foraging seabirds, Pygmy Blue Whale and Southern Right whale, Indo-Pacific/Spotted Bottlenose Dolphin, Grey nurse shark and	Narrow zone of water column exposure predicted to extend approximately 40 km from the spill location in north easterly and south westerly directions. Exposure will be confined to the surface 10m of the water column.	Small area less than 5 km in diameter located approx. 40 km north east of the release location. Exposure will be confined to the surface 10 m of the water column. Small area less than 5 km in diameter	Narrow zone of water column exposure predicted to extend approximately 20 km from the spill location in north easterly and south westerly directions. Exposure will be confined to the surface 10 m of the water column.	Confined to the surface 10 m of the water column. 0-10m water depth Foraging seabirds, Pygmy Blue Whale and Southern Right whale, White Shark BIA that occur in close proximity to release location

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)				
		LOC at West Kingfish (WKF)	LOC at Perch (PCA)	LOC at Barracouta (BTA)	LOC at Kipper (KPA)	LOC at Halibut (HLA)
		White Shark BIA that occur in close proximity to release location have less than 6% probability of being exposed at low instantaneous dissolved hydrocarbon threshold. Upwelling East of Eden KEF may be exposed at low threshold (1%). Exposure not predicted to extend into Victorian, NSW or Tasmanian State Waters.	0-10m water depth Foraging seabirds, Pygmy Blue Whale and Southern Right whale, Indo-Pacific/Spotted Bottlenose Dolphin, Grey nurse shark and White Shark BIA that occur in close proximity to LOC location have less than 3% probability of being exposed at low instantaneous dissolved hydrocarbon threshold. Exposure not predicted to extend into Victorian, NSW or Tasmanian State Waters.	located approx. 40 km NE of the release location. 0-10m water depth Low probability of foraging seabirds, and other nearby BIAs being exposed by low threshold instantaneous dissolved hydrocarbons (1%). No exposure to Victorian, NSW or Tasmanian State Waters.	0-10m water depth Foraging seabirds, Pygmy Blue Whale and Southern Right whale, White Shark BIA that occur in close proximity to release location have less than 2% probability of being exposed at low instantaneous dissolved hydrocarbon threshold. Upwelling East of Eden KEF may be exposed at low threshold (2%). Exposure not predicted to extend into Victorian, NSW or Tasmanian State Waters.	have up to 13% probability of being exposed at low instantaneous dissolved hydrocarbon threshold. Upwelling East of Eden KEF may be exposed at low threshold (29%). Exposure not predicted to extend into Victorian, NSW or Tasmanian State Waters.
In-water (entrained) Exposure	Low 10ppb instantaneous	Exposure will be confined to the surface 10m of the water column. 0-10m water depth: In-water entrained hydrocarbon at the low threshold extends along the southern Australian coast from the Bass Strait Islands, Tasmania to Ulladulla, NSW. The probability of contact with the nearshore waters of various terrestrial National Parks and Reserves ranges from approximately 10% at Croajingolong, to less than 6% at Cape Conran, Mimosa Rocks and Bournda Entrained hydrocarbon at the low threshold is predicted to encroach upon Victorian and NSW state waters with likelihoods of 20% and 15% respectively and contact Point Hicks, and Cape Howe Marine National Parks, Beware Reef Marine Sanctuary and Batemans Marine Park (NSW) Entrained hydrocarbon is predicted to encroach upon Tasmanian waters with a likelihood of 7% including the waters surrounding the terrestrial National Parks and Reserves of the Kent and Hogan Groups, East and West Moncouer Islands and Curtis Island. Other receptors predicted to be contacted by entrained oil at the low threshold - With probabilities of 20 - 50% are: • Albatross, shearwater and petrel foraging BIAs; • Little penguin foraging BIA; • Pygmy blue whale distribution and foraging BIAs; • Southern right whale migration BIA; • Indo-Pacific spotted bottlenose dolphin breeding BIA; • White shark foraging and distribution BIAs;	Exposure will be confined to the surface 10m of the water column. 0-10m water depth In-water entrained hydrocarbon at the low threshold extends along the southern Australian coast from Wilsons Promontory, Victoria to Jervis Bay, NSW. The probability of contact with the nearshore waters of various terrestrial National Parks and Reserves ranges from approximately 30% at Croajingolong, 15% at Cape Conran, 10% at Mimosa Rocks and Bournda, to less than 5% at Gippsland Lakes and Wilsons Promontory. Entrained hydrocarbon at the low threshold is predicted to encroach upon Victorian, and NSW state waters with likelihoods of 50% and 30% respectively and contact Point Hicks, Ninety Mile Beach and Cape Howe Marine National Parks, Beware Reef Marine Sanctuary and Batemans Marine Park (NSW) Entrained hydrocarbon is predicted to encroach upon Tasmanian waters with a likelihood of 5% including the waters surrounding the terrestrial National Parks and Reserves of the Kent and Hogan Groups, East and West Moncouer Islands and Curtis Island. Other receptors predicted to be contacted by entrained oil at the low threshold - With probabilities of 20 - 50% are: • Albatross, shearwater and petrel foraging BIAs; • Little penguin foraging BIA; • Pygmy blue whale distribution and foraging BIAs; • Southern right whale migration BIA; • Humpback whale foraging BIA;	Exposure will be confined to the surface 10m of the water column. 0-10m water depth In-water entrained hydrocarbon at the low threshold extends along the southern Australian coast from Wilsons Promontory, Victoria to Tathra, NSW. The probability of contact with the nearshore waters of various terrestrial National Parks and Reserves ranges from approximately 30% at Croajingolong, 15% at Cape Conran to less than 10% at Mimosa Rocks, Bournda, Gippsland Lakes and Wilsons Promontory. Entrained hydrocarbon at the low threshold is predicted to encroach upon Victorian and NSW state waters with likelihoods of 50% and 20% respectively and contact Point Hicks, Ninety Mile Beach and Cape Howe Marine National Parks, Beware Reef Marine Sanctuary and Batemans Marine Park (NSW) Entrained hydrocarbon is predicted to encroach upon Tasmanian waters with a likelihood of 4% including the waters surrounding the terrestrial National Parks and Reserves of the Kent and Hogan Groups, East and West Moncouer Islands and Curtis Island. Other receptors predicted to be contacted by entrained oil at the low threshold - With probabilities of 20 - 50% are: • Albatross, shearwater and petrel foraging BIAs; • Little penguin foraging BIA; • Pygmy blue whale distribution and foraging BIAs; • Southern right whale migration BIA; • Humpback whale foraging BIA; • Indo-Pacific spotted bottlenose dolphin breeding BIA;	Exposure will be confined to the surface 10m of the water column. 0-10m water depth In-water entrained hydrocarbon at the low threshold extends along the southern Australian coast from Marlo, Victoria to Ulladulla, NSW. The probability of contact with the nearshore waters of various terrestrial National Parks and Reserves ranges from approximately 10% at Croajingolong to less than 5% at Cape Conran and Eurobodalla. Entrained hydrocarbon at the low threshold is predicted to encroach upon Victorian and NSW state waters with likelihoods of 21% and 19% respectively and contact Point Hicks and Cape Howe Marine National Parks, Beware Reef Marine Sanctuary and Batemans Marine Park (NSW). Entrained hydrocarbon is predicted to encroach upon Tasmanian waters with a likelihood of 4% including the waters surrounding the terrestrial National Parks and Reserves of the Kent and Hogan Groups. Other receptors predicted to be contacted by entrained oil at the low threshold - With probabilities of 20 - 35% are: • Albatross, shearwater and petrel foraging BIAs; • Little penguin foraging BIA; • Pygmy blue whale distribution and foraging BIAs; • Southern right whale migration BIA; • Humpback whale foraging BIA; • Spotted bottlenose dolphin breeding BIA; • White shark distribution and foraging BIAs;	Exposure will be confined to the surface 10m of the water column. 0-10m water depth In-water entrained hydrocarbon at the low threshold extends along the southern Australian coast from Wilsons Promontory, Victoria to Tathra, NSW. The probability of contact with the nearshore waters of various terrestrial National Parks and Reserves ranges from approximately 15% at Croajingolong, to approximately 10% at Bournda, to less than 5% at Cape Conran, Gippsland Lakes and Wilsons Promontory. Entrained hydrocarbon at the low threshold is predicted to encroach upon Victorian and NSW state waters with likelihoods of 20% and 15% respectively and contact Point Hicks, Wilsons Promontory and Cape Howe Marine National Parks and Beware Reef Marine Sanctuary. Entrained hydrocarbon is predicted to encroach upon Tasmanian waters with a likelihood of 6% including the waters surrounding the terrestrial National Parks and Reserves of the Kent and Hogan Groups, East and West Moncouer Islands and Curtis Island. Other receptors predicted to be contacted by entrained oil at the low threshold - With probabilities of 30 - 85% are: • Albatross, shearwater and petrel foraging BIAs; • Pygmy blue whale distribution and foraging BIAs; • Southern right whale migration BIA; • Humpback whale foraging BIA; • White shark foraging and distribution BIAs; • KEF: Upwelling East of Eden

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)				
		LOC at West Kingfish (WKF)	LOC at Perch (PCA)	LOC at Barracouta (BTA)	LOC at Kipper (KPA)	LOC at Halibut (HLA)
		• KEF: Upwelling East of Eden • With probabilities at, or less than, 15% are: • Little penguin breeding BIA • Grey nurse shark foraging and migration BIAs; • White shark breeding BIA; • Humpback whale foraging BIA; • KEFs: Big Horseshoe Canyon, Canyons on the Eastern Continental Slope, and Shelf Rocky Reefs; • Beagle, East Gippsland and Flinders AMPs	• Indo-Pacific spotted bottlenose dolphin breeding BIA; • Grey nurse shark foraging and migration BIAs; • White shark foraging, distribution and breeding BIAs; • KEF: Upwelling East of Eden • With probabilities at, or less than, 10% are: • Little penguin breeding BIA • KEFs: Big Horseshoe Canyon, Canyons on the Eastern Continental Slope, and Shelf Rocky Reefs; • Beagle, East Gippsland, Flinders and Jervis AMPs	• White shark foraging, distribution and breeding BIAs; • KEF: Upwelling East of Eden • With probabilities at, or less than, 10% are: • Little penguin breeding BIA • Grey nurse shark foraging and migration BIAs; • KEFs: Big Horseshoe Canyon, Canyons on the Eastern Continental Slope, and Shelf Rocky Reefs; • Beagle, East Gippsland and Jervis AMPs	• Grey nurse shark foraging and migration BIAs; • KEF: Upwelling East of Eden • With probabilities at or less than 10% are: • Little penguin breeding BIA; • White shark breeding BIA; • KEFs: Big Horseshoe Canyon, Canyons on the Eastern Continental Slope, Seamounts South and East of Tasmania and Shelf Rocky Reefs; • East Gippsland, Beagle, Flinders, Freycinet and Jervis AMPs	• With probabilities at, or less than, 20% are: • Little penguin foraging BIA; • Grey nurse shark foraging and migration BIAs; • White shark breeding BIA; • Indo-Pacific spotted bottlenose dolphin breeding BIA; • KEFs: Big Horseshoe Canyon; • Beagle, East Gippsland and Flinders AMPs

7.5.3 Risk Assessment

An accidental release of marine diesel has the potential to result in the following impacts:

- Change in water quality;
- Change in habitat.

As a result of change in water quality and / or habitat, further impacts may occur which include:

- Injury / mortality to fauna;
- Change in fauna behaviour
- Change to the function, interests or activities of other users.

Receptors that could be affected by a LOC (Vessels) are identified in Table 7-13.

Table 7-13 Receptors potentially impacted by a LOC from a vessels

Impacts	Water quality	Plankton	Fish	Birds	Marine reptiles	Marine mammals	Coastal habitats and communities	KEFS	National Parks and Reserves	Cultural – Indigenous and Historic	Commercial Fisheries	Tourism and Recreation
Change in water quality	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Change in habitat							✓	✓	✓			
Injury / mortality to fauna		✓	✓	✓	✓	✓	✓					
Changes to the functions, interests or activities of other users										✓	✓	✓

7.5.3.1 Consequence Evaluation

Consequence evaluation of potentially exposed receptors in the event of a LOC from a vessel is described below.

Table 7-14 Risks of surface, shoreline and in-water hydrocarbon exposure from marine diesel spill

Receptor	Impact of MDO exposure	Exposure risk assessment
Water quality	A release of marine diesel has the potential to result in a change i.e. decline in water quality. However a significant proportion (~97.%) of MDO consists of volatile components which evaporate within the first 24 hours so water quality impacts are limited. Degraded water quality will potentially impact all the receptors identified in Table 7-13. These impacts are discussed individually within other sections.	Modelling predicts that a change in water quality will be restricted to surface exposure, with limited in water (dissolved) exposure predicted (i.e. no exposure above the moderate threshold). The area of surface exposure for an individual release event will be small, with maximum distance from the release site of surface exposure at the low threshold predicted to be 72 km. The consequences to water quality are assessed as **Level IV**.
Plankton	Plankton are found in nearshore and open waters beneath the surface in the water column. These organisms migrate vertically through the water column to feed in surface waters at night (NRDA, 2012). As they move close to the sea surface it is possible that they may be exposed to both surface hydrocarbons but to a greater extent, hydrocarbons dissolved or entrained in the water column	There is no predicted exposure above the moderate in-water (dissolved) threshold. The consequences to plankton are assessed as **Level IV**.
Fish	Fish can be exposed to oil through a variety of pathways, including: direct dermal contact (e.g. swimming through oil); ingestion (e.g. directly or via oil-affected prey/foods); and inhalation (e.g. elevated dissolved contaminant concentrations in water passing over the gills). <u>Surface oil</u> Since fish and sharks do not generally break the sea surface, the exposure of surface hydrocarbons to fish and shark species are unlikely to occur. Near the sea surface, fish are able to detect and avoid contact with surface slicks meaning fish mortalities rarely occur in the event of a hydrocarbon spill in open waters (Volkman *et a*l., 2004). As a result, wide-ranging pelagic fish of the open ocean generally are not highly susceptible to impacts from surface hydrocarbons. Adult fish kills reported after oil spills occur mainly to shallow water, near-shore benthic species (Volkman *et al*., 2004). Following the Deep Water Horizon incident, it was suggested that whale sharks may be vulnerable to oiling of gills if exposed to the oil. The tendency of whale sharks to feed close to surface waters will increase the likelihood of exposure to surface slicks and elevated hydrocarbon concentrations beneath slicks. <u>In-water oil</u> Exposure to hydrocarbons entrained or dissolved in the water column can be toxic to fishes. Studies have shown a range of impacts including changes in abundance, decreased size, inhibited swimming ability, changes to oxygen consumption and respiration, changes to reproduction, immune system responses, DNA damage, visible skin and organ lesions, and increased parasitism. However, many fish species can metabolise toxic hydrocarbons, which reduces the risk of bioaccumulation (NRDA, 2012). 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. Pelagic species are also generally highly mobile and as such are not likely to suffer extended exposure (e.g. >96 hours) at concentrations that would lead to chronic effects due to their patterns of movement. Demersal fish are not expected to be impacted given the presence of in-water hydrocarbons in surface layers only. Fish are most vulnerable to hydrocarbon discharges during their embryonic, larval and juvenile life stages. Oil exposure may result in decreased spawning success and abnormal larval development. Impacts on eggs and larvae entrained in the upper water column are not expected to be significant given the temporary period of water quality impairment, and the limited areal extent of a spill. 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.	NOAA (2013) and ITOPF (2011) state that marine diesel spills in open water are so rapidly diluted that fish kills are rarely observed. The predicted impact from surface oiling on fish is considered to be negligible at a population level. Pelagic free-swimming fish and sharks are unlikely to suffer either acute or chronic effects from oil spill exposure because dissolved/entrained hydrocarbons in the water column are predicted to be below thresholds at which impacts might occur and their mobile, transitory characteristics reduce the risk of prolonged exposure. The consequences to fish are assessed as **Level IV**.
Birds	Seabirds and shorebirds are sensitive to the impacts of oiling, with their vulnerability arising from the fact that they cross the air - water interface to feed, while their shoreline habitats may also be oiled (Hook *et al*., 2016). Species that raft together in large flocks on the sea surface are particularly at risk (ITOPF, 2011). <u>Surface oil</u> Birds foraging at sea have the potential to directly interact with oil on the sea surface some considerable distance from breeding sites in the course of normal foraging activities. Seabird species most at risk include those that readily rest on the sea surface (e.g. shearwaters) and surface plunging species (e.g. terns, boobies). As seabirds are a top order predator, any impact on other marine life (e.g. pelagic fish) may disrupt and limit food supply both for the maintenance of adults and the provisioning of young. For seabirds, direct contact with hydrocarbons can foul feathers, which may subsequently result in hypothermia due to a reduction in the ability of the bird to thermo-regulate and impair water-proofing. A bird suffering from cold, exhaustion and a loss of buoyancy may also dehydrate, drown or starve (DSEWPAC, 2011). Increased heat loss as a result of a loss of water-proofing results in an increased metabolism of food reserves in the body, which is not countered by a corresponding increase in food intake, may lead to emaciation (DSEWPAC, 2011). The greatest vulnerability in this case occurs when birds are feeding or resting at the sea surface (Peakall *et al.,* 1987). In a review of 45 actual marine spills, there was no correlation between the numbers of bird deaths and the volume of the spill (Burger, 1993).	Several threatened, migratory and/or listed marine species may occur in the area exposed to moderate to high surface thresholds. There are foraging BIA's for some species of petrels and albatrosses throughout the exposed area. However, there are no breeding BIAs within this area. Seabirds rafting, resting, diving or feeding at sea have the potential to come into contact with surface oil, ranging from moderate to high exposure. Given the extensive ocean foraging habitat available to species such as albatross and petrel, the small area and temporary nature of MDO on the sea surface makes it unlikely that a spill will limit their ability to forage for unaffected prey. When first released, the MDO has higher toxicity due to the presence of volatile components. Individual birds making contact close to the spill source at the time of the spill may suffer impacts however it is unlikely that a large number of birds will be affected. As such, acute or chronic toxicity impacts (death or long-term poor health) to small numbers of birds are possible, however this is not considered significant at a population level. The maximum length of shoreline predicted to be exposed to shoreline loading of hydrocarbons that may have biological impacts to birds (>100 g/m^2) is 14 km. This section of coastline comprises mostly wide sandy beaches that provides habitat for shorebird species such as Hooded plovers and terns and nesting habitat for seabird species. MDO is unlikely to persist on the surface of sandy beaches because it quickly penetrates porous sediments (NOAA, 2013). This behaviour limits the duration of exposure to fauna on the shoreline. Shorebirds foraging for food in intertidal areas or along the high tide mark and splash zone may encounter weathered hydrocarbons that may be brought back to nests.

Receptor	Impact of MDO exposure	Exposure risk assessment
	Penguins may be especially vulnerable to oil because they spend a high portion of their time in the water and readily lose insulation and buoyancy if their feathers are oiled (Hook *et al*., 2016). The Iron Baron vessel spill (325 tonnes of bunker fuel in Tasmania in 1995) is estimated to have resulted in the death of up to 20,000 penguins (Hook *et al*., 2016). Shoreline oil Shorebirds are likely to be exposed to oil when it directly impacts the intertidal zone and onshore due to their feeding habitats. Foraging shorebirds will be at potential risk of both direct impacts through contamination of individual birds (e.g. fouling of feathers) and indirect impacts (e.g. fouling and/or a reduction in prey items) (Clarke, 2010). Birds that are coated in oil can also suffer from damage to external tissues, including skin and eyes, as well as internal tissue irritation in their lungs and stomachs Breeding birds (both seabirds and shorebirds) may be exposed to oil via direct contact or the contamination of the breeding habitat (e.g. shores of islands) (Clarke, 2010). Bird eggs may subsequently be damaged if an oiled adult sits on the nest.	Hydrocarbon entering the sandy nests of Hooded plovers, terns or other bird species is likely to percolate through the sand and not accumulate in the feathers of adults or young. Toxicity effects from ingestion of contaminated prey caught in the intertidal zone or from direct exposure, or transport back to, are unlikely, as the volatile components are likely to have flashed off prior to stranding (minimum stranding times range from 2 days). The populations of seabird and shorebird species have a wide geographic range, meaning that impacts to individuals or a population at one location will not necessarily extend to populations at other un-impacted locations. Consequently, the potential consequence of risks to seabirds and shorebirds from a vessel collision event are considered to be **Level III**, to account for a species of local importance being affected.
Marine Reptiles	Marine turtles are vulnerable to the effects of oil at all life stages; eggs, hatchlings, juveniles, and adults. Oil exposure affects different turtle life stages in different ways; and each turtle life stage frequents a habitat with varied potential to be impacted during an oil spill. Several aspects of turtle biology and behaviour place them at particular risk, including a lack of avoidance, indiscriminate feeding in convergence zones, and large pre-dive inhalations. Marine turtles can be exposed to oil externally (e.g. swimming through oil slicks) or internally (e.g. swallowing the oil, consuming oil affected prey, or inhaling of volatile oil related compounds). Marine reptiles can therefore be affected by surface and shoreline exposure. Surface oil Effects of oil on turtles include increased egg mortality and developmental defects; direct mortality due to oiling in hatchlings, juveniles, and adults; and negative impacts to the skin, blood, digestive and immune systems, and salt glands. Oil can enter cavities such as the eyes, nostrils, or mouth; and oil covering their bodies may interfere with breathing because they inhale large volumes of air to dive. Experiments on physiological and clinical pathological effects of hydrocarbons on loggerhead turtles (~15–18 months old) showed that the turtles' major physiological systems were adversely affected by both chronic and acute exposures (96 hour exposure to a 0.05 cm layer of South Louisiana crude oil versus 0.5 cm for 48 hours) (Lutcavage *et al.* 1995). Recovery from the sloughing skin and mucosa took up to 21 days, increasing the turtle's susceptibility to infection or other diseases, such as fibropapilloma (Lutcavage *et al*. 1995). Records of oiled wildlife during spills rarely include marine turtles, even from areas where they are known to be relatively abundant (Short, 2011). An exception to this was the large number of marine turtles collected (613 dead and 536 live) during the Deep Water Horizon (DWH) incident in the Gulf of Mexico (GoM), although many of these animals did not show any sign of oil exposure (NOAA, 2013). Of the dead turtles found, 3.4% were visibly oiled and 85% of the live turtles found were oiled (NOAA, 2013). Of the captured animals, 88% of the live turtles were later released, suggesting that oiling does not inevitably lead to mortality. Shoreline oil Turtles may experience oiling impacts on nesting beaches and eggs through chemical exposures resulting in decreased survival to hatching and developmental defects in hatchlings. Adult females crossing an oiled beach could cause external oiling of the skin and carapace; nothing that most oil is deposited at the high-tide line, and most turtles nest well above this level. Studies on freshwater snapping turtles showed uptake of PAHs from contaminated nest sediments, but no impacts on hatching success or juvenile health following exposure of eggs to dispersed weathered light crude (Rowe *et* al., 2009). However, other studies found evidence that exposure of freshwater turtle embryos to PAHs results in deformities (Bell *et a*l., 2006, Van Meter *et al*., 2006). Turtle hatchlings may be more vulnerable to smothering as they emerge from the nests and make their way over the intertidal area to the water (AMSA, 2015). Hatchlings that contact oil residues while crossing a beach can exhibit a range of effects including impaired movement and bodily functions (Shigenaka, 2003). Hatchlings sticky with oily residues may also have more difficulty crawling and swimming, rendering them more vulnerable to predation. It should be noted that the threat and relative impacts of an unplanned discharge on some marine reptile species are considered less damaging than other stressors. Report cards produced on protected marine reptiles in Australia generally ranked oil pollution as either 'not of concern' or 'of less concern' depending on the marine region (DSEWPaC 2012a).	Marine turtles, or their habitat, may occur in the area potentially exposed to marine diesel at moderate - high concentrations, however they are not noted to reside or aggregate in significant numbers, and there are no recognised BIAs or critical habitats in the region. There are no turtle nesting beaches along the Gippsland coastline, so impacts to turtles from shoreline oiling will not occur. Although the effects of MDO on marine reptiles, specifically turtles can be severe, the low density of turtles expected in the region (due to lack of BIA or aggregations) suggests that few, if any, individuals would be affected. Consequently, the potential impacts to marine reptiles are considered to be **Consequence Level IV**.
Marine Mammals (Pinnipeds)	Pinnipeds are directly at risk from impacts associated with the exposure to surface, shoreline and in-water hydrocarbons. Surface oil Pinnipeds are vulnerable to sea surface exposures in particular 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, and regularly haul out on to beaches. Pinnipeds are also sensitive as they will stay near established colonies and haul-out areas, meaning they are less likely	Seals are known to occur within the area exposed to moderate-high surface threshold. However, these areas are not identified as critical habitat and there are no identified BIAs for seals in the region. There is no predicted oil stranding along shorelines known to be used by Australian or New Zealand fur-seals as breeding or haul-out sites. As such, it is unlikely that oiling of seals will occur on shorelines.

Receptor	Impact of MDO exposure	Exposure risk assessment
	to practise avoidance behaviours. This is corroborated by Geraci and St. Aubins (1988) who suggest seals, sea-lions and fur-seals have been observed swimming in oil slicks during a number of documented spills. As a result of exposure to surface oils, pinnipeds, with their relatively large, protruding eyes are particularly vulnerable to effects such as irritation to mucous membranes that surround the eyes and line the oral cavity, respiratory surfaces, and anal and urogenital orifices. Hook *et al* (2016) reports that seals appear not to be very sensitive to contact with oil, but instead to the toxic impacts from the inhalation of volatile components. For some pinnipeds, fur is an effective thermal barrier because it traps air and repels water. Petroleum stuck to fur reduces its insulative value by removing natural oils that waterproof the pelage. Consequently, the rate of heat transfer through fur seal pelts can double after oiling (Geraci & St.Aubin, 1988), adding an energetic burden to the animal. Kooyman *et al* (1976) suggest that in fact, fouling of approximately one-third of the body surface resulted in 50% greater heat loss in fur seals immersed in water at various temperatures. Fur-seals are particularly vulnerable due to the likelihood of oil adhering to fur. Heavy oil coating and tar deposits on fur-seals may result in reduced swimming ability and lack of mobility out of the water. <u>In-water oil</u> Ingested hydrocarbons can irritate or destroy epithelial cells that line the stomach and intestine, thereby affecting motility, digestion and absorption. However, pinnipeds have been found to have the enzyme systems necessary to convert absorbed hydrocarbons into polar metabolites, which can be excreted in urine (Engelhardt, 1982; Addison & Brodie, 1984; Addison *et al*., 1986). Volkman *et al* (1994) report that benzene and naphthalene ingested by seals is quickly absorbed into the blood through the gut, causing acute stress, with damage to the liver considered likely. If ingested in large volumes, hydrocarbons may not be completely metabolised, which may result in death. <u>Shoreline oil</u> Breeding colonies (used to birth and nurse until pups are weaned) are particularly sensitive to hydrocarbon spills (Higgins & Gass, 1993). ITOPF (2011) 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. It is reported that most pinnipeds scratch themselves vigorously with their flippers and do not lick or groom themselves, so are less likely to ingest oil from skin surfaces (Geraci & St. Aubin, 1988). However, mothers trying to clean an oiled pup may ingest oil. The Long Term Environmental Impact and Recovery report for the Iron Barren oil spill concluded that “The number of pups born at Tenth Island in 1995 was reduced when compared to previous years. There was a strong relationship between the productivity of the seal colonies and the proximity of the islands to the oil spill wherein the islands close to the spill showed reduced pup production and those islands more distant to the oil spill did not” (Tasmanian SMPC, 1999). Pinnipeds are further at risk because they appear to rely on scent to establish a mother-pup bond (Sandegren, 1970; Fogden, 1971), and consequently oil-coated pups may not be recognisable to their mothers. This is only theorised, with studies and research indicating interaction between mothers and oiled pups were normal (Davis and Anderson, 1976; Davies, 1949; Shaughnessy & Chapman, 1984). Australian sea-lions have 'naturally poor recovery abilities' due to 'unusual reproductive biology and life history' (TSSC, 2005). Due to the extreme philopatry of females and limited dispersal of males between breeding colonies, the removal of only a few individuals annually may increase the likelihood of decline and potentially lead to the extinction of some of the smaller colonies.	Although the characteristics of MDO reduce the risk of hyperthermia from oiling, other effects of surface and in-water MDO on pinnipeds can be severe. Long term impacts at a population level are considered unlikely however the consequence is assessed as **Level III.**
Marine Mammals (Cetaceans)	Whales and dolphins can be exposed to the chemicals in oil through: • Internal exposure by consuming oil or contaminated prey; • Inhaling volatile oil compounds when surfacing to breathe; • External exposure, by swimming in oil and having oil directly on the skin and body; and • Maternal transfer of contaminants to embryos (NRDA, 2012). <u>Surface oil</u> Unlike with pinnipeds (see above), oil would not be expected to adhere well to the surface of cetacean skin due to the lack of hairs and the frequent sloughing of skin cells (Engelhardt 1983, Helm *et al*. 2015). In addition, oil should not readily penetrate cetacean skin due to tight intercellular bridges and thick epidermis (O'Hara & O'Shea 2001). Nevertheless, cetaceans can be exposed to oil through direct contact with the eyes, mouth (ingestion), and airways (inhalation), potentially leading to inflammation and lung congestion (Geraci & St. Aubin 1990). Helm *et al.* (2015) suggested that inhalation of toxic compounds associated with fresh oil was of greater concern than absorption through the skin and ingestion. The inhalation of oil droplets, vapours and fumes is a distinct possibility if	Several threatened, migratory and/or listed cetacean species may traverse the MDO spill plume. The distribution and foraging BIA for the Pygmy blue whale and the migration BIA for the Southern right whale may be exposed to surface concentrations at moderate-high thresholds. Biological effects of physical contact with areas of moderate concentrations of MDO at the sea surface are unlikely to lead to any long-term consequences. In the unlikely event of an MDO spill, the environmental impact would be limited to a relatively short period following the release and would need to coincide migration to result in exposure of a large number of individuals. The highly mobile nature of cetacean species means that such exposure is not anticipated to result in long term population viability effects and the resultant impact is assessed as **Consequence Level III.**

Receptor	Impact of MDO exposure	Exposure risk assessment
	whales or dolphins surface in slicks to breathe. Exposure to hydrocarbons in this way could damage mucous membranes, damage airways or even cause death. Cetaceans may incidentally draw seawater and floating oil, into their lungs by breathing in splashed droplets or liquid that has collected near the blowhole just prior to inhalation. Aspiration of liquid oil can cause physical injuries to the respiratory tract by irritating tissues/membranes and can also lead to absorption of toxicants into the blood, as in inhalation exposure (Takeshita *et al*., 2017). French-McCay (2016) proposed exposure to oil concentrations of 10 g/m^{2}could result in mortality to marine mammals. Evidence suggests that many cetacean species are unlikely to detect and avoid spilled oil (Matkin *et al*. 2008). There are numerous examples where cetaceans have appeared to incidentally come into contact with oil and/or not demonstrated any obvious avoidance behaviour. Following the Exxon Valdez oil spill, Matkin *et al*. (2008) reported killer whales in slicks of oil as early as 24 hours after the spill and evidence presented by Aichinger Dias *et al.* (2017) showed that following the DWH oil spill cetaceans in the GoM came into direct contact with both oil and sheen by swimming through them. Although in the GoM it was observed that cetaceans were able to detect the thick and dark-coloured patches of oil, detection of the lighter substances may have been more difficult. Photographs of dolphins with oil on their bodies showed that oil can adhere to and persist on cetacean skin, and contrary to suggestions from previous studies, direct contact with oil and resultant exposure to toxic compounds is of concern (Aichinger Dias *et al*., 2017). <u>In water (dissolved and entrained) oil</u> The physical impacts from ingested hydrocarbon with subsequent lethal or sub-lethal impacts are applicable to both dissolved and entrained oil. However, the susceptibility of cetaceans varies with feeding habits. Baleen whales (such as Blue, Southern right and Humpback whales) are not particularly susceptible to ingestion of oil in the water column as they feed by skimming the surface. Oil may stick to the baleen while they 'filter feed' near slicks. Toothed whales and dolphins may be susceptible to ingestion of dissolved and entrained oil as they gulp feed at depth. As highly mobile species, in general it is very unlikely that these animals will be constantly exposed to concentrations of hydrocarbons in the water column for continuous durations (e.g., >96 hours) that would lead to chronic effects. Note also, many marine mammals appear to have the necessary liver enzymes to metabolise hydrocarbons and excrete them as polar derivatives (Ball and Truskewycz, 2013). Ingestion of oil may however result in acute nausea and vomiting and aspiration of oily vomitus into the lungs. Research conducted in the GoM linked aspiration pneumonia, lung abscesses, and pulmonary infections in dolphins to exposure to DWH oil (Venn-Watson *et al*., 2015a cited in Takeshita *et al.,* 2017) Some whales, particularly those with coastal migration and reproduction, display strong site fidelity to specific resting, breeding and feeding habitats, as well as to their migratory paths and this may override any tendency for cetaceans to avoid the noxious presence of hydrocarbons. The Southern right whale exhibits varying degrees of site fidelity, with the majority of females and calves returning to the same birthing location, while some also travel long distances between breeding grounds within a season (DSEWPAC, 2012c). If spilled oil reaches these biologically important habitats, the pollution may disrupt natural behaviours, displace animals, reduce foraging or reproductive success rates and increase mortality. Takeshita *et al.* (2017) concluded that the range of adverse health effects and increased mortality/reproductive failure observed in cetacean populations throughout the GoM since the DWH oil spill are consistent with the range of exposure scenarios. If sufficiently high numbers of animals are impacted, the greater population may experience reduced recovery and survival rates. The restitution time for cetaceans affected at a population level is assumed to be long term, i.e. 40 years, based on consensus on recovery times for marine mammals following the DWH incident (Bock *et. al*., 2018).	
Coastal Habitat – Shoreline (Sandy)	Sandy beaches provide potential foraging and breeding habitat for numerous bird, marine turtle and pinniped species. These activities primarily occur above the high tide line, with exception of haul outs. Note, most of the oil on a sandy shore will be concentrated at, and below, the high tide mark. Sandy beaches are also inhabited by a diverse assemblage (although not always abundant) of infauna (including nematodes, copepods and polychaetes); and macroinvertebrates (e.g. crustaceans). Because the sand retains oil, such animals may be killed if oil penetrates into the sediments. Long-term depletion of sediment fauna could have an adverse effect on birds or fish that use tidal flats as feeding grounds (IPIECA, 1999). Depth of penetration in sandy sediment is influenced by: • Particle size. Penetration is not generally as great on mud as on coarser sediments. • Oil viscosity. Viscous oils and mousse (water-in-oil emulsion) tend to penetrate less deeply than low-viscosity oils such as light crudes or diesel oil. • Drainage. If sediments are poorly drained (as is often the case with tidal flats remote from creeks or channels), the water content may prevent the oil from penetrating into the sediment. In contrast, oil may reach depths greater than one metre in coarse well-drained sediments. • Animal burrows and root pores. Penetration into fine sediments is increased if there are burrows of animals such as worms, or pores left where plant roots have decayed.	The maximum length of coastline potentially at risk from stranded oil at the moderate threshold is 14 km. This coastline is dominated by wide sandy beaches. With the shortest time to shoreline accumulation at the moderate threshold being 3 days the MDO will have partially weathered. The shoreline loadings may result in acute toxicity, and mortality, of invertebrate communities, especially as the MDO will easily penetrate into sandy sediments. However, tidal action is expected to lead to rapid weathering of any hydrocarbons in the intertidal area and the populations of these communities would be likely to rapidly recover. The impact of MDO coming ashore on sandy beaches is considered to have a **Consequence Level III.**

Receptor	Impact of MDO exposure	Exposure risk assessment
	A 100 g/m^2 threshold (considered a 'stain' or 'film', and equivalent to 0.1 mm thickness) is assumed as the lethal threshold for invertebrates on hard substrates and sediments (mud, silt, sand, gravel) in intertidal habitats. A threshold of 100 g/m^2 oil thickness would be enough to coat an animal and likely impact its survival and reproductive capacity (French-McCay, 2009). Based on this, areas of heavy oiling would likely result in acute toxicity, and death, of many invertebrate communities, especially where oil penetrates into sediments through animal burrows (IPIECA, 1999). However, these communities would be likely to rapidly recover (recruitment from unaffected individuals and recruitment from nearby areas) as oil is removed from the environment. Following the Sea Empress spill (in west Wales, 1996) many amphipods (sandhoppers), cockles and razor shells were killed. There were mass strandings on many beaches of both intertidal species (such as cockles) and shallow sub-tidal species. Similar mass strandings occurred after the Amoco Cadiz spill (in Brittany, France, 1978) (IPIECA, 1999). Following the Sea Empress spill, populations of mud snails recovered within a few months but some amphipod populations had not returned to normal after one year. Opportunists such as some species of worm may actually show a dramatic short-term increase following an oil spill (IPIECA, 1999). In March 2014, small volumes of crude oil from an unidentified source (confirmed to not be offshore oil and gas production facilities) washed up along a 7-km section of sandy beach on the Victorian Gippsland coast as small (a few millimetres thick) granular balls (Gippsland Times, 2014). AMSA (2014) reported that no impacts were observed over the course of two months following the incident. As a result of the DWH incident, oil washed up on sandy beaches of the Alabama coastline. The natural movement of sand and water through the beach system continually transformed and re-distributed oil within the beach system, and 18 months after the event, mobile remnant oil remained in various states of weathering buried at different depths in the beaches (Hayworth *et al*., 2011). There is also evidence that submerged oil mats (SOM) exist just offshore of the Alabama beaches (ranging in thickness from a few millimetres to several centimetres), which has resulted in the regular washing up of tar balls onto sandy beaches. These SOMs may serve as long-term sources of remnant oil to the beach ecosystem (Hayworth *et al*., 2011). Long-term changes to the beach ecosystem as a result of stranded oil are unknown. Other results from beach sampling undertaken at Dapuhin Island, Alabama, in May (pre-impact) and September 2011 (post-impact) found a large shift in the diversity and abundance of microbial species (e.g., nematodes, annelids, arthropods, polychaetes, protists, fungi, algae and bacteria). Post-spill, sampling indicated that species composition was almost exclusively dominated by a few species of fungi. DNA analyses revealed that the 'before' and 'after' communities at the same sites weren't closely related to each other (Bik *et al*., 2012). Similar studies found that oil deposited on the beaches caused a shift in the community structure toward a hydrocarbonoclastic consortium (petroleum hydrocarbon degrading microorganisms) (Lamendella *et al*., 2014).	
KEFs	Potential impacts to sensitive receptors related to the Upwelling East of Eden, such as plankton and other marine fauna, are discussed in the appropriate sections above.	The zone of moderate sea surface MDO exposure intersects the westernmost portion of the KEF: Upwelling East of Eden. While a spill would not affect the upwelling itself, if the spill occurs at the time of an upwelling event, it may result in krill being exposed to in-water MDO. However no in-water exposure is predicted above levels at which impacts are expected to occur. The consequence is assessed as **Level IV**.
National Parks and Reserves	Potential impacts to sensitive receptors related to the shoreline of the Gippsland Lakes Coastal Park, such as sandy beaches and birds, are discussed in the appropriate sections above.	Part of the coast bordering the Gippsland Lakes Coastal Park is within the zone of moderate shoreline exposure. The consequence to Gippsland Lakes Coastal Park is assessed as localised and short term, and ranked as **Consequence Level III.**
Commercial fisheries	Commercial fishing has the potential to be impacted through exclusion zones associated with the spill, the spill response and subsequent reduction in fishing effort. Exclusion zones may impede access to commercial fishing areas, for a short period of time, and nets and lines may become oiled. The impacts to commercial fishing from a public perception perspective however, may be much more significant and longer term than the spill itself. Fishing areas may be closed for fishing for shorter or longer periods because of the risks of the catch being tainted by oil. Concentrations of petroleum contaminants in fish and crustacean and mollusc tissues could pose a significant potential for adverse human health effects, and until these products from nearshore fisheries have been cleared by the health authorities, they could be restricted for sale and human consumption. Indirectly, the fisheries sector will suffer a heavy loss if consumers are either stopped from using or unwilling to buy fish and shellfish from the region affected by the spill. Impacts to fish stocks have the potential for reduction in profits for commercial fisheries, and exclusion zones exclude fishing effort. Davis *et al* (2002) report detectable tainting of fish flesh after a 24-hour exposure at crude concentrations of 0.1 ppm, marine fuel oil concentrations of 0.33 ppm and diesel concentrations of 0.25 ppm. The Montara spill (as the most recent [2009] example of a large hydrocarbon spill in Australian waters) occurred over an area fished by the Northern Demersal Scalefish Managed Fishery (with 11 licences held by 7 operators), with goldband snapper, red emperor, saddletail snapper and yellow spotted rockcod being the key species fished (PTTEP, 2013). As a precautionary measure, the WA Department of Fisheries advised the commercial fishing fleet to avoid fishing in oil-affected waters. Testing of fish caught in areas of visible oil slick (November 2009) found that there were no detectable	Several commercial fisheries may operate within the area potentially exposed in the event of a LOC and a temporary fisheries closure may be put in place. Oil may foul the hulls of fishing vessels and associated equipment, such as gill nets. A temporary fisheries closure, combined with oil tainting of target species (actual or perceived), may lead to financial losses to fisheries and economic losses for individual licence holders. Due to the rapid weathering of the MDO in the high energy Bass Strait environment it is unlikely that an exclusion zone would be established, consequently, the potential impacts to commercial fisheries from an MDO LOC are considered to be **Consequence Level III** (based on public impact consequence considerations as per Esso Risk Matrix Application Guide, 2018).

Receptor	Impact of MDO exposure	Exposure risk assessment
	petroleum hydrocarbons in fish muscle samples, suggesting fish were safe for human consumption. In the short-term, fish had metabolised petroleum hydrocarbons. Limited ill effects were detected in a small number of individual fish only (PTTEP, 2013). No consistent effects of exposure on fish health could be detected within two weeks following the end of the well release. Follow up sampling in areas affected by the spill during 2010 and 2011 (PTTEP, 2013) found negligible ongoing environmental impacts from the spill. Since testing began in the month after the DWH blowout in the Gulf of Mexico (GoM) (2010), levels of oil contamination residue in seafood consistently tested 100 to 1,000 times lower than safety thresholds established by the USA FDA, and every sample tested was found to be far below the FDA's safety threshold for dispersant compounds (BP, 2015). FDA testing of oysters found oil contamination residues to be 10 to 100 times below safety thresholds (BP, 2014). Sampling data shows that post-spill fish populations in the GoM since 2011 were generally consistent with pre-spill ranges and for many shellfish species, commercial landings in the GoM in 2011 were comparable to pre-spill levels. In 2012, shrimp (prawn) and blue crab landings were within 2.0% of 2007-09 landings. Recreational fishing harvests in 2011, 2012 and 2013 exceeded landings from 2007-09 (BP, 2014).	
Cultural – Indigenous and Historic	Visible sheen has the potential to reduce the visual amenity of cultural heritage sites such as indigenous or historic (e.g. shipwreck) protected areas.	Oil sheen is predicted to encroach upon nearshore waters in the vicinity of the Gunai Kurnai Native Title Determination Area and a number of historic shipwrecks. However, given the relatively short duration, and limited extent of predicted exposure the consequence level is considered **Level IV** (based on public impact consequence considerations as per Esso Risk Matrix Application Guide, 2018).
Tourism and Recreation	Refer to sections on fish, cetaceans and sandy shorelines above.	Tourism and recreation are also linked to the presence of marine fauna (e.g. whales), particular habitats and locations for swimming or recreational fishing. The modelling predicts a low probability of visible oil extending into Victorian waters (including Ninety Mile Beach MNP) and to the sandy shoreline along Ninety Mile Beach (including Gippsland Lakes Coastal Park). Short-term impacts to nature-based tourism and other human uses of beaches (and nearshore waters) may occur as a result of temporary beach closures to protect human health or due to perceptions of a polluted environment that is not desirable to visit. However, given the relatively short duration, and limited extent of predicted shoreline contact the consequence level is considered **Level III** (based on public impact consequence considerations as per Esso Risk Matrix Application Guide, 2018).

7.5.3.2 Likelihood Evaluation

Based on industry data, vessel collisions are considered rare (37 collisions reported from a total of 1200 marine incidents in Australian waters between 2005 and 2012). As most vessel collisions involve the loss of containment of a forward tank, which are generally double-lined and smaller than other tanks, the loss of the maximum volume used in the scenario above is unlikely.

Considering the inherent low likelihood of a collision occurring, the safeguards in place and enactment of the SMPEP and OPEP, and the rapid weathering of MDO, the probability of the impacts described above occurring is considered **Very Highly Unlikely (E)**.

7.5.4 Risk Ranking

Consequence	Likelihood	Risk Ranking
III	E	4

7.5.5 Controls

Good Practice	Adopted	Control	Rationale
Support vessel approach protocols	✓	**CM27**: Support vessel approach procedure	Support vessel approach procedure outlines the required 500 m approach and DP operational checklists complete to ensure safe approach to the platforms.
Structured operational limits criteria for dynamic positioning (DP) operations and vessel SIMOPS	✓	**CM28**: ASOG / CAMO procedures	The application of ASOG / CAMO risk management tools is industry best practice for DP operations. CAMO describes how to configure the vessels DP system and ASOG sets out the operational, environmental and equipment performance limits and procedures considered necessary for safe DP operations whilst carrying out a specific activity, including SIMOPS.
DP Class 2	✓	**CM27**: Support vessel DP system	DP Class 2 (redundancy so that no single fault in an active system will cause the system to fail) is the industry standard where loss of position keeping capability may cause personnel injury, pollution or damage with large economic consequences.
Shipboard Marine Pollution Emergency Plan (SMPEP)	✓	**CM20:** SMPEP	The vast majority of commercial ships are built to and surveyed for compliance with the standards (i.e. Rules) laid down by classification societies. The role of vessel classification and classification societies has been recognised by the International Maritime Organisation (IMO) across many critical areas including the International Convention for the Safety of Life at Sea, (SOLAS), the 1988 Protocol to the International Convention on Load Lines and the International Convention for the Prevention of Pollution from Ships (MARPOL). A vessel built in accordance with the applicable Rules of an IACS Member society may be assigned a class designation relevant to the IMO rules, on satisfactory completion of the relevant classification society surveys. For ships in service, the society carries out routine scheduled surveys to verify that the ship remains in compliance with those Rules. Should any defects that may

Good Practice	Adopted	Control	Rationale
			affect class become apparent, or damages be sustained between the relevant surveys, the owner is required to inform the society concerned without delay. MARPOL Annex I Regulations for the Prevention of Pollution by Oil specifically require that a SMPEP (or equivalent, according to class) is in place. To prepare for a spill event, the SMPEP details: • response equipment available to control a spill event • review cycle to ensure that the SMPEP is kept up to date • testing requirements, including the frequency and nature of these tests. In the event of a spill, the SMPEP details: • reporting requirements and a list of authorities to be contacted • activities to be undertaken to control the release • procedures for coordinating with local authorities.

7.5.6 Demonstration of ALARP

ALARP Decision Context and Justification	**Decision Context A** Operating vessels is common practice for activities such as fuel transfer, provision of cargo, and reverse logistical support. These activities are well regulated with associated control measures, well understood, and are implemented across the offshore industry. Although there is the potential for impacts of consequence Level III from a vessel collision, spill source volumes are limited in size, the environmental impact of MDO is well understood, a credible spill volume has been modelled and a very conservative threshold has been selected to define the PEA, so there is limited uncertainty associated with this event. During stakeholder engagement, no questions were raised regarding the acceptability of the risk of this event. Esso believes **ALARP Decision Context A** should apply.

7.5.7 Demonstration of Acceptability

Factor	Demonstration Criteria	Criteria Met	Rationale
Risk Assessment Process for Unplanned Events	The risk ranking is lower than Category 1	✓	The risk ranking is Category 4 (the lowest category) and therefore considered acceptable.
Principles of Ecologically Sustainable Development (ESD)	No potential to affect biological diversity and ecological integrity.	✓	The potential impact associated with this aspect is limited to a localised short-term impact, which is not considered as having the potential to affect biological diversity and ecological integrity.
	Activity does not have the potential to result in serious	✓	The activities were evaluated as having the potential to result in a Level III

Factor	Demonstration Criteria	Criteria Met	Rationale
	or irreversible environmental damage.		consequence thus are not considered as having the potential to result in serious or irreversible environmental damage.
Legislative and Other Requirements	Legislative and other requirements have been identified and met.	✓	The proposed activities align with the requirements of the: • Navigation Act 2012 – Chapter 6 (Safety of Navigation) Part 6 deals with safe navigation including provisions about reporting of movement of vessels. The requirements of MARPOL Annex I has been adopted. The following legislative and other requirements are considered relevant as they apply to the implementation of MARPOL in Australia: • Protection of the Sea (Prevention of Pollution from Ships) Act 1983. • Navigation Act 2012 – Chapter 4 (Prevention of Pollution). • Marine Order 91 (Marine pollution prevention – oil) 2014
Internal Context	Consistent with Esso's Environment Policy.	✓	Proposed activities are consistent with Esso's Environment Policy, in particular, to "comply with all applicable environmental laws and regulations and apply responsible standards where laws and regulations do not exist"
	Meets ExxonMobil Environmental Standards	✓	There is no standard related to a LOC of marine diesel but the activities proposed meet the strategic objectives of the Upstream Environmental Standards.
	Meets ExxonMobil Operations Integrity Management System (OIMS) Objectives	✓	Proposed activities meet: • OIMS System 6-5 objective to identify and assess environmental aspects; significant aspects are addressed and controlled consistent with policy and regulatory requirements; • OIMS System 8-1 objective to clearly define and communicate operations integrity requirements to contractors; and • OIMS System 10-2 objectives to document, resource and communicate emergency response plans, and conduct training, exercises and/or drills to determine the adequacy of the plans.
External Context	Stakeholder concerns have been considered / addressed through the consultation process.	✓	No specific stakeholder concerns have been raised concerning the risk of a LOC resulting from vessel collision.

7.6 Accidental Release – LOC from pipeline

7.6.1 Causes of Accidental Release – LOC from pipeline

Loss of containment from a pipeline could occur due to a variety of mechanisms varying from a pinhole leak through to a rupture. Details of different release scenarios have been described in Table 7-15.

7.6.2 Spill Modelling

Spill modelling was prepared for the worst case discharge scenarios to establish the extent of possible environmental impact (RPS, 2020). The spill modelling was prepared based on the parameters described in Table 7-23. The modelling was based on 100 spill simulations and annual analysis (i.e. over all seasons).

7.6.2.1 Discharge Scenarios and Modelling Inputs

Table 7-15 Selection of worst case discharge scenario - LOC from pipeline

Process	Description
Identify potential discharge scenarios	Loss of containment from a pipeline could occur due to a variety of mechanisms. Release scenarios from a pipeline are highly dependent on the size of the hole in the pipeline. Pipeline discharge scenarios could vary from a pinhole leak, a minor hole to a full rupture. Pinhole leaks could be caused through: • Corrosion Minor holes could be caused by: • Corrosion • Dropped objects • Anchor drag A full rupture could be caused by: • Failure of an unsupported span • Anchor drag on an unprotected section of pipeline. Vessel collision with platform that results in loss of containment from pipeline risers. A collision of a vessel with a riser could occur on facilities where oil risers that are external to the jacket and are located on the same side that vessel transfers occur (east side). On all of these facilities, pipeline risers are protected by a riser guard. The facilities where this is the case are: • Marlin Complex at Marlin A: MLA300 (300mm oil) • Marlin Complex at Marlin A: TNA200 (200mm oil) • Snapper: SNA250 (250mm oil)
Identification of potential pollutants	Bass Strait Operations include up to 600km of pipelines which contain a mixture of hydrocarbons, produced water and production chemicals. In general, pipelines are classified as “oil” or “gas” by their liquid content. As part of Bass Strait Offshore Operations there are eight pipelines which cross shore. The contents of these pipelines is as follows:

License	Name	DN (mm)	From	Contents	Contents	Status
VIC/PL4	BTA-Shore	150	Barracouta	Oil	Condensate from BTA.	In Service
VIC/PL5	HLA-VS1	600	Halibut	Oil	The HLA600 Pipeline contains liquids (condensate and crude) from a number of platforms in the HLA pipeline network.	In Service

<table>
<tr><th>Process</th><th>Description</th></tr>
<tr><td></td><td>
<table>
<tr><td></td><td></td><td></td><td></td><td></td><td>Contents of the HLA pipeline includes liquid products from 11 different facilities (BMB, BMA, WKF, FTA, CBA, HLA, WTN, FLA, TNA, WTA, SNA)</td><td></td></tr>
<tr><td>VIC/PL21</td><td>PCA-Shore</td><td>300</td><td>Perch</td><td>Oil</td><td>The PCA to shore pipeline has been suspended and filled with inhibited seawater.</td><td>Suspended</td></tr>
<tr><td>VIC/PL1</td><td>BTA-Shore</td><td>450</td><td>Barracouta</td><td>Gas</td><td>Gas from BTA. Gas from the BTW project will be fed into this pipeline once operations commence.</td><td>In Service</td></tr>
<tr><td>VIC/PL2</td><td>MLA-Shore</td><td>500</td><td>Marlin</td><td>Gas</td><td>Gas from TNA, WTN, FLA and MLA</td><td>In Service</td></tr>
<tr><td>VIC/PL13</td><td>SNA-Shore</td><td>600</td><td>Snapper</td><td>Gas</td><td>Gas from SNA</td><td>In Service</td></tr>
<tr><td>VIC/PL32</td><td>BMA-VS3</td><td>350</td><td>Bream A</td><td>Gas</td><td>Gas from BMA</td><td>In Service</td></tr>
<tr><td>n/a (secondary pipeline)</td><td>Shore-PCA</td><td>100</td><td>Shore</td><td>Gas lift</td><td>Inhibited seawater</td><td>Suspended</td></tr>
</table>
A loss of containment from a gas filled pipeline is considered to be of a lower consequence than from an oil pipeline as the product will disperse into the marine environment quickly. This assessment considers a release from an oil pipeline as the worst case.
</td></tr>
<tr><td>Determine characteristics of the discharge scenario (including calculation of potential spill volumes)</td><td>
A spill from a pipeline could happen at any location. In order to understand potential impacts to sensitive shoreline receptors, for the purposes of this worst case discharge scenario, it is assumed that the discharge occurs close to shore (at 3NM). Loss of containment at a pipeline riser on a platform would be further from shore than 3NM (as the closet platform is 23km (~12NM) from shore.
A pipeline discharge scenario could happen subsea but could also happen at surface where the pipeline reaches the platform (via a riser).
Loss of containment from a pipeline could occur due to a variety of mechanisms with volumes released highly dependent on the size of the hole.
Pinhole leak: Generally pinhole leaks release at a low rate. Release time can vary dependent on when the leak is identified and how it is repaired. Volumes of pinhole leaks have been estimated at up to 10kL
Minor hole (1 – 3 mm): Leaks from a minor hole are highly dependent on the size of the hole. The volume of release from a minor leak with a hole up to 3mm is approximately 400kL.
Full Rupture: Full rupture of a pipeline assumes a large hole and partial loss of contents from the pipeline up to a point of isolation. Taking into account distance between isolation points and diameter of the pipeline, the largest volume of oil pipelines is:

HLA – Shore: 20,300 kL
WKF – HLA: 5,500 kL
BMA – WKF: 3,600 kL

This release scenario does not assume loss full loss of inventory due to emergency de-pressuring of the pipeline and reaching subsea pressure equilibrium.
</td></tr>
<tr><td>Determine likelihood of the</td><td>Accidental release due to a pipeline pinhole leak has occurred within Esso Bass Strait Operations in the past 10 years. This scenario is considered likely (classified as likelihood A).</td></tr>
</table>

Process	Description
discharge scenario	Minor hole has not occurred within Esso Bass Strait Operations in the past 10 years but has occurred within the industry. This scenario is considered very unlikely (classified as likelihood D). A rupture of a pipeline has never occurred within Esso Bass Strait Operations and is not a common occurrence in the industry. It is considered very highly unlikely (classified as likelihood E).
Selection of worst case scenario	Although the likelihood of a pipeline leak is high, a preliminary assessment of impacts from a spill of this volume suggest it would have minor environmental impacts. Despite the very highly unlikely likelihood of occurrence, the impacts from a rupture would be considerably greater. Hence, the worst case pipeline scenario has been determined to be a rupture of the pipeline with the largest volume of oil, at a location close to shore.

The WCS scenario for the loss of hydrocarbon is a pipeline rupture resulting in the partial loss of inventory of the pipeline based on the following:

- A worst-case credible release duration of 12 hours.
- A release location at the Halibut to shore (HLA-VS1 600) pipeline, at a distance 3 nm from the shore.
- A subsea release in 40 m water depth.
- 18,980 kL of a representative light crude released.
    - As described in Table 7-15, the HLA pipeline is fed by a variety of different crudes. The composition of this pipeline could change on any given day dependent on which platforms are producing. Proportions or gas, oil and water can vary.
    - Given the varied composition of the HLA pipeline, a representative crude has been chosen.
        - CBA is expected to be the facility producing the highest volumes of crude over the next 5 years.
        - HLA crude has been chosen for modelling as the CBA facility produces from the HLA reservoir. See Appendix A for further details of Gippsland oil types.

Modelling of the release scenario indicated that 50% of the pipeline contents would be released in 24 hours before the pressure of the pipeline reaches equilibrium with the pressure of seawater at 40m depth. Modelling suggests that the release rate would reach zero however, in reality, small amounts of oil may be discharged as sea state interacts with the hole in the pipeline. These discharges would be intermittent and dependent on sea state.

For the purposes of spill trajectory modelling and to assist in informing spill response capability, it has been assumed that the remaining 50% of the volume is released at a constant rate of 106 m^3/day, over a period of 90 days based on the estimated time to repair the pipeline.

Table 7-16 LOC from a pipeline modelling inputs and parameters

Parameter	Details
Number of spill simulations	100
Period of the year (season)	Annual
Release location	HLA600 pipeline, 3NM from Shore
Coordinates (GDA94)	38° 01' 01" S

Parameter	Details			
	147° 44' 59" E			
Water Depth	40 m			
Hydrocarbon Type	Light crude			
Total spill volume	18,980 m^3			
Volume basis	Release volume calculated based on volume of pipeline sections over a total of 74,000m assuming that: Release occurs at the 3NM limit at 40m water depth. Inventory at depths greater than 40m will release, inventory at depths between 0-40m will remain in the pipeline			
Release duration	50% of volume released in 24hrs Remaining volume released at a constant rate over 90 days			
Duration basis	Modelling a starting pressure of 4500kPag and an atmospheric pressure of 400kpa resulted in 50% of the pipeline released in approximately 24hrs before reaching pressure equilibrium with atmospheric. At this point, modelling indicated release rate trending to zero. It has been assumed that the remaining 50% of the volume is released at a constant rate over 90 days, based on the estimated time to repair the pipeline.			
Modelled duration	110 days			
Hydrocarbon Characteristics	Density (@ 15oC)		0.8215 (g/ml)	
	API		40.6	
	Dynamic Viscosity		2.97 (cP) @ 15 ºC	
	Pour Point		0 ºC	
	Oil Property Category		Group II (Light persistent oil)	
Boiling Point (BP) ºC (RPS, 2020)	Volatile < 180 15.18%	Semi-volatile 180 – 265 25.59%	Low volatility 265 – 380 41.61%	Residual > 380 17.62%
Oil proxy justification	CBA 19 was temporarily plugged and not producing at the time of sampling. CBA A19 accesses the same Halibut reservoir as was sampled from the HLA platform.			

7.6.2.2 Modelling Outputs – Weathering and Fate

The properties of the oil used in the modelling of the LOC scenario is shown in Table 7-22. Halibut crude is classified as a Group II oil according to the International Tanker Owners Pollution Federation classifications (ITOPF, 2015).

On release to the marine environment, crude is predicted to be distributed over time into the following components:

- surface;
- water column, including
  - entrained (non-dissolved oil droplets that are physically entrained by wave action);
  - dissolved (principally the aromatic hydrocarbons);
- evaporated;
- stranded on shoreline and
- decayed (microbial biodegradation).

- Of these components, surface hydrocarbons and dissolved aromatics have the greatest impact on receptors.

Figure 7-6 presents the fate and weathering graph for the modelled crude release.

Halibut crude contains 17.6% by mass of hydrocarbon compounds that will not evaporate at atmospheric temperatures. These compounds will persist in the marine environment. The whole oil has a high wax content (approx. 24%), indicating that surface slicks of Halibut crude are likely to form waxy flakes in the environment as it weathers over time. Soluble, aromatic, hydrocarbons contribute approximately 23% by mass of the whole oil. Surface discharge will inhibit the process of dissolution, with compounds tending to evaporate from the water into the atmosphere (RPS, 2020).

Evaporation rates will increase with temperature, but in general, about 15.2% of the oil mass should evaporate within the first 12 hours (BP < 180°C); a further 25.6% should evaporate within the first 24 hours (180°C < BP < 265°C); and a further 41.6% should evaporate over several days (265°C < BP < 380°C).

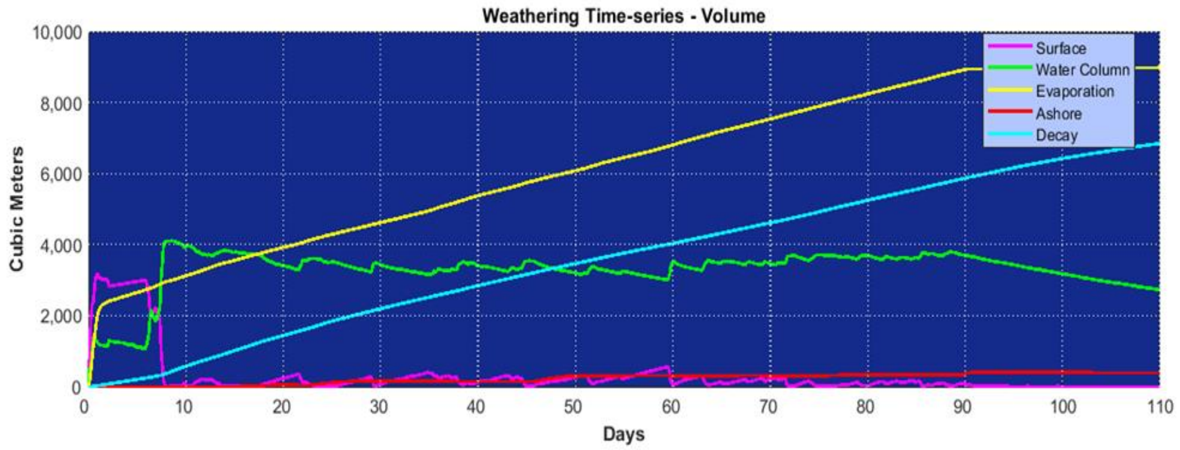


Figure 7-6 Predicted weathering and fates of Halibut crude from modelling the single spill trajectory with the largest area of floating surface oil from a 18980m³ LOC release from the HLA600 pipeline over 90 days, tracked for 110 days.

7.6.2.3 Modelling Outputs – Stochastic

As described in Section 7.2.1.1, oil spill modelling predicts that the total area that could be exposed to hydrocarbon, including trace concentrations of oil in the water column, as a result of any spill. The PEA (refer Section 5.1) is derived from this data and is used for planning purposes to ensure that all social and environmental sensitivities are acknowledged, described and considered in the development of the EP.

Modelling is also used to inform specific impact or consequence assessments by understanding the location and extent of oil at different concentrations. There is no agreed exposure level below which environmental impacts will not occur, therefore outputs should not be interpreted as a boundary. However, mapping areas which could be moderately impacted by a spill is a useful tool for impact or consequence assessment.

The environmental sensitivities within the moderate threshold area are described in Table 7-17. The sensitivities outside of the mapped (moderately exposed) area but within the PEA are shown in Table 7-18.

Table 7-17 Environmental sensitivities with potential for moderate hydrocarbon exposure from a LOC from a pipeline

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)
Surface exposure	Moderate 10 g/m^2	Maximum distance from the release location was 343 km in a north easterly direction. The zone of moderate exposure overlaps the following BIAs: Birds • Antipodean Albatross – Foraging (5% probability) • Black Petrel – Foraging (2% probability • Black-browed Albatross – Foraging (87% probability) • Buller's Albatross - Foraging (79% probability) • Campbell Albatross –Foraging (87% probability) • Crested Tern – Foraging (2% probability) • Common Diving Petrel – Foraging (100% probability) • Flesh-footed Shearwater – Foraging (2% probability) • Great winged Petrel – Foraging (1% probability) • Indian Yellow-nosed Albatross – Foraging (87% probability) • Shy Albatross – Foraging (100% probability) • Short-tailed Shearwater – Foraging (10% probability) • Sooty Shearwater – Foraging (3% probability) • Wandering Albatross – Foraging (87% probability) • Wedge-tailed Shearwater – Foraging (3% probability) • White-capped Albatross – Foraging (1% probability) • White-faced Storm Petrel – Breeding / Foraging (1% / 18% probability) • Wilsons Storm Petrel – Migration (1% probability) • Little Penguin – Breeding (2% probability) Marine mammals / shark • Pygmy Blue Whale - Distribution & Foraging (100% probability) • Southern Right Whale – Migration (100% probability) • White Shark – Breeding & Distribution / Foraging (100 / 7% probability) • Grey Nurse Shark – Foraging / Migration (2% probability • Humpback whale – Foraging (3% probability) • Indo-Pacific/Spotted Bottlenose Dolphin – Breeding (2% probability) Upwelling East of Eden has 58% probability of exposure. Contact with Victorian waters is predicted with a probability of 100%, including Ninety Mile Beach and Point Hicks Marine National Parks. Contact with nearshore receptors ranges from 60% probability at Lakes Entrance to 16% at Ocean Grange and <3% at Sydenham Inlet and Seaspray. Contact with Gippsland Lakes Ramsar wetland is predicted with a probability of 29%. Contact with NSW waters is predicted with a probability of 2% including Batemans Marine Park. Contact with the nearshore receptor Eurobodalla is predicted at 2% probability.

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)
	High 100 g/m^2	Maximum distance from the release location was 7 km in a westerly direction. The zone of high exposure overlaps the following BIAs.(100% probability): Birds • Black-browed Albatross (57%) • Buller's Albatross (55%) • Campbell Albatross (57%) • Common Diving-Petrel • Indian Yellow-nosed Albatross (57%) • Shy Albatross • Wandering Albatross (57%) Marine mammals / shark • Pygmy Blue Whale - Distribution & Foraging • Southern Right Whale – Migration • White Shark – Breeding & Distribution Upwelling East of Eden has 10% probability of exposure. Contact with Victorian waters is predicted with a probability of 100%. Contact with nearshore receptors ranges from 33% probability at Lakes Entrance to 6% at Ocean Grange and 1% at Seaspray. Although no Marine Parks are predicted to be contacted, contact with Gippsland Lakes Ramsar wetland is predicted with a probability of 2%.
Shoreline Exposure	Moderate 100 g/m^2	Shoreline contact at the moderate exposure threshold is predicted from Woodside Beach to Batemans Bay (NSW), with probabilities ranging from 1-2% at the outer edge of the contact zone to 100% in the Lakes Entrance / Ocean Grange area. Note: several National Parks and Reserves lie along this coastline including Gippsland Lakes, Lake Tyers, Cape Conran, Marlo, Croajingolong, Nadgee, Ben Boyd, Bournda, Mimosa Rocks, Montague Island and Eurobodalla. The minimum time before shoreline accumulation at the moderate threshold is approximately 6 hours (at Lakes Entrance). The maximum length of shoreline exposed is 115 km (average 49 km).
	High 1000 g/m^2	Shoreline contact at the high exposure threshold is most likely to occur in the Lakes Entrance / Ocean Grange area with a predicted probability of up to 92%. Probabilities range from 5 – 7% at the outer edge of the contact zone at Golden Beach and Lake Tyers Beach. The minimum time before shoreline accumulation at the high threshold is approximately 9 hours (at Lakes Entrance). The maximum length of shoreline exposed is 39 km (average 19 km).
In-water (dissolved) Exposure	Moderate 50ppb instantaneous	0-10m water depth The probability of in-water dissolved hydrocarbon exposure at the moderate threshold to Victorian coastal receptors was 92% for East Gippsland, 32% for Wellington Shire (Ninety Mile Beach) and 20% for Gabo Island. Marine National Parks Cape Howe, Ninety Mile Beach and Point Hicks and Beware Reef Marine Sanctuary were also predicted to be contacted with probabilities between 8% and 92%. Gippsland Lakes Ramsar wetland was predicted to be exposed with a probability of 38%. For NSW probabilities were 13% for southern NSW (Bega Valley), 3% for Eurobodalla and Montague Island and 2% for Shoal Haven. Batemans Marine Park was also predicted to be contacted with a probability of 4%.

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)
		For the Tasmanian islands in Bass Strait the probabilities were 3% for Hogan Island Group, 1% for Curtis Island and 1% for the waters of the Kent Group National Park. The KEF: Upwelling East of Eden was predicted to be exposed to in-water dissolved hydrocarbons (above the moderate threshold) with a probability of 92%. KEF Shelf rocky reefs was also predicted to be exposed with a probability of 4%. AMPs Beagle, East Gippsland, Flinders, Freycinet, Lord Howe and Central Eastern were predicted to be exposed at between 3 and 1% likelihood. Additionally, several BIAs were predicted to be exposed at the low threshold within the 0-10 m surface layer: Birds • Antipodean Albatross – Foraging (64% probability) • Back Noddy – Foraging (1% probability • Black Petrel – Foraging (5% probability) • Black-browed Albatross – Foraging (72% probability) • Black-winged Petrel – Foraging (1% probability) • Buller's Albatross - Foraging (65% probability) • Campbell Albatross –Foraging (72% probability) • Common Noddy – Breeding / Foraging (1% probability) • Crested Tern – Breeding / Foraging (4% probability) • Common Diving-Petrel - Foraging (82% probability) • Flesh-footed Shearwater – Foraging (5% probability) • Great-winged Petrel – Foraging (2% probability) • Indian Yellow-nosed Albatross – Foraging (72% probability) • Shy Albatross – Foraging (92% probability) • Wandering Albatross – Foraging (72% probability) • Wedge-tailed Shearwater – Foraging (24% probability) • White-capped Albatross – Foraging (2% probability) • White-faced Storm Petrel – Breeding / Foraging (8% / 92% probability) • Wilsons Storm Petrel – Migration (2% probability) • Little Penguin – Breeding / Foraging (4% / 24% probability) • Northern Giant petrel – Foraging (2% probability) • Short tailed Shearwater – Foraging (17% probability) • Sooty Shearwater – Foraging (16% probability) Marine mammals / shark • Pygmy Blue Whale - Distribution & Foraging (92% probability) • Southern Right Whale – Migration (92% probability) • White Shark –Distribution & Foraging (92% probability) • Grey Nurse Shark – Foraging / Migration (17% probability • Humpback whale – Foraging (17% probability) • Indo-pacific/Spotted Bottlenose Dolphin – Breeding (18% probability)

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)
		10-20m water depth The probability of in-water dissolved hydrocarbon exposure at the moderate threshold to Victorian coastal receptors was 39% for East Gippsland, 15% for Wellington Shire (Ninety Mile Beach) and 12% for Gabo Island. Marine National parks Cape Howe, Ninety Mile Beach and Point Hicks and Beware Reef Marine Sanctuary were also predicted to be contacted with probabilities between 8% and 92%. Gippsland Lakes Ramsar wetland was predicted to be contacted with a probability of 21%. For NSW probabilities were 7% for southern NSW (Bega Valley), 4% for Eurobodalla and Montague Island and 2% for Shoal Haven. Batemans and Jervis Bay Marine Parks were also predicted to be contacted with a probability of 4% and 1% respectively. The KEF: Upwelling East of Eden was predicted to be exposed to in-water dissolved hydrocarbons (above the moderate threshold) with a probability of 41%., KEFs Shelf rocky reefs (2%) and Canyons on the eastern continental shelf and Tasman front and eddy field (both1%) were also predicted to be exposed. AMPs East Gippsland, Beagle, Flinders and Jervis were predicted to be exposed at between 2 and 1% likelihood. Additionally, several BIAs were predicted to be exposed at the low threshold within the 10-20m water column layer: Birds • Antipodean Albatross – Foraging (27% probability) • Black petrel – Foraging (4% probability) • Black-browed Albatross – Foraging (31% probability) • Buller's Albatross - Foraging (29% probability) • Campbell Albatross –Foraging (31% probability) • Crested Tern – Breeding / Foraging (4% probability) • Common Diving-Petrel – Foraging (35% probability) • Flesh-footed Shearwater – Foraging 4% probability) • Great-winged Petrel – Foraging (1% probability) • Indian Yellow-nosed Albatross – Foraging (31% probability) • Shy Albatross – Foraging (41% probability) • Wandering Albatross – Foraging (31% probability) • Wedge-tailed Shearwater – Foraging (13% probability) • White-capped Albatross – Foraging (1% probability) • White-faced Storm Petrel – Breeding / Foraging (6% / 41% probability) • Wilsons Storm Petrel – Migration (1% probability) • Little Penguin – Breeding / Foraging (4% / 13% probability) • Northern Giant petrel – Foraging (1% probability) • Short tailed Shearwater – Foraging (10% probability) • Sooty Shearwater – Foraging (8% probability) Marine mammals / shark • Pygmy Blue Whale - Distribution & Foraging (41% probability) • Southern Right Whale – Migration (41% probability) • White Shark –Breeding / Distribution & Foraging (31% / 41% probability)

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)
		• Grey Nurse Shark – Foraging / Migration (7% probability • Humpback whale – Foraging / Migration (11% / 1% probability) • Indo-pacific/Spotted Bottlenose Dolphin – Breeding (9% probability) 20-30m water depth For this water depth the pattern of contact was very similar but with considerably reduced likelihoods. Contact with coastal receptors and Marine Parks in Victoria was predicted at less than 5% probability and in NSW less than 2%. The highest likelihood of contact with any BIA was 8% for several seabird foraging BIAs.

Table 7-18 Environmental sensitivities outside of the moderately exposed area but within the PEA from a LOC from a pipeline

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)
Surface Exposure	Low 1 g/m^2	Maximum distance from the release location was 1331 km in an ENE direction. The zone of low exposure overlaps the following BIAs: Birds • Antipodean Albatross – Foraging (5% probability) • Black Petrel – Foraging (2% probability • Black-browed Albatross – Foraging (87% probability) • Buller's Albatross - Foraging (79% probability) • Campbell Albatross –Foraging (87% probability) • Crested Tern – Foraging (2% probability) • Common Diving-Petrel – Foraging (100% probability) • Flesh-footed Shearwater – Foraging (2% probability) • Great winged Petrel – Foraging (1% probability) • Indian Yellow-nosed Albatross – Foraging (87% probability) • Shy Albatross - Foraging (100% probability) • Short-tailed Shearwater – Foraging (10% probability) • Sooty Shearwater – Foraging (3% probability) • Wandering Albatross – Foraging (87% probability) • Wedge-tailed Shearwater – Foraging (3% probability) • White-capped Albatross – Foraging (1% probability) • White-faced Storm Petrel – Foraging (18% probability) • Wilsons Storm Petrel – Migration (1% probability) • Little Penguin – Breeding (2% probability) Marine mammals / shark • Pygmy Blue Whale - Distribution & Foraging (100% probability) • Southern Right Whale – Migration (100% probability) • White Shark – Breeding & Distribution / Foraging (100% / 7% probability)

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)
		• Grey Nurse Shark – Foraging / Migration (2% probability • Humpback whale – Foraging (3% probability) • Indo-Pacific/Spotted Bottlenose Dolphin – Breeding (2% probability) Upwelling East of Eden has 58% probability of exposure. Contact with Victorian waters is predicted with a probability of 100%, including Ninety Mile Beach and Point Hicks Marine National Parks. Contact with nearshore receptors ranges from 60% probability at Lakes Entrance to 16% at Ocean Grange and <3% at Sydenham Inlet and Seaspray. Contact with Gippsland Lakes Ramsar wetland is predicted with a probability of 29%. Contact with NSW waters is predicted with a probability of 2% including Batemans Marine Park. Contact with the nearshore receptor Eurobodalla is predicted at 2% probability.
Shoreline Exposure	Low 10g/m^2	Shoreline contact at the low exposure threshold is predicted from Woodside Beach to Batemans Bay (NSW), with probabilities ranging from 3% at the outer edge of the contact zone to 100% in the Lakes Entrance / Ocean Grange area. Note: several National Parks and Reserves lie along this coastline including Gippsland Lakes, Lake Tyers, Cape Conran, Marlo, Croajingolong, Nadgee, Ben Boyd, Bournda, Mimosa Rocks, Montague Island and Eurobodalla. The minimum time before shoreline accumulation at the low threshold is approximately 6 hours (at Lakes Entrance). The maximum length of shoreline exposed is 160 km (average 82 km).
In-water (dissolved) Exposure	Low 10ppb instantaneous	0-10m water depth The probability of in-water dissolved hydrocarbon exposure at the low threshold to Victorian nearshore receptors was 100% for East Gippsland, 73% for Wellington Shire (Ninety Mile Beach) and 78% for Gabo Island. Marine National Parks Cape Howe, Ninety Mile Beach, Wilsons Promontory and Point Hicks and Beware Reef Marine Sanctuary were also predicted to be contacted with probabilities up to 100%. Gippsland Lakes Ramsar wetland was predicted to be contacted at 89%. For NSW probabilities were 71% for southern NSW (Bega Valley), 17% Montague Island, 11% for Eurobodalla, 7% for Shoal Haven and 1-2% for Kiama, Sutherland Shire, Wollongong, Waverly, Woollahra and Lord Howe Island. Batemans, Jervis Bay and Lord Howe Island Marine Parks were also predicted to be contacted with probabilities up to 21%. For the Tasmanian islands in Bass Strait the probabilities were 6% for Hogan Island Group, 2% for Curtis Island and the waters of the Kent Group National Park and 1% for Moncoeur Islands. The KEF: Upwelling East of Eden was predicted to be exposed to in-water dissolved hydrocarbons (above the low threshold) with a probability of 100%., KEFs Shelf rocky reefs (21%), Canyons on the eastern continental shelf (14%), Lord Howe Seamount Chain, Tasmantid seamount chain, Seamounts south and east of Tasmania and Tasman front and eddy field (1-3%) were also predicted to be exposed. AMPs East Gippsland (17%), Beagle (8%), Flinders (5%) and Freycinet, Jervis, Lord Howe and Central Eastern (between 1 – 3%). Additionally, several BIAs were predicted to be exposed at the low threshold within the 0-10 m surface layer: Birds • Antipodean Albatross – Foraging (100% probability) • Back Noddy – Breeding / Foraging (1% probability • Black Petrel – Foraging (25% probability)

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)
		• Black-browed Albatross – Foraging (100% probability) • Black-winged Petrel – Breeding / Foraging (1% probability) • Buller's Albatross - Foraging (99% probability) • Campbell Albatross –Foraging (100% probability) • Common Noddy – Breeding / Foraging (1% probability) • Crested Tern – Breeding / Foraging (21% probability) • Common Diving-Petrel – Foraging (100% probability) • Flesh-footed Shearwater – Breeding / Foraging (1% / 25% probability) • Great-winged Petrel – Foraging (21% probability) • Indian Yellow-nosed Albatross – Foraging (100% probability) • Shy Albatross Petrel – Foraging (100% probability) • Wandering Albatross – Foraging (100% probability) • Wedge-tailed Shearwater – Breeding / Foraging (1% / 82% probability) • White-bellied Storm Petrel – Breeding / Foraging (1% probability) • White-capped Albatross – Foraging (21% probability) • White-faced Storm Petrel – Breeding / Foraging (37% / 100% probability) • Wilsons Storm Petrel – Migration (21% probability) • Kermadec Petrel – Foraging (1% probability) • Grey ternlet – Breeding / Foraging (1% probability) • Little Penguin – Breeding / Foraging (21% / 82% probability) • Little Shearwater – Breeding / Foraging (1% probability) • Masked Booby – Breeding / Foraging (1% probability) • Northern Giant petrel – Foraging (21% probability) • Providence Petrel – Breeding / Foraging (1% probability) • Red-tailed Tropicbird – Breeding / Foraging (1% probability) • Short tailed Shearwater – Foraging (61% probability) • Sooty Shearwater – Foraging (50% probability) • Sooty Tern – Foraging (1% probability) • Southern Giant Petrel – Foraging (21% probability) Marine mammals / shark • Pygmy Blue Whale - Distribution & Foraging (100% probability) • Southern Right Whale – Migration (100% probability) • White Shark – Breeding, Distribution & Foraging (100% probability) • Grey Nurse Shark – Foraging / Migration (58% / 54% probability • Humpback whale – Foraging / Migration (75% / 3% probability) • Indo-pacific/Spotted Bottlenose Dolphin – Breeding (77% probability) • 10-20m water depth The probability of in-water dissolved hydrocarbon exposure at the low threshold to Victorian nearshore receptors was 93% for East Gippsland, 57% for

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)
		Wellington Shire (Ninety Mile Beach) and 63% for Gabo Island. Marine National Parks Cape Howe, Ninety Mile Beach, Wilsons Promontory and Point Hicks and Beware Reef Marine Sanctuary were also predicted to be contacted with probabilities up to 92%. Gippsland Lakes Ramsar wetland was predicted to be contacted at 89%. For NSW probabilities were 40% for southern NSW (Bega Valley), 11% Montague Island, 9% for Eurobodalla, 5% for Shoal Haven and 1-2% for Kiama, Wollongong and Lord Howe Island. Batemans, Jervis Bay and Lord Howe Island Marine Parks were also predicted to be contacted with probabilities up to 15%. For the Tasmanian islands in Bass Strait the probabilities were 5% for Hogan Island Group, 2% for the Kent Group National Park and 1% for Moncoeur Islands, Rodondo Island and Curtis Island. The KEF: Upwelling East of Eden was predicted to be exposed to in-water dissolved hydrocarbons (above the low threshold) with a probability of 94%., KEFs Shelf rocky reefs (13%), Canyons on the eastern continental shelf (8%), Lord Howe Seamount Chain, Tasmantid seamount chain, Seamounts south and east of Tasmania and Tasman front and eddy field (1-2%) were also predicted to be exposed. AMPs East Gippsland (8%), Beagle (7%), Flinders (3%), Jervis and Freycinet, Lord Howe and Central Eastern (each 2%). Additionally, several BIAs were predicted to be exposed at the low threshold within the 10-20m water column layer: <u>Birds</u> • Antipodean Albatross – Foraging (87% probability) • Back Noddy – Breeding / Foraging (1% probability • Black Petrel – Foraging (18% probability) • Black-browed Albatross – Foraging (87% probability) • Black-winged Petrel – Breeding / Foraging (1% probability) • Buller's Albatross - Foraging (78% probability) • Campbell Albatross –Foraging (87% probability) • Common Noddy – Breeding / Foraging (1% probability) • Crested Tern – Breeding / Foraging (15% / 18% probability) • Common Diving-Petrel – Foraging (94% probability) • Flesh-footed Shearwater – Breeding / Foraging (1% / 18% probability) • Great-winged Petrel – Foraging (12% probability) • Indian Yellow-nosed Albatross – Foraging (87% probability) • Shy Albatross – Foraging (94% probability) • Wandering Albatross – Foraging (87% probability) • Wedge-tailed Shearwater – Breeding / Foraging (1% / 67% probability) • White-bellied Storm Petrel – Breeding / Foraging (1% probability)

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)
		• White-capped Albatross – Foraging (12% probability) • White-faced Storm Petrel – Breeding / Foraging (27% / 94% probability) • Wilsons Storm Petrel – Migration (12% probability) • Kermadec Petrel – Foraging (1% probability) • Grey ternlet – Breeding / Foraging (1% probability) • Little Penguin – Breeding / Foraging (17% / 67% probability) • Little Shearwater – Breeding / Foraging (1% probability) • Masked Booby – Breeding / Foraging (1% probability) • Northern Giant petrel – Foraging (12% probability) • Providence Petrel – Breeding / Foraging (1% probability) • Red-tailed Tropicbird – Breeding / Foraging (1% probability) • Short tailed Shearwater – Foraging (43% probability) • Sooty Shearwater – Foraging (34% probability) • Sooty Tern – Foraging (1% probability) • Southern Giant Petrel – Foraging (12% probability) Marine mammals / shark • Pygmy Blue Whale - Distribution & Foraging (94% probability) • Southern Right Whale – Migration (94% probability) • White Shark – Breeding / Distribution & Foraging (85% / 92% probability) • Grey Nurse Shark – Foraging / Migration (41% / 37% probability • Humpback whale – Foraging / Migration (48% / 2% probability) • Indo-pacific/Spotted Bottlenose Dolphin – Breeding (46% probability) 20-30m water depth For this water depth the pattern of contact was very similar but with considerably reduced likelihoods. Contact with coastal receptors and Marine Parks in Victoria was predicted at less than 15% probability and in NSW less than 10%. The highest likelihood of contact with any BIA was 30% for Pygmy Blue Whale distribution/foraging, Southern Right Whale migration, White Shark distribution/foraging and several seabird foraging BIAs.
In-water (entrained) Exposure	Low 10ppb instantaneous	0-10m water depth At the surface layer (0-10 m), the probability of low exposure to the KEF Upwelling East of Eden, and Cape Conran, Point Hicks, Cape Howe / Mallacoota, Croajingolong, Corringle, Lake Tyers Beach, Lakes Entrance, Marlo and Sydenham Inlet nearshore receptors was 100%. Contact with NSW waters was also predicted with 100% probability, including the nearshore receptors of Bega valley (southern NSW) and Eurobodalla. Contact with Tasmanian and Queensland waters was predicted with likelihoods of 26% and 1% respectively. Additionally, several BIAs were predicted to be exposed at the low threshold with probabilities of 100%: Indo-Pacific/Spotted Bottlenose Dolphin – breeding, Humpback whale – foraging, Grey nurse shark – foraging/migration, Little penguin – foraging, Pygmy blue whale – distribution and foraging, Southern right

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)
		whale – migration, White shark – breeding, foraging and distribution as well as several seabird foraging BIAs. Marine National Parks • Bunurong 3% • Cape Howe 100% • Corner Inlet 5% • Ninety Mile Beach 53% • Point Hicks 100% • Marine Parks • Wilsons Promontory 10% • Batemans 81% • Great Sandy 1% • Jervis Bay 44% • Lord Howe Island 12% • Moreton Bay 1% • Port Stephens - Great Lakes 7% • Solitary Islands 2% • Marine Sanctuaries • Beware Reef 100% Marine Parks and Reserves • Kent Group 21% • Booderee 33% • Corner Inlet Marine and Coastal Park 6% • Nooramunga Marine and Coastal Park 6% • Shallow Inlet Marine and Coastal Park 6% • Wilsons Promontory Marine Park 12% • Wilsons Promontory Marine Reserve 7% • Ramsar wetlands • Corner Inlet 7% • East Coast Cape Barren Island Lagoons 4% • Elizabeth and Middleton Reefs Marine National Nature Reserve 6% • Gippsland Lakes 100% • Hunter Estuary Wetlands 1% • Logan Lagoon 3% Contact with the AMPS East Gippsland (99%), Jervis (61%), Flinders (41%), Beagle (29%), Central Eastern (24%), Freycinet (18%), Hunter (10%), Apollo (5%) and Coral Sea, Gifford, Huon, Norfolk, Solitary Islands and South Tasman Rise (each 1-2%). 10-20m water depth

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)
		At the 10-20m layer the probability of low exposure to the KEF Upwelling East of Eden was 100%. Additionally, several BIAs were predicted to be exposed at the low threshold with probabilities of 100%: Indo-Pacific/Spotted Bottlenose Dolphin – breeding, Humpback whale – foraging, Grey nurse shark – foraging/migration, Little penguin – foraging, Pygmy blue whale – distribution and foraging, Southern right whale – migration, White shark – breeding, foraging and distribution as well as several seabird foraging BIAs. Contact with Victorian waters was predicted at 100% likelihood, the highest predicted likelihoods for nearshore receptors were 98% at East Gippsland and 76% at Gabo Island. Contact with NSW and Tasmanian waters was predicted with likelihoods of 66% and 9% respectively. <u>20-30m water depth</u> At this water depth the exposure pattern was very similar to that of the layers above but with reduced likelihoods. The highest likelihood of contact with any BIA was 92% for Pygmy Blue Whale distribution/foraging, Southern Right Whale migration, White Shark breeding/distribution and several seabird foraging BIAs.

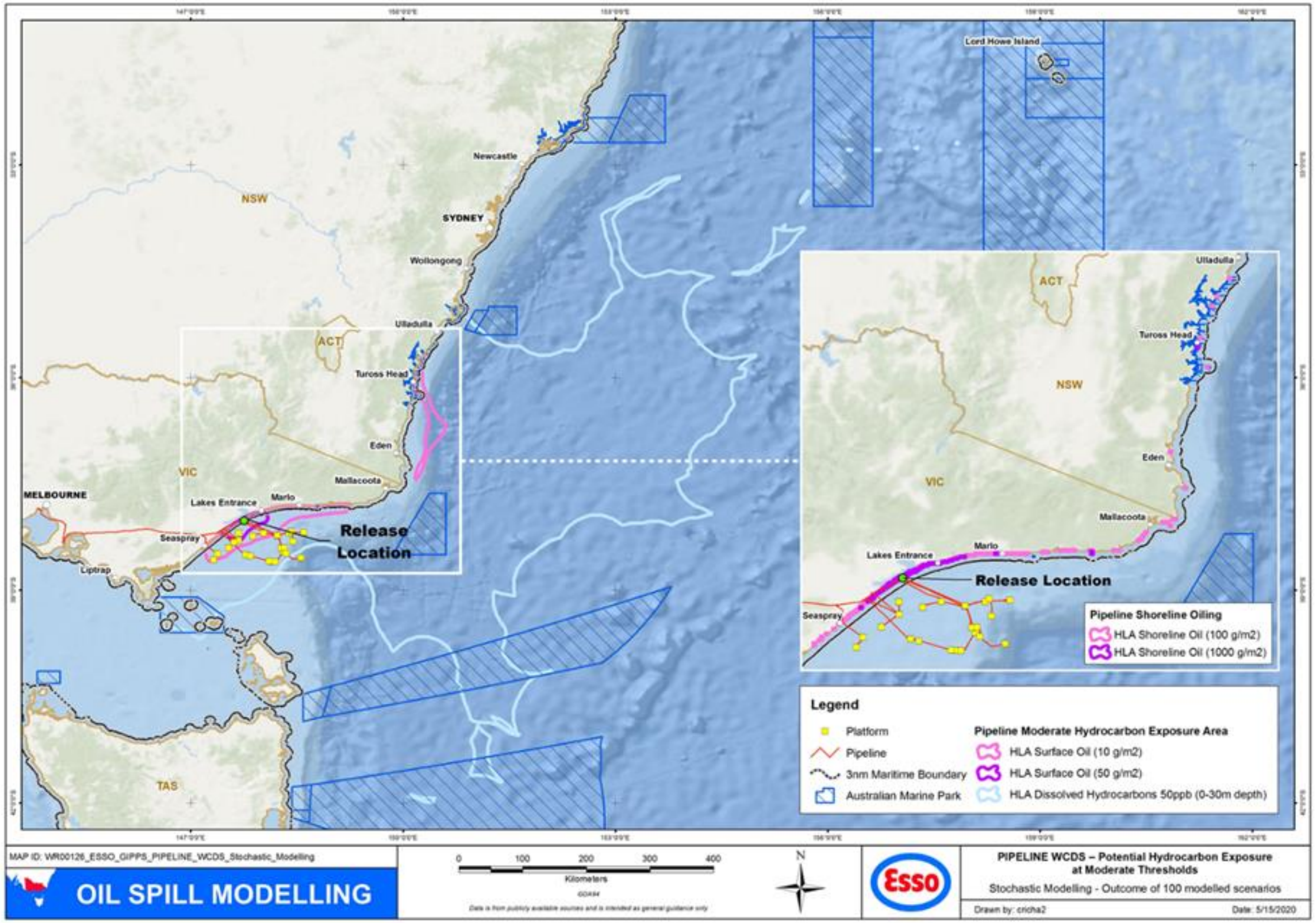


Figure 7-7 LOC stochastic modelling output for Pipeline WCDS. Hydrocarbon exposure at the moderate thresholds (Surface: 10 g/m^2, shoreline: 100 g/m^2, and In-water (dissolved): 50 ppb instantaneous)

7.6.3 Risk Assessment

An accidental release of reservoir hydrocarbons as a result from a loss of containment from a pipeline has the potential to result in the following impacts:

- Change in water quality;
- Change in habitat.

As a result of change in water quality and / or habitat, further impacts may occur which include:

- Injury / mortality to fauna;
- Change to the function, interests or activities of other users.

Receptors that could be affected by a loss of containment from a pipeline are identified in Table 7-19.

Table 7-19 Receptors potentially impacted by a LOC from a pipeline

Impacts	Water quality	Benthic Habitats and Communities	Plankton	Fish	Birds	Marine Reptiles	Marine Mammals	Coastal Habitats and Communities	Wetlands	National Parks and Reserves	Australian Marine Parks	KEFs	Cultural – Historic and Indigenous	Commercial Fisheries	Tourism and Recreation
Change in water quality	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Change in habitat		✓						✓	✓	✓	✓	✓			
Injury / mortality to fauna			✓	✓	✓	✓	✓								
Change to the function, interests or activities of other users													✓	✓	✓

7.6.3.1 Consequence Evaluation

Consequence evaluation of potentially exposed receptors in the event of a LOC from a pipeline are described in Table 7-20.

Table 7-20 Risk of surface, shoreline and in-water hydrocarbon exposure from loss of containment from a pipeline

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
Water quality	A release of reservoir hydrocarbons resulting from a pipeline LOC has the potential to result in a change i.e. decline in water quality. Degraded water quality will potentially impact all the receptors identified in Table 7-19. These impacts are discussed individually within other sections.	Modelling predicts that surface, shoreline and in-water (dissolved) exposure will occur as a result of a LOC. Figure 7-7, show the extent of potential impacts to water quality (at moderate thresholds). Due to the potentially persistent nature of the hydrocarbon and the potential area of impact, the consequences to water quality are assessed as **Level III.**
Benthic Habitats – Bare Substrate, Coral, Seagrass, Macroalgae, Subtidal Rocky Reef	**Bare Substrate** While this receptor represents the 'bare sand' areas offshore, it does provide habitat for benthic invertebrates (both infauna and macroinvertebrates). Unconsolidated mixed and particulate sediments are likely to be dominated by burrowing fauna (e.g. annelid worms, molluscs, echinoderms, crustaceans, cnidarians). Many of the organisms that live in these habitats are habitat modifiers (e.g. through burrows or shell production), stabilising and/or oxygenating the sediments around them, and providing additional ecological niches for colonisation by other fauna – increasing local biodiversity. Surveys undertaken after the Montara blowout found no obvious visual signs of major disturbance at Barracouta and Vulcan shoals (Heyward *et al.,* 2010), which occur about 20-30 m below the water line in otherwise deep waters (generally >150 m water depth). Later sampling indicated the presence of low-level severely degraded oil at some shoals, though in the absence of pre-impact data, this could not be directly linked to the Montara spill. Levels of hydrocarbons in the sediments were, in any case, several orders of magnitude lower than levels at which biological effects become possible (Heyward *et al.,* 2012; Gagnon & Rawson, 2011). Studies undertaken since the DWH incident have shown that fewer than 2% of the more than 8,000 sediment samples collected exceeded the US EPA sediment toxicity benchmark for aquatic life, and these were largely limited to the area close to the wellhead (BP, 2015). Acute or chronic exposure through contact and/or digestion can result in toxicological risks to invertebrates. However, the presence of an	Exposure to in-water hydrocarbons is restricted to 30m below the surface and therefore any potential impact to benthic habitats from in-water hydrocarbons will only occur in shallower nearshore waters. The zone of moderate exposure to dissolved hydrocarbons is predicted to extend into nearshore Tasmanian (i.e. Bass Strait islands), Victorian and southern NSW waters. The predominant benthic habitat in the Gippsland Basin is bare substrate. However, known areas of seagrass which may be exposed include at Lakes Entrance, Bemm River Estuary and Tamboon Inlet and numerous estuaries and inlets along the southern NSW coast. There is the potential that exposure could result in sub-lethal impacts, more so than lethal impacts, possibly because much of seagrasses' biomass is underground in their rhizomes (Zieman *et al*., 1984). Seagrass in this region is not considered a significant food source for marine fauna. Suitable hard substrate for macroalgal beds including the threatened 'Giant Kelp' (*Macrocystis pyrifera)* occur in areas such as around Gabo Island and within the Bemm River Estuary. Little is known about the effects of oil on *M. pyrifera,* but some studies (e.g. Edgar & Barrett 2000; Reed & Lewis 1994) suggest that this species, like other macroalgae, may be some of the least sensitive marine species to oil exposure. As described opposite, intertidal species of macroalgae are more prone to direct exposure than subtidal beds, however sub-lethal toxicity effects from in-water (dissolved) hydrocarbons may be observed. Corals are not a common habitat type in the Gippsland Basin however solitary soft corals may occur where suitable hard substrate, such as rocky reef or man-made structures, is present. Sub-lethal toxicity effects may result from direct contact with

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	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. Exposure can induce changes in burrowing depth into the substrate (which can lead to higher predation rates on some species) and can limit the growth, recruitment and reproductive capacity of some marine invertebrates (Fukuyama et al,. 1998). Deep water benthic invertebrates are usually protected from oiling by the buoyant nature of hydrocarbons, although the depth of oil penetration is dependent on turbulence in the water column. Hydrocarbons can also reach the benthos through the settlement of oiled particles such as faeces, dead plankton or inorganic sand particles (Jewett *et al*., 1999). **Coral** Corals are generally located in shallow and intertidal regions, where there is the potential for exposure to surface and in-water hydrocarbons. Experimental studies and field observations indicate all coral species are sensitive to the effects of oil, although there are considerable differences in the degree of tolerance between species. Differences in sensitivities may be due to the ease with which oil adheres to the coral structures, the degree of mucous production and self cleaning, or simply different physiological tolerances. Direct contact of coral by hydrocarbons may impair respiration and also photosynthesis by symbiotic zooanthellae (IPIECA, 1992). Coral gametes or larvae in the surface layer where they are exposed to the slick may also be fouled (Epstein *et al.,* 2000). Physical oiling of coral tissue can cause a decline in metabolic rate and may cause varying degrees of tissue decomposition and death (Negri and Heyward, 2000). Oil may also cling to certain types of sediment causing oil to sink to the seafloor, covering corals in oiled sediment. Where corals come into direct contact with surface exposures (i.e., intertidal/shallow areas), they are more susceptible due to physical presence, than toxicity associated with dissolved oil components within the water column which, in some cases, may be more toxic than the floating surface slicks (Volkman *et al*., 1994). A range of impacts is	in-water hydrocarbons or indirectly through feeding on contaminated prey (plankton). Benthic species which come into direct contact with hydrocarbons in the immediate vicinity of the release location may be affected, however their habitat is widespread throughout Bass Strait and population level impacts are not anticipated. The benthic habitat of the OA (described in detail in Section 5.2.1.1) is predominantly featureless muddy, gravelly sand and no areas of rocky reef have been observed. Recent studies have shown that infaunal taxa are similar across the Bass Strait but the contribution of each to the assemblage varies Where hard substrate or points of attachment (facilities) are present, colonisation by epifauna occurs mostly in the form of sessile, invertebrate, filter feeders. The degree of colonisation varies between facilities however sponge beds have only been detected at Bream B. Benthic invertebrate species closer to shore may also be affected, although these effects will be localised and temporary. Invertebrates of value (i.e. target species, see Commercial Fisheries below) have been identified to include squid, crustaceans (rock lobster, crabs) and molluscs (scallops, abalone). Filter-feeding, sessile benthic invertebrates such as sponges, bryozoans, scallops, abalone and hydroids may be exposed to sub-lethal impacts however population level impacts are considered unlikely. The consequence of a LOC on benthic habitats is assessed as **Level II.**

Effect Dimensions		Sensitivity Dimensions	
Duration	M	Irreplaceability	M-H
Size/Scale	M	Vulnerability	M
Intensity	M	Influence	M
M		M	

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	reported to result from toxicity including partial mortality of colonies, reduced growth rates, bleaching and reduced photosynthesis. Laboratory and field studies have demonstrated that branching corals appear to have a higher susceptibility to hydrocarbon exposure than massive corals or corals with large polyps. Chronic effects of oil exposure have been consistently noted in corals and, ultimately, can kill the entire colony. Chronic impacts include histological, biochemical, behavioural, reproductive and developmental effects. Field studies of chronically polluted areas and manipulative studies in which corals are artificially exposed to oil show that some coral species tolerate oil better than other species (NOAA, 2010). Reproductive stages of corals have been found to be more sensitive to oil toxicity. Fertilisation of coral species has been observed to be completely blocked in *Acropora tenuis* at heavy fuel oil concentrations of 150 ppb (Harrison, 1999), with significant reductions in fertilisation of *A.millepora* and *A. valida* at concentrations between 580 and 5800 ppb, in addition to developmental abnormalities and reduced survival of coral larvae at similar concentrations. Lower concentrations of less than 100 ppb crude oil were observed to inhibit larval metamorphosis in *A. millepora* (Negri & Heyward, 2000). Studies undertaken after the Montara incident 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 hydrocarbons 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. In addition, surveys undertaken after the Montara blowout on the plateau areas of Barracouta and Vulcan shoals (Heyward *et al.,* 2010), which occur about 20-30 m below the water line in otherwise deep waters	

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	(generally >150 m water depth), and contain algae, hard coral and seagrass, found no obvious visual signs of major disturbance. **Macroalgae** Macroalgae are generally limited to growing on intertidal and subtidal rocky substrata in shallow waters to 10 m depth. As such, they may be exposed to subsurface and entrained and dissolved hydrocarbons, however are susceptible to surface hydrocarbon exposure more so in intertidal habitats as opposed to subtidal habitats. Reported toxic responses to oils have included a variety of physiological changes to enzyme systems, photosynthesis, respiration, and nucleic acid synthesis (Lewis & Pryor 2013). Despite the well-established pool of literature on macroalgae exposure to petroleum oils, very few investigations have reported effects on species that are common in Australian waters (Lewis & Pryor 2013). 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'Brien & 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'. The morphological features of macroalgae, such as the presence of a mucilage layer or the presence of fine 'hairs' will influence the amount of hydrocarbon that will adhere to the algae. A review of field studies conducted after spill events by Connell *et al*. (1981) indicated a high degree of variability in the level of impact, but in all instances, the algae appeared to be able to recover rapidly from even very heavy oiling. The rapid recovery of algae was attributed to the fact that for most algae, new growth is produced from near the base of the plant while the distal parts (which would be exposed to the oil contamination) are continually lost. Other studies have indicated that oiled kelp beds had a 90% recovery within 3-4 years of impact, however full recovery to pre-spill diversity may not occur for long periods after the spill (French-McCay, 2004). Intertidal macroalgal beds are more prone to oil spills than subtidal beds because although the mucous coating prevents oil adherence, oil that is trapped in the upper canopy can increase the persistence of the oil,	

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	which impacts upon site-attached species. Additionally, when oil sticks to dry fronds on the shore, they can become overweight and break as a result of wave action (IPIECA, 1995). The toxicity of hydrocarbons to macroalgae varies for the different macroalgal life stages, with water-soluble hydrocarbons more toxic to macroalgae (O'Brien and Dixon, 1976). Toxic effect concentrations for hydrocarbons and algae have varied greatly among species and studies, ranging 2 - 10,000,000 ppb (Lewis & Pryor, 2013). The sensitivity of gametes, larva and zygote stages however have all proven more responsive to petroleum oil exposure than adult growth stages (Lewis & Pryor, 2013). Macrophytes, including macroalgae, require light to photosynthesise. So in addition to the potential impacts from direct smothering or exposure to entrained and dissolved hydrocarbons, the presence of entrained hydrocarbon within the water column can affect light qualities and the ability of macrophytes to photosynthesise. Exposure to in-water hydrocarbons poses the greatest threat to sensitive macroalgal assemblages, specifically the Giant Kelp Forests TEC, that grow on rocky reefs from the sea floor ≥8 m below sea level. The largest extent of this TEC is in Tasmanian coastal waters. Substrate on which this TEC may occur is also found in Victoria along the west coast of Wilson's Promontory and from Sydenham Inlet to Gabo Island (DSEWPaC 2012b). . **Seagrass** Seagrasses generally grow in sediments in 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. As such, they may be exposed to both surface and sub-surface hydrocarbons. Submerged vegetation in nearshore areas can be exposed to oil by direct contact (i.e., smothering) and by uptake by rhizomes through contaminated sediments. Exposure also can take place via uptake of hydrocarbons through plant membranes. In addition, seeds may be affected by contact with oil contained within sediments (NRDA, 2012). When seagrass leaves are exposed to petroleum oil, sub-lethal quantities of the soluble fraction can be incorporated into the tissue, causing a reduction in tolerance to other stress factors (Zieman *et al*.,	

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	1984). The toxic components of petroleum oils are thought to be the PAH, which are lipophilic and therefore able to pass through lipid membranes and tend to accumulate in the thylakoid membranes of chloroplasts (Ren *et al*., 1994). As such, the susceptibility of seagrasses to hydrocarbon spills will depend largely on distribution. Deeper communities will be protected from oiling under all but the most extreme weather conditions. Shallow seagrasses are more likely to be affected by dispersed oil droplets or, in the case of emergent seagrasses, direct oiling. Theoretically, intertidal seagrass communities would be the most susceptible because the leaves and rhizomes may both be affected. **Subtidal rocky reefs** Nearshore and offshore subtidal reef habitats are dominated by seaweeds, mobile invertebrates and fish. Potential impacts to sensitive receptors related to these reefs discussed in the appropriate sections. It was observed that the release of large quantities of fuel oil during the grounding of the Iron Baron did not substantially affect populations of subtidal reef associated organisms (Edgar & Barrett, 1995)	
Plankton	Plankton are found in nearshore and open waters beneath the surface in the water column. These organisms migrate vertically through the water column to feed in surface waters at night (NRDA, 2012). As they move close to the sea surface it is possible that they may be exposed to floating hydrocarbons but plankton also has the potential to be directly affected by in-water hydrocarbons as a result of toxicity effects. Phytoplankton are typically not sensitive to the impacts of oil, though they do accumulate it rapidly (Hook *et al*., 2016) due to their small size and high surface area to volume ratio. Oil can affect the rate of photosynthesis and inhibit growth in phytoplankton, depending on the concentration range. For example, photosynthesis is stimulated by low concentrations of oil in the water column (10–30 ppb) but becomes progressively inhibited above 50 ppb. Conversely, photosynthesis can be stimulated below 100 ppb for exposure to weathered oil (González *et al*. 2009). In addition, the potential for effects to photosynthesis (i.e. temporary suppression of primary production) from shading caused by continuous surface slicks may have implications for consumers of phytoplankton (Hook *et al.,* 2016), though a prolonged surface coverage over an extensive area would be required. During the DWH oil spill it	Plankton are likely to be exposed to in-water (dissolved) hydrocarbons above the moderate exposure threshold, within a zone (up to approximately 500 km in width) extending parallel to the Gippsland and southern NSW coastline (for up to approximately 500 km from the release location). Plankton are at their highest concentrations below surface waters (e.g. 60 m water depth for phytoplankton during the day) and undertake a vertical migration which would likely reduce their potential for (and duration of) exposure to dissolved hydrocarbons in the surface layer of the water column. The impact to plankton is therefore predicted to be **Level III** with potential effects on the food web recognised.

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	was observed that plankton and other surface material were found to be sinking at rates of more than 10 times the normal level. It was hypothesised that the weathered spilled oil catalysed clumping of organic particles (Schrope 2013). It is currently unclear as to whether this effect was caused by the chemical characteristics of the weathered oil, or a bacterial effect. Zooplankton (microscopic animals such as rotifers, copepods and krill that feed on phytoplankton) are vulnerable to hydrocarbons (Hook *et a*l., 2016). Water column organisms that come into contact with oil risk exposure through ingestion, inhalation and dermal contact (NRDA, 2012), which can cause immediate mortality or declines in egg production and hatching rates along with a decline in swimming speeds (Hook *et al*., 2016). Plankton are generally abundant in the upper layers of the water column and is the basis of the marine food web, so an oil spill in any one location is unlikely to have long-lasting impacts on plankton populations at a regional level. Reproduction by survivors or dispersion from unaffected areas (via sea surface currents) is likely to rapidly replenish losses (Abbriano et al. 2011). Plankton have life cycles based on rapid reproduction with levels of high productivity. It is also in the nature of plankton to be dispersive. Oil spill field observations show minimal or transient effects on plankton (Abbriano *et al.* 2011). Once background water quality is re-established, plankton takes weeks to months to recover (ITOPF, 2011). Plankton found in open waters of the exposure zone is expected to be widely represented within waters of the wider Bass Strait region and generally across all waters in the south eastern offshore region, which aids in the re-establishment of communities.	

<table>
<tr><th>Receptor</th><th>Impact of hydrocarbon exposure</th><th>Exposure risk assessment</th></tr>
<tr><td>Fish</td><td>Fish can be exposed to oil through a variety of pathways, including: direct dermal contact (e.g. swimming through oil); ingestion (e.g. directly or via oil-affected prey/foods); and inhalation (e.g. elevated dissolved contaminant concentrations in water passing over the gills). Fish are generally considered vulnerable to oil spills because they inhabit areas coincident with oil exploration and production and those areas that may be subsequently impacted by an oil spill; including coral reefs, seagrasses, nearshore areas, deep offshore areas, pelagic habitats and demersal habitats (Moore & Dwyer, 1974; Gundlach & Hayes, 1978). Of the potential toxicants, monocyclic and polycyclic aromatic hydrocarbons (MAHs and PAHs) are generally regarded as the most toxic to fish.

<u>Surface oil</u>

Since fish and sharks do not generally break the sea surface, the exposure of surface hydrocarbons to fish and shark species are unlikely to occur. Near the sea surface, fish are able to detect and avoid contact with surface slicks meaning fish mortalities rarely occur in the event of a hydrocarbon spill in open waters (Volkman et al., 2004). As a result, wide-ranging pelagic fish of the open ocean generally are not highly susceptible to impacts from surface hydrocarbons. Adult fish kills reported after oil spills occur mainly to shallow water, near-shore benthic species (Volkman et al., 2004). Following the DWH incident, it was suggested that Whale sharks may be vulnerable to oiling of gills if exposed to the oil. The tendency of Whale sharks to feed close to surface waters will increase the likelihood of exposure to surface slicks and elevated hydrocarbon concentrations beneath slicks.

<u>In-water oil</u>

Exposure to hydrocarbons entrained or dissolved in the water column can be toxic to fishes. Studies have shown a range of impacts including changes in abundance, decreased size, inhibited swimming ability, changes to oxygen consumption and respiration, changes to reproduction, immune system responses, DNA damage, visible skin and organ lesions, and increased parasitism. However, many fish species can metabolise toxic hydrocarbons, which reduces the risk of bioaccumulation (NRDA, 2012). Pelagic species are also generally highly mobile and as such are not likely to suffer extended exposure (e.g. >96 hours) at concentrations that would lead to chronic effects due</td><td>The release location is located in open waters however being only 3NM from shore floating oil is predicted to extend into shallower nearshore waters along the Ninety Mile Beach and eastwards towards Sydenham Inlet. Moderate surface exposure is predicted to cover a maximum area of approximately 100 km^2.The zone of moderate exposure to dissolved hydrocarbons is predicted to extend into nearshore Tasmanian (i.e. Bass Strait islands), Victorian and southern NSW waters.

Shallow inshore fish species including various syngnathids (seahorses, pipefish, pipehorses and seadragons) are less likely to be able to move away from surface or in-water oils and therefore may be exposed to elevated levels or for longer periods. Their habitats are typically widespread however any impacts are expected to be local on individual organism levels.

Although pelagic fish species may be exposed to moderate levels of dissolved oil their mobile, transitory characteristics reduce the risk of prolonged exposure. Large-scale population level effects following a LOC on fish species, abundances or assemblage composition would be unlikely due to the wide geographical distribution of many fish in Bass Strait and the potential for rapid re-colonisation, especially in the cases of widely distributed relatively common pelagic species. Deep water demersal fish are not expected to be impacted given the presence of in-water hydrocarbons in upper layers (0 – 30 m) of the water column only.

The zone of moderate exposure to dissolved hydrocarbons may contact the White shark distribution and breeding BIAs and Grey nurse shark foraging and migration BIAs. Pelagic species of shark are at greatest risk of being exposed to oil following a LOC given their wide foraging areas and risks of consuming contaminated prey. White sharks are known to aggregate near Ninety Mile Beach and philopatric characteristics means they may return to the place of birth to breed even if habitats are contaminated. This species is widely distributed and thus unlikely to suffer ecologically important declines in abundance.

The consequences to fish and sharks are assessed as Level II, taking into consideration the potential impacts to threatened species such as the White and Grey nurse sharks.

<table>
<tr><td colspan="2">Effect Dimensions</td><td colspan="2">Sensitivity Dimensions</td></tr>
<tr><td>Duration</td><td>M</td><td>Irreplaceability</td><td>M</td></tr>
<tr><td>Size/Scale</td><td>M</td><td>Vulnerability</td><td>H</td></tr>
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<table>
<tr><th>Receptor</th><th>Impact of hydrocarbon exposure</th><th>Exposure risk assessment</th></tr>
<tr><td></td><td>to their patterns of movement. Demersal fish are not expected to be impacted given the presence of in-water hydrocarbons in surface layers only.

Fish are most vulnerable to hydrocarbon discharges during their embryonic, larval and juvenile life stages. Oil exposure may result in decreased spawning success and abnormal larval development. Impacts on eggs and larvae entrained in the upper water column are not expected to be significant given the temporary period of water quality impairment, and the limited areal extent of the spill. 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.</td><td><table><tr><td>Intensity</td><td>M</td><td>Influence</td><td>M</td></tr><tr><td colspan="2">M</td><td colspan="2">M - H</td></tr></table></td></tr>
<tr><td>Birds</td><td>Seabirds and shorebirds are sensitive to the impacts of oiling, with their vulnerability arising from the fact that they cross the air-water interface to feed, while their shoreline habitats may also be oiled (Hook et al., 2016). Species that raft together in large flocks on the sea surface are particularly at risk (ITOPF, 2011).

<u>Sea surface oil</u>

Birds foraging at sea have the potential to directly interact with oil on the sea surface some considerable distance from breeding sites in the course of normal foraging activities. Seabird species most at risk include those that readily rest on the sea surface (e.g. shearwaters) and surface plunging species (e.g. terns, boobies). As seabirds are a top order predator, any impact on other marine life (e.g. pelagic fish) may disrupt and limit food supply both for the maintenance of adults and the provisioning of young.

For seabirds, direct contact with hydrocarbons can foul feathers, which may subsequently result in hypothermia due to a reduction in the ability of the bird to thermo-regulate and impair water-proofing. A bird suffering from cold, exhaustion and a loss of buoyancy may also dehydrate, drown or starve (DSEWPAC, 2011). Increased heat loss as a result of a loss of water-proofing results in an increased metabolism of food reserves in the body, which is not countered by a corresponding increase in food intake, may lead to emaciation (DSEWPAC, 2011). The greatest vulnerability in this case occurs when birds are feeding or</td><td>A number of listed threatened and/or migratory seabird species may occur in the area exposed above moderate surface thresholds. Moderate surface exposure is predicted to cover a maximum area of 100km^2. There are foraging BIA's for several species of petrels, shearwater and albatross, however, no breeding BIAs overlap with this exposed area.

Seabirds rafting, resting, diving or feeding at sea have the potential to come into contact with surface oil, ranging from moderate to high exposure, as such, acute or chronic toxicity impacts (death or long-term poor health) to seabirds are possible. Most species tend to forage on their own, though large feeding flocks will gather at rich or passing food sources.

The length of shoreline predicted to be exposed to shoreline loading of hydrocarbons that may have biological impacts to birds is approximately 115 km above the moderate threshold and 40 km above the high threshold. This section of coastline comprises mostly wide sandy beaches that provide nesting habitat for species such as Hooded plovers and terns or rocky islands and headlands that provide habitat for seabird colonies (such as Little penguin, petrels and albatrosses).

The Little penguin is not considered at risk globally, but some colonies are at risk on a regional scale (Cannell et al. 2016). and declines in the status of this species have been reported from Tasmania (Stevenson & Woehler 2007). Oil concentrations at the moderate to high threshold are predicted to accumulate on the shorelines of Gabo Island, which supports the world's largest Little penguin colony, The Skerries and Tasmanian Bass Strait islands such as Curtis Island</td></tr>
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<tr><th>Receptor</th><th>Impact of hydrocarbon exposure</th><th>Exposure risk assessment</th></tr>
<tr><td></td><td>resting at the sea surface (Peakall et al., 1987). . In a review of 45 actual marine spills, there was no correlation between the numbers of bird deaths and the volume of the spill (Burger, 1993).

Penguins may be especially vulnerable to an oil spill because they do not fly and therefore spend a high proportion of their time in the water when away from resting and breeding locations and readily lose insulation and buoyancy if their feathers are oiled (Hook et al., 2016). This species also has strong attachment to its natal area (Colombelli-Négrel 2016) and consequently, birds are likely to retain a strong attachment to a site even if the site and adjacent waters are severely contaminated by oil. The Iron Baron vessel spill (325 tonnes of bunker fuel in Tasmania in 1995) is estimated to have resulted in the death of up to 20,000 penguins (Hook et al., 2016).

<u>Shoreline oil</u>

Shorebirds are likely to be exposed to oil when it directly impacts the intertidal zone and onshore due to their feeding habitats. Foraging shorebirds will be at potential risk of both direct impacts through contamination of individual birds (e.g. fouling of feathers) and indirect impacts (e.g. fouling and/or a reduction in prey items) (Clarke, 2010). Birds that are coated in oil can also suffer from damage to external tissues, including skin and eyes, as well as internal tissue irritation in their lungs and stomachs

Breeding birds (both seabirds and shorebirds) may be exposed to oil via direct contact or the contamination of the breeding habitat (e.g. shores of islands) (Clarke, 2010). Bird eggs may subsequently 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. Studies of contamination of duck eggs by small quantities of crude oil, mimicking the effect of oil transfer by parent birds, have been shown to result in mortality of developing embryos.

Toxic effects on birds may result where oil is ingested as the bird attempts to preen its feathers, or via consumption of oil-affected prey. Whether this toxicity ultimately results in mortality will depend on the amount consumed and other factors relating to the health and sensitivity of the particular bird species.

Engelhardt (1983), Clark (1984), Geraci & St Aubin (1988) and Jenssen (1994) indicated that the threshold thickness of oil that could impart a</td><td>potentially impacting local populations. Under certain metocean conditions the zone of moderate surface exposure is predicted to overlap with the Little penguin breeding BIA.

There are many listed threatened and migratory shorebird species likely to occur in the area overlapping the extent of exposed shoreline. In the event of a LOC, these birds are potentially at risk of shoreline exposure. Birds are not likely to be significantly affected by in-water concentrations of hydrocarbons due to their limited exposure time in the water column. Shorebirds foraging in intertidal areas or along the high tide mark and splash zone, or nest in coastal areas particularly close to the high-water mark, are most at risk of exposure effects. Because the zone of moderate in-water exposure extends into nearshore waters foraging shorebirds may be indirectly impacted by the loss of invertebrate prey.

The populations of both seabird and shorebird species have a wide geographic range, meaning that impacts to individuals at one location will not necessarily extend to populations at other un-impacted locations.

Consequently, the potential consequence of risks to seabirds and shorebirds from a LOC are considered to be Level II.

<table><tr><td colspan="2">Effect Dimensions</td><td colspan="2">Sensitivity Dimensions</td></tr><tr><td>Duration</td><td>M</td><td>Irreplaceability</td><td>H</td></tr><tr><td>Size/Scale</td><td>M</td><td>Vulnerability</td><td>H</td></tr><tr><td>Intensity</td><td>M</td><td>Influence</td><td>H</td></tr><tr><td colspan="2">M</td><td colspan="2">H</td></tr></table></td></tr>
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Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	lethal dose to an individual wildlife species is 10 µm (~10 g/m^2). Scholten *et al*. (1996) indicates that a layer 25 µm thick would be harmful for most birds that contact the slick.	
Marine Reptiles - Turtles	Marine turtles are vulnerable to the effects of oil at all life stages; eggs, hatchlings, juveniles, and adults. Oil exposure affects different turtle life stages in different ways; and each turtle life stage frequents a habitat with varied potential to be impacted during an oil spill. Several aspects of turtle biology and behaviour place them at particular risk, including a lack of avoidance, indiscriminate feeding in convergence zones, and large pre-dive inhalations. Marine turtles can be exposed to oil externally (e.g. swimming through oil slicks) or internally (e.g. swallowing the oil, consuming oil affected prey, or inhaling of volatile oil related compounds). <u>Surface oil</u> Effects of oil on turtles include increased egg mortality and developmental defects; direct mortality due to oiling in hatchlings, juveniles, and adults; and negative impacts to the skin, blood, digestive and immune systems, and salt glands. Oil can enter cavities such as the eyes, nostrils, or mouth; and oil covering their bodies may interfere with breathing because they inhale large volumes of air to dive. Experiments on physiological and clinical pathological effects of hydrocarbons on loggerhead turtles (~15–18 months old) showed that the turtles' major physiological systems were adversely affected by both chronic and acute exposures (96 hour exposure to a 0.05 cm layer of South Louisiana crude oil versus 0.5 cm for 48 hours) (Lutcavage *et al*. 1995). Recovery from the sloughing skin and mucosa took up to 21 days, increasing the turtle's susceptibility to infection or other diseases, such as fibropapilloma (Lutcavage *et al*. 1995). Records of oiled wildlife during spills rarely include marine turtles, even from areas where they are known to be relatively abundant (Short, 2011). An exception to this was the large number of marine turtles collected (613 dead and 536 live) during the DWH incident in the GoM, although many of these animals did not show any sign of oil exposure (NOAA 2013). Of the dead turtles found, 3.4% were visibly oiled and 85% of the live turtles found were oiled (NOAA, 2013). Of the captured	While marine turtles, including threatened species, are known to occur in the area potentially exposed to hydrocarbons above surface and in-water (dissolved) moderate exposure thresholds, they are not noted to reside or aggregate in significant numbers, and there are no recognised BIAs in the region. There are no turtle nesting beaches along the Gippsland or southern NSW coastlines, so impacts to turtles from shoreline oiling will not occur. Although the effects of hydrocarbons on marine reptiles, specifically turtles can be severe, the low density of turtles expected in the region (due to lack of BIA or aggregations) suggests that a LOWC would affect individuals rather than population level. Consequently, the potential impacts to marine reptiles are considered to be **Consequence Level II**. Effect Dimensions / Sensitivity Dimensions: Duration: M — Irreplaceability: H Size/Scale: M — Vulnerability: H Intensity: M — Influence: H M — H

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	animals, 88% of the live turtles were later released, suggesting that oiling does not inevitably lead to mortality. Shoreline oil Turtles may experience oiling impacts on nesting beaches and eggs through chemical exposures resulting in decreased survival to hatching and developmental defects in hatchlings. Adult females crossing an oiled beach could cause external oiling of the skin and carapace; nothing that most oil is deposited at the high-tide line, and most turtles nest well above this level. Studies on freshwater snapping turtles showed uptake of PAHs from contaminated nest sediments, but no impacts on hatching success or juvenile health following exposure of eggs to dispersed weathered light crude (Rowe *et al.,* 2009). However, other studies found evidence that exposure of freshwater turtle embryos to PAHs results in deformities (Bell *et al*., 2006, Van Meter *et al.,* 2006). Turtle hatchlings may be more vulnerable to smothering as they emerge from the nests and make their way over the intertidal area to the water (AMSA, 2015). Hatchlings that contact oil residues while crossing a beach can exhibit a range of effects including impaired movement and bodily functions (Shigenaka, 2003). Hatchlings sticky with oily residues may also have more difficulty crawling and swimming, rendering them more vulnerable to predation. It should be noted that the threat and relative impacts of an unplanned discharge on some marine reptile species are considered less damaging than other stressors. Report cards produced on protected marine reptiles in Australia generally ranked oil pollution as either 'not of concern' or 'of less concern' depending on the marine region (DSEWPaC 2012a).	
Marine Mammals (Pinnipeds)	Pinnipeds are directly at risk from impacts associated with the exposure to surface, shoreline and in-water hydrocarbons. Sea surface oil Pinnipeds are vulnerable to sea surface exposures in particular 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, and regularly haul out on to beaches. Pinnipeds are also sensitive as they will stay near established colonies and haul-out areas, meaning they are less likely to	Both the New Zealand fur-seal (*Arctocephalus forsteri*) and the Australian fur-seal (*Arctocephalus pusillus doriferus*) are listed marine species with habitat and breeding sites known to occur in areas potentially exposed to surface, in-water and shoreline oil above the moderate threshold. These areas are not identified as critical habitat and there are no identified BIAs for fur seals in the region. Both the Australian and New Zealand fur seals are at risk to surface oil while at sea and shoreline accumulated oil at haul out sites or rookeries. The direct effect to pups from exposure to shoreline oil at ≥100 g/m^2 could result in mortality, while

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practise avoidance behaviours. This is corroborated by Geraci and St. Aubins (1988) who suggest seals, sea-lions and fur-seals have been observed swimming in oil slicks during a number of documented spills.
As a result of exposure to surface oils, pinnipeds, with their relatively large, protruding eyes are particularly vulnerable to effects such as irritation to mucous membranes that surround the eyes and line the oral cavity, respiratory surfaces, and anal and urogenital orifices. Hook et al (2016) reports that seals appear not to be very sensitive to contact with oil, but instead to the toxic impacts from the inhalation of volatile components.
For some pinnipeds, fur is an effective thermal barrier because it traps air and repels water. Petroleum stuck to fur reduces its insulative value by removing natural oils that waterproof the pelage. Consequently, the rate of heat transfer through fur seal pelts can double after oiling (Geraci & St.Aubin, 1988), adding an energetic burden to the animal. Kooyman et al (1976) suggest that in fact, fouling of approximately one-third of the body surface resulted in 50% greater heat loss in fur seals immersed in water at various temperatures. Fur-seals are particularly vulnerable due to the likelihood of oil adhering to fur. Heavy oil coating and tar deposits on fur-seals may result in reduced swimming ability and lack of mobility out of the water.
<u>In-water oil</u>
Ingested hydrocarbons can irritate or destroy epithelial cells that line the stomach and intestine, thereby affecting motility, digestion and absorption.
However, pinnipeds have been found to have the enzyme systems necessary to convert absorbed hydrocarbons into polar metabolites, which can be excreted in urine (Engelhardt, 1982; Addison & Brodie, 1984; Addison et al., 1986). Volkman et al (1994) report that benzene and naphthalene ingested by seals is quickly absorbed into the blood through the gut, causing acute stress, with damage to the liver considered likely. If ingested in large volumes, hydrocarbons may not be completely metabolised, which may result in death.
<u>Shoreline oil</u>
Breeding colonies (used to birth and nurse until pups are weaned) are particularly sensitive to hydrocarbon spills (Higgins & Gass, 1993).
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indirect effects could be negative behavioural changes associated with the smell of shoreline oil or contamination of prey.
The Australian fur seal is vulnerable to a population decline following a LOC because breeding locations are restricted to the islands of Bass Strait. It is predicted that major rookeries on The Skerries and Gabo Island may be exposed to accumulated shoreline oil at the moderate threshold.
These species are particularly vulnerable to oil because oil is believed to adhere more readily to their coats, such oiling can have significant effects to their function if foraging in areas with fresh oil. Fur seals are known to aggregate around offshore oil and gas facilities where, in the event of a release, exposure to fresh oil would occur.
The consequence of a LOC on pinnipeds is assessed as Level II.
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<tr><td colspan="2">Effect Dimensions</td><td colspan="2">Sensitivity Dimensions</td></tr>
<tr><td>Duration</td><td>H</td><td>Irreplaceability</td><td>M</td></tr>
<tr><td>Size/Scale</td><td>H</td><td>Vulnerability</td><td>L</td></tr>
<tr><td>Intensity</td><td>H</td><td>Influence</td><td>M</td></tr>
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Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	ITOPF (2011) 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. It is reported that most pinnipeds scratch themselves vigorously with their flippers and do not lick or groom themselves, so are less likely to ingest oil from skin surfaces (Geraci & St. Aubin, 1988). However, mothers trying to clean an oiled pup may ingest oil. The Long Term Environmental Impact and Recovery report for the Iron Barren oil spill concluded that “The number of pups born at Tenth Island in 1995 was reduced when compared to previous years. There was a strong relationship between the productivity of the seal colonies and the proximity of the islands to the oil spill wherein the islands close to the spill showed reduced pup production and those islands more distant to the oil spill did not” (Tasmanian SMPC, 1999). Pinnipeds are further at risk because they appear to rely on scent to establish a mother-pup bond (Sandegren, 1970; Fogden, 1971), and consequently oil-coated pups may not be recognisable to their mothers. This is only theorised, with studies and research indicating interaction between mothers and oiled pups were normal (Davis and Anderson, 1976; Davies, 1949; Shaughnessy & Chapman, 1984). Australian sea lions are endemic to Australia, found only in South Australia and Western Australia (DSEWPaC. 2013). Australian sea-lions have 'naturally poor recovery abilities' due to 'unusual reproductive biology and life history' (TSSC, 2005). Due to the extreme philopatry of females and limited dispersal of males between breeding colonies, the removal of only a few individuals annually may increase the likelihood of decline and potentially lead to the extinction of some of the smaller colonies.	
Marine Mammals (Cetaceans)	Whales and dolphins can be exposed to the chemicals in oil through: • Internal exposure by consuming oil or contaminated prey; • Inhaling volatile oil compounds when surfacing to breathe; • External exposure, by swimming in oil and having oil directly on the skin and body; and	Several threatened, migratory and/or listed cetacean species may traverse the spill plume. The distribution and (possible (DoE, 2015b)) foraging BIAs for the Pygmy blue whale and the migration BIA for the Southern right whale may be exposed to surface and in-water concentrations above the moderate exposure threshold. The foraging BIA for the Humpback whale and breeding BIA for the Indo-Pacific

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• Maternal transfer of contaminants to embryos (NRDA, 2012).

<u>Surface oil</u>

Unlike with pinnipeds (see above), oil would not be expected to adhere well to the surface of cetacean skin due to the lack of hairs and the frequent sloughing of skin cells (Engelhardt 1983, Helm *et al*. 2015). In addition, oil should not readily penetrate cetacean skin due to tight intercellular bridges and thick epidermis (O'Hara & O'Shea 2001). Nevertheless, cetaceans can be exposed to oil through direct contact with the eyes, mouth (ingestion), and airways (inhalation), potentially leading to inflammation and lung congestion (Geraci & St. Aubin 1990).

Helm *et al.* (2015) suggested that inhalation of toxic compounds associated with fresh oil was of greater concern than absorption through the skin and ingestion. The inhalation of oil droplets, vapours and fumes is a distinct possibility if whales or dolphins surface in slicks to breathe. Exposure to hydrocarbons in this way could damage mucous membranes, damage airways or even cause death. Cetaceans may incidentally draw seawater and floating oil, into their lungs by breathing in splashed droplets or liquid that has collected near the blowhole just prior to inhalation. Aspiration of liquid oil can cause physical injuries to the respiratory tract by irritating tissues/membranes and can also lead to absorption of toxicants into the blood, as in inhalation exposure (Takeshita *et al*., 2017). French-McCay (2016) proposed exposure to oil concentrations of 10 g/m^2 could result in mortality to marine mammals.

Evidence suggests that many cetacean species are unlikely to detect and avoid spilled oil (Matkin *et al*. 2008). There are numerous examples where cetaceans have appeared to incidentally come into contact with oil and/or not demonstrated any obvious avoidance behaviour. Following the Exxon Valdez oil spill, Matkin *et al*. (2008) reported killer whales in slicks of oil as early as 24 hours after the spill and evidence presented by Aichinger Dias *et al.* (2017) showed that following the DWH oil spill cetaceans in the GoM came into direct contact with both oil and sheen by swimming through them.

Although in the GoM it was observed that cetaceans were able to detect the thick and dark-coloured patches of oil, detection of the lighter substances may have been more difficult. Photographs of dolphins with oil on their bodies showed that oil can adhere to and persist on cetacean skin, and contrary to suggestions from previous studies, direct contact

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bottlenose dolphin (which extends northwards into NSW from the Victorian border) may also overlap the zone of moderate in water (dissolved) hydrocarbon.

If present, these species (and other cetaceans) may be exposed to oil in the manner described in this table.

It is plausible that individual whales could encounter surface oil above the moderate to high exposure threshold in the immediate vicinity of the release location, but the release would need to coincide with pod migration or foraging for a greater number of individuals to be present in the plume. Sightings of Blue whales in the Gippsland Basin are reasonably rare (Bannister *et al*., 1996) and acoustic detecting indicates that the Pygmy blue whale are predominantly located to the east, west and south of the OA. It is difficult to predict with certainty if a spill would lead to levels of mortality or reproductive depression that would manifest in terms of a population-level response.

The highly mobile and transitory nature of cetacean species in Bass Strait means that exposure to moderate to high levels of surface oil (in the vicinity of the release location) or moderate levels of in-water hydrocarbon is not anticipated to result in long term population viability effects. Nevertheless, taking into account that the populations of some whale species remain small relative to pre-whaling days and are thought to have a multi-decadal recovery time, mortality of even a small number of adults and or calves as result of oiling could inhibit or retard species recovery, the resultant impact is therefore assessed as **Consequence Level II**.

<table>
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Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	with oil and resultant exposure to toxic compounds is of concern (Aichinger Dias *et al*., 2017). In water (dissolved and entrained) oil The physical impacts from ingested hydrocarbon with subsequent lethal or sub-lethal impacts are applicable to both dissolved and entrained oil. However, the susceptibility of cetaceans varies with feeding habits. Baleen whales (such as Blue, Southern right and Humpback whales) are not particularly susceptible to ingestion of oil in the water column as they feed by skimming the surface. Oil may stick to the baleen while they 'filter feed' near slicks. Toothed whales and dolphins may be susceptible to ingestion of dissolved and entrained oil as they gulp feed at depth. As highly mobile species, in general it is very unlikely that these animals will be constantly exposed to concentrations of hydrocarbons in the water column for continuous durations (e.g., >96 hours) that would lead to chronic effects. Note also, many marine mammals appear to have the necessary liver enzymes to metabolise hydrocarbons and excrete them as polar derivatives (Ball and Truskewycz, 2013). Ingestion of oil may however result in acute nausea and vomiting and aspiration of oily vomitus into the lungs. Research conducted in the GoM linked aspiration pneumonia, lung abscesses, and pulmonary infections in dolphins to exposure to DWH oil (Venn-Watson *et al*., 2015a cited in Takeshita *et al.,* 2017) Some whales, particularly those with coastal migration and reproduction, display strong site fidelity to specific resting, breeding and feeding habitats, as well as to their migratory paths and this may override any tendency for cetaceans to avoid the noxious presence of hydrocarbons. The Southern right whale exhibits varying degrees of site fidelity, with the majority of females and calves returning to the same birthing location, while some also travel long distances between breeding grounds within a season (DSEWPAC, 2012c). If spilled oil reaches these biologically important habitats, the pollution may disrupt natural behaviours, displace animals, reduce foraging or reproductive success rates and increase mortality. Takeshita *et al.* (2017) concluded that the range of adverse health effects and increased mortality/reproductive failure observed in cetacean populations throughout the GoM since the DWH oil spill are consistent with the range of exposure scenarios.	

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	If sufficiently high numbers of animals are impacted, the greater population may experience reduced recovery and survival rates. The restitution time for cetaceans affected at a population level is assumed to be long term, i.e. 40 years, based on consensus on recovery times for marine mammals following the DWH incident (Bock *et. al*., 2018).	
Coastal Habitats and Communities– Sandy Shoreline, Rocky Shoreline, Mangroves and Saltmarsh	**Sandy beaches** Sandy beaches provide potential foraging and breeding habitat for numerous bird, marine turtle and pinniped species. These activities primarily occur above the high tide line, with exception of haul outs. Note, most of the oil on a sandy shore will be concentrated at, and below, the high tide mark. Sandy beaches are also inhabited by a diverse assemblage (although not always abundant) of infauna (including nematodes, copepods and polychaetes); and macroinvertebrates (e.g. crustaceans). Because the sand retains oil, such animals may be killed if oil penetrates into the sediments. Long-term depletion of sediment fauna could have an adverse effect on birds or fish that use tidal flats as feeding grounds (IPIECA, 1999). Depth of penetration in sandy sediment is influenced by: • Particle size. Penetration is not generally as great on mud as on coarser sediments. • Oil viscosity. Viscous oils and mousse (water-in-oil emulsion) tend to penetrate less deeply than low-viscosity oils such as light crudes or diesel oil. • Drainage. If sediments are poorly drained (as is often the case with tidal flats remote from creeks or channels), the water content may prevent the oil from penetrating into the sediment. In contrast, oil may reach depths greater than one metre in coarse well-drained sediments. • Animal burrows and root pores. Penetration into fine sediments is increased if there are burrows of animals such as worms, or pores left where plant roots have decayed. A 100 g/m^2 threshold (considered a 'stain' or 'film', and equivalent to 0.1 mm thickness) is assumed as the lethal threshold for invertebrates on hard substrates and sediments (mud, silt, sand, gravel) in intertidal habitats. A threshold of 100 g/m^2 oil thickness would be enough to coat	There are different types of shorelines found along the Gippsland and southern NSW coast and offshore islands (including Tasmanian islands), however this coastline is dominated by wide sandy beaches with intermittent rocky shores, and salt marshes and isolated mangroves within tidal estuaries, coastal lakes and bays. The type of shoreline will influence the volume of hydrocarbon that could be stranded ashore and its thickness before the shoreline saturation point occurs. For instance, a sandy beach may allow hydrocarbon to percolate through the sand, and weathered oil may be buried, thus increasing its ability to hold more hydrocarbon ashore over tidal cycles and various wave actions in comparison to a rocky shore; hence hydrocarbon can increase in thickness onshore over time. The maximum length of shoreline exposed to oil at the moderate threshold is 115 km and at the high threshold 39km. The high shoreline loadings would likely result in acute toxicity, and death, of many invertebrate communities, especially for the light crude release scenarios which will easily penetrate into sandy sediments. However, tidal action is expected to lead to rapid weathering of any hydrocarbons in the intertidal area and the populations of these communities would be likely to rapidly recover. Rocky shores along the Gippsland and southern NSW coastline are generally exposed and any oil deposited would be rapidly removed by wave action. Impacts on intertidal communities are typically short term unless acute exposure to fresh product causes high mortality. In Victoria, mangroves are known to occur within sheltered bays or inlets such as Western Port, Lakes Entrance and Corner Inlet. Based on the modelling results, mangrove habitats at most risk, are those near Lakes Entrance however many of the stands are in river estuaries or associated wetlands with only limited or intermittent access to the open ocean. Further north, the NSW coast mangroves may be exposed under certain conditions to shoreline accumulations of oil above moderate thresholds.

<table>
<tr><th>Receptor</th><th>Impact of hydrocarbon exposure</th><th>Exposure risk assessment</th></tr>
<tr><td></td><td>
an animal and likely impact its survival and reproductive capacity (French-McCay, 2009). Based on this, areas of heavy oiling would likely result in acute toxicity, and death, of many invertebrate communities, especially where oil penetrates into sediments through animal burrows (IPIECA, 1999). However, these communities would be likely to rapidly recover (recruitment from unaffected individuals and recruitment from nearby areas) as oil is removed from the environment.
Following the Sea Empress spill (in west Wales, 1996) many amphipods (sandhoppers), cockles and razor shells were killed. There were mass strandings on many beaches of both intertidal species (such as cockles) and shallow sub-tidal species. Similar mass strandings occurred after the Amoco Cadiz spill (in Brittany, France, 1978) (IPIECA, 1999). Following the Sea Empress spill, populations of mud snails recovered within a few months but some amphipod populations had not returned to normal after one year. Opportunists such as some species of worm may actually show a dramatic short-term increase following an oil spill (IPIECA, 1999). In March 2014, small volumes of crude oil from an unidentified source (confirmed to not be offshore oil and gas production facilities) washed up along a 7-km section of sandy beach on the Victorian Gippsland coast as small (a few millimetres thick) granular balls (Gippsland Times, 2014). AMSA (2014) reported that no impacts were observed over the course of two months following the incident.
As a result of the DWH spill, oil washed up on sandy beaches of the Alabama coastline. The natural movement of sand and water through the beach system continually transformed and re-distributed oil within the beach system, and 18 months after the event, mobile remnant oil remained in various states of weathering buried at different depths in the beaches (Hayworth et al., 2011). There is also evidence that submerged oil mats (SOM) exist just offshore of the Alabama beaches (ranging in thickness from a few millimetres to several centimetres), which has resulted in the regular washing up of tar balls onto sandy beaches. These SOMs may serve as long-term sources of remnant oil to the beach ecosystem (Hayworth et al., 2011). Long-term changes to the beach ecosystem as a result of stranded oil are unknown.
Other results from beach sampling undertaken at Dapuhin Island, Alabama, in May (pre-impact) and September 2011 (post-impact) found a large shift in the diversity and abundance of microbial species (e.g., nematodes, annelids, arthropods, polychaetes, protists, fungi, algae and
</td><td>
For NSW, oil arriving would be well weathered with little lasting impact on salt marshes. Marshes in Victoria near Wilsons Promontory are not predicted to be exposed to above moderate threshold shoreline accumulation. Salt marsh are important benthic primary producers and provide habitat for other species, thus the loss of salt marshes could have long-lasting indirect effects on other organisms (EPA 2016).
The effect of a LOC on individual shorelines will depend on the type of shoreline, aspect and whether they are high or low energy shores. Shoreline recovery studies link restitution times to oil type, climate, shoreline type and results range depending on the receptors monitored and level of clean up.
The oil from the 2010 DWH spill in the GoM was documented by shoreline assessment teams as stranding on 1,773 km of shoreline (Michel et al. 2013). Shoreline clean-up activities were authorized on 660 km, or 73.3% of oiled beaches and up to 71 km, or 8.9% of oiled marshes and associated habitats. In 2013 Michel et al. reported that one year after the spill began, oil remained on 847 km; two years later, oil remained on 687 km, though at much lesser degrees of oiling. For example, shorelines characterised as heavily oiled went from a maximum of 360 km, to 22.4 km one year later, and to 6.4 km two years later.
Hence recovery can range widely from around 2 years (Sea Empress, 1996, North Sea crude) to more than 20 years for soft sediment shorelines deeply contaminated during the 1991 Gulf War spills (IOGP, 2016).
Of the shorelines of the states potentially impacted, the consequence to shorelines in Victoria is predicted to be greatest (contacted first, highest loadings and freshest oil). The resultant impact is assessed conservatively as a Consequence Level II
<table>
<tr><td colspan="2">Effect Dimensions</td><td colspan="2">Sensitivity Dimensions</td></tr>
<tr><td>Duration</td><td>H</td><td>Irreplaceability</td><td>M</td></tr>
<tr><td>Size/Scale</td><td>H</td><td>Vulnerability</td><td>M</td></tr>
<tr><td>Intensity</td><td>M</td><td>Influence</td><td>M</td></tr>
<tr><td colspan="2">M-H</td><td colspan="2">M</td></tr>
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Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	bacteria). Post-spill, sampling indicated that species composition was almost exclusively dominated by a few species of fungi. DNA analyses revealed that the 'before' and 'after' communities at the same sites weren't closely related to each other (Bik *et al.,* 2012). Similar studies found that oil deposited on the beaches caused a shift in the community structure toward a hydrocarbonoclastic consortium (petroleum hydrocarbon degrading microorganisms) (Lamendella *et al.*, 2014). **Rocky shorelines** Rocky shores encompass a wide variety of habitats. Exposure to the sun and wave energy are key factors in determining the types of plants and animals that inhabit the rocky shores. The persistence of oil is largely governed by the same forces (IOGP, 2016). Rock surfaces exposed to strong wave action are typically dominated by barnacles and limpets that are firmly attached and if oil strands on those surfaces it may result in mortality of the affected animals, but is unlikely to persist. Sheltered rocky shores in estuaries or inlets are typically dominated by macroalgae (seaweed) with various invertebrates living on or under the algae. Oil deposited in these habitats may not be washed off so quickly and recovery from impacts may take longer. **Mangroves and salt marshes** Mangroves grow in intertidal mud and sand, with specially adapted aerial roots (pneumatophores) that provide for gas exchange during low tide (DEWR 2006). The effects of surface hydrocarbons on mangroves include damage by smothering of lenticels (mangrove breathing pores) on pneumatophores or aerial prop roots, or the lower trunk; or by the loss of leaves (defoliation) due to chemical burning. It is also known that mangroves take up hydrocarbons from contact with leaves, roots or sediments, and it is suspected that this uptake causes defoliation through leaf damage and tree death (Wardrop *et al.* 1987). In-water entrained and dissolved hydrocarbons may affect mangrove communities directly through root uptake of toxic contaminants or indirectly due to effects on benthic infauna leading to reduced rates of bioturbation and subsequent oxygen stress on the plants root systems. Observed thresholds for effects are likely to vary depending on the health of the system, the hydrocarbon spilled and the environmental conditions; however, observations by Lin and Mendelssohn (1996)	

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	demonstrated that more than 1 kg/m^2 of oil during the growing season would be required to affect salt marsh or mangrove plants significantly. "Subtropical and temperate coastal salt marsh" (otherwise referred to as coastal salt marsh) is listed as a TEC. This TEC is usually associated with sandy/muddy shores of estuaries and embayments along low wave energy coastlines. The physical environment for the TEC is coastal areas under regular or intermittent tidal influence, with salt marsh being the key vegetation type – that being salt-tolerant grasses, herbs, sedges, rushes and shrubs generally less than 50 cm high (DSEWPaC, 2013b). Salt marshes occur in sheltered conditions, commonly in the strandline zone, and the vegetation offers a large surface area for oil absorption and trapping. Additionally, many salt marsh grasses, which can be dominant over large areas, have corrugated leaf surfaces which increase their holding capacity. Evidence from case histories and experiments shows that the damage resulting from oiling is very variable – as are recovery times. Lighter, more penetrating oils are more likely to cause acute toxic damage than heavy or weathered oils. In areas of light to moderate oiling where oil is mainly on perennial vegetation with little penetration of sediment, the shoots of the plants may be killed, but recovery can take place from the underground systems. Good recovery commonly occurs within one to two years. Where thick deposits of viscous oil or mousse accumulate on the marsh surface, vegetation is likely to be killed by smothering and recovery delayed because persistent deposits inhibit recolonisation.	
Wetlands	Most wetlands of international importance i.e. Ramsar wetlands have minimal risk of receiving oil following a LOWC because they have no, or very narrow and/or seasonal, connections to the sea. If surface oil was to enter a Ramsar site, the level of effect would be dependent on the type of receptors exposed to oil and the proportion of the site exposed to oil as well as the nature of the oil (fresh versus weathered). Sensitive receptors found in Ramsar sites connected to the sea could include mangroves, salt marshes, fish, shorebirds and seabirds. The consequences of oil exposure to these specific receptors have been described individually in the sections above.	Under certain metocean conditions both floating surface and in-water (dissolved oil) at moderate thresholds is predicted to contact the Gippsland Lakes Ramsar wetland. Oil is predicted to accumulate at high – moderate thresholds on the shoreline at Lakes Entrance and along the Ninety Mile Beach however the presence of sand dunes between the ocean and the Gippsland Lakes wetlands means the wetland itself is highly unlikely to be affected in any manner. The consequence is assessed as **Level III.**

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
National Parks and Reserves	Potential impacts to sensitive receptors related to the shorelines of the terrestrial parks, such as coastal habitats and birds, and the waters of the marine parks, such as benthic habitats, fish, cetaceans and pinnipeds, are discussed in the appropriate sections above. Impacts on tourism and recreation from degraded aesthetic values and water quality or restricted access to the coast and recreational locales within the Parks due to clean up efforts are discussed below.	Modelling predicts contact at the moderate in-water (dissolved) threshold for five marine parks, reserves and sanctuaries (Ninety Mile Beach, Point Hicks, Cape Howe and Beware Reef in Victoria and Batemans in NSW). Dissolved hydrocarbon at the moderate threshold is also predicted to encroach upon the waters surrounding the terrestrial parks and reserves of the Kent and Hogan Groups and Curtis Island in Tasmania. Oil is predicted to accumulate above the moderate exposure threshold on the Gippsland and southern NSW coastline adjacent to several terrestrial parks and reserves including Gippsland Lakes, Cape Conran and Croajingolong in Victoria and Nadgee, Ben Boyd, Bournda, Mimosa Rocks, Montague Island and Eurobodalla in NSW. The consequence is assessed as **Level II** taking into consideration the length of shoreline potentially impacted and the extent of oil accumulation predicted.
AMPs	AMPs vary in their conservation objectives and specific values, but all are designed to conserve fauna, habitats and water quality over the long term. A temporary deterioration of water quality could have negative effects on organisms, such as plankton, seabirds, marine mammals and fisheries resources which in turn affect the values of that Park. These impacts are discussed individually within other sections.	Surface and in-water (dissolved) oil entering these AMPs will degrade water quality until the oil is broken down and or currents shift the weathering oil outside the boundaries of the AMPs. Thus, water quality effects are predicted to persist only over the short to medium term in the AMPs. No AMPs were predicted to experience exposure to surface oil at or above the moderate threshold. Modelling indicated that six AMPs (East Gippsland, Beagle, Flinders, Jervis, Freycinet and Central Eastern), could, depending on the prevailing wind and current direction, be exposed to moderate thresholds of dissolved oil. Taking into consideration the potential impacts to the receptors within the AMPs the overall consequence is assessed as **Level II.**
KEFs	KEFS are underwater features, and hence are not at direct risk from floating surface oil or shoreline accumulated oil. However, biological values associated with KEFs such as the Upwelling East of Eden and Shelf Rocky Reefs may be at risk from oil. Potential impacts to sensitive receptors related to the KEF Upwelling East of Eden such as plankton and cetaceans, or to the KEF Shelf Rocky Reefs such as benthic communities and fish, are discussed in the appropriate sections above.	While a spill would not affect the KEF Upwelling East of Eden itself, if the spill occurs at the time of an upwelling event, it may result in krill being exposed to in-water phase hydrocarbons. Pygmy blue whales feeding at this time may suffer from reduced availability of prey however these impacts are expected to be localised and temporary. The rocky-reef habitat of the KEF Shelf Rocky Reefs generally occurs at depths of greater than 45 m and is therefore not expected to be impacted by in water (dissolved) hydrocarbons in the upper layers of the water column. The consequence is assessed as **Level III**.

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
Cultural – Indigenous and Historic	Visible sheen or oil stranded on the shoreline has the potential to reduce the visual or cultural (including activities such as camping, rituals and ceremonies) amenity of cultural heritage sites such as historic (e.g. shipwreck) or indigenous protected areas. Impacts from oil exposure are unlikely for submerged shipwrecks.	Oil sheen and, under certain conditions, oil 'slicks' are predicted to encroach upon nearshore waters in the vicinity of the Gunai-Kurnai Native Title Determination Area and a number of historic shipwrecks. Parts of the Gippsland coast over which the Gunai-Kurnai people hold native title are predicted to be exposed to moderate – high shoreline oil loadings which may lead to reduced amenity or temporary exclusions during clean-up. Impacts from degraded aesthetics of sites along the coast may take time to recover but loss of access to sites during response or for health reasons are temporary and relatively short term. The consequence level is considered **Level III** based on public impact consequence considerations (media coverage, the scope of the disruption (personal, commerce, transportation or socio-economic) and the size of the population affected) as per ExxonMobil Risk Matrix Application Guide, 2018 (Refer Section 4.6, Table 4-5).
Commercial Fisheries	Commercial fishing has the potential to be impacted through exclusion zones associated with the spill, the spill response and subsequent reduction in fishing effort. Exclusion zones may impede access to commercial fishing areas, for a short period of time, and nets and lines may become oiled. The impacts to commercial fishing from a public perception perspective however, may be much more significant and longer term than the spill itself. Fishing areas may be closed for fishing for shorter or longer periods because of the risks of the catch being tainted by oil. Concentrations of petroleum contaminants in fish and crustacean and mollusc tissues could pose a significant potential for adverse human health effects, and until these products from nearshore fisheries have been cleared by the health authorities, they could be restricted for sale and human consumption. Indirectly, the fisheries sector will suffer a heavy loss if consumers are either stopped from using or unwilling to buy fish and shellfish from the region affected by the spill. Impacts to fish stocks have the potential for reduction in profits for commercial fisheries, and exclusion zones exclude fishing effort. Davis *et al* (2002) report detectable tainting of fish flesh after a 24-hour exposure at crude concentrations of 0.1 ppm, marine fuel oil concentrations of 0.33 ppm and diesel concentrations of 0.25 ppm. The Montara spill (as the most recent [2009] example of a large hydrocarbon spill in Australian waters) occurred over an area fished by the Northern Demersal Scalefish Managed Fishery (with 11 licences	Several commercial fisheries may operate within the area potentially exposed in the event of a LOC. Floating oil is predicted to extend 100's of kms from the release location making it likely that in these situations an exclusion zone (or fisheries closure) would be established. There are currently no commercially viable scallop beds fished in the area potentially exposed to dissolved hydrocarbons (ABARES, 2019: VFA, 2019: Koopman *et al.,* 2018). Limited data is publicly available on the location and extent of abalone fishing within Victorian waters however a number of licences are active and it is known that harvesting occurs off Cape Conran and at Mallacoota (DEDJTR, 2019). Of the State and Commonwealth administered fisheries which overlap the PEA (see Table 5-1, Description of Environment) the fisheries most active in the area potentially exposed to hydrocarbons, and therefore potentially most at risk of socioeconomic impact from reduced market confidence, are the Southern and Eastern Scalefish and Shark Fishery (31 trawl vessels, 19 Danish-seine vessels and 21 scalefish hook vessels active in total) and the Wrasse Fishery (22 licences in total) (ABARES, 2019: VFA, 2019). A temporary fisheries closure and the flow on losses from the lack of income derived from these fisheries based on reduced market confidence and the potential for extended media coverage (potentially greater than 3 months) has the possibility of exceeding medium community disruption (> 100 – 1000 people) such as reduced employment (in fisheries service industries and the seafood supply chain). The potential economic impacts to commercial fisheries from LOC are considered to be Public Impact **Consequence Level I** based on public impact consequence

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	held by 7 operators), with goldband snapper, red emperor, saddletail snapper and yellow spotted rockcod being the key species fished (PTTEP, 2013). As a precautionary measure, the WA Department of Fisheries advised the commercial fishing fleet to avoid fishing in oil-affected waters. Testing of fish caught in areas of visible oil slick (November 2009) found that there were no detectable petroleum hydrocarbons in fish muscle samples, suggesting fish were safe for human consumption. In the short-term, fish had metabolised petroleum hydrocarbons. Limited ill effects were detected in a small number of individual fish only (PTTEP, 2013). No consistent effects of exposure on fish health could be detected within two weeks following the end of the well release. Follow up sampling in areas affected by the spill during 2010 and 2011 (PTTEP, 2013) found negligible ongoing environmental impacts from the spill. Since testing began in the month after the DWH blowout in the GoM (2010), levels of oil contamination residue in seafood consistently tested 100 to 1,000 times lower than safety thresholds established by the USA FDA, and every sample tested was found to be far below the FDA's safety threshold for dispersant compounds (BP, 2015). FDA testing of oysters found oil contamination residues to be 10 to 100 times below safety thresholds (BP, 2014). Sampling data shows that post-spill fish populations in the GoM since 2011 were generally consistent with pre-spill ranges and for many shellfish species, commercial landings in the GoM in 2011 were comparable to pre-spill levels. In 2012, shrimp (prawn) and blue crab landings were within 2.0% of 2007-09 landings. Recreational fishing harvests in 2011, 2012 and 2013 exceeded landings from 2007-09 (BP, 2014).	considerations (media coverage, the scope of the disruption (personal, commerce, transportation or socio-economic) and the size of the population affected) as per ExxonMobil Risk Matrix Application Guide, 2018 (Refer Section 4.5).
Tourism and Recreation	Refer also to sections on fish, cetaceans, benthic and coastal habitats and National Parks and Reserves above.	Tourism and recreation is also linked to the presence of marine fauna (e.g. whales), particular habitats and locations for swimming or recreational fishing. The modelling predicts visible oil extending into nearshore Victorian waters (including waters of Ninety Mile Beach, Point Hicks and Cape Howe Marine National Parks and Beware Reef Marine Sanctuary). Oil is predicted to contact hundreds of kilometres of shoreline at the moderate – high exposure threshold. The shoreline is dominated by sandy beaches popular for a range of recreational activities. A number of National Parks and Reserves including the very popular (Gippsland) Lakes National Park is situated along this potentially exposed coastline.

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
		Short to Medium-term impacts to nature-based tourism and other human uses of beaches (and nearshore waters) may occur as a result of temporary beach closures to enable clean-up, protect human health or due to perceptions of a polluted environment that is not desirable to visit. With respect to human health, post-Macondo oil spill (April 2010) studies in December found of 17000 water samples, none exceeded USEPA benchmarks for protection of human health (OSAT, 2010) and a year later residual oil in nearshore and sandy shoreline areas was highly weathered and concentrations of constituents of concern were below levels of concern for human health (OSAT, 2011). Alaska's tourism economy took approximately two years to recover from the Exxon Valdez (BOEM, 2017). The Eastern Research Group (2014) reported that while the DWH spill had had a significant impact on several areas of tourism in the short term and had wide-ranging impacts across the GoM, the tourism economy has rebounded to pre-spill levels within four years. The extent of potential impacts to tourism and recreation depends on when the spill occurs, size and where it comes ashore. Considering the range of activities and locations, the potential for reduced amenity of areas used by coastal tourists and recreational visitors, temporary health implications and possible closures, the consequence level is considered **Level I,** based on public impact consequence considerations (media coverage, the scope of the disruption (personal, commerce, transportation or socio-economic) and the size of the population affected) as per ExxonMobil Risk Matrix Application Guide, 2018 (Refer Section 4.5).

7.6.3.2 Likelihood Evaluation

A rupture of a pipeline has never occurred within Esso Bass Strait Operations and is not a common occurrence in the industry.

Considering the inherent low likelihood of a rupture of a pipeline, the safeguards in place and enactment of the SMPEP and OPEP, and the rapid weathering of hydrocarbons, the likelihood of the impacts described above occurring is considered **Very Highly Unlikely (E)**.

7.6.4 Risk Ranking

Consequence	Likelihood	Risk Ranking
II (environmental) / I (public impact)	E	4 (environmental / 3 (public impact)

7.6.5 Controls

Good Practice	Adopted	Control	Rationale
Support vessel approach protocols	✓	**CM27**: Support vessel approach procedure	Support vessel approach procedure outlines the required 500 m approach and DP operational checklists complete to ensure safe approach to the platforms.
Structured operational limits criteria for dynamic positioning (DP) operations	✓	**CM28**: ASOG / CAMO procedures	The application of ASOG / CAMO risk management tools is industry best practice for DP operations. CAMO describes how to configure the vessels DP system and ASOG sets out the operational, environmental and equipment performance limits considered necessary for safe DP operations whilst carrying out a specific activity.
DP Class 2	✓	**CM29**: Support vessel DP system	DP Class 2 (redundancy so that no single fault in an active system will cause the system to fail) is the industry standard where loss of position keeping capability may cause personnel injury, pollution or damage with large economic consequences.
Pipeline Network Safety Case	✓	**CM34:** NOPSEMA accepted Safety Case	The NOPSEMA accepted Pipeline Network Safety Case demonstrates how the risks to the integrity of the pipelines will be reduced to as low as reasonably practicable (ALARP). This includes: • Safe design and operation of pipelines • Reduction of risks to ALARP • Inspection, maintenance and monitoring of pipelines

Good Practice	Adopted	Control	Rationale
Corrosion control management and monitoring program	✓	**CM55:** Corrosion monitoring and control plans for pipelines developed and actioned per FIMS process	A corrosion control and monitoring program is in place as part of OIMS System 6-2 (FIMS). The Corrosion Control and Monitoring program ensures corrosion controls are implemented (including cathodic protection and chemical corrosion inhibition) and monitors the performance of these controls. This program is in place to reduce the likelihood of corrosion in pipelines.
Subsea pipeline inspections and monitoring	✓	**CM56:** Pipeline inspection and monitoring program developed and actioned per FIMS process	Pipeline Inspection Programs is in place as part of OIMS System 6-2 (FIMS). The Pipeline Inspection and monitoring program includes underwater pipeline inspection, leak detection and in-line metal loss surveys. This program is in place to reduce the likelihood of LOC due to corrosion, failure of an unsupported span and impacts to an unprotected section of pipeline.
Pipeline isolation and depressuring	✓	**CM57:** Isolation test plan for pipeline isolation valves developed and actioned per FIMS process	Pipeline isolation is triggered by shutdown systems. Shutdowns can be put in effect by a number of initiators that indicate abnormal operating conditions (e.g. high pressures) that could bring the process to an unsafe state or an actual loss of containment of hydrocarbons (e.g. triggering gas detectors on the topsides). They can also be initiated manually. A Surface Shutdown shuts down and isolates process equipment on a platform. A Subsurface Shutdown does this and also initiates boundary isolation at the well subsurface safety valves and the pipeline LVOs (last valves on), FVOs (first valves off) and actuated SSIVs (subsea isolation valves) where installed. A Generator Shutdown shuts down the electricity generators and initiates a Surface Shutdown. A Total Platform Shutdown (TPS) initiates all of the above shutdowns and trips all sources of battery power other than those feeding hazardous area rated communications, lighting and navigation aids. Closure of the LVO / FVO during platform topsides blowdown prevents the pipeline inventory from feeding a leak. Pipeline isolation valves are in place and maintained as part of FIMS. A Subsurface Shutdown can be initiated on the platform or it can also be initiated from the Production Control Room at Longford. Other

Good Practice	Adopted	Control	Rationale
			shutdowns are initiated from the EAA or the control room on the platform. In the event of an incident, pipelines can be depressured in order to respond to a leak. Process for depressuring pipelines is specific to the location and equipment available on the relevant facility where the depressuring will take place. Facility specific procedures are in place to provide guidance to safety depressure facilities and pipelines. In general: For offshore pipelines coming onshore, platforms feeding into the pipeline can be shut in. Pressure is relieved at the platform, as far as practicable. For inter-platform pipelines, platform at the supply end to shut in and isolate at the LVO. The platform at the receiving end can reduce line pressure to flare pressure, then isolate line at the FVO. Should pipelines upstream of the damaged pipeline require depressuring during an emergency, pipelines can be depressured through the platform scraper launchers and receivers to the platform vent and drain systems.
Crane maintenance	✓	**CM42:** Crane Operations, Maintenance and Inspection Manual (COMI) - Lifting Procedures	Crane maintenance and inspection programs are undertaken in accordance with the Crane Operations Maintenance and Inspection Manual (COMI). This includes maintenance and inspection of cranes, Rigging and lifting gear and testing of equipment This is in place to minimise the likelihood of objects being dropped as they are being lifted and minimise the risk of an object being dropped onto a pipeline.
	✓	**CM40**: Flag State lifting requirements	Vessel lifting equipment maintenance standards and procedures undertaken in accordance with vessel Flag state requirements (e.g. Australia: Marine Order 32 - Cargo handling equipment). This is in place to minimise the likelihood of objects being dropped as they are being lifted and minimise the risk of an object being dropped onto a pipeline.
Location of pipelines is published and available for fishermen	✓	**CM58:** Navigational charts	The location of facilities, PSZs and pipelines are plotted on navigational chart AUS357. This is in order to reduce the likelihood of vessels and fishermen impacting pipelines when using anchors or fishing equipment.
Observation flights	✓	**CM59**: Observation during helicopter flights	Helicopter flights travel offshore routinely between all facilities to transfer personnel to and from the platforms. During these fights, helicopter pilots record any hydrocarbon sheens observed. Flights are diverted to CoP facilities routinely to observe for any indications of leaks. Should a leak be observed, helicopter pilots report this to safety and environmental coordinators to initiate further response measures as required.

Good Practice	Adopted	Control	Rationale
Oil spill response planning	✓	**CM12:** OPEP	Under the OPGGSE Regulations, the petroleum activity must have an accepted Oil Pollution Emergency Plan (OPEP) in place (Reg. 14(8). In the event of a LOC, the OPEP will be implemented. Capability is maintained to ensure OPEP can be implemented in response to an incident, as expected. This includes maintaining contracts with third party service providers to ensure required materials are available at the time of an incident.
Oil spill monitoring planning	✓	**CM35:** OSMP	The OSMP is a key part of an integrated package of environmental management documentation that also includes the environment plan (EP) and the oil pollution emergency plan (OPEP). It is defined under (Reg. 14(8) of the OPGGSE Regulations. The OSMP is the principle tool for determining the extent, severity and persistence of environmental impacts from an oil spill, and allows titleholders to determine whether their environmental protection goals are met. Esso's OSMP details the arrangements and capability in place for: • Operational monitoring of a hydrocarbon spill to inform response activities • Scientific monitoring of environmental impacts of the spill and response activities. Operational monitoring will allow adequate information to be provided to aid decision making to ensure response activities are timely, safe, and appropriate. Scientific monitoring will identify if potential longer-term remediation activities may be required Capability is maintained to ensure OSMP can be implemented in response to an incident, as expected.
Utilisation of idle fishing vessels	✓	**CM51:** Utilisation of idle vessels	Opportunities to utilise idle fishing vessels for oil spill response and monitoring activities will be taken where there is agreement of the vessel owner and where a risk assessment shows that there are no additional risks to vessels and crew.
Communication with fisheries	✓	**CM52**: Communication with fisheries	Updates on oil spill response and monitoring provided to fishery representative bodies (through SETFIA) to enable accurate information on spill status, impacts and effects of spilled hydrocarbons on seafood safety to be provided to fishing industry members and the public. Daily updates provided in the first week until the modelling is completed and then as needed, until relief well completed (and beyond if there is ongoing concern).

7.6.6 Demonstration of ALARP

ALARP Decision Context and Justification	Decision Context B Pipeline operations are a standard offshore activity. The risks associated with a loss of containment from a pipeline are well understood. Esso is experienced in the implementation of industry requirements through their existing ongoing operations. The environmental and public consequences of a LOC have been assessed as moderate – high and in recognition of the interest from both relevant stakeholders and the public about the potential impacts of a major oil spill. The utilisation of idle fishing vessels (where practicable and safe to do so) and ensuring ongoing communication with the fishing industry bodies will assist in mitigating socioeconomic impacts to commercial fisheries and the seafood supply chain. Consequently, Esso believes **ALARP Decision Context B** should apply.

Additional, Alternative, Improved Controls	Benefit	Cost / Feasibility	Adopted
Utilisation of idle fishing vessels	Opportunities to utilise idle fishing vessels for oil spill response and monitoring activities will be taken where there is agreement of the vessel owner and where a risk assessment shows that there are no additional risks to vessels and crew.	There is minor costs associated with using idle fishing vessels including ensuring safety and training standards are met in the event of an incident. Costs are considered reasonable given the high public impact consequence	Adopted **CM51:** Utilisation of idle vessels
Communication with fisheries	Updates on oil spill response and monitoring provided to fishery representative bodies (through SETFIA) to enable accurate information on spill status, impacts and effects of spilled hydrocarbons on seafood safety to be provided to fishing industry members and the public. Daily updates provided in the first week until the modelling is completed and then as needed, until relief well completed (and beyond if there is ongoing concern).	There is minor costs associated with sending communication out to stakeholders, particularly as there has been ongoing consultation through the EP. Costs are considered reasonable given the high public impact consequence.	Adopted **CM52**: Communication with fisheries
Trenching/ burial of pipelines for protection from external damage	Retrospective burial of pipelines may reduce the likelihood of external damage outside the PSZ	Many pipelines are on the sea floor and retrospective burial is costly. Visual inspections of the pipeline are completed regularly as part of pipeline maintenance programs. Other controls in place are considered to reduce risks to ALARP (location of pipelines published on marine charts and ATBA	Not adopted

Additional, Alternative, Improved Controls	Benefit	Cost / Feasibility	Adopted
		to eliminate large ships form the area). The cost of retrospective burial is considered grossly disproportionate to the reduction in risk.	

7.6.7 Demonstration of Acceptability

Factor	Demonstration Criteria	Criteria Met	Rationale
Risk Assessment Process for Unplanned Events	The risk ranking is lower than Category 1	✓	The environmental risk ranking is Category 3 and the public impact risk ranking Category 2, and therefore considered acceptable.
Principles of Ecologically Sustainable Development (ESD)	No potential to affect biological diversity and ecological integrity.	✓	The impacts associated with this aspect are potentially significant but moderate in size/scale and medium term, which is not considered as having the potential to affect biological diversity and ecological integrity.
	Activity does not have the potential to result in serious or irreversible environmental damage.	✓	The activity is not considered as having the potential to result in long term or irreversible environmental damage.
Legislative and Other Requirements	Legislative and other requirements have been identified and met.	✓	• The proposed activities align with the requirements of the OPGGS Act 2006: • Schedule 3 Occupational health and safety and OPGGS(S)R. The OPGGS(S)R require the operator of each offshore facility to prepare a safety case for submission to NOPSEMA. Activities at a facility must be conducted in accordance with a safety case that has been accepted by NOPSEMA. • The following other requirements were identified as relevant to impacts from a LOC from a pipeline. Oil spills are a recognised threat to these species and proposed activity is consistent with conservation / management actions where specified: • Approved Conservation Advice for *Thinornis rubricollis* (Hooded Plover, Eastern) • Approved Conservation Advice for *Sternula nereis nereis* (Fairy Tern)

Internal Context	Consistent with Esso's Environment Policy.	✓	Proposed activities are consistent with Esso's Environment Policy, in particular, to "comply with all applicable environmental laws and regulations and apply responsible standards where laws and regulations do not exist".
	Meets ExxonMobil Environmental Standards	✓	There is no standard related to a LOC from a pipeline but the activities proposed meet the strategic objectives of the Upstream Environmental Standards.
	Meets ExxonMobil Operations Integrity Management System (OIMS) Objectives	✓	Proposed activities meet: OIMS System 6-2 objectives ensure equipment is maintained over the operating life of the equipment preventing or mitigating a significant event that could result in significant and environment consequences. OIMS System 6-5 objective to identify and assess environmental aspects; significant aspects are addressed and controlled consistent with policy and regulatory requirements; OIMS System 8-1 objective to clearly define and communicate operations integrity requirements to contractors; OIMS System 10-1 objective to anticipate community concerns and develop response plans, as appropriate; and OIMS System 10-2 objectives to document, resource and communicate emergency response plans, and conduct training, exercises and/or drills to determine the adequacy of the plans.
External Context	Stakeholder concerns have been considered / addressed through the consultation process.	✓	Concerns from relevant stakeholders addressed through the consultation process. Any new relevant stakeholder objections, claims or issues will be considered in line with the ongoing consultation.

7.7 Accidental Release - Loss of Well Control

7.7.1 Causes of Loss of Well Control

A loss of well control (LOWC) can occur when primary and secondary well control measures fail, which could potentially result in a release of reservoir hydrocarbons into the marine environment.

During production operations the probability of loss of containment of reservoir hydrocarbons is very unlikely. However, workover operations pose a remote chance of losing primary and secondary well control, resulting in a release of reservoir hydrocarbons to the marine environment.

7.7.2 Spill Modelling

Spill modelling was prepared for the worst case discharge scenarios to establish the extent of possible environmental impact (RPS, 2019b, 2019c, 2020). The spill modelling was prepared based on the parameters described in Table 7-23. The modelling was based on 100 spill simulations and annual analysis (i.e. over all seasons).

7.7.2.1 Discharge Scenarios and Modelling Inputs

A comprehensive review of all current, future and historically producing wells across Bass Strait wells was completed to identify potential worst case discharge scenarios.

The potential discharge scenario developed based on a failure of all preventative and mitigating barriers resulting in a loss of well control and a release of reservoir hydrocarbons.

The assessment considered all producing wells across Bass Strait including future activity on existing wells and wells which will start producing during the period of this EP (e.g. West Barracouta).

Table 7-21 Selection of worst case discharge scenario – Loss of well control

Process	Description

Identify potential discharge scenarios	In consultation with Reservoir, Wellwork and Facilities Engineers, it was identified that discharge of reservoir fluids could occur due to loss of containment during:
	• “Minor” workover
	  ○ Workovers (including P&As) where tubing remains in the well
	  ○ All wireline activities are considered ‘minor’ workovers because tubing is not removed.
	  ○ Flow during a LOWC could be via tubing
	  ○ Could be caused by:
	    ▪ Loss of barriers during wellwork
	• “Major” workover
	  ○ Workovers (including P&As) where tubing is removed from the well (also known as ‘tubing pull workovers’)
	  ○ Flow during a LOWC could be via tubing and annulus
	  ○ Could be caused by:
	    ▪ Loss of barriers during wellwork
	• Loss of containment outside of wellwork scenarios (e.g. during production; while the well is shut in)
	  ○ An incident occurs resulting in a loss of containment from the well or associated equipment
	  ○ This could occur:
	    ▪ During production
	    ▪ While the well is shut-in, suspended or temporarily abandoned
	  ○ Could be caused by:
	    ▪ Loss of barriers in the well
	    ▪ Loss of containment from well head equipment and flowlines
	For more detail about different types of workovers refer to Section 2.4.2.
	Note that wellwork (including P&A) using a Jack Up Rig (JUR) is excluded from this assessment. Impacts and risks associated with the use of a JUR are not included in this Environment Plan and these activities will be subject to assessment in separate project/campaign specific EPs. At the time of writing the rig program was under review due

Process	Description
	to COVID-19 but could include the plug and abandonment of SHA, TWA, PCA, DPA, Mulloway, Whiptail. This assessment includes consideration of seven temporarily abandoned exploration wells. P&A of these wells will be completed using a rig and will be subject to assessment in a separate EP.

Name	License	Area
WHIPTAIL 1A	VIC/L1	Close to shore
MARLIN 1	VIC/L3	Northern
HALIBUT 1	VIC/L5	Central Fields
GUDGEON 1	VIC/L6	Central fields
EAST PILCHARD 1	VIC/L9	Northern
TERAKIHI 1	VIC/L20	Central fields (further from shore)
MULLOWAY 1	VIC/RL1	Close to shore

Process	Description
Identification of potential pollutants	Oil types for different reservoirs were classified and grouped based on ITOPF Classifications (ITOPF, 2015). Hydrocarbon liquid types across the Bass Strait vary from Group I (light oils/condensate) to Group IV (heavy crude). Details of fluid properties for each reservoir can be found in Appendix A, Section 4.4. Seven samples were collected to analyse the different types of condensate and crude oils across all facilities. These samples span the range of fluid properties of Bass Strait Operations. Fluid properties sampled were selected based on a combination of oil type, production flow rates and location to ensure the range of fluid properties were modelled. Crude types selected for modelling were: • West Kingfish Crude • Halibut Crude • Flounder Crude • Snapper N Crude • Moonfish Crude Kipper and Barracouta condensates were considered to determine the volume of a worst case discharge from a gas / condensate well and were modelled in Prosper for the highest producing gas / condensate wells. As shown, the volume of the release during production operations (from a completed well with production tubing in place) is considerably lower than the WCDS for a LOWC during drilling (7.8 kbbl / day). This scenario has been assessed in the accepted JUR Drilling EP and therefore are not considered a worst case scenario. Environmental impacts have been assessed in Section 6.7 of the JUR Drilling EP available on NOPSEMAs website here and has not been addressed further in this EP. Response to condensate spills has been addressed in Appendix A of Volume 3 (in the OPEP).

Well	Daily release rate (kbbl /day)	Total release volume over 98 days (kbbl)
KPA	5.5	539
BTW	1.9	186

Process	Description
Determine characteristics of	**<u>Location</u>**

Process	Description
the discharge scenario (including the location and calculation of potential spill volumes)	Bass Strait Production can largely be separated into four different areas • Central Fields (BKA, HLA, FTA, CBA, MKA) • Close to shore (SHA, TWA, BTW, BTA, WTA, SNA, PCA, DPA) • Northern (KPA, MLA, MLB, WTN, TNA, FLA) • Southern (KFA, KFB, WKF, BMA, BMB) The Whiting platform has been excluded from this assessment as all wells have been abandoned Following the abandonment of SHA, TWA and BKA subsea facilities, there are no subsea oil wells producing in the Gippsland region. Remaining subsea facilities (KPA and BTW) produce gas and condensate (as discussed above). Therefore, all crude spill scenarios are assumed to occur at surface. **Volume** The flow rate of discharge scenarios was established based on the most recent well test data for all wells, to identify the highest producing wells. Spills from abandoned wells, during wireline activities and during production would be expected to result in a significantly lower rate of release compared to releases due to workover activities. There are a number of restrictions at surface which would restrict flow rate should an incident occur. For the purposes of this worst case scenario assessment, a spill from a workover activity have been considered as it presents a spill of the highest volume and the highest likelihood of occurrence. Wells which do not free flow were excluded from the assessment as they would not be able to flow to atmosphere for an extended period should an incident occur. The volume of the discharge scenarios was determined based on modelling a discharge scenario from the most productive well for each crude type at each location using Prosper. Prosper is a program which allows for modelling flow from reservoirs, through wells to the surface by taking into account well design, fluid flow regimes and hydraulic constraints (such as casings and valves within the well). It was assumed that the discharge scenario requires a relief well drilled by a Semi-sub rig that has a response time of 98 days, as described in Section 7.7.5.1.
Determine likelihood of the discharge scenario	The highest risk activities which could lead to a loss of containment from wells is during well workover activities. This is reflected in the IOGP Risk Assessment Data Directory – Blowout Frequency (2019) as outlined below.

Well type	Definition	Frequency of Well release	Unit
Abandoned wells	Permanently abandoned, temporarily abandoned and long-time plugged wells. Categorised as Suspended, Temporarily abandoned, Abandoned in the WOMP.	$2.3x10^{-5}$	per well year
Wireline	Wireline operations in production or injection wells (i.e., not wireline operations carried out as part of drilling and completion operations).	$2.5x10^{-5}$	per operation
Production	Wells that are used for production and injection purposes. This includes closed in production wells. Categorised as Shut in, Active in the WOMP	$4.5x10^{-5}$	per well year
Workover	Workover activities (not including wireline, snubbing or coiled tubing operations). Often referred to as “heavy workover”.	$5.7x10^{-4}$	per operation

<table>
<tr><th>Process</th><th>Description</th></tr>
<tr><td></td><td>According to the IOGP Risk Assessment Data Directory, the likelihood of a LOWC from a production or an abandoned well is less than during a workover activity.</td></tr>
<tr><td>Selection of worst case scenario</td><td>
Based on the assessment of oil type, location and volume described above, representative worst case discharge scenarios were selected at a variety of facilities to give an understanding of discharge scenarios and impacts to receptors at a representative selection of locations across the Strait. A summary of these scenarios has been provided in Table 7-22.
A summary of how these scenarios are representative of spill risks for all Bass Strait Operations is provided below.
<table>
<tr><th rowspan="3">Area</th><th colspan="3">Representative Worst Case Discharge Scenario*</th></tr>
<tr><th>Non workover (inc. production & shut-in wells)</th><th>Minor workover (inc. P&A)</th><th>Major workovers</th></tr>
<tr><td>Production
Shut in wells</td><td>Workovers where tubing is not removed</td><td>Tubing pull workovers</td></tr>
<tr><td>Central Fields
(BKA, HLA, FTA, CBA, MKA)</td><td>Non-workover discharge scenarios for Central Fields will be represented by CBA A19 workover discharge scenario due to similar crude types and lesser volume (due to reduced flow rate and restrictions at surface).</td><td>Minor workover discharge scenario in Central Fields will be represented by a workover on CBA A19 well as it has been modelled as the highest producing well in the area.</td><td>Major workover discharge scenarios for Central fields will be represented by the TNA A2 major workover scenario (refer to Northern Area). Note: CBA A19 well has a higher production rate, while TNA A2 scenario is closer to shore, therefore both have been considered.</td></tr>
<tr><td>Close to shore
(SHA, TWA, BTW, BTA, , SNA, PCA, DPA)</td><td>Non-workover discharge scenarios for close to shore will be represented by SHA 1 workover.</td><td>SNA A19 is highest producing well in the area. Although SNA-A19 has a slightly higher production rate, this scenario was not selected.
The minor workover scenario for the SHA subsea facility was selected as it is closer to shore (and was included to provide a representative subsea discharge).
Although wells which produce from the Moonfish reservoir also have a lesser production rate than the SNA-A19, the Moonfish well minor workover scenario was selected because the Group IV oil type is expected to result in a spill with higher consequences.</td><td>Major workover discharge scenario for close to shore represented by the TNA A2 major workover scenario (refer to Northern Area), as all wells in this area have a lesser production rate than TNA A2. The TNA A2 a Group IV crude (persistent oils) which is representative of the worst case crudes across Bass Strait Operations.</td></tr>
<tr><td>Northern
(KPA, MLA, MLB, WTN, TNA, FLA)</td><td>Non-workover discharge scenario represented by MLA A10 workover due to similar crude types and lesser volume (due to reduced flow rate and restrictions at surface).</td><td>Minor workover discharge scenario in Northern area will be represented by a workover on MLA A10 because it is the highest producing well in the area.</td><td>Major workover discharge scenario for Northern area represented by TNA A2 major workover, which is the highest producing well in a central production area.</td></tr>
<tr><td>Southern
(KFA, KFB, WKF, BMA, BMB)</td><td>Non-worokver discharge scenario represented by WKF W2 workover due to similar crude types and lesser volume (due to reduced flow rate and restrictions at surface).</td><td>Minor workover discharge scenario in Southern area represented by WKF W2 workover because it is the highest producing well in the area.</td><td>Major workover discharge scenario for Southern Area represented by the TNA A2 major workover scenario as all wells in this area have a lesser production rate than TNA A2. The TNA A2 a Group IV crude (persistent oils) which is representative of the worst case crudes across Bass Strait Operations.</td></tr>
</table>
*scenarios in Bold have been modelled. See Table 7-22 for modelling details
</td></tr>
</table>

Process	Description
	<u>Moonfish Reservoir</u> Sampling was completed of crude oil from the Moonfish reservoir which indicated high wax content and low pour point. Modelling was completed on the M31 well which is currently producing from the Moonfish oil reservoir. The risk of loss of well control from production and 'minor' workovers from wells producing from the Moonfish reservoir (i.e. Wellwork activities where the worst case discharge scenario is flow through tubing only, such as wellwork where tubing remains in the well) have been assessed and are within the scope of this EP. Minor workovers for maintenance and repair activities may need to be completed on wells which are currently producing from the Moonfish reservoir. These are considered 'minor' workovers and impacts and risks have been assessed as per the consequence assessment in Table 7-25 and Table 7-26. The risk of loss of well control from 'major' workovers from wells producing from the Moonfish reservoir (i.e. wellwork activities where the worst case discharge scenario is flow through tubing and annulus such as wellwork where tubing is removed from the well) have not been assessed in this EP.

Table 7-22 Representative Worst Case Discharge Scenarios

Release Area	Close to Shore	Southern	Central Fields	Northern	Northern	Close to Shore
WCDS Selection Basis	The Seahorse scenario (SHA 1 well) represents a crude well close to shore. Note that the SHA well was abandoned in October 2020. However the modelling for this 'workover' discharge scenario was used to represent an oil spill close to shore and the flowrate is comparable with the production rate of the SNA A19. A spill from the Snapper platform would be a surface spill but given the shallow depth at the SHA location, the spill modelling is considered to be comparable to that of a surface spill.	The West Kingfish scenario (from the WKF W2 well) represents the highest performing well in the south section of Gippsland basin (although lower than the other scenarios due to reservoir decline). WKF crude is considered a Group II (Light persistent oil) which is representative of crude in this area.	The Cobia scenario (from the CBA A19 well) was determined to be the highest performing well representing the central fields. The well was not producing at the time of modelling however, predicted flow rates were determined to be the highest in the area. The Cobia scenario was modelled using Halibut crude which is classified as Group II (Light persistent oil). This is representative of the types of oil found in the Central Block reservoirs.	The Marlin scenario (from the TRA A10 well) represents the highest performing wells in the northern area. Crude samples from current Turrum (TRA) wells were not able to be analysed to produce an assay due to the water cut being too high and as such, a crude assay proxy was chosen, based on present testing and historical reservoir information. The TRA wells were modelled using West Kingfish crude. The Group II crude (Light persistent oil) is representative of the crudes in the Northern area.	The Tuna scenario was prepared to model a discharge scenario from a major workover. The TNA A2 well is expected to produce at a higher rate following workover. The TNA A2 was modelled using tubing and annular flow to represent a worst case scenario during major workover. Crude samples from current TNA wells were not able to be analysed to produce an assay due to the water cut being too high and as such, a crude assay proxy was chosen, based on present testing and historical reservoir information. The TNA well was modelled using Flounder crude. The Group IV crude (persistent oils) is representative of the worst case crudes across Bass Strait Operations.	The Snapper M31 scenario was prepared to model a discharge scenario from the Moonfish oil reservoir given its high wax content and pour point (Group IV Persistent oils). The SNA M31 scenario was modelled using tubing flow only.
Scenario description	• Minor workover / P&A • Tubing available to flow				• Major workover	• Minor workover / P&A

	• Discharge rate assumed to be constant • Modelled with actual water cut	• Tubing and annulus available to flow • Discharge rate not assumed to be constant, as limited by reserves volume and will decline. • Modelled assuming 0% water cut (note actual water cut	• Tubing available to flow • Discharge rate assumed to be constant • Modelled with actual water cut

Table 7-23 LOWC spill modelling inputs

Release Area	Close to Shore	Southern	Central Fields	Northern	Northern	Close to Shore
Release location	Seahorse (SHA) Subsea Facility	West Kingfish (WKF) Platform	Cobia (CBA) Platform	Marlin (MLA) Platform	Tuna (TNA) Platform	Snapper (SNA) Platform
Coordinates (GDA94)	38° 11' 42" S 147° 40' 27" E	38° 35' 39" S 148° 06' 15" E	38° 27' 04" S 148° 18' 28" E	38° 13' 54" S 148° 13' 09" E	38° 10' 16" S 148° 25' 05" E	38°11' 42" S 148° 01' 26" E
Well / Crude	Seahorse 1 West Seahorse-3 crude	West Kingfish W2 West Kingfish crude	Cobia A19A Halibut crude	Turrum A10 West Kingfish crude	Tuna A2 Flounder crude	Moonfish M31 Moonfish crude
Total spill volume	127 kbbl / 0.08 GCF	114 kbbl / 0.04 GCF	391 kbbl / 0.10 GCF	519 kbbl / 0.39 GCF	158 kbbl / 0.07 GCF	4.14 kbbl
Daily release rate	1,300 bbl/day	1,163 bbl/day	3,990 bbl/day	5,296 bbl/day	1,612 bbl/day	315 bbl/day
Release duration	A release duration of 98 days Relief well drilling was assumed to be the primary response (see Volume 3). The response time for a relief well is based on rig mobilisation from Singapore; 98 days was chosen for volume calculations, assuming a semi-submersible MODU					A release duration of 14 days Well kill skid was assumed to be the primary response.
Density (@ 15oC)	0.7925 (g/ml)	0.7981 (g/ml)	0.8215 (g/ml)	0.7981 (g/ml)	0.7999 (g/ml)	0.8876 (g/ml)

Release Area	Close to Shore	Southern	Central Fields	Northern	Northern	Close to Shore
API	48	45.7	40.6	45.7	45.3	27.8
Dynamic Viscosity	2.0 (cP) @ 20°C	2.4 (cP) @ 20 ºC	3.4 (cP) @ 20 ºC	2.4 (cP) @ 20 ºC	2.80 (cP) @ 20 ºC	4.5 (cP) @ 20 oC
Pour Point	-15 ºC	9 ºC	0 ºC	9 ºC	18 ºC	27 ºC
Oil Property Category	Group II (Light persistent oil)	Group II (Light persistent oil)	Group II (Light persistent oil)	Group II (Light persistent oil)	Group IV (Persistent oils)	Group IV (Persistent oils)
Proxy oil type justification	SHA production ceased in 2014. The West Seahorse-3 (located < 5 km west of SHA) proxy matches the boiling point distribution of available reservoir data.	-	CBA 19 was temporarily plugged and not producing at the time of sampling. CBA A19 accesses the same Halibut reservoir as was sampled from the HLA platform.	WKF Crude used as proxy as data from MLA A10 samples demonstrated that heavy ends of MLA crude matched WKF.	Available data indicated that WKF or FLA could be used as an analogue. FLA oil was chosen as a worst case because it is a more persistent oil type.	-

Table 7-24 Boiling point ranges of the oil types used in this study

Boiling Point (BP) ºC	Volatile (%) < 180	Semi-volatile (%) 180 - 265	Low volatility (%) 265 - 380	Residual (%) > 380
West Seahorse-3 crude (RPS 2019c)	36.0	17.5	34.0	12.5
West Kingfish crude (RPS 2019b)	13.6	35.9	36.8	13.7
Halibut Crude (RPS 2019b)	10.7	34.1	41.8	13.6
Flounder crude (RPS 2019b)	9.1	36.6	39.1	15.0
Moonfish crude (RPS 2020)	7.2	28.8	46.9	17.2

7.7.2.2 Modelling Outputs - Weathering and Fate

The properties of the oils used in the modelling of the LOWC scenarios is shown in Table 7-23. West Seahorse-3, West Kingfish and Halibut crudes are classified as a Group II oils according to the International Tanker Owners Pollution Federation classifications (ITOPF, 2014), while Moonfish and Flounder crudes are classified as a Group IV oils due to the high pour point (above ambient temperature) (ITOPF, 2015).

On release to the marine environment, crude is predicted to be distributed over time into the following components:

- surface;
- water column, including
  - entrained (non-dissolved oil droplets that are physically entrained by wave action);
  - dissolved (principally the aromatic hydrocarbons);
- evaporated;
- stranded on shoreline and
- decayed (microbial biodegradation).

Of these components, surface hydrocarbons and dissolved aromatics have the greatest impact on receptors.

Figure 7-9, Figure 7-10, Figure 7-11, Figure 7-12, Figure 7-12 and Figure 7-13 present the fate and weathering graphs for modelled crude releases.

West Seahorse-3 crude is composed of 87.5% volatiles and semi- to low-volatile compounds and 12.5% persistent compounds. It is expected from laboratory tests that once the light end hydrocarbons are lost to evaporation, the remaining surface oil would be semi-solid in state, although it is unlikely to form a cohesive slick (RPS, 2019c).

The West Kingfish and Halibut crudes contains a relatively low proportion (approx.13% by mass) of hydrocarbon compounds that will not evaporate at atmospheric temperatures. These compounds will persist in the marine environment. The whole oil has a high wax content (approx. 25%), indicating that surface slicks of West Kingfish and Halibut crude are likely to form waxy flakes in the environment as they weather over time. Soluble, aromatic, hydrocarbons contribute approximately 23% by mass of the whole oil. Surface discharge will inhibit the process of dissolution, with compounds tending to evaporate from the water into the atmosphere (RPS, 2019b).

Evaporation rates will increase with temperature, but in general, for West Kingfish crude about 13.6% of the oil mass should evaporate within the first 12 hours (BP < 180 °C); a further 35.9% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and a further 36.8% should evaporate over several days (265 °C < BP < 380 °C). For Halibut crude about 10.7% of the oil mass should evaporate within the first 12 hours, a further 34.1% should evaporate within the first 24 hours and a further 41.8% should evaporate over several days.

The Flounder crude also contains a relatively low proportion (15% by mass) of hydrocarbon compounds that will not evaporate at atmospheric temperatures. The high pour point of the whole oil (18°C) and a very high wax content (32%) indicates that this crude will likely solidify when released into the environment over the annual temperatures observed in the Gippsland Basin. Soluble, aromatic, hydrocarbons contribute approximately 15.6% by mass of the whole oil. Surface discharge will inhibit the process of dissolution, with compounds tending to evaporate from the water into the atmosphere (RPS, 2019b).

For Flounder crude in general, about 9.1% of the oil mass should evaporate within the first 12 hours, a further 36.6% should evaporate within the first 24 hours and a further 39.1% should evaporate over several days.

The weathering graphs demonstrated that the West Kingfish, Halibut and Flounder crudes tend to persist on the sea surface for approximately 20 days under low wind conditions, while a large portion of the spill volume could potentially remain entrained in the water column for extended times in the presence of winds greater than 10 knots.

Moonfish crude contains 17.2% by mass of hydrocarbon compounds that will not evaporate at atmospheric temperatures. The high pour point of the whole oil (27°C) indicates that this crude will solidify when released into the environment over the annual temperatures observed in the Gippsland Basin. The very high wax content (38.5%) indicates that surface slicks of this crude are likely to form waxy flakes as it weathers over time. Soluble, aromatic, hydrocarbons contribute approximately 17.3% by mass of the whole oil. Surface discharge will inhibit the process of dissolution, with compounds tending to evaporate from the water into the atmosphere (RPS, 2020).

The weathering graphs demonstrated that the persistent component of the Moonfish crude will remain on the sea surface for long period of times, under low wind conditions while a large portion of the spill volume could potentially remain entrained in the water column in the presence of winds greater than 10 knots. It is worth noting that due to the physical properties of the crude, stronger winds were required to push the surface oil into the water column.

For Moonfish crude in general, about 7% of the oil mass should evaporate within the first 12 hours, a further 29% should evaporate within the first 24 hours and a further 47% should evaporate over several days.

Note that evaporation rates will increase with temperature. However, volatile components (BP <180°C) are expected to evaporate within the first 12 hours, semi-volatile components (180 °C < BP < 265 °C) within the first 24 hours; and low volatility components (265 °C < BP < 380 °C) are expected to evaporate over several days.

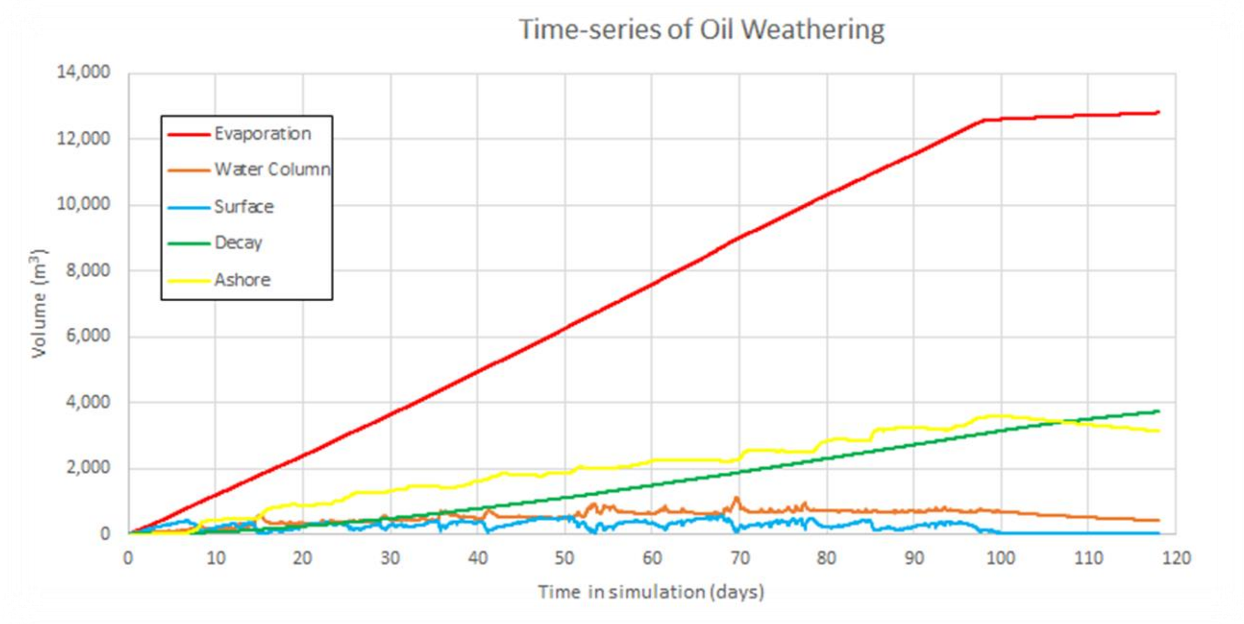

Figure 7-8 Predicted weathering and fates of West Seahorse-3 crude from modelling a selected single trajectory of a 127 kbbl LOWC release from Seahorse Subsea Facility over 98 days, tracked for 118 days

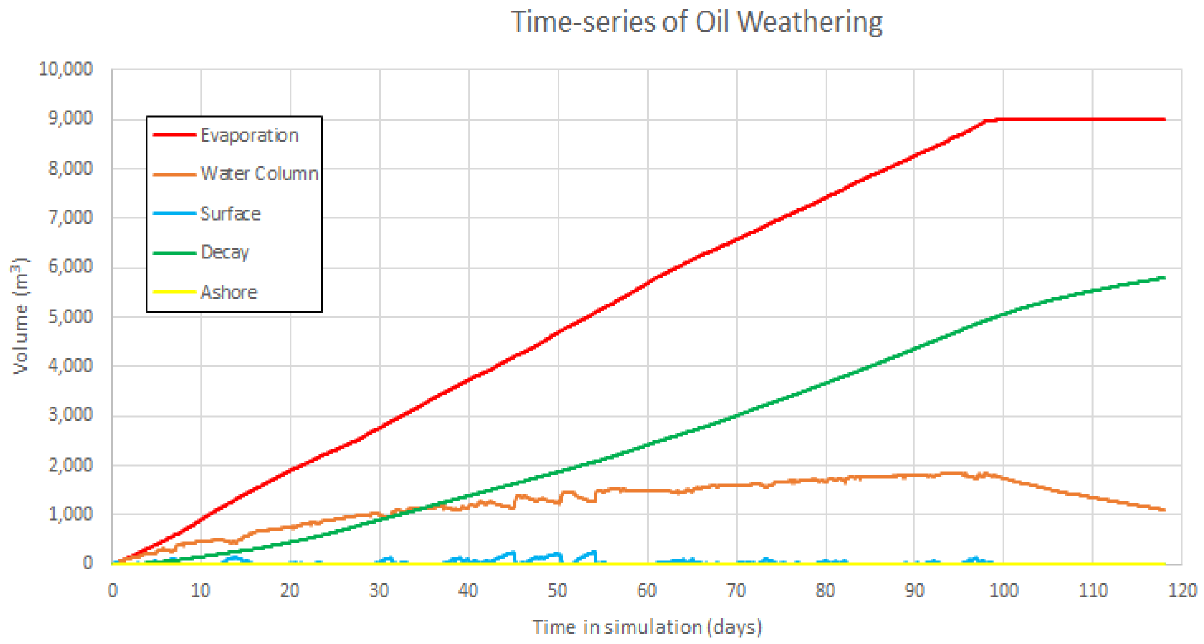

Figure 7-9 Predicted weathering and fates of West Kingfish crude from modelling a single trajectory of a 114 kbbl LOWC release from West Kingfish Platform over 98 days, tracked for 118 days

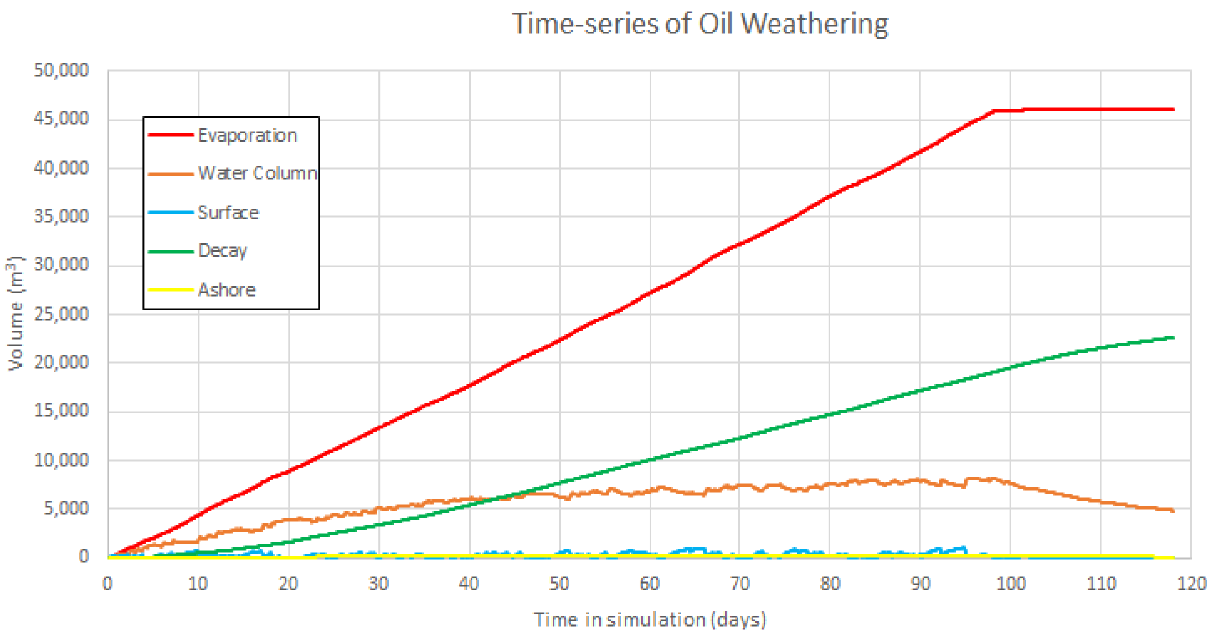

Figure 7-10 Predicted weathering and fates of Halibut crude from modelling a single spill trajectory of a 391 kbbl LOWC release from Cobia Platform over 98 days, tracked for 118 days.

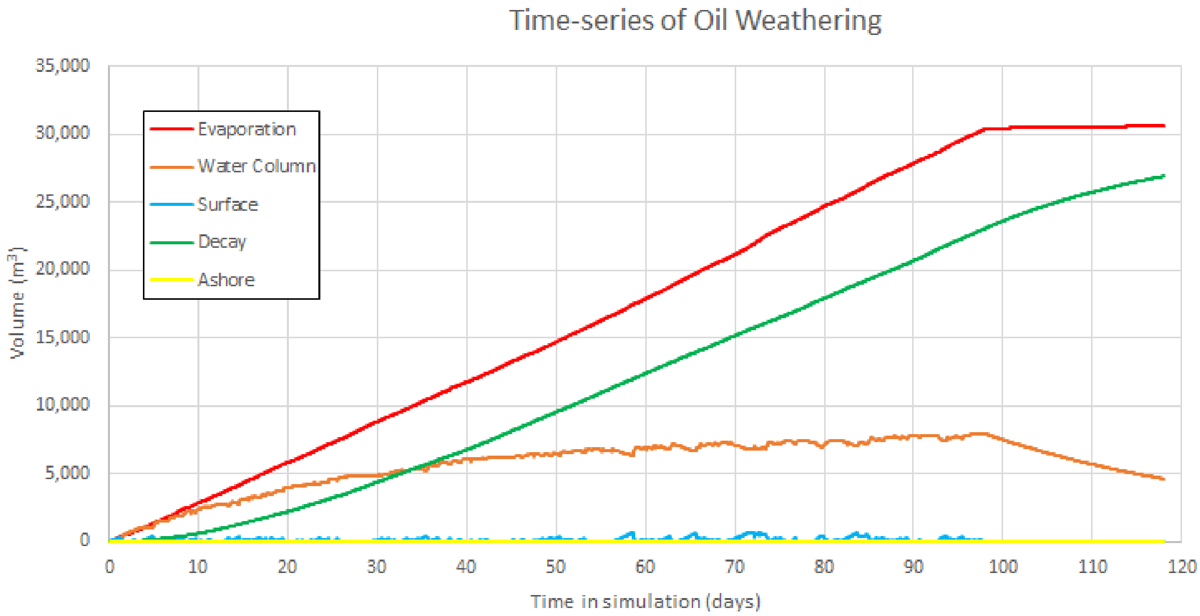

Figure 7-11 Predicted weathering and fates of West Kingfish crude from modelling a single spill trajectory of a 519 kbbl LOWC release from Marlin A Platform over 98 days, tracked for 118 days.

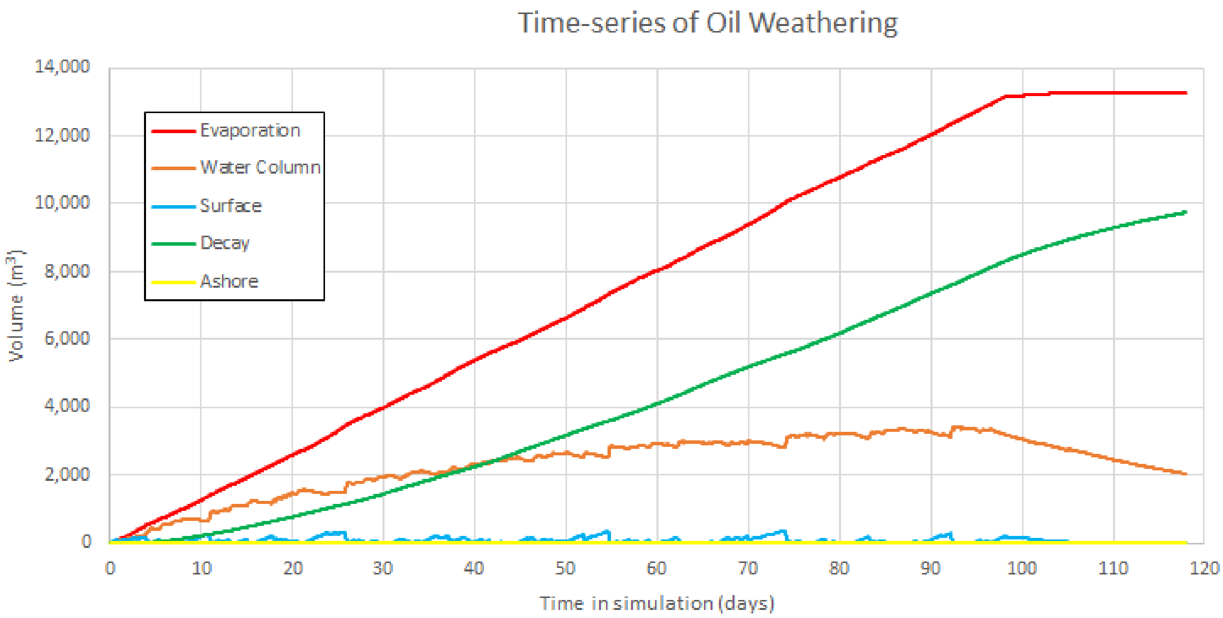

Figure 7-12 Predicted weathering and fates of Flounder crude from modelling a single spill trajectory of a 158 kbbl LOWC release from Tuna Platform over 98 days, tracked for 118 days.

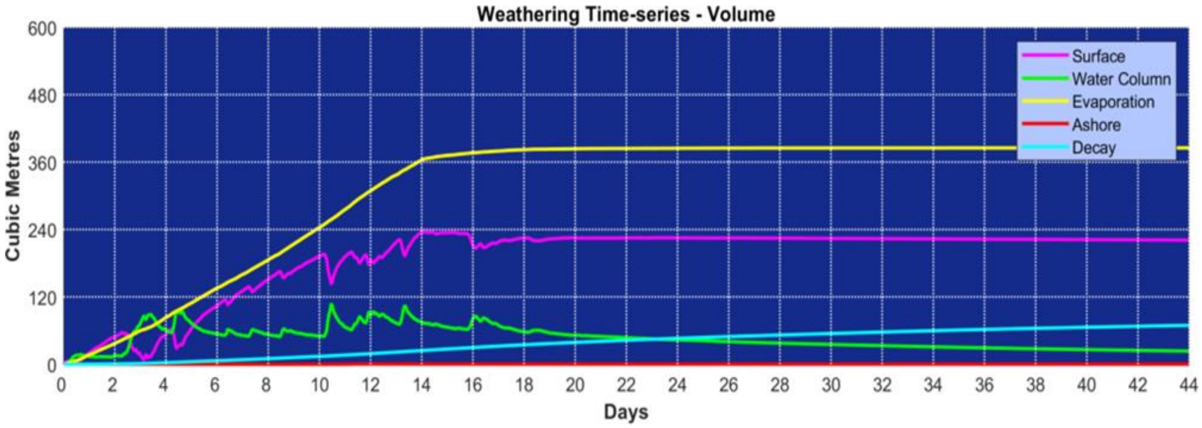

Figure 7-13 Predicted weathering and fates of Moonfish crude from modelling a single spill trajectory of a 4.41 kbbl LOWC release from Snapper Platform over 14 days, tracked for 44 days

7.7.2.3 Modelling Outputs – Stochastic and Deterministic

As described in Section 7.2.1.1, oil spill modelling predicts that the total area that could be exposed to hydrocarbon, including trace concentrations of oil in the water column, as a result of any spill. The PEA (refer Section 5.1) is derived from this data and is used for planning purposes to ensure that all social and environmental sensitivities are acknowledged, described and considered in the development of the EP.

Modelling is also used to inform specific impact or consequence assessments by understanding the location and extent of oil at different concentrations. There is no agreed exposure level below which environmental impacts will not occur, therefore outputs should not be interpreted as a boundary. However, mapping areas which could be moderately impacted by a spill is a useful tool for impact or consequence assessment.

The environmental sensitivities within the moderate threshold area are described in Table 7-25. The sensitivities outside of the mapped (moderately exposed) area but within the PEA are shown in Table 7-26.

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Table 7-25 Environmental sensitivities with potential for moderate hydrocarbon exposure from a LOWC

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)			
		LOWC at Seahorse Subsea Facility	**LOWC at West Kingfish Platform**	**LOWC at Cobia Platform**	**LOWC at Marlin A Platform**
Surface exposure	Moderate 10 g/m^2	Maximum distance from the release location was 150 km in an ENE direction. The zone of moderate exposure overlaps the following BIAs (99-100% probability): Birds • Black-browed Albatross - Foraging • Buller's Albatross – Foraging • Campbell Albatross - Foraging • Common Diving-petrel - Foraging • Indian Yellow-nosed Albatross- Foraging • Shy Albatross - Foraging • Wandering Albatross - Foraging Marine mammals / shark • Pygmy Blue Whale - Distribution & Foraging • Southern Right Whale – Migration • White Shark –Distribution & Breeding Upwelling East of Eden has 13% probability of exposure. Contact with nearshore waters at Lakes Entrance and Point Hicks (including the waters of the Point Hicks Marine National Park) is predicted with a probability of less than 10%.	Maximum distance from the release location was 2.4 km in an easterly direction. The zone of moderate exposure overlaps the following BIAs (26% probability): Birds • Black-browed Albatross • Buller's Albatross • Campbell Albatross • Common Diving-petrel • Indian Yellow-nosed Albatross • Shy Albatross • Wandering Albatross • Short-tailed Shearwater - Foraging Marine mammals / shark • Pygmy Blue Whale - Distribution & Foraging • Southern Right Whale – Migration • White Shark –Distribution Does not extend into State waters or contact any National Parks and Reserves	Maximum distance from the release location was 31 km in a southerly direction. The zone of moderate exposure overlaps the following BIAs (100% probability): Birds • Black-browed Albatross • Buller's Albatross • Campbell Albatross • Common Diving-petrel • Indian Yellow-nosed Albatross • Shy Albatross • Wandering Albatross • Short-tailed Shearwater (4% probability) Marine mammals / shark • Pygmy Blue Whale - Distribution & Foraging • Southern Right Whale – Migration • White Shark –Distribution • Upwelling East of Eden has 3% probability of exposure. • Does not extend into State waters or contact any National Parks and Reserves	Maximum distance from the release location was 59 km in an ENE direction. The zone of moderate exposure overlaps the following BIAs (100% probability): Birds • Antipodean Albatross – Foraging (14% probability) • Black-browed Albatross • Buller's Albatross • Campbell Albatross • Common Diving-petrel • Indian Yellow-nosed Albatross • Shy Albatross • Wandering Albatross • White-faced Storm Petrel – Foraging (14% probability) Marine mammals / shark • Pygmy Blue Whale - Distribution & Foraging • Southern Right Whale – Migration • White Shark –Distribution & Breeding (5% probability) Upwelling East of Eden has 100% probability of exposure. Contact with Victorian waters is predicted with a probability of 1%, however no contact with any National Parks and Reserves is predicted.
	High 100 g/m^2	-	-	-	Maximum distance from the release location was 7 km in a westerly direction. The zone of high exposure overlaps the following BIAs (70% probability): Birds • Black-browed Albatross • Buller's Albatross • Campbell Albatross • Common Diving-petrel • Indian Yellow-nosed Albatross • Shy Albatross • Wandering Albatross Marine mammals / shark • Pygmy Blue Whale - Distribution & Foraging • Southern Right Whale – Migration • White Shark –Distribution

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)			
		LOWC at Seahorse Subsea Facility	LOWC at West Kingfish Platform	LOWC at Cobia Platform	LOWC at Marlin A Platform
					Upwelling East of Eden has 70% probability of exposure.
Shoreline Exposure	Moderate 100 g/m^2	Shoreline contact at the moderate exposure threshold is predicted from Wilsons Promontory to Tuross Head (NSW), with probabilities ranging from less than 20% at the outer edge of the contact zone to between 80 and 90% along the east Gippsland coast. Note: several National Parks and Reserves lie along this coastline including Wilsons Promontory, Corner Inlet, Nooramunga, Gippsland Lakes, Lake Tyers, Cape Conran, Marlo, Croajingolong, Ben Boyd, Bournda, Mimosa Rocks, Montague Island and Eurobodalla. The minimum time before shoreline accumulation at the moderate threshold is approximately 2 days (in the Lakes Entrance, Seaspray area). The maximum length of shoreline exposed is 277 km (average 78 km).	None predicted from direct exposure or accumulation of surface or entrained hydrocarbons on shoreline.	Shoreline contact at the moderate exposure threshold is predicted along the far east Gippsland coast and into southern NSW with a probability of up to 15%. Note: The shoreline of Croajingolong, National Park has a probability of contact of 2%. The minimum time before shoreline accumulation at the moderate threshold is approximately 12 days (at Mallacoota, Cape Howe and the southern NSW coast). The maximum length of shoreline exposed is 12 km (average 6 km).	Shoreline contact at the moderate exposure threshold is predicted from Ninety Mile Beach to Tuross Head (NSW), with probabilities ranging from less than 10% at the outer edge of the contact zone to between 40 and 60% along the east Gippsland coast. Note: several National Parks and Reserves lie along this coastline including Gippsland Lakes, Lake Tyers, Cape Conran, Marlo, Croajingolong, Ben Boyd, Bournda, Mimosa Rocks, Montague Island and Eurobodalla. There is also a predicted 5% probability of contact with the shoreline of the Kent Group (TAS). The minimum time before shoreline accumulation at the moderate threshold is approximately 3 days (at Point Hicks and Gabo Island). The maximum length of shoreline exposed is 150 km (average 36.2 km).
	High 1000 g/m^2	Shoreline contact at the high exposure threshold is predicted from Wilsons Promontory to Tuross Head (NSW), with probabilities ranging from less than 10% at the outer edge of the contact zone to between 60 and 90% along the east Gippsland coast. Note: several National Parks and Reserves lie along this coastline including Wilsons Promontory, Corner Inlet, Nooramunga, Gippsland Lakes, Lake Tyers, Cape Conran, Marlo, Croajingolong, Ben Boyd, Bournda, Mimosa Rocks, Montague Island and Eurobodalla. The minimum time before shoreline accumulation at the high threshold is approximately 2 days. The maximum length of shoreline exposed is 99 km (average 33 km).	-	-	Shoreline contact at the high exposure threshold is predicted along the east Gippsland coast and into southern NSW with a probability of approximately 15%. The minimum time before shoreline accumulation at the high threshold is approximately 3 days (at Point Hicks and Gabo Island). The maximum length of shoreline exposed is 15 km (average 5.2 km).
In-water (dissolved) Exposure	Moderate 50ppb instantaneous	<u>0-10m water depth</u> The probability of in-water dissolved hydrocarbon exposure at the moderate threshold to coastal receptors was only 1% at Marlo, Lakes Entrance and Lake Tyers Beach. The KEF: Upwelling East of Eden was the only KEF receptor exposed to in-water dissolved hydrocarbons (above the moderate threshold) with a low probability of 1%. Additionally, several BIAs were predicted to be exposed at the low threshold within the 0-10 m surface layer with a low probability of 1%: Pygmy blue whale – distribution and foraging, Southern right whale – migration, Shy albatross – foraging, White shark – distribution and foraging, Common diving petrel - foraging and the White-faced storm-petrel – foraging. <u>10-20m water depth</u> The greatest probability of in-water dissolved hydrocarbon exposure for the 10-20 m layer above the	<u>0-10m water depth</u> The probability of in-water dissolved hydrocarbon exposure at the moderate threshold to coastal receptors ranged from 11% at Cape Howe / Mallacoota and the southern NSW coast to only 1-2% at Point Hicks and Croajingolong and Eurobodalla National Parks. Dissolved hydrocarbon at the moderate threshold is predicted to encroach upon Victorian and NSW state waters with likelihoods of 21 and 13% respectively and contact Ninety Mile Beach, Point Hicks and Cape Howe Marine National Parks and Batemans Marine Park (NSW). Dissolved hydrocarbon is predicted to encroach upon Tasmanian waters with a likelihood of 10% including the waters surrounding the terrestrial National Parks and Reserves of the Kent and Hogan Groups, East and West Moncouer Islands and Curtis Island. KEFs potentially within the zone of moderate exposure include the Upwelling East of Eden KEF (94%), Big	<u>0-10m water depth</u> The probability of in-water dissolved hydrocarbon exposure at the moderate threshold to coastal receptors ranged from 50 - 70% at Cape Howe / Mallacoota, Croajingolong and the southern NSW coast to less than 5% at the furthest reaches of exposure such as Lakes Entrance and Shoalhaven. Dissolved hydrocarbon at the moderate threshold is predicted to encroach upon Victorian and NSW state waters with likelihoods of 95 and 78% respectively and contact Ninety Mile Beach, Point Hicks and Cape Howe Marine National Parks, Beware Reef Marine Sanctuary and Batemans Marine Park (NSW). Dissolved hydrocarbon is predicted to encroach upon Tasmanian waters with a likelihood of 26% including the waters surrounding the terrestrial National Parks and Reserves of the Kent and Hogan Groups, East and West Moncouer Islands and Curtis Island. KEFs potentially within the zone of moderate exposure include Upwelling East of Eden (100%), followed by Big	<u>0-10m water depth:</u> The probability of in-water dissolved hydrocarbon exposure at the moderate threshold to coastal receptors ranged from 80 - 90% at Cape Howe / Mallacoota, Croajingolong and the southern NSW coast to less than 7% at the furthest reaches of exposure such as Wilsons Promontory and Shoalhaven. Dissolved hydrocarbon at the moderate threshold is predicted to encroach upon Victorian and NSW state waters with likelihoods of 100 and 96% respectively and contact Wilsons Promontory, Ninety Mile Beach, Point Hicks and Cape Howe Marine National Parks, Beware Reef Marine Sanctuary and Batemans, Jervis Bay and Lord Howe Island Marine Parks (NSW). Dissolved hydrocarbon is predicted to encroach upon Tasmanian waters with a likelihood of 24% including the waters surrounding the terrestrial National Parks and Reserves of the Kent and Hogan Groups, East and West Moncouer Islands and Curtis Island.

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)			
		LOWC at Seahorse Subsea Facility	LOWC at West Kingfish Platform	LOWC at Cobia Platform	LOWC at Marlin A Platform
		low threshold was 1% predicted for the same receptors as the surface layer with the addition of Black browed albatross – foraging, Campbell albatross – foraging, Indian yellow-nosed albatross – foraging and Wandering albatross – foraging.	Horseshoe Canyon (6%), Canyons on the Eastern Continental Slope and Shelf rocky reefs (1%). AMPs: Beagle AMP (5%), East Gippsland AMP (3%), Flinders AMP (4%) and Freycinet AMP. (1%). Additionally, several BIAs were predicted to be exposed at the moderate threshold within the 0 – 10 m surface layer. The zone of moderate exposure potentially overlaps albatross, petrel and tern foraging BIAs (1-97%), and breeding BIAs (1-2%). Marine mammal / shark BIAs potentially in the zone of moderate exposure include (2-97%): Grey Nurse Shark (foraging and migration), Humpback Whale (foraging), Indo-Pacific / Spotted Bottlenose Dolphin (breeding), Pygmy Blue Whale (foraging and distribution), Southern Right Whale (migration), and White Shark (breeding, distribution and foraging). <u>10-20m water depth</u> Probability of exposure to seabirds is substantially lower than in 0-10 m water depth (below 38%). Upwelling East of Eden (38%) probability of being exposed. For the remaining receptors, the probabilities are similar to that within 0-10m depth.	Horseshoe Canyon (67%), Shelf rocky reefs (17%) and Canyons on the eastern continental slope (14%). AMPs: Beagle AMP (25%), East Gippsland AMP (31%), Flinders AMP (5%) and Jervis AMP (1%) may be exposed at moderate instantaneous thresholds Additionally, several BIAs were predicted to be exposed at the moderate threshold within the 0 – 10 m surface layer. A number of seabirds that forage near the LOWC location are predicted to have a 100% probability of exposure at moderate instantaneous dissolved hydrocarbon levels in 0-10m water depth: Short-tailed Shearwater, Shy Albatross, Wandering Albatross, and White-faced Storm-petrel. Also, Pygmy Blue Whale Southern Right Whale (migration), White Shark (distribution & foraging) were also predicted to have a 100% probability of exposure. Little Penguin & Wedge-tailed Shearwater (each 92%), Sooty Shearwater (52%), Flesh-footed Shearwater (28%), Crested Tern (24%), Great-winged Petrel, Northern Giant Petrel, Southern Giant Petrel, White-capped Albatross & Wilsons Storm Petrel (each 21%) showed a lower probability during foraging, while Little Penguin (breeding: 16%), Crested Tern (breeding: 15%), Indo-Pacific/Spotted Bottlenose Dolphin (breeding: 83%), Humpback Whale (foraging: 82%), Grey Nurse Shark (foraging: 63%), Southern Right Whale (connecting Habitat: 5%), Short-tailed Shearwater (breeding: 3%), Grey Nurse Shark (migration: 61%), White Shark (breeding: 25%), White-faced Storm-petrel (breeding: 39%) also showed a lower probability. <u>10-20m water depth</u> In 10-20 m depth, the pattern is quite similar.	There is a 1% probability of contact at the moderate threshold with the Gippsland Lakes RAMSAR site. KEF Upwelling East of Eden showed 100% probability at moderate levels in 0-10m water depth. Big Horseshoe Canyon (26%), Canyons on the Eastern Continental Slope (23%), Shelf rocky reefs (27%) and Lord Howe seamount chain (1%). AMPs: East Gippsland AMP (34%), Beagle AMP (25%), Flinders AMP (4%), Jervis AMP (3%) and Freycinet and Central Eastern AMPs (1%). Additionally, several BIAs were predicted to be exposed at the moderate threshold within the 0 – 10 m surface layer. A number of seabirds that forage near the LOWC location are predicted to have a 100% probability of exposure at moderate instantaneous dissolved hydrocarbon levels in 0-10m water depth: Antipodean Albatross, Black-browed Albatross, Campbell Albatross, Indian Yellow-nosed Albatross, Shy Albatross, Wandering Albatross, White-faced Storm-petrel, Wedge-tailed Shearwater, Little Penguin, Common Diving-petrel, Short-tailed Shearwater, Buller's Albatross. Also, Pygmy Blue Whale (distribution & foraging), Southern Right Whale (migration), White Shark (distribution & foraging), Humpback Whale (foraging), Indo-Pacific/Spotted Bottlenose Dolphin (breeding) and Grey Nurse Shark (migration) were also predicted to have a 100% probability of exposure. <u>10-20m water depth</u> Patterns of exposure to moderate instantaneous dissolved hydrocarbon levels were comparable in 10-20 a water depth. The probability of exposure in 20-30 m water depth was below 47% and was largely limited to a number of foraging seabirds, and other BIAs near the LOWC location. <u>20-30m water depth</u> East Gippsland, Beagle, Flinders, Jervis, Lord Howe, Central Eastern, and Freycinet AMP were predicted to have a probability less than 9% for instantaneous exposure to moderate hydrocarbons in 20-30 m water depth. Victoria (40%), NSW (35%) and Tasmania State Waters (7%) showed lower probability of exposure within 20-30 m water depth than in water depth between 0-20m. Cape Howe / Mallacoota (21%), Croajingolong (15%) and the southern NSW coast (33%) have a lower likelihood of exposure in 20-30 m water depth, with less than 5% for the furthest reaches of exposure such as Ninety Mile Beach and Shoalhaven.

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)	
		LOWC at Tuna Platform	LOWC at Snapper Platform
Surface exposure	Moderate 10 g/m^2	Maximum distance from the release location was 16 km in a WSW direction. The zone of moderate exposure overlaps the following BIAs (100% probability): <u>Birds</u> • Black-browed Albatross • Buller's Albatross • Campbell Albatross • Common Diving-petrel • Indian Yellow-nosed Albatross • Shy Albatross • Wandering Albatross <u>Marine mammals</u> • Pygmy Blue Whale - Distribution & Foraging • Southern Right Whale – Migration • White Shark –Distribution Upwelling East of Eden has 100% probability of exposure. Does not extend into State waters or contact any National Parks and Reserves	No surface exposure predicted. Note (J Bernard 2020, pers. comm., 27 May): The relatively low release rate modelled (2m^3/hour) means the crude is able to spread (or entrain) more easily and quickly; and Moderate to strong wind conditions facilitate rapid dispersion and/or entrainment of the surface oil immediately after being released.
	High 100 g/m^2	-	-
Shoreline Exposure	Moderate 100 g/m^2	Only the coastline at the border of Victoria and NSW (5% probability) recorded shoreline contact above the moderate threshold. The minimum time before shoreline accumulation at the moderate threshold is more than three weeks. The maximum length of shoreline exposed is 2 km.	Shoreline contact at the moderate exposure threshold is predicted from the Curtis Islands in Bass Strait to Ulladulla (NSW), with probabilities ranging from 1 - 2% at the outer edge of the contact zone to between 15 and 25% along the east Gippsland coast. Note: several National Parks and Reserves lie along this coastline including Cape Conran and Croajingolong. The minimum time before shoreline accumulation at the moderate threshold is approximately 3.5 days (at Point Hicks). The maximum length of shoreline exposed is 66 km (average 11 km).
	High 1000 g/m^2	-	Shoreline contact at the high exposure threshold is predicted to occur at Lakes Entrance and in far East Gippsland / southern NSW with probabilities in the range of only 1 – 3%. The minimum time before shoreline accumulation at the high threshold is approximately 6.5 days (at Gabo Island). The maximum length of shoreline exposed is 5 km (average 2 km).
In-water (dissolved) Exposure	Moderate 50ppb instantaneous	<u>0-10m water depth</u> The probability of in-water dissolved hydrocarbon exposure at the moderate threshold to coastal receptors ranged from approximately 50% at Cape Howe /	No exposure predicted.

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)	
		LOWC at Tuna Platform	LOWC at Snapper Platform
		Mallacoota and the southern NSW coast to only 1-2% at Shoal Haven and Woodside Beach. Dissolved hydrocarbon at the low threshold is predicted to encroach upon Victorian and NSW state waters with likelihoods of 82 and 59% respectively and contact Point Hicks and Cape Howe Marine National Parks, Beware Reef Marine Sanctuary and Batemans Marine Park (NSW). Dissolved hydrocarbon is predicted to encroach upon Tasmanian waters with a likelihood of 4% including the waters surrounding the terrestrial National Parks and Reserves of the Kent and Hogan Groups, East and West Moncouer Islands and Curtis Island. KEFs potentially within the zone of moderate exposure include the Upwelling East of Eden KEF (94%), Big Horseshoe Canyon (6%), Canyons on the Eastern Continental Slope and Shelf rocky reefs (1%). AMPs: Beagle AMP (3%), East Gippsland AMP (15%) and Flinders and Freycinet AMPs. (1%). Additionally, several BIAs were predicted to be exposed at the moderate threshold within the 0 – 10 m surface layer. A number of seabirds that forage near the LOWC location are predicted to have a 95 - 99% probability of exposure at moderate instantaneous dissolved hydrocarbon levels in 0-10m water depth: Antipodean Albatross, Black-browed Albatross, Campbell Albatross, Indian Yellow-nosed Albatross, Shy Albatross, Wandering Albatross, White-faced Storm-petrel, Common Diving-petrel, and Buller's Albatross. Also, Pygmy Blue Whale (distribution & foraging), Southern Right Whale (migration) and White Shark (distribution & foraging) were also predicted to have a 99% probability of exposure. Little Penguin & Wedge-tailed Shearwater (each 88%), Sooty Shearwater (42%), Flesh-footed Shearwater, Black Petrel and Crested Tern (both 16%), Great-winged Petrel, Northern Giant Petrel, Southern Giant Petrel, White-capped Albatross & Wilsons Storm Petrel (each 12%) showed a lower probability during foraging, while Little Penguin (breeding: 10%), Crested Tern (breeding: 6%), Indo-Pacific/Spotted Bottlenose Dolphin (breeding: 64%), Humpback Whale (foraging: 82%), Grey Nurse Shark (foraging: 60%), Grey Nurse Shark (migration: 52%), White Shark (breeding: 8%), White-faced Storm-petrel (breeding: 21%) also showed a lower probability. <u>10-20m water depth</u> Pattern is similar for moderate exposure at the 10-20m water depth, although all BIAs are predicted to have less than 64% probability of moderate exposure and AMPs all less than 7%.	

Table 7-26 Environmental sensitivities outside of the moderately exposed area but within the PEA from a LOWC

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)			
		LOWC at Seahorse Subsea Facility	LOWC at West Kingfish Platform	LOWC at Cobia Platform	LOWC at Marlin A Platform
Surface Exposure	Low 1 g/m^2	Zone of low exposure extends approx. 460 km from release location in a predominantly ENE direction. There is a 40 to 80% probability of contact with nearshore waters along the Gippsland Coast between Seaspray and Cape Howe, including waters of Ninety Mile Beach, Point Hicks and Cape Howe Marine National Parks and Beware Reef Marine National Sanctuary. The minimum time before Victorian nearshore waters are exposed to visible surface oil is approximately 1.5 days. There is a predicted 27% probability of contact with the Gippsland Lakes Ramsar wetland, and predicted 7 and 47% probabilities of contact with the Beagle and East Gippsland AMPs respectively. There is an approx. 10% probability of contact with NSW nearshore waters as far north as Ulladulla.	Maximum distance extends approx. 43 km from release location in a predominantly south westerly direction. Area of low exposure overlaps (100%) with foraging bird BIAs (Black-browed Albatross, Buller's Albatross, Campbell Albatross, Common Diving-petrel and Indian Yellow-nosed Albatross, Short-tailed Shearwater, Shy Albatross, Wandering Albatross), Pygmy Blue Whale foraging and distribution BIAs, Southern Right Whale migration BIA and White Shark distribution BIA. There is also a 31% probability for overlap with the White-faced Storm-petrel foraging BIA. There is a 12% probability of surface exposure within the Upwelling East of Eden KEF. Does not extend into State waters or contact any National Parks and Reserves	Maximum distance extends approx. 239 km from release location in a predominantly north easterly direction. BIAs affected by moderate exposure (described in Table 7-25) will also be affected (100%) by low surface exposure. Additional bird foraging BIAs potentially within the zone of low exposure include Antipodean Albatross (48%), Little penguin (13%), Short-tailed shearwater (95%), Sooty Shearwater (1%), Wedge-tailed Shearwater (21%), and White-faced Storm-petrel (44%). Additional marine mammal/shark BIAs include: Grey Nurse Shark migration (1%), Humpback Whale foraging (8%), White Shark foraging (9%). There is a 96% probability of surface exposure within the KEF Upwelling East of Eden. Does not extend into State waters or contact any National Parks and Reserves	Maximum distance extends approx. 382 km from release location in a predominantly north easterly direction. There is a < 20% probability of contact with nearshore waters along the Gippsland Coast between Seaspray and Cape Howe, including waters of Point Hicks Marine National Park and Beware Reef Marine Sanctuary. There is also a predicted 5% probability of contact with the Gippsland Lakes Ramsar wetland The minimum time before Victorian nearshore waters are exposed to visible surface oil is approximately 3 days (at Point Hicks). There is an approx. 40% probability of contact with NSW waters as far north as Ulladulla, including Batemans Marine Park. Likelihood of contact with Tasmanian waters is predicted at 2% including Kent Group National Park and Marine Reserve. East Gippsland AMP is the only AMP predicted to be contacted at the low surface threshold (4%). 100% probability of surface exposure predicted for albatross species BIAs, White-face Storm petrel BIA and Common-diving petrel BIA, as well as Pygmy Blue Whale, White Shark and Southern Right Whale BIAs. The Short-tailed Shearwater BIA has a 98% probability and the Humpback Whale a 90% probability. The Black Petrel, Crested Tern, Flesh-footed Shearwater, Great-winged Petrel and Northern Giant Petrel BIAs have a 5% probability of being exposed during foraging and Wilsons Storm Petrel migration BIA (5%), while the Little Penguin Foraging (32%) and Breeding (4%) BIA may also be exposed. The Indo-Pacific/Spotted Bottlenose Dolphin Breeding BIA has a 26% probability of being exposed. There is a 100% probability of surface exposure within the KEF Upwelling East of Eden, 5% for the Canyons on the eastern continental slope and 3% for Big Horseshoe Canyon.
Shoreline Exposure	Low 10g/m^2	Shoreline contact at the low exposure threshold is predicted from Wilsons Promontory to Montague Island, with probabilities ranging from less than 20% at the outer edge of the contact zone to between 80 and 90% along the east Gippsland coast. Note: several National Parks and Reserves lie along this coastline including Wilsons Promontory, Corner Inlet, Nooramunga, Gippsland Lakes, Lake Tyers, Cape Conran, Marlo and Croajingolong. Minimum time for visible oil to shore is approx. 1.5 days. Maximum volume of oil ashore is approx. 3000 m^3 (approximately 15% of the total volume) and maximum length of shoreline exposed is 286 km (average 83 km)	None predicted from direct exposure or accumulation of surface or entrained hydrocarbons on shoreline.	Shoreline contact at the low exposure threshold is predicted only in East Gippsland and the southern NSW coast. The highest probability of contact (23%) by shoreline oil was predicted for Cape Howe/Mallacoota. The minimum time for visible oil to shore was 210 hours (8.75 days). The maximum volume of oil ashore was 46 m^3 (289 bbl) and the maximum length of shoreline exposed 17 km (average 9 km).	Shoreline contact at the low exposure threshold is predicted from Wilsons Promontory to Montague Island, with probabilities ranging from approximately 5% at the outer edge of the contact zone to between 30 and 60% along the east Gippsland and southern NSW coasts. Note: several National Parks and Reserves lie along this coastline including Wilsons Promontory, Corner Inlet, Nooramunga, Gippsland Lakes, Lake Tyers, Cape Conran, Marlo and Croajingolong in Victoria, and Nadgee, Ben Boyd, Bournda, and Mimosa Rocks in NSW. There is also a predicted 5% probability of contact with the Kent Island Group (and National Park).

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)			
		LOWC at Seahorse Subsea Facility	LOWC at West Kingfish Platform	LOWC at Cobia Platform	LOWC at Marlin A Platform
					The maximum probability of any shoreline contact is 94% on the east Gippsland coast, with a minimum time for visible hydrocarbons ashore of 62 hrs. The maximum predicted volume ashore is 563 m^3 with a maximum length 0f shoreline exposed of 221 km (average: 60 km).
In-water (dissolved) Exposure	Low 10ppb instantaneous	0-10m water depth The probability of in-water dissolved hydrocarbon exposure at the low threshold to coastal receptors varied from 1% at Croajingolong, approx. 20% at Lakes Entrance to 37% at Point Hicks. Contact with NSW waters was predicted with a likelihood of 1%. The KEF: Upwelling East of Eden was the only KEF receptor exposed to in-water dissolved hydrocarbons (above the low threshold) with a probability of 37% and a predicted 13% probability of contact with the Gippsland Lakes Ramsar wetland. Additionally, several BIAs were predicted to be exposed at the low threshold within the 0-10 m surface layer with a probability of 37%: Pygmy blue whale – distribution and foraging, Southern right whale – migration, Shy albatross – foraging, White shark – distribution and foraging and the White-faced storm-petrel– foraging. The greatest probability of in-water dissolved hydrocarbon exposure for the 10-20 m layer above the low threshold was 23% predicted for the same receptors as the surface layer with the addition of Black browed albatross – foraging, Campbell albatross – foraging, Common diving-petrel – foraging, Indian yellow-nosed albatross – foraging and Wandering albatross – foraging. 10-20m water depth In the 10-20 m depth layer, exposure pattern is quite similar, however no contact with NSW waters is predicted.	0-10m water depth Victoria State Waters (88%), NSW State Waters (75%) and Tasmania State Waters (37%) may be exposed to low threshold instantaneous dissolved hydrocarbons including Cape Howe, Point Hicks and Ninety Mile Beach MNPs, Beware Reef Marine Sanctuary, Kent Group NP and Marine Reserve (TAS) and Batemans and Jervis Bay Marine Parks (NSW). The probability of in-water dissolved hydrocarbon exposure at the low threshold to coastal receptors varied from 1-3% at Mcloughlin's Beach, Lake Tyers Beach, Corringle , Woodside Beach and Shoal Haven, approx. 10 - 20% at Sydenham Inlet, Marlo, Cape Conran and Eurobodalla to approx. 60 - 70% at Point Hicks, Croajingolong, Cape Howe / Mallacoota and Bega Valley (southern NSW). Also Beagle AMP (37%), East Gippsland AMP (25%), Flinders AMP (4%), Freycinet & Jervis AMPs (1%). The KEF Upwelling East of Eden KEF recorded a 100% probability of low dissolved hydrocarbon exposure, followed by Big Horseshoe Canyon (64%), Canyons on the eastern continental slope (13%), and Shelf rocky reefs (21%). At the surface layer (0-10 m), the probability of dissolved hydrocarbon exposure at the low threshold to receptors is 100% for the a number of sea birds frequenting the area near the LOWC event during foraging: Antipodean Albatross, Black-browed Albatross, Buller's Albatross, Campbell Albatross, Common Diving-petrel, Indian Yellow-nosed Albatross, Short-tailed Shearwater, Shy Albatross, Wandering Albatross, White-faced Storm-petrel. The following BIAs have a 20-99% probability during foraging: Great-winged Petrel, Northern Giant Petrel, Southern Giant Petrel, White-capped Albatross, Black Petrel, Crested Tern, Flesh-footed Shearwater, Little Penguin Wedge-tailed Shearwater). The White Shark (distribution), Pygmy Blue Whale (foraging & distribution) and Southern Right Whale (migration) BIAs also have a 100% probability. The following BIAs also have a high probability of exposure: White Shark (foraging: 99%; breeding: 25%), Humpback Whale (foraging: 83%), Indo-Pacific/Spotted Bottlenose Dolphin – (breeding: 77%), Grey Nurse Shark (foraging: 66%; migration: 62%), Sooty Shearwater (foraging: 62%), White-faced Storm-petrel (breeding: 39%), Little Penguin (breeding: 23%),	0-10m water depth Victoria State Waters (100%), NSW State Waters (97%) and Tasmania State Waters (43%) may be exposed to low threshold instantaneous dissolved hydrocarbons including Cape Howe, Point Hicks, Wilsons Promontory and Ninety Mile Beach MNPs, Beware Reef Marine Sanctuary, Kent Group NP and Marine Reserve (TAS) and Batemans and Jervis Bay Marine Parks (NSW). There is also 6% probability of contact with Gippsland Lakes Ramsar site. The probability of in-water dissolved hydrocarbon exposure at the low threshold to coastal receptors varied from 1% at Wilsons promontory, and Mc Loughlin's Beach, approx. 10-15% at Lakes Entrance, Lake Tyres Beach and Shoal Haven (NSW) to >90% at Point Hicks, Croajingolong, Cape Howe/Mallacoota and Bega Valley (southern NSW). Also East Gippsland AMP (62%), Beagle AMP (41%), Flinders AMP (28%), Jervis AMP (8%), Freycinet AMP (6%) and Central Eastern and Lord Howe AMPs (both 1%). Additionally, the KEF Upwelling East of Eden recorded a 100% probability of low dissolved hydrocarbon exposure. Big Horseshoe Canyon KEF (95%), Shelf rocky reefs (57%) and Canyons on the eastern continental slope (53%) showed a lower probability of exposure. The greatest probability of low dissolved hydrocarbon exposure in the 0-10 m layer was 100%, predicted for the foraging seabirds near the LOWC location: Antipodean Albatross, Black-browed Albatross, Buller's Albatross, Campbell Albatross, Common Diving-petrel, Indian Yellow-nosed Albatross, Little Penguin, Short-tailed Shearwater, Shy Albatross, Wandering Albatross, Wedge-tailed Shearwater, and White-faced Storm-petrel, as well as Humpback Whale (foraging), Pygmy Blue Whale (distribution and foraging), Southern Right Whale – (migration), White Shark (distribution and foraging). 10-20m water depth In the 10-20 m depth layer, exposure pattern is quite similar.	0-10m water depth Victoria and NSW State Waters have a 100% probability, with 38% for Tasmania State Waters including Cape Howe, Point Hicks, Wilsons Promontory, Corner Inlet, Nooramunga and Ninety Mile Beach MNPs, Beware Reef Marine Sanctuary, Kent Group NP and Marine Reserve (TAS) and Batemans and Jervis Bay Marine Parks and Booderee National Park (NSW). There is also a predicted 52% probability of contact with Gippsland Lakes Ramsar wetland and 36% for Corner Inlet Ramsar wetland. Coastal receptors: Bega Valley (southern NSW) Cape Howe / Mallacoota, Croajingolong and Point Hicks showed a 100% probability, followed Sydenham Inlet (86%), Cape Conran (80%), Marlo (78%), Eurobodalla (57%) (NSW), Corringle (52%), Lake Tyers Beach (37%), Lakes Entrance (32%), Shoal Haven (30%) (NSW), Ocean Grange (15%), Snake Island (14%), Wilsons Promontory (14%), Clonmel Island (13%), Corner Inlet (11%) and Golden Beach (10%). Seaspray, Woodside Beach, McLoughlins Beach and Port Welshpool all had less than 10% probability. NSW Central Coast, Northern Beaches, Wollongong, Kiama and Sutherland Shire each had less than 10% probability. Also, East Gippsland (86%), Beagle (42%), Jervis (20%) and Flinders AMP (17%) may be exposed, with Freycinet, Lord Howe, Central Eastern and Hunter AMP having less than 4% probability. The KEF Upwelling East of Eden KEF recorded a 100% probability of low dissolved hydrocarbon exposure in 0-10m water depth, followed by Big Horseshoe Canyon (84%), Canyons on the eastern continental slope (53%), Shelf rocky reefs (69%), Lord Howe seamount chain and Tasman Front and eddy field (both 4%), Tasmantid seamount chain (2%) and Seamounts south and east of Tasmania (1%). The greatest probability of low dissolved hydrocarbon exposure in the 0-10 m layer was 100%, predicted for the foraging seabirds near the LOWC location: Antipodean Albatross, Black-browed Albatross, Buller's Albatross, Campbell Albatross, Common Diving-petrel, Indian Yellow-nosed Albatross, Little Penguin, Short-tailed Shearwater, Shy Albatross, Wandering Albatross, Wedge-tailed Shearwater, White-faced Storm-petrel. Additionally, the following seabirds had a 95-68% probability of being exposed during foraging in 0-10m water depth: Sooty Shearwater, Black Petrel, Flesh-

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)			
		LOWC at Seahorse Subsea Facility	LOWC at West Kingfish Platform	LOWC at Cobia Platform	LOWC at Marlin A Platform
			Crested Tern (breeding: 22%), Wilsons Storm Petrel (migration: 20%) 10-20m water depth Within 10-20 m water depth, the exposure pattern is very similar		footed Shearwater, Crested Tern, Great-winged Petrel, Northern Giant Petrel, Southern Giant Petrel, White-capped Albatross. And the following seabird BIAs: Wilsons Storm Petrel (migration), White-faced Storm-petrel (breeding), Crested Tern (breeding), Little Penguin (breeding). A number of other seabird BIAs had 1-4% probability of exposure. Other BIAs with 100% probability of exposure include: Indo- Pacific/Spotted Bottlenose Dolphin (breeding), Grey Nurse Shark (migration), Humpback Whale (foraging), Pygmy Blue Whale (distribution), Pygmy Blue Whale (foraging), Southern Right Whale (migration), White Shark (distribution), White Shark (foraging), with Grey Nurse Shark (foraging: 99%) and White Shark (breeding: 82%) a slightly lower probability of exposure. Humpback Whale (migration), and Southern Right Whale (connecting Habitat) showed a 4% probability. . 10-20m water depth In the 10-20 m depth layer, the exposure pattern is quite similar to the top layer. 20-30m water depth In 20-30 m water depth, the exposure pattern is also quite similar to the layers above however probabilities are generally lower: Victoria State Waters are predicted to have a 94% probability of exposure, 87% for NSW State Waters and 26% for Tasmania State waters.
In-water (entrained) Exposure	Low 10ppb instantaneous	Note, although low entrained hydrocarbon exposure was predicted in the 10-20 m depth layer, no receptors recorded any probability of exposure above the low threshold. No exposure at any of the levels was predicted below 20 m. 0-10m water depth At the surface layer (0-10 m), the probability of low exposure to the KEF Upwelling East of Eden, Point Hicks Marine National Park, Beware Reef Marine Sanctuary and Cape Conran, Croajingolong and Sydenham Inlet coastal receptors was 100%. Additionally, several BIAs were predicted to be exposed at the low threshold with probabilities of 100%: Little penguin – foraging, Pygmy blue whale – distribution and foraging, Southern right whale – migration, White shark – breeding and distribution as well as several bird species. Contact with NSW and Tasmanian waters was predicted with likelihoods of 91% and 15% respectively. Contact with Flinders, Beagle and East Gippsland AMPs was predicted with likelihoods of 2, 22 and 40% respectively.	0-10m water depth The greatest probability of entrained hydrocarbon exposure at the low threshold was 100%, predicted during seabird foraging near the LOWC location: Black-browed Albatross, Campbell Albatross, Indian Yellow-nosed Albatross, Short-tailed Shearwater, Shy Albatross, Wandering Albatross, Common Diving-petrel, Antipodean Albatross and White-faced Storm-petrel. 100% probability is also predicted for the following BIAs when near the LOWC location: Pygmy Blue Whale (distribution/foraging), Southern Right Whale (migration), White Shark (distribution/foraging). The flowing seabird BIAs have a probability below 10% during foraging near the LOWC location: Little Penguin, Wedge-tailed Shearwater, Sooty Shearwater, Black Petrel, Flesh-footed Shearwater, Crested Tern, Great-winged Petrel, Northern Giant Petrel, Southern Giant Petrel, White-capped Albatross, as well as following BIAs: Little Penguin (breeding), Wilsons Storm Petrel (migration) and White-faced Storm-petrel (breeding). The Humpback Whale (foraging), Grey Nurse Shark (migration/foraging) and Indo-Pacific/Spotted Bottlenose Dolphin (breeding) have 91-98% probability,	0-10m water depth The greatest probability of entrained hydrocarbon exposure at the low threshold was 100%, predicted during seabird foraging near the LOWC location: White-faced Storm-petrel, Black-browed Albatross, Campbell Albatross, Indian Yellow-nosed Albatross, Shy Albatross, Wandering Albatross, Antipodean Albatross, Buller's Albatross, Short-tailed Shearwater, Wedge-tailed Shearwater, Little Penguin, Sooty Shearwater, as well as Common Diving-petrel during breeding. 100% probability is also predicted for the following BIAs when near the LOWC location: Pygmy Blue Whale (distribution/foraging), Southern Right Whale (migration), White Shark (distribution/foraging), Humpback Whale (foraging), Grey Nurse Shark (migration/foraging). The following seabirds had an 81-83% probability when foraging near the LOWC location: Black Petrel, Flesh-footed Shearwater, Great-winged Petrel, Northern Giant Petrel, Southern Giant Petrel, White-capped Albatross (83% each), Crested Tern (81%). And the following during breeding: Little Penguin (79%), Crested Tern (67%), White-faced Storm-petrel (96%). And Wilsons Storm Petrel during migration (83%).	0-10m water depth A number of seabirds foraging near the LOWC location have a 100% probability of exposure: White-faced Storm-petrel, Black-browed Albatross, Campbell Albatross, Indian Yellow-nosed Albatross, Shy Albatross, Wandering Albatross, Antipodean Albatross, Buller's Albatross, Short-tailed Shearwater, Wedge-tailed Shearwater, Little Penguin, Common Diving-petrel, Sooty Shearwater, as well as White-faced Storm-petrel during breeding. Black Petrel, Flesh-footed Shearwater, Crested Tern (88% each), Great-winged Petrel, Northern Giant Petrel, Southern Giant Petrel), White-capped Albatross (85% each) also have a high probability of exposure, as has Wilsons Storm Petrel (migration: 85%), and Little Penguin and Crested Tern (87% each) during breeding. The following seabirds had less than 8% probability when foraging near the LOWC location: Black-winged Petrel, Common Noddy, Grey Ternlet, Little Shearwater, Masked Booby, Providence Petrel, Red-tailed Tropicbird, Kermadec Petrel, Sooty Tern, Black Noddy, White-bellied Storm Petrel, White Tern. And Common Noddy, Black Noddy, Flesh-footed Shearwater, Grey Ternlet, Little Shearwater, Masked

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)			
		LOWC at Seahorse Subsea Facility	LOWC at West Kingfish Platform	LOWC at Cobia Platform	LOWC at Marlin A Platform
			while Southern Right Whale (connecting Habitat) has 18% probability. East Gippsland, Beagle and Flinders AMP have a 43-79% probability, with Freycinet and Jervis AMP 8-12% probability. KEF Upwelling East of Eden has 100% probability, followed by Big Horseshoe Canyon (91%) and Shelf rocky reefs 63% and Canyons on the eastern continental slope (55%). Victoria (98%), NSW (91%) and Tasmania State Waters (47%) have a high probability of being exposed. Marine Parks: Cape Howe 96%), Point Hicks 95%), Batemans 62%), Kent Group (47%), Beware Reef 32%), Wilsons Promontory (10%), Ninety Mile Beach (8%), Jervis Bay (7%), Booderee (6%) and Gippsland Lakes (1%). The following coastal receptors have between 79-94% probability of exposure: Croajingolong, Cape Howe / Mallacoota, Point Hicks, and Bega Valley (southern NSW), Followed by Cape Conran (38%), Marlo (36%), Eurobodalla (32%) (NSW), Corringle (32%), Shoal Haven (NSW) (28%), Lake Tyers Beach (18%), Lakes Entrance (West), Ocean Grange, and Golden Beach (: 11% each), Wilsons Promontory (10%), Seaspray (9%), Woodside Beach (7%), Lakes Entrance, Clonmel Island and McLoughlins Beach (5% each). <u>10-20m water depth</u> The foraging BIAs for the Black-browed Albatross, Bullers Albatross, Campbell Albatross, Indian Yellow-nosed Albatross, Wandering Albatross, Common Diving-petrel and Shy Albatross, the Pygmy Blue Whale distribution/foraging BIAs, White Shark distribution BIA and the KEF Upwelling East of Eden all had a 12% probability of low instantaneous entrained exposure in 10-20 m water depth.	The Black-faced Cormorant (25%), White-fronted Tern (19%) and Gould's Petrel (5%) have a lower probability of exposure during foraging, as has Short-tailed Shearwater during breeding (27%). The White Shark (breeding: 64%; Aggregation: 5%), Southern Right Whale (connecting Habitat: 30%), Humpback Whale (migration: 6%) and Indo-Pacific/Spotted Bottlenose Dolphin (foraging: 3%) may be exposed to low instantaneous entrained hydrocarbons in 0-10m water depth. East Gippsland (100%), Flinders (74%), and Beagle AMP (53%) are likely to be exposed, with lower probability for Jervis (37%), Freycinet 18%), Hunter (6%) and Central Eastern AMP (2%). Upwelling East of Eden and Big Horseshoe Canyon KEF have 100% probability of exposure, followed by Canyons on the eastern continental slope (83%), Shelf rocky reefs (80%), Tasman Front and eddy field (18%) and Seamounts South and east of Tasmania 14%). Victoria State Waters have a 100% probability of exposure, followed by NSW (99%) and Tasmania State Waters (52%). Marine Parks: Point Hicks (99%), Cape Howe (99%), Beware Reef (77%), Batemans (66%) and Kent Group (52%) have 52-100% probability of exposure, followed by Jervis Bay (28%), Booderee (22%), Gippsland Lakes (21%), Ninety Mile Beach 17%) and Arthur Bay CA (22%). Wilsons Promontory, Port Stephens - Great Lakes, Flood Plain Lower Ringarooma River, Corner Inlet Marine and Coastal Park. Nooramunga Marine and Coastal Park, Corner Inlet and Cape Portland CA have less than 9% probability of exposure. The following coastal receptors, Croajingolong (West: 99%; East: 93%), Cape Howe / Mallacoota 98%), Bega Valley 98%), Cape Conran (81%), Marlo (70%), Eurobodalla (52%) and Corringle (46%) are likely to be exposed, followed by Lake Tyers Beach (33%), Ocean Grange (27%), Golden Beach (27%), Lakes Entrance (22-24%), McLoughlins Beach (17%) and Clonmel Island (13%). The NSW Central Coast, Northern Beaches, Kiama, Mid-Coast, Lake Macquarie and Newcastle have less than 9% probability of exposure. <u>10-20m water depth</u> The pattern is similar in 10-20m water depth to that in 0-10m water depth, although at lower probability. Victoria State Waters have a 96% probability of exposure, followed by NSW (55%) and Tasmania State Waters (32%). Upwelling East of Eden has 100% probability, followed by Big Horseshoe Canyon (72%), Canyons on the	Booby, Providence Petrel, Red-tailed Tropicbird, Black-winged Petrel, during breeding. 100% probability is also predicted for the following BIAs when near the LOWC location: Pygmy Blue Whale (distribution/foraging), Southern Right Whale (migration), White Shark (distribution/foraging), Humpback Whale (foraging), Indo-Pacific/Spotted Bottlenose Dolphin (breeding), Grey Nurse Shark (migration) and Grey Nurse Shark (foraging), followed by White Shark (breeding: 95%) and Humpback Whale (migration: 10%). East Gippsland AMP has 100% probability of exposure, followed by Flinders 60%), Jervis (59%), Beagle 48%), Freycinet (21%), Towra Point (13%), Central Eastern (10%), Lord Howe (8%), Hunter AMP (7% and North Sydney Harbour (3%). KEF Upwelling East of Eden has 100% probability of exposure, followed by Big Horseshoe Canyon (98%), Shelf rocky reefs (88%), Canyons on the eastern continental slope (85%), Tasman Front and eddy field 18%). Tasmantid seamount chain and Lord Howe seamount chain has less than 8% probability. Victoria and NSW State Waters have 100% probability of exposure to low threshold instantaneous entrained hydrocarbons, with 43% for Tasmania State Waters. Marine Parks: Point Hicks & Cape Howe MNP, have 100% probability, followed by Beware Reef (95%), Batemans (87%), Jervis Bay 59%), Gippsland Lakes (40%), Kent Group (40%), Booderee (38%) and Ninety Mile Beach (35%). Wilsons Promontory, Corner Inlet, Nooramunga Marine and Coastal Park, Shallow Inlet Marine and Coastal Park, Bunurong, Port Stephens - Great Lakes, Lord Howe Island, East Coast Cape Barren Island Lagoons, and Elizabeth and Middleton Reefs Marine National Nature Reserve are below 16% probability. The following coastal receptors, Croajingolong, Cape Howe / Mallacoota, Point Hicks, and Bega Valley (southern NSW) have 100% probability. Sydenham Inlet (96%), Cape Conran (94%), Marlo (90%), Eurobodalla (73%), Shoal Haven (69%), Corringle (68%), Lake Tyers Beach (55%), Lakes Entrance (46%) Ocean Grange (41%), Golden Beach (34%), Kiama (28%), Seaspray (25%), Wollongong (25%) and Woodside Beach (20%) may be exposed, with 19% or less for Clonmel Island, McLoughlins Beach, Wilsons Promontory, Port Welshpool, Waratah Bay, Corner Inlet, Snake Island, Cape Liptrap, NSW Central Coast Southerland Shire Randwick, Waverly, Woollahra, Northern Beaches, Lake Macquarie, Newcastle, Port Stephens, Venus Bay, NSW Mid-Coast and Kilcunda. <u>10-20m water depth</u>

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)			
		LOWC at Seahorse Subsea Facility	LOWC at West Kingfish Platform	LOWC at Cobia Platform	LOWC at Marlin A Platform
				eastern continental slope (29%) and Shelf rocky reefs (11%). East Gippsland AMP has 48% probability, followed by Beagle (31%) and Flinders AMP (11%).	In the 10-20 m depth layer, the extent of instantaneous entrained hydrocarbon levels at low threshold is substantially less than in 0-10m water depth. Exposure by seabirds during foraging is less than 80%, with many seabird BIAs below 12% probability. Pygmy Blue Whale (foraging/distribution), Southern Right Whale (migration), White Shark (foraging/distribution) are below 80%, with 5-63% for Humpback Whale (foraging), Grey Nurse Shark (foraging/migration, and Indo-Pacific/Spotted Bottlenose Dolphin – and White Shark during breeding. Upwelling East of Eden KEF has an 80% probability for exposure, flowed by Canyons on the eastern continental slope (10%), Shelf rocky reefs (4%), and Big Horseshoe Canyon (2%). Victoria State Waters have a 57% probability of exposure in 10-20 m water depth, with 36% for NSW and 3% forTasmania State Waters.

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)	
		LOWC at Tuna Platform	LOWC at Snapper Platform
Surface Exposure	Low 1 g/m^2	Maximum distance extends approx. 198 km from release location in a predominantly ENE direction. There is only a 1% probability of contact with Victorian waters. 100% probability of surface exposure predicted for albatross species BIAs (Black-browed Albatross, Bullers Albatross, Campbell Albatross, Common Diving-petrel, Indian Yellow-nosed Albatross, Shy Albatross, Wandering Albatross), as well as Pygmy Blue Whale and Southern Right Whale and White Shark distribution BIAs. The Antipodean Albatross (98%), White-faced Storm-petrel (98%), and Short-tailed Shearwater (5%) may be exposed during foraging, as is the White Shark Breeding BIA (6%). The KEF Upwelling East of Eden demonstrated a 100% probability of low surface hydrocarbon exposure.	Maximum distance extends approx. 984 km from release location in an ENE direction. There is up to 14% probability of contact with nearshore waters along the Gippsland coast, more likely in the east (Cape Howe/Mallacoota, Gabo Island) including waters of Point Hicks and Cape Howe Marine National Parks. There is less than 5% likelihood of contact with nearshore waters of Bega Valley (southern NSW) including Batemans Marine Park. The minimum time before Victorian and NSW nearshore waters are exposed to visible surface oil is approximately 4.5 and 6 days respectively. There is a predicted 9% probability of contact with the East Gippsland AMP. The KEF Upwelling East of Eden demonstrated a 99% probability of contact, Canyons on the eastern continental shelf 2% and Big Horseshoe Canyon and Tasman Front and eddy field 1% each.
Shoreline Exposure	Low 10g/m^2	Only Lakes Entrance, Cape Howe / Mallacoota and southern NSW (each 5% or less probability) recorded shoreline contact above the low threshold. The minimum time before shoreline accumulation at the low threshold is more than three weeks. The maximum length of shoreline exposed is 5 km.	Shoreline contact at the low exposure threshold is predicted from Curtis Island in Bass Strait to Ulladulla, with probabilities ranging from 1-2% at the outer edge of the contact zone to between 15 and 25% along the east Gippsland coast (in particular Gabo Island). Note: several National Parks and Reserves lie along this coastline including Cape Conran and Croajingolong. Minimum time for visible oil to shore is approx. 3 days at Point Hicks.

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)	
		LOWC at Tuna Platform	LOWC at Snapper Platform
			Maximum volume of oil ashore is approx. 183 m^3 and maximum length of shoreline exposed is 98 km (average 15 km)
In-water (dissolved) Exposure	Low 10ppb instantaneous	<u>0-10m water depth</u> Victoria and NSW State Waters are predicted to have 100% exposure, with Tasmania State Waters at 25%. including Cape Howe, Point Hicks, Nooramunga, Wilson's Promontory and Ninety Mile Beach MNPs, Beware Reef Marine Sanctuary, Kent Group NP and Marine Reserve (TAS) and Batemans and Jervis Bay Marine Parks and Booderee National Park (NSW). There is also a predicted 5% probability of contact with Gippsland Lakes Ramsar wetland and 1% for Corner Inlet Ramsar wetland. The probability of in-water dissolved hydrocarbon exposure at the low threshold to coastal receptors varied from 1-5% at Wollongong (NSW), Sutherland Shire (NSW), Kiama (NSW), Wilsons Promontory, Corner Inlet, Clonmel island, Snake Island, Ocean Grange, and Lakes Entrance, approx. 30 - 50% at Corringle, Sydenham Inlet, Marlo, Cape Conran and Eurobodalla (NSW) to approx. 60 - 70% at Point Hicks, Croajingolong, Cape Howe / Mallacoota and Bega Valley (southern NSW). East Gippsland (65%) and Beagle AMP (24%) may be exposed, with Jervis, Flinders, Central Eastern and Freycinet AMP all below 8% probability. The KEF Upwelling East of Eden recorded a 100% probability of low instantaneous dissolved hydrocarbon exposure. Big Horseshoe Canyon (75%), Shelf rocky reefs (55%) and Canyons on the eastern continental slope (51%) and Tasman Front and eddy field and Tasmantid seamount chain (each 1%) showed a lower probability. The greatest probability of low dissolved hydrocarbon exposure in the 0-10 m layer was 100%, predicted for the foraging seabirds near the LOWC location: Black-browed Albatross, Campbell Albatross, Indian Yellow-nosed Albatross, Shy Albatross, Wandering Albatross, White-faced Storm-petrel, Antipodean Albatross, Wedge-tailed Shearwater, Little Penguin, Short-tailed Shearwater, Common Diving-petrel and Buller's Albatross with Sooty Shearwater predicted to have a 95% probability, Black Petrel and Flesh-footed Shearwater a 66% probability, and Great-winged Petrel, Northern Giant Petrel, Southern Giant Petrel, and White-capped Albatross 59% each, Little Penguin and Crested Tern Breeding BIA 61% each, and Wilsons Storm Petrel (migration) (59%). The following BIAs are also predicted to have a 100% probability of exposure: Pygmy Blue Whale (distribution & foraging), Southern Right Whale (migration), White Shark (distribution & foraging), Humpback Whale (foraging), Indo-Pacific/Spotted Bottlenose Dolphin	<u>0-10m water depth</u> The probability of in-water dissolved hydrocarbon exposure at the low threshold to coastal receptors varied from 1% at Eurobodalla, Shoal Haven and Montague Island in NSW, to 4 -5% at Croajingolong, Gabo Island and Cape Howe / Mallacoota, to 10% at Point Hicks. East Gippsland AMP 25% probability and Beagle AMP 1 % probability. Contact with the KEF: Upwelling East of Eden was the predicted with a probability of 10%, KEF: Canyons on the eastern continental shelf and Shelf rocky reefs both at 1%. Additionally, several BIAs were predicted to be exposed at the low threshold within the 0-10 m surface layer with the highest probabilities being 10%: Pygmy blue whale – distribution and foraging, Southern right whale – migration, Shy albatross – foraging, White shark – distribution and foraging and the White-faced storm-petrel– foraging and 6%: Little penguin – foraging, Wedge-tailed shearwater foraging, Indo-Pacific /spotted bottlenose dolphin – breeding, <u>10-20m water depth</u> Exposure pattern is very similar in 10-20 m water depth however probabilities range between 1 and 4% with a probability of 4% for contact with both Victorian and NSW waters. <u>20-30 m water depth</u> Extent of exposure at 20-30m water depth is less than layers above. Probability of contact with any receptor does not exceed 1% with a probability of 1% for contact with southern NSW waters only.

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)	
		LOWC at Tuna Platform	LOWC at Snapper Platform
		(breeding), Grey Nurse Shark (foraging & migration). White Shark (breeding: 58%). 10-20m water depth Pattern is very similar in 10-20 m water depth for low instantaneous dissolved hydrocarbon exposure.	
In-water (entrained) Exposure	Low 10ppb instantaneous	0-10m water depth A number of seabirds foraging near the LOWC location have a 100% probability of exposure: White-faced Storm-petrel, Little Penguin, Sooty Shearwater, Black-browed Albatross, Campbell Albatross, Indian Yellow-nosed Albatross, Short-tailed Shearwater, Shy Albatross, Wandering Albatross, Antipodean Albatross, Buller's Albatross, as well as Common Diving-petrel (breeding) and Wedge-tailed Shearwater (breeding). The following seabirds had a 65-97% probability during foraging near the LOWC location: Black Petrel, Flesh-footed Shearwater, Great-winged Petrel, Northern Giant Petrel, Southern Giant Petrel, White-capped Albatross, Crested Tern. As well as the Little Penguin, Crested Tern and White-faced Storm-petrel during breeding, and the Wilsons Storm Petrel during migration. Other seabirds had less than 6% probability. Other BIAs with 100% probability includes: Grey Nurse Shark (migration), Pygmy Blue Whale (distribution/foraging), Southern Right Whale (migration), White Shark (distribution/foraging), Humpback Whale (foraging), Grey Nurse Shark (foraging), and Indo-Pacific/Spotted Bottlenose Dolphin (breeding). Southern Right Whale (connecting Habitat) and Humpback Whale (migration) were < 11% probability. Of the KEFs, Upwelling East of Eden had a 100% probability of exposure to low instantaneous threshold entrained hydrocarbons on 0-10m water depth, followed by Big Horseshoe Canyon (97%), Canyons on the eastern continental slope (78%) and Shelf rocky reefs (75%), other KEFs were below 6% probability: Tasman Front and eddy field, Tasmantid seamount chain, Lord Howe seamount chain, Seamounts South and east of Tasmania. East Gippsland AMP has a high probability (95%), followed by Beagle (41%), Jervis (32%), Flinders AMP (31%), Freycinet (10%) and Central Eastern and Lord Howe (each 6%). Victoria and NSW (each 100%), have a high probability of being exposed, and Tasmania State Waters (38%). Marine Parks: Point Hicks (100%), Cape Howe (100%), Beware Reef (61%), Batemans (NSW) (65%) and Kent Group (TAS) and Jervis Bay (NSW) (each 37%), followed by Ninety Mile Beach (17%).	No entrained hydrocarbon predicted below the 10m depth layer. 0-10m water depth Of the KEFs, Upwelling East of Eden had a 100% probability of exposure to low instantaneous threshold entrained hydrocarbons on 0-10 m water depth, followed by Canyons on the eastern continental slope (4%), Big Horseshoe Canyon (3%) and Shelf rocky reefs (3%). East Gippsland AMP has a probability of 11% and Beagle AMP of 6%. Victoria (81%) and NSW (51%) have a high probability of being exposed, and Tasmania State Waters only a low probability (4%). Marine Parks: Point Hicks (76%), Cape Howe (56%), Beware Reef (17%), Batemans, Jervis (NSW) and Kent Group (TAS) (each 2%) and Ninety Mile Beach and Jervis Bay (NSW) (each 1%). The following coastal receptors have between 30 - 60% probabilities of exposure: Croajingolong, Cape Howe / Mallacoota, Sydenham Inlet and Point Hicks. Followed by Cape Conran (22%), Marlo (24%), Bega Valley (southern NSW) (10%) (NSW), Corringle (8%), Lake Tyers Beach (3%) and Lakes Entrance, Woodside Beach, Clonmel Island, Eurobodalla (NSW) and Shoal Haven (NSW) (at 1% each).

Model Parameter	Exposure Value	Stochastic Modelling (based on 100 annualised spill trajectories)	
		LOWC at Tuna Platform	LOWC at Snapper Platform
		Booderee (NSW), Wilsons Promontory, Corner Inlet, Nooramunga, and Lord Howe Island (NSW) all had probabilities of between 5 and 12%. There is a 29% probability of contact with Gippsland Lakes Ramsar wetland and 9% with Corner Inlet Ramsar wetland at the low exposure threshold. The following coastal receptors have between 92 - 100% probabilities of exposure: Croajingolong, Cape Howe / Mallacoota, Point Hicks, and Bega Valley (southern NSW). Followed by Sydenham Inlet (72%, Cape Conran (62%), Marlo (61%), Eurobodalla (44%) (NSW), Corringle (38%), Shoal Haven (NSW) (39%), Lake Tyers Beach (36%), Lakes Entrance (31%), Ocean Grange (21%), Golden Beach (18%) and Wilsons Promontory, Waratah, Clonmel Island, Snake Island, Corner Inlet (in Victoria) and Sutherland Shire, Randwick, Waverly, Wollongong, Kiama, Northern Beaches and Central Coast (in NSW) (at <10% each). 10-20m water depth No receptors recorded any probability of entrained hydrocarbon exposure above the low threshold, except low probability (<3%) for a number of foraging seabirds near the LOWC location (Black-browed Albatross, Campbell Albatross, Indian Yellow-nosed Albatross, Short-tailed Shearwater, Shy Albatross, Wandering Albatross, Antipodean Albatross, White-capped Albatross, Buller's Albatross). And Wedge-tailed Shearwater, Common Diving-petrel, Indo-Pacific/Spotted during breeding; and Pygmy Blue Whale (distribution/foraging), Southern Right Whale (migration), White Shark (distribution/foraging), Bottlenose Dolphin (breeding), Humpback Whale (foraging), and Grey Nurse Shark (foraging). There was a 1% predicted probability of contacting NSW waters.	

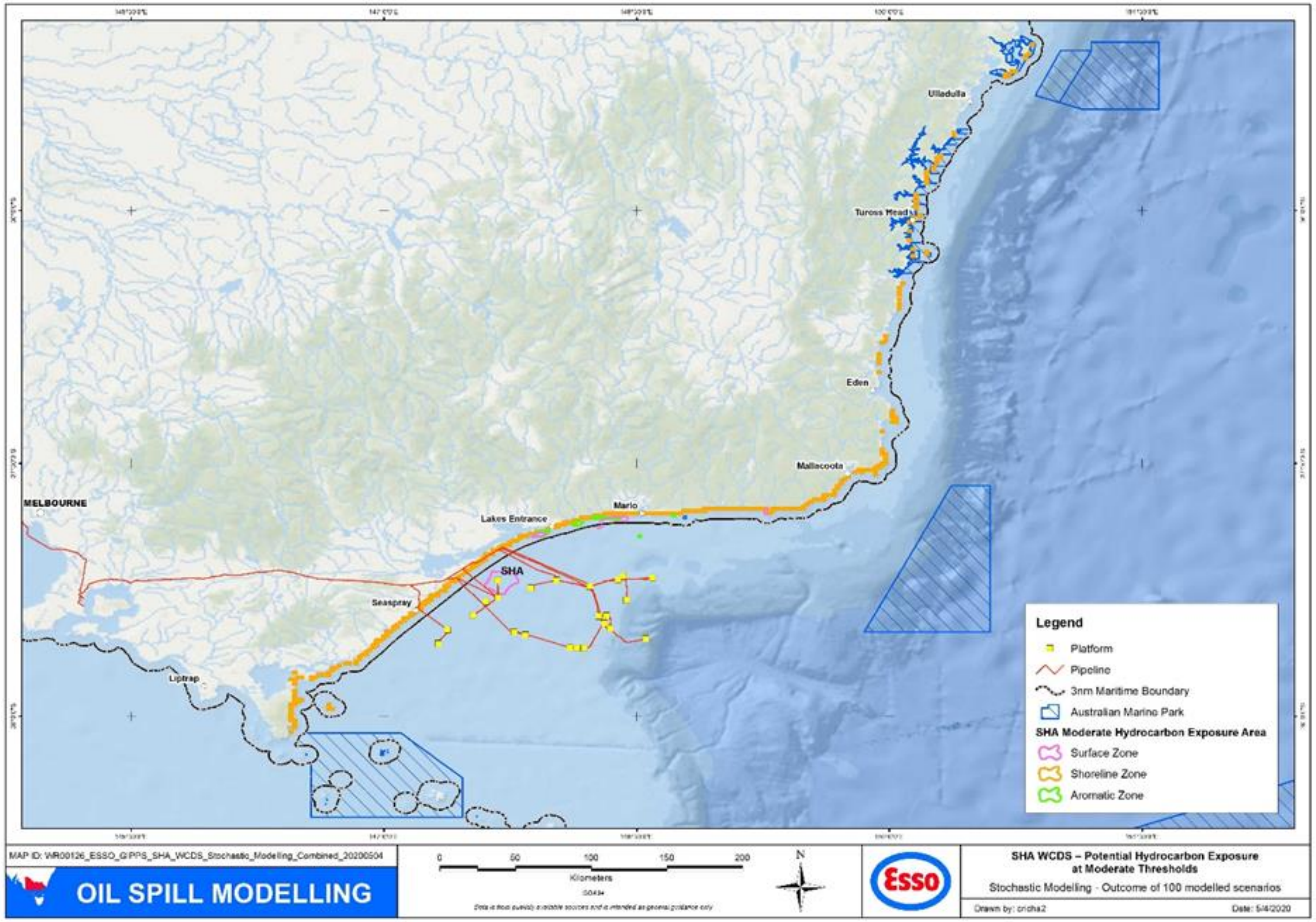

Figure 7-14 LOWC stochastic modelling output for Seahorse WCDS. Hydrocarbon exposure at the moderate thresholds (Surface: 10 g/m^2, shoreline: 100 g/m^2, and In-water (dissolved): 50 ppb instantaneous)

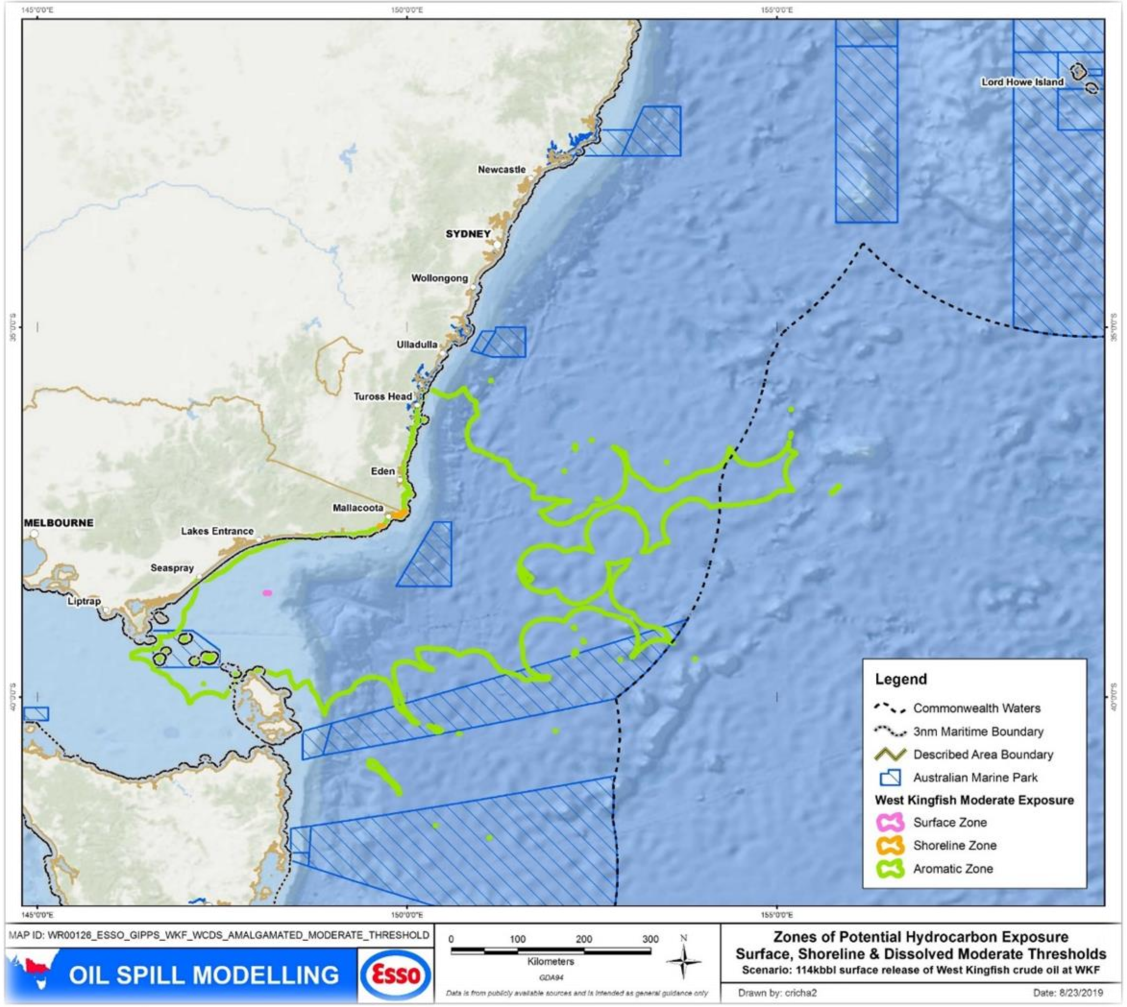

Figure 7-15 LOWC stochastic modelling output for West Kingfish WCDS. Hydrocarbon exposure at the moderate thresholds (Surface: 10 g/m^2, shoreline: 100 g/m^2, and In-water (dissolved): 50 ppb instantaneous)

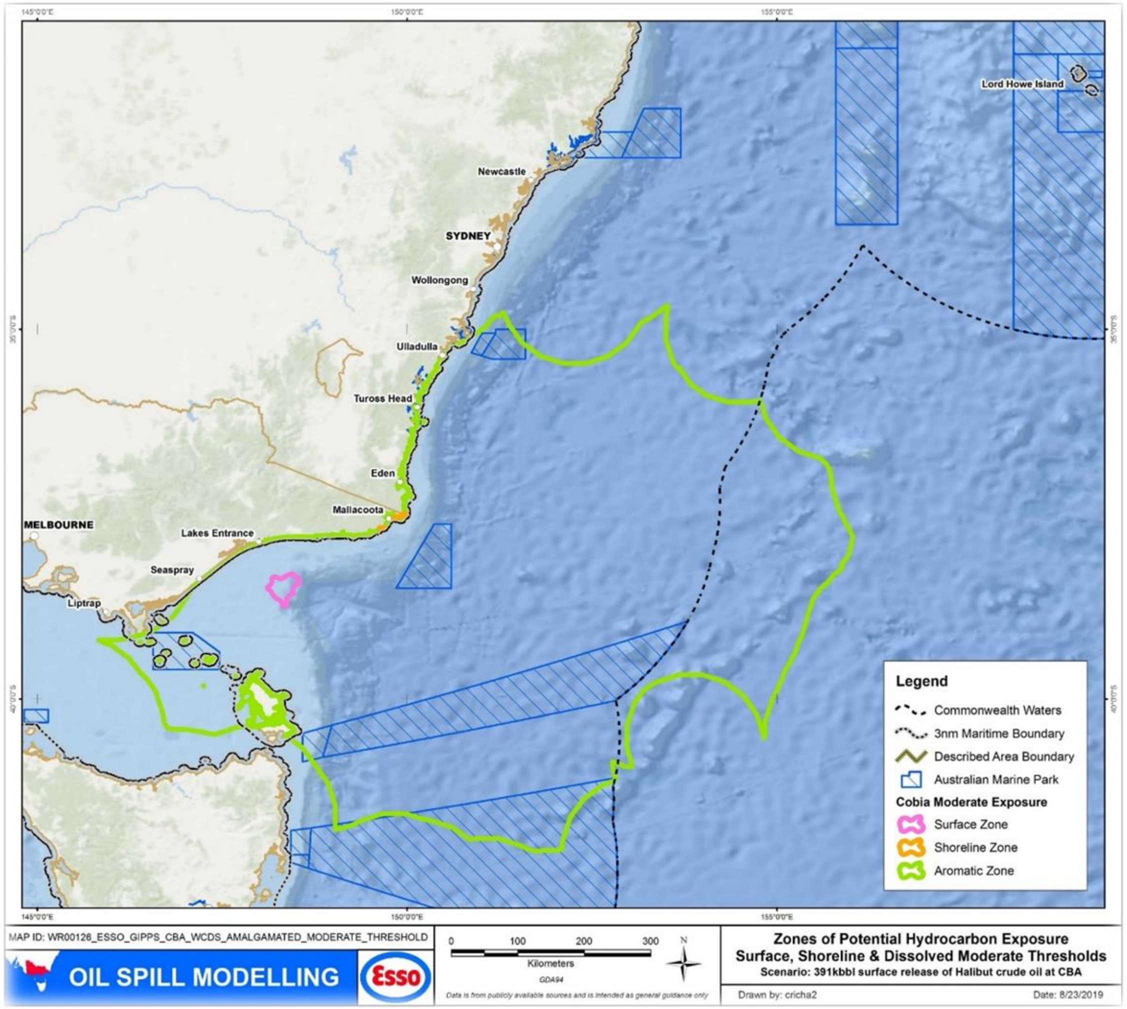

Figure 7-16 LOWC stochastic modelling output for Cobia WCDS. Hydrocarbon exposure at the moderate thresholds (Surface: 10 g/m^2, shoreline: 100 g/m^2, and In-water (dissolved): 50 ppb instantaneous)

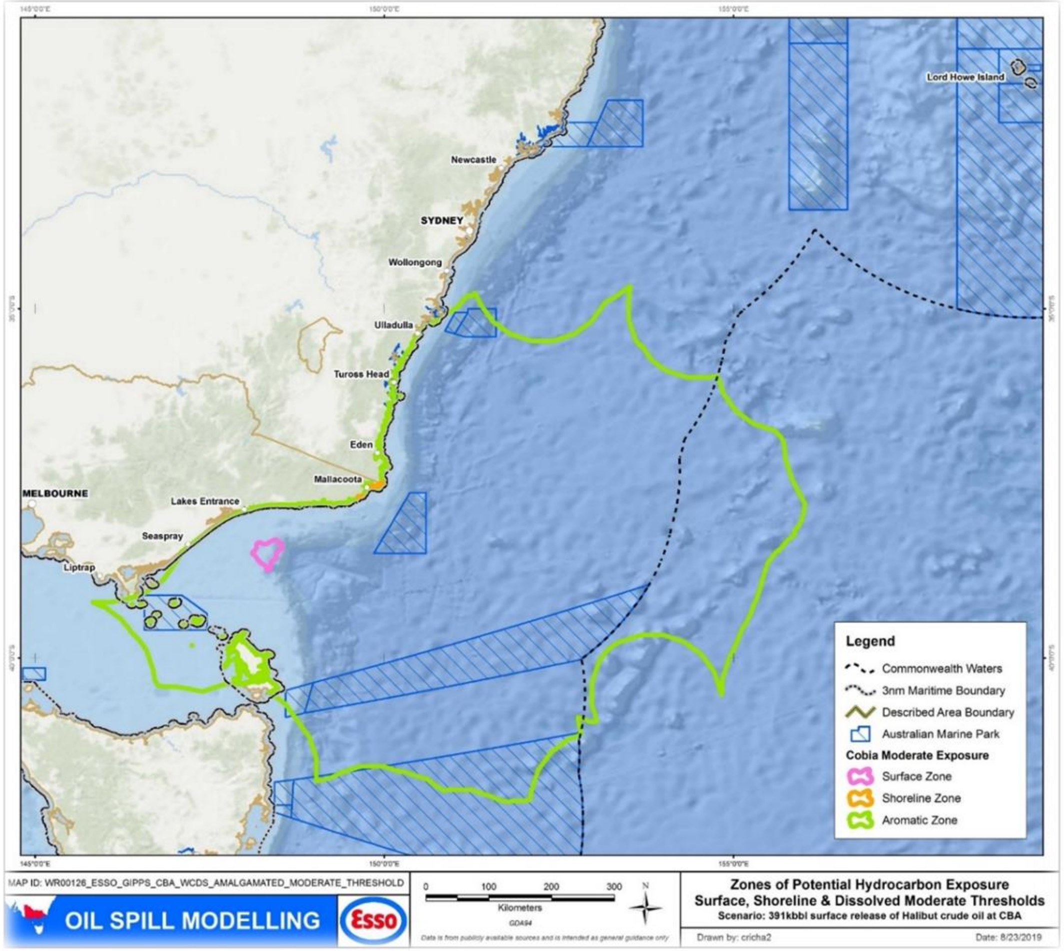

Figure 7-17 LOWC stochastic modelling output for Marlin WCDS. Hydrocarbon exposure at the moderate thresholds (Surface: 10 g/m^2, shoreline: 100 g/m^2, and In-water (dissolved): 50 ppb instantaneous)

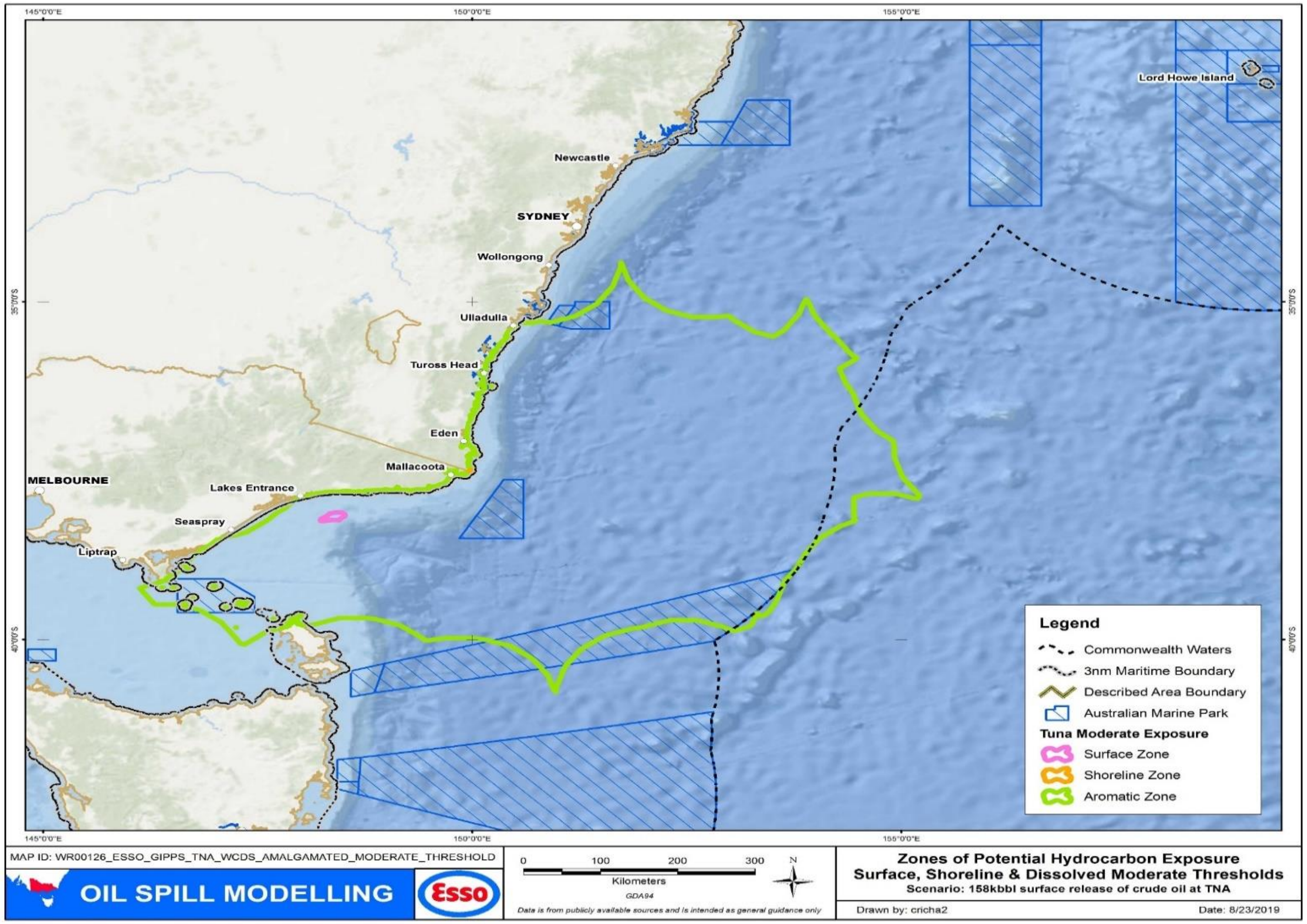

Figure 7-18 LOWC stochastic modelling output for Tuna WCDS. Hydrocarbon exposure at the moderate thresholds (Surface: 10 g/m², shoreline: 100 g/m², and In-water (dissolved): 50 ppb instantaneous)

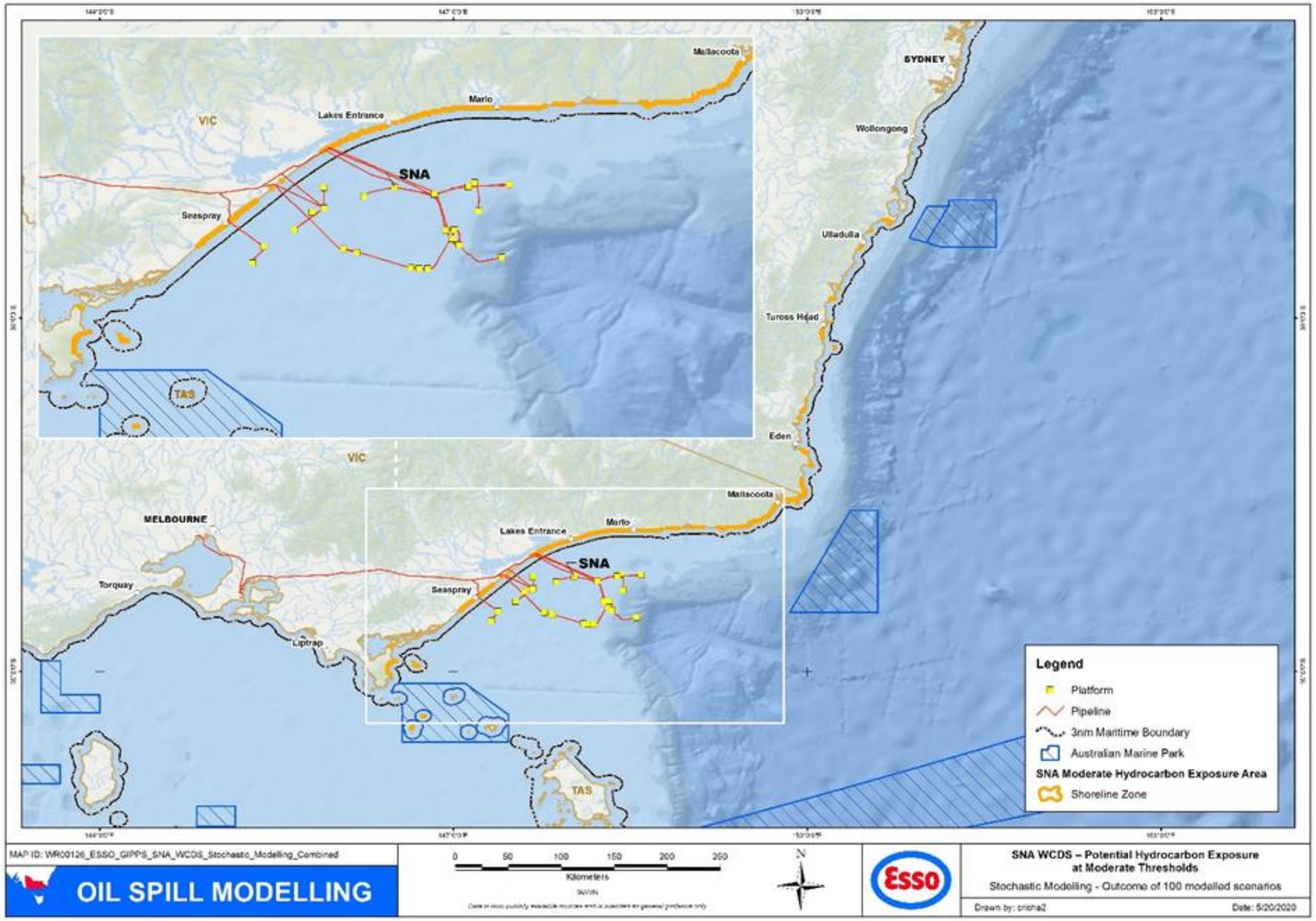

Figure 7-19 LOWC stochastic modelling output for Snapper WCDS. Hydrocarbon exposure at the moderate thresholds (Surface: 10 g/m^2, shoreline: 100 g/m^2, and In-water (dissolved): 50 ppb instantaneous)

7.7.3 Risk Assessment

An accidental release of reservoir hydrocarbons as a result from Loss of Well Control (LOWC) has the potential to result in the following impacts:

- Change in water quality;
- Change in habitat.

As a result of change in water quality and / or habitat, further impacts may occur which include:

- Injury / mortality to fauna;
- Change in fauna behaviour
- Change to the function, interests or activities of other users.

Receptors that could be affected by a LOWC are identified in Table 7-27.

Table 7-27 Receptors potentially impacted by a LOWC

Impacts	Water quality	Benthic Habitats and Communities	Plankton	Fish	Birds	Marine Reptiles	Marine Mammals	Coastal Habitats and Communities	Wetlands	National Parks and Reserves	Australian Marine Parks	KEFs	Cultural – Historic and Indigenous	Commercial Fisheries	Tourism and Recreation
Change in water quality	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Change in habitat		✓						✓	✓	✓	✓	✓			
Injury / mortality to fauna			✓	✓	✓	✓	✓								
Change to the function, interests or activities of other users													✓	✓	✓

7.7.3.1 Consequence Evaluation

Consequence evaluation of potentially exposed receptors in the event of a LOWC are described in Table 7-28.

Table 7-28 Risk of surface, shoreline and in-water hydrocarbon exposure from LOWC

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
Water quality	A release of reservoir hydrocarbons has the potential to result in a change i.e. decline in water quality. Degraded water quality will potentially impact all the receptors identified in Table 7-28. These impacts are discussed individually within other sections.	Modelling predicts that surface, shoreline and in-water (dissolved) exposure will occur as a result of a LOWC. Figure 7-14, Figure 7-15, Figure 7-16, Figure 7-17, Figure 7-18 and Figure 7-19 show the extent of potential impacts to water quality (at moderate thresholds). Due to the potentially persistent nature of the hydrocarbon and the potential area of impact, the consequences to water quality are assessed as **Level III.**
Benthic Habitats – Bare Substrate, Coral, Seagrass, Macroalgae, Subtidal Rocky Reef	**Bare Substrate** While this receptor represents the 'bare sand' areas offshore, it does provide habitat for benthic invertebrates (both infauna and macroinvertebrates). Unconsolidated mixed and particulate sediments are likely to be dominated by burrowing fauna (e.g. annelid worms, molluscs, echinoderms, crustaceans, cnidarians). Many of the organisms that live in these habitats are habitat modifiers (e.g. through burrows or shell production), stabilising and/or oxygenating the sediments around them, and providing additional ecological niches for colonisation by other fauna – increasing local biodiversity. Surveys undertaken after the Montara blowout found no obvious visual signs of major disturbance at Barracouta and Vulcan shoals (Heyward *et al.,* 2010), which occur about 20-30 m below the water line in otherwise deep waters (generally >150 m water depth). Later sampling indicated the presence of low-level severely degraded oil at some shoals, though in the absence of pre-impact data, this could not be directly linked to the Montara spill. Levels of hydrocarbons in the sediments were, in any case, several orders of magnitude lower than levels at which biological effects become possible (Heyward *et al.,* 2012; Gagnon & Rawson, 2011). Studies undertaken since the DWH incident have shown that fewer than 2% of the more than 8,000 sediment samples collected exceeded the US EPA sediment toxicity benchmark for aquatic life, and these were largely limited to the area close to the wellhead (BP, 2015). Acute or chronic exposure through contact and/or digestion can result in toxicological risks to invertebrates. However, the presence of an	Exposure to in-water hydrocarbons is restricted to 30m below the surface and therefore any potential impact to benthic habitats from in-water hydrocarbons will only occur in shallower nearshore waters. The zone of moderate exposure to dissolved hydrocarbons is predicted to extend into nearshore Tasmanian (i.e. Bass Strait islands), Victorian and southern NSW waters in five of the six LOWC scenarios. The predominant benthic habitat in the Gippsland Basin is bare substrate. However, known areas of seagrass which may be exposed include at Lakes Entrance, Bemm River Estuary and Tamboon Inlet and numerous estuaries and inlets along the southern NSW coast. There is the potential that exposure could result in sub-lethal impacts, more so than lethal impacts, possibly because much of seagrasses' biomass is underground in their rhizomes (Zieman et al., 1984). Seagrass in this region isn't considered a significant food source for marine fauna. Suitable hard substrate for macroalgal beds including the threatened 'Giant Kelp' (*Macrocystis pyrifera)* occur in areas such as around Gabo Island and within the Bemm River Estuary. Little is known about the effects of oil on *M. pyrifera,* but some studies (e.g. Edgar & Barrett 2000; Reed & Lewis 1994) suggest that this species, like other macroalgae, may be some of the least sensitive marine species to oil exposure. As described opposite, intertidal species of macroalgae are more prone to direct exposure than subtidal beds, however sub-lethal toxicity effects from in-water (dissolved) hydrocarbons may be observed. Corals are not a common habitat type in the Gippsland Basin however solitary soft corals may occur where suitable hard substrate, such as rocky reef or man-made structures, is present. Sub-lethal toxicity effects may result from direct contact with in-water hydrocarbons or indirectly through feeding on contaminated prey (plankton). Impact by direct contact of benthic species with hydrocarbon in the deeper areas of the release area is not expected given the surface nature of all except the SHA

<table>
<tr><th>Receptor</th><th>Impact of hydrocarbon exposure</th><th>Exposure risk assessment</th></tr>
<tr><td></td><td>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. Exposure can induce changes in burrowing depth into the substrate (which can lead to higher predation rates on some species) and can limit the growth, recruitment and reproductive capacity of some marine invertebrates (Fukuyama et al,. 1998).

Deep water benthic invertebrates are usually protected from oiling by the buoyant nature of hydrocarbons, although the depth of oil penetration is dependent on turbulence in the water column. Hydrocarbons can also reach the benthos through the settlement of oiled particles such as faeces, dead plankton or inorganic sand particles (Jewett et al., 1999).

Coral

Corals are generally located in shallow and intertidal regions, where there is the potential for exposure to surface and in-water hydrocarbons.

Experimental studies and field observations indicate all coral species are sensitive to the effects of oil, although there are considerable differences in the degree of tolerance between species. Differences in sensitivities may be due to the ease with which oil adheres to the coral structures, the degree of mucous production and self cleaning, or simply different physiological tolerances.

Direct contact of coral by hydrocarbons may impair respiration and also photosynthesis by symbiotic zooanthellae (IPIECA, 1992). Coral gametes or larvae in the surface layer where they are exposed to the slick may also be fouled (Epstein et al., 2000). Physical oiling of coral tissue can cause a decline in metabolic rate and may cause varying degrees of tissue decomposition and death (Negri and Heyward, 2000). Oil may also cling to certain types of sediment causing oil to sink to the seafloor, covering corals in oiled sediment.

Where corals come into direct contact with surface exposures (i.e., intertidal/shallow areas), they are more susceptible due to physical presence, than toxicity associated with dissolved oil components within the water column which, in some cases, may be more toxic than the floating surface slicks (Volkman et al., 1994). A range of impacts is reported to result from toxicity including partial mortality of colonies, reduced growth rates, bleaching and reduced photosynthesis.</td><td>subsea facility spill and the water depths at the spill locations. The benthic habitat of the OA (described in detail in Section 5.2.1.1) is predominantly featureless muddy, gravelly sand and no areas of rocky reef have been observed. Recent studies have shown that infaunal taxa are similar across the Bass Strait but the contribution of each to the assemblage varies Where hard substrate or points of attachment (facilities) are present, colonisation by epifauna occurs mostly in the form of sessile, invertebrate, filter feeders. The degree of colonisation varies between facilities however sponge beds have only been detected at Bream B.

Benthic invertebrate species closer to shore may be affected, although these effects will be localised and temporary. Invertebrates of value (i.e. target species, see Commercial Fisheries below) have been identified to include squid, crustaceans (rock lobster, crabs) and molluscs (scallops, abalone). Filter-feeding, sessile benthic invertebrates such as sponges, bryozoans, scallops, abalone and hydroids may be exposed to sub-lethal impacts however population level impacts are considered unlikely.

The consequence of a LOWC on benthic habitats is assessed as Level II.

<table><tr><td colspan="2">Effect Dimensions</td><td colspan="2">Sensitivity Dimensions</td></tr><tr><td>Duration</td><td>M</td><td>Irreplaceability</td><td>M-H</td></tr><tr><td>Size/Scale</td><td>M</td><td>Vulnerability</td><td>M</td></tr><tr><td>Intensity</td><td>M</td><td>Influence</td><td>M</td></tr><tr><td colspan="2">M</td><td colspan="2">M</td></tr></table></td></tr>
</table>

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	Laboratory and field studies have demonstrated that branching corals appear to have a higher susceptibility to hydrocarbon exposure than massive corals or corals with large polyps. Chronic effects of oil exposure have been consistently noted in corals and, ultimately, can kill the entire colony. Chronic impacts include histological, biochemical, behavioural, reproductive and developmental effects. Field studies of chronically polluted areas and manipulative studies in which corals are artificially exposed to oil show that some coral species tolerate oil better than other species (NOAA, 2010). Reproductive stages of corals have been found to be more sensitive to oil toxicity. Fertilisation of coral species has been observed to be completely blocked in *Acropora tenuis* at heavy fuel oil concentrations of 150 ppb (Harrison, 1999), with significant reductions in fertilisation of *A.millepora* and *A. valida* at concentrations between 580 and 5800 ppb, in addition to developmental abnormalities and reduced survival of coral larvae at similar concentrations. Lower concentrations of less than 100 ppb crude oil were observed to inhibit larval metamorphosis in *A. millepora* (Negri & Heyward, 2000). Studies undertaken after the Montara incident 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 hydrocarbons 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. In addition, surveys undertaken after the Montara blowout on the plateau areas of Barracouta and Vulcan shoals (Heyward *et al.,* 2010), which occur about 20-30 m below the water line in otherwise deep waters (generally >150 m water depth), and contain algae, hard coral and seagrass, found no obvious visual signs of major disturbance. **Macroalgae**	

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	Macroalgae are generally limited to growing on intertidal and subtidal rocky substrata in shallow waters to 10 m depth. As such, they may be exposed to subsurface and entrained and dissolved hydrocarbons, however are susceptible to surface hydrocarbon exposure more so in intertidal habitats as opposed to subtidal habitats. Reported toxic responses to oils have included a variety of physiological changes to enzyme systems, photosynthesis, respiration, and nucleic acid synthesis (Lewis & Pryor 2013). Despite the well-established pool of literature on macroalgae exposure to petroleum oils, very few investigations have reported effects on species that are common in Australian waters (Lewis & Pryor 2013). 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'Brien & 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'. The morphological features of macroalgae, such as the presence of a mucilage layer or the presence of fine 'hairs' will influence the amount of hydrocarbon that will adhere to the algae. A review of field studies conducted after spill events by Connell *et al*. (1981) indicated a high degree of variability in the level of impact, but in all instances, the algae appeared to be able to recover rapidly from even very heavy oiling. The rapid recovery of algae was attributed to the fact that for most algae, new growth is produced from near the base of the plant while the distal parts (which would be exposed to the oil contamination) are continually lost. Other studies have indicated that oiled kelp beds had a 90% recovery within 3-4 years of impact, however full recovery to pre-spill diversity may not occur for long periods after the spill (French-McCay, 2004). Intertidal macroalgal beds are more prone to oil spills than subtidal beds because although the mucous coating prevents oil adherence, oil that is trapped in the upper canopy can increase the persistence of the oil, which impacts upon site-attached species. Additionally, when oil sticks to dry fronds on the shore, they can become overweight and break as a result of wave action (IPIECA, 1995).	

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	The toxicity of hydrocarbons to macroalgae varies for the different macroalgal life stages, with water-soluble hydrocarbons more toxic to macroalgae (O'Brien and Dixon, 1976). Toxic effect concentrations for hydrocarbons and algae have varied greatly among species and studies, ranging 2 - 10,000,000 ppb (Lewis & Pryor, 2013). The sensitivity of gametes, larva and zygote stages however have all proven more responsive to petroleum oil exposure than adult growth stages (Lewis & Pryor, 2013). Macrophytes, including macroalgae, require light to photosynthesise. So in addition to the potential impacts from direct smothering or exposure to entrained and dissolved hydrocarbons, the presence of entrained hydrocarbon within the water column can affect light qualities and the ability of macrophytes to photosynthesise. Exposure to in-water hydrocarbons poses the greatest threat to sensitive macroalgal assemblages, specifically the Giant Kelp Forests TEC, that grow on rocky reefs from the sea floor ≥8 m below sea level. The largest extent of this TEC is in Tasmanian coastal waters. Substrate on which this TEC may occur is also found in Victoria along the west coast of Wilson's Promontory and from Sydenham Inlet to Gabo Island (DSEWPaC 2012b). . **Seagrass** Seagrasses generally grow in sediments in 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. As such, they may be exposed to both surface and sub-surface hydrocarbons. Submerged vegetation in nearshore areas can be exposed to oil by direct contact (i.e., smothering) and by uptake by rhizomes through contaminated sediments. Exposure also can take place via uptake of hydrocarbons through plant membranes. In addition, seeds may be affected by contact with oil contained within sediments (NRDA, 2012). When seagrass leaves are exposed to petroleum oil, sub-lethal quantities of the soluble fraction can be incorporated into the tissue, causing a reduction in tolerance to other stress factors (Zieman *et al*., 1984). The toxic components of petroleum oils are thought to be the PAH, which are lipophilic and therefore able to pass through lipid	

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	membranes and tend to accumulate in the thylakoid membranes of chloroplasts (Ren *et al*., 1994). As such, the susceptibility of seagrasses to hydrocarbon spills will depend largely on distribution. Deeper communities will be protected from oiling under all but the most extreme weather conditions. Shallow seagrasses are more likely to be affected by dispersed oil droplets or, in the case of emergent seagrasses, direct oiling. Theoretically, intertidal seagrass communities would be the most susceptible because the leaves and rhizomes may both be affected. **Subtidal rocky reefs** Nearshore and offshore subtidal reef habitats are dominated by seaweeds, mobile invertebrates and fish. Potential impacts to sensitive receptors related to these reefs discussed in the appropriate sections. It was observed that the release of large quantities of fuel oil during the grounding of the Iron Baron did not substantially affect populations of subtidal reef associated organisms (Edgar & Barrett, 1995)	
Plankton	Plankton are found in nearshore and open waters beneath the surface in the water column. These organisms migrate vertically through the water column to feed in surface waters at night (NRDA, 2012). As they move close to the sea surface it is possible that they may be exposed to floating hydrocarbons but plankton also has the potential to be directly affected by in-water hydrocarbons as a result of toxicity effects. Phytoplankton are typically not sensitive to the impacts of oil, though they do accumulate it rapidly (Hook *et al*., 2016) due to their small size and high surface area to volume ratio. Oil can affect the rate of photosynthesis and inhibit growth in phytoplankton, depending on the concentration range. For example, photosynthesis is stimulated by low concentrations of oil in the water column (10–30 ppb) but becomes progressively inhibited above 50 ppb. Conversely, photosynthesis can be stimulated below 100 ppb for exposure to weathered oil (González *et al*. 2009). In addition, the potential for effects to photosynthesis (i.e. temporary suppression of primary production) from shading caused by continuous surface slicks may have implications for consumers of phytoplankton (Hook *et al.,* 2016), though a prolonged surface coverage over an extensive area would be required. During the DWH oil spill it was observed that plankton and other surface material were found to be sinking at rates of more than 10 times the normal level. It was	Plankton are likely to be exposed to in-water (dissolved) hydrocarbons above the moderate exposure threshold within a zone (up to approximately 500 km in width) extending parallel to the Gippsland and southern NSW coastline (for up to approximately 500 km from the release location). Plankton are at their highest concentrations below surface waters (e.g. 60 m water depth for phytoplankton during the day) and undertake a vertical migration which would likely reduce their potential for (and duration of) exposure to dissolved hydrocarbons in the surface layer of the water column. The impact to plankton is therefore predicted to be **Level III** with potential effects on the food web recognized.

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	hypothesised that the weathered spilled oil catalysed clumping of organic particles (Schrope 2013). It is currently unclear as to whether this effect was caused by the chemical characteristics of the weathered oil, or a bacterial effect. Zooplankton (microscopic animals such as rotifers, copepods and krill that feed on phytoplankton) are vulnerable to hydrocarbons (Hook *et al*., 2016). Water column organisms that come into contact with oil risk exposure through ingestion, inhalation and dermal contact (NRDA, 2012), which can cause immediate mortality or declines in egg production and hatching rates along with a decline in swimming speeds (Hook *et al*., 2016). Plankton are generally abundant in the upper layers of the water column and is the basis of the marine food web, so an oil spill in any one location is unlikely to have long-lasting impacts on plankton populations at a regional level. Reproduction by survivors or dispersion from unaffected areas (via sea surface currents) is likely to rapidly replenish losses (Abbriano et al. 2011). Plankton have life cycles based on rapid reproduction with levels of high productivity. It is also in the nature of plankton to be dispersive. Oil spill field observations show minimal or transient effects on plankton (Abbriano *et al.* 2011). Once background water quality is re-established, plankton takes weeks to months to recover (ITOPF, 2011). Plankton found in open waters of the exposure zone is expected to be widely represented within waters of the wider Bass Strait region and generally across all waters in the south eastern offshore region, which aids in the re-establishment of communities.	
Fish	Fish can be exposed to oil through a variety of pathways, including: direct dermal contact (e.g. swimming through oil); ingestion (e.g. directly or via oil-affected prey/foods); and inhalation (e.g. elevated dissolved contaminant concentrations in water passing over the gills). Fish are generally considered vulnerable to oil spills because they inhabit areas coincident with oil exploration and production and those areas that may be subsequently impacted by an oil spill; including coral reefs, seagrasses, nearshore areas, deep offshore areas, pelagic habitats and demersal habitats (Moore & Dwyer, 1974; Gundlach & Hayes, 1978). Of the potential toxicants, monocyclic and polycyclic aromatic hydrocarbons (MAHs and PAHs) are generally regarded as the most toxic to fish.	Release locations are all located in open ocean waters and floating oil is not predicted to extend into shallow nearshore waters. Moderate surface exposure is predicted to cover a maximum area of approximately 40 km^2 (from the MLA scenario). The zone of moderate exposure to dissolved hydrocarbons is predicted to extend into nearshore Tasmanian (i.e. Bass Strait islands), Victorian and southern NSW waters in five of the six LOWC scenarios. Shallow inshore fish species including various syngnathids (seahorses, pipefish, pipehorses and seadragons) are less likely to be able to move away from in-water oils and therefore may be exposed to elevated levels. Their habitats are typically widespread and impacts are expected to be local on individual organism levels.

<table>
<tr><th>Receptor</th><th>Impact of hydrocarbon exposure</th><th>Exposure risk assessment</th></tr>
<tr><td></td><td>
<u>Surface oil</u>

Since fish and sharks do not generally break the sea surface, the exposure of surface hydrocarbons to fish and shark species are unlikely to occur. Near the sea surface, fish are able to detect and avoid contact with surface slicks meaning fish mortalities rarely occur in the event of a hydrocarbon spill in open waters (Volkman et al., 2004). As a result, wide-ranging pelagic fish of the open ocean generally are not highly susceptible to impacts from surface hydrocarbons. Adult fish kills reported after oil spills occur mainly to shallow water, near-shore benthic species (Volkman et al., 2004). Following the DWH incident, it was suggested that Whale sharks may be vulnerable to oiling of gills if exposed to the oil. The tendency of Whale sharks to feed close to surface waters will increase the likelihood of exposure to surface slicks and elevated hydrocarbon concentrations beneath slicks.

<u>In-water oil</u>

Exposure to hydrocarbons entrained or dissolved in the water column can be toxic to fishes. Studies have shown a range of impacts including changes in abundance, decreased size, inhibited swimming ability, changes to oxygen consumption and respiration, changes to reproduction, immune system responses, DNA damage, visible skin and organ lesions, and increased parasitism. However, many fish species can metabolise toxic hydrocarbons, which reduces the risk of bioaccumulation (NRDA, 2012). Pelagic species are also generally highly mobile and as such are not likely to suffer extended exposure (e.g. >96 hours) at concentrations that would lead to chronic effects due to their patterns of movement. Demersal fish are not expected to be impacted given the presence of in-water hydrocarbons in surface layers only.

Fish are most vulnerable to hydrocarbon discharges during their embryonic, larval and juvenile life stages. Oil exposure may result in decreased spawning success and abnormal larval development. Impacts on eggs and larvae entrained in the upper water column are not expected to be significant given the temporary period of water quality impairment, and the limited areal extent of the spill. 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.
</td><td>
Although pelagic fish species may be exposed to moderate levels of dissolved oil their mobile, transitory characteristics reduce the risk of prolonged exposure. Large-scale population level effects following a LOWC on fish species, abundances or assemblage composition would be unlikely due to the wide geographical distribution of many fish in Bass Strait and the potential for rapid re-colonisation, especially in the cases of widely distributed relatively common pelagic species. Deep water demersal fish are not expected to be impacted given the presence of in-water hydrocarbons in upper layers (0 – 30 m) of the water column only.

The zone of moderate exposure to dissolved hydrocarbons may contact the White shark distribution and breeding BIAs and Grey nurse shark foraging and migration BIAs. Pelagic species of shark are at greatest risk of being exposed to oil following a LOWC given their wide foraging areas and risks of consuming contaminated prey. White sharks are known to aggregate near Ninety Mile Beach and philopatric characteristics means they may return to the place of birth to breed even if habitats are contaminated. This species is widely distributed and thus unlikely to suffer ecologically important declines in abundance.

The consequences to fish and sharks are assessed as Level II, taking into consideration the potential impacts to threatened species such as the White and Grey nurse sharks.

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<tr><td colspan="2">Effect Dimensions</td><td colspan="2">Sensitivity Dimensions</td></tr>
<tr><td>Duration</td><td>M</td><td>Irreplaceability</td><td>M</td></tr>
<tr><td>Size/Scale</td><td>M</td><td>Vulnerability</td><td>H</td></tr>
<tr><td>Intensity</td><td>M</td><td>Influence</td><td>M</td></tr>
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Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
Birds	Seabirds and shorebirds are sensitive to the impacts of oiling, with their vulnerability arising from the fact that they cross the air-water interface to feed, while their shoreline habitats may also be oiled (Hook *et al*., 2016). Species that raft together in large flocks on the sea surface are particularly at risk (ITOPF, 2011). <u>Sea surface oil</u> Birds foraging at sea have the potential to directly interact with oil on the sea surface some considerable distance from breeding sites in the course of normal foraging activities. Seabird species most at risk include those that readily rest on the sea surface (e.g. shearwaters) and surface plunging species (e.g. terns, boobies). As seabirds are a top order predator, any impact on other marine life (e.g. pelagic fish) may disrupt and limit food supply both for the maintenance of adults and the provisioning of young. For seabirds, direct contact with hydrocarbons can foul feathers, which may subsequently result in hypothermia due to a reduction in the ability of the bird to thermo-regulate and impair water-proofing. A bird suffering from cold, exhaustion and a loss of buoyancy may also dehydrate, drown or starve (DSEWPAC, 2011). Increased heat loss as a result of a loss of water-proofing results in an increased metabolism of food reserves in the body, which is not countered by a corresponding increase in food intake, may lead to emaciation (DSEWPAC, 2011). The greatest vulnerability in this case occurs when birds are feeding or resting at the sea surface (Peakall *et a*l., 1987). . In a review of 45 actual marine spills, there was no correlation between the numbers of bird deaths and the volume of the spill (Burger, 1993). Penguins may be especially vulnerable to an oil spill because they do not fly and therefore spend a high proportion of their time in the water when away from resting and breeding locations and readily lose insulation and buoyancy if their feathers are oiled (Hook *et al*., 2016). This species also has strong attachment to its natal area (Colombelli-Négrel 2016) and consequently, birds are likely to retain a strong attachment to a site even if the site and adjacent waters are severely contaminated by oil. The Iron Baron vessel spill (325 tonnes of bunker fuel in Tasmania in 1995) is estimated to have resulted in the death of up to 20,000 penguins (Hook *et al*., 2016).	A number of listed threatened and/or migratory seabird species may occur in the area exposed above moderate surface thresholds. Moderate surface exposure is predicted to cover a maximum area of approximately 40 km^2 (from the MLA scenario). There are foraging BIA's for several species of petrels, shearwater and albatross, however, no breeding BIAs overlap with this exposed area. Seabirds rafting, resting, diving or feeding at sea have the potential to come into contact with surface oil, ranging from moderate to high exposure, as such, acute or chronic toxicity impacts (death or long-term poor health) to seabirds are possible. Most species tend to forage on their own, though large feeding flocks will gather at rich or passing food sources. The length of shoreline predicted to be exposed to shoreline loading of hydrocarbons that may have biological impacts to birds is approximately 280 km above the moderate threshold and 100 km above the high threshold for the SHA release scenario. This section of coastline comprises mostly wide sandy beaches that provide nesting habitat for species such as Hooded plovers and terns or rocky islands and headlands that provide habitat for seabird colonies (such as Little penguin, petrels and albatrosses). The Little penguin is not considered at risk globally, but some colonies are at risk on a regional scale (Cannell *et a*l. 2016) and declines in the status of this species have been reported from Tasmania (Stevenson & Woehler 2007). Oil concentrations at the moderate to high threshold are predicted to accumulate on the shorelines of Gabo Island, which supports the world's largest Little penguin colony, The Skerries and Tasmanian Bass Strait islands such as Curtis Island potentially impacting local populations. There are many listed threatened and migratory shorebird species likely to occur in the area overlapping the extent of exposed shoreline. In the event of a LOWC, these birds are potentially at risk of shoreline exposure. Birds are not likely to be significantly affected by in-water concentrations of hydrocarbons due to their limited exposure time in the water column. Shorebirds foraging in intertidal areas or along the high tide mark and splash zone, or nest in coastal areas particularly close to the high-water mark, are most at risk of exposure effects. Because the zone of moderate in-water exposure extends into nearshore waters foraging shorebirds may be indirectly impacted by the loss of invertebrate prey.

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<tr><th>Receptor</th><th>Impact of hydrocarbon exposure</th><th>Exposure risk assessment</th></tr>
<tr><td></td><td><u>Shoreline oil</u>

Shorebirds are likely to be exposed to oil when it directly impacts the intertidal zone and onshore due to their feeding habitats. Foraging shorebirds will be at potential risk of both direct impacts through contamination of individual birds (e.g. fouling of feathers) and indirect impacts (e.g. fouling and/or a reduction in prey items) (Clarke, 2010). Birds that are coated in oil can also suffer from damage to external tissues, including skin and eyes, as well as internal tissue irritation in their lungs and stomachs

Breeding birds (both seabirds and shorebirds) may be exposed to oil via direct contact or the contamination of the breeding habitat (e.g. shores of islands) (Clarke, 2010). Bird eggs may subsequently 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. Studies of contamination of duck eggs by small quantities of crude oil, mimicking the effect of oil transfer by parent birds, have been shown to result in mortality of developing embryos.

Toxic effects on birds may result where oil is ingested as the bird attempts to preen its feathers, or via consumption of oil-affected prey. Whether this toxicity ultimately results in mortality will depend on the amount consumed and other factors relating to the health and sensitivity of the particular bird species.

Engelhardt (1983), Clark (1984), Geraci & St Aubin (1988) and Jenssen (1994) indicated that the threshold thickness of oil that could impart a lethal dose to an individual wildlife species is 10 µm (~10 g/m^2). Scholten et al. (1996) indicates that a layer 25 µm thick would be harmful for most birds that contact the slick.</td><td>The populations of both seabird and shorebird species have a wide geographic range, meaning that impacts to individuals at one location will not necessarily extend to populations at other un-impacted locations.
Consequently, the potential consequence of risks to seabirds and shorebirds from a LOWC are considered to be Level II.

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<tr><td colspan="2">Effect Dimensions</td><td colspan="2">Sensitivity Dimensions</td></tr>
<tr><td>Duration</td><td>M</td><td>Irreplaceability</td><td>H</td></tr>
<tr><td>Size/Scale</td><td>M</td><td>Vulnerability</td><td>H</td></tr>
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<tr><td>Marine Reptiles - Turtles</td><td>Marine turtles are vulnerable to the effects of oil at all life stages; eggs, hatchlings, juveniles, and adults. Oil exposure affects different turtle life stages in different ways; and each turtle life stage frequents a habitat with varied potential to be impacted during an oil spill. Several aspects of turtle biology and behaviour place them at particular risk, including a lack of avoidance, indiscriminate feeding in convergence zones, and large pre-dive inhalations.</td><td>While marine turtles, including threatened species, are known to occur in the area potentially exposed to hydrocarbons above surface and in-water (dissolved) moderate exposure thresholds they are not noted to reside or aggregate in significant numbers, and there are no recognised BIAs in the region.

There are no turtle nesting beaches along the Gippsland or southern NSW coastlines, so impacts to turtles from shoreline oiling will not occur.

Although the effects of hydrocarbons on marine reptiles, specifically turtles can be severe, the low density of turtles expected in the region (due to lack of BIA or</td></tr>
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<tr><th>Receptor</th><th>Impact of hydrocarbon exposure</th><th>Exposure risk assessment</th></tr>
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Marine turtles can be exposed to oil externally (e.g. swimming through oil slicks) or internally (e.g. swallowing the oil, consuming oil affected prey, or inhaling of volatile oil related compounds).
<u>Surface oil</u>
Effects of oil on turtles include increased egg mortality and developmental defects; direct mortality due to oiling in hatchlings, juveniles, and adults; and negative impacts to the skin, blood, digestive and immune systems, and salt glands. Oil can enter cavities such as the eyes, nostrils, or mouth; and oil covering their bodies may interfere with breathing because they inhale large volumes of air to dive.
Experiments on physiological and clinical pathological effects of hydrocarbons on loggerhead turtles (~15–18 months old) showed that the turtles' major physiological systems were adversely affected by both chronic and acute exposures (96 hour exposure to a 0.05 cm layer of South Louisiana crude oil versus 0.5 cm for 48 hours) (Lutcavage et al. 1995). Recovery from the sloughing skin and mucosa took up to 21 days, increasing the turtle's susceptibility to infection or other diseases, such as fibropapilloma (Lutcavage et al. 1995).
Records of oiled wildlife during spills rarely include marine turtles, even from areas where they are known to be relatively abundant (Short, 2011). An exception to this was the large number of marine turtles collected (613 dead and 536 live) during the DWH incident in the GoM, although many of these animals did not show any sign of oil exposure (NOAA 2013). Of the dead turtles found, 3.4% were visibly oiled and 85% of the live turtles found were oiled (NOAA, 2013). Of the captured animals, 88% of the live turtles were later released, suggesting that oiling does not inevitably lead to mortality.
<u>Shoreline oil</u>
Turtles may experience oiling impacts on nesting beaches and eggs through chemical exposures resulting in decreased survival to hatching and developmental defects in hatchlings. Adult females crossing an oiled beach could cause external oiling of the skin and carapace; nothing that most oil is deposited at the high-tide line, and most turtles nest well above this level. Studies on freshwater snapping turtles showed uptake of PAHs from contaminated nest sediments, but no impacts on hatching success or juvenile health following exposure of eggs to dispersed weathered light crude (Rowe et al., 2009). However, other studies found
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aggregations) suggests that a LOWC would affect individuals rather than population level. Consequently, the potential impacts to marine reptiles are considered to be Consequence Level II.
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<tr><td>Size/Scale</td><td>M</td><td>Vulnerability</td><td>H</td></tr>
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Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	evidence that exposure of freshwater turtle embryos to PAHs results in deformities (Bell *et al*., 2006, Van Meter *et al.,* 2006). Turtle hatchlings may be more vulnerable to smothering as they emerge from the nests and make their way over the intertidal area to the water (AMSA, 2015). Hatchlings that contact oil residues while crossing a beach can exhibit a range of effects including impaired movement and bodily functions (Shigenaka, 2003). Hatchlings sticky with oily residues may also have more difficulty crawling and swimming, rendering them more vulnerable to predation. It should be noted that the threat and relative impacts of an unplanned discharge on some marine reptile species are considered less damaging than other stressors. Report cards produced on protected marine reptiles in Australia generally ranked oil pollution as either 'not of concern' or 'of less concern' depending on the marine region (DSEWPaC 2012a).	
Marine Mammals (Pinnipeds)	Pinnipeds are directly at risk from impacts associated with the exposure to surface, shoreline and in-water hydrocarbons. <u>Sea surface oil</u> Pinnipeds are vulnerable to sea surface exposures in particular 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, and regularly haul out on to beaches. Pinnipeds are also sensitive as they will stay near established colonies and haul-out areas, meaning they are less likely to practise avoidance behaviours. This is corroborated by Geraci and St. Aubins (1988) who suggest seals, sea-lions and fur-seals have been observed swimming in oil slicks during a number of documented spills. As a result of exposure to surface oils, pinnipeds, with their relatively large, protruding eyes are particularly vulnerable to effects such as irritation to mucous membranes that surround the eyes and line the oral cavity, respiratory surfaces, and anal and urogenital orifices. Hook *et al* (2016) reports that seals appear not to be very sensitive to contact with oil, but instead to the toxic impacts from the inhalation of volatile components. For some pinnipeds, fur is an effective thermal barrier because it traps air and repels water. Petroleum stuck to fur reduces its insulative value by removing natural oils that waterproof the pelage. Consequently, the	Both the New Zealand fur-seal (*Arctocephalus forsteri*) and the Australian fur-seal (*Arctocephalus pusillus doriferus*) are listed marine species with habitat and breeding sites known to occur in areas potentially exposed to surface, in-water and shoreline oil above the moderate threshold. These areas are not identified as critical habitat and there are no identified BIAs for fur seals in the region. Both the Australian and New Zealand fur seals are at risk to surface oil while at sea and shoreline accumulated oil at haul out sites or rookeries. The direct effect to pups from exposure to shoreline oil at ≥100 g/m^2 could result in mortality, while indirect effects could be negative behavioural changes associated with the smell of shoreline oil or contamination of prey. The Australian fur seal is vulnerable to a population decline following a LOWC because breeding locations are restricted to the islands of Bass Strait. It is predicted that major rookeries on The Skerries and Gabo Island may be exposed to accumulated shoreline oil at moderate to high thresholds from five of the six discharge scenarios. Waxy crude from the SNA scenario is also predicted to accumulate at the moderate threshold on islands off Wilsons Promontory which also support significant breeding populations. These species are particularly vulnerable to oil because oil is believed to adhere more readily to their coats, such oiling can have significant effects to this function if foraging in areas with fresh oil. Fur seals are known to aggregate around

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rate of heat transfer through fur seal pelts can double after oiling (Geraci & St.Aubin, 1988), adding an energetic burden to the animal. Kooyman et al (1976) suggest that in fact, fouling of approximately one-third of the body surface resulted in 50% greater heat loss in fur seals immersed in water at various temperatures. Fur-seals are particularly vulnerable due to the likelihood of oil adhering to fur. Heavy oil coating and tar deposits on fur-seals may result in reduced swimming ability and lack of mobility out of the water.
<u>In-water oil</u>
Ingested hydrocarbons can irritate or destroy epithelial cells that line the stomach and intestine, thereby affecting motility, digestion and absorption.
However, pinnipeds have been found to have the enzyme systems necessary to convert absorbed hydrocarbons into polar metabolites, which can be excreted in urine (Engelhardt, 1982; Addison & Brodie, 1984; Addison et al., 1986). Volkman et al (1994) report that benzene and naphthalene ingested by seals is quickly absorbed into the blood through the gut, causing acute stress, with damage to the liver considered likely. If ingested in large volumes, hydrocarbons may not be completely metabolised, which may result in death.
<u>Shoreline oil</u>
Breeding colonies (used to birth and nurse until pups are weaned) are particularly sensitive to hydrocarbon spills (Higgins & Gass, 1993). ITOPF (2011) 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.
It is reported that most pinnipeds scratch themselves vigorously with their flippers and do not lick or groom themselves, so are less likely to ingest oil from skin surfaces (Geraci & St. Aubin, 1988). However, mothers trying to clean an oiled pup may ingest oil. The Long Term Environmental Impact and Recovery report for the Iron Barren oil spill concluded that “The number of pups born at Tenth Island in 1995 was reduced when compared to previous years. There was a strong relationship between the productivity of the seal colonies and the
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offshore oil and gas facilities where, in the event of a release, exposure to fresh oil would occur.
The consequence of a LOWC on pinnipeds is assessed as Level II.
<table>
<tr><td colspan="2">Effect Dimensions</td><td colspan="2">Sensitivity Dimensions</td></tr>
<tr><td>Duration</td><td>H</td><td>Irreplaceability</td><td>M</td></tr>
<tr><td>Size/Scale</td><td>H</td><td>Vulnerability</td><td>L</td></tr>
<tr><td>Intensity</td><td>H</td><td>Influence</td><td>M</td></tr>
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Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	proximity of the islands to the oil spill wherein the islands close to the spill showed reduced pup production and those islands more distant to the oil spill did not" (Tasmanian SMPC, 1999). Pinnipeds are further at risk because they appear to rely on scent to establish a mother-pup bond (Sandegren, 1970; Fogden, 1971), and consequently oil-coated pups may not be recognisable to their mothers. This is only theorised, with studies and research indicating interaction between mothers and oiled pups were normal (Davis and Anderson, 1976; Davies, 1949; Shaughnessy & Chapman, 1984). Australian sea-lions have 'naturally poor recovery abilities' due to 'unusual reproductive biology and life history' (TSSC, 2005). Due to the extreme philopatry of females and limited dispersal of males between breeding colonies, the removal of only a few individuals annually may increase the likelihood of decline and potentially lead to the extinction of some of the smaller colonies. Note: Australian sea lions are endemic to Australia, found only in South Australia and Western Australia (DSEWPaC, 2013c).	
Marine Mammals (Cetaceans)	Whales and dolphins can be exposed to the chemicals in oil through: • Internal exposure by consuming oil or contaminated prey; • Inhaling volatile oil compounds when surfacing to breathe; • External exposure, by swimming in oil and having oil directly on the skin and body; and • Maternal transfer of contaminants to embryos (NRDA, 2012). <u>Surface oil</u> Unlike with pinnipeds (see above), oil would not be expected to adhere well to the surface of cetacean skin due to the lack of hairs and the frequent sloughing of skin cells (Engelhardt 1983, Helm *et al*. 2015). In addition, oil should not readily penetrate cetacean skin due to tight intercellular bridges and thick epidermis (O'Hara & O'Shea 2001). Nevertheless, cetaceans can be exposed to oil through direct contact with the eyes, mouth (ingestion), and airways (inhalation), potentially leading to inflammation and lung congestion (Geraci & St. Aubin 1990).	Several threatened, migratory and/or listed cetacean species may traverse the spill plume. The distribution and (possible (DoE, 2015b)) foraging BIAs for the Pygmy blue whale and the migration BIA for the Southern right whale may be exposed to surface and in-water concentrations above the moderate exposure threshold for five of the six scenarios. The foraging BIA for the Humpback whale and breeding BIA for the Indo-Pacific bottlenose dolphin (which extends northwards into NSW from the Victorian border) may also overlap the zone of moderate in water (dissolved) hydrocarbon. If present, these species (and other cetaceans) may be exposed to oil in the manner described in this table. It is plausible that individual whales could encounter surface oil above the moderate to high exposure threshold in the immediate vicinity of the release location, but the release would need to coincide with pod migration or foraging for a greater number of individuals to be present in the plume. Sightings of Blue whales in the Gippsland Basin are reasonably rare (Bannister *et al*., 1996) and acoustic detecting indicates that the Pygmy blue whale are predominantly located to the east, west and south of the OA. It is difficult to predict with certainty if a spill

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Helm et al. (2015) suggested that inhalation of toxic compounds associated with fresh oil was of greater concern than absorption through the skin and ingestion. The inhalation of oil droplets, vapours and fumes is a distinct possibility if whales or dolphins surface in slicks to breathe. Exposure to hydrocarbons in this way could damage mucous membranes, damage airways or even cause death. Cetaceans may incidentally draw seawater and floating oil, into their lungs by breathing in splashed droplets or liquid that has collected near the blowhole just prior to inhalation. Aspiration of liquid oil can cause physical injuries to the respiratory tract by irritating tissues/membranes and can also lead to absorption of toxicants into the blood, as in inhalation exposure (Takeshita et al., 2017). French-McCay (2016) proposed exposure to oil concentrations of 10 g/m^2could result in mortality to marine mammals.
Evidence suggests that many cetacean species are unlikely to detect and avoid spilled oil (Matkin et al. 2008). There are numerous examples where cetaceans have appeared to incidentally come into contact with oil and/or not demonstrated any obvious avoidance behaviour. Following the Exxon Valdez oil spill, Matkin et al. (2008) reported killer whales in slicks of oil as early as 24 hours after the spill and evidence presented by Aichinger Dias et al. (2017) showed that following the DWH oil spill cetaceans in the GoM came into direct contact with both oil and sheen by swimming through them.
Although in the GoM it was observed that cetaceans were able to detect the thick and dark-coloured patches of oil, detection of the lighter substances may have been more difficult. Photographs of dolphins with oil on their bodies showed that oil can adhere to and persist on cetacean skin, and contrary to suggestions from previous studies, direct contact with oil and resultant exposure to toxic compounds is of concern (Aichinger Dias et al., 2017).
<u>In water (dissolved and entrained) oil</u>
The physical impacts from ingested hydrocarbon with subsequent lethal or sub-lethal impacts are applicable to both dissolved and entrained oil. However, the susceptibility of cetaceans varies with feeding habits. Baleen whales (such as Blue, Southern right and Humpback whales) are not particularly susceptible to ingestion of oil in the water column as they feed by skimming the surface. Oil may stick to the baleen while they ‘filter feed’ near slicks. Toothed whales and dolphins may be susceptible to ingestion of dissolved and entrained oil as they gulp feed at depth. As
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would lead to levels of mortality or reproductive depression that would manifest in terms of a population-level response.
The highly mobile and transitory nature of cetacean species in Bass Strait means that exposure to moderate to high levels of surface oil (in the vicinity of the release location) or moderate levels of in-water hydrocarbon is not anticipated to result in long term population viability effects. Nevertheless, taking into account that the populations of some whale species remain small relative to pre-whaling days and are thought to have a multi-decadal recovery time, mortality of even a small number of adults and or calves as result of oiling could inhibit or retard species recovery, the resultant impact is therefore assessed as Consequence Level II.
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<tr><td colspan="2">Effect Dimensions</td><td colspan="2">Sensitivity Dimensions</td></tr>
<tr><td>Duration</td><td>H</td><td>Irreplaceability</td><td>H</td></tr>
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Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	highly mobile species, in general it is very unlikely that these animals will be constantly exposed to concentrations of hydrocarbons in the water column for continuous durations (e.g., >96 hours) that would lead to chronic effects. Note also, many marine mammals appear to have the necessary liver enzymes to metabolise hydrocarbons and excrete them as polar derivatives (Ball and Truskewycz, 2013). Ingestion of oil may however result in acute nausea and vomiting and aspiration of oily vomitus into the lungs. Research conducted in the GoM linked aspiration pneumonia, lung abscesses, and pulmonary infections in dolphins to exposure to DWH oil (Venn-Watson *et al*., 2015a cited in Takeshita *et al.,* 2017) Some whales, particularly those with coastal migration and reproduction, display strong site fidelity to specific resting, breeding and feeding habitats, as well as to their migratory paths and this may override any tendency for cetaceans to avoid the noxious presence of hydrocarbons. The Southern right whale exhibits varying degrees of site fidelity, with the majority of females and calves returning to the same birthing location, while some also travel long distances between breeding grounds within a season (DSEWPAC, 2012c). If spilled oil reaches these biologically important habitats, the pollution may disrupt natural behaviours, displace animals, reduce foraging or reproductive success rates and increase mortality. Takeshita *et al.* (2017) concluded that the range of adverse health effects and increased mortality/reproductive failure observed in cetacean populations throughout the GoM since the DWH oil spill are consistent with the range of exposure scenarios. If sufficiently high numbers of animals are impacted, the greater population may experience reduced recovery and survival rates. The restitution time for cetaceans affected at a population level is assumed to be long term, i.e. 40 years, based on consensus on recovery times for marine mammals following the DWH incident (Bock *et. al*., 2018).	
Coastal Habitats and Communities– Sandy Shoreline, Rocky	**Sandy beaches** Sandy beaches provide potential foraging and breeding habitat for numerous bird, marine turtle and pinniped species. These activities primarily occur above the high tide line, with exception of haul outs. Note, most of the oil on a sandy shore will be concentrated at, and below, the high tide mark. Sandy beaches are also inhabited by a	There are different types of shorelines found along the Gippsland and southern NSW coast and offshore islands (including Tasmanian islands), however this coastline is dominated by wide sandy beaches with intermittent rocky shores, and salt marshes and isolated mangroves within tidal estuaries, coastal lakes and bays.

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
Shoreline, Mangroves and Saltmarsh	diverse assemblage (although not always abundant) of infauna (including nematodes, copepods and polychaetes); and macroinvertebrates (e.g. crustaceans). Because the sand retains oil, such animals may be killed if oil penetrates into the sediments. Long-term depletion of sediment fauna could have an adverse effect on birds or fish that use tidal flats as feeding grounds (IPIECA, 1999). Depth of penetration in sandy sediment is influenced by: • Particle size. Penetration is not generally as great on mud as on coarser sediments. • Oil viscosity. Viscous oils and mousse (water-in-oil emulsion) tend to penetrate less deeply than low-viscosity oils such as light crudes or diesel oil. • Drainage. If sediments are poorly drained (as is often the case with tidal flats remote from creeks or channels), the water content may prevent the oil from penetrating into the sediment. In contrast, oil may reach depths greater than one metre in coarse well-drained sediments. • Animal burrows and root pores. Penetration into fine sediments is increased if there are burrows of animals such as worms, or pores left where plant roots have decayed. A 100 g/m^2 threshold (considered a 'stain' or 'film', and equivalent to 0.1 mm thickness) is assumed as the lethal threshold for invertebrates on hard substrates and sediments (mud, silt, sand, gravel) in intertidal habitats. A threshold of 100 g/m^2 oil thickness would be enough to coat an animal and likely impact its survival and reproductive capacity (French-McCay, 2009). Based on this, areas of heavy oiling would likely result in acute toxicity, and death, of many invertebrate communities, especially where oil penetrates into sediments through animal burrows (IPIECA, 1999). However, these communities would be likely to rapidly recover (recruitment from unaffected individuals and recruitment from nearby areas) as oil is removed from the environment. Following the Sea Empress spill (in west Wales, 1996) many amphipods (sandhoppers), cockles and razor shells were killed. There were mass strandings on many beaches of both intertidal species (such as cockles) and shallow sub-tidal species. Similar mass strandings occurred after the Amoco Cadiz spill (in Brittany, France, 1978) (IPIECA, 1999).	The type of shoreline will influence the volume of hydrocarbon that could be stranded ashore and its thickness before the shoreline saturation point occurs (ITOPF, 2014). For instance, a sandy beach may allow hydrocarbon to percolate through the sand, and weathered oil may be buried, thus increasing its ability to hold more hydrocarbon ashore over tidal cycles and various wave actions in comparison to a rocky shore; hence hydrocarbon can increase in thickness onshore over time. The maximum length of shoreline exposed to oil at the moderate threshold is 277 km and at the high threshold 99km. The high shoreline loadings would likely result in acute toxicity, and death, of many invertebrate communities, especially for the light crude release scenarios which will easily penetrate into sandy sediments. However, tidal action is expected to lead to rapid weathering of these hydrocarbons in the intertidal area and the populations of these communities would be likely to rapidly recover. More persistent waxy residues are less likely to penetrate into intertidal sediments but may be forced to depth by wave action on high energy beaches. Oil residue retained deep beneath sediment may be protected from re-mobilisation and exposure to further weathering reduced (Lee *et al.,* 2015) Rocky shores along the Gippsland and southern NSW coastline are generally exposed and any oil deposited would be rapidly removed by wave action. Impacts on intertidal communities are typically short term unless acute exposure to fresh product causes high mortality. In Victoria, mangroves are known to occur within sheltered bays or inlets such as Western Port, Lakes Entrance and Corner Inlet. Based on the modelling results, mangrove habitats at most risk, are those near Lakes Entrance however many of the strands are in river estuaries or associated wetlands with only limited or intermittent access to the open ocean. Further north, the NSW coast mangroves may be exposed under certain conditions to shoreline accumulations of oil above moderate thresholds. For NSW, oil arriving would be well weathered with little lasting impact on salt marshes. Isolated marshes in Victoria near Wilsons Promontory potentially could be exposed to above moderate threshold shoreline accumulation from one LOWC scenario. Salt marsh are important benthic primary producers and provide habitat for other species, thus the loss of salt marshes could have long-lasting indirect effects on other organisms (EPA 2016).

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	Following the Sea Empress spill, populations of mud snails recovered within a few months but some amphipod populations had not returned to normal after one year. Opportunists such as some species of worm may actually show a dramatic short-term increase following an oil spill (IPIECA, 1999). In March 2014, small volumes of crude oil from an unidentified source (confirmed to not be offshore oil and gas production facilities) washed up along a 7-km section of sandy beach on the Victorian Gippsland coast as small (a few millimetres thick) granular balls (Gippsland Times, 2014). AMSA (2014) reported that no impacts were observed over the course of two months following the incident. As a result of the DWH spill, oil washed up on sandy beaches of the Alabama coastline. The natural movement of sand and water through the beach system continually transformed and re-distributed oil within the beach system, and 18 months after the event, mobile remnant oil remained in various states of weathering buried at different depths in the beaches (Hayworth *et al*., 2011). There is also evidence that submerged oil mats (SOM) exist just offshore of the Alabama beaches (ranging in thickness from a few millimetres to several centimetres), which has resulted in the regular washing up of tar balls onto sandy beaches. These SOMs may serve as long-term sources of remnant oil to the beach ecosystem (Hayworth *et al*., 2011). Long-term changes to the beach ecosystem as a result of stranded oil are unknown. Other results from beach sampling undertaken at Dapuhin Island, Alabama, in May (pre-impact) and September 2011 (post-impact) found a large shift in the diversity and abundance of microbial species (e.g., nematodes, annelids, arthropods, polychaetes, protists, fungi, algae and bacteria). Post-spill, sampling indicated that species composition was almost exclusively dominated by a few species of fungi. DNA analyses revealed that the 'before' and 'after' communities at the same sites weren't closely related to each other (Bik *et al.,* 2012). Similar studies found that oil deposited on the beaches caused a shift in the community structure toward a hydrocarbonoclastic consortium (petroleum hydrocarbon degrading microorganisms) (Lamendella *et al.*, 2014). **Rocky shorelines** Rocky shores encompass a wide variety of habitats. Exposure to the sun and wave energy are key factors in determining the types of plants and animals that inhabit the rocky shores. The persistence of oil is largely governed by the same forces (IOGP, 2016). Rock surfaces	The effect of a LOWC on individual shorelines will depend on the type of shoreline, aspect and whether they are high or low energy shores. Shoreline recovery studies link restitution times to oil type, climate, shoreline type and results range depending on the receptors monitored and level of clean up. The oil from the 2010 DWH spill in the GoM was documented by shoreline assessment teams as stranding on 1,773 km of shoreline (Michel *et al.* 2013). Shoreline clean-up activities were authorized on 660 km, or 73.3% of oiled beaches and up to 71 km, or 8.9% of oiled marshes and associated habitats. In 2013 Michel *et al*. reported that one year after the spill began, oil remained on 847 km; two years later, oil remained on 687 km, though at much lesser degrees of oiling. For example, shorelines characterised as heavily oiled went from a maximum of 360 km, to 22.4 km one year later, and to 6.4 km two years later. Hence recovery can range widely from around 2 years (Sea Empress, 1996, North Sea crude) to more than 20 years for soft sediment shorelines deeply contaminated during the 1991 Gulf War spills (IOGP, 2016). Of the shorelines of the states potentially impacted, the consequence to shorelines in Victoria is predicted to be greatest (contacted first, highest loadings and freshest oil). The resultant impact is assessed conservatively as a **Consequence Level II**

Effect Dimensions		Sensitivity Dimensions	
Duration	H	Irreplaceability	M
Size/Scale	H	Vulnerability	M
Intensity	M	Influence	M
M-H		M	

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	exposed to strong wave action are typically dominated by barnacles and limpets that are firmly attached and if oil strands on those surfaces it may result in mortality of the affected animals, but is unlikely to persist. Sheltered rocky shores in estuaries or inlets are typically dominated by macroalgae (seaweed) with various invertebrates living on or under the algae. Oil deposited in these habitats may not be washed off so quickly and recovery from impacts may take longer. **Mangroves and salt marshes** Mangroves grow in intertidal mud and sand, with specially adapted aerial roots (pneumatophores) that provide for gas exchange during low tide (DEWR 2006). The effects of surface hydrocarbons on mangroves include damage by smothering of lenticels (mangrove breathing pores) on pneumatophores or aerial prop roots, or the lower trunk; or by the loss of leaves (defoliation) due to chemical burning. It is also known that mangroves take up hydrocarbons from contact with leaves, roots or sediments, and it is suspected that this uptake causes defoliation through leaf damage and tree death (Wardrop *et al.* 1987). In-water entrained and dissolved hydrocarbons may affect mangrove communities directly through root uptake of toxic contaminants or indirectly due to effects on benthic infauna leading to reduced rates of bioturbation and subsequent oxygen stress on the plants root systems. Observed thresholds for effects are likely to vary depending on the health of the system, the hydrocarbon spilled and the environmental conditions; however, observations by Lin and Mendelssohn (1996) demonstrated that more than 1 kg/m^2 of oil during the growing season would be required to affect salt marsh or mangrove plants significantly. “Subtropical and temperate coastal salt marsh” (otherwise referred to as coastal salt marsh) is listed as a TEC. This TEC is usually associated with sandy/muddy shores of estuaries and embayments along low wave energy coastlines. The physical environment for the TEC is coastal areas under regular or intermittent tidal influence, with salt marsh being the key vegetation type – that being salt-tolerant grasses, herbs, sedges, rushes and shrubs generally less than 50 cm high (DSEWPaC, 2013b). Salt marshes occur in sheltered conditions, commonly in the strandline zone, and the vegetation offers a large surface area for oil absorption and trapping. Additionally, many salt marsh grasses, which	

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	can be dominant over large areas, have corrugated leaf surfaces which increase their holding capacity. Evidence from case histories and experiments shows that the damage resulting from oiling is very variable – as are recovery times. Lighter, more penetrating oils are more likely to cause acute toxic damage than heavy or weathered oils. In areas of light to moderate oiling where oil is mainly on perennial vegetation with little penetration of sediment, the shoots of the plants may be killed, but recovery can take place from the underground systems. Good recovery commonly occurs within one to two years. Where thick deposits of viscous oil or mousse accumulate on the marsh surface, vegetation is likely to be killed by smothering and recovery delayed because persistent deposits inhibit recolonisation.	
Wetlands	Most wetlands of international importance i.e. Ramsar wetlands have minimal risk of receiving oil following a LOWC because they have no, or very narrow and/or seasonal, connections to the sea. If surface oil was to enter a Ramsar site, the level of effect would be dependent on the type of receptors exposed to oil and the proportion of the site exposed to oil as well as the nature of the oil (fresh versus weathered). Sensitive receptors found in Ramsar sites connected to the sea could include mangroves, salt marshes, fish, shorebirds and seabirds. The consequences of oil exposure to these specific receptors have been described individually in the sections above.	No Ramsar sites were predicted to be exposed to floating surface oil at or above the moderate threshold. Oil is predicted to accumulate at high – moderate thresholds on the shoreline at Lakes Entrance and along the Ninety Mile Beach however the presence of sand dunes between the ocean and the Gippsland Lakes wetlands means the wetland itself is highly unlikely to be affected in any manner. Under certain metocean conditions in one LOWC scenario in-water (dissolved) hydrocarbons at the moderate threshold are predicted to reach the Gippsland Lakes Ramsar site. The consequence is assessed as **Level III.**
National Parks and Reserves	Potential impacts to sensitive receptors related to the shorelines of the terrestrial parks, such as coastal habitats and birds, and the waters of the marine parks, such as benthic habitats, fish, cetaceans and pinnipeds, are discussed in the appropriate sections above. Impacts on tourism and recreation from degraded aesthetic values and water quality or restricted access to the coast and recreational locales within the Parks due to clean up efforts are discussed below.	Modelling predicts contact at the moderate in-water (dissolved) threshold for eight marine parks, reserves and sanctuaries (Wilsons Promontory, Ninety Mile Beach, Point Hicks, Cape Howe and Beware Reef in Victoria and Batemans, Jervis Bay and Lord Howe Island in NSW). Dissolved hydrocarbon at the moderate threshold is also predicted to encroach upon the waters surrounding the terrestrial parks and reserves of the Kent and Hogan Groups, East and West Moncouer Islands and Curtis Island in Tasmania. Oil is predicted to accumulate above the moderate exposure threshold on the Gippsland and southern NSW coastline adjacent to several terrestrial parks and reserves including Wilsons Promontory, Nooramunga, Gippsland Lakes, Cape Conran and Croajingolong in Victoria and Nadgee, Ben Boyd, Bournda, Mimosa Rocks, Montague Island and Eurobodalla in NSW). Under certain metocean

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
		conditions in one LOWC scenario oil at the moderate threshold is predicted to accumulate on the shoreline of the Kent Group National Park (Tasmania). The consequence is assessed as **Level II** taking into consideration the length of shoreline potentially impacted and the extent of oil accumulation predicted.
AMPs	AMPs vary in their conservation objectives and specific values, but all are designed to conserve fauna, habitats and water quality over the long term. AMPs support populations of threatened seabird, marine mammal and fish species. A temporary deterioration of water quality could have negative effects on organisms, such as plankton, seabirds, marine mammals and fisheries resources which in turn affect the values of that Park. These impacts are discussed individually within other sections.	Surface and in-water (dissolved) oil entering these AMPs will degrade water quality until the oil is broken down and or currents shift the weathering oil outside the boundaries of the AMPs. Thus, water quality effects are predicted to persist only over the short to medium term in the AMPs. No AMPs were predicted to experience exposure to surface oil at or above the moderate threshold. Modelling indicated that six AMPs (East Gippsland, Beagle, Flinders, Jervis, Freycinet and Central Eastern), could be exposed to moderate thresholds of dissolved oil. East Gippsland, Modelling predicts the exposure of AMPs resulting from a LOWC ranges widely, depending the prevailing wind and current direction, and the proximity of the AMP to the release point. Flinders and Beagle AMPs were predicted to be contacted in four of the six modelled LOWC scenarios whereas Jervis and Freycinet were contacted in three of the six and Central Eastern in only one. Taking into consideration the potential impacts to the receptors within the AMPs the overall consequence is assessed as **Level II**
KEFs	KEFS are underwater features, and hence are not at direct risk from floating surface oil or shoreline accumulated oil. Deepwater geological features, such as the Big Horseshoe Canyon and Canyons on the Eastern Continental Slope will not be impacted directly by oil. However, biological values associated with KEFs such as the Upwelling East of Eden and Shelf Rocky Reefs may be at risk from oil. Potential impacts to sensitive receptors related to the KEF Upwelling East of Eden such as plankton and cetaceans, or to the KEF Shelf Rocky Reefs such as benthic communities and fish, are discussed in the appropriate sections above.	While a spill would not affect the KEF Upwelling East of Eden itself, if the spill occurs at the time of an upwelling event, it may result in krill being exposed to in-water phase hydrocarbons. Pygmy blue whales feeding at this time may suffer from reduced availability of prey however these impacts are expected to be localised and temporary. The rocky-reef habitat of the KEF Shelf Rocky Reefs generally occurs at depths of greater than 45 m and is therefore not expected to be impacted by in water (dissolved) hydrocarbons in the upper layers of the water column. The consequence is assessed as **Level III**.
Cultural – Indigenous and Historic	Visible sheen or oil stranded on the shoreline has the potential to reduce the visual or cultural (including activities such as camping, rituals and ceremonies) amenity of cultural heritage sites such as historic (e.g. shipwreck) or indigenous protected areas. Impacts from oil exposure are unlikely for submerged shipwrecks.	Oil sheen is predicted to encroach upon nearshore waters in the vicinity of the Gunai-Kurnai Native Title Determination Area and a number of historic shipwrecks. Parts of the Gippsland coast over which the Gunai-Kurnai people hold native title are predicted to be exposed to moderate – high shoreline oil loadings which may lead to reduced amenity or temporary exclusions during clean-up. Impacts from degraded aesthetics of sites along the coast may take time to recover but loss of access to sites during response or for health reasons are

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
		temporary and relatively short term. The consequence level is considered **Level III** based on public impact consequence considerations (media coverage, the scope of the disruption (personal, commerce, transportation or socio-economic) and the size of the population affected) as per ExxonMobil Risk Matrix Application Guide, 2018 (Refer Section 4.6, Table 4-5).
Commercial Fisheries	Commercial fishing has the potential to be impacted through exclusion zones associated with the spill, the spill response and subsequent reduction in fishing effort. Exclusion zones may impede access to commercial fishing areas, for a short period of time, and nets and lines may become oiled. The impacts to commercial fishing from a public perception perspective however, may be much more significant and longer term than the spill itself. Fishing areas may be closed for fishing for shorter or longer periods because of the risks of the catch being tainted by oil. Concentrations of petroleum contaminants in fish and crustacean and mollusc tissues could pose a significant potential for adverse human health effects, and until these products from nearshore fisheries have been cleared by the health authorities, they could be restricted for sale and human consumption. Indirectly, the fisheries sector will suffer a heavy loss if consumers are either stopped from using or unwilling to buy fish and shellfish from the region affected by the spill. Impacts to fish stocks have the potential for reduction in profits for commercial fisheries, and exclusion zones exclude fishing effort. Davis *et al* (2002) report detectable tainting of fish flesh after a 24-hour exposure at crude concentrations of 0.1 ppm, marine fuel oil concentrations of 0.33 ppm and diesel concentrations of 0.25 ppm. The Montara spill (as the most recent [2009] example of a large hydrocarbon spill in Australian waters) occurred over an area fished by the Northern Demersal Scalefish Managed Fishery (with 11 licences held by 7 operators), with goldband snapper, red emperor, saddletail snapper and yellow spotted rockcod being the key species fished (PTTEP, 2013). As a precautionary measure, the WA Department of Fisheries advised the commercial fishing fleet to avoid fishing in oil-affected waters. Testing of fish caught in areas of visible oil slick (November 2009) found that there were no detectable petroleum hydrocarbons in fish muscle samples, suggesting fish were safe for human consumption. In the short-term, fish had metabolised petroleum	Several commercial fisheries may operate within the area potentially exposed in the event of a LOWC. In several scenarios floating oil is predicted to extend 10's of kilometres outside the platform or subsea facility PSZ (from which fishing vessels are already excluded) making it likely that in these situations an exclusion zone (or fisheries closure) would be established. There are currently no commercially viable scallop beds fished in the area potentially exposed to dissolved hydrocarbons (ABARES, 2019: VFA, 2019: Koopman et al., 2018). Limited data is publicly available on the location and extent of abalone fishing within Victorian waters however a number of licences are active and it is known that harvesting occurs off Cape Conran and at Mallacoota (DEDJTR, 2019). Of the State and Commonwealth administered fisheries which overlap the PEA (see Table 5-1, Description of Environment) the fisheries most active in the area potentially exposed to hydrocarbons, and therefore potentially most at risk of socioeconomic impact from reduced market confidence, are the Southern and Eastern Scalefish and Shark Fishery (31 trawl vessels, 19 Danish-seine vessels and 21 scalefish hook vessels active in total) and the Wrasse Fishery (22 licences in total) (ABARES, 2019: VFA, 2019). A temporary fisheries closure and the flow on losses from the lack of income derived from these fisheries based on reduced market confidence and the potential for extended media coverage (potentially greater than 3 months) has the possibility of exceeding medium community disruption (> 100 – 1000 people) such as reduced employment (in fisheries service industries and the seafood supply chain). The potential economic impacts to commercial fisheries from LOWC are considered to be Public Impact **Consequence Level I** based on public impact consequence considerations (media coverage, the scope of the disruption (personal, commerce, transportation or socio-economic) and the size of the population affected) as per ExxonMobil Risk Matrix Application Guide, 2018 (Refer Section 4.5).

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
	hydrocarbons. Limited ill effects were detected in a small number of individual fish only (PTTEP, 2013). No consistent effects of exposure on fish health could be detected within two weeks following the end of the well release. Follow up sampling in areas affected by the spill during 2010 and 2011 (PTTEP, 2013) found negligible ongoing environmental impacts from the spill. Since testing began in the month after the DWH blowout in the GoM (2010), levels of oil contamination residue in seafood consistently tested 100 to 1,000 times lower than safety thresholds established by the USA FDA, and every sample tested was found to be far below the FDA's safety threshold for dispersant compounds (BP, 2015). FDA testing of oysters found oil contamination residues to be 10 to 100 times below safety thresholds (BP, 2014). Sampling data shows that post-spill fish populations in the GoM since 2011 were generally consistent with pre-spill ranges and for many shellfish species, commercial landings in the GoM in 2011 were comparable to pre-spill levels. In 2012, shrimp (prawn) and blue crab landings were within 2.0% of 2007-09 landings. Recreational fishing harvests in 2011, 2012 and 2013 exceeded landings from 2007-09 (BP, 2014).	
Tourism and Recreation	Refer also to sections on fish, cetaceans, benthic and coastal habitats and National Parks and Reserves above.	Tourism and recreation is also linked to the presence of marine fauna (e.g. whales), particular habitats and locations for swimming or recreational fishing. The modelling predicts visible oil extending into nearshore Victorian waters (including waters of Ninety Mile Beach, Point Hicks and Cape Howe Marine National Parks and Beware Reef Marine Sanctuary). Oil is predicted to contact hundreds of kilometres of shoreline at the moderate – high exposure threshold. The shoreline is dominated by sandy beaches popular for a range of recreational activities. A number of National parks and Reserves including the very popular Wilsons Promontory and (Gippsland) Lakes National Parks are situated along this potentially exposed coastline. Short to Medium-term impacts to nature-based tourism and other human uses of beaches (and nearshore waters) may occur as a result of temporary beach closures to enable clean-up, protect human health or due to perceptions of a polluted environment that is not desirable to visit. With respect to human health, post-Macondo oil spill (April 2010) studies in December found of 17000 water samples, none exceeded USEPA benchmarks for protection of human health (OSAT, 2010) and a year later residual oil in nearshore and sandy shoreline areas was highly weathered and concentrations

Receptor	Impact of hydrocarbon exposure	Exposure risk assessment
		of constituents of concern were below levels of concern for human health (OSAT, 2011). Alaska's tourism economy took approximately two years to recover from the Exxon Valdez (BOEM, 2017). The Eastern Research Group (2014) reported that while the DWH spill had had a significant impact on several areas of tourism in the short term and had wide-ranging impacts across the GoM, the tourism economy has rebounded to pre-spill levels within four years. The extent of potential impacts to tourism and recreation depends on when the spill occurs, size and where it comes ashore. Considering the range of activities and locations, the potential for reduced amenity of areas used by coastal tourists and recreational visitors, temporary health implications and possible closures, the consequence level is considered **Level I,** based on public impact consequence considerations (media coverage, the scope of the disruption (personal, commerce, transportation or socio-economic) and the size of the population affected) as per ExxonMobil Risk Matrix Application Guide, 2018 (Refer Section 4.5).

7.7.3.2 Likelihood Evaluation

The likelihood of LOWC has been developed based on SINTEF[1] records (as presented in the IOGP Risk Assessment Data Directory for Blowout Frequencies 2019) (IOGP, 2019) which presents the recommended frequencies of blowouts and well release incident based on industry data. The likelihood for LOWC has been established based on the following assumptions:

- Drilling and well operations are defined as being "of North Sea Standard" ("Operation performed with BOP installed including shear ram and two barrier principle followed") given the relevant safety case has been developed based on European standards and references various North Sea standards (e.g. NORSOK for barrier analysis, IOGP for relief well studies, Oil & Gas UK for relief well planning).
- The type of well operation is 'Workover'
  - As described in Section 7.7.1, the worst case discharge scenarios are based on a LOWC during a workover activities
  - Other activities considered have a lower likelihood of occurrence.
- The category is 'well release'
  - The IOGP Risk Assessment Data Directory differentiates between a 'well blowout' and a 'well release'.
    - A well blowout is defined as: "An incident where formation fluid flows out of the well or between formation layers after all the predefined technical well barriers or the activation of the same have failed."
    - A well release (defined as: "An incident where hydrocarbons flow from the well at some point where flow was not intended and the flow was stopped by use of the barrier system that was available on the well at the time of the incident")

As all ExxonMobil wellwork activities require multiple barriers and controls during wellwork activities, any well integrity issue is likely to be restricted to a limited well release rather than a blow-out.

Based on these assumptions, the frequency of a well release is expected to be:

- 7.6 × 10-4 for a Gas Well
- 3.7 × 10-4 for an oil well

This indicates the chances of the activity resulting in a LOWC (and the subsequent impacts to receptors) are **Very Unlikely (D)**

7.7.4 Risk Ranking

Consequence	Likelihood	Risk Ranking
II (environmental) / I (public impact)	D	3 (environmental) / 2 (public impact)

[1] SINTEF is a comprehensive event database for blowout risk assessment. The database includes information on 642 offshore blowouts/well releases that have occurred world-wide since 1955 and overall exposure data from the US Gulf of Mexico, Outer Continental Shelf and the North Sea. The blowouts/well releases are categorized in several parameters, emphasising blowout causes.

7.7.5 Controls

Good Practice	Adopted	Control	Rationale
Well operations planning to prevent LOWC	✓	**CM32:** NOPSEMA accepted WOMP	Under Part 5 of the Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011, NOPSEMA is required to accept a WOMP to enable well activities to be undertaken. The NOPSEMA accepted WOMP demonstrates how the risks to the integrity of the wells will be reduced to as low as reasonably practicable (ALARP). Esso's NOPSEMA-accepted WOMP describes the minimum requirements for maintaining a minimum of two independent tested barriers at all times, including during wellwork activities. . Barrier integrity is verified upon installation and at periodic intervals and operations will be suspended if a barrier fails resulting in fewer than two independent barriers remaining in place.
Implementation of a safety management system which controls risks arising from major incidents and achieves safe operation of the facility	✓	**CM34:** NOPSEMA accepted Safety Case	The NOPSEMA accepted Safety Case demonstrates how the risks to the integrity of the wells will be reduced to as low as reasonably practicable (ALARP). This includes: • Planned maintenance of pressure well control equipment • Testing of well control equipment • Validation of safety critical equipment
Maintain control of well during wellwork activities	✓	**CM33** WellWork Execution Manual (WEM)	The WEM defines the processes that must be followed to ensure that well intervention activities are undertaken safely. This includes the requirement that a program is prepared for each well intervention activity which includes consideration for • completion design, • wellwork fluid selection, • formation pressure and • existing known issues. This is to ensure that there are two barriers in the well at any time during wellwork. Procedures are signed off at appropriate level of management. The WEM outlines well control equipment requirements to prevent unexpected pressure releases or blowouts Well control equipment must be installed on every well that is being completed, worked over, or serviced to reliably shut

Good Practice	Adopted	Control	Rationale
			in the wellbore and to allow for control of any influx BOP equipment classifications are determined based on the properties of the well. BOPs must be pressure tested before any wellwork activities can commence.
Maintain well integrity	✓	**CM48** Well Integrity Management System (WIMS)	WIMS defines the processes that must be followed to ensure integrity of a well is monitored and maintained until it is abandoned. Integrity of the well is monitored through pressure monitoring and equipment testing. Integrity of the well is maintained through preventative maintenance and downhole corrosion control. WIMS testing is not completed on old exploration wells.
Maintain integrity of surface well equipment	✓		WIMS defines the process for maintaining and monitoring integrity of surface equipment associated with the wellhead such as the Christmas tree, safety valves and flowlines.
Source control methodology	✓	**CM60:** Isolation test plan for Subsurface isolation valves developed and actioned per FIMS process	Shutdowns can be put in effect by a number of initiators that indicate abnormal operating conditions (e.g. high pressures) that could bring the process to an unsafe state or an actual loss of containment of hydrocarbons (e.g. triggering gas detectors on the topsides). They can also be initiated manually. • A Surface Shutdown shuts down and isolates process equipment on a platform. • A Subsurface Shutdown does this and also initiates boundary isolation at the well subsurface safety valves and the pipeline LVOs (last valves on), FVOs (first valves off) and actuated SSIVs (subsea isolation valves) where installed. • A Generator Shutdown shuts down the electricity generators and initiates a Surface Shutdown. • A Total Platform Shutdown (TPS) initiates all of the above shutdowns and trips all sources of battery power other than those feeding hazardous area rated communications, lighting and navigation aids. A Subsurface Shutdown can be initiated on the platform or it can also be initiated from the Production Control Room at

Good Practice	Adopted	Control	Rationale
			Longford. Other shutdowns are initiated from the EAA or the control room on the platform.
	✓	**CM61**: Well Kill Contingency Plan	A well control response plan has been prepared for any production well with a critical well failure on a staffed or unstaffed platform in Bass Strait. The well control response plan has been developed to be applicable to all platforms and includes the following details: • Key roles and responsibilities • Defining relevant process conditions, equipment and procedures relevant to response activities at each platform • Defining critical well failure scenarios • Identifying key equipment and materials to execute the well control response plan • Rig up drawings at each facility The well control response plan primarily focuses on bullhead killing or lubricating production wells with the Well Kill Equipment Skid. Note that well failures on subsea wells, in open water and where the platform or wellhead is inaccessible due to fire or damage are outside the scope of this document. Such situations are covered in the Drilling Emergency Preparedness and Response (EP&R) Manual
	✓	**CM62**: Drilling Emergency Preparedness and Response Manual	The Drilling Emergency Preparedness and Response (EP&R) Manual outlines the approach UIS-Wells will take in response to emergencies. The Drilling EP&R Manual Includes Quick Reference Guides for emergency response including notifications, safety and first response checklists. Wells Team specific Tier II / III Emergency Preparedness & Response Plan may be prepared to plan for an expanded response structure in the event of a large-scale drilling-related incident.
	✓	**CM63:** Monitoring relief well rig availability.	A register of the status and location of suitable rigs to drill relief wells will be maintained and will be updated on a quarterly basis. The monitoring process used to identify availability of suitable rigs and support vessels (HLVs, OSVs) is done through a system which allows Esso to determine how long the rigs are likely to be available for and therefore provides an outlook of

Good Practice	Adopted	Control	Rationale
			when availability might change in advance. Under normal circumstances, the average rig count for Australia is 16, with most of these capable of drilling a relief well in the Bass Strait area. The average rig count generally remains constant and is not expected to change significantly. In the unlikely event that there is no suitable rig available to allow a relief well to be drilled in the committed timeframe, (see Section 7.7.5.1 below) the wellwork activities will be made safe and suspended until such time as the activity can comply with this EP or the EP is resubmitted and accepted.
Oil spill response planning	✓	**CM12:** OPEP	Under the OPGGSE Regulations, the petroleum activity must have an accepted Oil Pollution Emergency Plan (OPEP) in place (Reg. 14(8). In the event of a LOWC, the OPEP will be implemented. Capability is maintained to ensure OPEP can be implemented in response to an incident, as expected. This includes maintaining contracts with third party service providers to ensure required materials are available at the time of an incident.
Oil spill monitoring planning	✓	**CM35:** OSMP	The OSMP is a key part of an integrated package of environmental management documentation that also includes the environment plan (EP) and the oil pollution emergency plan (OPEP). It is defined under (Reg. 14(8) of the OPGGSE Regulations. The OSMP is the principle tool for determining the extent, severity and persistence of environmental impacts from an oil spill, and allows titleholders to determine whether their environmental protection goals are met. Esso's OSMP details the arrangements and capability in place for: • Operational monitoring of a hydrocarbon spill to inform response activities • Scientific monitoring of environmental impacts of the spill and response activities. Operational monitoring will allow adequate information to be provided to aid decision making to ensure response activities are timely, safe, and appropriate. Scientific monitoring will identify if potential longer-term remediation activities may be required

Good Practice	Adopted	Control	Rationale
			Capability is maintained to ensure OSMP can be implemented in response to an incident, as expected.
Utilisation of idle fishing vessels		**CM51:** Utilisation of idle vessels	Opportunities to utilise idle fishing vessels for oil spill response and monitoring activities will be taken where there is agreement of the vessel owner and where a risk assessment shows that there are no additional risks to vessels and crew.
Communication with fisheries	✓	**CM52**: Communication with fisheries	Updates on oil spill response and monitoring provided to fishery representative bodies (through SETFIA) to enable accurate information on spill status, impacts and effects of spilled hydrocarbons on seafood safety to be provided to fishing industry members and the public. Daily updates provided in the first week until the modelling is completed and then as needed, until relief well completed (and beyond if there is ongoing concern).

7.7.5.1 Relief well drilling

Should implementation of relief well drilling be required to mitigate the impacts from LOWC, it is expected to take up to 98 days. The response time for a relief well is based on rig mobilisation from Dampier, assuming a semi-submersible MODU being wet-towed. The time to drill a relief well was chosen as the basis for spill volume calculations.

A detailed breakdown for response times based on the 98 day planning scenario is provided in Table 7-29. The IOGP Response Time Model Toolkit would also be utilised to plan response time for a relief well (IOGP, 2019a).

Table 7-29 Response Time Breakdown (Wet Tow Scenario)

Operation	Duration (days)	Cumulative (days)
Notifications; Mobilise specialist personnel; Initiate source control emergency response plan; Source MODU; Contract; Source AHTS.	7	7
MODU suspend well, demoor, transit to Dampier	14	21
Tow to incident location (4 knots)	30	51
Load materials	2	53
Moor and drill relief well	35	88
Weather allowance	5	93
Kill well	**5**	**98**

The 98 day drilling scenario is a conservative estimate. Mobilisation may be able to be accelerated through the use of a Heavy Lift Vessel (HLV) for MODU/JUR transport which would occur, as an example from Singapore, in approximately 85 days. An example of the breakdown of the 85 day response scenario is provided in Table 7-30.

Table 7-30 Response Time Breakdown (HLV Scenario)

Operation	Duration (days)	Cumulative (days)
Notifications; Mobilise specialist personnel; Initiate source control emergency response plan; Source MODU; Contract; Prepare for transport Source Heavy Transport Vessel; Prepare for transport operation	10	10
Load MODU	3	13
Transit Singapore to Westernport Bay	15	28
Offload MODU; Load materials	2	30
Tow to incident site; Load materials	4	34
Conduct jack-up foundation geotechnical survey; Preload	4	38
Drill relief well	35	73
Weather allowance	7	80
Kill well	**5**	**85**

A critical part of the response will be to secure a suitable MODU/JUR capable of drilling a relief well. Depending upon the location, the MODU may require the use of a HLV to expedite mobilisation (towed MODU averages 4 knots, compared with >12 knots for HLV).

The selection of a suitable MODU/JUR and support vessels would focus on the units currently operating in Australia under an accepted Safety Case that are suitable to drill the relief well (considering water depth and other well specifications). If required, a vessel Safety Case acceptance would be worked during the time it takes to mobilise the rig to the incident location (~ 51 days).

The accepted vessel Safety Case as revised for the WTA P&A campaign would be used as the basis for preparing the relief rig Safety Case and best efforts would be made to secure acceptance for the relief rig within the mobilisation timeframe. MODU/JUR, HLV and support vessels would need to meet project ballast water / biofouling requirements.

7.7.6 Demonstration of ALARP

ALARP Decision Context and Justification	Decision Context B Operation and wellwork activities are a well-established practice and the environmental and public impact risks (Category 3 Medium and Category 2 Medium respectively) associated with a LOWC are well understood and effectively managed by existing controls. The environmental and public consequences of a LOWC have been assessed as moderate – high and in recognition of the interest from both relevant stakeholders and the public about the potential impacts of a major oil spill. The utilisation of idle fishing vessels (where practicable and safe to do so) and ensuring ongoing communication with the fishing industry bodies will assist in mitigating socioeconomic impacts to commercial fisheries and the seafood supply chain. Consequently, Esso believes **ALARP Decision Context B** should apply.

Additional, Alternative, Improved Controls	Benefit	Cost / Feasibility	Adopted
Utilisation of idle fishing vessels	Opportunities to utilise idle fishing vessels for oil spill response and	There are minor costs associated with using idle	Adopted

Additional, Alternative, Improved Controls	Benefit	Cost / Feasibility	Adopted
	monitoring activities will be taken where there is agreement of the vessel owner and where a risk assessment shows that there are no additional risks to vessels and crew.	fishing vessels including ensuring safety and training standards are met in the event of an incident. Costs are considered reasonable given the high public impact consequence	**CM51:** Utilisation of idle vessels
Communication with fisheries	Updates on oil spill response and monitoring provided to fishery representative bodies (through SETFIA) to enable accurate information on spill status, impacts and effects of spilled hydrocarbons on seafood safety to be provided to fishing industry members and the public. Daily updates provided in the first week until the modelling is completed and then as needed, until relief well completed (and beyond if there is ongoing concern).	There is minor costs associated with sending communication out to stakeholders, particularly as there has been ongoing consultation through the EP. Costs are considered reasonable given the high public impact consequence.	Adopted **CM52**: Communication with fisheries
Continual WIMS monitoring of old exploration wells	Monitoring of old exploration wells could provide early indication of integrity issues.	Exploration wells have not been perforated for production, meaning the production casing is intact, further reducing pathways for reservoir to atmosphere. Exploration wells have been temporarily abandoned which reduces the likelihood of release as per IOGP Blowout Frequency Data. Exploration wells do not have infrastructure installed to allow for WIMS testing. WIMS testing would require use of an ROV and well intervention. The act of undertaking this activity would increase the likelihood of a release. The cost and increased risk of release from completing WIMS testing on old exploration wells does not provide a net benefit.	Not adopted
Early abandonment of each well, outside of P&A campaign	Abandonment of wells can minimise the likelihood of a loss of well control incident occurring.	Use of a wellwork skid to abandon a well is highly expensive requiring mobilisation of vessels, equipment and personnel to a platform. Use of a Jack Up Rig to abandon wells is more expensive than a wellwork skid and requires additional vessel support. Use of a JUR would require a supporting environment plan as the rig	Not adopted

Additional, Alternative, Improved Controls	Benefit	Cost / Feasibility	Adopted
		presents a number of environmental impacts. There are significant cost and safety efficiencies in completing well abandonments as part of a campaign. As per the analysis in Section 6.7.1 above, the initiating event leading to a worst case discharge scenario is undertaking wellwork activities. The likelihood and consequence associated with shut-in, suspended and temporarily abandoned wells is less than that during wellwork activities. This indicates that, provided there are no integrity or safety drivers to abandon wells, there is no significant increase in risk for shut-in, suspended and temporarily abandoned wells, which is less than that during wellwork activities. Considering the increase in risk of release while undertaking wellwork activities, the risk reduction gained from abandonment of individual wells outside of P&A campaigns is not proportionate to the cost.	
Use of a capping stack (vertical or offset)	Capping stacks can be used on subsea wells in the event of a LOWC to reduce flow from a well and reduce the volume of reservoir fluid released.	Capping stacks cannot be used on platform based wells. Capping stacks have limited applicability on subsea facilities. OSRL's offset capping stack system is limited due to minimum depth requirements (>75 m) and long mobilisation times. Use of capping stacks is not feasible due to water depth at West Barracouta (BTW) (at 46m depth) Note that the subsea wells at Blackback (at 402m depth), Seahorse (42m depth) and Tarwhine (at 42m depth) have been abandoned and are no longer considered part of the activity (as per OPPGS Regulations (Well Operations), Reg 5.17). Use of a capping stack at the KPA location (95m) is not considered reasonably	Not adopted

Additional, Alternative, Improved Controls	Benefit	Cost / Feasibility	Adopted
		practicable for the following reasons which indicate that the technical feasibility of using a capping stack at the KPA location is not feasible: • Modelling of a LOC at the KPA location indicates a ~66m radius “bubble zone” at the water line due to the shallow gas release. This eliminates the potential for vertical access capping stacks. • Use of the OSRL offset installation system (OIS) is notionally rated to 75-600m water depth and deployment is particularly challenging in shallow waters, under high discharge rates and/or high gas/oil ratio (GOR). • The KPA wells have a high GOR (0.15 sKL/SKm3) further reducing the safety and likelihood of effective use of a capping stack. • While in production, well heads are covered with trawl protection frames further reducing the likelihood that a capping stack could be deployed.	
Third level of well barriers	Increased level of protection from uncontrolled flow from a well beyond the ‘two barrier’ requirement.	The two barrier philosophy is considered industry best practice and the BOP already has multiple barriers with redundancy, specifically designed to reduce the risk to ALARP as per the WOMP.	Not Adopted
Relief well drilling rig available locally to reduce mobilisation time	Having a MODU on standby may allow the relief well to be drilled 34 days earlier, thus reducing the volume of release. There is an extremely low probability of occurrence of a source control event.	Esso Bass Strait Operations are a continuous production operation with production and wellwork activities happing on an ongoing basis. It is not feasible to have a standby MODU available throughout the lifetime of the operation. Given the high costs to the program, implementing this control measure is considered disproportionate, given that the source control event has an extremely low likelihood of occurrence.	Not Adopted

Additional, Alternative, Improved Controls	Benefit	Cost / Feasibility	Adopted
Relief well materials staged locally	Response time for relief well drilling is dependent on the availability of necessary well construction equipment (i.e. wellhead, casing). No meaningful reduction in time for relief well drilling as sufficient materials available as spares or can be procured within short timeframes.	Wellhead and casing requirements will be identified during the planning phase done concurrent with MODU mobilisation. Any additional equipment would be mobilised from existing ExxonMobil global inventory.	Not Adopted
Prepare detailed Relief Well Plan in advance	Detailed Relief Well Plan needs to be developed on a case by case basis. Detailed Plan can be developed immediately after LOWC scenario is fully understood, and while relief well rig is being mobilised. The benefit from preparing a detailed relief well plan without knowing specifics of the LOWC is nominal.	Sufficient time would be available to prepare a detailed relief well plan when the specific blow-out parameters for a relief well can be determined, immediately following the incident, and whilst the relief rig is being mobilised. Given the requirements for specific details and the number of different types of well locations and well designs in Bass Strait Operations, this control measure is considered disproportionate, given that the source control event has an extremely low likelihood of occurrence.	Not Adopted

7.7.7 Demonstration of Acceptability

Factor	Demonstration Criteria	Criteria Met	Rationale
Risk Assessment Process for Unplanned Events	The risk ranking is lower than Category 1	✓	The environmental risk ranking is Category 3 and the public impact risk ranking Category 2, and therefore considered acceptable.
Principles of Ecologically Sustainable Development (ESD)	No potential to affect biological diversity and ecological integrity.	✓	The impacts associated with this aspect are potentially significant but moderate in size/scale and medium term, which is not considered as having the potential to affect biological diversity and ecological integrity.
	Activity does not have the potential to result in serious or irreversible environmental damage.	✓	The activity is not considered as having the potential to result in long term or irreversible environmental damage.
Legislative and Other Requirements	Legislative and other requirements have been identified and met.	✓	• The proposed activities align with the requirements of the OPGGS Act 2006: • Schedule 3 Occupational health and safety and OPGGS(S)R. The OPGGS(S)R require the operator of

Factor	Demonstration Criteria	Criteria Met	Rationale
			each offshore facility to prepare a safety case for submission to NOPSEMA. Activities at a facility must be conducted in accordance with a safety case that has been accepted by NOPSEMA. • Part 5, OPGGS (Resource Management and Administration) Regulations 2011 which require NOPSEMA to accept a WOMP to enable well activities to be undertaken. • The following other requirements were identified as relevant to impacts from a LOWC. Oil spills are a recognised threat to these species and proposed activity is consistent with conservation / management actions where specified: • Approved Conservation Advice for *Thinornis rubricollis* (Hooded Plover, Eastern) • Approved Conservation Advice for Sternula nereis nereis (Fairy Tern)
Internal Context	Consistent with Esso's Environment Policy.	✓	Proposed activities are consistent with Esso's Environment Policy, in particular, to "comply with all applicable environmental laws and regulations and apply responsible standards where laws and regulations do not exist"
	Meets ExxonMobil Environmental Standards	✓	There is no standard related to a LOC of reservoir hydrocarbons but the activities proposed meet the strategic objectives of the Upstream Environmental Standards.
	Meets ExxonMobil Operations Integrity Management System (OIMS) Objectives	✓	Proposed activities meet: • OIMS System 6-3 Well Management, detailing Wellwork Execution Manual (WEM). • OIMS System 6-5 objective to identify and assess environmental aspects; significant aspects are addressed and controlled consistent with policy and regulatory requirements; • OIMS System 8-1 objective to clearly define and communicate operations integrity requirements to contractors; • OIMS System 10-1 objective to anticipate community concerns and develop response plans, as appropriate; and • OIMS System 10-2 objectives to document, resource and communicate emergency response plans, and conduct training, exercises and/or drills

Factor	Demonstration Criteria	Criteria Met	Rationale
			to determine the adequacy of the plans.
External Context	Stakeholder concerns have been considered / addressed through the consultation process.	✓	Concerns from relevant stakeholders addressed through the consultation process. Any new relevant stakeholder objections, claims or issues will be considered in line with the ongoing consultation.

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Appendix A – Bass Strait Operations Inventory

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4.1 Facilities

Table 1 Facilities (Platforms)

Item	Inventory	Staffing status [max POB]	Location	Distance to coast	Water depth	Status (as at Dec 2020)	Expected status as at 2025
Barracouta (BTA)	Barracouta platform is an eight-leg steel piled jacket. Staffed facility. 10 conductor slots, 10 conductors and 10 wells drilled. One well injects LPG into the reservoir for storage when gas demand exceeds LPG processing capacity.	Staffed [31]	VIC/L02 (38° 17' 53" S; 147° 40' 28" E)	23 km	46 m	Production	Cessation of Production
Whiting (WTA)	Whiting platform. Four leg steel piled jacket with 6 conductor slots, provision for 8 wells but 5 wells drilled. Day-only accommodation Oil production ceased in 1997 and facility was declared CoP in 2019 after studies found gas development at Whiting unviable. Wells P&A'd in 2020 and all conductors have been pulled.	Unstaffed	VIC/L02 (38° 14' 29" S; 147° 72' 20" E)	34 km	54 m	Cessation of Production	Stasis mode
Marlin A (MLA)	Marlin A platform is an eight-leg steel piled jacket. MLA and MLB are connected by an upper and lower walkway bridge. 24 slots, 24 conductors and 24 wells drilled. The majority of wells in service are classified as gas producers, with a few wells classified as oil producers and reinjectors.	Staffed [96]	VIC/L03: (38° 13' 54" S, 148° 13' 09" E)	42 km	59 m	Production	Cessation of Production
Marlin B (MLB)	Marlin B platform is an eight-leg steel piled jacket. MLA and MLB are connected by an upper and lower walkway bridge. No accommodation facilities on Marlin B. 18 conductor slots, 7 conductors and 5 wells drilled. Wells include oil production wells, gas production wells and gas re-injection wells.	Staffed [n/a, accommodation on MLA]	VIC/L03: (38° 13' 46" S, 148° 13' 16" E)	42 km	59 m	Production	Production
West Tuna (WTN)	West Tuna platform is a three-leg concrete gravity structure (CGS). Northern legs of the CGS are each designed with 24 well conductor slots. In total 48 conductors and 47 wells drilled. The majority of wells are classified as oil producers; however, they do also produce gas. A minority of wells are gas injectors and gas producers.	Staffed [82]	VIC/L04: (38° 11' 37" S, 148° 23' 15" E) **RAT** VIC/L04: (38° 11' 29"	45 km	61 m	Production	Production

Item	Inventory	Staffing status [max POB]	Location	Distance to coast	Water depth	Status (as at Dec 2020)	Expected status as at 2025
	WTN is connected to the KPA subsea facility via WTN350 pipeline and MLB via WTN450 pipeline. These pipelines are attached to WTN via a Riser Access Tower (RAT), located approximately 60 m to the north-east of WTN and connected by a bridge.		S, 148° 23' 23" E)				
Halibut (HLA)	The Halibut platform is made up of two steel piled jacket structures, each consisting of eight legs. 24 conductor slots, with 23 conductors and 22 wells drilled. All wells are classified as oil producers. HLA acts as a gathering platform. Pipeline contents from BMA, BMB, WKF, KFA, KFB, MKA, CBA and FTA platforms is combined with HLA produced oil and transferred to shore via the HLA-Shore 600 pipeline. HLA receives fuel gas from MLA through MLA-MKA100. Fuel gas from this pipeline is also exported to CBA (HLA-CBA100) and FTA (HLA-FTA100).	Staffed [44]	VIC/L05: (38° 24' 20" S, 148° 19' 07" E)	63 km	73 m	Production	Cessation of Production
Fortescue (FTA)	Fortescue platform is an eight-leg steel piled jacket. 31 slots, 31 conductors and 31 wells drilled. All wells are classified as oil producers. Ceased production in March 2020	Periodically staffed during cessation of production stage. [60]	VIC/L05: (38° 28' 50" S, 148° 20' 28" E)	62 km	69 m	Cessation of production	Stasis mode
Cobia (CBA)	Cobia platform is an eight-leg steel piled jacket. 25 slots, 25 conductors and 25 wells drilled. All wells are classified as oil producers. Cobia platform suspended production in 2014 due to a leak in the CBA300 pipeline. The pipeline was repaired and production recommenced in Q4 2019.	Staffed [58]	VIC/L05: (38° 24' 32" S, 148° 16' 36" E)	68 km	75 m	Production	Cessation of Production
Mackerel (MKA)	Mackerel platform is an eight-leg steel piled jacket. 25 slots, 25 conductors and 25 wells drilled. Ceased production in 2015. P&A in progress. Expect P&A to be completed by end of 1Q 2021.	Periodically staffed during cessation of production stage. [58]	VIC/L05: (38° 27' 04" S, 148° 18' 28" E)	72 km	93 m	Cessation of Production	Stasis mode
Kingfish A (KFA)	Kingfish A platform is an eight-leg steel piled jacket. 21 slots, 21 conductors and 21 wells drilled. Ceased production in 2015.	Periodically staffed during cessation of production stage. [41]	VIC/L07: (38° 35' 51" S, 148° 08' 35" E)	77 km	77 m	Cessation of Production	Cessation of Production
Kingfish B (KFB)	Kingfish B platform is an eight-leg steel piled jacket. 21 slots, 21 conductors and 21 wells drilled. All of the wells in service are classified as oil producers except for two which are classified as water injectors. Ceased production in 2019.	Periodically staffed during cessation of production stage. [41]	VIC/L07: (38° 35' 54" S, 148° 11' 11" E)	77 km	78 m	Cessation of Production	Cessation of Production

Item	Inventory	Staffing status [max POB]	Location	Distance to coast	Water depth	Status (as at Dec 2020)	Expected status as at 2025
West Kingfish (WKF)	West Kingfish platform is an eight-leg steel piled jacket. 33 slots, 33 conductors and 32 wells. All of the wells in service are classified as oil producers	Staffed [56]	VIC/L07: (38° 35' 39" S; 148° 06' 15" E)	72 km	76 m	Production	Cessation of Production
Tuna (TNA)	Tuna platform is an eight-leg steel piled jacket. 33 slots, 33 conductors and 33 wells drilled. Wells are classified as either oil or gas producers. One well is a gas injector.	Staffed [51]	VIC/L09: (38° 10' 16" S; 148° 25' 05" E)	43 km	59 m	Production	Production
Snapper (SNA)	Snapper platform is an eight-leg steel piled jacket. 45 slots, 39 conductors and 33 wells drilled. All wells are classified as oil or gas producers.	Staffed [79]	VIC/L10: (38° 11' 42" S; 148° 01' 26" E)	32 km	55 m	Production	Cessation of Production
Flounder (FLA)	Flounder platform is an eight-leg steel piled jacket. 27 slots, 27 conductors and 27 wells drilled. Wells produce oil and gas. Ceased production in May 2020.	Staffed. In the future, will be periodically staffed during cessation of production stage. [73]	VIC/L11: (38° 18' 44" S; 148° 26' 16" E)	58 km	93 m	Cessation of Production	Stasis mode
Bream A (BMA)	Bream A platform is an eight-leg steel piled jacket. 27 slots, 27 conductors and 27 wells drilled. Most wells are classified as oil producers, but also produce gas. Others are classified as gas producers. Ceased production in September 2020.	Periodically staffed during cessation of production stage. [80]	VIC/L13: (38° 30' 03" S; 147° 46' 15" E)	48 km	59 m	Cessation of Production	Stasis mode
Bream B (BMB)	Bream B platform is a fixed installation on a single leg CGS. 18 slots, 17 conductors and 17 wells drilled. The majority of wells are classified as oil producers. One well is classified as a gas producer and is used for gas lift. Ceased production in September 2020.	No accommodation facilities. Day visits only.	VIC/L14: (38° 31' 12" S; 147° 50' 16" E)	51 km	61 m	Cessation of Production	Cessation of Production
Dolphin (DPA)	Dolphin platform is a fixed installation on a steel gravity based monotower. The DPA platform has 2 slots, 2 conductors and 2 wells drilled. Ceased production in 2014.	No accommodation facilities. Day visits only.	VIC/L15: (38° 29' 20" S; 147° 22' 34" E)	21 km	38 m	Cessation of Production	Stasis mode
Perch (PCA)	Perch platform is a fixed installation on a steel gravity based monotower. The PCA platform has 2 slots, 2 conductors and 2 wells drilled. Ceased production in 2014.	No accommodation facilities. Day visits only.	VIC/L17: (38° 34' 15" S; 147° 19' 16" E)	24 km	42 m	Cessation of Production	Stasis mode

Table 2 Facilities (Subsea)

Item	Inventory	Location	Distance to coast	Water depth	Status (as at Dec 2020)	Expected status as at 2025
Kipper (KPA)	Kipper subsea facility connect to WTN via the WTN-RAT. Comprises production manifold, 4 x coolers, 4 flowbases with 2 wellheads (fitted with trawl protection frames). The Kipper wells are classified as gas producers. Additional subsea gas production wells are planned for the existing facility.	VIC/L25: (38°10' 53" S; 148° 35' 35" E) Or 38° 18' 11" S; 148° 59' 36 E" (BTW Campaign??)	41 km	95 m	Production	Production
Seahorse (SHA)	Seahorse subsea facility connected to BTA by an oil pipeline (SHA-BTA150), a 65 mm gas lift line and an electrohydraulic umbilical. The SHA subsea facility consists of one subsea well. The well is classified as an oil producer Subsea tree was removed following plug and abandonment in September 2020. Electrical Flying Leads, subsea tree base plate, UTA and umbilical remain in place on the seabed pending assessment as part of the Bass Strait decommissioning program. The SHA and TWA plug and abandonment activity is the subject of a separate Environment Plan. Ceased production in 2014.	VIC/L18: (38° 11' 42" S; 147° 40' 27" E)	21 km	42 m	Stasis mode	Stasis mode
Tarwhine (TWA)	Tarwhine subsea facility is connected to BTA by an oil pipeline (TWA-BTA200), a 65 mm gas lift line and an electrohydraulic umbilical. The TWA subsea facility consists of one subsea well. The well is classified as an oil producer. Subsea tree was removed following plug and abandonment in October 2020. Subsea tree base plate, UTA and umbilical remain on the seabed pending assessment as part of the Bass Strait decommissioning program. The SHA and TWA plug and abandonment activity is the subject of a separate Environment Plan. Ceased production in 2008.	VIC/L01: (38° 24' 12" S; 147° 31' 46" E)	21 km	42 m	Stasis mode	Stasis mode
Blackback (BKA)	The three BKA wells have been plugged and abandoned and the subsea trees have been removed in 2018. Disconnected flexible jumpers, electrical and chemical flying leads, UTA and PTA remain in place on seabed pending assessment as part of the Bass Strait decommissioning program, as well as the TGB for one well, below the mudline. Ceased production in 2010.	VIC/L20: (38° 32' 26" S148° 33' 16" E)	87 km	402 m	Stasis mode	Stasis mode
West Barracouta (BTW)	Two subsea gas production wells have been drilled in 2020 approximately 6 km southwest of the BTA platform. The subsea facility will consist of two subsea trees with trawl protection frames connected via jumpers and flying leads to a FLEM and UTA. This subsea facility will be controlled from BTA	VIC/L02 (38° 19' 06" S, 147° 36' 53" E)	22 km	46 m	Expected to commence production in 2021	Production

Item	Inventory	Location	Distance to coast	Water depth	Status (as at Dec 2020)	Expected status as at 2025
	via an electrohydraulic umbilical and is to be tied back to the existing BTA450 pipeline.					

4.2 Pipelines

Table 3 Primary pipelines

Licence(s)	Pipeline Name	From	To	Length (km)	Nominal OD (mm)	Product	Equipment design life	Status (as at Dec 2020)	Expected status as at 2025
VIC/PL1, VIC/PL1(V)	BTA450-Shore	BTA	Shore	24.5	450	Gas	2030	Production	Production
VIC/PL1	BTW300-BTA450Tee	BTW	BTA450Tee	5.6	300	Gas	2036	Production	Production
VIC/PL2, VIC/PL2(V)	MLA500-Shore	MLA	Shore	52.6	500	Gas	2040	Production	Production
VIC/PL4, VIC/PL4(V)	BTA150-Shore	BTA	Shore	24.5	150	Oil	2030	Production	Production
VIC/PL5, VIC/PL5(V)	HLA600-Shore	HLA	Shore	77	600	Oil	2040	Production	Production
VIC/PL6	KFA400-KFB	KFA	KFB	4.6	400	Oil	2030	Production	Cessation of Production
VIC/PL7	KFB500-HLA	KFB	HLA	27	500	Oil	2030	Production	Cessation of Production
VIC/PL8	MKA300-HLA	MKA	HLA	8.6	300	Oil	2030	Cessation of Production	Stasis mode
VIC/PL9	TNA300-MLA	TNA	MLA	18.7	300	Gas, previously in oil service	2035	Production	Production
VIC/PL10	TNA200-MLA	TNA	MLA	18.7	200	Oil, previously in gas service	2035	Production	Production
VIC/PL11	MLA300-HLA600Tee	MLA	HLA600Tee	1.6	300	Oil	2030	Production	Cessation of Production
VIC/PL13, VIC/PL13(V)	SNA600-Shore	SNA	Shore		600	Gas	2040	Production	Production

Licence(s)	Pipeline Name	From	To	Length (km)	Nominal OD (mm)	Product	Equipment design life	Status (as at Dec 2020)	Expected status as at 2025
VIC/PL14	WKF300-KFA	WKF	KFA	3.5	300	Oil	2030	Production	Cessation of Production
VIC/PL15	CBA300-HLA	CBA	HLA	5.5	300	Inhibited Seawater	2030	Cessation of Production	Stasis mode
VIC/PL15	CBA150-HLA	CBA	HLA	5.5	150	Oil	2036	Production	Cessation of Production
VIC/PL16	FTA300-HLA	FTA	HLA	4.1	300	Oil	2030	Cessation of Production	Stasis mode
VIC/PL17	FLA250-TNA	FLA	TNA	17	250	Gas, previously in oil service	2030	Production	Cessation of Production
VIC/PL18	FLA250-TNA	FLA	TNA	17	250	Oil, previously in gas service	2030	Cessation of Production	Cessation of Production
VIC/PL19	SNA250-MLA	SNA	MLA	18	250	Oil	2035	Production	Production
VIC/PL20	BMA400-WKF	BMA	WKF	32	400	Oil	2030	Cessation of Production	Stasis mode
VIC/PL21, VIC/PL21(V)	PCA/DPA300-Shore	PCA/DPA	Shore	32	300	Oil	2019 (requalification in progress)	Cessation of Production	Stasis mode
VIC/PL22	SHA150-BTA	SHA	BTA	11.3	150	Inhibited seawater	n/a	Cessation of Production	Stasis mode
VIC/PL23	TWA200-BTA	TWA	BTA	17.4	200	Inhibited seawater	n/a	Cessation of production	Stasis mode
VIC/PL24	WTA250-SNA	WTA	SNA	14.6	250	Inhibited seawater	n/a	Cessation of Production	Stasis mode
VIC/PL25	WTA200-SNA	WTA	SNA	14.6	200	Inhibited seawater	n/a	Cessation of Production	Stasis mode
VIC/PL26	BMB250-BMA	BMB	BMA	6.2	250	Oil, Gas	2026	Cessation of Production	Stasis mode
VIC/PL27	TNA100-WTN	TNA	WTN	3.6	100	Gas	2026	Production	Production
VIC/PL28	WTN250-TNA	WTN	TNA	3.6	250	Oil	2026	Production	Production
VIC/PL29	BKA200-MKA	BKA	MKA	22.5	200	Inhibited seawater	n/a	Cessation of production	Stasis mode

Licence(s)	Pipeline Name	From	To	Length (km)	Nominal OD (mm)	Product	Equipment design life	Status (as at Dec 2020)	Expected status as at 2025
VIC/PL32, VIC/PL32(V)	BMA350-Shore	BMA	Shore	46.9	350	Gas	2032	Production	Stasis mode
VIC/PL39	KPA350-WTN (North & South)	KPA	WTN	18.1 each	both 350	Gas	2036	Production	Production
VIC/PL40	WTN450-MLB	WTN	MLB	16.5	450	Gas	2036	Production	Production
VIC/PL41	MLB450-SNA	MLB	SNA	18.3	450	Gas	2036	Production	Production

Table 4 Secondary pipelines

Licence(s)	Pipeline Name	From	To	Length (km)	Nominal OD (mm)	Product	Status (as at Dec 2020)	Expected status as at 2025
VIC/SL2	MLA100-HLA/MKA	MLA	HLA/MKA	32	100	Gas	Production	Production
VIC/SL3	HLA100-CBA	HLA	CRA	5.5	100	Gas	Production	Production
VIC/SL4	HLA100-FTA	HLA	FTA	4.1	100	Gas	Production	Production
VIC/SL5	Shore-PCA/DPA100	Shore	PCA/DPA	32	100	Gas	Cessation of Production	Stasis mode
VIC/SL6	BTA65-SHA	BTA	SHA	11.3	65	Inhibited seawater	Cessation of Production	Stasis mode
VIC/SL7	BTA65-TWA	BTA	TWA	17.4	65	Inhibited seawater	Cessation of Production	Stasis mode
VIC/SL8	MKA65-BKA	MKA	BKA	22.5	65	Inhibited seawater	Cessation of Production	Stasis mode
VIC/SL9	MLA150-KFB/KFA/WKF	MLA	KFB/KFA/WKF	53	150	Gas	Production	Production

Secondary lines are not petroleum pipelines and therefore do not have separate petroleum pipeline licences

As well as the section of the original CBA300 pipeline listed in Table 3 there are other sections of pipelines which have been flushed and are on the seabed:-

- 4km of MKA300 oil pipeline (at MKA end)
- 7km of FLA250 oil pipeline (at FLA end)
- 2 x 4.5km CBA2 100 to MKA oil pipelines (VIC/SL1)
- 1 x 4.5km MKA 25 to CBA2 chemical line
- 0.2km BTA250 to subsea vent gas line
- 0.25km MLA250 to subsea vent gas line

Subsea umbilicals:-

- 23.2km MKA to BKA electrical/hydraulic umbilical –not operating
- 4.6km MKA to CBA2 electrical umbilical –not operating

- 11.5km BTA to SHA electrical/hydraulic umbilical –not operating
- 17.6km BTA to TWA electrical/hydraulic umbilical –not operating
- 6.3km BMA to BMB control umbilical –operating
- 5.9km BTA to BTW electrical/hydraulic umbilical – will be operating by end of 2020
- 18.3km WTN to KPA electrical umbilical –operating
- 18.3km WTN to KPA fluids umbilical –operating
- 5 ea short (<0.3km) umbilicals to operate subsea valves in pipelines – all currently operating:-
    - Umbilical to subsea UV in KFA branch of MLA150 FG line near KFA
    - Umbilical to subsea UV in KFB branch of MLA150 FG line near KFB
    - Umbilical to subsea UV in MLA150 FG line near WKF
    - Umbilical to SSIV in MLB450 near SNA
    - Umbilical to SSIV in BMA350 near BMA

4.3 Wells

Table 5 Well Status Definition

Wells (as per description in Section 3.1 of Gippsland Basin Well Operations Management Plan)	
Active	Wells which flow naturally to the surface or are assisted by gas lift injection.
Shut-in	Production from, or injection into, a well has been ceased without isolating the well from the reservoir, with the intention that the operation be resumed within one year.
Suspended	Production from, or injection into, a well has been ceased by isolating the tubing from the reservoir, with the intention that the operation be resumed either after a period that is: • Short term (hour/days/weeks) or • Long term (months/years) Depending on the planned suspension duration, non-permanent barriers such as wireline plugs and kill weight fluid may be employed.
Temporarily abandoned	Reservoir has been isolated with a temporary plug and abandonment (TP&A) barrier, such as a mechanical plug or cement.
Abandoned	Reservoir has been isolated and plug and abandonment has been completed in accordance with the requirements in the WOMP.

Table 6 List of applicable wells

Name	License	Status
BARRACOUTA A1	VIC/L1	Active
WEST BARRACOUTA W1	VIC/L1	Suspended
WEST BARRACOUTA W2	VIC/L1	Suspended
TARWHINE 1	VIC/L1	Abandoned
WHIPTAIL 1A	VIC/L1	Temporarily Abandoned
COBIA A9	VIC/L10	Suspended
SNAPPER A1	VIC/L10	Active
SNAPPER A10	VIC/L10	Active
SNAPPER A11	VIC/L10	Active
SNAPPER A12	VIC/L10	Active
SNAPPER A13	VIC/L10	Active
SNAPPER A14	VIC/L10	Active
SNAPPER A15	VIC/L10	Active
SNAPPER A16	VIC/L10	Active
SNAPPER A17	VIC/L10	Active
SNAPPER A18	VIC/L10	Active
SNAPPER A19	VIC/L10	Active
SNAPPER A2	VIC/L10	Suspended
SNAPPER A20	VIC/L10	Active
SNAPPER A21	VIC/L10	Active
SNAPPER A22	VIC/L10	Active
SNAPPER A23	VIC/L10	Active
SNAPPER A24	VIC/L10	Temporarily Abandoned
SNAPPER A25	VIC/L10	Suspended
SNAPPER A26	VIC/L10	Suspended
SNAPPER A27	VIC/L10	Active

Name	License	Status
SNAPPER A28	VIC/L10	Suspended
SNAPPER A3	VIC/L10	Active
SNAPPER A36	VIC/L10	Temporarily Abandoned
SNAPPER A39	VIC/L10	Active
SNAPPER A4	VIC/L10	Active
SNAPPER A5	VIC/L10	Suspended
SNAPPER A6	VIC/L10	Active
SNAPPER A7	VIC/L10	Temporarily Abandoned
SNAPPER A8	VIC/L10	Active
SNAPPER A9	VIC/L10	Temporarily Abandoned
SNAPPER M29	VIC/L10	Temporarily Abandoned
SNAPPER M31	VIC/L10	Active
SNAPPER M33	VIC/L10	Active
FLOUNDER A1	VIC/L11	Temporarily Abandoned
FLOUNDER A10	VIC/L11	Temporarily Abandoned
FLOUNDER A12	VIC/L11	Suspended
FLOUNDER A14	VIC/L11	Suspended
FLOUNDER A15	VIC/L11	Shut-in
FLOUNDER A16	VIC/L11	Suspended
FLOUNDER A17	VIC/L11	Shut-in
FLOUNDER A18	VIC/L11	Temporarily Abandoned
FLOUNDER A19	VIC/L11	Suspended
FLOUNDER A2	VIC/L11	Shut-in
FLOUNDER A21	VIC/L11	Suspended
FLOUNDER A22	VIC/L11	Suspended
FLOUNDER A23	VIC/L11	Shut-in
FLOUNDER A24	VIC/L11	Shut-in
FLOUNDER A25	VIC/L11	Suspended
FLOUNDER A26	VIC/L11	Suspended
FLOUNDER A3	VIC/L11	Shut-in
FLOUNDER A4	VIC/L11	Suspended
FLOUNDER A5	VIC/L11	Shut-in
FLOUNDER A7	VIC/L11	Temporarily Abandoned
FLOUNDER A8	VIC/L11	Shut-in
FLOUNDER A9	VIC/L11	Shut-in
BREAM A10	VIC/L13	Temporarily Abandoned
BREAM A11	VIC/L13	Temporarily Abandoned
BREAM A12	VIC/L13	Suspended
BREAM A13	VIC/L13	Suspended
BREAM A14	VIC/L13	Shut-in
BREAM A15	VIC/L13	Shut-in
BREAM A16	VIC/L13	Shut-in
BREAM A18	VIC/L13	Temporarily Abandoned
BREAM A19	VIC/L13	Shut-in
BREAM A1	VIC/L13	Shut-in

Name	License	Status
BREAM A2	VIC/L13	Suspended
BREAM A20	VIC/L13	Shut-in
BREAM A21	VIC/L13	Temporarily Abandoned
BREAM A22	VIC/L13	Shut-in
BREAM A23	VIC/L13	Shut-in
BREAM A24	VIC/L13	Shut-in
BREAM A25	VIC/L13	Suspended
BREAM A26	VIC/L13	Temporarily Abandoned
BREAM A27	VIC/L13	Shut-in
BREAM A5	VIC/L13	Shut-in
BREAM A7	VIC/L13	Suspended
BREAM A9	VIC/L13	Shut-in
BREAM B1	VIC/L13	Suspended
BREAM B12	VIC/L13	Suspended
BREAM B13	VIC/L13	Suspended
BREAM B16	VIC/L13	Shut-in
BREAM B17	VIC/L13	Shut-in
BREAM B3	VIC/L13	Shut-in
BREAM B4	VIC/L13	Suspended
BREAM B8	VIC/L13	Shut-in
BREAM A17	VIC/L14	Temporarily Abandoned
BREAM A4	VIC/L14	Shut-in
BREAM A6	VIC/L14	Shut-in
BREAM A8	VIC/L14	Shut-in
BREAM B10	VIC/L14	Suspended
BREAM B11	VIC/L14	Shut-in
BREAM B14	VIC/L14	Suspended
BREAM B15	VIC/L14	Suspended
BREAM B2	VIC/L14	Shut-in
BREAM B5	VIC/L14	Suspended
BREAM B6	VIC/L14	Suspended
BREAM B7	VIC/L14	Shut-in
BREAM B9	VIC/L14	Suspended
DOLPHIN A3	VIC/L15	Suspended
PERCH 4	VIC/L15	Shut-in
DOLPHIN 2	VIC/L15	Suspended
PERCH 3	VIC/L17	Shut-in
SEAHORSE 1	VIC/L18	Abandoned
FORTESCUE A29	VIC/L19	Shut-in
BARRACOUTA A10	VIC/L2	Active
BARRACOUTA A2	VIC/L2	Active
BARRACOUTA A3	VIC/L2	Temporarily Abandoned
BARRACOUTA A4	VIC/L2	Active
BARRACOUTA A5	VIC/L2	Suspended
BARRACOUTA A6	VIC/L2	Active

Name	License	Status
BARRACOUTA A7	VIC/L2	Suspended
BARRACOUTA A8	VIC/L2	Active
BARRACOUTA A9	VIC/L2	Active
BREAM A3	VIC/L2	Suspended
WHITING A2	VIC/L2	Abandoned
WHITING A3	VIC/L2	Abandoned
WHITING A5	VIC/L2	Abandoned
WHITING A6	VIC/L2	Abandoned
WHITING A7	VIC/L2	Abandoned
TERAKIHI 1	VIC/L20	Temporarily Abandoned
KIPPER A4	VIC/L25	Active
MARLIN 1	VIC/L3	Temporarily Abandoned
MARLIN A1	VIC/L3	Suspended
MARLIN A10	VIC/L3	Active
MARLIN A11	VIC/L3	Active
MARLIN A12	VIC/L3	Suspended
MARLIN A13	VIC/L3	Shut-in
MARLIN A14	VIC/L3	Shut-in
MARLIN A15	VIC/L3	Suspended
MARLIN A16	VIC/L3	Suspended
MARLIN A17	VIC/L3	Shut-in
MARLIN A18	VIC/L3	Active
MARLIN A19	VIC/L3	Active
MARLIN A2	VIC/L3	Shut-in
MARLIN A20	VIC/L3	Active
MARLIN A21	VIC/L3	Shut-in
MARLIN A22	VIC/L3	Active
MARLIN A23	VIC/L3	Active
MARLIN A24	VIC/L3	Active
MARLIN A3	VIC/L3	Shut-in
MARLIN A4	VIC/L3	Shut-in
MARLIN A5	VIC/L3	Active
MARLIN A6	VIC/L3	Active
MARLIN A7	VIC/L3	Temporarily Abandoned
MARLIN A8	VIC/L3	Active
MARLIN A9	VIC/L3	Shut-in
MARLIN B10	VIC/L3	Active
MARLIN B15	VIC/L3	Active
MARLIN B16	VIC/L3	Active
MARLIN B4	VIC/L3	Active
MARLIN B9	VIC/L3	Active
FLOUNDER A11	VIC/L4	Shut-in
FLOUNDER A13	VIC/L4	Shut-in
FLOUNDER A6	VIC/L4	Shut-in
TUNA A1	VIC/L4	Suspended

Name	License	Status
TUNA A11	VIC/L4	Active
TUNA A12	VIC/L4	Active
TUNA A14	VIC/L4	Active
TUNA A16	VIC/L4	Active
TUNA A2	VIC/L4	Active
TUNA A21	VIC/L4	Active
TUNA A29	VIC/L4	Active
TUNA A3	VIC/L4	Suspended
TUNA A5	VIC/L4	Active
TUNA A7	VIC/L4	Active
WEST TUNA W1	VIC/L4	Active
WEST TUNA W10	VIC/L4	Active
WEST TUNA W11	VIC/L4	Active
WEST TUNA W12	VIC/L4	Active
WEST TUNA W13	VIC/L4	Active
WEST TUNA W14	VIC/L4	Active
WEST TUNA W15	VIC/L4	Active
WEST TUNA W17	VIC/L4	Active
WEST TUNA W18	VIC/L4	Active
WEST TUNA W19	VIC/L4	Suspended
WEST TUNA W2	VIC/L4	Shut-in
WEST TUNA W20	VIC/L4	Active
WEST TUNA W21	VIC/L4	Active
WEST TUNA W22	VIC/L4	Active
WEST TUNA W23	VIC/L4	Active
WEST TUNA W24	VIC/L4	Active
WEST TUNA W25	VIC/L4	Temporarily Abandoned
WEST TUNA W26	VIC/L4	Active
WEST TUNA W28	VIC/L4	Active
WEST TUNA W29	VIC/L4	Active
WEST TUNA W3	VIC/L4	Active
WEST TUNA W30	VIC/L4	Active
WEST TUNA W31	VIC/L4	Active
WEST TUNA W32	VIC/L4	Active
WEST TUNA W33	VIC/L4	Active
WEST TUNA W34	VIC/L4	Active
WEST TUNA W35	VIC/L4	Active
WEST TUNA W36	VIC/L4	Active
WEST TUNA W37	VIC/L4	Active
WEST TUNA W38	VIC/L4	Active
WEST TUNA W39	VIC/L4	Active
WEST TUNA W4	VIC/L4	Active
WEST TUNA W40	VIC/L4	Active
WEST TUNA W41	VIC/L4	Suspended
WEST TUNA W42	VIC/L4	Active

Name	License	Status
WEST TUNA W43	VIC/L4	Active
WEST TUNA W44	VIC/L4	Temporarily Abandoned
WEST TUNA W45	VIC/L4	Active
WEST TUNA W46	VIC/L4	Shut-in
WEST TUNA W47	VIC/L4	Active
WEST TUNA W48	VIC/L4	Active
WEST TUNA W5	VIC/L4	Active
WEST TUNA W6	VIC/L4	Suspended
WEST TUNA W7	VIC/L4	Active
WEST TUNA W8	VIC/L4	Active
WEST TUNA W9	VIC/L4	Suspended
COBIA A10	VIC/L5	Active
COBIA A11	VIC/L5	Suspended
COBIA A12	VIC/L5	Suspended
COBIA A14	VIC/L5	Suspended
COBIA A15	VIC/L5	Suspended
COBIA A16	VIC/L5	Active
COBIA A18	VIC/L5	Active
COBIA A19	VIC/L5	Active
COBIA A20	VIC/L5	Active
COBIA A21	VIC/L5	Active
COBIA A28	VIC/L5	Active
COBIA A33	VIC/L5	Active
COBIA A6	VIC/L5	Suspended
COBIA A7	VIC/L5	Active
COBIA F1	VIC/L5	Active
COBIA F13	VIC/L5	Suspended
COBIA F17	VIC/L5	Suspended
COBIA F2	VIC/L5	Active
COBIA F27	VIC/L5	Active
COBIA F3	VIC/L5	Active
COBIA F35	VIC/L5	Active
COBIA F4	VIC/L5	Active
COBIA F5	VIC/L5	Active
COBIA F8	VIC/L5	Suspended
FLOUNDER A20	VIC/L5	Shut-in
FORTESCUE A1	VIC/L5	Suspended
FORTESCUE A10	VIC/L5	Suspended
FORTESCUE A11	VIC/L5	Suspended
FORTESCUE A12	VIC/L5	Suspended
FORTESCUE A13	VIC/L5	Temporarily Abandoned
FORTESCUE A14	VIC/L5	Temporarily Abandoned
FORTESCUE A15	VIC/L5	Temporarily Abandoned
FORTESCUE A16	VIC/L5	Temporarily Abandoned
FORTESCUE A17	VIC/L5	Shut-in

Name	License	Status
FORTESCUE A18	VIC/L5	Suspended
FORTESCUE A19	VIC/L5	Temporarily Abandoned
FORTESCUE A2	VIC/L5	Suspended
FORTESCUE A20	VIC/L5	Temporarily Abandoned
FORTESCUE A21	VIC/L5	Suspended
FORTESCUE A22	VIC/L5	Suspended
FORTESCUE A23	VIC/L5	Shut-in
FORTESCUE A25	VIC/L5	Suspended
FORTESCUE A27	VIC/L5	Suspended
FORTESCUE A28	VIC/L5	Suspended
FORTESCUE A3	VIC/L5	Suspended
FORTESCUE A30	VIC/L5	Shut-in
FORTESCUE A32	VIC/L5	Suspended
FORTESCUE A34	VIC/L5	Suspended
FORTESCUE A35	VIC/L5	Suspended
FORTESCUE A4	VIC/L5	Suspended
FORTESCUE A5	VIC/L5	Suspended
FORTESCUE A6	VIC/L5	Suspended
FORTESCUE A7	VIC/L5	Temporarily Abandoned
FORTESCUE A8	VIC/L5	Suspended
FORTESCUE A9	VIC/L5	Temporarily Abandoned
HALIBUT 1	VIC/L5	Temporarily Abandoned
HALIBUT A1	VIC/L5	Active
HALIBUT A10	VIC/L5	Active
HALIBUT A11	VIC/L5	Active
HALIBUT A13	VIC/L5	Active
HALIBUT A14	VIC/L5	Active
HALIBUT A15	VIC/L5	Suspended
HALIBUT A16	VIC/L5	Active
HALIBUT A17	VIC/L5	Suspended
HALIBUT A18	VIC/L5	Suspended
HALIBUT A19	VIC/L5	Temporarily Abandoned
HALIBUT A2	VIC/L5	Active
HALIBUT A20	VIC/L5	Active
HALIBUT A21	VIC/L5	Shut-in
HALIBUT A23	VIC/L5	Active
HALIBUT A24	VIC/L5	Active
HALIBUT A3	VIC/L5	Active
HALIBUT A4	VIC/L5	Active
HALIBUT A5	VIC/L5	Active
HALIBUT A6	VIC/L5	Active
HALIBUT A7	VIC/L5	Active
HALIBUT A8	VIC/L5	Suspended
HALIBUT A9	VIC/L5	Active
MACKEREL A1	VIC/L5	Temporarily Abandoned

Name	License	Status
MACKEREL A10	VIC/L5	Temporarily Abandoned
MACKEREL A11	VIC/L5	Temporarily Abandoned
MACKEREL A12	VIC/L5	Temporarily Abandoned
MACKEREL A13	VIC/L5	Temporarily Abandoned
MACKEREL A14	VIC/L5	Temporarily Abandoned
MACKEREL A15	VIC/L5	Temporarily Abandoned
MACKEREL A16	VIC/L5	Temporarily Abandoned
MACKEREL A17	VIC/L5	Temporarily Abandoned
MACKEREL A18	VIC/L5	Temporarily Abandoned
MACKEREL A19	VIC/L5	Temporarily Abandoned
MACKEREL A2	VIC/L5	Temporarily Abandoned
MACKEREL A20	VIC/L5	Temporarily Abandoned
MACKEREL A21	VIC/L5	Temporarily Abandoned
MACKEREL A22	VIC/L5	Temporarily Abandoned
MACKEREL A23	VIC/L5	Temporarily Abandoned
MACKEREL A24	VIC/L5	Temporarily Abandoned
MACKEREL A25	VIC/L5	Suspended
MACKEREL A3	VIC/L5	Temporarily Abandoned
MACKEREL A4	VIC/L5	Temporarily Abandoned
MACKEREL A5	VIC/L5	Suspended
MACKEREL A6	VIC/L5	Temporarily Abandoned
MACKEREL A7	VIC/L5	Temporarily Abandoned
MACKEREL A8	VIC/L5	Temporarily Abandoned
MACKEREL A9	VIC/L5	Temporarily Abandoned
TUNA A23	VIC/L5	Active
TUNA A32	VIC/L5	Shut-in
TUNA A33	VIC/L5	Suspended
FLOUNDER A27	VIC/L6	Active
GUDGEON 1	VIC/L6	Temporarily Abandoned
KINGFISH A1	VIC/L7	Suspended
KINGFISH A10	VIC/L7	Suspended
KINGFISH A11	VIC/L7	Suspended
KINGFISH A12	VIC/L7	Temporarily Abandoned
KINGFISH A13	VIC/L7	Suspended
KINGFISH A14	VIC/L7	Suspended
KINGFISH A15	VIC/L7	Suspended
KINGFISH A16	VIC/L7	Suspended
KINGFISH A17	VIC/L7	Suspended
KINGFISH A18	VIC/L7	Suspended
KINGFISH A19	VIC/L7	Temporarily Abandoned
KINGFISH A2	VIC/L7	Suspended
KINGFISH A20	VIC/L7	Temporarily Abandoned
KINGFISH A21	VIC/L7	Suspended
KINGFISH A3	VIC/L7	Suspended
KINGFISH A4	VIC/L7	Suspended

Name	License	Status
KINGFISH A5	VIC/L7	Suspended
KINGFISH A6	VIC/L7	Suspended
KINGFISH A7	VIC/L7	Temporarily Abandoned
KINGFISH A8	VIC/L7	Suspended
KINGFISH A9	VIC/L7	Temporarily Abandoned
KINGFISH B1	VIC/L7	Suspended
KINGFISH B10	VIC/L7	Suspended
KINGFISH B11	VIC/L7	Suspended
KINGFISH B12	VIC/L7	Suspended
KINGFISH B13	VIC/L7	Suspended
KINGFISH B14	VIC/L7	Suspended
KINGFISH B15	VIC/L7	Temporarily Abandoned
KINGFISH B16	VIC/L7	Suspended
KINGFISH B17	VIC/L7	Temporarily Abandoned
KINGFISH B18	VIC/L7	Suspended
KINGFISH B19	VIC/L7	Suspended
KINGFISH B2	VIC/L7	Temporarily Abandoned
KINGFISH B20	VIC/L7	Suspended
KINGFISH B21	VIC/L7	Suspended
KINGFISH B3	VIC/L7	Temporarily Abandoned
KINGFISH B4	VIC/L7	Suspended
KINGFISH B5	VIC/L7	Temporarily Abandoned
KINGFISH B6	VIC/L7	Temporarily Abandoned
KINGFISH B7	VIC/L7	Suspended
KINGFISH B8	VIC/L7	Suspended
KINGFISH B9	VIC/L7	Suspended
WEST KINGFISH W1	VIC/L7	Suspended
WEST KINGFISH W11	VIC/L7	Suspended
WEST KINGFISH W12	VIC/L7	Active
WEST KINGFISH W13	VIC/L7	Active
WEST KINGFISH W14	VIC/L7	Suspended
WEST KINGFISH W15	VIC/L7	Suspended
WEST KINGFISH W16	VIC/L7	Active
WEST KINGFISH W17	VIC/L7	Suspended
WEST KINGFISH W18	VIC/L7	Active
WEST KINGFISH W19	VIC/L7	Suspended
WEST KINGFISH W2	VIC/L7	Suspended
WEST KINGFISH W20	VIC/L7	Active
WEST KINGFISH W21	VIC/L7	Active
WEST KINGFISH W22	VIC/L7	Active
WEST KINGFISH W23	VIC/L7	Active
WEST KINGFISH W24	VIC/L7	Active
WEST KINGFISH W25	VIC/L7	Active
WEST KINGFISH W26	VIC/L7	Active
WEST KINGFISH W27	VIC/L7	Active

Name	License	Status
WEST KINGFISH W28	VIC/L7	Suspended
WEST KINGFISH W29	VIC/L7	Active
WEST KINGFISH W3	VIC/L7	Suspended
WEST KINGFISH W30	VIC/L7	Temporarily Abandoned
WEST KINGFISH W31	VIC/L7	Active
WEST KINGFISH W32	VIC/L7	Active
WEST KINGFISH W4	VIC/L7	Suspended
WEST KINGFISH W5	VIC/L7	Active
WEST KINGFISH W6	VIC/L7	Active
WEST KINGFISH W8	VIC/L7	Active
WEST KINGFISH W9	VIC/L7	Active
WEST KINGFISH W10	VIC/L8	Active
EAST PILCHARD 1	VIC/L9	Temporarily Abandoned
KIPPER A2	VIC/L9	Active
TUNA A10	VIC/L9	Suspended
TUNA A13	VIC/L9	Active
TUNA A15	VIC/L9	Active
TUNA A17	VIC/L9	Active
TUNA A18	VIC/L9	Active
TUNA A19	VIC/L9	Active
TUNA A20	VIC/L9	Active
TUNA A22	VIC/L9	Active
TUNA A24	VIC/L9	Suspended
TUNA A25	VIC/L9	Active
TUNA A26	VIC/L9	Suspended
TUNA A27	VIC/L9	Active
TUNA A30	VIC/L9	Active
TUNA A31	VIC/L9	Active
TUNA A34	VIC/L9	Suspended
TUNA A4	VIC/L9	Active
TUNA A6	VIC/L9	Active
TUNA A8	VIC/L9	Active
TUNA A9	VIC/L9	Active
WEST TUNA W27	VIC/L9	Active
MULLOWAY 1	VIC/RL1	Temporarily Abandoned

4.4 Oil Types

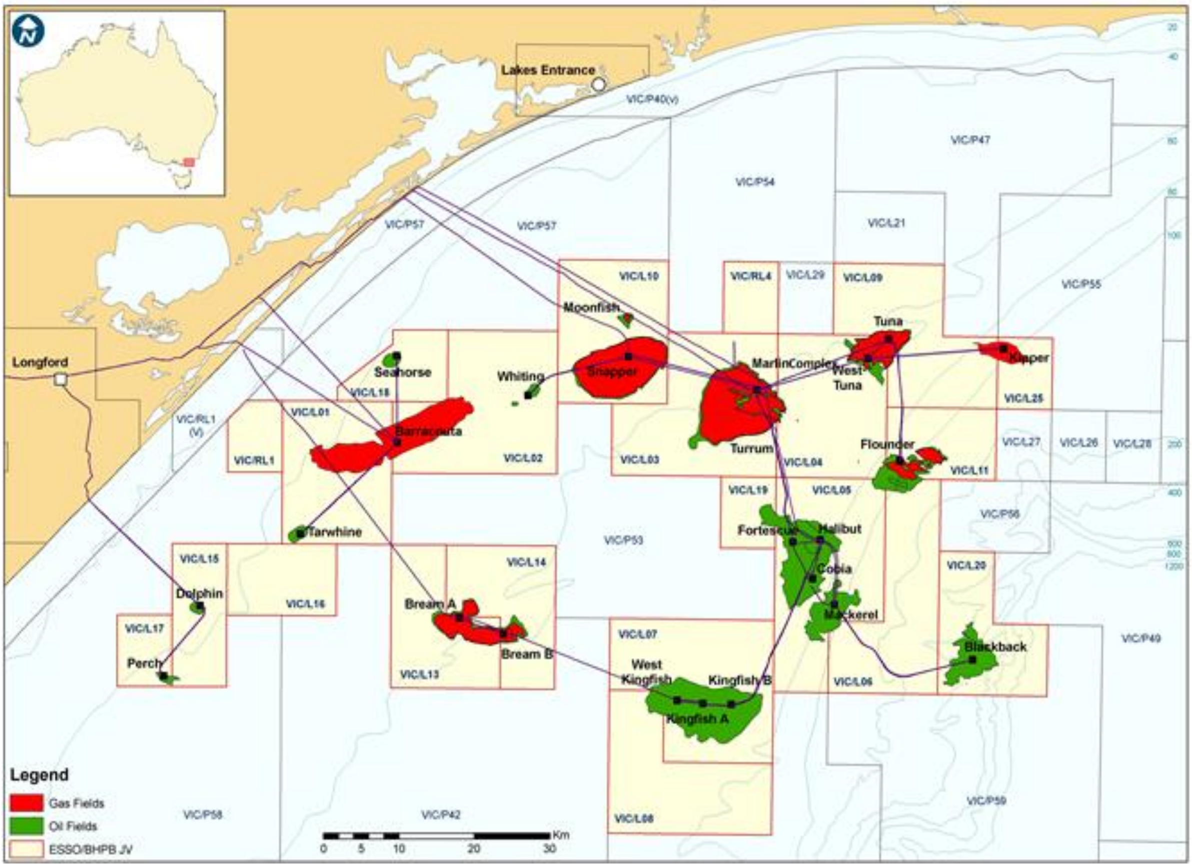
The main physical properties that affect the behaviour of spilt oil are specific gravity, distillation characteristics, viscosity and pour points. All are dependent on chemical composition such as the proportion of volatile components and the content of ashphaltenes, resins and waxes. The range of condensates and crude oils produced by the Bass Strait Operations were reviewed for each field and have been classified in accordance with groupings defined in the OPEP Section 7.2.2. Details of the data used for classifications is outlined in Table 7.

Table 7 Data used for classification of condensate and crude oil

Property	Description	Data provided
Specific Gravity	Specific gravity is an oil's density in relation to water. API gravity is an inverse measure of a petroleum liquid's density relative to that of water and it is used to compare densities of petroleum liquids.	API
Distillation characteristics	Distillation characteristics of an oil describe its volatility. Distillation characteristics are expressed as the proportions of the parent oil that distil within given temperatures. Wax content is a measure of bituminous waxy or asphaltenic residues which do not readily distil even at high temperatures.	Wax Content
Viscosity	Viscosity of an oil is its resistance to flow. High viscosity oils flow less easily than those of lower viscosity. All oils become more viscous as the temperature falls.	Data not available. Pour Point substituted.
Pour Point	The pour point is the temperature below which an oil no longer flows and is a function of its wax and ashphaltene content (ITOPS, 2011). Average water temperature for the Bass Strait is 15.7ºC (per RPS reports) and 14ºC has been used as the winter sea temperature for dispersant effectiveness testing. Therefore, it is assumed that crudes and condensates with a pour point >14ºC will be liquid at ambient temperatures.	Pour Point

At each location, a variety of oil, condensate and gas is produced from different reservoirs. As can be seen in Figure 1, the gas reservoirs (red) and oil reservoirs (green) are often layered on top of one another, meaning one facility may access multiple reservoirs and produce a variety of products. For example, multiple platforms could produce from the same reservoir (e.g. TNA and WTN producing from the Tuna M Reservoir) and/or one platform can produce from multiple reservoirs (e.g. Snapper producing from Snapper L, Snapper N and Moonfish).

Figure 1 Location of Oil and Gas Reservoirs in Bass Strait Operations



Where all data was not available, condensates and crudes have been classified according to available data and the closest available sample. Items highlighted in blue were sampled in 2019 in preparation for submission of this Environment Plan. These seven samples span the range of fluid properties of Bass Strait Operations. Over time, there will be a reduction in pressure in the reservoir due to on-going production. It is unlikely that these changes will impact composition at atmospheric temperatures and pressures. Therefore, the data available is considered to represent current conditions.

Table 8 Range of condensates and crude oils produced by the Bass Strait Operations

Field	Type	API	Pour Point (ºC)	Wax Content (%)	Oil Classification
Snapper IL	Condensate	74.7			Group 1
Tuna / West Tune M	Condensate	67.5		0.1	Group 1
Snapper N	Condensate	64.5			Group 1
Marlin	Condensate	63.1			Group 1
Batfish	Condensate	60.6		0.7	Group 1
Whiting	Condensate	58.7			Group 1
Tarwhine	Crude	55.9			Group 1
Whiting	Crude	54.8	-37	0.05	Group 1
Kipper	Condensate	54.5	-39	2.3	Group 1
Flounder	Condensate	54.0			Group 1
Seahorse	Crude	53.0			Group 1
East Pilchard	Condensate	52.5			Group 1
Turrum L	Condensate	50.8		4.3	Group 1
Barracouta	Condensate	51.6	-39	1.8	Group 1
Dolphin	Crude	46.3		2.3	Group 1
Blackback	Crude	51.9	-9	7.7	Group 2
Bream	Crude	49.0	5	0.9	Group 2
Kingfish	Crude	45.7	9	25.0	Group 2
West Kingfish	Crude	45.7	9	25.0	Group 2
Turrum L	Crude	45.5		13.8	Group 2
Cobia	Crude	45.2	12		Group 4
Whiptail	Crude	42.0			Group 2
Perch	Crude	41.2	-40	1.8	Group 2
Moonfish	Condensate	40.7			Group 2
Halibut	Crude	40.6	0	23.7	Group 2
Bream	Condensate	39.1			Group 2
Fortescue	Crude	39.9	12	32.6	Group 4
Snapper IL	Crude	47.4	27	12.1	Group 4
Mackerel	Crude	46.7	21	24.4	Group 4
Tuna / West Tune M	Crude	46.2			Group 4
Terakihi	Crude	46.0	22	8.0	Group 4
Flounder	Crude	45.3	18	32.0	Group 4
Tuna L	Condensate				Group 4
Tuna L	Crude	44.0	27		Group 4
Gudgeon	Crude	43.7	29	23.4	Group 4
Snapper N	Crude	42.1	18	35.6	Group 4
Tuna T	Condensate				Group 4
Tuna T	Crude	40.4	24	39.4	Group 4
West Tuna R & S	Condensate	38.6			Group 4
Snapper Deep	Condensate	38.2	32	7.4	Group 4
West Tuna R & S	Crude	35.6	37	26.8	Group 4
Mulloway	Crude	32.0			Group 4
Moonfish	Crude	27.8	27	38.5	Group 4

Appendix B – Inventory Maintenance And Planning End State

Infrastructure Group	Facility	Current state (as of Dec 2020)	Inspection, Maintenance, Repair Philosophy for CoP Stage	Inspection, Maintenance, Repair Philosophy for Stasis Mode Stage	Indicative Decom Timing	Provisional End State	Base Case End State expected under Section 572 of the OPGGS Act 2006	Decommissioning activity plans
Platforms - Steel Pile Jackets shallow water	Fortescue, Bream A, Whiting	Cessation of Production	• Confirm platform appurtenances (e.g. pipe supports, cable trays) are secured to minimise dropped object risks where required. • Maintain platform topsides primary and secondary structures fit for service to facilitate CoP activities. • Platform handrails and deck grating maintained on an 'as needs' basis to provide access and egress for activities being conducted during CoP stage, temporary repairs conducted where appropriate. • Helideck structural capacity required for helicopter landings maintained. • Maintain flare boom fit for service to facilitate operational flare. • Maintain jackets fit for service to facilitate staffed operations risk profile until platform is de-staffed. • Maintain jackets fit for service to facilitate de-staffed operations risk profile once platform is de-staffed (inspections reduced in line with occupancy).	• Maintain platform topsides primary and secondary structures fit for service to enable HLV removal and prevent dropped objects. • Maintain jackets fit for service to enable HLV removal. • Confirm platform appurtenances (e.g. pipe supports, cable trays) are secured to minimise dropped object risks where required	1st removal campaign	Topsides fully removed. Substructure fully removed (to seabed). Marlin A - Marlin B bridge fully removed.	Topsides fully removed Substructures fully removed to seabed.	EP for decommissioning execution activities (1st removal campaign) expected to be submitted in approximately 2025. EP for decommissioning execution activities (2nd removal campaign) expected to be submitted in approximately 2034.
	Snapper, Marlin A, Barracouta	Production Expected to reach CoP prior to 2025			1st removal campaign (Barracouta only) 2nd removal campaign (Snapper and Marlin A)			
	Marlin B, Tuna, West Tuna Riser Access Tower.	Production			2nd removal campaign			
Platforms - Steel Pile Jackets, deeper water	Kingfish A, Kingfish B, Mackerel, Flounder	Cessation of Production			1st removal campaign	Topsides - fully removed Substructure cut at approx. 55m below mean sea level and top section removed. Lower section of jacket decommissioned in situ.	Topsides fully removed Substructures fully removed to seabed.	Decommissioning strategy framework including initial justification for provisional end state included in this EP. Submission of EP(s) to seek deviation from full removal will be provided in approximately 2023. EP for decommissioning execution activities (1st removal campaign) expected to be submitted in approximately in 2025.
	Halibut, Cobia, West Kingfish	Production Expected to reach CoP prior to 2025						
Platforms - Concrete Gravity Structures	Bream B	Cessation of Production			1st removal campaign	Topsides fully removed. Substructure decommissioned in-situ.	Topsides fully removed. Substructure fully removed.	Decommissioning strategy framework including initial justification for provisional end state included in this EP. Submission of EP(s) to seek deviation from full removal will be provided in approximately 2023. EP for decommissioning execution activities (1st removal campaign) expected to be submitted in approximately 2025. EP for decommissioning execution activities (2nd removal campaign) expected to be submitted in approximately 2034.
	West Tuna	Production			2nd removal campaign	Topsides fully removed. Substructure decommissioned in-situ West Tuna - West Tuna RAT bridge fully removed.		
Platforms - Monopods	Perch, Dolphin	Cessation of Production			1st removal campaign	Fully removed.	Fully removed.	EP for decommissioning execution activities (1st removal campaign) expected to be submitted in approximately 2025.
Subsea production systems (excluding pipelines, umbilicals and umbilical	Cobia-2, Seahorse, Tarwhine, Blackback	Stasis Mode	Risk based inspections will continue to be carried out to maintain integrity	Risk based inspections of items remaining at each location will continue commensurate with the	Wells have been P&A'd, wellheads have been removed	Fully removed.	Fully removed.	The equipment removal activity will be covered under this EP which will be subject to review and

Infrastructure Group	Facility	Current state (as of Dec 2020)	Inspection, Maintenance, Repair Philosophy for CoP Stage	Inspection, Maintenance, Repair Philosophy for Stasis Mode Stage	Indicative Decom Timing	Provisional End State	Base Case End State expected under Section 572 of the OPGGS Act 2006	Decommissioning activity plans
termination assemblies which are covered below)				need to maintain integrity so as to enable full removal.	Timing of removal of remaining equipment subject to appropriate vessel availability.			assessment to ensure the scope of activities is covered.
	Kipper, West Barracouta	Production			Post end of field life, not tied to HLV campaign			EP for P&A of subsea facilities expected to be submitted in 2033/34. EP for removal activities will be covered under a separate EP post 2033/2034.
Offshore pipelines, umbilicals and associated equipment	Refer to Appendix A for listing	Production - Refer to Tables 3 & 4 in Appendix A for listing Cessation of Production / not operating - Refer to Appendix A for listing	For pipelines • LVOs, FVOs and topsides coating inspections will continue to maintain operational integrity of these items. • Pipeline internal and external corrosion will be controlled with appropriate risk based modifications to the internal and external corrosion control programs. • Risk based underwater inspections of the pipelines, risers and riser clamps will continue. For umbilicals Risk based inspections will be carried out as part of the underwater pipeline inspection programs.	For pipelines Pipeline external corrosion will continue to be controlled by existing pipeline coatings supplemented by existing pipeline anodes (where installed). Pipeline internal corrosion will be managed and risk based inspections will continue commensurate with the need to maintain integrity so as to enable full removal. For umbilicals Risk based inspections will be carried out commensurate with the need to maintain integrity so as to enable full removal.	Timing of removal subject to appropriate vessel availability.	Decommissioned in-situ (pipelines, umbilicals, pipeline stability items, pipeline end terminations, pipeline pull in sleds and umbilical termination assemblies). Fully removed (pipeline anode sleds, SSIV/MOV valve structures).	Fully removed.	Decommissioning strategy framework including initial justification for provisional end state included in this EP. Submission of EP(s) to seek deviation from full removal will be provided in approximately 2023. EP(s) for decommissioning execution activities expected to be submitted in approximately 2025. EP(s) for decommissioning execution activities expected to be submitted in approximately 2034 (for other pipelines).
Production Wells	Refer to Table 6 in Appendix A for listing of production wells	Refer to Table 6 in Appendix A for production well current status	Care & Preservation • WIMS testing and well monitoring per WOMP and internal Well Integrity Manuals. Wells suspended with deep set tubing plugs where possible. Plug & Abandonment • Downhole cement isolation plugs installed with well monitoring between abandonment phases where possible.	No further Inspection, maintenance, repair activities required as the wells have been P&A'd (decommissioned)	P&A activities are ongoing - see indicative schedule in Figure 1-3 of this EP.	Wells plugged and abandoned Conductors / subsea wellheads removed	Wells plugged and abandoned. Conductors / subsea wellheads removed.	Well P&A campaign indicative schedule included in Figure 1-3 of this EP. P&A activities undertaken on platform wells included in this EP. P&A campaigns carried out by JUR or MODU subject to separate EP submissions prior to campaign.
Exploration and appraisal wells	Mulloway-1, Whiptail-1, Halibut-1, Marlin-1, East Pilchard-1, Gudgeon-1, Terakihi-1	Temporarily abandoned	• 3 yearly ROV inspections (based on well risk characterization) for Mulloway-1, Whiptail-1a, Gudgeon-1, Terakihi-1, Halibut-1 to allow the wellhead to be inspected for oil seepage, gas bubbles, for signs of extensive corrosion, damage or excessive debris and confirmation of well status (debris cap position).	No further Inspection, maintenance, repair activities required as the wells have been P&A'd	See indicative schedule in Figure 1-3 of this EP.	Wells plugged and abandoned Subsea wellheads removed	Wells plugged and abandoned. Subsea wellheads removed.	Well P&A campaign indicative schedule included in Figure 1-3 of this EP. Exploration well P&A carried out by either JUR or MODU and subject to separate EP submission prior to campaign.

Infrastructure Group	Facility	Current state (as of Dec 2020)	Inspection, Maintenance, Repair Philosophy for CoP Stage	Inspection, Maintenance, Repair Philosophy for Stasis Mode Stage	Indicative Decom Timing	Provisional End State	Base Case End State expected under Section 572 of the OPGGS Act 2006	Decommissioning activity plans
			• 6 yearly ROV inspections (based on well status and barriers in place) for Marlin-1, East Pilchard-1 to allow the wellhead to be inspected for oil seepage, gas bubbles, for signs of extensive corrosion, damage or excessive debris and confirmation of well status (debris cap position).					
Other property (i.e. debris)	Various	N/A	None required to enable removal.	None required to enable removal.	Ongoing in accordance with suitable vessel availability.	Fully removed.	Fully removed.	Vessel activities covered in this EP.

Notes:

1: While Snapper and Marlin A are expected to reach CoP prior to 2025, the removal of these facilities is planned for the 2nd campaign as they will continue to be staffed after CoP to support Kipper and Turrum (MLB) production.

The provisional end states outlined in the table above do not preclude preparation towards complete removal as a potential decommissioning outcome, which is ongoing.

Appendix C – EPBC Act Listed Species PEA

Table 1 - EPBC Act listed fish (bony) species or species habitat that may occur within the PEA

(Note: Shaded species denotes that they occur in both the OA (generally) and the PEA. Refer Appendix C for EPBC Act Listed Species in OAs)

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Fish						
Acentronura tentaculata	Shortpouch pygmy pipehorse			✓		MO
Brachionichthys hirsutus	Spotted Handfish	CE				MO
Brachiopsilus ziebelli	Ziebell's Handfish	V				MO
Campichthys tryoni	Tryon's Pipefish			✓		MO
Corythoichthys amplexus	Fijian Banded pipefish			✓		MO
Corythoichthys ocellatus	Orange-spotted Pipefish			✓		MO
Cosmocampus howensis	Lord Howe pipefish			✓		MO
Epinephelus daemelii	Black rockcod	V				MO
Festucalex cinctus	Girdled Pipefish			✓		MO
Filicampus tigris	Tiger Pipefish			✓		MO
Halicampus grayi	Mud Pipefish			✓		MO
Heraldia nocturna	Upside-down pipefish			✓		MO
Hippichthys cyanospilos	Blue-speckled Pipefish			✓		MO
Hippichthys heptagonus	Madura Pipefish			✓		MO
Hippichthys penicillus	Beady Pipefish,			✓		MO
Hippocampus abdominalis	Big-belly seahorse			✓		MO
Hippocampus breviceps	Short-head seahorse			✓		MO

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Hippocampus kelloggi	Kellogg's Seahorse			✓		MO
Hippocampus kuda	Spotted Seahorse			✓		MO
Hippocampus minotaur	Bullneck seahorse			✓		MO
Hippocampus planifrons	Flat-face Seahorse			✓		MO
Hippocampus trimaculatus	Three-spot Seahorse,			✓		MO
Hippocampus whitei	White's seahorse			✓		MO
Histiogamphelus briggsii	Briggs' crested pipefish			✓		MO
Histiogamphelus cristatus	Rhino pipefish			✓		MO
Hypselognathus rostratus	Knife-snout pipefish			✓		MO
Kaupus costatus	Deep-bodied pipefish			✓		MO
Kimblaeus bassensis	Trawl pipefish			✓		MO
Leptoichthys fistularius	Brushtail pipefish			✓		MO
Lissocampus caudalis	Smooth pipefish			✓		MO
Lissocampus runa	Javelin pipefish			✓		MO
Maroubra perserrata	Sawtooth pipefish			✓		MO
Micrognathus andersonii	Anderson's Pipefish			✓		MO
Micrognathus brevirostris	Thorn-tailed Pipefish			✓		MO
Microphis manadensis	Manado Pipefish			✓		MO
Mitotichthys mollisoni	Mollison’s pipefish			✓		MO
Mitotichthys semistriatus	Halfbanded pipefish			✓		MO

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Mitotichthys tuckeri	Tucker's pipefish			✓		MO
Notiocampus ruber	Red pipefish			✓		MO
Phycodrus eques	Leafy seadragon			✓		MO
Phyllopteryx taeniolatus	Weedy seadragon			✓		MO
Prototroctes maraena	Australian grayling	V				LO
Pugnaso curtirostris	Pugnose pipefish			✓		MO
Solegnathus dunckeri	Duncker's Pipehorse			✓		MO
Solegnathus hardwickii	Pallid Pipehorse			✓		MO
Solegnathus robustus	Robust spiny pipehorse			✓		MO
Solegnathus spinosissimus	Australian spiny pipehorse			✓		MO
Solenostomus cyanopterus	Robust ghostpipefish			✓		MO
Solenostomus paradoxus	Ornate Ghostpipefish			✓		MO
Stigmatopora argus	Spotted pipefish			✓		MO
Stigmatopora nigra	Widebody pipefish			✓		MO
Stipecampus cristatus	Ringback pipefish			✓		MO
Syngnathoides biaculeatus	Double-ended pipehorse			✓		MO
Thymichthys politus	Red handfish	CE				MO
Trachyrhamphus bicoarctatus	Bentstick Pipefish			✓		MO
Urocampus carinirostris	Hairy pipefish			✓		MO
Vanacampus margaritifer	Mother-of-pearl pipefish			✓		MO

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Vanacampus phillipi	Port Phillip pipefish			✓		MO
Vanacampus poecilolaemus	Australian long-snout pipefish			✓	-	MO
Threatened Species: *V Vulnerable* *CE Critically Endangered*	*Type of Presence:* *MO Species or species habitat may occur within the area*					

Table 2 - Fish species (cartilaginous) or species habitat that may occur within the PEA

(Note: Shaded species denotes that they occur in both the OA and the PEA)

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Sharks and Rays						
Carcharias Taurus (east coast population)	Grey Nurse Shark (east coast population)	CE			d	KO
Carcharodon carcharias	Great White Shark	V	✓		b, d	BKO
Isurus oxyrinchus	Shortfin Mako		✓			LO
Lamna nasus	Porbeagle		✓			LO
Manta birostris	Giant Manta Ray		✓			KO
Manta aldfredi	Reef Manta Ray		✓			KO
Pristis zijsron	Green Sawfish, Dindagubba, Narrowsnout Sawfish	V	✓			BKO
Rhincodon typus	Whale Shark	V	✓			MO
<u>Threatened Species</u>: *V Vulnerable* *CE Critically Endangered* *<u>Biologically Important Areas</u>:* *b Breeding* *d Distribution*	*<u>Type of Presence</u>:* *MO Species or species habitat may occur within the area* *LO Species or species habitat likely to occur within the area* *KO Species or species habitat known to occur within the area* *BKO Breeding known to occur within the area*					

Table 3 – Seabird and shorebird species or species habitat that may occur within the PEA

(Note: Shaded species denotes that they occur in both the OA and the PEA)

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Albatross						
Diomedia antipodensis	Antipodean Albatross	V	✓ (M)	✓	f	FLO
Diomedia epomophora	Southern Royal Albatross	V	✓ (M)	✓		FLO
Diomedia exulans	Wandering Albatross	V	✓ (M)	✓	f	FLO
Diomedia gibsoni	Gibson's Albatross	V		✓		FLO
Diomedia sanfordi	Northern Royal Albatross	E	✓ (M)	✓		FLO
Phoebetria fusca	Sooty Albatross	V	✓ (M)	✓		LO
Thalassarche bulleri	Buller's Albatross	V	✓ (M)	✓	f	FLO
Thalassarche bulleri platei	Pacific Albatross	V		✓		FLO
Thalassarche cauta	Shy Albatross	V	✓ (M)	✓	f	FLO
Thalassarche chrysostoma	Grey-headed Albatross	E	✓ (M)	✓		MO
Thalassarche eremita	Chatham Albatross	E	✓ (M)	✓		FLO
Thalassarche impavida	Campbell Albatross	V	✓ (M)	✓	f	FLO
Thalassarche melanophris	Black-browed Albatross	V	✓ (M)	✓	f	FLO
Thalassarche salvini	Salvin's Albatross	V	✓ (M)	✓		FLO
Thalassarche steadi	White-capped Albatross	V	✓ (M)	✓	f	FLO
Petrels						
Fregetta grallaria grallaria	White-bellied Storm-Petrel	V				LO
Halobaena caerulea	Blue Petrel	V		✓		MO
Macronectes giganteus	Southern Giant Petrel	E	✓ (M)	✓	f	FLO

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Macronectes halli	Northern Giant Petrel	V	✓ (M)	✓	f	MO
Pelagodroma marina	White-faced Storm Petrel			✓	b, f	BKO
Pelecanoides urinatrix	Common Diving-Petrel			✓	b, f	BKO
Pterodroma heraldica	Herald Petrel	CE		✓		LO
Pterodroma leucoptera leucoptera	Gould's Petrel	E				BKO
Pterodroma macroptera	Great-winged Petrel			✓	f	
Pterodroma mollis	Soft-plumaged Petrel	V		✓		MO
Pterodromoa neglecta neglecta	Kermadec Petrel (western)	V				FMO
Pterodroma nigripennis	Black-winged Petrel			✓		BKO
Pterodroma solandri	Providence Petrel			✓		BKO
Plovers						
Charadrius bicinctus	Double-banded Plover		✓ (W)	✓		RKO
Charadrius leschenaultii	Greater Sand Plover	V	✓ (W)	✓		FKO
Charadrius mongolus	Lesser Sand Plover	E	✓ (W)	✓		FKO
Charadrius ruficapillus	Red-capped Plover			✓		RKO
Charadrius veredus	Oriental Plover		✓ (W)	✓		FKO
Pluvialis fulva	Pacific Golden Plover		✓ (W)	✓		RKO
Pluvialis squatarola	Grey Plover		✓ (W)	✓		RKO
Thinornis rubricollis	Hooded Plover			✓		KO
Thinornis rubricollis rubricollis	Hooded Plover (eastern)	V		✓		KO
Scolopacidae -Sandpipers						

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Actitis hypoleucos	Common Sandpiper		✓ (W)	✓		KO
Calidris acuminata	Sharp-tailed Sandpiper		✓ (W)	✓		RKO
Calidris ferruginea	Curlew Sandpiper	CE	✓ (W)	✓		KO
Calidris melanotos	Pectoral Sandpiper		✓ (W)	✓		KO
Limicola falcinellus	Broad-billed Sandpiper		✓ (W)	✓		KO
Tringa glareola	Wood Sandpiper		✓ (W)	✓		FKO
Tringa stagnatilis	Marsh Sandpiper		✓ (W)	✓		FKO
Xenus cinereus	Terek Sandpiper		✓ (W)	✓		FKO
Scolopacidae - Other						
Arenaria interpres	Ruddy Turnstone		✓ (W)	✓		RKO
Calidris alba	Sanderling		✓ (W)	✓		RKO
Calidris canutus	Red Knot	E	✓ (W)	✓		KO
Calidris ruficollis	Red-necked Stint		✓ (W)	✓		RKO
Calidris subminuta	Long-toed Stint		✓ (W)	✓		RKO
Calidris tenuirostris	Great Knot	CE	✓ (W)	✓		RKO
Gallinago hardwickii	Latham's Snipe		✓ (W)	✓		RMO
Gallinago megala	Swinhoe's Snipe		✓ (W)	✓		RLO
Gallinago stenura	Pin-tailed Snipe		✓ (W)	✓		RLO
Heteroscelus brevipes	Grey-tailed Tattler		✓ (W)	✓		FKO
Limnodromus semipalmatus	Asian Dowitcher		✓ (W)	✓		KO
Limosa lapponica	Bar-tailed Godwit		✓ (W)	✓		KO

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Limosa lapponica baueri	Bar-tailed Godwit (auera)	V				KO
Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit	CE				MO
Limosa limosa	Black-tailed Godwit		✓ (W)	✓		FKO
Numenius madagascariensis	Eastern Curlew	CE	✓ (W)	✓		KO
Numenius minutusf	Little Curlew		✓ (W)	✓		RLO
Numenius phaeopus	Whimbrel		✓ (W)	✓		RKO
Phalaropus lobatus	Red-necked Phalarope		✓ (W)	✓		KO
Philmachus pugnax	Ruff		✓ (W)	✓		FKO
Tringa brevipes	Grey-tailed Tattler		✓ (W)	✓		KO
Tringa incana	Wandering Tattler		✓ (W)	✓		KO
Tringa nebularia	Common Greenshank		✓ (W)	✓		KO
Shearwaters						
Calonectris leucomelas	Streaked Shearwater		✓ (M)			MO
Puffinus carneipes	Flesh-footed Shearwater		✓ (M)	✓	f	FLOsouthern
Puffinus griseus	Sooty Shearwater		✓ (M)	✓	b, f	BKO
Puffinus pacificus	Wedge-tailed Shearwater		✓ (M)	✓	b, f	BKO
Puffinus tenuirostris	Short-tailed Shearwater		✓ (M)	✓	b, f	BKO
Terns						
Sterna albifrons	Little Tern		✓ (M)	✓		BKO
Sterna bergii	Crested Tern		✓ (M)	✓	b, f	BKO
Sterna caspia	Caspian Tern		✓ (M)	✓		BKO
Sterna fuscata	Sooty Tern			✓		BKO

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Sterna nereis	Fairy Tern			✓		BKO
Sterna striata	White-fronted Tern			✓		BKO
Sternula nereis nereis	Australian Fairy Tern	V				BKO
Others						
Anthohaera Phrygia	Regent Honeyeater	CE				KO
Anous stolidus	Common Noddy		✓ (M)	✓		MO
Apus pacificus	Fork-tailed Swift		✓ (M)	✓		LO
Ardea alba	Great Egret			✓		BKO
Ardea ibis	Cattle Egret			✓		MO
Aseranas semipalmata	Magpie Goose			✓		MO
Aulia audax fleayi	Tasmanian Wedge-tailed Eagle	E				BLO
Botaurus poiciloptilus	Australasian Bittern	E				KO
Catharacta skua	Great Skua			✓		MO
Ceyx azureus	Tasmanian Azure Kingfisher	E				BKO
Cuculus saturatus	Oriental Cuckoo		✓ (T)	✓		KO
Dasyomis brachypterus	Eastern Bristlebird	E				KO
Eudyptula minor	Little Penguin			✓	b, f	BKO
Fregata ariel	Least Frigatebird		✓ (M)	✓		LO
Fregata minor	Great Frigatebird		✓ (M)	✓		MO
Grantiella picta	Painted Honeyeater	V				BKO
Haliaeetus leucogaster	White-bellied Sea Eagle			✓		BKO

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Himantopus himantopus	Black-winged Stilt (Pied Stilt)			✓		RKO
Hirundapus caudacutus	White-throated Needletail		✓ (T)	✓		KO
Larus dominicanus	Kelp Gull			✓		BKO
Larus novaehollandiae	Silver Gull			✓		BKO
Larus pacificus	Pacific Gull			✓		BKO
Lathamus discolor	Swift Parrot	CE		✓		KO
Merops ornatus	Rainbow Bee-eater			✓		MO
Monarcha melanopsis	Black-faced Monach		✓ (T)	✓		KO
Monarcha trivirgatus	Spectacled Monach		✓ (T)	✓		KO
Morus serrator	Australian Gannet			✓		BKO
Motacilla flava	Yellow Wagtail		✓ (T)	✓		MO
Myiagra cyanoleuca	Satin Flycatcher		✓ (T)	✓		KO
Neophema chrysogaster	Orange-bellied Parrot	CE		✓		KO
Pachyptila turtur	Fairy Prion			✓		KO
Pachyptila turtur subantartica	Fairy Prion (southern)	V				KO
Pandion haliaetus	Osprey		✓ (W)	✓		KO
Pardalotus quadragintus	Forty-spotted Pardalote	E				KO
Phaethon rubricauda	Red-tailed Tropicbird		✓(M)	✓		BKO
Phalacrocorax fuscescens	Black-faced Cormorant			✓		BKO
Recurvirostra novaehollandiae	Red-necked Avocet			✓		FKO
Rhipidura rufifrons	Rufous Fantail		✓ (T)	✓		LO

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Rostratula australis	Australian Painted Snipe	E		✓		LO
Sula dactylatra	Masked Booby		✓(M)	✓		BKO
Tyto novaehollandiae castanops	Masked Owl (Tasmanian population)	V				BKO

Threatened Species: *V Vulnerable* *E Endangered* *CE Critically Endangered* *Migratory Species:* *M Marine* *W Wetland* *T Terrestrial* *Biologically Important Areas:* *b Breeding* *f Foraging*	*Type of Presence*: *MO Species or species habitat may occur within the area* *LO Species or species habitat likely to occur within the area* *KO Species or species habitat known to occur within the area* *FMO Foraging, feeding or related behaviour may occur within the area* *FLO Foraging, feeding or related behaviour likely to occur within the area* *FKO Foraging, feeding or related behaviour known to occur within the area* *BKO Breeding known to occur within the area* *RMO Roosting may occur within the area* *RLO Roosting likely to occur within the area* *RKO Roosting known to occur within the area*

Table 4 – Marine Mammals (Cetacean) or species habitat that may occur within the PEA

(Note: Shaded species denotes that they occur in both the OA and the PEA)

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Whales						
Balaenoptera acutorostrata	Minke Whale					MO
Balaenoptera bonaerensis	Antartic Minke Whale		✓			LO
Balaenoptera borealis	Sei Whale	V	✓			FLO
Balaenoptera edeni	Bryde's Whale		✓			LO
Balaenoptera musculus	Blue Whale	E	✓		f	LO
Balaenoptera physalus	Fin Whale	V	✓			FLO
Berardius arnuxii	Arnoux's Beaked Whale					MO
Caperea marginata	Pygmy Right Whale		✓			FLO
Eubalaena australis	Southern Right Whale	E	✓		m	KO
Globicephala macrorhynchus	Short-finned Pilot Whale					MO
Globicephala melas	Long-finned Pilot Whale					MO
Hyperoodon planifrons	Southern Bottlenose Whale					MO
Kogia breviceps	Pygmy Sperm Whale					MO
Kogia simus	Dwarf Sperm Whale					MO
Megaptera novaeangliae	Humpback Whale	V	✓		m	FKO
Mesoplodon bowdoini	Andrew's Beaked Whale					MO
Mesoplodon densirostris	Blainville's Beaked Whale					MO
Mesoplodon ginkgodens	Gingko-toothed Beaked Whale					MO

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Mesoplodon grayi	Gray's Beaked Whale					MO
Mesoplodon hectori	Hector's Beaked Whale					MO
Mesoplodon layardii	Strap-toothed Beaked Whale					MO
Mesoplodon mirus	True's Beaked Whale					MO
Physeter microcephalus	Sperm Whale		✓			MO
Tasmacetus shepherdi	Shepherd's Beaked Whale					MO
Ziphius cavirostris	Cuvier's Beaked Whale					MO
Dolphins						
Delphinus delphis	Common Dolphin					MO
Feresa attenuata	Pygmy Killer Whale					MO
Grampus griseus	Risso's Dolphin					MO
Lagenorhynchus cruciger	Hourglass Dolphin					MO
Lagenorhynchus obscurus	Dusky Dolphin		✓			LO
Lissodelphiss peronii	Southern Right Whale Dolphin					MO
Orcaella brevirostris	Australian Snubfin Dolphin (formerly Irrawaddy Dolphin)		✓			LO
Orcinus orca	Killer Whale		✓			LO
Pseudorca crassidens	False Killer Whale					MO
Sousa chinensis	Indo-Pacific Humpback Dolphin		✓			LO
Stenalla attenuata	Spotted Dolphin					MO
Stenalla coeruleoalba	Striped Dolphin					MO

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Stenalla logirostris	Long-snouted Spinner Dolphin					MO
Steno bredanensis	Rough-toothed Dolphin					MO
Tursiops aduncus	Indian Ocean Bottlenose Dolphin				bc	LO
Tursiops truncatus s. str.	Bottlenose Dolphin					MO
Porpoise						
Phocoena dioptrica	Spectacled Porpoise		✓			MO
Pinnipeds						
Arctocephalus forsteri	New Zealand Fur-seal			✓		MO
Arctocephalus pusillus	Australian Fur-seal			✓		BKO
Neophoca cinerea	Australian Sealion	V		✓		KO
Sirenians						
Dugong dugon	Dugong		✓	✓		MO
<u>Threatened Species</u>: *V Vulnerable* *E Endangered* *<u>Biologically Important Areas</u>:* *bc Breeding, calving* *f Foraging* *m Migration*	*<u>Type of Presence</u>:* *MO Species or species habitat may occur within the area* *LO Species or species habitat likely to occur within the area* *KO Species or species habitat known to occur within the area* *FLO Foraging, feeding or related behaviour likely to occur within the area* *FKO Foraging, feeding or related behaviour known to occur within the area* *BKO Breeding known to occur within the area*					

Table 5 – Marine Reptiles (Turtles) or species habitat that may occur within the PEA

(Note: Shaded species denotes that they occur in both the OA and the PEA)

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Turtles						
Caretta caretta	Loggerhead Turtle	E	✓	✓		BLO
Chelonia mydas	Green Turtle	V	✓	✓		FKO
Dermochelys coriacea	Leatherback Turtle	E	✓	✓		FKO
Eretmochelys imbricata	Hawksbill Turtle	V	✓	✓		FKO
Natator depressus	Flatback Turtle	V	✓	✓		FKO
Lepidochelys olivacea	Olive Ridley Rurtle	V	✓	✓		BLO
Seasnakes						
Astrotia stokesii	Stokes' Seasnake			✓		MO
Hydrophis elegans	Elegant Seasnake			✓		MO
Pelamis platurus	Yellow-bellied Seasnake			✓		MO
Threatened Species: *V Vulnerable* *E Endangered*	*Type of Presence:* *FKO Foraging, feeding or related behaviour known to occur within the area* *BLO Breeding likely to occur within the area*					

Appendix D – EPBC Act Listed Species by OA and EPBC Reports

	Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	Seahorse	Perch Dolphin Tarwhine	West Barracouta Barracouta	Whiting	Snapper Moonfish	Bream A Bream B	Marlin A Marlin B	West Tuna Tuna	Kipper	West Kingfish Kingfish A Kingfish B	Fortescue Halibut Cobia Mackerel	Flounder	Blackback
Bony Fish	*Heraldia nocturna*	Upside-down pipefish			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Hippocampus abdominalis	Big-belly seahorse			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Hippocampus breviceps	Short-head seahorse			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Hippocampus minotaur	Bullneck seahorse			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Histiogamphelus briggsii	Briggs' crested pipefish			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Histiogamphelus cristatus	Rhino pipefish			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Hypselognathus rostratus	Knife-snout pipefish			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Kaupus costatus	Deep-bodied pipefish			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Kimblaeus bassensis	Trawl pipefish			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Leptoichthys fistularius	Brushtail pipefish			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Lissocampus runa	Javelin pipefish			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Maroubra perserrata	Sawtooth pipefish			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Mitotichthys semistriatus	Halfbanded pipefish			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Mitotichthys tuckeri	Tucker's pipefish			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Notiocampus ruber	Red pipefish			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Phyllopteryx taeniolatus	Weedy seadragon			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Prototroctes maraena	Australian grayling	V			y	y	y										-
	Solegnathus robustus	Robust spiny pipehorse			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Solegnathus spinosissimus	Australian spiny pipehorse			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Stigmatopora argus	Spotted pipefish			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Stigmatopora nigra	Widebody pipefish			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Stipecampus cristatus	Ringback pipefish			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Syngnathoides biaculeatus	Double-ended pipehorse			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Urocampus carinirostris	Hairy pipefish			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Vanacampus margaritifer	Mother-of-pearl pipefish			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Vanacampus phillipi	Port Phillip pipefish			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
	Vanacampus poecilolaemus	Australian long-snout pipefish			✓	y	y	y	y	y	y	y	y	y	y	y	y	-
Fish - Cartilagi	*Carcharodon carcharias*	Great White Shark	V	✓		y	y	y	y	y	y	y	y	y	y	y	y	y
	Isurus oxyrinchus	Shortfin Mako		✓			y	y	y	y	y	y	y	y	y	y	y	y
	Lamna nasus	Porbeagle		✓		y	y	y	y	y	y	y	y	y	y	y	y	y
	Rhincodon typus	Whale Shark	V	✓		y	y	y	y	y	y	y	y	y	y	y	y	
Birds	**Albatross**																	
	Diomedia antipodensis	Antipodean Albatross	V	✓ (M)	✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Diomedia epomophora	Southern Royal Albatross	V	✓ (M)	✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Diomedia exulans	Wandering Albatross	V	✓ (M)	✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Diomedia gibsoni	Gibson's Albatross	V		✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Diomedia sanfordi	Northern Royal Albatross	E	✓ (M)	✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Phoebetria fusca	Sooty Albatross	V	✓ (M)	✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Thalassarche bulleri	Buller's Albatross	V	✓ (M)	✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Thalassarche bulleri platei	Northern Buller's Albatross	V		✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Thalassarche cauta	Shy Albatross	V	✓ (M)	✓	y	y	y	y	y	y	y	y	y	y	y	y	y

	Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	Seahorse	Perch Dolphin Tarwhine	West Barracouta Barracouta	Whiting	Snapper Moonfish	Bream A Bream B	Marlin A Marlin B	West Tuna Tuna	Kipper	West Kingfish Kingfish A Kingfish B	Fortescue Halibut Cobia Mackerel	Flounder	Blackback
	Thalassarche chrysostoma	Grey-headed Albatross	E	✓ (M)	✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Thalassarche eremita	Chatham Albatross	E	✓ (M)	✓					y		y	y	y	y	y	y	y
	Thalassarche impavida	Campbell Albatross	V	✓ (M)	✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Thalassarche melanophris	Black-browed Albatross	V	✓ (M)	✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Thalassarche salvini	Salvin's Albatross	V	✓ (M)	✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Thalassarche steadi	White-capped Albatross	V	✓ (M)	✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Petrels																	
	Fregetta grallaria grallaria	White-bellied Storm-Petrel	V			y	y	y	y	y	y	y	y	y	y	y	y	y
	Halobaena caerulea	Blue Petrel	V		✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Macronectes giganteus	Southern Giant Petrel	E	✓ (M)	✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Macronectes halli	Northern Giant Petrel	V	✓ (M)	✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Pterodroma leucoptera leucoptera	Gould's Petrel	E			y	y	y	y	y	y	y	y	y	y	y	y	y
	Thinornis rubricollis rubricollis	Hooded Plover (eastern)	V		✓	y												
	Scolopacidae -Sandpipers																	
	Actitis hypoleucos	Common Sandpiper		✓ (W)	✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Calidris acuminata	Sharp-tailed Sandpiper		✓ (W)	✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Calidris ferruginea	Curlew Sandpiper	CE	✓ (W)	✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Calidris melanotos	Pectoral Sandpiper		✓ (W)	✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Calidris canutus	Red Knot	E	✓ (W)	✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Numenius madagascariensis	Eastern Curlew	CE	✓ (W)	✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Puffinus carneipes	Flesh-footed Shearwater		✓ (M)	✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Puffinus griseus	Sooty Shearwater		✓ (M)	✓		y	y		y	y	y	y	y	y	y	y	y
	Sternula nereis nereis	Australian Fairy Tern	V			y	y	y	y	y	y	y	y	y	y	y	y	y
	Others																	
	Catharacta skua	Great Skua			✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Pachyptila turtur	Fairy Prion			✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Pachyptila turtur subantartica	Fairy Prion (southern)	V			y	y	y	y	y	y	y	y	y	y	y	y	y
	Pandion haliaetus	Osprey		✓ (W)	✓	y	y	y	y	y								
Whales	*Balaenoptera acutorostrata*	Minke Whale				y	y	y	y	y	y	y	y	y	y	y	y	y
	Balaenoptera borealis	Sei Whale	V	✓					y	y	y	y	y	y	y	y	y	y
	Balaenoptera edeni	Bryde's Whale		✓								y	y	y	y	y	y	y
	Balaenoptera musculus	Blue Whale	E	✓		y	y	y	y	y	y	y	y	y	y	y	y	y
	Balaenoptera physalus	Fin Whale	V	✓					y	y	y	y	y	y	y	y	y	y
	Berardius arnuxii	Arnoux's Beaked Whale																y
	Caperea marginata	Pygmy Right Whale		✓		y	y	y	y	y	y	y	y	y	y	y	y	y
	Eubalaena australis	Southern Right Whale	E	✓		y	y	y	y	y	y	y	y	y	y	y	y	y
	Globicephala macrorhynchus	Short-finned Pilot Whale																y
	Globicephala melas	Long-finned Pilot Whale																y
	Mesoplodon bowdoini	Andrew's Beaked Whale																y
	Mesoplodon densirostris	Blainville's Beaked Whale																y

	Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	Seahorse	Perch Dolphin Tarwhine	West Barracouta Barracouta	Whiting	Snapper Moonfish	Bream A Bream B	Marlin A Marlin B	West Tuna Tuna	Kipper	West Kingfish Kingfish A Kingfish B	Fortescue Halibut Cobia Mackerel	Flounder	Blackback
	Mesoplodon hectori	Hector's Beaked Whale																y
	Mesoplodon layardii	Strap-toothed Beaked Whale																y
	Mesoplodon mirus	True's Beaked Whale																y
	Megaptera novaeangliae	Humpback Whale	V	✓		y	y	y	y	y	y	y	y	y	y	y	y	y
	Physeter microcephalus	Sperm Whale		✓														y
	Ziphius cavirostris	Cuvier's Beaked Whale																y
Dolphins	*Delphinus delphis*	Common Dolphin				y	y	y	y	y	y	y	y	y	y	y	y	y
	Grampus griseus	Risso's Dolphin				y	y	y	y	y	y	y	y	y	y	y	y	y
	Kogia breviceps	Pygmy Sperm Whale																y
	Kogia simus	Dwarf Sperm Whale																y
	Lagenorhynchus obscurus	Dusky Dolphin		✓		y	y	y	y	y	y	y	y	y	y	y	y	y
	Lissodelphiss peronii	Southern Right Whale Dolphin																y
	Orcinus orca	Killer Whale		✓		y	y	y	y	y	y	y	y	y	y	y	y	y
	Pseudorca crassidens	False Killer Whale							y	y	y	y	y	y	y	y	y	y
	Tursiops truncatus s. str.	Bottlenose Dolphin				y	y	y	y	y	y	y	y	y	y	y	y	y
Pinnipeds	*Arctocephalus forsteri*	New Zealand Fur-seal			✓	y	y	y	y	y	y	y	y	y	y	y	y	
	Arctocephalus pusillus	Australian Fur-seal			✓	y	y	y	y	y	y	y	y	y	y	y	y	
Reptiles	*Caretta caretta*	Loggerhead Turtle	E	✓	✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Chelonia mydas	Green Turtle	V	✓	✓	y	y	y	y	y	y	y	y	y	y	y	y	y
	Dermochelys coriacea	Leatherback Turtle	E	✓	✓	y	y	y	y	y	y	y	y	y	y	y	y	y

MO	Species or species habitat may occur
LO	Species or species habitat likely to occur
KO	Species or species habitat known to occur
FLO	Foraging, feeding or related behaviour known or likely to occur within area
BKO	Breeding known to occur within area

Australian Government
Department of the Environment and Energy

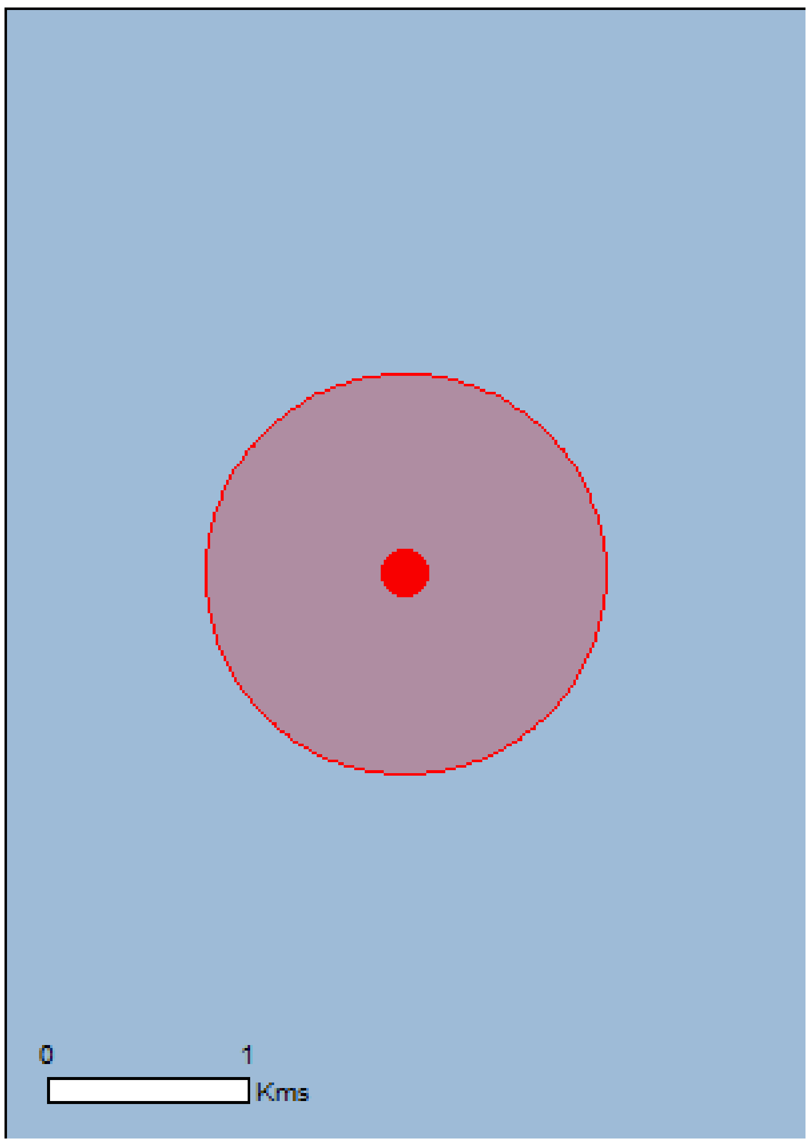
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

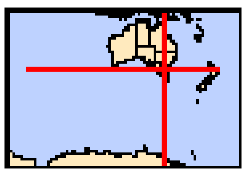
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 09/03/20 16:56:56



Coordinates
Buffer: 1.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	33
Listed Migratory Species:	36

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	59
Whales and Other Cetaceans:	10
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	None
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	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 the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

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

Name
South-east

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
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
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

Name	Status	Type of Presence
		area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
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 may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	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 cauta cauta Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Fish		
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat may occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species

Name	Status	Type of Presence
		habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
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 known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Breeding known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species

[Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat 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
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Breeding known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory 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
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
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
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
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 gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
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
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
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	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
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
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 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

Name	Threatened	Type of Presence
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
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Reptiles		
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 known to 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]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within

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

Extra Information

Caveat

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

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

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

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-38.29635 147.67704

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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Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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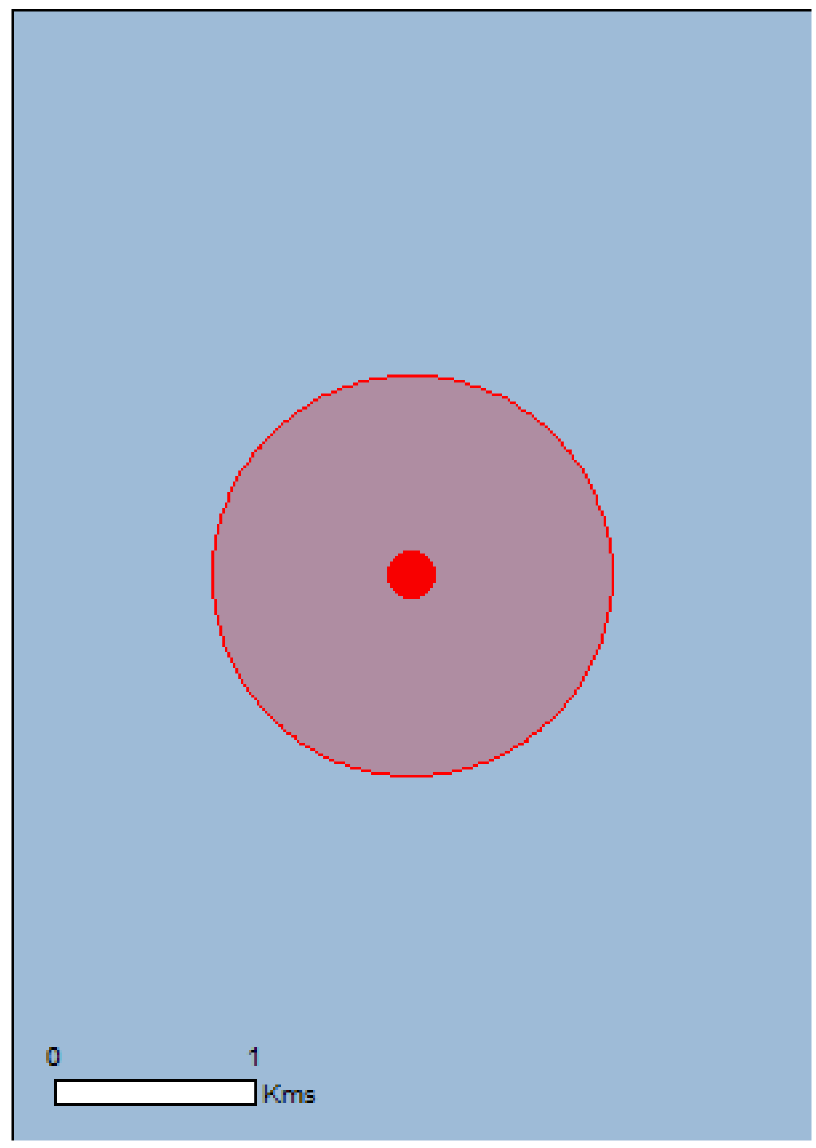

Coordinates
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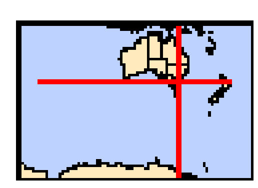

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	35
Listed Migratory Species:	39

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	59
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

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

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 the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

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

Name
South-east

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
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	Species or species habitat likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	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
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within

Name	Status	Type of Presence
		area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
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 may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	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 cauta cauta Shy Albatross [82345]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Species or species habitat likely 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	Species or species habitat likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
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

Name	Status	Type of Presence
		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
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat may 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
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species

[Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Ardenna grisea Sooty Shearwater [82651]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Species or species habitat likely 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	Species or species habitat likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera 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 likely to 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 may occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	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
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]

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

Name	Threatened	Type of Presence
Birds		
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

Name	Threatened	Type of Presence
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
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	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	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	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
Pachyptila turtur Fairy Prion [1066]		Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		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

Name	Threatened	Type of Presence
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Species or species habitat likely 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	Species or species habitat likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely 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
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

Name	Threatened	Type of Presence
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
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
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat may 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]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
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 likely to occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

Key Ecological Features (Marine) [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
Upwelling East of Eden	South-east

Caveat

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

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

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

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-38.31144 148.43784

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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Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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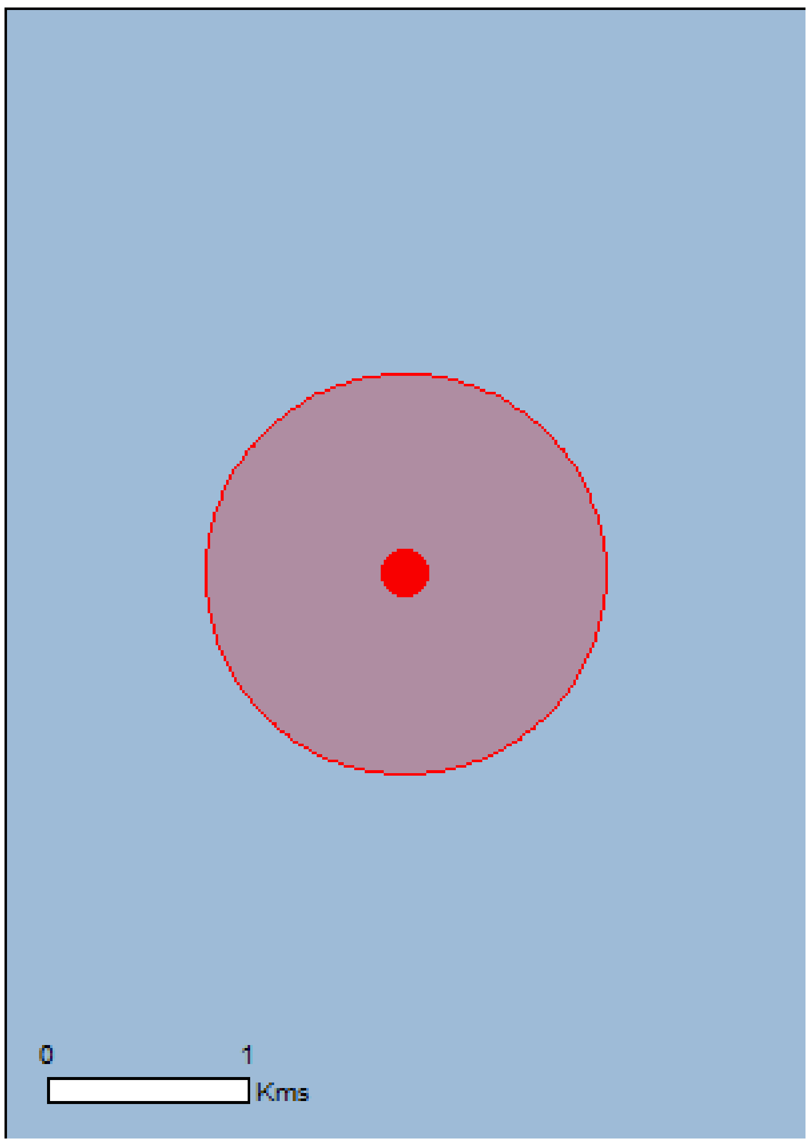
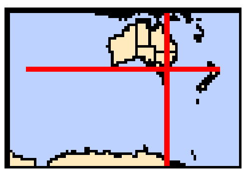


Coordinates
Buffer: 1.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	34
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 http://www.environment.gov.au/heritage

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	58
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	None
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	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 the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

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

Name
South-east

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
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
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

Name	Status	Type of Presence
		area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
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 may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	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 cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Mammals		
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

Name	Status	Type of Presence
		to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
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 known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	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 known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	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
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
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
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

Name	Threatened	Type of Presence
Catharacta skua Great Skua [59472]		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 gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
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
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		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 cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
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
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 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

Name	Threatened	Type of Presence
Notiocampus ruber Red Pipefish [66265]		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
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Reptiles		
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 known to 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]

Name	Status	Type of Presence

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

Caveat

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- marine

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

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

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

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

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

Coordinates

-38.23569 147.87715

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
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-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
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-Ocean Biogeographic Information System
-Australian Government, Department of Defence
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-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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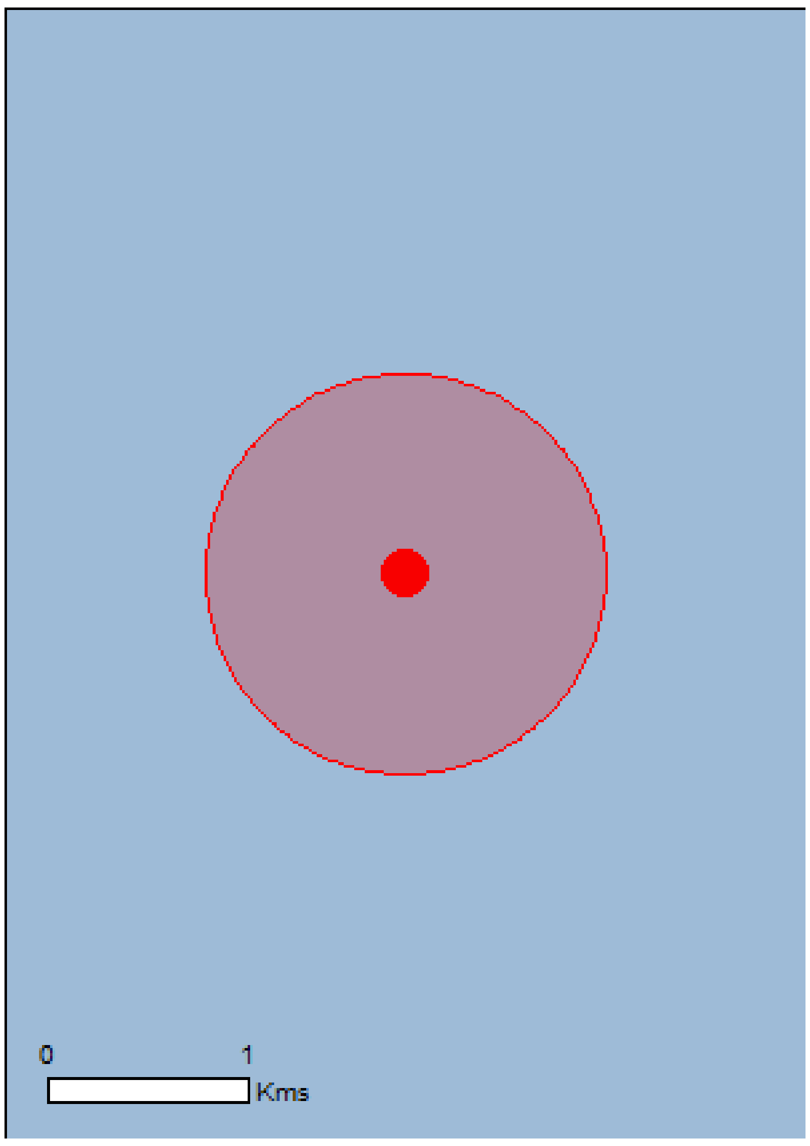
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 09/03/20 15:56:11



Coordinates
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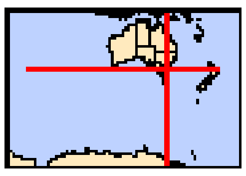

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	34
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 http://www.environment.gov.au/heritage

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	58
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	None
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	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 the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

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

Name
South-east

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
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
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

Name	Status	Type of Presence
		area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
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 may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	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 cauta cauta Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Mammals		
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

Name	Status	Type of Presence
		to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
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 likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species

[Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat may 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
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	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 likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	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
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]

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

Name	Threatened	Type of Presence
Birds		
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

Name	Threatened	Type of Presence
Catharacta skua Great Skua [59472]		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 gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
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 may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat may occur within area
Puffinus griseus Sooty Shearwater [1024]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
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
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 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

Name	Threatened	Type of Presence
Notiocampus ruber Red Pipefish [66265]		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
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Reptiles		
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 likely to 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]

Name	Status	Type of Presence

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

Caveat

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

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

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

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
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The following groups have been mapped, but may not cover the complete distribution of the species:

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

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

Coordinates

-38.51803 147.83359

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
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- -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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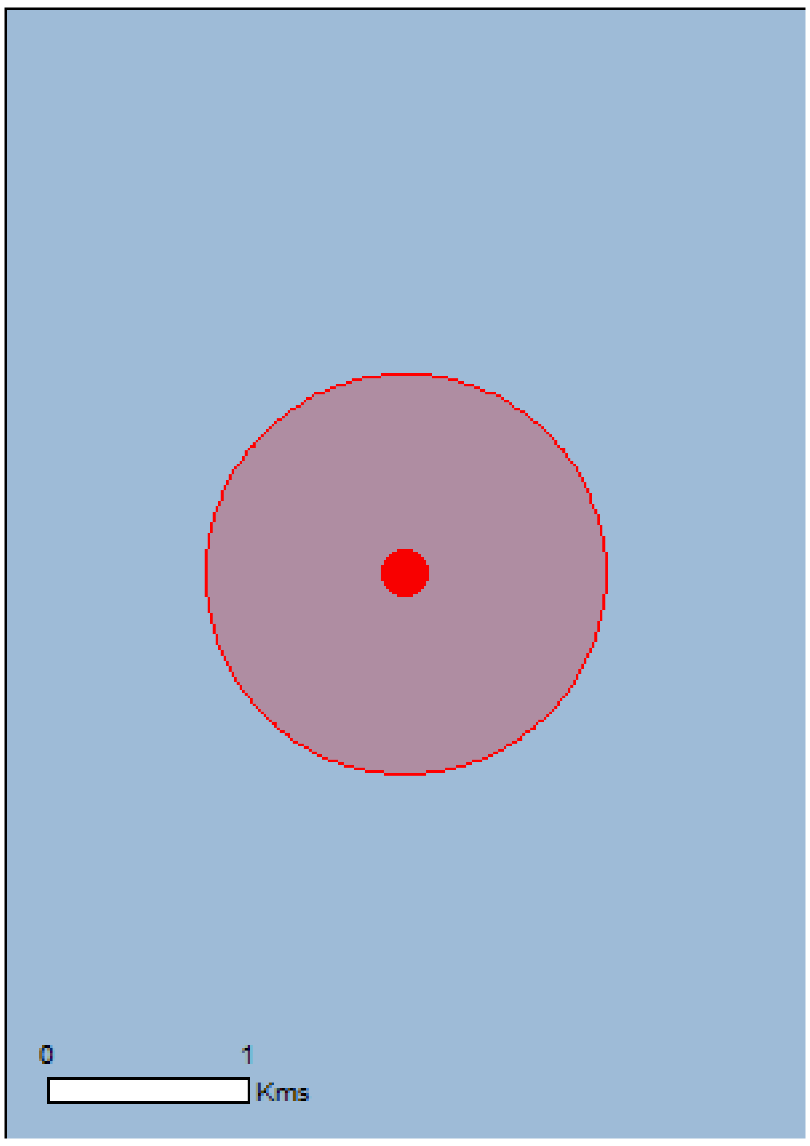
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

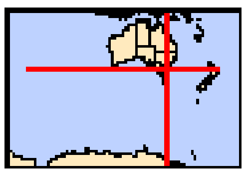
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 09/03/20 16:52:11



Coordinates
Buffer: 1.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	35
Listed Migratory Species:	39

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	59
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

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

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 the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

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

Name
South-east

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
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
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

Name	Status	Type of Presence
		area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
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 may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	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 cauta cauta Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to 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	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Mammals		
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

Name	Status	Type of Presence
		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
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
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 likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat 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
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Phoebetria fusca		
Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri		
Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta		
Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma		
Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche eremita		
Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to 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	Species or species habitat may occur within area
Thalassarche salvini		
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis		
Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera 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 likely to 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 likely to occur within area

Name	Threatened	Type of Presence
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	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
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]

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

Name	Threatened	Type of Presence
Birds		
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

Name	Threatened	Type of Presence
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
Catharacta skua Great Skua [59472]		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 gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
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 may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		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

Name	Threatened	Type of Presence
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to 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	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
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
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

Name	Threatened	Type of Presence
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
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
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Reptiles		
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 likely to 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]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
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 likely to occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

Key Ecological Features (Marine) [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
Upwelling East of Eden	South-east

Caveat

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

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

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

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-38.18202 148.59439

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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Australian Government
Department of the Environment and Energy

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Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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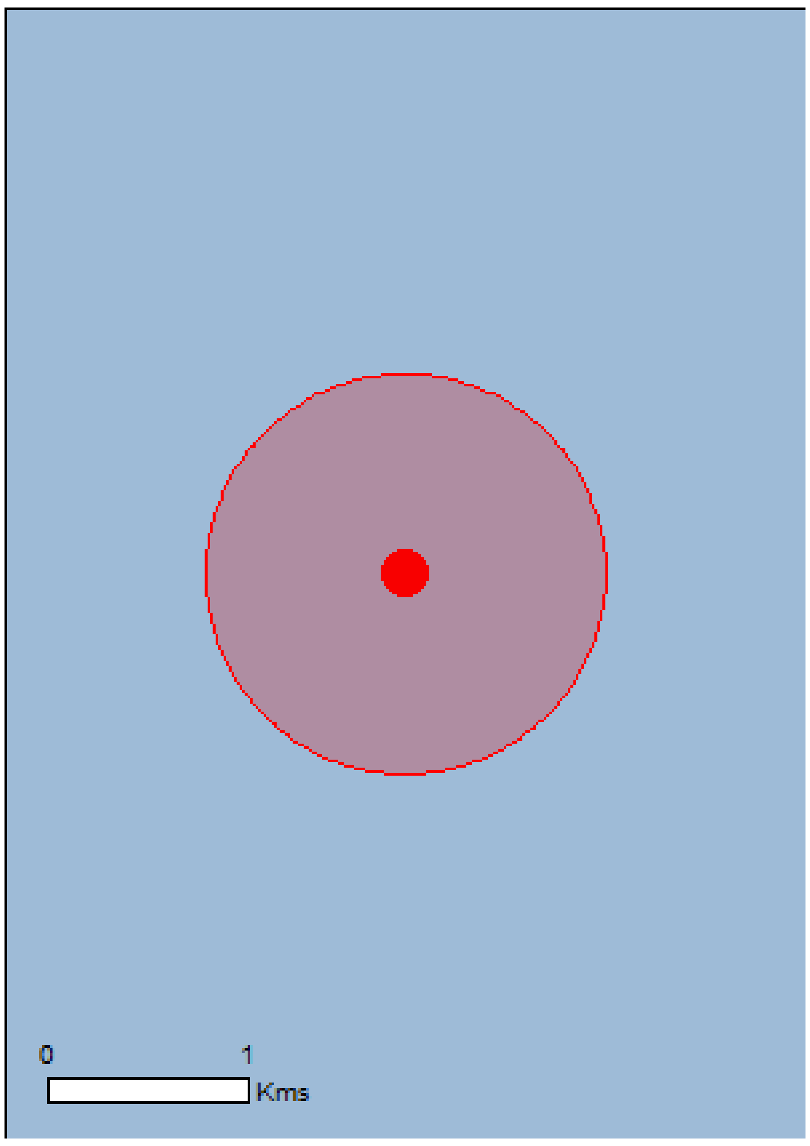

Coordinates
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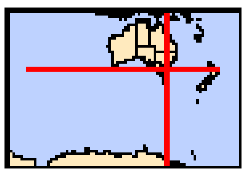

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	35
Listed Migratory Species:	39

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	59
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	None
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	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 the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

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

Name
South-east

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
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	Species or species habitat likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	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
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within

Name	Status	Type of Presence
		area
[Macronectes giganteus](#) Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
[Macronectes halli](#) Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
[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 may occur within area
[Pterodroma leucoptera leucoptera](#) Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
[Sternula nereis nereis](#) Australian Fairy Tern [82950]	Vulnerable	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](#) Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
[Thalassarche cauta cauta](#) Shy Albatross [82345]	Vulnerable	Species or species habitat likely to occur within area
[Thalassarche cauta steadi](#) White-capped Albatross [82344]	Vulnerable	Species or species habitat likely 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	Species or species habitat likely to occur within area
[Thalassarche impavida](#) Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat likely to occur within area
[Thalassarche melanophris](#) Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
[Thalassarche salvini](#) Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
[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

Name	Status	Type of Presence
		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
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat may 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
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Ardenna grisea Sooty Shearwater [82651]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Species or species habitat likely 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	Species or species habitat likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera 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
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 may occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	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
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]

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

Name	Threatened	Type of Presence
Birds		
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

Name	Threatened	Type of Presence
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
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	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	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	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
Pachyptila turtur Fairy Prion [1066]		Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		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

Name	Threatened	Type of Presence
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Species or species habitat likely 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	Species or species habitat likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely 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
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

Name	Threatened	Type of Presence
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
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
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat may 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]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
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
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

Caveat

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

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

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

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-38.59321 148.14396

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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Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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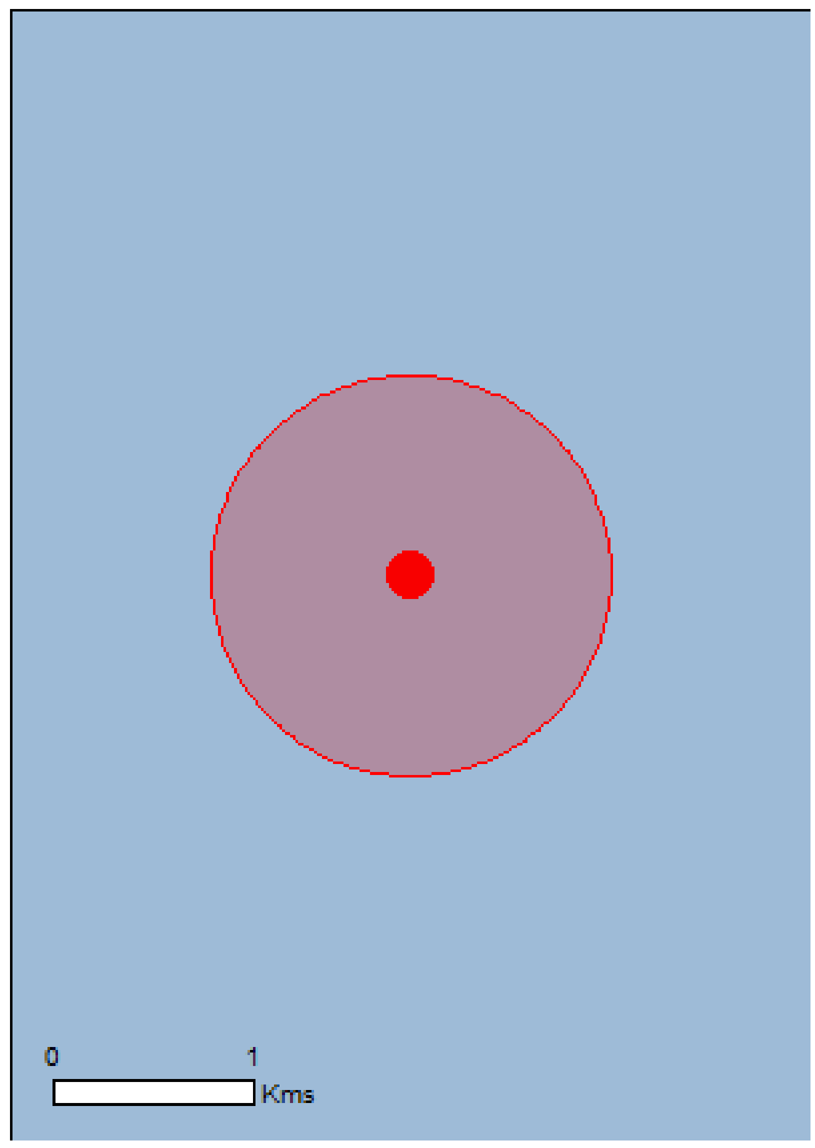

Coordinates
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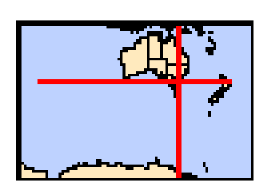

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	34
Listed Migratory Species:	39

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	31
Whales and Other Cetaceans:	27
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	None
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	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 the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

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

Name
South-east

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
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	Species or species habitat likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	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
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within

Name	Status	Type of Presence
		area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
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 may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	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 Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta cauta Shy Albatross [82345]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Species or species habitat likely 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	Species or species habitat likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
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

Name	Status	Type of Presence
		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 may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
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 likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area

Listed Migratory Species

[Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Ardenna grisea Sooty Shearwater [82651]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Species or species habitat likely 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	Species or species habitat likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	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 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
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 likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
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]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
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
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]

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

Name	Threatened	Type of Presence
Birds		
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

Name	Threatened	Type of Presence
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
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	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	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	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
Pachyptila turtur Fairy Prion [1066]		Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area
Reptiles		
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 likely to 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]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
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

Name	Status	Type of Presence
[Delphinus delphis] Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
[Eubalaena australis] Southern Right Whale [40]	Endangered	Species or species habitat may 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 simus] Dwarf Sperm Whale [58]		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]	Vulnerable	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
[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

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

Extra Information

Caveat

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

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

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

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-38.54382 148.55075

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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Australian Government

Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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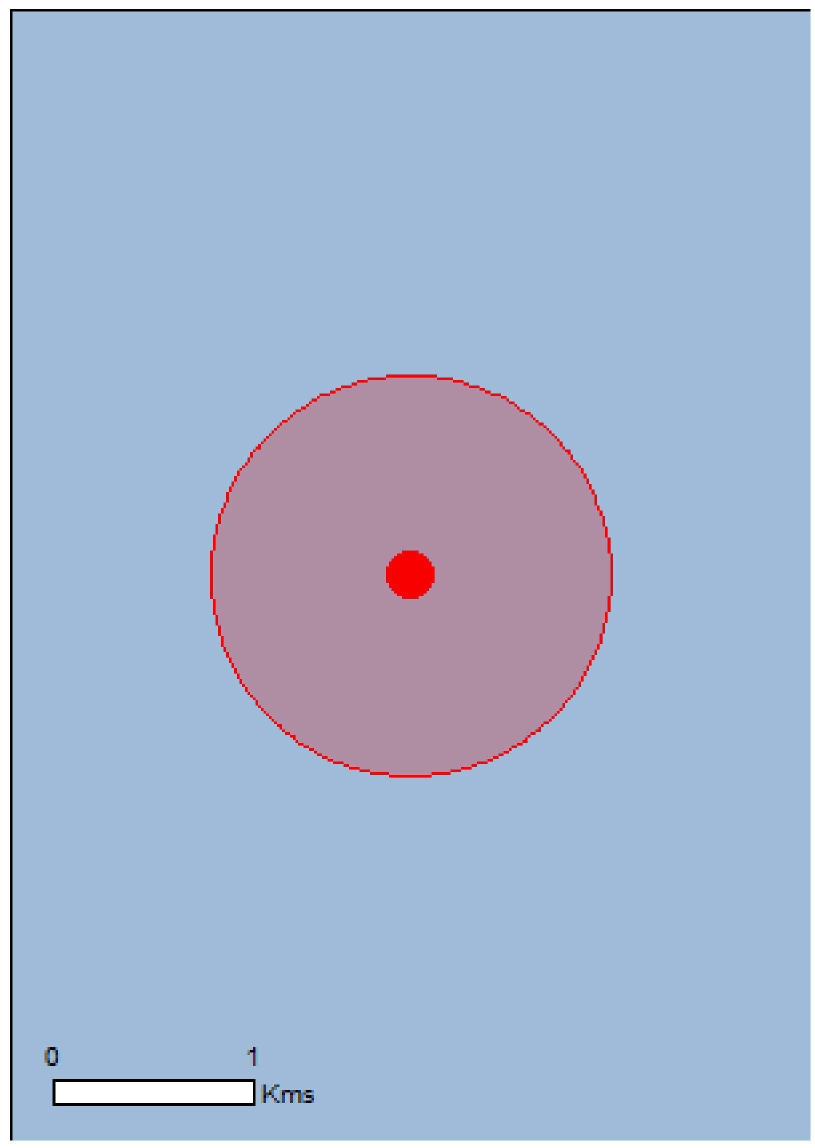
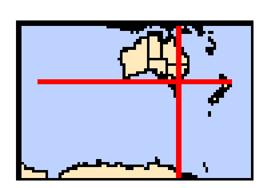


Coordinates

Buffer: 1.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	35
Listed Migratory Species:	39

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	59
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	None
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	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 the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

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

Name
South-east

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
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	Species or species habitat likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	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
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within

Name	Status	Type of Presence
		area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
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 may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	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 Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta cauta Shy Albatross [82345]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Species or species habitat likely 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	Species or species habitat likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
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

Name	Status	Type of Presence
		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
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat may 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
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Ardenna grisea Sooty Shearwater [82651]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Species or species habitat likely 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	Species or species habitat likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera 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 likely to 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 may occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	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
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]

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

Name	Threatened	Type of Presence
Birds		
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

Name	Threatened	Type of Presence
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
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	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	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	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
Pachyptila turtur Fairy Prion [1066]		Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		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

Name	Threatened	Type of Presence
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Species or species habitat likely 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	Species or species habitat likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely 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
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

Name	Threatened	Type of Presence
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
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
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat may 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]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
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 likely to occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

Caveat

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

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

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

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-38.40405 148.32523

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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Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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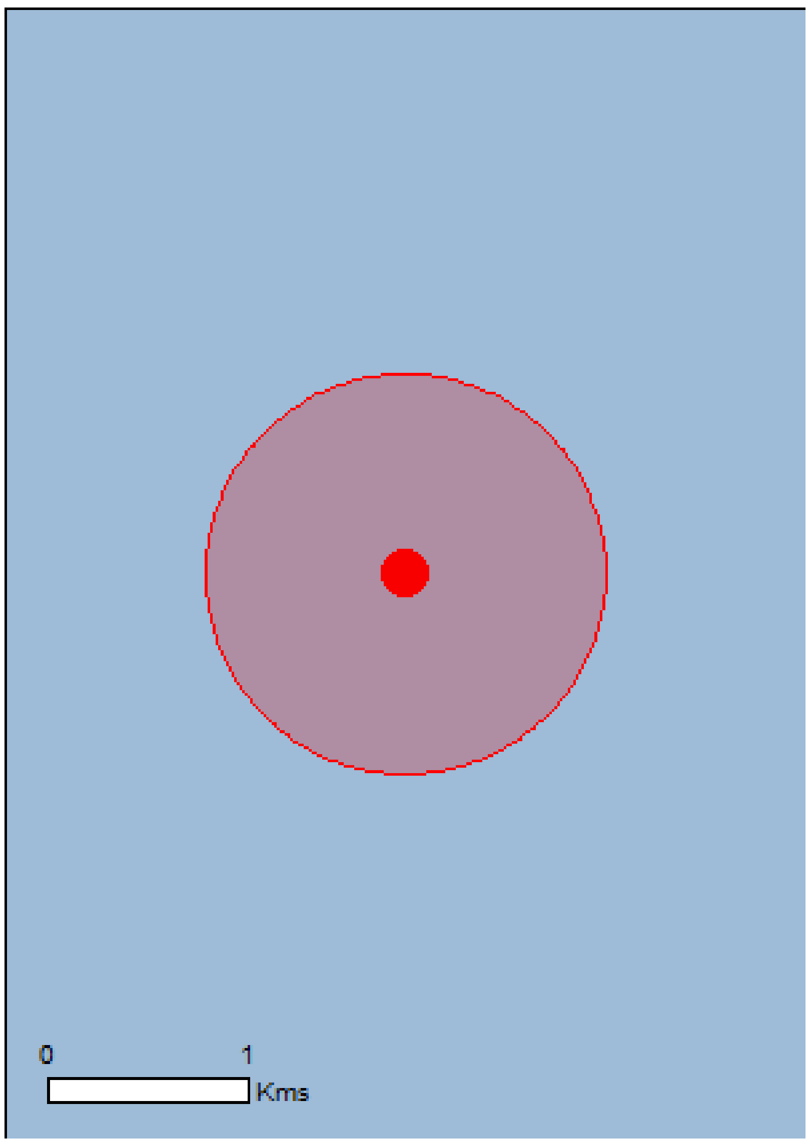

Coordinates
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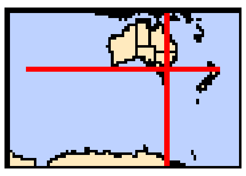

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	35
Listed Migratory Species:	39

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	59
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

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

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 the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

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

Name
South-east

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
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
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

Name	Status	Type of Presence
		area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
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 may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	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 cauta cauta Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to 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	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Mammals		
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

Name	Status	Type of Presence
		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
[Megaptera novaeangliae](#) Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
[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 known to occur within area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Sharks		
[Carcharodon carcharias](#) White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
[Rhincodon typus](#) Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
[Ardenna carneipes](#) Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat 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
[Macronectes giganteus](#) Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
[Macronectes halli](#) Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to 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	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera 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 likely to 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 known to occur within area

Name	Threatened	Type of Presence
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	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
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]

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

Name	Threatened	Type of Presence
Birds		
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

Name	Threatened	Type of Presence
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
Catharacta skua Great Skua [59472]		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 gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
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 may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		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

Name	Threatened	Type of Presence
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to 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	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
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
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

Name	Threatened	Type of Presence
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
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
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Reptiles		
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 known to 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]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
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 likely to occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

Key Ecological Features (Marine) [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
Upwelling East of Eden	South-east

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

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

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

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-38.19281 148.3884

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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Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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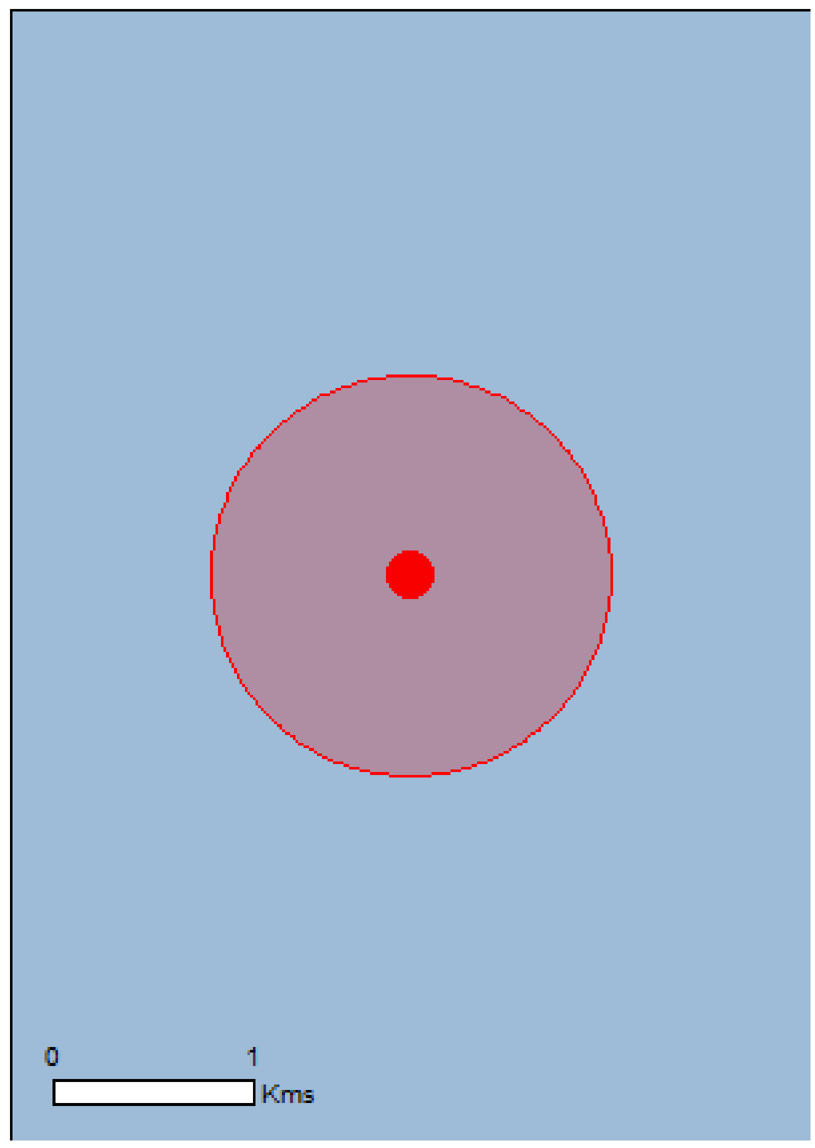

Coordinates
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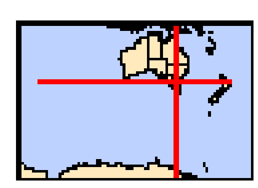

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	34
Listed Migratory Species:	34

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	59
Whales and Other Cetaceans:	10
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	None
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	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 the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

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

Name
South-east

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
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
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

Name	Status	Type of Presence
		area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
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 may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	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 cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat may occur within area
Fish		
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat may occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
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 known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Breeding known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species

[Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Breeding known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Wetlands Species		

Name	Threatened	Type of Presence
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
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
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
Catharacta skua Great Skua [59472]		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

Name	Threatened	Type of Presence
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
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
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		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 cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat may 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
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 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
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
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
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Reptiles		
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 known to 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]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur

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

Extra Information

Caveat

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

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

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

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-38.19494 147.67431

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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EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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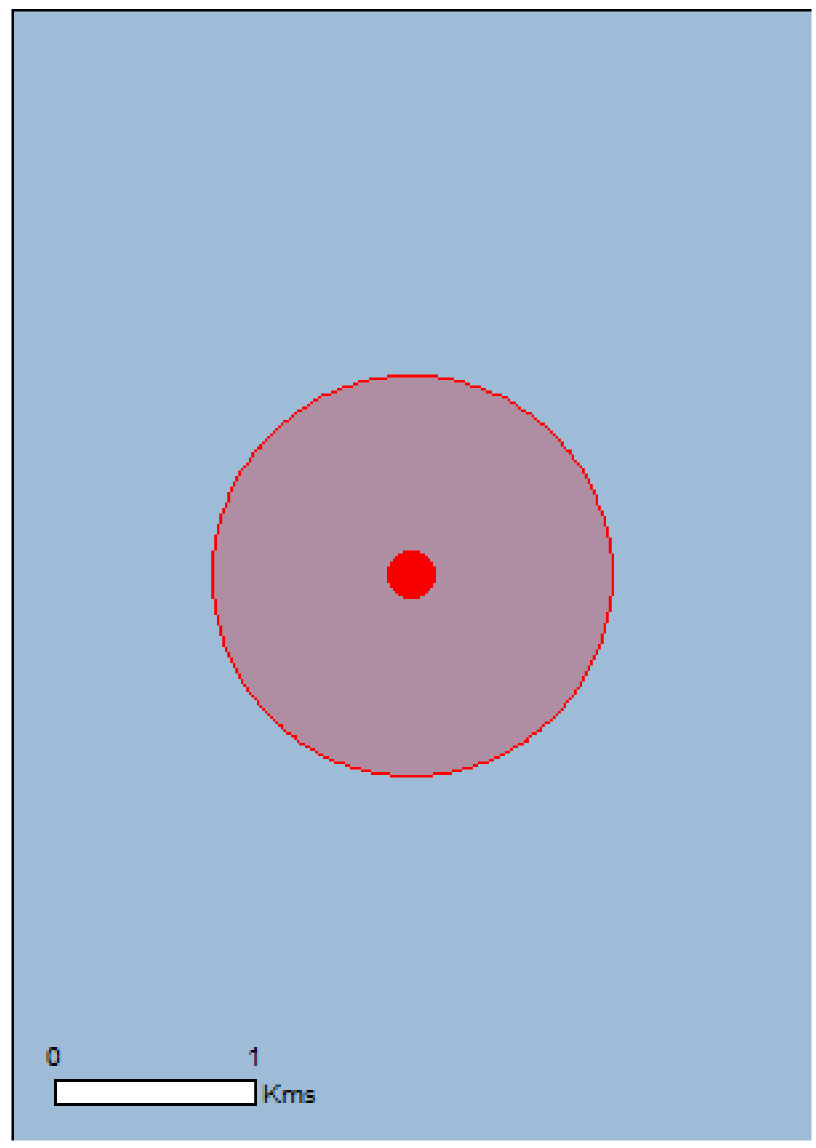

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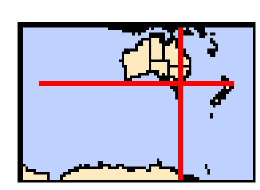

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	35
Listed Migratory Species:	39

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	60
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	None
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	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 the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

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

Name
South-east

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
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
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

Name	Status	Type of Presence
		area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
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 may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	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 cauta cauta Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to 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	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Mammals		
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

Name	Status	Type of Presence
		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
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
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 known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat 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
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to 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	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour likely to 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 known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	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
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
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
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

Name	Threatened	Type of Presence
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
Catharacta skua Great Skua [59472]		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 gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
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
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to 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	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
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
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

Name	Threatened	Type of Presence
Leptoichthys fistularius Brushtail Pipefish [66248]		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
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
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Reptiles		
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 known to 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]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
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 likely to occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

Caveat

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

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

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

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-38.19281 148.0286

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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Australian Government

Department of the Environment and Energy

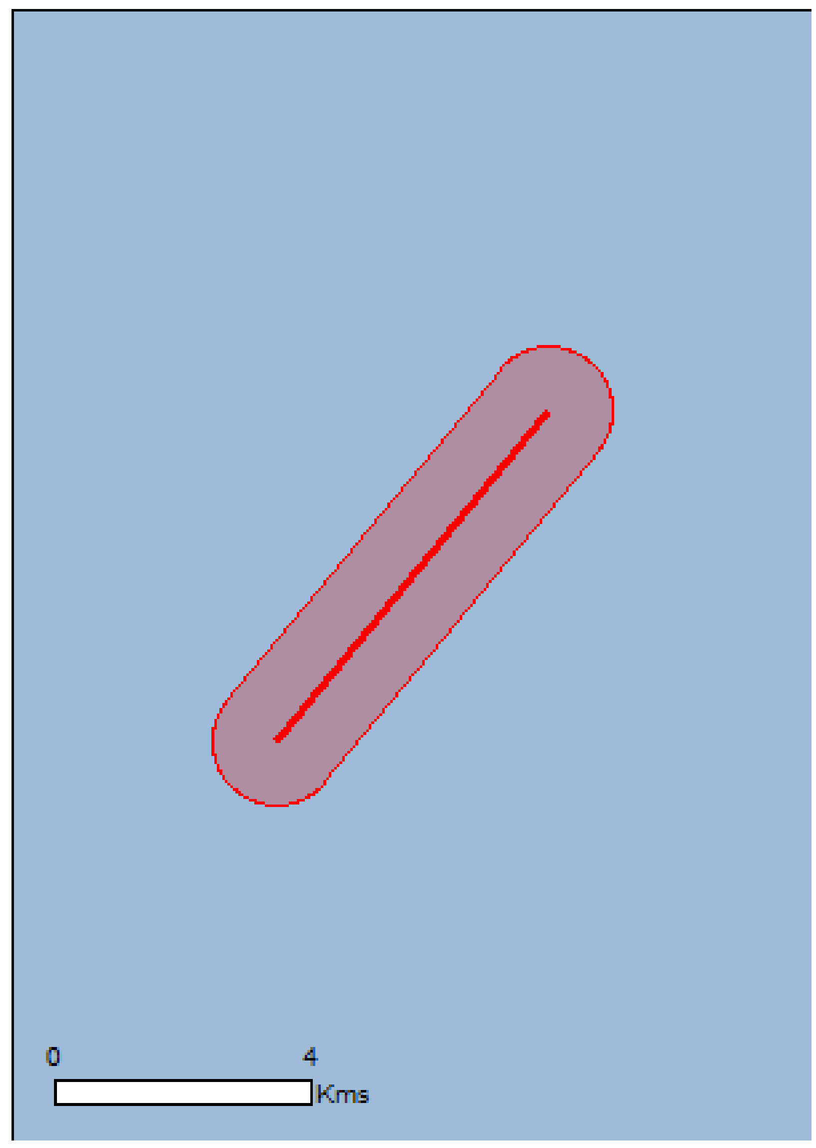
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

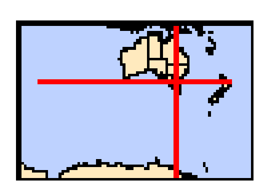
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 06/03/20 11:53:37



Coordinates

Buffer: 1.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	33
Listed Migratory Species:	36

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	59
Whales and Other Cetaceans:	10
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	None
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	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 the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

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

Name
South-east

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
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
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

Name	Status	Type of Presence
		area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
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 may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	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 cauta cauta Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Fish		
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat may occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species

Name	Status	Type of Presence
		habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
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 known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Breeding known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species

[Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat 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
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Breeding known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	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 may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory 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
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
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
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
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 gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
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
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
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	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
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
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 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

Name	Threatened	Type of Presence
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
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Reptiles		
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 known to 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]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within

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

Extra Information

Caveat

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

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

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

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-38.573884 147.324916,-38.537371 147.363368,-38.537371 147.363368

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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Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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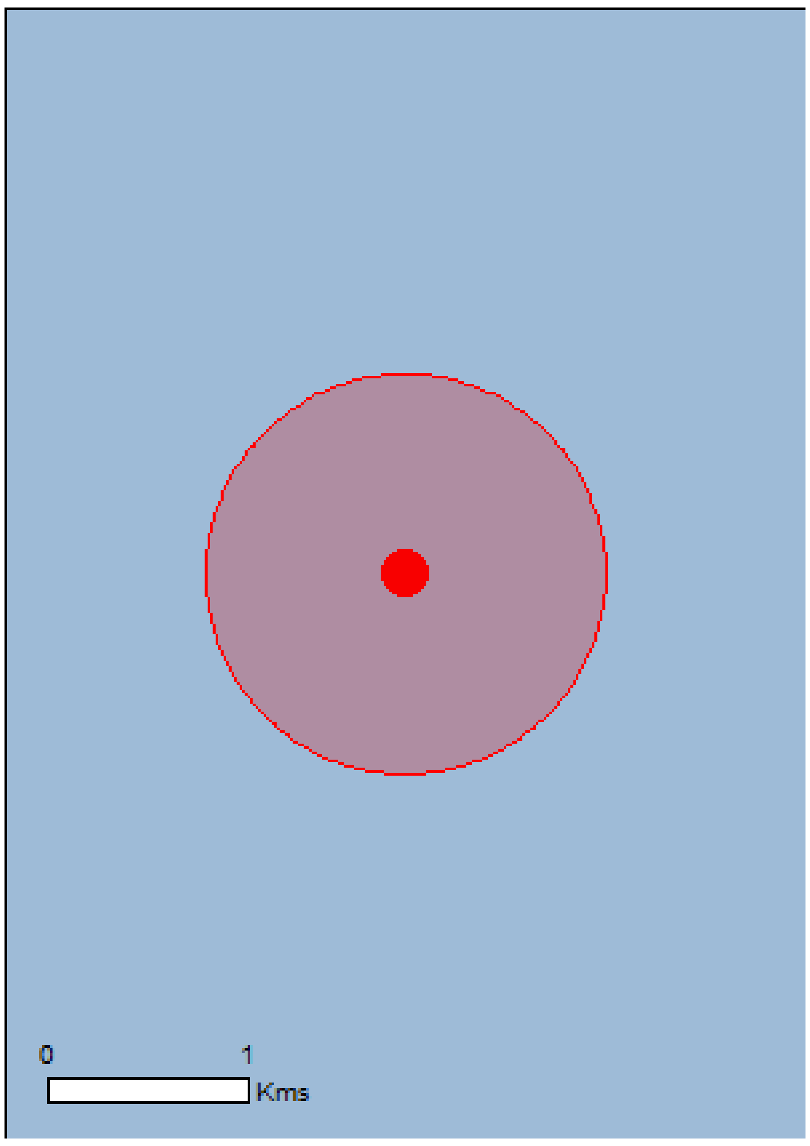

Coordinates
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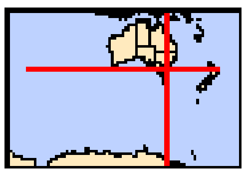

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	35
Listed Migratory Species:	39

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	59
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

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

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 the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

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

Name
South-east

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
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	Species or species habitat likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	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
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within

Name	Status	Type of Presence
		area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
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 may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	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 cauta cauta Shy Albatross [82345]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Species or species habitat likely 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	Species or species habitat likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
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

Name	Status	Type of Presence
		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
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat may occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Ardenna grisea Sooty Shearwater [82651]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Species or species habitat likely 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	Species or species habitat likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera 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 likely to 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 may occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	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
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]

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

Name	Threatened	Type of Presence
Birds		
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

Name	Threatened	Type of Presence
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
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	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	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	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
Pachyptila turtur Fairy Prion [1066]		Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		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

Name	Threatened	Type of Presence
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Species or species habitat likely 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	Species or species habitat likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely 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
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

Name	Threatened	Type of Presence
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
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
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat may occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to 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]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
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 likely to occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

Key Ecological Features (Marine) [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
Upwelling East of Eden	South-east

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

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

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

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-38.23165 148.22635

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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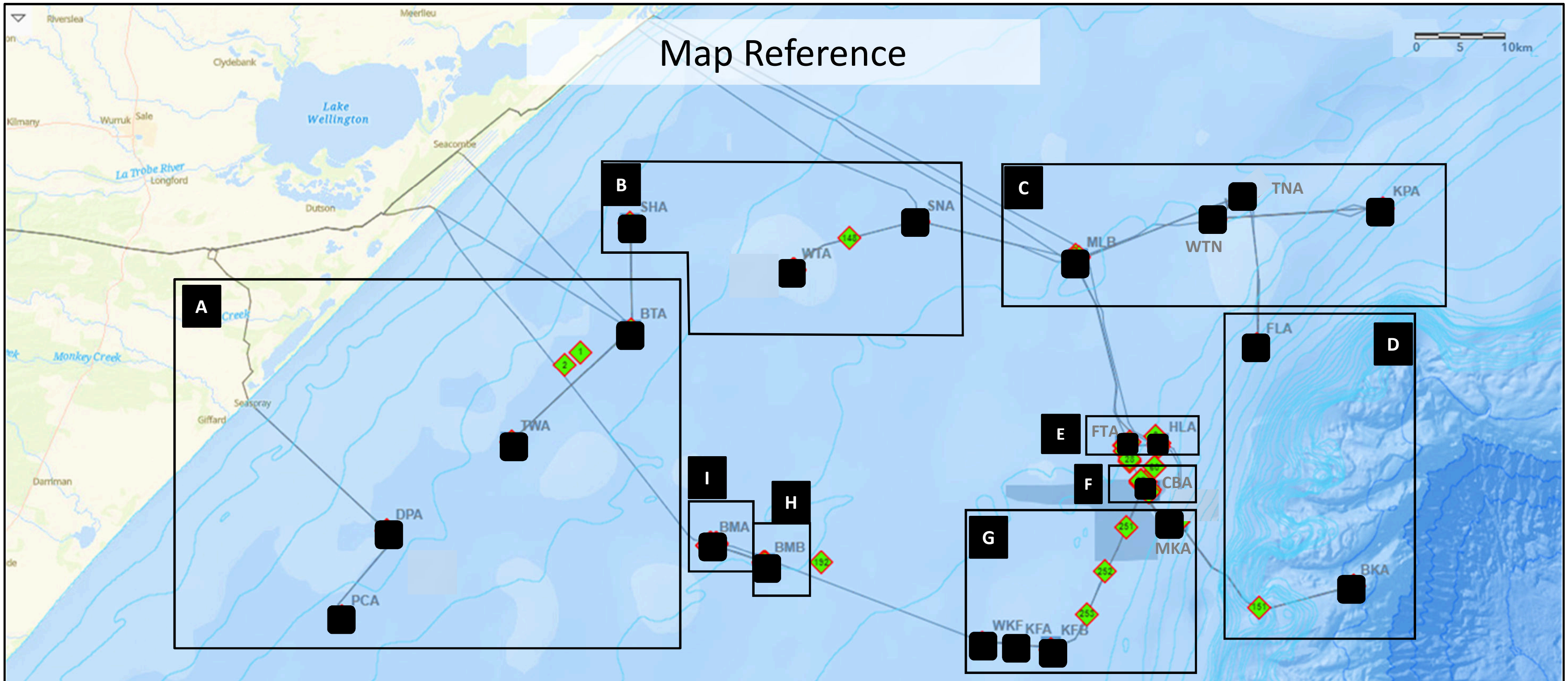
Appendix E – Bass Strait Facilities Survey Data



Map A
PCA - Perch
DPA - Dolphin
TWA - Tarwhine
BTA - Barracouta

Map B
SHA – Seahorse
WTA - Whiting
SNA - Snapper

Map C
MLA - Marlin
WTN - West Tuna
TNA - Tuna
KPA - Kipper

Map D
FLA - Flounder
BKA - Blackback

Map E
FTA - Fortescue
HLA - Halibut

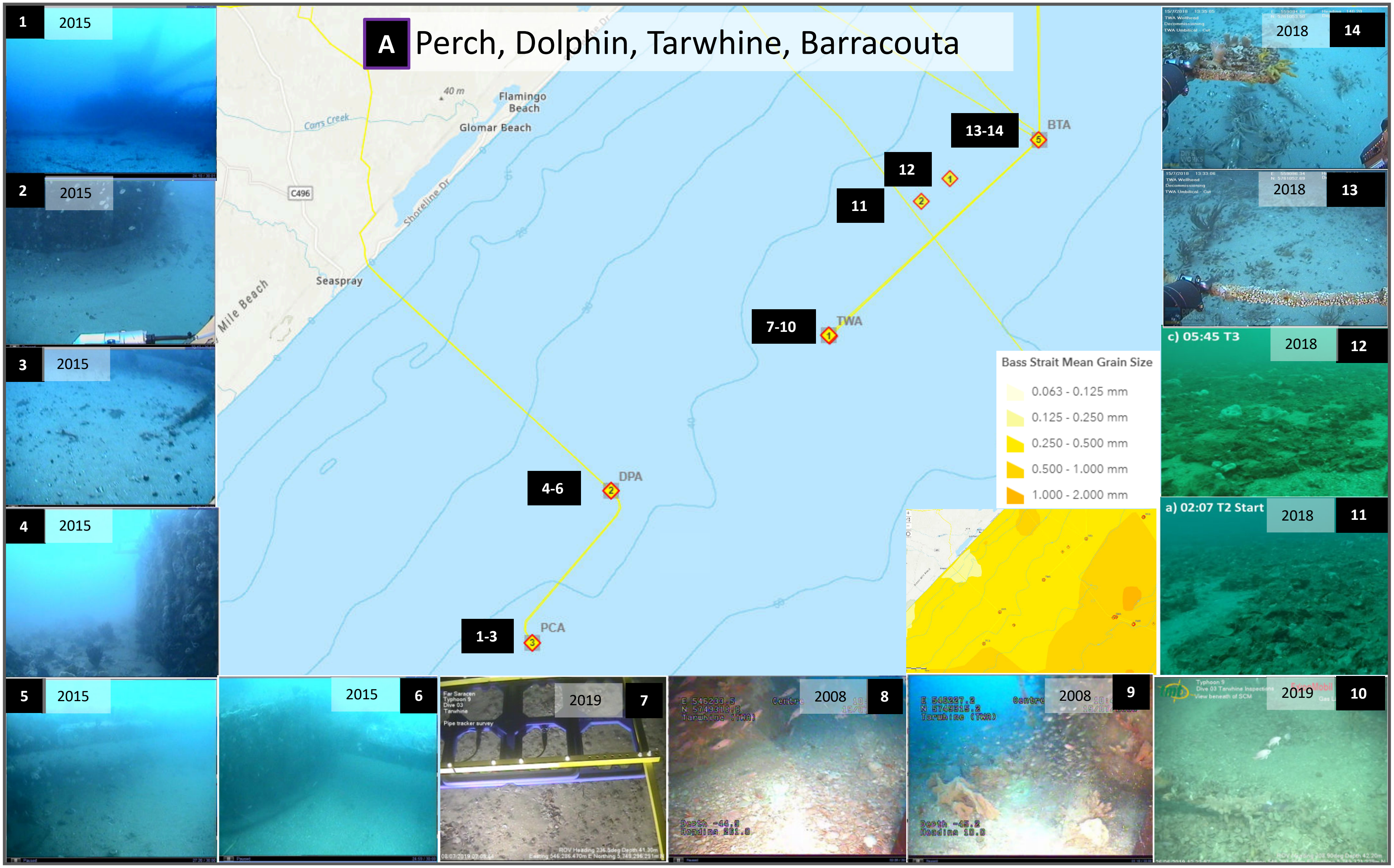
Map F
CBA - Cobia

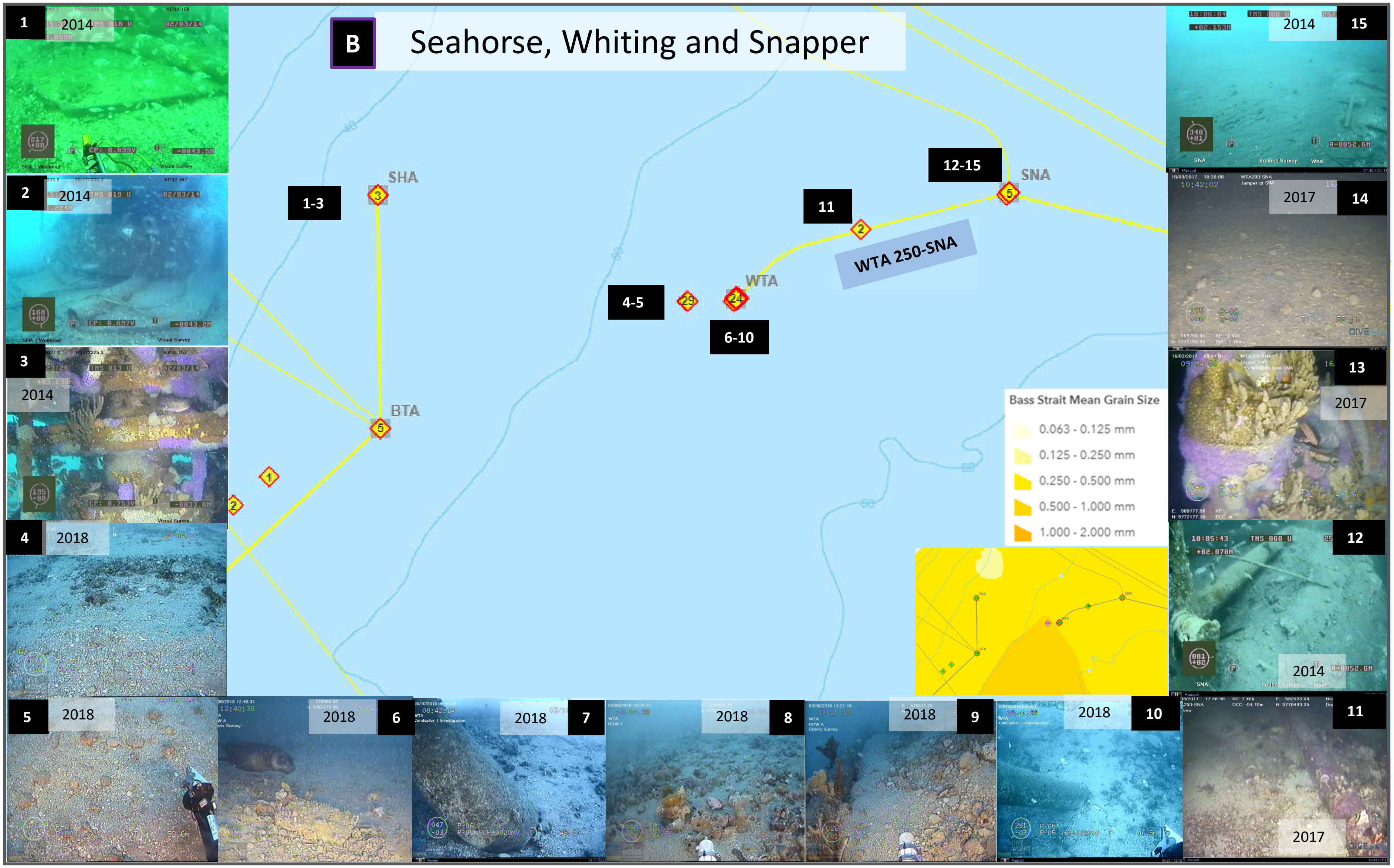
Map G
WKF - West Kingfish
KFA - Kingfish A
KFB - Kingfish B
MKA - Mackerel

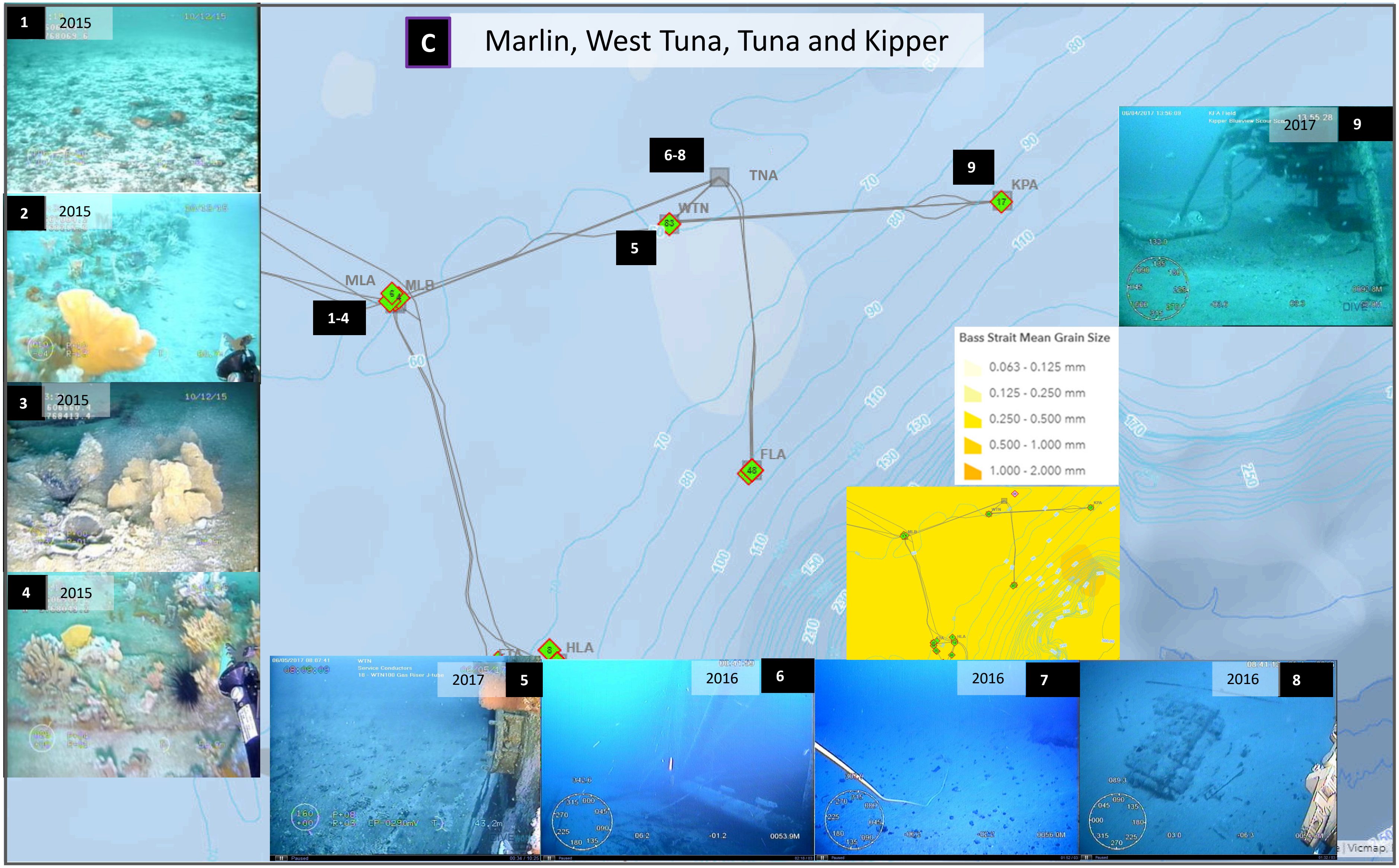
Map H
BMB - Bream B

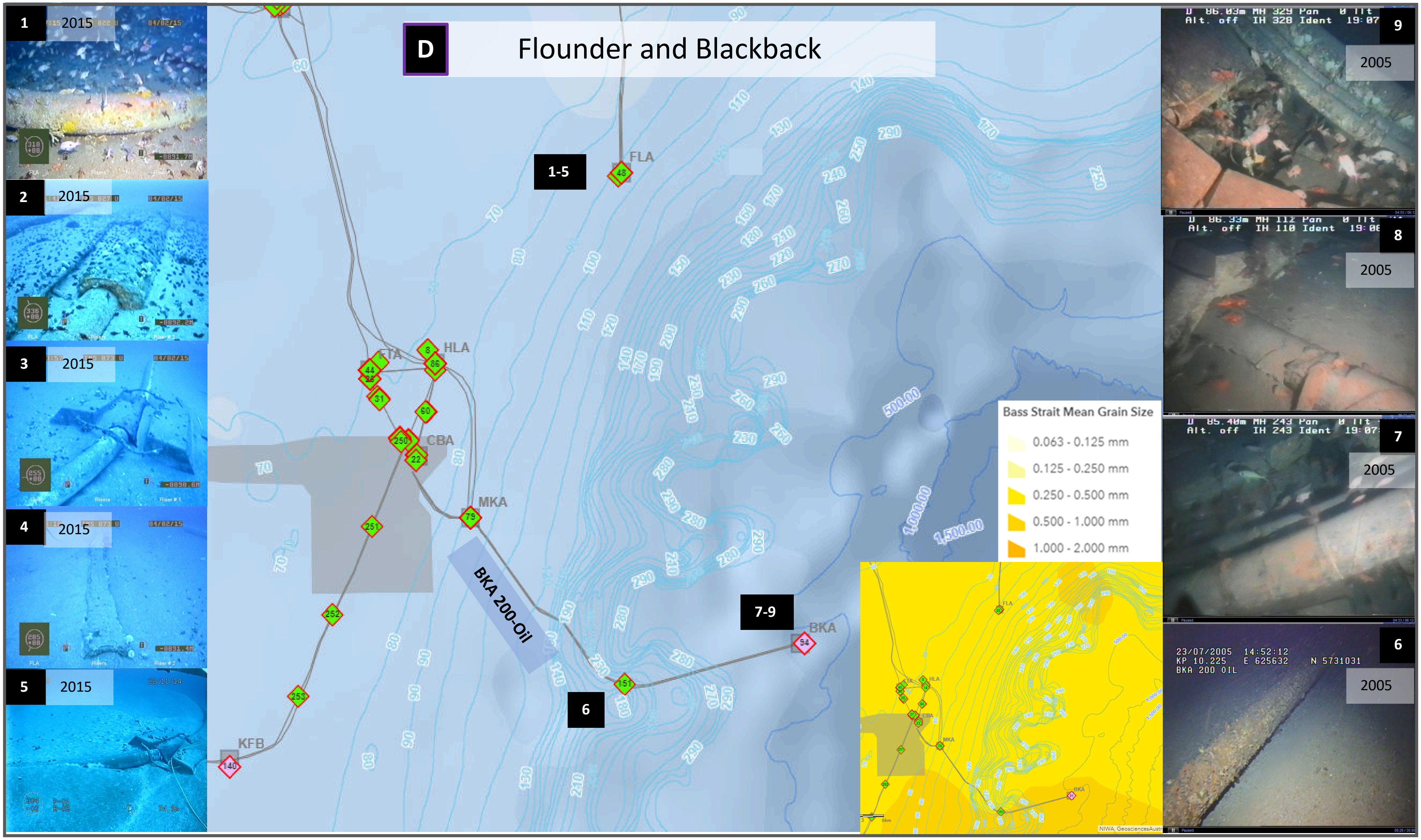
Map I
BMA - Bream A

Notes: Facilities have been grouped spatially. Correlations are not inferred by these groupings.
images have been collated from past Esso ROV surveys as conducted for inspection purposes

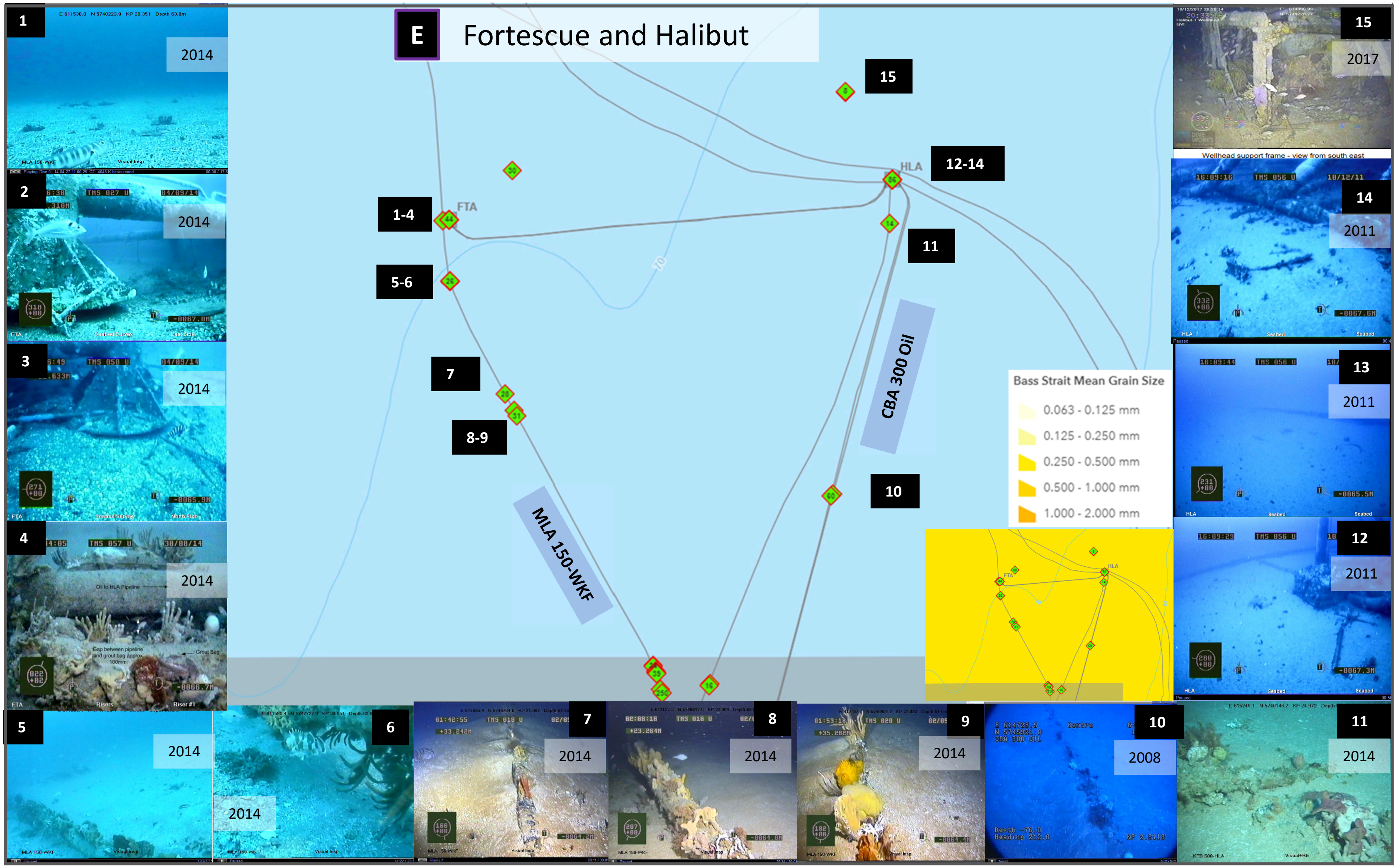

A Perch, Dolphin, Tarwhine, Barracouta
1 2015
2 2015
3 2015
4 2015
5 2015
2015 6
2019 7
2008 8
2008 9
2019 10
2018 11
a) 02:07 T2 Start
2018 12
c) 05:45 T3
2018 13
2018 14
13-14
BTA
12
11
7-10
TWA
4-6
DPA
1-3
PCA
Flamingo Beach
Glomar Beach
Seaspray
Shoreline Dr
Carrs Creek
C496
40 m
Mile Beach
Bass Strait Mean Grain Size
0.063 - 0.125 mm
0.125 - 0.250 mm
0.250 - 0.500 mm
0.500 - 1.000 mm
1.000 - 2.000 mm

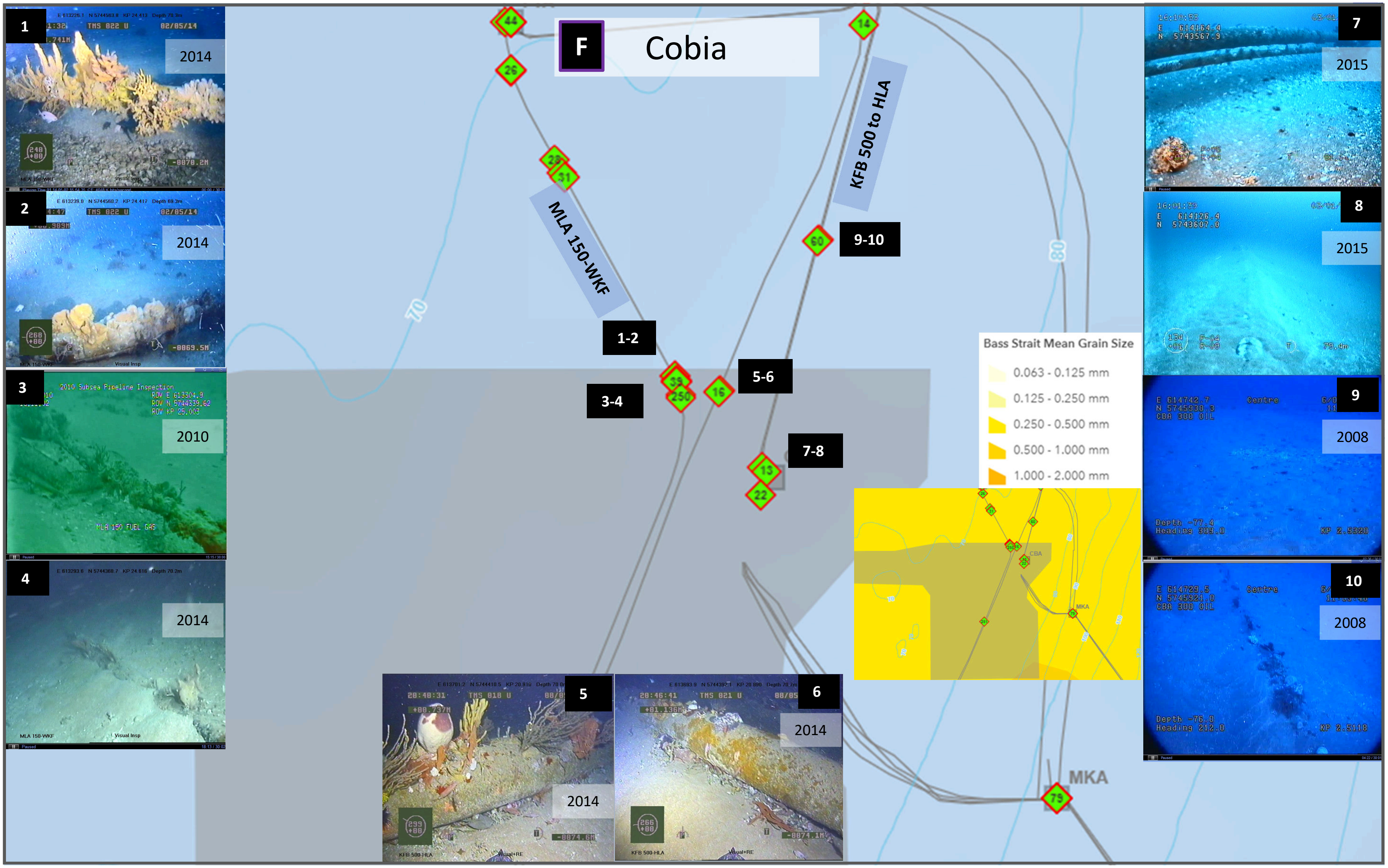

B
Seahorse, Whiting and Snapper
1
2014
2
2014
3
2014
4
2018
5
2018
6
2018
7
2018
8
2018
9
2018
10
2018
11
2017
12
2014
13
2017
14
2017
15
2014
1-3
SHA
BTA
4-5
6-10
WTA
11
12-15
SNA
WTA 250-SNA
Bass Strait Mean Grain Size
0.063 - 0.125 mm
0.125 - 0.250 mm
0.250 - 0.500 mm
0.500 - 1.000 mm
1.000 - 2.000 mm

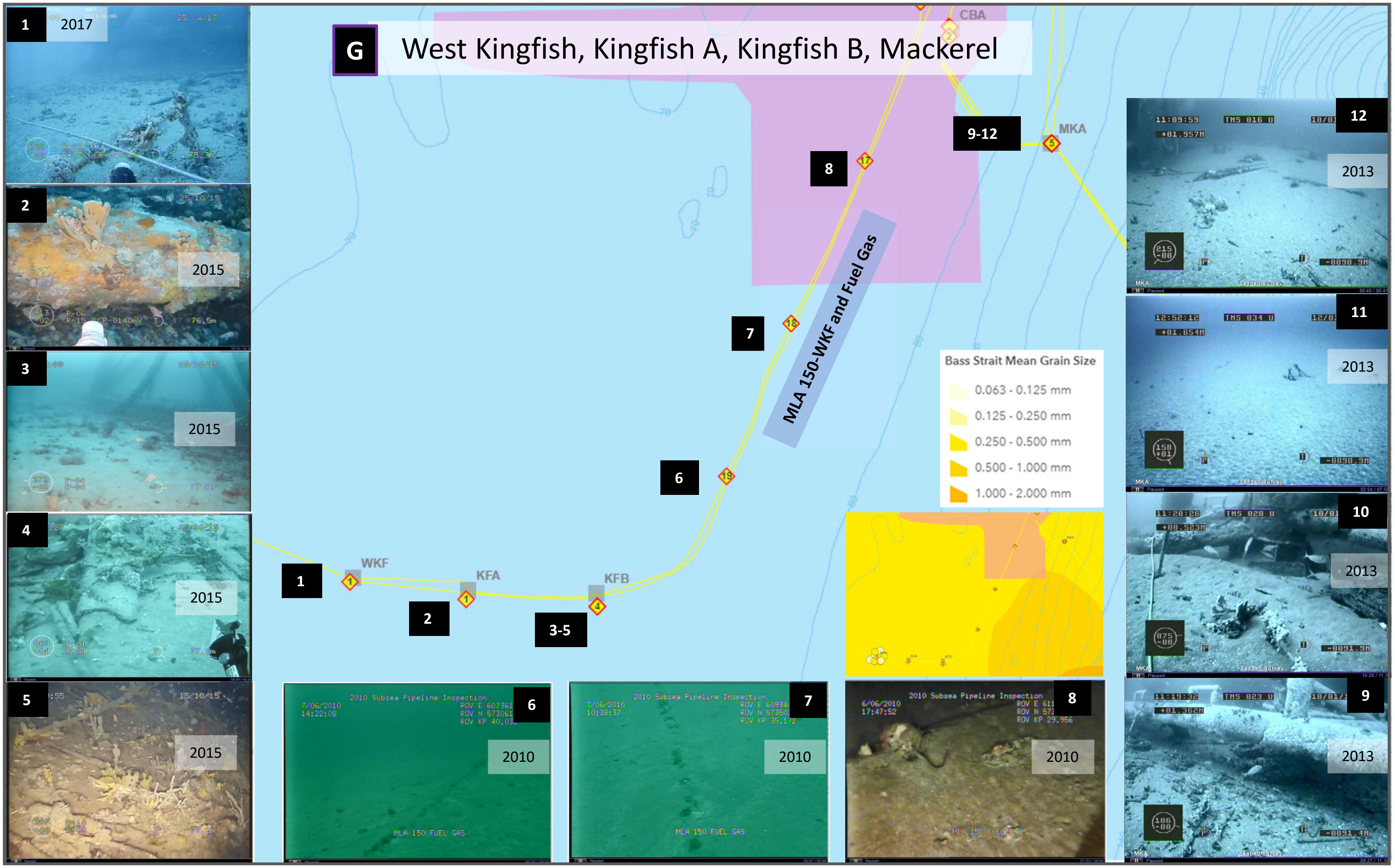

C
Marlin, West Tuna, Tuna and Kipper
1
2015
2
2015
3
2015
4
2015
6-8
TNA
WTN
9
KPA
5
MLA
MLB
1-4
FLA
HLA
Bass Strait Mean Grain Size
0.063 - 0.125 mm
0.125 - 0.250 mm
0.250 - 0.500 mm
0.500 - 1.000 mm
1.000 - 2.000 mm
2017
9
2017
5
2016
6
2016
7
2016
8

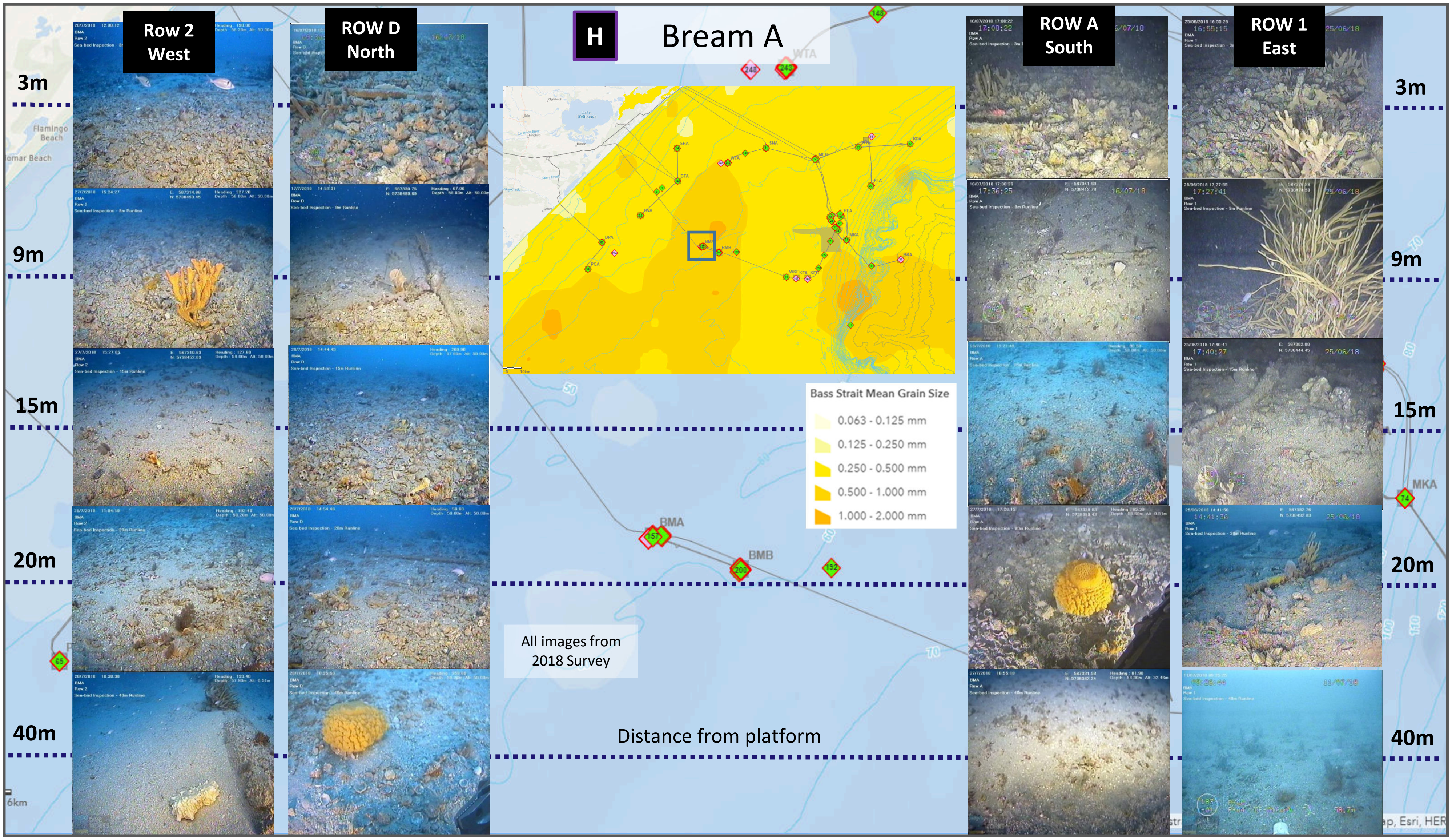


D
Flounder and Blackback
1-5
6
7-9
FLA
HLA
FTA
CBA
MKA
BKA
KFB
BKA 200-Oil
Bass Strait Mean Grain Size
0.063 - 0.125 mm
0.125 - 0.250 mm
0.250 - 0.500 mm
0.500 - 1.000 mm
1.000 - 2.000 mm
1
2015
2
2015
3
2015
4
2015
5
2015
9
2005
8
2005
7
2005
6
2005
23/07/2005 14:52:12
KP 10.225 E 625632 N 5731031
BKA 200 OIL

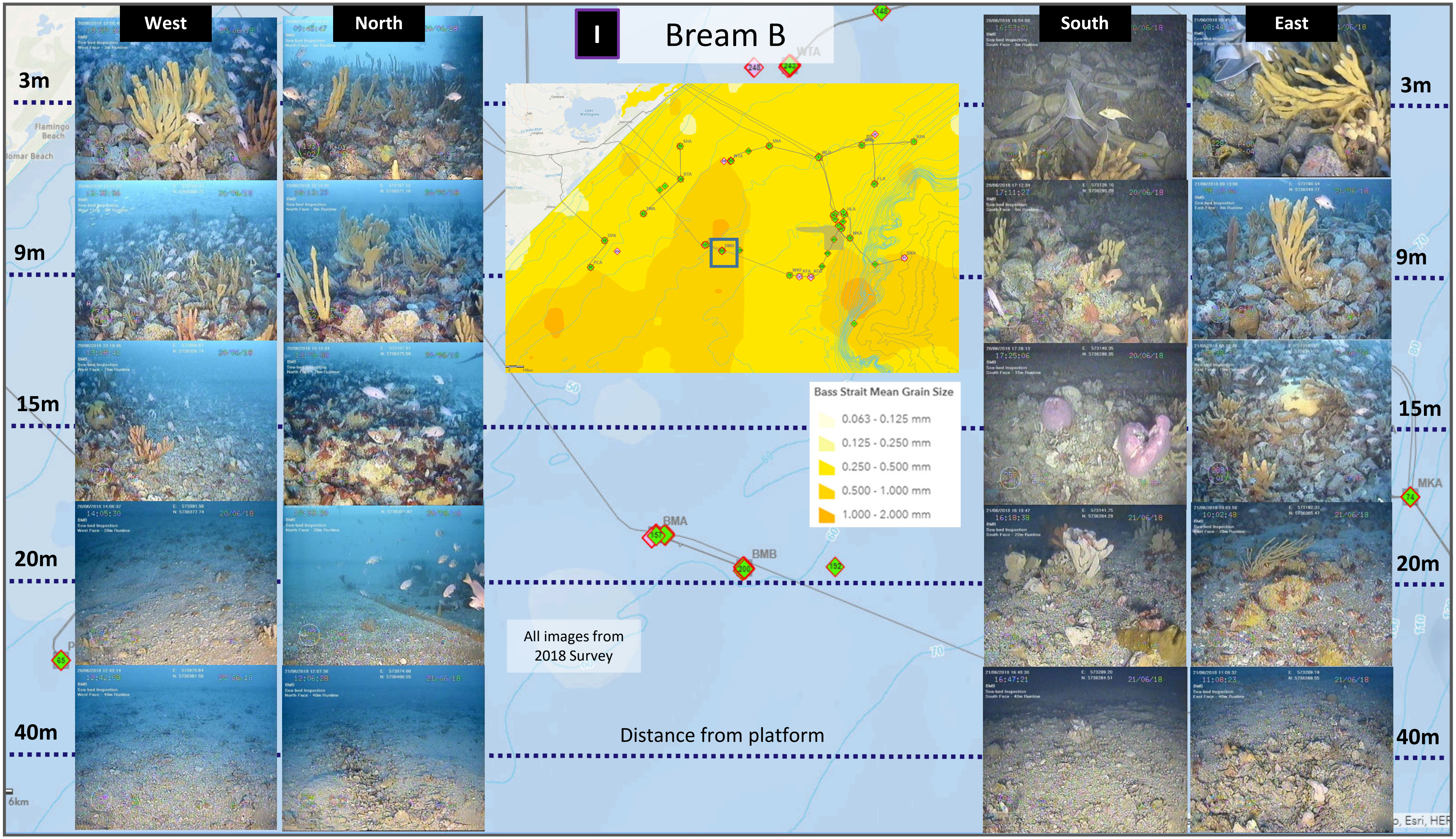

E
Fortescue and Halibut
1
2014
2
2014
3
2014
4
2014
5
2014
6
2014
7
2014
8
2014
9
2014
10
2008
11
2014
12
2011
13
2011
14
2011
15
2017
Wellhead support frame - view from south east
1-4
5-6
7
8-9
10
11
12-14
15
FTA
HLA
MLA 150-WKF
CBA 300 Oil
Bass Strait Mean Grain Size
0.063 - 0.125 mm
0.125 - 0.250 mm
0.250 - 0.500 mm
0.500 - 1.000 mm
1.000 - 2.000 mm


F
Cobia
MLA 150-WKF
KFB 500 to HLA
1-2
3-4
5-6
7-8
9-10
MKA
Bass Strait Mean Grain Size
0.063 - 0.125 mm
0.125 - 0.250 mm
0.250 - 0.500 mm
0.500 - 1.000 mm
1.000 - 2.000 mm
1
2014
2
2014
3
2010
2010 Subsea Pipeline Inspection
MLA 150 FUEL GAS
4
2014
5
2014
6
2014
7
2015
8
2015
9
2008
10
2008


G
West Kingfish, Kingfish A, Kingfish B, Mackerel
MLA 150-WKF and Fuel Gas
WKF
KFA
KFB
MKA
CBA
1
2
3-5
6
7
8
9-12
Bass Strait Mean Grain Size
0.063 - 0.125 mm
0.125 - 0.250 mm
0.250 - 0.500 mm
0.500 - 1.000 mm
1.000 - 2.000 mm
1 2017
2 2015
3 2015
4 2015
5 2015
6 2010
7 2010
8 2010
9 2013
10 2013
11 2013
12 2013
2010 Subsea Pipeline Inspection
MLA 150 FUEL GAS



Row 2 West
ROW D North
H
Bream A
ROW A South
ROW 1 East
3m
9m
15m
20m
40m
Bass Strait Mean Grain Size
0.063 - 0.125 mm
0.125 - 0.250 mm
0.250 - 0.500 mm
0.500 - 1.000 mm
1.000 - 2.000 mm
BMA
BMB
MKA
All images from 2018 Survey
Distance from platform



West
North
South
East
I
Bream B
3m
9m
15m
20m
40m
Bass Strait Mean Grain Size
0.063 - 0.125 mm
0.125 - 0.250 mm
0.250 - 0.500 mm
0.500 - 1.000 mm
1.000 - 2.000 mm
BMA
BMB
MKA
All images from 2018 Survey
Distance from platform

Visualisation Assessment Summary by Facility

Facility	Sediment	Bioturbation	Shells	Dead scallops with calcification/ remnants of inverterbrates	Marine invertebrates including sponges	Fish
Figure A						
Perch	Y - fine	Possibly	Possibly few	Possibly few	on structures fewer on seabed near structures	Y
Dolphin	Y - fine	Possibly	Possibly few	Possibly few	on structures fewer on seabed near structures	Y
Tarwhine	coarse sediment	Possibly	Y - visible	Y - visible	on structures fewer on seabed near structures	Schools of fish visible
Barracouta	Sediment at all sites were dominated by coarse size fractions, with all sites (with the exception of one site – SQ1) containing more than 50% of sediments over 1 mm. (Marine Solutions, 2018)	Possibly	Y - visible	A mosaic of bioturbated coarse sand, overlaid with patchy unconsolidated bivalve beds containing erect sponges, dead scallops with calcification, fragmented dead shells and a mixture of live and dead bivalves (Marine Solutions, 2018).	on structures fewer on seabed near structures	Y
West Barracouta	Sediment at all sites were dominated by coarse size fractions, with all sites (with the exception of one site – SQ1) containing more than 50% of sediments over 1 mm. (Marine Solutions, 2018)	Possibly	Y - visible	A mosaic of bioturbated coarse sand, overlaid with patchy unconsolidated bivalve beds containing erect sponges, dead scallops with calcification, fragmented dead shells and a mixture of live and dead bivalves (Marine Solutions, 2018).	on structures fewer on seabed near structures	Y
Figure B						
Seahorse	-	Possibly	Possibly few	Possibly	on structures fewer on seabed near structures	Y
Whiting	fine to coarser sand	Possibly	overlay of shell grit	Visible patches of dead scallop or remnants of invertebrates	benthic invertebrates on structures on seabed near structures growing in uniform spread	different species of fish visible
Snapper	The natural substrate was observed as unconsolidated, dark, fine to medium grained silt/sediment (Coffey, 2010).	Small burrows and bioturbation mounds within the soft sediment, which have been created by benthic infauna such as crustaceans and polychaete worms(Coffey, 2010).	Possibly few	none visible	Marine invertebrates gowing on structures Given the lack of hard substrate, there was little to no colonisation of the seabed by benthic marine invertebrates such as bryzoans, ascidians and poriferans. Instead, there were a large number of small burrows and bioturbation mounds within the soft sediment, which have been created by benthic infauna such as crustaceans and polychaete worms (Coffey, 2010).	Y

Visualisation Assessment Summary by Facility

Facility	Sediment	Bioturbation	Shells	Dead scallops with calcification/ remnants of inverterbrates	Marine invertebrates including sponges	Fish
Figure C						
Marlin	Hard compact sand with shell grit, overlaid with fine sand ripples (Marine Solutions, 2015).	Possibly	no	possible areas of dispersed patches of dead scallop or dead invertebrates	Low-relief compacted soft sediments Hard natural substrate was absent from the surveyed area. Sponge growth was prolific on a number of pipelines laying on the seabed (Marine Solutions, 2015).	Y
West Tuna	fine to coarser sand	Possibly	overlay of shell grit	possible areas of dispersed patches of dead scallop or dead invertebrates	on structures on seabed near structures	Y
Tuna	Sand was the dominant sediment class at platform lightly muddy (<0.06mm~2%), gravelly(>2mm~23%) sand (o.6mm – 2mm - ~75%)(Coffey, 2009).	Possibly	possibly	possible areas of dispersed patches of dead scallop or dead invertebrates	few stands (or remnants) only on structures	none visible
Kipper	predominanatly bare sand shown with possibility of coarse overlay	none visible	none visible	none visible	Possibly few	Y
Figure D						
Flounder	fine sand	Possibly	no	none visible	few stands only on structures	Different schools of fish species seen
Blackback	fine to coarser sand	Possibly	no	none visible	few stands only on structures	Y
Figure E						
Fortescue	fine to coarser sand	likely	yes	possible	significant on structures little visible elsewhere	Y
Halibut	fine	possible	no	none visible	significant on structures little visible elsewhere	Y
Figure F						
Cobia	fine to coarser sand	Possibly	yes	seen in some images on MLA 150-WKF pipeline, not uniformly	significant on pipelines closer to the platform centre for both the MLA 150-WKF and the KFB 500-HLA. little visible elsewhere	Y

Visualisation Assessment Summary by Facility

Facility	Sediment	Bioturbation	Shells	Dead scallops with calcification/ remnants of inverterbrates	Marine invertebrates including sponges	Fish
Figure G						
West Kingfish	Sand was the dominant sediment class at each platform slightly muddy, gravelly sand (WKF generally had higher proportion of sand than gravel)(Cardno, 2018)	Polychaetes, crustaceans and molluscs were dominant infauna (Cardno, 2018)	Possibly	areas of dispersed patches of dead scallop	visible on structures few on seabed near structures	not visible
Kingfish A	-	Possibly	none visible	Possibly	visible on structures	Y
Kingfish B	fine	Possibly	none visible	Possibly	visible on structures	Y
Mackerel	predominanatly bare sand shown	none visible	none visible	Possibly	visible on structures	Y
Figure H						
Bream A	coarser grained, gravelly sand	likely	Possibly	seen in some images on MLA 150-WKF pipeline, not uniformly	a mix of live benthic invertebrates growing amongst what appears to be calcified remains of invertebrates. Possible small areas of sponge beds closer to platform. Radiating out to individual stands in all directions of the platform	few numbers of various fish species seen
Figure I						
Bream B	coarser grained, gravelly sand	likely	Possibly	seen in some images on MLA 150-WKF pipeline, not uniformly	significant assemblages of benthic invertebrates composed of different species evident close to the platform. Abundance distictly decreases with distance from platform. Decrease in abundance appears unifrom in all directions	different species of small and large fish in abundance

(white)	Visual assessment
(grey)	Benthic survey findings
-	Not possible to discern

Note:
Visualisation assessments are by definition, coarse scale assessments of the environment providing some quantification of abundance, diversity and seabed type. This information should be used accordingly. Targeted surveys would be required to accurately define and describe the benthic environment.

Appendix F – PFW Data File

Appendix F: PFW Data File

Note: Appendix G.1 – Breakout Box 1 further discusses chemical compounds not found in PFW across the various platforms in Bass Strait. More details about available background and reference data is found in Appendix G.2 – Breakout Box 2. Appendix G.7 – Breakout Box 7 discusses the results from in-situ water sampling showing the dispersion of metals, hydrocarbon and other analytes in water around the Tuna platform.

Contents

Appendix F.1 Tuna Platform PFW Data

Table F-1 Tuna platform PFW physical and chemical composition data – 2014 to 2020

Parameter	Number records	2014	2015	2015	2016	2017	2018	2019	2020	Mean	Std Error	Lower 95% confidence level	Upper 95% confidence level	Minimum detected (mg/l)	Maximum detected (mg/l)	Background levels	Dilution factor
Physical parameters																	
Temperature (C)	2	55	80							68	6	55	80	55	80	14[a]	6
Conductivity (uS/cm)	6	49000	45000	51000	41000	57000			50000	48833	2728	43366	54301	41000	57000	46500[b]	1
pH (units)	7	6.6	6.9	6.8	7.6	6.7		7.8	7	7.1	0.1	6.8	7.3	6.6	7.8	8.2[c]	1
Suspended solids	7	51	23	25	20	18		20	14	24	6	12	37	14	51	34[d]	2
Total dissolved solids	7	34000	30000	30000	33000	23000		30000	34000	30571	1107	28354	32789	23000	34000	N/A	N/A
Maximum dilution to reach background levels																	**6**

a: Surface: 14-20°C, EP Volume 1
b: 35-36psu = 45,900uS/cm – 47,100uS/cm assuming 18°C, EP Volume 1
c: pH default trigger values given in ANZECC (2000) Table 3.3.2 Default trigger values for physical and chemical stressors for south-east Australia for slightly disturbed ecosystems (marine, offshore).
d: Non-detect to 34mg/L, from 19 reference site samples taken at BTW location prior to drilling.

Parameter	2014	2015	2015	2016	2017	2018	2019	2020	% Detected i.e. 100% detection = detected every time it was sampled	Number times detected	Mean	Std Error	Lower 95% confidence level	Upper 95% confidence level	Minimum detected (mg/l)	Maximum detected (mg/l)	ANZECC water quality criteria (95% species protection level), mg/L	ANZECC water quality criteria (99% species protection level), mg/L	Dilution factor to ANZECC water quality 95% criteria	Dilution factor to ANZECC water quality 99% criteria	ANZECC Seafood Taint threshold (mg/L)	Dilution factor to ANZECC Seafood taint threshold
Mono-aromatic hydrocarbons and derivatives																						
Benzene	2.1	2.7	3.6	6.0	5.4	2.8	3.1	4.2	100	8	3.74	0.40	2.93	4.55	2.10	6.00	0.7	0.5	9	12		
Toluene	4.4	5.4	5.7	9.9	7.7	3.25	4.3	4.7	100	8	5.67	0.69	4.30	7.04	3.25	9.90					0.25	40
Ethylbenzene	0.14	0.42	0.23	0.42	0.19	0.146	0.21	0.13	100	8	0.24	0.09	0.05	0.42	0.13	0.42					0.25	2
m&p-Xylenes	1.2	2.4	2.0	3.3	2.1	0.9	1.6	1.3	100	8	1.85	0.25	1.35	2.35	0.90	3.30						
o-Xylene	0.43	0.79	0.67	1.1	0.69	0.4	0.55	0.48	100	8	0.64	0.09	0.47	0.81	0.40	1.10						
1.2.4-Trimethylbenzene	0.12	0.38	0.20	0.44	0.20	0.107	0.28	0.15	100	8	0.23	0.03	0.17	0.30	0.11	0.44						
1.3.5-Trimethylbenzene	0.059	0.18	0.066	0.18	0.08	0.04	0.096	0.045	100	8	0.09	0.01	0.06	0.12	0.04	0.18						
Benzyl chloride	<0.005	<0.05	0.019	<0.005	<0.005	<0.0002	< 0.005		14	1	0.02	0.05	0.00	0.16	0.02	0.02						
Dibenzofuran	<0.005	<0.05	< 0.005	<0.005	<0.005	<0.015	< 0.005	<0.05	0	0	0	0	0	0	0	0						
Nitrobenzene				<0.5	<0.05		< 0.05	<0.05	0	0	0	0	0	0	0	0						
1,2,4-trichlorobenzene	<0.005	<0.05	<0.005	<0.005	<0.005	<0.01	< 0.005	<0.003	0	0							0.08	0.02	Not detected	Not detected		
Poly-aromatic hydrocarbons and derivatives																						
Naphthalene	0.16	0.093	0.15	0.25	0.17	0.242	0.066	0.82	100	8	0.24	0.06	0.12	0.37	0.07	0.82	0.07	0.05	12	16	1	1
2-Methylnaphthalene	0.13	0.059	0.11	0.21	0.11	0.139	0.052	0.48	100	8	0.16	0.05	0.07	0.26	0.05	0.48						
Fluorene	0.002	<0.01	0.003	<0.001	0.001	0.00463	< 0.001	0.0085	63	5	0.004	0.002	0.000	0.008	0.001	0.009						
Phenanthrene	0.002	<0.01	0.002	0.004	<0.002	0.00526	< 0.001	0.0097	63	5	0.005	0.002	0.000	0.009	0.002	0.010						
Acenapthene	< 0.001	<0.01	< 0.001	<0.005	<0.001	0.00107	< 0.001	<0.004	13	1	0.00107	0.00207	0	0.0064	0.00107	0.00107					0.02	0

Parameter	2014	2015	2015	2016	2017	2018	2019	2020	% Detected i.e. 100% detection = detected every time it was sampled	Number times detected	Mean	Std Error	Lower 95% confidence level	Upper 95% confidence level	Minimum detected (mg/l)	Maximum detected (mg/l)	ANZECC water quality criteria (95% species protection level), mg/L	ANZECC water quality criteria (99% species protection level), mg/L	Dilution factor to ANZECC water quality 95% criteria	Dilution factor to ANZECC water quality 99% criteria	ANZECC Seafood Taint threshold (mg/L)	Dilution factor to ANZECC Seafood taint threshold
Anthracene				<0.001	<0.001	0.00058	< 0.001	<0.001	20	1	0.00058	.	.	.	0.00058	0.00058						
Pyrene	< 0.001	<0.01	< 0.001	<0.001	<0.001	0.00028	< 0.001	<0.001	13	1	0.00028	.	.	.	0.00028	0.00028						
Flouranthene	< 0.001	<0.01	< 0.001	<0.001	<0.001	0.0003	< 0.001	<0.001	13	1	0.0003	0	0	0	0.0003	0.0003						
Isopropyl Benzene			< 0.04	<0.1	<0.05	<0.01	< 0.05	0.006	17	1	0.006	0.00707	0	0.09585	0.006	0.006					0.25	0
Phenols																						
Phenol	0.56	0.40	0.58	1.10	0.51	0.86	0.20	3.60	100	8	0.98	0.20	0.58	1.37	0.20	3.60	0.4	0.27	9	13	1	4
m & p Cresol[e]	0.54	0.34	0.4	0.24	0.52	0.834	0.13	2.2	100	8	0.65	0.16	0.34	0.96	0.13	2.20					0.2[f]	11
m & p Cresol[e]	0.54	0.34	0.4	0.24	0.52	0.834	0.13	2.2	100	8	0.65	0.16	0.34	0.96	0.13	2.20					0.1[g]	22
o-Cresol	0.27	0.20	0.21	0.37	0.31	0.51	0.10	1.40	100	8	0.42	0.10	0.22	0.63	0.10	1.40					0.4	4
2,4-Dimethylphenol	0.12	0.068	0.11	0.16	0.17	0.171	0.051	0.77	100	8	0.20	0.07	0.07	0.33	0.05	0.77					0.4	2
Pentachlorophenol	< 0.01	<0.1	< 0.01	<0.01	<0.01	<0.015	< 0.01	<0.05	0	0							0.022	0.011	Not detected	Not detected		
Total petroleum hydrocarbons																						
TRH C6-C9		15	20	37	20	7.8	10.0	13.0	100	7	17.5	2.9	11.7	23.4	7.8	37.0						
TRH C10-C14		4.9	10	10	2.4	4.8	1.2	5.5	100	7	5.5	4.4	0.0	14.4	1.2	10.0						
TRH C15 -C28		3.1	22	15	1.6	7.5	0.4	2.0	100	7	7.4	8.3	0.0	24.2	0.4	22.0						
TRH C29-C36		0.3	3.0	4.5	0.2	0.6	< 0.1	0.1	86	6	1.5	0.5	0.4	2.5	0.1	4.5						
1,1,2-trichloroethane	<0.02	<0.1	<0.04	<0.1	<0.05	<0.01	< 0.05	<0.003	0	0							1.9	0.14	Not detected	Not detected		
Oil, emulsifiable[d]																73.5					15	5
Inorganic constituents																						
Ammonia (as N)	43	45	42	43	43	29.6	44	46	100	8	42.0	1.6	38.7	45.3	30.0	46.0	0.91	0.5	51	91		
Phosphate	0.07			<0.05			0.11	0.08	75	3	0.1	0.4	0.0	1.0	0.1	0.1						
Sulphide	0.6	1.4	1.6	2.5	0.8	0.03		<0.5	86	6	1.2	2.1	0.0	5.3	0.0	2.5						
Cyanide (total)	< 0.005	<0.05	0.008	<0.005	<0.005	<0.004	< 0.005	<0.004	13	1	0.008	0.017	0.000	0.056	0.008	0.008	0.004	0.002	2	4		
Nutrients																						
Total Nitrogen as N	2200	45	42	46	43	33.8	45	46	100	8	313	95	123	502	34	2200						
BOD	260	220	250	210	270		> 60	160	86	6	228	36	157	300	160	270						
Metals																						
Calcium	330	250	150	310	330	290	340	390	100	8	299	21	257	341	150	390						
Iron	6.3	4.8	9.2	6.3	5	0.018	6	0.032	100	8	4.7	0.5	3.7	5.7	0.0	9.2						
Manganese	0.2	0.19	0.18	0.24	0.21	0.172	0.17	0.19	100	8	0.19	0.06	0.07	0.32	0.17	0.24						
Arsenic	< 0.001	<0.01	< 0.01	<0.005	0.001	<0.0005	< 0.001	<0.0005	13	1	0.001	0.046	0.000	0.130	0.001	0.001						
Cadmium	< 0.0002	<0.002	< 0.002	<0.001	< 0.0002	<0.0002	< 0.0002	<0.0001	0	0	0	0	0	0	0	0	0.0055	0.0007	Not detected	Not detected		
Chromium[a]	< 0.001	<0.01	< 0.01	<0.005	< 0.001	<0.0005	< 0.001	<0.0002	0	0	0	0	0	0	0	0	0.0274[b]	0.0077[b]	Not detected	Not detected		
Chromium[a]	< 0.001	<0.01	< 0.01	<0.005	< 0.001	<0.0005	< 0.001	<0.0002	0	0	0	0	0	0	0	0	0.0044[c]	0.00014[c]	Not detected	Not detected		
Cobalt		<0.01	< 0.01	<0.005	< 0.001	<0.0002	< 0.001	0.00014	14	1	0.00014	0.00000	0.00000	0.00000	0.00014	0.00014	0.001	0.000005	0	28		
Copper	< 0.001	<0.01	0.014	<0.005	< 0.001	<0.001	< 0.001	<0.0002	13	1	0.014	0.000	0.000	0.000	0.014	0.014	0.0013	0.0003	11	47	1	0

Parameter	2014	2015	2015	2016	2017	2018	2019	2020	% Detected i.e. 100% detection = detected every time it was sampled	Number times detected	Mean	Std Error	Lower 95% confidence level	Upper 95% confidence level	Minimum detected (mg/l)	Maximum detected (mg/l)	ANZECC water quality criteria (95% species protection level), mg/L	ANZECC water quality criteria (99% species protection level), mg/L	Dilution factor to ANZECC water quality 95% criteria	Dilution factor to ANZECC water quality 99% criteria	ANZECC Seafood Taint threshold (mg/L)	Dilution factor to ANZECC Seafood taint threshold
Lead	< 0.001	<0.01	< 0.01	<0.005	<0.001	<0.0002	< 0.001	<0.0001	0	0	0	0	0	0	0	0	0.0044	0.0022	Not detected	Not detected		
Mercury	< 0.0001	<0.001	< 0.001	<0.0005	< 0.0001	<0.00004	< 0.0001	<0.0002	0	0	0	0	0	0	0	0	0.0004	0.0001	Not detected	Not detected		
Nickel	0.001	<0.01	0.018	<0.005	0.001	<0.0005	0.003	0.0061	63	5	0.006	0.003	0.000	0.013	0.001	0.018	0.07	0.007	0	3		
Selenium	0.001	<0.01	0.021	<0.005	0.001	<0.002	0.001	<0.001	50	4	0.006	0.005	0.000	0.018	0.001	0.021						
Silver		<0.05	< 0.05	<0.025	< 0.005	<0.0001	< 0.005	<0.0001	0	0	0	0	0	0	0	0	0.0014	0.0008	Not detected	Not detected		
Vanadium	< 0.005	<0.05	< 0.05	<0.025	< 0.005	0.0013	< 0.005	<0.0003	13	1	0.001	0.000	0.000	0.000	0.001	0.001	0.16	0.05	0	3		
Zinc	0.013	<0.01	< 0.01	<0.005	< 0.005	<0.005	< 0.005	0.002	25	2	0.008	0.019	0.000	0.049	0.002	0.013	0.015	0.007	1	2	5	0
Other chemicals																						
Total organic carbon (TOC)	150	370	150	140	130	146	160	160	100	8	176	41	93	259	130	370						
Surfactants (MBAS)	0.5	<0.2	< 1	<0.2	0.2		< 0.2	1.3	43	3	0.67	0.38	0.00	1.52	0.20	1.30						
2-butanone (MEK)	0.054	<0.1	< 0.04	<0.1	<0.05		< 0.05		17	1	0.05	0.06	0.00	0.21	0.05	0.05						
2-propanone (acetone)	0.28	<0.1	0.24	<0.1	<0.05	0.52	< 0.05		43	3	0.35	0.11	0.10	0.59	0.24	0.52						
Bis-(2-ethylhexyl) phthalate	<0.005	<0.05	0.012	0.006	<0.005	<0.015	< 0.005	<0.5	25	2	0.009	0.007	0.000	0.028	0.006	0.012						
Methylene chloride			< 0.04	<0.1	<0.05		< 0.05	<0.015	0	0	0	0	0	0	0	0						
Acetophenone	<0.005	<0.05	0.011	<0.05	<0.005	<0.015	< 0.005	<0.05	13	1	0.01	.	.	.	0.01	0.01					0.5	0
Methanol	< 5	< 5	< 5	<5	<5	<1	< 0.5	<1	0	0	0	0	0	0	0	0						
Glycol	<50	<20	< 20	<20	<20	<0.005	< 20	13	13	1	13	.	.	.	13	13						
Maximum dilution to reach criteria																			**51**	**91**		**40**

a = Total Chromium; b = Chromium III, c = Chromium VI; d: Taken to mean, TRH C6-C36; e = m&p Cresol; f: m-Cresol; g: p-Cresol

Table F-2 shows the levels of total sulphide in PFW, together with an approximate concentration of hydrogen sulphide based on conversions in ANZECC (2000). Per ANZECC, in general, studies reported show the observed effect concentrations of sulphide are consistent with the un-ionised H2S (hydrogen sulphide) form, not total sulphide.

Table F-2 Sulphide properties of TNA PFW relative to background levels, and dilution factor

Chemical	Maximum concentration in PFW (mg/L)	Percentage of hydrogen sulphide in total aqueous sulphide at 30C, pH 7.0-7.5 and 35% salinity#	Expected hydrogen sulphide concentration, mg/L	Background levels, mg/L*	Dilution factor to background levels of hydrogen sulphide
Sulphide	2.5	pH = 7.0: 22.4% pH = 7.5: 8.36%	0.56 0.21	Minimum: <0.01	56 21
		pH = 7.0: 22.4% pH = 7.5: 8.36%	0.56 0.21	Average 0.015	37 14
		pH = 7.0: 22.4% pH = 7.5: 8.36%	0.56 0.21	Maximum: 0.03	19 7
Maximum dilution to reach background levels					**56**

#From ANZECC, 2000, Table 8.3.10, p. 8.3-173
*Taken from 18 reference site samples taken away from Tuna platform location.

Table F-3 shows the TOC of produced water relative to background levels of TOC in sea water. The use of TOC directly to compare to background levels is over-conservative as it assumes that any or all TOC constituents, including low molecular weight carboxylic acids, could contribute to a potential impact on the environment.

Table F-3 TOC properties of TNA PFW relative to background levels, and dilution factor

Chemical	Maximum concentration in PFW (mg/L)	Background levels*	Dilution factor to background levels of TOC
TOC	370	<1 to 2	370
Maximum dilution to reach background levels			**370**

*Taken from 18 reference site samples taken away from Tuna platform location.

Table F-4 Particle Size Distribution for TNA PFW

Wentworth Size Classifications	2020
Total Clay % (0-4 µm)	**69.69**
Very Fine Silt % (4-8 µm)	7.60
Fine Silt % (8-16 µm)	8.06
Medium Silt % (16-31 µm)	6.38
Course Silt % (31-63 µm)	4.48
Total Silt (4-63 µm)	**26.53**
Very Fine sand % (63-125 µm)	3.39
Fine sand % (125-250 µm)	0.39
Medium sand % (250-500 µm)	0.00
Coarse sand % (500-1000 µm)	0.00
Very Coarse sand % (1000-2000 µm)	0.00
Total Sand (63-2000 µm)	**3.79**
Total Gravels (>2000 µm)	**0.00**

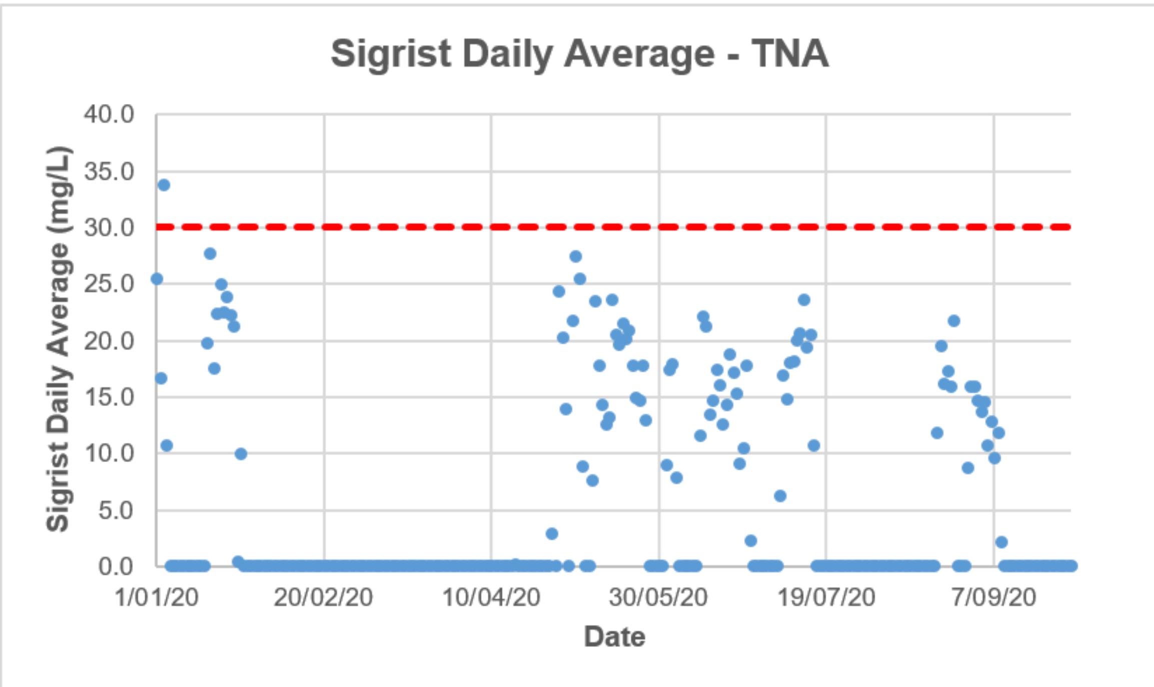


Figure F-1 Platform overboard discharge levels of oil in water (in mg/L) since 1 Jan 2020

A summary of Sigrist daily averages exceeding 30 mg/L on Tuna for the period of 1st January 2020 to 30th September 2020 is given below in Table F-5.

Table F-5 TNA Oil in water exceedances from January 2020 to September 2020

Date	Sigrist Daily Average (mg/L)	Total Oil Load (kg/day)	Comments
03/01/20	33.9	86.0	Oil in water spikes resulted in a Sigrist daily average that exceeded 30 mg/L. Reported to NOPSEMA in January monthly recordable incidents report.

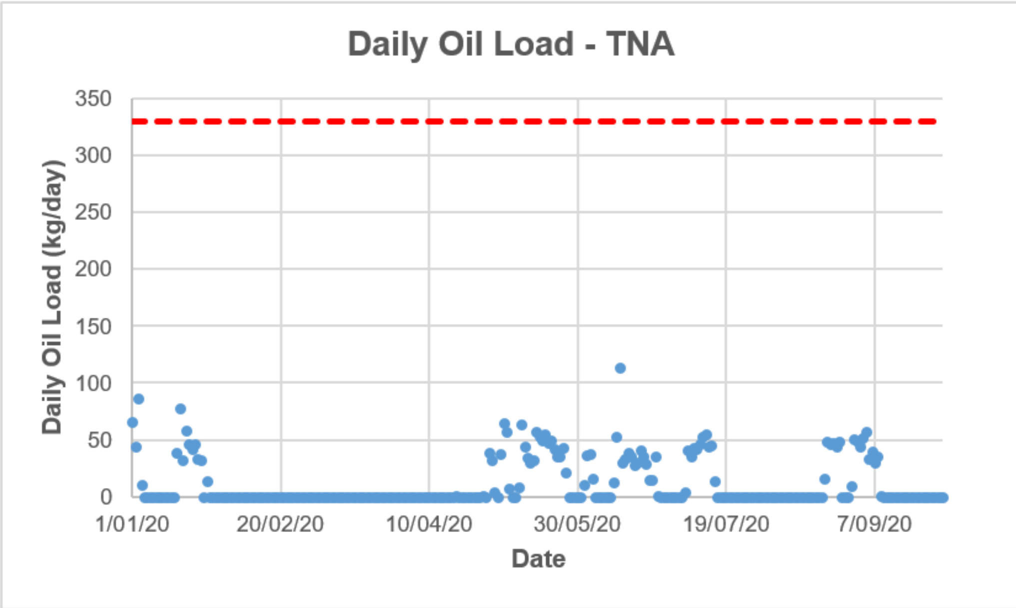


Figure F-2 Platform overboard oil load (in kg/d, mg/L oil concentration multiplied by volume discharged) since 1 Jan 2020

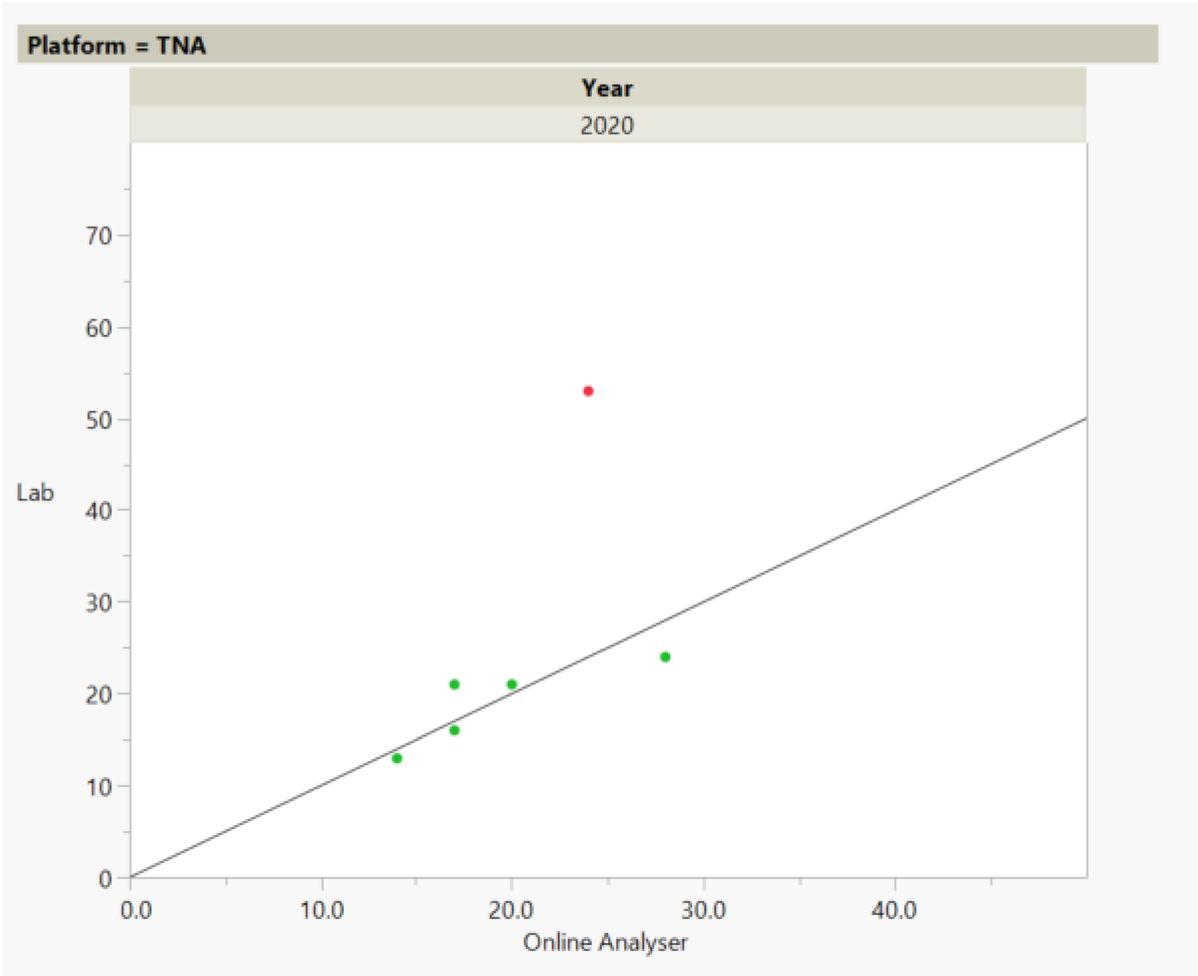


Figure F-3 Cross-check of platform online monitor readings with routine laboratory tests

Table F-6 Dispersion model inputs – Tuna platform

Parameter	Value
Discharge rate (kL/day)	11,462
Discharge temperature (°C)	80
Discharge salinity (ppt)	34
Internal diameter of outlet (inch) [m]	9.84 [0.25]
Outlet orientation	vertically downward
Depth of outlet below MSL (m)	28.8
Total water depth at site (m)	59

Figure F-4 shows the model outputs for the platform (dilution contours) with distance from the platform. The inset in Figure F-4 (b) shows there is no physical interaction of the plume with the seabed and hence no direct exposure of the constituents of PFW with the sediment.

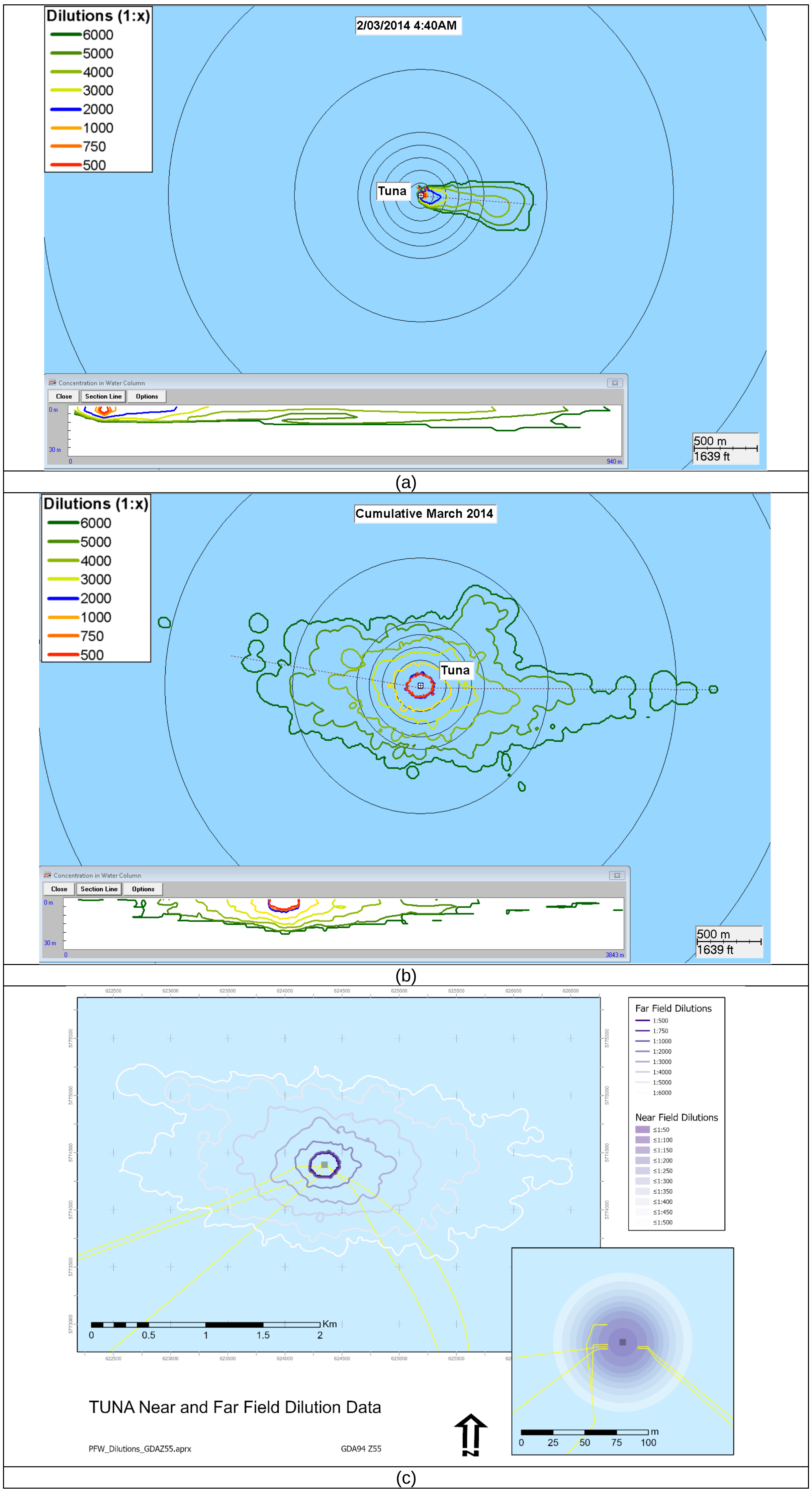


Figure F-4 **Dilution around the TNA platform and in the water column from PFW. (a) Snapshot of dilution of produced water plume around the platform, surface and cross-sectional view. (b) Summary of the dilution contours around the platform, conglomerated over one month (taking account of tide/current directions on any given day). (c) Yearly far-field dilution contours, inset are near-field contours.**

Table F-7 **Dilution factors with distance from the platform under typical currents.**

Dilution factor	Distance from platform (m)
10	1.0
50	12.5
100	19.4
200	29.0
500	130
750	140
1000	140
2000	320
3000	620
4000	840

Table F-8 Dispersion model outputs – water quality

Criteria	Dilution required (1:X)	Distance from platform
Meets physical parameters background levels	6	<1 m
Meets ANZECC 95% species protection water quality criteria	51	<19.4 m
Meets ANZECC 99% species protection water quality criteria	91	<19.4 m
Meets hydrogen sulphide background levels	56	<19.4 m
Meets TOC background levels	370	<130 m

Table F-9 Dispersion model outputs – fisheries

Criteria	Dilution required (1:X)	Distance from platform
Meets ANZECC seafood taint thresholds	40	<12.5 m

Table F-10 2014 results in percentage effluent of Tuna PFW for no effect concentration (NOEC), lowest effect concentration (LOEC), concentration with effects or inhibition of 10% species (E/IC10), and concentration with effects or inhibition of 50% species.

Species	NOEC (% effluent)	LOEC (% effluent)	E/IC50 (% effluent)	E/IC10 (% effluent)
Hormosira banksii (brown algae)	1.6	3.1	2.9	1.9
Heliocidaris tuberculata (sea urchin)	6.3	12.5	10.7	7.3
Mytilus galloprovincialis (Mediterranean mussel)	6.3	12.5	16.4	10.8
Nitzschia closterium (diatom algae)	12.5	25	18.2	8.9
Allorchestes compressa (amphipod)	50	100	44.7	57.4
Lates calcarifer (barramundi)	25	50	15.3	23.9

Table F-11 2020 results in percentage effluent of Tuna PFW for no effect concentration (NOEC), lowest effect concentration (LOEC), concentration with effects or inhibition of 10% species (E/IC10), and concentration with effects or inhibition of 50% species (E/IC50)

Test	NOEC (% effluent)	LOEC (% effluent)	E/IC50 (% effluent)	E/IC10 (% effluent)
72-hour microalgal growth (Tisochrysis lutea)	25	50	42.4	33.9
72-hour microalgal growth (Nitzschia closterium)	12.5	25	29.9	17.1
72-hour macroalgal germination success (Hormosira banksii)	12.5	25	39.1	22.1
1 hr sea urchin fertilisation success (Echinometra mathaei)	3.1	6.3	8.0	4.4
72-hour sea urchin larval development (Heliocidaris tuberculata)	3.1	6.3	8.2	6.0
48-hour mollusc larval development (Mytilus edulis)	1.6	3.1	10.6	5.0
5-7 day copepod larval development (Gladioferens imparipes)	<1.6	1.6	3.9	2.4
7-day fish larval development (Seriola lalandi)	0.2	0.4	0.93	0.23

Table F-12 Species sensitivity distribution output species protection levels – TNA effluent

Species sensitivity distribution outputs	2014 WET test result (% effluent)	2020 WET test result (% effluent)
95% species protection level	3.0%	0.44%
Dilution to obtain 95% species protection	33	227
Maximum dilution to obtain 95% species protection	227	
99% species protection level	1.8%	0.105%
Dilution to obtain 99% species protection	56	952
Maximum dilution to obtain 99% species protection	952	

Table F-13 Dispersion model outputs – ecotoxicity

Criteria	Dilution required (1:X)	Distance from platform
Meets 95% species protection levels based on whole effluent toxicity	227	<130 m
Meets 99% species protection levels based on whole effluent toxicity	952	<140 m

Appendix F.2 Halibut Platform PFW Data

Table F-14 Halibut platform PFW physical and chemical composition data – 2014 to 2020

Parameter	Number records	2014	2015	2015	2016	2017	2018	2019	2020	Mean	Std Error	Lower 95% confidence level	Upper 95% confidence level	Minimum detected (mg/l)	Maximum detected (mg/l)	Background levels	Dilution factor
Physical parameters																	
Temperature (C)	4	89	80	80					88	84	4	75	93	80	89	14[a]	6
Conductivity (uS/cm)	7	68000	54000	50000	48000	58000	56000		52100	55157	2526	50095	60219	48000	68000	46500[b]	1
pH (units)	8	6.6	6.9	6.7	6.7	7.3	7.1	7.2	6.5	6.9	0.1	6.6	7.1	6.5	7.3	8.2[c]	1
Suspended solids	8	26	5.3	8.1	2.3	3.4	7.6	4.2	2	7	6	0	19	2	26	34[d]	1
Total dissolved solids	8	38000	36000	36000	37000	36000	37000	36000	36000	36500	1036	34426	38574	36000	38000	N/A	N/A
Maximum dilution to reach background levels																	**6**

a: Surface: 14-20°C, EP Volume 1
b: 35-36psu = 45,900uS/cm – 47,100uS/cm assuming 18°C, EP Volume 1
c: pH default trigger values given in ANZECC (2000) Table 3.3.2 Default trigger values for physical and chemical stressors for south-east Australia for slightly disturbed ecosystems (marine, offshore).
d: Non-detect to 34mg/L, from 19 reference site samples taken at BTW location prior to drilling.

Parameter	2014	2015	2015	2016	2017	2018	2019	2020	% Detected	Number times detected	Mean	Std Error	Lower 95% confidence level	Upper 95% confidence level	Minimum detected (mg/l)	Maximum detected (mg/l)	ANZECC water quality criteria (95% species protection level), mg/L	ANZECC water quality criteria (99% species protection level), mg/L	Dilution factor to ANZECC water quality 95% criteria	Dilution factor to ANZECC water quality 99% criteria	ANZECC Seafood Taint threshold (mg/L)	Dilution factor to ANZECC Seafood taint threshold
Mono-aromatic hydrocarbons and derivatives																						
Benzene	1.2	1.4	1.0	1.3	1.2	1.0	1.7	0.9	100	8	1.21	0.40	0.40	2.02	0.90	1.70	0.7	0.5	2	3		
Toluene	2.6	2.1	1.7	2.1	2.4	0.17	2.7	1.3	100	8	1.88	0.69	0.51	3.26	0.17	2.70					0.25	11
Ethylbenzene	0.16	0.17	0.12	0.18	0.18	0.99	0.27	0.12	100	8	0.27	0.09	0.09	0.46	0.12	0.99					0.25	4
m&p-Xylenes	1.3	1.1	0.78	1.2	1.3	0.3	1.7	0.7	100	8	1.05	0.25	0.54	1.55	0.30	1.70						
o-Xylene	0.35	0.33	0.22	0.36	0.37	1.7	0.46	0.22	100	8	0.50	0.09	0.33	0.67	0.22	1.70						
1.2.4-Trimethylbenzene	0.15	<0.1	0.094		0.12	0.15	0.25	0.13	86	6	0.15	0.04	0.08	0.22	0.09	0.25						
1.3.5-Trimethylbenzene	0.097	<0.1	0.040		<0.05	0.064	0.13	0.054	71	5	0.08	0.02	0.04	0.11	0.04	0.13						
Benzyl chloride	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	< 0.005		0	0	0	0	0	0	0	0						
Dibenzofuran	<0.005	<0.005	0.009	0.012	<0.02	<0.005	< 0.005	<0.05	25	2	0.01	0.00	0.00	0.02	0.01	0.01						
Nitrobenzene				<0.05	<0.05	<0.05	< 0.05	<0.05	0	0	0	0	0	0	0	0						
1,2,4-trichlorobenzene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	< 0.005	<0.001	0	0							0.08	0.02	Not detected	Not detected		
Poly-aromatic hydrocarbons and derivatives																						
Naphthalene	0.34	0.28	0.11	0.38	0.27	0.22	0.025	0.3	100	8	0.24	0.06	0.11	0.37	0.03	0.38	0.07	0.05	5	8	1	0
2-Methylnaphthalene	0.27	0.16	0.11	0.33	0.19	0.19	0.007	0.27	100	8	0.19	0.05	0.09	0.29	0.01	0.33						
Fluorene	0.012	<0.001	0.011	0.012	<0.02	0.008	< 0.001	0.016	63	5	0.012	0.002	0.008	0.016	0.008	0.016						
Phenanthrene	<0.001	0.009	0.012	0.014	0.012	0.007	< 0.001	0.021	75	6	0.013	0.002	0.008	0.017	0.007	0.021						
Acenapthene	0.001	<0.001	<0.002		<0.005	0.003	< 0.001	<0.007	29	2	0.002	0.00147	0	0.00577	0.001	0.003					0.02	0
Anthracene				<0.001	<0.001	<0.001	< 0.001	<0.001	0	0	0	0	0	0	0	0						
Pyrene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.001	<0.001	0	0	0	0	0	0	0	0						
Flouranthene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.001	<0.0011	0	0	0	0	0	0	0	0						

Parameter	2014	2015	2015	2016	2017	2018	2019	2020	% Detected	Number times detected	Mean	Std Error	Lower 95% confidence level	Upper 95% confidence level	Minimum detected (mg/l)	Maximum detected (mg/l)	ANZECC water quality criteria (95% species protection level), mg/L	ANZECC water quality criteria (99% species protection level), mg/L	Dilution factor to ANZECC water quality 95% criteria	Dilution factor to ANZECC water quality 99% criteria	ANZECC Seafood Taint threshold (mg/L)	Dilution factor to ANZECC Seafood taint threshold
Isopropyl Benzene			<0.02		<0.05	<0.02	< 0.05	0.015	20	1	0.015	0.00707	0	0.10485	0.015	0.015					0.25	0
Phenols																						
Phenol	0.46	0.38	0.15	0.3	0.46	0.39	0.12	0.59	100	8	0.36	0.20	0.00	0.75	0.12	0.59	0.4	0.27	1	2	1	1
m & p Cresol[e]	0.36	0.29	0.091	0.24	0.074	0.2	0.11	0.34	100	8	0.21	0.16	0.00	0.53	0.07	0.36					0.2[f]	2
m & p Cresol[e]	0.36	0.29	0.091	0.24	0.074	0.2	0.11	0.34	100	8	0.21	0.16	0.00	0.53	0.07	0.36					0.1[g]	4
o-Cresol	0.30	0.22	0.072	0.22	0.17	<0.003	0.066	0.3	88	7	0.19	0.11	0.00	0.41	0.07	0.30					0.4	1
2,4-Dimethylphenol	0.082	0.068	0.027	0.066	0.075	0.059	0.04	0.058	100	8	0.06	0.07	0.00	0.19	0.03	0.08					0.4	0
Pentachlorophenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	< 0.01	<0.05	0	0							0.022	0.011	Not detected	Not detected		
Total petroleum hydrocarbons																						
TRH C6-C9		8.8	8.0	8.7	8.3	6.3	12	4.2	100	7	8.0	2.9	2.2	13.9	4.2	12.0						
TRH C10-C14		2.5	1.4	3.9	2.1	84	0.41	3.9	100	7	14.0	4.4	5.2	22.9	0.4	84.0						
TRH C15 -C28		3.2	2.0	6.8	1.3	160	0.2	7.1	100	7	25.8	8.3	9.0	42.6	0.2	160.0						
TRH C29-C36		0.5	0.4	0.9	0.2	<0.1	< 0.1	1.1	71	5	0.6	0.6	0.0	1.7	0.2	1.1						
1,1,2-trichloroethane	<0.02	<0.1	<0.02		<0.05	<0.02	< 0.05	<0.004	0	0							1.9	0.14	Not detected	Not detected		
Oil, emulsifiable[d]																257.1					15	17
Inorganic constituents																						
Ammonia (as N)	12	13	12	12	12	12	12	9.8	100	8	11.9	1.6	8.6	15.1	9.8	13.0	0.91	0.5	14	26		
Phosphate	<0.05			0.06	0.27	0.02	0.1	0.06	83	4	0.1	0.4	0.0	0.9	0.0	0.3						
Sulphide	3.0	6.0	12	12	12	7		1	100	7	7.6	1.9	3.7	11.4	1.0	12.0						
Cyanide (total)	0.002	<0.05	<0.05	<0.005	<0.005	0.048	0.02	0.012	50	4	0.021	0.009	0.000	0.044	0.002	0.048	0.004	0.002	12	24		
Nutrients																						
Total Nitrogen as N	17	13	15	12	12	12	9.3	12	100	7	13	101	0	216	12	17						
BOD	100	94	150	120	83	69	190	68	100	8	109	31	47	171	68	190						
Metals																						
Calcium	420	490	450	410	320	460	450	470	100	8	434	21	392	476	320	490						
Iron	0.56	0.57	<0.5	1.2	0.81	0.56	0.51	0.38	88	7	0.7	0.5	0.0	1.7	0.4	1.2						
Manganese	2.0	2.3	2.1	2.4	2.4	2.0	2.1	1.7	100	8	2.13	0.06	2.00	2.25	1.70	2.40						
Arsenic	<0.001	<0.01	<0.01	<0.005	< 0.005	0.001	< 0.01	<0.001	13	1	0	0	0	0	0	0.001						
Cadmium	<0.0002	<0.002	<0.002	<0.001	< 0.001	<0.0002	< 0.002	<0.0002	0	0	0	0	0	0	0	0	0.0055	0.0007	Not detected	Not detected		
Chromium[a]	<0.0001	<0.01	<0.01	<0.005	< 0.005	<0.001	< 0.01	<0.0004	0	0	0	0	0	0	0	0	0.0274[b]	0.0077[b]	Not detected	Not detected		
Chromium[a]	<0.0001	<0.01	<0.01	<0.005	< 0.005	<0.001	< 0.01	<0.0004	0	0	0	0	0	0	0	0	0.0044[c]	0.00014[c]	Not detected	Not detected		
Cobalt	<0.0001	<0.01	<0.01	<0.005	< 0.005	<0.001	< 0.01	<0.0001	0	0	0	0	0	0	0	0	0.001	0.000005	Not detected	Not detected		
Copper	<0.0001	<0.01	<0.01	<0.005	< 0.005	<0.001	< 0.01	<0.0004	0	0	0	0	0	0	0	0	0.0013	0.0003	Not detected	Not detected	1	Not detected
Lead	<0.001	<0.01	<0.01	<0.005	< 0.005	<0.001	< 0.01	<0.0002	0	0	0	0	0	0	0	0	0.0044	0.0022	Not detected	Not detected		
Mercury	<0.0001	<0.0001	<0.001	<0.0005	< 0.0005	<0.0001	< 0.001	<0.0001	0	0	0	0	0	0	0	0	0.0004	0.0001	Not detected	Not detected		
Nickel	<0.001	<0.01	<0.01	<0.005	< 0.005	<0.001	< 0.01	<0.0006	0	0	0	0	0	0	0	0	0.07	0.007	Not detected	Not detected		
Selenium	0.022	<0.01	<0.01	<0.005	< 0.005	<0.001	< 0.01	<0.002	13	1	0.022	0.009	0.000	0.046	0.022	0.022						
Silver	<0.0005	<0.05	<0.05	<0.25	< 0.025	<0.005	< 0.05	<0.0002	0	0	0	0	0	0	0	0	0.0014	0.0008	Not detected	Not detected		

Parameter	2014	2015	2015	2016	2017	2018	2019	2020	% Detected	Number times detected	Mean	Std Error	Lower 95% confidence level	Upper 95% confidence level	Minimum detected (mg/l)	Maximum detected (mg/l)	ANZECC water quality criteria (95% species protection level), mg/L	ANZECC water quality criteria (99% species protection level), mg/L	Dilution factor to ANZECC water quality 95% criteria	Dilution factor to ANZECC water quality 99% criteria	ANZECC Seafood Taint threshold (mg/L)	Dilution factor to ANZECC Seafood taint threshold
Vanadium	<0.001	<0.05	<0.05	<0.25	< 0.025	<0.005	< 0.05	<0.0006	0	0	0	0	0	0	0	0	0.16	0.05	Not detected	Not detected		
Zinc	0.019	0.039	0.024	0.11	0.015	0.009	< 0.05	<0.002	75	6	0.036	0.011	0.012	0.060	0.009	0.110	0.015	0.007	7	16	5	0
Other chemicals																						
Total organic carbon (TOC)	55	78	50	59	16	36	62	35	100	8	49	41	0	132	16	78						
Surfactants (MBAS)	<1	<0.5	<1	<0.2	<0.2	<0.2	< 0.2	2.9	13	1	2.90	0.65	1.43	4.37	2.90	2.90						
2-butanone (MEK)	<0.02	<0.1	<0.02		<0.05	<0.02	< 0.05		0	0	0.00	0.00	0.00	0.00	0.00	0.00						
2-propanone (acetone)	<0.02	<0.1	<0.1		<0.05	<0.1	0.15		17	1	0.15	0.19	0.00	0.58	0.15	0.15						
Bis-(2-ethylhexyl) phthalate	<0.005	<0.005	0.009	<0.005	<0.005	<0.005	< 0.005	<0.5	13	1	0.009	0.010	0.000	0.036	0.009	0.009						
Methylene chloride			<0.02		<0.5	<0.02	< 0.05	<0.01	0	0	0	0	0	0	0	0						
Acetophenone	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	< 0.005	<0.05	0	0	0	0	0	0	0	0					0.5	Not detected
Methanol	<5	<5	<5	<20	<5		< 0.5	<1	0	0	0	0	0	0	0	0						
Glycol	<20	<40	<20	<20	<20		< 20	2	14	1	2	.	.	.	2	2						
Maximum dilution to reach criteria																			**14**	**26**		**17**

a = Total Chromium
b = Chromium III
c = Chromium VI
d: Taken to mean, TRH C6-C36
e: m&p Cresol
f: m-Cresol
g: p-Cresol

Table F-15 shows the levels of total sulphide in PFW, together with an approximate concentration of hydrogen sulphide based on conversions in ANZECC (2000). Per ANZECC, in general, studies reported show the observed effect concentrations of sulphide are consistent with the un-ionised H2S (hydrogen sulphide) form, not total sulphide.

Table F-15 Sulphide properties of HLA PFW relative to background levels, and dilution factor

Physical property	Maximum concentration in PFW	Percentage of hydrogen sulphide in total aqueous sulphide at 30C, pH 7.0-7.5 and 35% salinity#	Expected hydrogen sulphide concentration, mg/L	Background levels, mg/L*	Dilution factor
Sulphide	12.0	pH = 7.0: 22.4%	2.7	Minimum: <0.01	269
		pH = 7.5: 8.36%	1.0		100
		pH = 7.0: 22.4%	2.7	Average 0.015	179
		pH = 7.5: 8.36%	1.0		67
		pH = 7.0: 22.4%	2.7	Maximum: 0.03	90
		pH = 7.5: 8.36%	1.0		33
Maximum dilution to reach background levels					**269**

#From ANZECC, 2000, Table 8.3.10, p. 8.3-173
*Taken from 18 reference site samples taken away from Tuna platform location.

Table F-16 shows the TOC of produced water relative to background levels of TOC in sea water.

Table F-16 TOC properties of HLA PFW relative to background levels, and dilution factor

Physical property	Maximum concentration in PFW	Background levels*	Dilution factor
TOC	78	<1 to 2	78
Maximum dilution to reach background levels			**78**

*Taken from 18 reference site samples taken away from Tuna platform location.

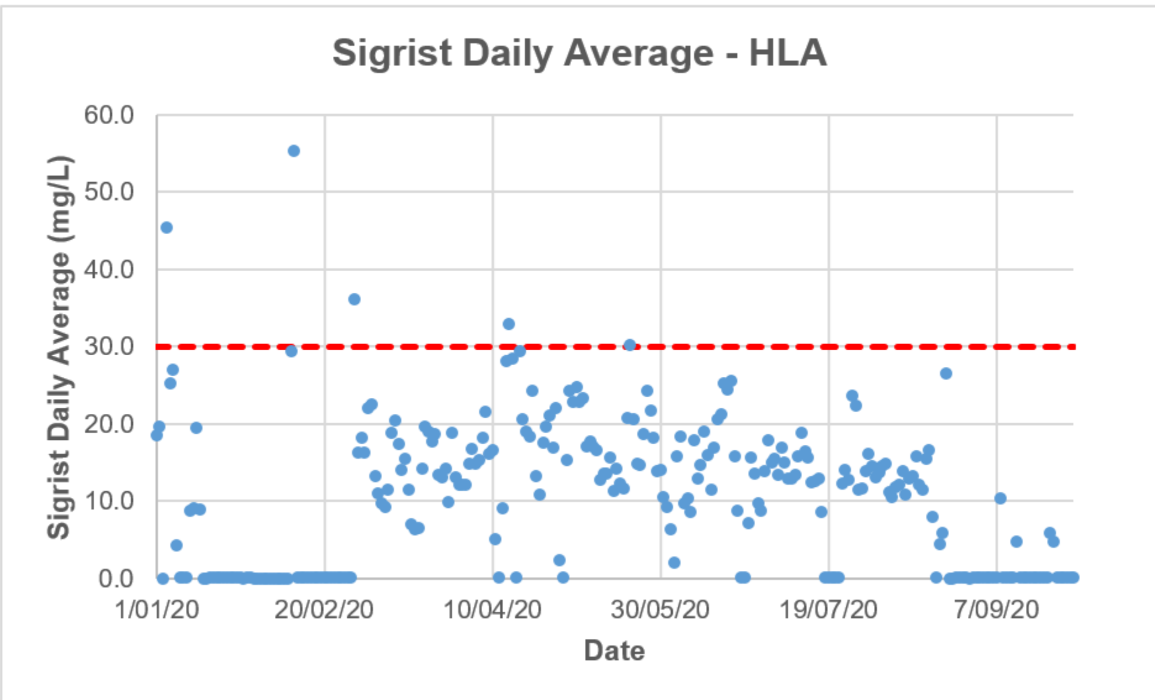


Figure F-5 Platform overboard discharge levels of oil in water (in mg/L) since 1 Jan 2020

A summary of Sigrist daily averages exceeding 30 mg/L on Halibut for the period of 1st January 2020 to 30th September 2020 is given below in Table F-17.

Table F-17 HLA Oil in water exceedances from January 2020 to September 2020

Date	Sigrist Daily Average (mg/L)	Total Oil Load (kg/day)	Comments
04/01/20	45.4	43.6	Oil in water spikes were noted due to start-up of the water handling system. Reported to NOPSEMA in January monthly recordable incidents report.
10/02/20	34.0	25.8	Platform experienced oil in water spikes upon platform start-up. Reported to NOPSEMA in February monthly recordable incidents report.
29/02/20	36.2	30.7	Platform was coming back online following shutdown. Reported to NOPSEMA in February monthly recordable incidents report.
15/04/20	33.0	137.5	Sigrist data not stored in DCS due to a malfunction. Hourly Sigrist readings were noted which exceeded 30 mg/L. Reported to NOPSEMA in April monthly recordable incidents report.
21/05/20	30.2	100.9	Oil in water spikes were noted following WIMS testing and a well kick the previous evening. Reported to NOPSEMA in May monthly recordable incidents report.

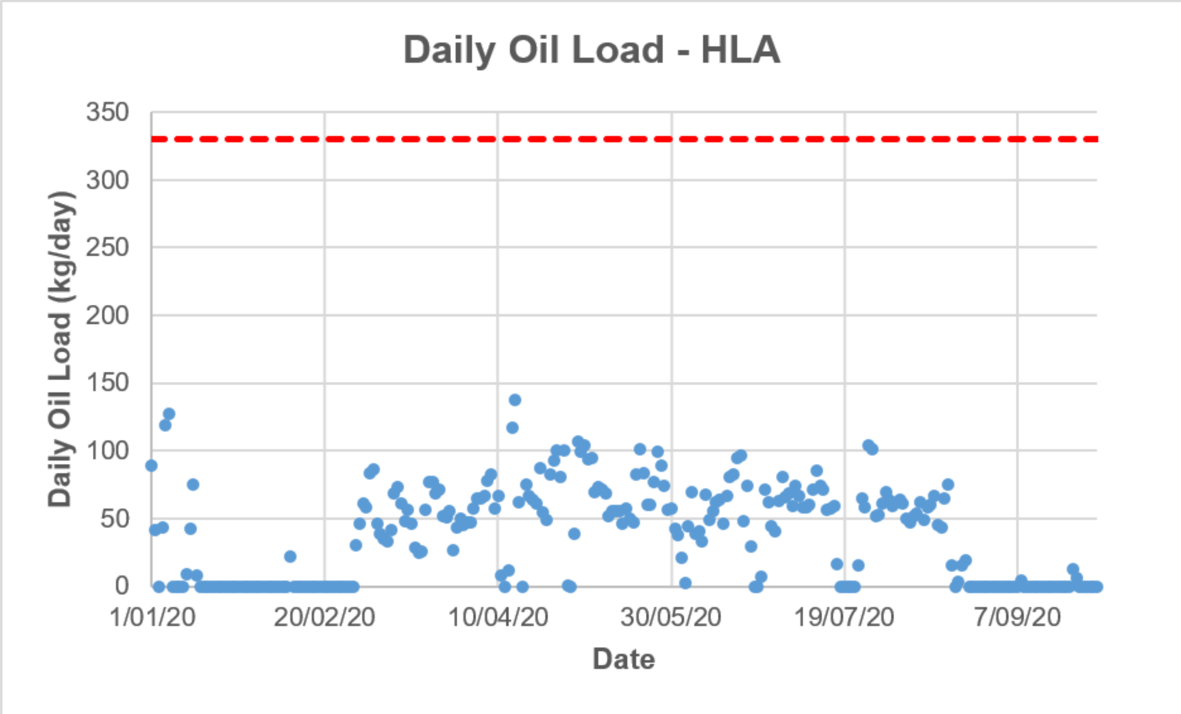


Figure F-6 Platform overboard oil load (in kg/d, mg/L oil concentration multiplied by volume discharged) since 1 Jan 2020

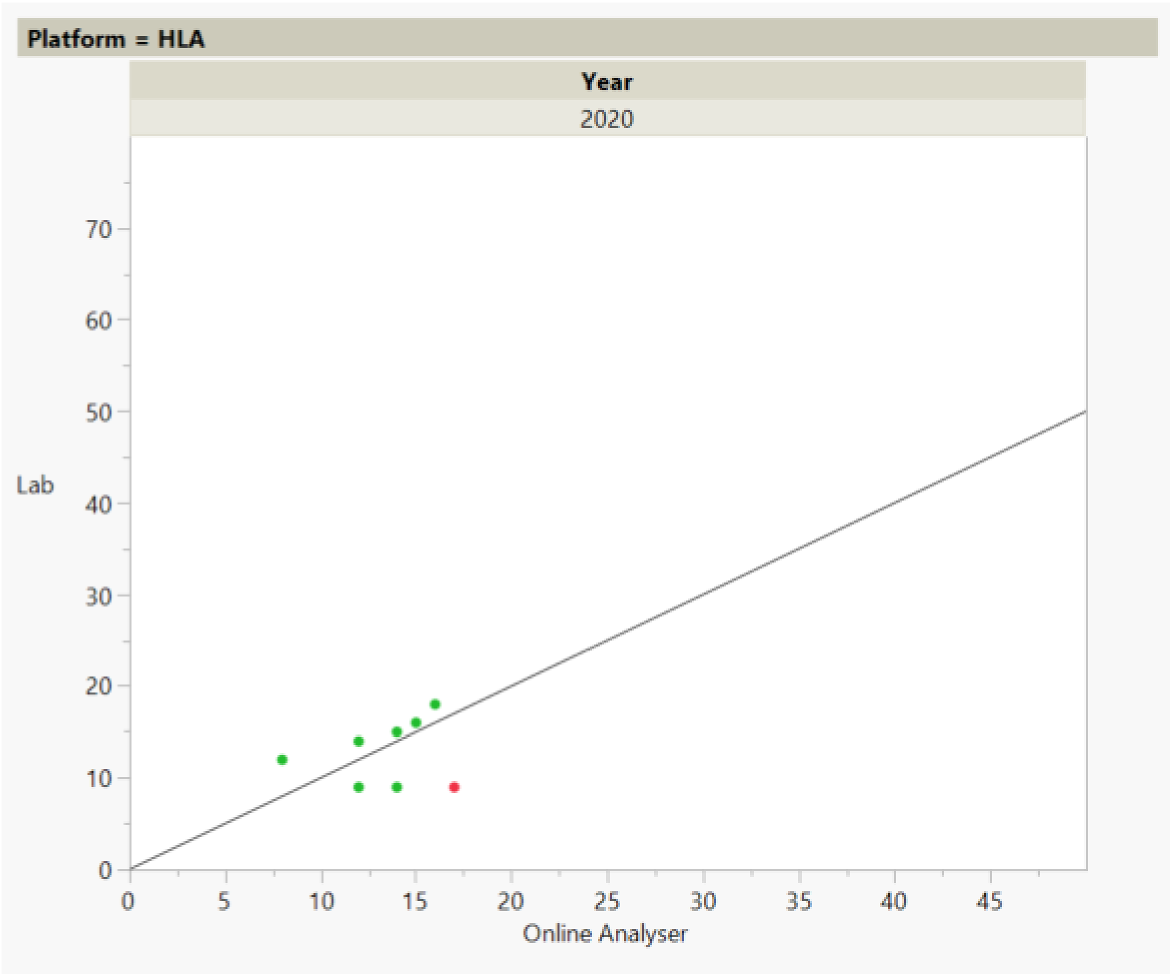


Figure F-7 Cross-check of platform online monitor readings with routine laboratory tests

Table F-18 Dispersion model inputs – Halibut platform

Parameter	Value
Discharge rate (kL/day)	12,481
Discharge temperature (°C)	89
Discharge salinity (ppt)	38
Internal diameter of outlet (inch) [m]	6.61 [0.168]
Outlet orientation	vertically downward
Depth of outlet below MSL (m)	11
Total water depth at site (m)	73

Figure F-8 show the model outputs for the platform (dilution contours) with distance from the platform. The inset in Figure F-8 (b) shows there is no physical interaction of the plume with the seabed and hence no direct exposure of the constituents of PFW with the sediment.

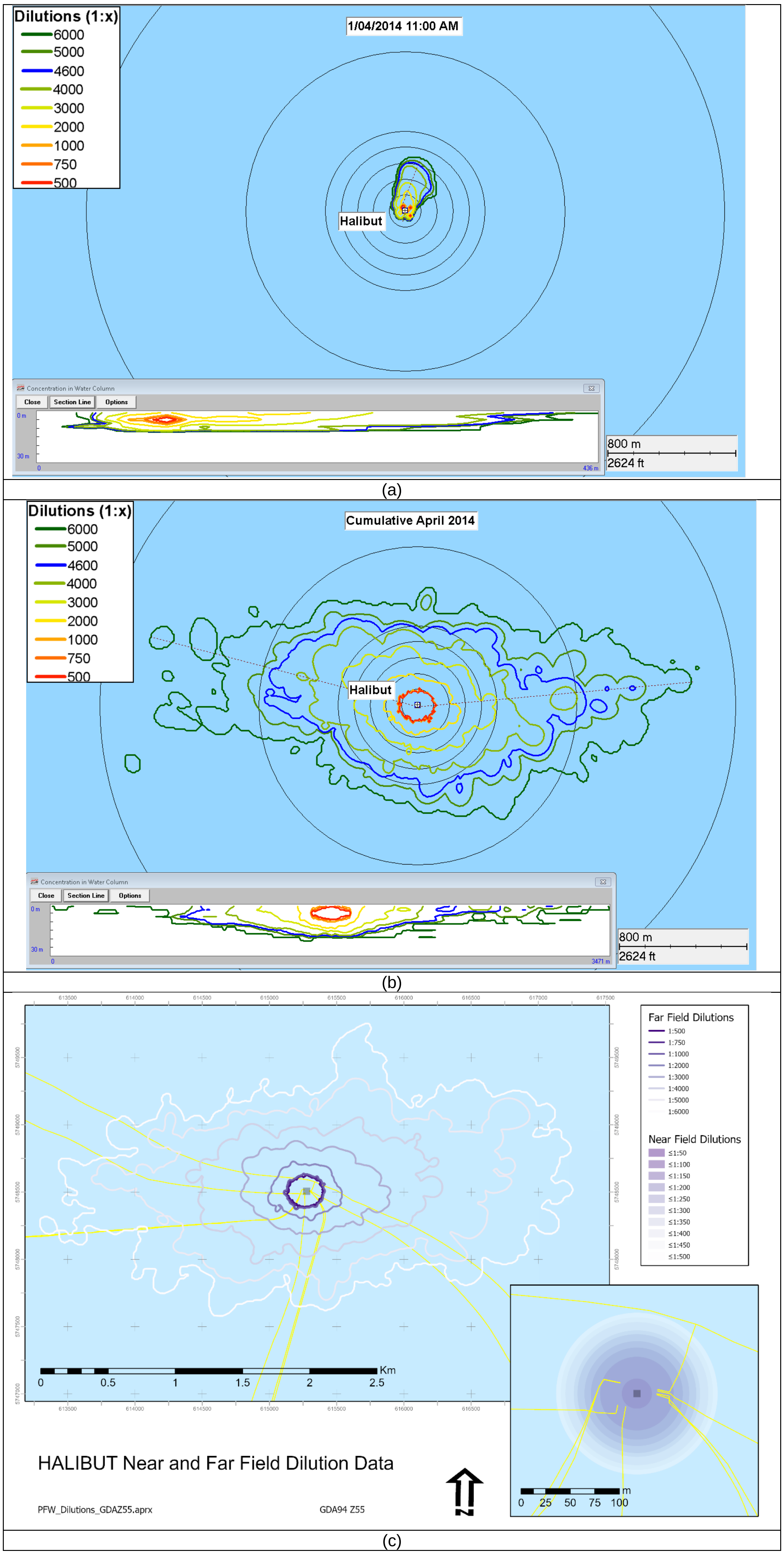


Figure F-8 **Dilution around the HLA platform and in the water column from PFW. (a) Snapshot of dilution of produced water plume around the platform, surface and cross-sectional view. (b) Summary of the dilution contours around the platform, conglomerated over one month (taking account of tide/current directions on any given day). (c) Yearly far-field dilution contours, inset are near-field contours.**

Table F-19 Dilution factors with distance from the HLA platform under typical currents.

Dilution factor	Distance from platform (m)
10	0.6
50	4.3
100	15
200	47
500	150
750	160
1000	160
2000	290
3000	630
4000	1010

Table F-20 Dispersion model outputs – water quality

Criteria	Dilution required (1:X)	Distance from platform
Meets physical parameters background levels	6	<0.6 m
Meets ANZECC 95% species protection water quality criteria	14	<4.3 m
Meets ANZECC 99% species protection water quality criteria	26	<4.3 m
Meets hydrogen sulphide background levels	269	<150 m
Meets TOC background levels	78	<15 m

Table F-21 Dispersion model outputs – fisheries

Criteria	Dilution required (1:X)	Distance from platform
Meets ANZECC seafood taint thresholds	17	<4.3 m

Table F-22 2014 results in percentage effluent of Halibut PFW for no effect concentration (NOEC), lowest effect concentration (LOEC), concentration with effects or inhibition of 10% species (E/IC10), and concentration with effects or inhibition of 50% species (E/IC50).

Species	NOEC (% effluent)	LOEC (% effluent)	E/IC50 (% effluent)	E/IC10 (% effluent)
Heliocidaris tuberculata (sea urchin)	12.5	25	17.1	12.9
Mytilus galloprovincialis (Mediterranean mussel)	12.5	25	30.2	16.1
Nitzschia closterium (diatom algae)	12.5	25	18.7	N/A
Hormosira banksii (brown algae)	3.1	6.3	7.8	3.8
Allorchestes compressa (amphipod)	12.5	25	26.3	11.9
Lates calcarifer (barramundi)	50	100	68.3	52.2

Table F-23 2020 results in percentage effluent of Halibut PFW for no effect concentration (NOEC), lowest effect concentration (LOEC), concentration with effects or inhibition of 10% species (E/IC10), and concentration with effects or inhibition of 50% species (E/IC50)

Test	NOEC (% effluent)	LOEC (% effluent)	E/IC50 (% effluent)	E/IC10 (% effluent)
72-hour microalgal growth (Tisochrysis lutea)	25	50	32.0	28.8
72-hour microalgal growth (Nitzschia closterium)	25	50	85.2	42.4
72-hour macroalgal germination success (Hormosira banksii)	12.5	25	32.1	21.2
1 hr sea urchin fertilisation success (Echinometra mathaei)	<0.8	0.8	1.87	0.67
72-hour sea urchin larval development (Heliocidaris tuberculata)	6.3	12.5	16.8	12.7
48-hour mollusc larval development (Mytilus edulis)	0.8	1.6	9.1	3.1
5-7 day copepod larval development (Gladioferens imparipes)	1.6	3.1	6.0	1.8
7-day fish larval development (Seriola lalandi)*	0.2	0.4	1.06	0.51

**Note that this species was not used to determine the SSD for HLA for 2020. Following delays in conducting the fish larval development test, validation of the data gave variable results requiring that this species be excluded from the SSD to ensure a representative curve*

Table F-24 Species sensitivity distribution output species protection levels – HLA effluent

Species sensitivity distribution outputs	2014 WET test result (% effluent)	2020 WET test result (% effluent)
95% species protection level	2.3%	0.59%
Dilution to obtain 95% species protection	4	169
Maximum dilution to obtain 95% species protection	169	
99% species protection level	1.0%	0.13%
Dilution to obtain 99% species protection	100	769
Maximum dilution to obtain 99% species protection	769	

Table F-25 Dispersion model outputs – ecotoxicity

Criteria	Dilution required (1:X)	Distance from platform
Meets 95% species protection levels based on whole effluent toxicity	169	<47 m
Meets 99% species protection levels based on whole effluent toxicity	769	<160 m

Appendix F.3 Snapper Platform PFW Data

Table F-26 Snapper platform PFW physical and chemical composition data – 2014 to 2020

Parameter	Number records	2014	2015	2015	2016	2017	2018	2019	2020	Mean	Std Error	Lower 95% confidence level	Upper 95% confidence level	Minimum detected (mg/l)	Maximum detected (mg/l)	Background levels	Dilution factor
Physical parameters																	
Temperature (C)	5	80	67	80				74	80	76	4	68	84	67	80	14[a]	6
Conductivity (uS/cm)	8	29000	36000	34000	37000	32000	39000	37000	32700	34588	2363	29853	39322	29000	39000	46500[b]	1
pH (units)	8	7.3	7.2	7.3	7.1	7.9	7.5	7.8	7.4	7.4	0.1	7.2	7.7	7.1	7.9	8.2[c]	1
Suspended solids	8	12	14	10	11	7	27	9	4	12	6	0	23	4	27	34[d]	1
Total dissolved solids	8	18000	23000	22000	24000	14000	22000	16000	21000	20000	1036	17926	22074	14000	24000	N/A	N/A
Maximum dilution to reach background levels																	**6**

a: Surface: 14-20°C, EP Volume 1
b: 35-36psu = 45,900uS/cm – 47,100uS/cm assuming 18°C, EP Volume 1
c: pH default trigger values given in ANZECC (2000) Table 3.3.2 Default trigger values for physical and chemical stressors for south-east Australia for slightly disturbed ecosystems (marine, offshore).
d: Non-detect to 34mg/L, from 19 reference site samples taken at BTW location prior to drilling.

Parameter	2014	2015	2015	2016	2017	2018	2019	2020	% Detected	Number times detected	Mean	Std Error	Lower 95% confidence level	Upper 95% confidence level	Minimum detected (mg/l)	Maximum detected (mg/l)	ANZECC water quality criteria (95% species protection level), mg/L	ANZECC water quality criteria (99% species protection level), mg/L	Dilution factor to ANZECC water quality 95% criteria	Dilution factor to ANZECC water quality 99% criteria	ANZECC Seafood Taint threshold (mg/L)	Dilution factor to ANZECC Seafood taint threshold
Mono-aromatic hydrocarbons and derivatives																						
Benzene	6.7	5.6	6.3	5.6	5.2	8.9	2.4	3.6	100	8	5.54	0.40	4.73	6.35	2.40	8.90	0.7	0.5	13	18		
Toluene	13	9.2	11	9	8.7	11.0	2.9	5.6	100	8	8.80	0.69	7.43	10.17	2.90	13.00					0.25	52
Ethylbenzene	<0.5	0.25	`	0.31	0.21	0.20	0.13	0.24	75	6	0.22	0.11	0.01	0.44	0.13	0.31					0.25	1
m&p-Xylenes	4.3	2.6	3.7	2.9	2.6	1.8	1.0	1.1	100	8	2.50	0.25	2.00	3.00	1.00	4.30						
o-Xylene	1.2	0.72	1.1	0.93	0.67	0.63	0.41	0.69	100	8	0.79	0.09	0.62	0.96	0.41	1.20						
1.2.4-Trimethylbenzene	<0.5	0.16	0.41		0.23	0.21	0.19	0.29	86	6	0.25	0.04	0.18	0.32	0.16	0.41						
1.3.5-Trimethylbenzene	0.15	<0.1	0.15		<0.1	0.066	0.062	0.1	71	5	0.11	0.02	0.07	0.14	0.06	0.15						
Benzyl chloride	<0.005	<0.005	<0.005	<0.005	<0.005	< 0.005	<0.005		0	0	0	0	0	0	0	0						
Dibenzofuran	0.030	0.011	0.009	<0.005	<0.005	< 0.005	<0.005	<0.05	38	3	0.02	0.00	0.01	0.02	0.01	0.03						
Nitrobenzene				<0.05	<0.05	< 0.05	<0.05	<0.05	0	0	0	0	0	0	0	0						
1,2,4-trichlorobenzene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	0	0							0.08	0.02	Not detected	Not detected		
Poly-aromatic hydrocarbons and derivatives																						
Naphthalene	1.5	0.83	0.66	0.82	0.16	0.31	0.82	0.68	100	8	0.72	0.06	0.59	0.85	0.16	1.50	0.07	0.05	21	30	1	2
2-Methylnaphthalene	1.2	0.41	0.39	0.61	<0.005	0.2	0.35	0.52	88	7	0.53	0.05	0.42	0.63	0.20	1.20						
Fluorene	0.037	0.019	0.012	0.024	<0.005	0.006	0.016	0.017	88	7	0.019	0.002	0.015	0.022	0.006	0.037						
Phenanthrene	0.037	0.019	0.012	0.026	0.003	0.006	0.015	0.018	100	8	0.017	0.002	0.013	0.021	0.003	0.037						
Acenapthene	<0.001	0.007	<0.001		<0.001	< 0.001	0.003	<0.005	29	2	0.005	0.00147	0.0012	0.00877	0.003	0.007					0.02	0
Anthracene				<0.001	<0.001	< 0.005	<0.001	<0.001	0	0	0	0	0	0	0	0						
Pyrene	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.005	<0.001	<0.001	0	0	0	0	0	0	0	0						
Flouranthene	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.01	<0.001	<0.001	0	0	0	0	0	0	0	0						

Parameter	2014	2015	2015	2016	2017	2018	2019	2020	% Detected	Number times detected	Mean	Std Error	Lower 95% confidence level	Upper 95% confidence level	Minimum detected (mg/l)	Maximum detected (mg/l)	ANZECC water quality criteria (95% species protection level), mg/L	ANZECC water quality criteria (99% species protection level), mg/L	Dilution factor to ANZECC water quality 95% criteria	Dilution factor to ANZECC water quality 99% criteria	ANZECC Seafood Taint threshold (mg/L)	Dilution factor to ANZECC Seafood taint threshold
Isopropyl Benzene			<0.1		<0.1	< 0.02	<0.05	0.014	20	1	0.014	0.00707	0	0.10385	0.014	0.014					0.25	0
Phenols																						
Phenol	2.4	1.3	1.8	1.3	0.89	1.90	3.10	3.20	100	8	1.99	0.20	1.59	2.38	0.89	3.20	0.4	0.27	8	12	1	3
m & p Cresol[e]	3.1	1.9	1.9	1.7	0.22	0.88	2.4	2.9	100	8	1.88	0.16	1.56	2.19	0.22	3.10					0.2[f]	16
m & p Cresol[e]	3.1	1.9	1.9	1.7	0.22	0.88	2.4	2.9	100	8	1.88	0.16	1.56	2.19	0.22	3.10					0.1[g]	31
o-Cresol	2.4	1.7	1.3	1.5	0.41	0.91	1.40	2.10	100	8	1.47	0.10	1.26	1.67	0.41	2.40					0.4	6
2,4-Dimethylphenol	1.5	0.83	0.65	0.7	0.22	0.39	0.75	0.79	100	8	0.73	0.07	0.60	0.86	0.22	1.50					0.4	4
Pentachlorophenol	<0.01	<0.01	<0.01	<0.01	<0.01	< 0.01	<0.01	<0.05	0								0.022	0.011	Not detected	Not detected		
Total petroleum hydrocarbons																						
TRH C6-C9		25	37	31	29	41	11	16	100	7	27.1	2.9	21.3	33.0	11.0	41.0						
TRH C10-C14		14	12	15	1.9	5.4	9.3	16	100	7	10.5	4.4	1.7	19.4	1.9	16.0						
TRH C15 -C28		9.1	2.1	19	0.4	0.8	1.1	12	100	7	6.4	8.3	0.0	23.1	0.4	19.0						
TRH C29-C36		1.2	0.2	2.4	<0.1	< 0.1	<0.1	1.6	57	4	1.4	0.6	0.1	2.6	0.2	2.4						
1,1,2-trichloroethane	<0.001	<0.1	<0.1		<0.1	<0.02	<0.05	<0.002	0	0							1.9	0.14	Not detected	Not detected		
Oil, emulsifiable[d]																78.4					15	5
Inorganic constituents																						
Ammonia (as N)	27	33	36	35	27	34	41	32	100	8	33.1	1.6	29.9	36.4	27.0	41.0	0.91	0.5	45	82		
Phosphate	1.1		0.9	0.07	1.00	1.80	0.57	0.38	100	7	0.8	0.3	0.2	1.4	0.1	1.8						
Sulphide	5.2	12	8.0	12.0	14	10	6	0.8	100	8	8.5	1.8	4.9	12.1	0.8	14.0						
Cyanide (total)	0.022	<0.05	<0.05	<0.005	<0.005	< 0.005	<0.005	<0.004	13	1	0.022	0.017	0.000	0.070	0.022	0.022	0.004	0.002	6	11		
Nutrients																						
Total Nitrogen as N	22	33	36	35	30	35	41	33	100	8	33	95	0	223	22	41						
BOD	470	520	530	110	>300	45	>300	210	75	7	312	33	246	379	45	530						
Metals																						
Calcium	130	140	160	140	190	170	180	160	100	8	159	21	117	201	130	190						
Iron	1.4	0.39	1.9	2.5	2.70	2.10	4.40	0.11	100	8	1.9	0.5	1.0	2.9	0.1	4.4						
Manganese	0.066	<0.025	0.070	0.1	0.11	0.11	0.18	0.067	88	7	0.10	0.06	0.00	0.23	0.07	0.18						
Arsenic	<0.001	<0.005	<0.005	<0.005	< 0.005	0.003	<0.001	<0.001	13	1	0.003	0.046	0.000	0.132	0.003	0.003						
Cadmium	<0.0002	<0.001	<0.001	<0.0001	< 0.001	< 0.0002	<0.0002	<0.0002	0	0	0	0	0	0	0	0	1.9	0.14	Not detected	Not detected		
Chromium[a]	<0.0001	<0.005	<0.005	<0.005	< 0.005	0.001	0.46	<0.0004	25	2	0.231	0.104	0.000	0.497	0.001	0.460	0.0274[b]	0.0077[b]	17	60		
Chromium[a]	<0.0001	<0.005	<0.005	<0.005	< 0.005	0.001	0.46	<0.0004	25	2	0.231	0.104	0.000	0.497	0.001	0.460	0.0044[c]	0.00014[c]	105	3286		
Cobalt	<0.0001	<0.005	<0.005	<0.005	< 0.005	< 0.001	0.003	<0.0001	13	1	0.003	0.000	0.000	0.000	0.003	0.003	0.001	0.000005	3	600		
Copper	<0.0001	<0.005	<0.005	<0.005	< 0.005	< 0.001	0.002	<0.0004	13	1	0.002	0.000	0.000	0.000	0.002	0.002	0.0013	0.0003	2	7	1	0
Lead	<0.001	<0.005	<0.005	<0.005	< 0.005	< 0.001	<0.001	<0.0002	0	0	0	0	0	0	0	0	0.0044	0.0022	Not detected	Not detected		
Mercury	<0.0001	<0.0005	<0.0005	<0.0005	< 0.0005	< 0.0001	<0.0001	<0.0001	0	0	0	0	0	0	0	0	0.0004	0.0001	Not detected	Not detected		
Nickel	<0.001	<0.005	<0.005	<0.005	< 0.005	< 0.001	0.14	<0.0006	13	1	0.140	0.006	0.125	0.155	0.140	0.140	0.07	0.007	2	20		
Selenium	<0.001	<0.005	<0.005	<0.005	< 0.005	0.001	<0.001	<0.002	13	1	0.001	0.009	0.000	0.025	0.001	0.001						
Silver	<0.0005	<0.025	<0.025	<0.025	< 0.025	< 0.005	0.017	<0.0002	13	1	0.017	0.000	0.000	0.000	0.017	0.017	0.0014	0.0008	12	21		

Parameter	2014	2015	2015	2016	2017	2018	2019	2020	% Detected	Number times detected	Mean	Std Error	Lower 95% confidence level	Upper 95% confidence level	Minimum detected (mg/l)	Maximum detected (mg/l)	ANZECC water quality criteria (95% species protection level), mg/L	ANZECC water quality criteria (99% species protection level), mg/L	Dilution factor to ANZECC water quality 95% criteria	Dilution factor to ANZECC water quality 99% criteria	ANZECC Seafood Taint threshold (mg/L)	Dilution factor to ANZECC Seafood taint threshold
Vanadium	<0.001	<0.025	<0.025	<0.025	< 0.025	< 0.005	<0.005	<0.0006	0	0	0	0	0	0	0	0	0.16	0.05	Not detected	Not detected		
Zinc	0.002	<0.005	<0.005	0.005	< 0.005	< 0.005	0.018	<0.002	38	3	0.008	0.015	0.000	0.042	0.002	0.018	0.015	0.007	1	3	5	0
Other chemicals																						
Total organic carbon (TOC)	260	390	270	400	820	360	220	250	100	8	371	41	288	454	220	820						
Surfactants (MBAS)	<0.5	<0.2	<0.5	<0.2	<0.2	< 0.2	0.6	1.2	25	2	0.90	0.46	0.00	1.94	0.60	1.20						
2-butanone (MEK)	0.15	<0.1	<0.1		<0.1	0.22	0.3		50	3	0.22	0.03	0.13	0.31	0.15	0.30						
2-propanone (acetone)	<2.5	0.44	<0.1		<0.1	0.76	0.76		50	3	0.65	0.11	0.41	0.90	0.44	0.76						
Bis-(2-ethylhexyl) phthalate	<0.005	<0.005	<0.005	<0.005	<0.005	< 0.005	<0.005	<0.5	0	0	0	0	0	0	0	0						
Methylene chloride			<0.1		<0.1	0.21	<0.05	<0.01	20	1	0.21	.	.	.	0.21	0.21						
Acetophenone	<0.005	<0.01	<0.005	<0.005	<0.005	< 0.005	<0.005	<0.05	0	0	0	0	0	0	0	0					0.5	Not detected
Methanol	<5	<5	<5	<5	<5	< 0.5	<5	<1	0	0	0	0	0	0	0	0						
Glycol	<20	<20	<20	<20	<20	< 40	<20	65	13	1	65	.	.	.	65	65						
Maximum dilution to reach criteria																			**105**	**3286**		**52**

a = Total Chromium
b = Chromium III
c = Chromium VI
d: Taken to mean, TRH C6-C36
e: m&p Cresol
f: m-Cresol
g: p-Cresol

Table F-27 shows the levels of total sulphide in PFW, together with an approximate concentration of hydrogen sulphide based on conversions in ANZECC (2000). Per ANZECC, in general, studies reported show the observed effect concentrations of sulphide are consistent with the un-ionised H_2S (hydrogen sulphide) form, not total sulphide.

Table F-27 Sulphide properties of SNA PFW relative to background levels, and dilution factor

Physical property	Maximum concentration in PFW	Percentage of hydrogen sulphide in total aqueous sulphide at 30C, pH 7.0-7.5 and 35% salinity#	Expected hydrogen sulphide concentration, mg/L	Background levels, mg/L*	Dilution factor
Sulphide	14.0	pH = 7.0: 22.4%	3.1	Minimum: <0.01	314
		pH = 7.5: 8.36%	1.2		117
		pH = 7.0: 22.4%	3.1	Average 0.015	209
		pH = 7.5: 8.36%	1.2		78
		pH = 7.0: 22.4%	3.1	Maximum: 0.03	105
		pH = 7.5: 8.36%	1.2		39
Maximum dilution to reach background levels					**314**

#From ANZECC, 2000, Table 8.3.10, p. 8.3-173
*Taken from 18 reference site samples taken away from Tuna platform location.

Table F-28 shows the TOC of produced water relative to background levels of TOC in sea water.

Table F-28 TOC properties of SNA PFW relative to background levels, and dilution factor

Physical property	Maximum concentration in PFW	Background levels*	Dilution factor
TOC	820	<1 to 2	820
Maximum dilution to reach background levels			**820**

*Taken from 18 reference site samples taken away from Tuna platform location.

Table F-29 Particle Size Distribution for SNA PFW

Wentworth Size Classifications	2020
Total Clay % (0-4 µm)	**55.49**
Very Fine Silt % (4-8 µm)	14.09
Fine Silt % (8-16 µm)	12.07
Medium Silt % (16-31 µm)	9.51
Course Silt % (31-63 µm)	6.69
Total Silt (4-63 µm)	**42.37**
Very Fine sand % (63-12 5µm)	1.99
Fine sand % (125-250 µm)	0.15
Medium sand % (250-500 µm)	0.00
Coarse sand % (500-1000 µm)	0.00
Very Coarse sand % (1000-2000 µm)	0.00
Total Sand (63-2000 µm)	**2.14**
Total Gravels (>2000 µm)	**0.00**

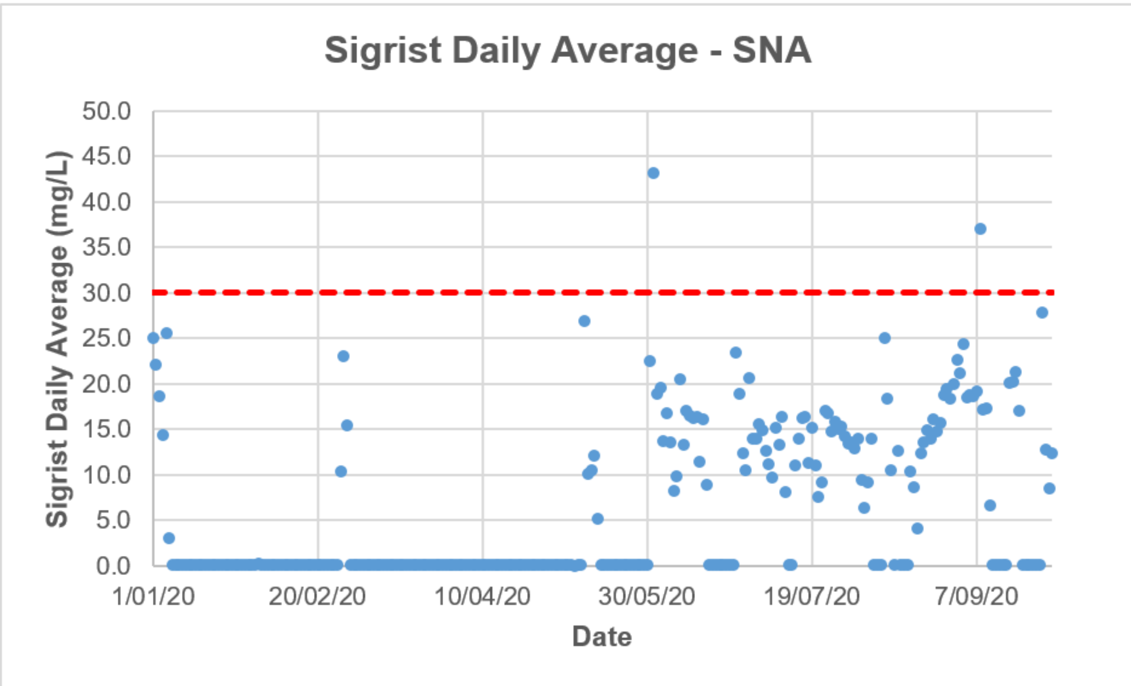


Figure F-9 Platform overboard discharge levels of oil in water (in mg/L) since 1 Jan 2020

A summary of Sigrist daily averages exceeding 30 mg/L on Snapper for the period of 1st January 2020 to 30th September 2020 is given below in Table F-30.

Table F-30 SNA Oil in water exceedances from January 2020 to September 2020

Date	Sigrist Daily Average (mg/L)	Total Oil Load (kg/day)	Comments
01/06/20	43.2	55.3	Significant foaming occurred after bringing a well online due to inhibitor which resulted in elevated readings on the Sigrist. Reported to NOPSEMA in June monthly recordable incidents report.
08/09/20	37.0	65.5	Oil in water spikes were observed after brining a well online. Reported to NOPSEMA in September monthly recordable incidents report.

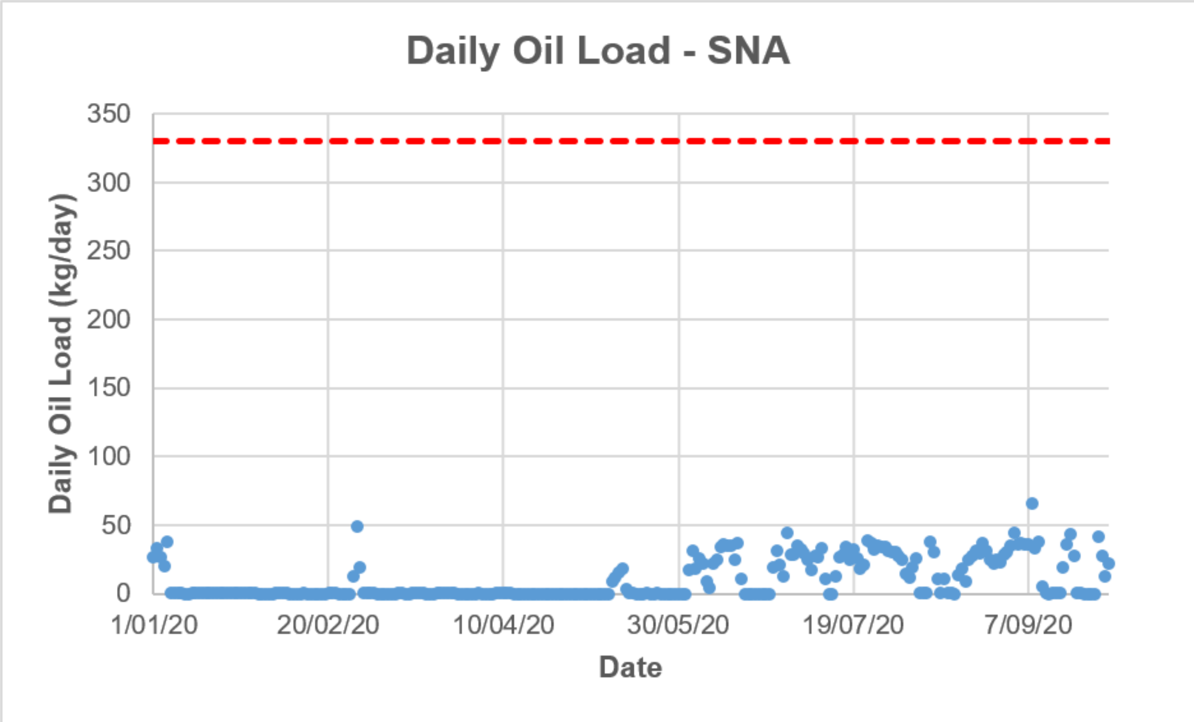


Figure F-10 Platform overboard oil load (in kg/d, mg/L oil concentration multiplied by volume discharged) since 1 Jan 2020

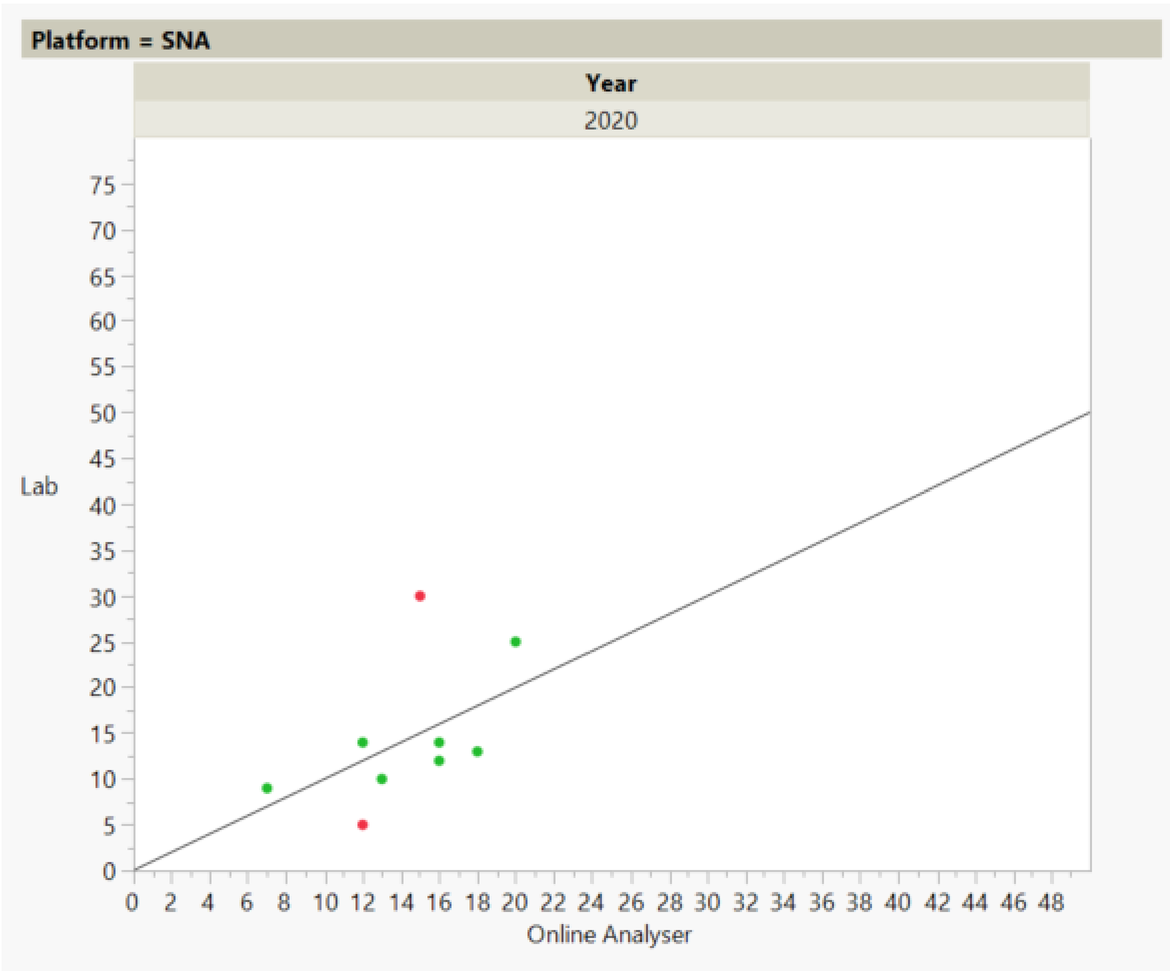


Figure F-11 Cross-check of platform online monitor readings with routine laboratory tests

Table F-31 Dispersion model inputs – Snapper platform

Parameter	Value
Discharge rate (kL/day)	4,370
Discharge temperature (°C)	80
Discharge salinity (ppt)	23
Internal diameter of outlet (inch) [m]	12.81 [0.32]
Outlet orientation	vertically downward
Depth of outlet below MSL (m)	8.2
Total water depth at site (m)	55

Figure F-12 shows the model outputs for the platform (dilution contours) with distance from the platform. The inset in Figure F-12 (b) shows there is no physical interaction of the plume with the seabed and hence no direct exposure of the constituents of PFW with the sediment.

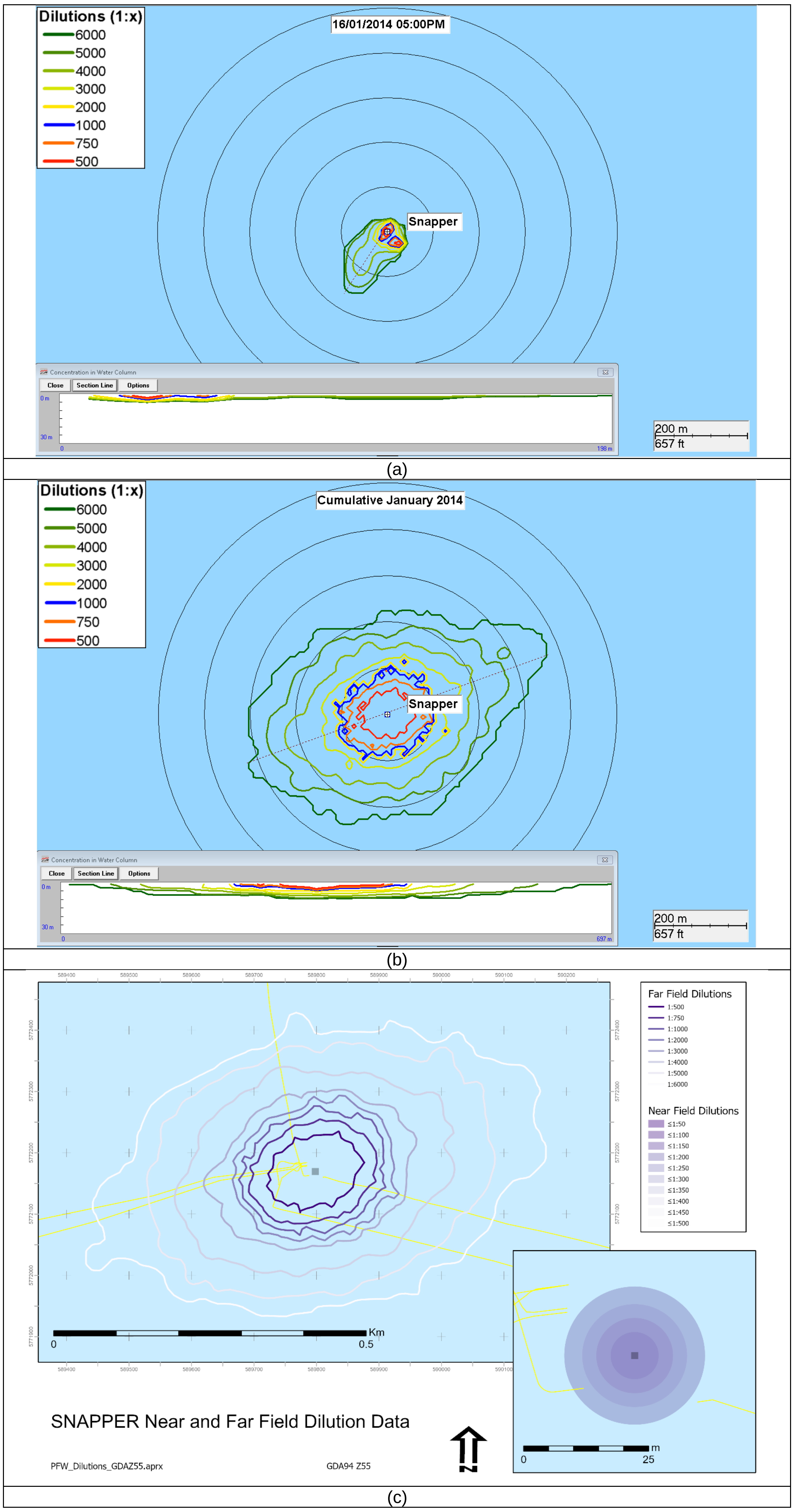


Figure F-12 Dilution around the SNA platform and in the water column from PFW. (a) Snapshot of dilution of produced water plume around the platform, surface and cross-sectional view. (b) Summary of the dilution contours around the platform, conglomerated over one month (taking account of tide/current directions on any given day). (c) Yearly far-field dilution contours, inset are near-field contours.

Table F-32 Dilution factors with distance from the SNA platform under typical currents.

Dilution factor	Distance from platform (m)
10	1.6
50	5
100	8
500	80
750	110
1000	120
2000	130
3000	170
4000	230

Table F-33 Dispersion model outputs – water quality

Criteria	Dilution required (1:X)	Distance from platform
Meets physical parameters background levels	6	<1.6 m
Meets ANZECC 95% species protection water quality criteria	105	<80 m
Meets ANZECC 99% species protection water quality criteria	3286	<230 m
Meets hydrogen sulphide background levels	314	<80 m
Meets TOC background levels	820	<120 m

Table F-34 Dispersion model outputs – fisheries

Criteria	Dilution required (1:X)	Distance from platform
Meets ANZECC seafood taint thresholds	52	<8 m

Table F-35 2014 results in percentage effluent of Snapper PFW for no effect concentration (NOEC), lowest effect concentration (LOEC), concentration with effects or inhibition of 10% species (E/IC10), and concentration with effects or inhibition of 50% species.

Species	NOEC (% effluent)	LOEC (% effluent)	E/IC50 (% effluent)	E/IC10 (% effluent)
Heliocidaris tuberculata (sea urchin)	3.1	6.3	6.6	4.3
Mytilus galloprovincialis (Mediterranean mussel)	6.3	12.5	11.9	6.7
Nitzschia closterium (diatom algae)	12.5	25	26.8	15.2
Hormosira banksii (brown algae)	1.6	3.1	3	0.8
Allorchestes compressa (amphipod)	12.5	25	16.8	12.7
Lates calcarifer (barramundi)	12.5	25	17.7	16.3

Table F-36 2020 results in percentage effluent of Snapper PFW for no effect concentration (NOEC), lowest effect concentration (LOEC), concentration with effects or inhibition of 10% species (E/IC10), and concentration with effects or inhibition of 50% species (E/IC50)

Test	NOEC (% effluent)	LOEC (% effluent)	E/IC50 (% effluent)	E/IC10 (% effluent)
72-hour microalgal growth (Tisochrysis lutea)	50	100	54.3	42.0
72-hour microalgal growth (Nitzschia closterium)	25	50	34.0	25.1
72-hour macroalgal germination success (Hormosira banksii)	12.5	25	27.6	18.3
1 hr sea urchin fertilisation success (Echinometra mathaei)	3.1	6.3	9.6	4.6
72-hour sea urchin larval development (Heliocidaris tuberculata)	6.3	12.5	7.5	6.7
48-hour mollusc larval development (Mytilus edulis)	6.3	12.5	12.5	8.9
5-7 day copepod larval development (Gladioferens imparipes)	0.8	1.6	2.8	1.7
7-day fish larval development (Seriola lalandi)	0.8	1.6	1.12	0.41

Table F-37 Species sensitivity distribution output species protection levels – SNA effluent

Species sensitivity distribution outputs	2014 WET test result (% effluent)	2020 WET test result (% effluent)
95% species protection level	0.75%	0.55%
Dilution to obtain 95% species protection	133	182
Maximum dilution to obtain 95% species protection	182	
99% species protection level	0.27%	0.14%
Dilution to obtain 99% species protection	370	714
Maximum dilution to obtain 99% species protection	714	

Table F-38 Dispersion model outputs – ecotoxicity

Criteria	Dilution required (1:X)	Distance from platform
Meets 95% species protection levels based on whole effluent toxicity	182	<80 m
Meets 99% species protection levels based on whole effluent toxicity	714	<110 m

Appendix F.4 West Kingfish Platform PFW Data

Table F-39 West Kingfish platform PFW physical and chemical composition data – 2014 to 2020

Parameter	Number records	2014	2015	2015	2016	2017	2018	2019	2020	Mean	Std Error	Lower 95% confidence level	Upper 95% confidence level	Minimum detected (mg/l)	Maximum detected (mg/l)	Background levels	Dilution factor
Physical parameters																	
Temperature (C)	4	50	84	80					70	71	4	62	80	50	84	14[a]	6
Conductivity (uS/cm)	8	63000	51000	53000	41000	55000	60000	49000	51500	52938	2363	48203	57672	41000	63000	46500[b]	1
pH (units)	8	6.5	6.7	6.6	6.9	6.5	6.6	7	6.5	6.7	0.1	6.4	6.9	6.5	7.0	8.2[c]	1
Suspended solids	7	39	21	3.5	8.8	19	< 5	15	2	15	6	3	28	2	39	34[d]	1
Total dissolved solids	8	36000	38000	36000	47000	40000	75	36000	37000	39125	1036	37051	41199	36000	47000	N/A	N/A
Maximum dilution to reach background levels																	**6**

a: Surface: 14-20°C, EP Volume 1
b: 35-36psu = 45,900uS/cm – 47,100uS/cm assuming 18°C, EP Volume 1
c: pH default trigger values given in ANZECC (2000) Table 3.3.2 Default trigger values for physical and chemical stressors for south-east Australia for slightly disturbed ecosystems (marine, offshore).
d: Non-detect to 34mg/L, from 19 reference site samples taken at BTW location prior to drilling.

Parameter	2014	2015	2015	2016	2017	2018	2019	2020	% Detected	Number times detected	Mean	Std Error	Lower 95% confidence level	Upper 95% confidence level	Minimum detected (mg/l)	Maximum detected (mg/l)	ANZECC water quality criteria (95% species protection level), mg/L	ANZECC water quality criteria (99% species protection level), mg/L	Dilution factor to ANZECC water quality 95% criteria	Dilution factor to ANZECC water quality 99% criteria	ANZECC Seafood Taint threshold (mg/L)	Dilution factor to ANZECC Seafood taint threshold
Mono-aromatic hydrocarbons and derivatives																						
Benzene	1.0	0.91	0.88	0.87	0.7	0.74	1	0.5	100	8	0.83	0.40	0.02	1.63	0.50	1.00	0.7	0.5	1	2		
Toluene	3.6	3.1	3.0	2.6	2.6	2.7	3.3	1.4	100	8	2.79	0.69	1.41	4.16	1.40	3.60					0.25	14
Ethylbenzene	0.3	0.24	0.21	0.22	0.2	0.23	0.29	0.16	100	8	0.23	0.09	0.05	0.42	0.16	0.30					0.25	1
m&p-Xylenes	2.2	2.0	1.6	1.6	1.6	1.5	2.0	0.8	100	8	1.66	0.25	1.16	2.17	0.80	2.20						
o-Xylene	0.56	0.50	0.39	0.43	0.37	0.45	0.53	0.23	100	8	0.43	0.09	0.26	0.60	0.23	0.56						
1.2.4-Trimethylbenzene	0.28	0.16	0.19	<0.005	0.17	0.21	0.26	0.15	88	7	0.20	0.03	0.14	0.27	0.15	0.28						
1.3.5-Trimethylbenzene	0.15	0.079	0.083	<0.005	0.097	0.11	0.12	0.071	88	7	0.10	0.02	0.07	0.13	0.07	0.15						
Benzyl chloride	<0.05	<0.05	<0.005	<0.005	<0.05	< 0.005	< 0.005		0	0	0	0	0	0	0	0						
Dibenzofuran	<0.05	<0.05	0.007	0.011	<0.05	< 0.005	< 0.005	<0.005	25	2	0.01	0.00	0.00	0.02	0.01	0.01						
Nitrobenzene				<0.05	<0.05	< 0.05	< 0.05	<0.005	0	0	0	0	0	0	0	0						
1,2,4-trichlorobenzene	<0.05	<0.05	<0.005	<0.005	<0.04	<0.005	< 0.005	<0.001	0	0	0	0	0	0	0	0	0.08	0.02	Not detected	Not detected		
Poly-aromatic hydrocarbons and derivatives																						
Naphthalene	0.23	0.15	0.17	0.33	0.1	0.12	0.06	0.2	100	8	0.17	0.06	0.04	0.30	0.06	0.33	0.07	0.05	5	7	1	0
2-Methylnaphthalene	0.15	0.14	0.16	0.32	0.11	0.1	0.055	<0.002	88	7	0.15	0.05	0.05	0.25	0.06	0.32						
Fluorene	<0.01	<0.01	0.008	0.012	0.014	< 0.001	0.003	0.005	63	5	0.008	0.002	0.004	0.013	0.003	0.014						
Phenanthrene	<0.01	<0.01	0.008	0.014	0.011	< 0.001	0.002	0.006	63	5	0.008	0.002	0.003	0.013	0.002	0.014						
Acenapthene	<0.01	<0.01	<0.002	<0.001	<0.01	< 0.001	< 0.001	<0.002	0	0	0	0	0	0	0	0					0.02	Not detected
Anthracene				<0.001	<0.01	< 0.001	< 0.001	<0.002	0	0	0	0	0	0	0	0						
Pyrene	<0.01	<0.01	<0.001	<0.001	<0.01	< 0.001	< 0.001	<0.002	0	0	0	0	0	0	0	0						
Flouranthene	<0.01	<0.01	<0.001	<0.001	<0.01	< 0.001	< 0.001	<0.002	0	0	0	0	0	0	0	0						

Parameter	2014	2015	2015	2016	2017	2018	2019	2020	% Detected	Number times detected	Mean	Std Error	Lower 95% confidence level	Upper 95% confidence level	Minimum detected (mg/l)	Maximum detected (mg/l)	ANZECC water quality criteria (95% species protection level), mg/L	ANZECC water quality criteria (99% species protection level), mg/L	Dilution factor to ANZECC water quality 95% criteria	Dilution factor to ANZECC water quality 99% criteria	ANZECC Seafood Taint threshold (mg/L)	Dilution factor to ANZECC Seafood taint threshold
Isopropyl Benzene			<0.02		<0.04	< 0.05	0.022	0.012	40	2	0.017	0.005	0	0.08053	0.012	0.022					0.25	0
Phenols																						
Phenol	0.25	0.13	0.26	0.44	0.085	0.22	0.11	0.42	100	8	0.24	0.20	0.00	0.64	0.09	0.44	0.4	0.27	1	2	1	0
m & p Cresol[e]	0.2	0.11	0.12	0.24	0.012	0.1	0.053	0.2	100	8	0.13	0.16	0.00	0.44	0.01	0.24					0.2[f]	1
m & p Cresol[e]	0.2	0.11	0.12	0.24	0.012	0.1	0.053	0.2	100	8	0.13	0.16	0.00	0.44	0.01	0.24					0.1[g]	2
o-Cresol	0.11	0.065	0.071	0.17	0.022	0.068	0.033	0.12	100	8	0.08	0.10	0.00	0.29	0.02	0.17					0.4	0
2,4-Dimethylphenol	0.042	0.020	0.024	<0.003	<0.03	< 0.003	0.011	<0.002	50	4	0.02	0.09	0.00	0.21	0.01	0.04					0.4	0
Pentachlorophenol	<0.1	<0.1	<0.01	<0.01	<0.1	< 0.01	< 0.01	<0.01	0	0							0.022	0.011	Not detected	Not detected		
Total petroleum hydrocarbons																						
TRH C6-C9		8.9	13	9.7	12	8	11	4.6	100	7	9.6	2.9	3.8	15.4	4.6	13.0						
TRH C10-C14		8.4	3.0	3.4	7.1	22.0	3.3	1.8	100	7	7.0	4.4	0.0	15.8	1.8	22.0						
TRH C15 -C28		17	5.9	4.8	17	32	4.4	1.1	100	7	11.7	8.3	0.0	28.5	1.1	32.0						
TRH C29-C36		2.8	1.0	0.8	1.7	5.8	0.5	<0.1	86	6	2.1	0.5	1.1	3.1	0.5	5.8						
1,1,2-trichloroethane	<0.05	<0.04	<0.02		<0.05	<0.05	< 0.02	<0.001	0	0							1.9	0.14	Not detected	Not detected		
Oil, emulsifiable[d]																72.8					15	5
Inorganic constituents																						
Ammonia (as N)	17	17	19	17	16	14	17	14	100	8	16.4	1.6	13.1	19.6	14.0	19.0	0.91	0.5	21	38		
Phosphate	<0.05			0.1	3.1	0.02	0.08	0.037	83	5	0.7	0.3	0.0	1.4	0.0	3.1						
Sulphide	10.0	8.0	9.0	10.0	1.7	2.0	4.0	4.4	100	8	6.1	1.8	2.5	9.8	1.7	10.0						
Cyanide (total)	<0.005	<0.05	<0.05	<0.005	<0.005	0.006	< 0.005	<0.004	13	1	0.006	0.017	0.000	0.054	0.006	0.006	0.004	0.002	2	3		
Nutrients																						
Total Nitrogen as N	23	19	21	17	21	110	17	15	100	8	30	95	0	220	15	110						
BOD	95	120	120	94	97	55	210	78	100	8	109	31	47	171	55	210						
Metals																						
Calcium	550	470	510	470	550	480	550	530	100	8	514	21	472	556	470	550						
Iron	3.4	2.2	3.7	3.3	2.9	2.7	4.7	0.72	100	8	3.0	0.5	2.0	3.9	0.7	4.7						
Manganese	1.3	1.3	1.4	1.3	1.5	1.1	1.1	1	100	8	1.25	0.06	1.13	1.37	1.00	1.50						
Arsenic	<0.005	<0.01	<0.01	<0.005	0.11	0.003	0.01	0.0032	50	4	0.032	0.023	0.000	0.096	0.003	0.110						
Cadmium	<0.0005	<0.002	<0.002	<0.001	< 0.002	< 0.0002	< 0.0002	<0.0001	0	0	0	0	0	0	0	0	0.0055	0.0007	Not detected	Not detected		
Chromium[a]	<0.005	<0.01	<0.01	<0.005	0.058	0.003	0.006	0.0002	50	4	0.017	0.073	0.000	0.205	0.000	0.058	0.0274[b]	0.0077[b]	2	8		
Chromium[a]	<0.005	<0.01	<0.01	<0.005	0.058	0.003	0.006	0.0002	50	4	0.017	0.073	0.000	0.205	0.000	0.058	0.0044[c]	0.00014[c]	13	414		
Cobalt	<0.005	<0.01	<0.01	<0.005	< 0.001	< 0.001	< 0.001	<0.00005	0	0	0	0	0	0	0	0	0.001	0.000005	Not detected	Not detected		
Copper	<0.005	<0.01	<0.01	<0.005	< 0.001	< 0.001	< 0.001	0.0003	13	1	0.0003	0.0000	0.0000	0.0000	0.0003	0.0003	0.0013	0.0003	0	1	1	0
Lead	<0.005	<0.01	<0.01	<0.005	< 0.01	< 0.001	< 0.001	<0.0001	0	0	0	0	0	0	0	0	0.0044	0.0022	Not detected	Not detected		
Mercury	<0.0001	<0.001	<0.001	<0.0005	< 0.001	< 0.0001	< 0.0001	<0.0001	0	0	0	0	0	0	0	0	0.0004	0.0001	Not detected	Not detected		
Nickel	<0.005	<0.01	<0.01	<0.005	0.011	< 0.001	0.004	<0.0003	25	2	0.008	0.004	0.000	0.018	0.004	0.011	0.07	0.007	0	2		
Selenium	<0.005	<0.01	<0.01	<0.005	< 0.01	< 0.001	< 0.001	<0.002	0	0	0	0	0	0	0	0						
Silver	<0.0005	<0.05	<0.05	<0.025	< 0.05	< 0.005	< 0.005	<0.0001	0	0	0	0	0	0	0	0	0.0014	0.0008	Not detected	Not detected		

Parameter	2014	2015	2015	2016	2017	2018	2019	2020	% Detected	Number times detected	Mean	Std Error	Lower 95% confidence level	Upper 95% confidence level	Minimum detected (mg/l)	Maximum detected (mg/l)	ANZECC water quality criteria (95% species protection level), mg/L	ANZECC water quality criteria (99% species protection level), mg/L	Dilution factor to ANZECC water quality 95% criteria	Dilution factor to ANZECC water quality 99% criteria	ANZECC Seafood Taint threshold (mg/L)	Dilution factor to ANZECC Seafood taint threshold
Vanadium	<0.01	<0.05	<0.05	<0.025	< 0.05	< 0.005	< 0.005	<0.0003	0	0	0	0	0	0	0	0	0.16	0.05	Not detected	Not detected		
Zinc	<0.005	<0.01	<0.01	<0.005	< 0.005	< 0.005	< 0.005	<0.001	0	0	0	0	0	0	0	0	0.015	0.007	Not detected	Not detected	5	Not detected
Other chemicals																						
Total organic carbon (TOC)	58	77	70	75	57	740	53	45	100	8	147	41	64	230	45	740						
Surfactants (MBAS)	<1	<5	<1	<0.2	<1	0.3	0.5	1.8	38	3	0.87	0.38	0.02	1.72	0.30	1.80						
2-butanone (MEK)	<0.05	<0.04	<0.02		<0.04	< 0.05	< 0.02		0	0	0	0	0	0	0	0						
2-propanone (acetone)	<0.05	<0.04	<0.1		<0.04	< 0.05	< 0.25		0	0	0	0	0	0	0	0						
Bis-(2-ethylhexyl) phthalate	<0.05	<0.05	0.006	0.027	<0.05	< 0.005	< 0.005	<0.05	25	2	0.017	0.007	0.000	0.035	0.006	0.027						
Methylene chloride			<0.02		<0.04	< 0.5	< 0.02	<0.005	0	0	0	0	0	0	0	0						
Acetophenone	<0.05	<0.05	<0.005	<0.005	<0.05	< 0.005	< 0.005	<0.005	0	0	0	0	0	0	0	0					0.5	Not detected
Methanol	<5	<5	<5	<5	<5	< 0.5	< 0.5	<1	0	0	0	0	0	0	0	0						
Glycol	<50	<20	<20	<20	<20	< 40	< 20	13	13	1	13	.	.	.	13	13						
Maximum dilution to reach criteria																			**21**	**414**		**14**

a = Total Chromium
b = Chromium III
c = Chromium VI
d: Taken to mean, TRH C6-C36
e: m&p Cresol
f: m-Cresol
g: p-Cresol

Table F-40 shows the levels of total sulphide in PFW, together with an approximate concentration of hydrogen sulphide based on conversions in ANZECC (2000). Per ANZECC, in general, studies reported show the observed effect concentrations of sulphide are consistent with the un-ionised H_2S (hydrogen sulphide) form, not total sulphide.

Table F-40 Sulphide properties of WKF PFW relative to background levels, and dilution factor

Physical property	Maximum concentration in PFW	Percentage of hydrogen sulphide in total aqueous sulphide at 30C, pH 7.0-7.5 and 35% salinity#	Expected hydrogen sulphide concentration, mg/L	Background levels, mg/L*	Dilution factor
Sulphide	10.0	pH = 7.0: 22.4%	2.2	Minimum: <0.01	224
		pH = 7.5: 8.36%	0.8		84
		pH = 7.0: 22.4%	2.2	Average 0.015	149
		pH = 7.5: 8.36%	0.8		56
		pH = 7.0: 22.4%	2.2	Maximum: 0.03	75
		pH = 7.5: 8.36%	0.8		28
Maximum dilution to reach background levels					**224**

#From ANZECC, 2000, Table 8.3.10, p. 8.3-173
*Taken from 18 reference site samples taken away from Tuna platform location.

Table F-41 shows the TOC of produced water relative to background levels of TOC in sea water.

Table F-41 TOC properties of WKF PFW relative to background levels, and dilution factor

Physical property	Maximum concentration in PFW	Background levels*	Dilution factor
TOC	740	<1 to 2	740
Maximum dilution to reach background levels			**740**

*Taken from 18 reference site samples taken away from Tuna platform location.

Table F-42 Particle Size Distribution for WKF PFW

Wentworth Size Classifications	2020
Total Clay % (0-4 µm)	**15.97**
Very Fine Silt % (4-8 µm)	31.36
Fine Silt % (8-16 µm)	38.27
Medium Silt % (16-31 µm)	10.45
Course Silt % (31-63 µm)	3.29
Total Silt (4-63 µm)	**83.38**
Very Fine sand % (63-125 µm)	0.65
Fine sand % (125-250 µm)	0.00
Medium sand % (250-500 µm)	0.00
Coarse sand % (500-1000 µm)	0.00
Very Coarse sand % (1000-2000 µm)	0.00
Total Sand (63-2000 µm)	**0.65**
Total Gravels (>2000 µm)	**0.00**

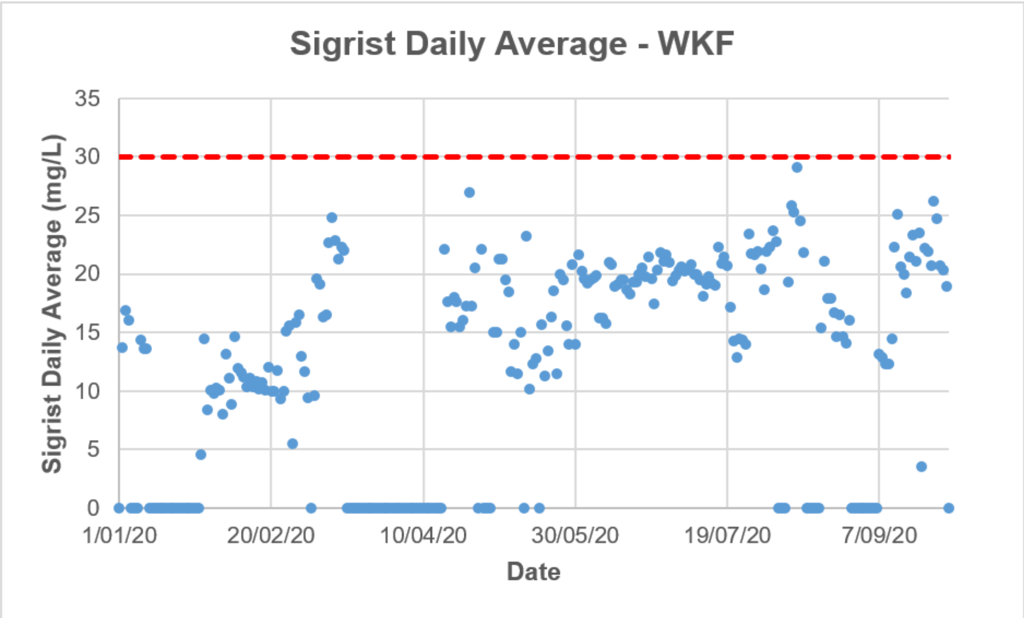


Figure F-13 Platform overboard discharge levels of oil in water (in mg/L) since 1 Jan 2020

There were no Sigrist daily averages that exceeded 30 mg/L in West Kingfish between 1st January 2020 and 30th September 2020.

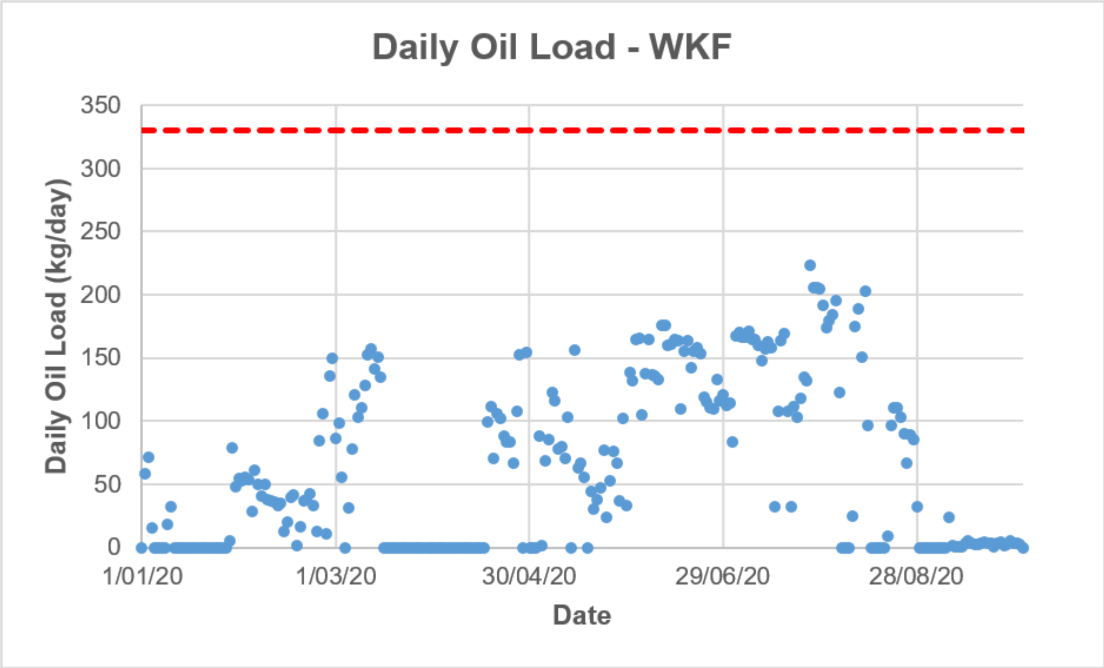


Figure F-14 Platform overboard oil load (in kg/d, mg/L oil concentration multiplied by volume discharged) since 1 Jan 2020

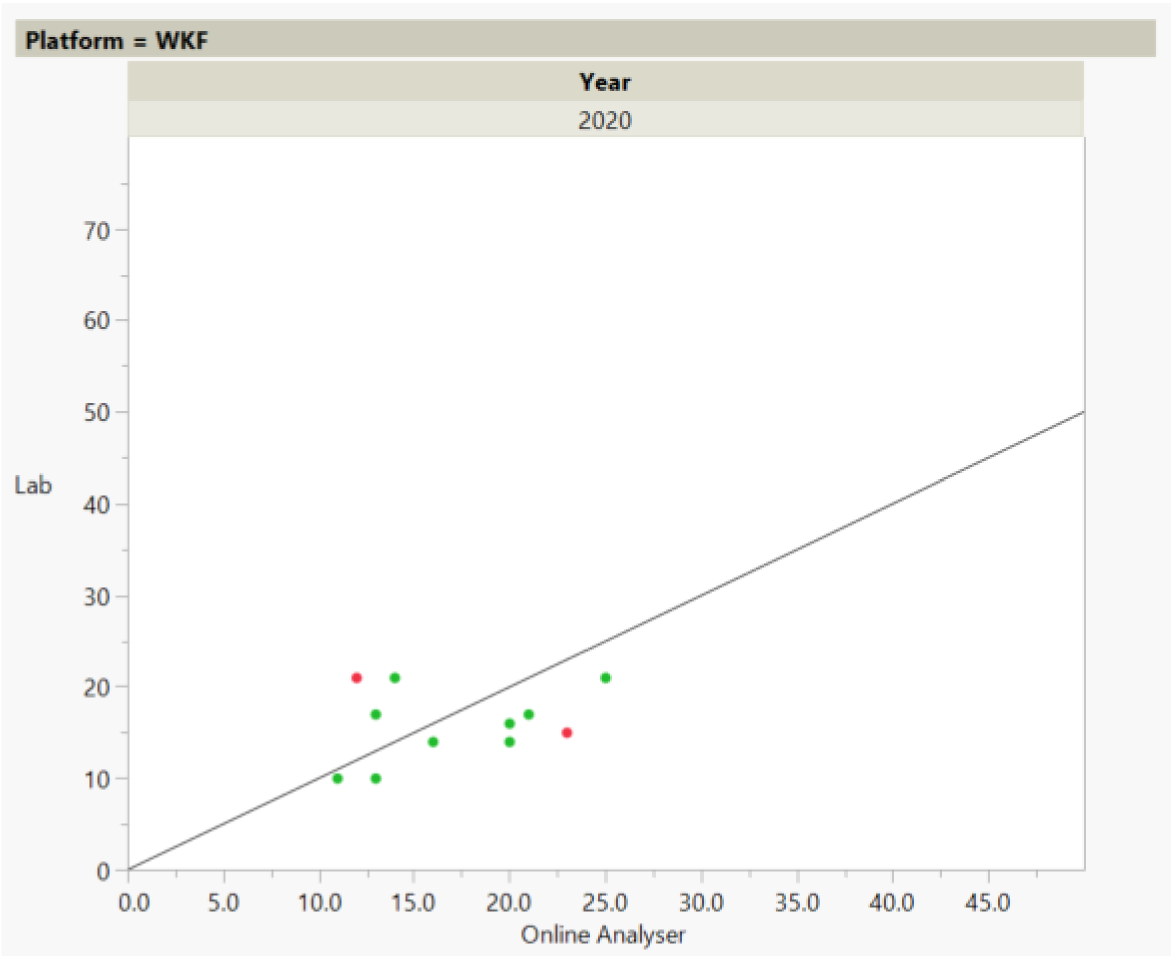
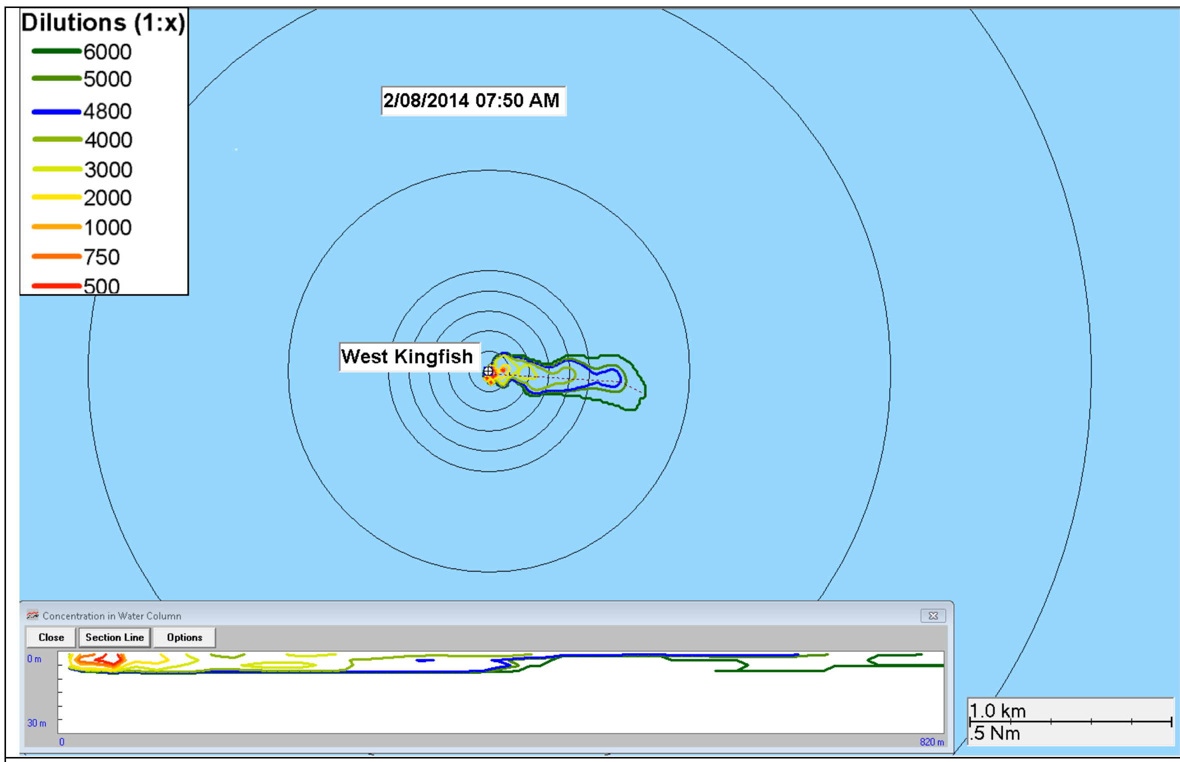


Figure F-15 Cross-check of platform online monitor readings with routine laboratory tests

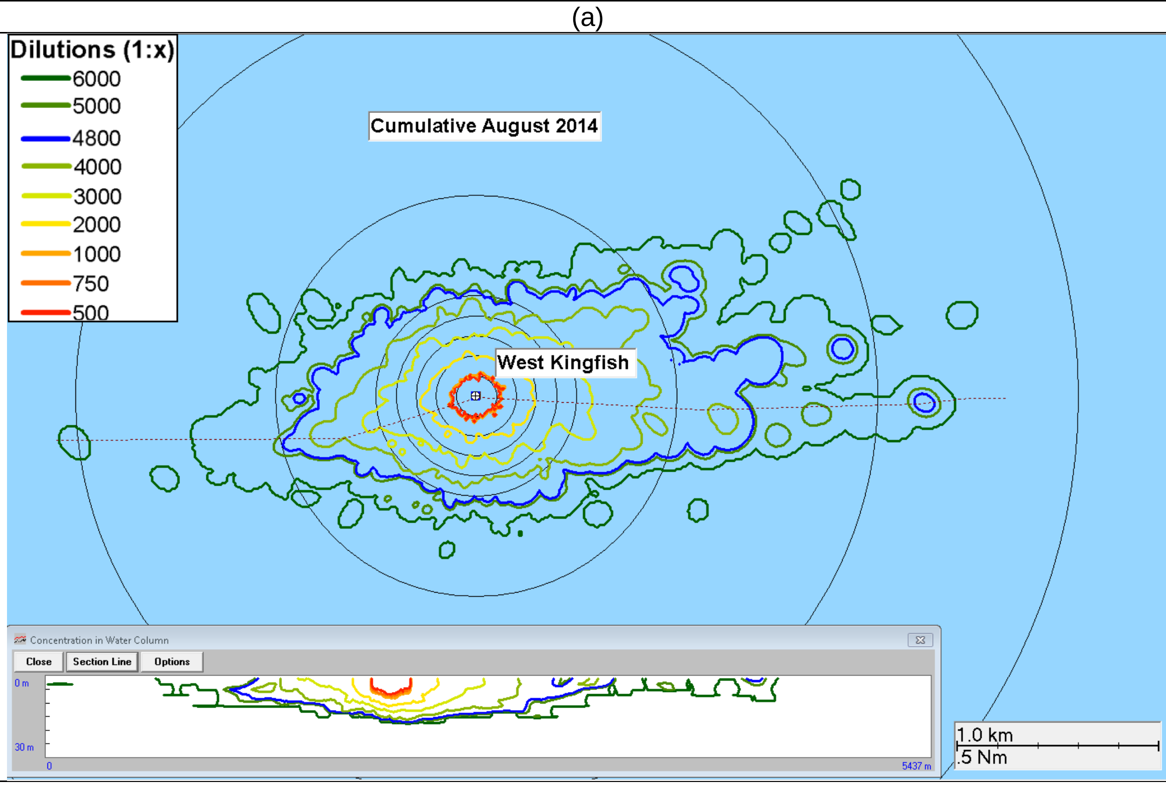
Table F-43 Dispersion model inputs – West Kingfish platform

Parameter	Value
Discharge rate (kL/day)	13,053
Discharge temperature (°C)	84
Discharge salinity (ppt)	38
Internal diameter of outlet (inch) [m]	9.84 [0.25]
Outlet orientation	vertically downward
Depth of outlet below MSL (m)	16
Total water depth at site (m)	76

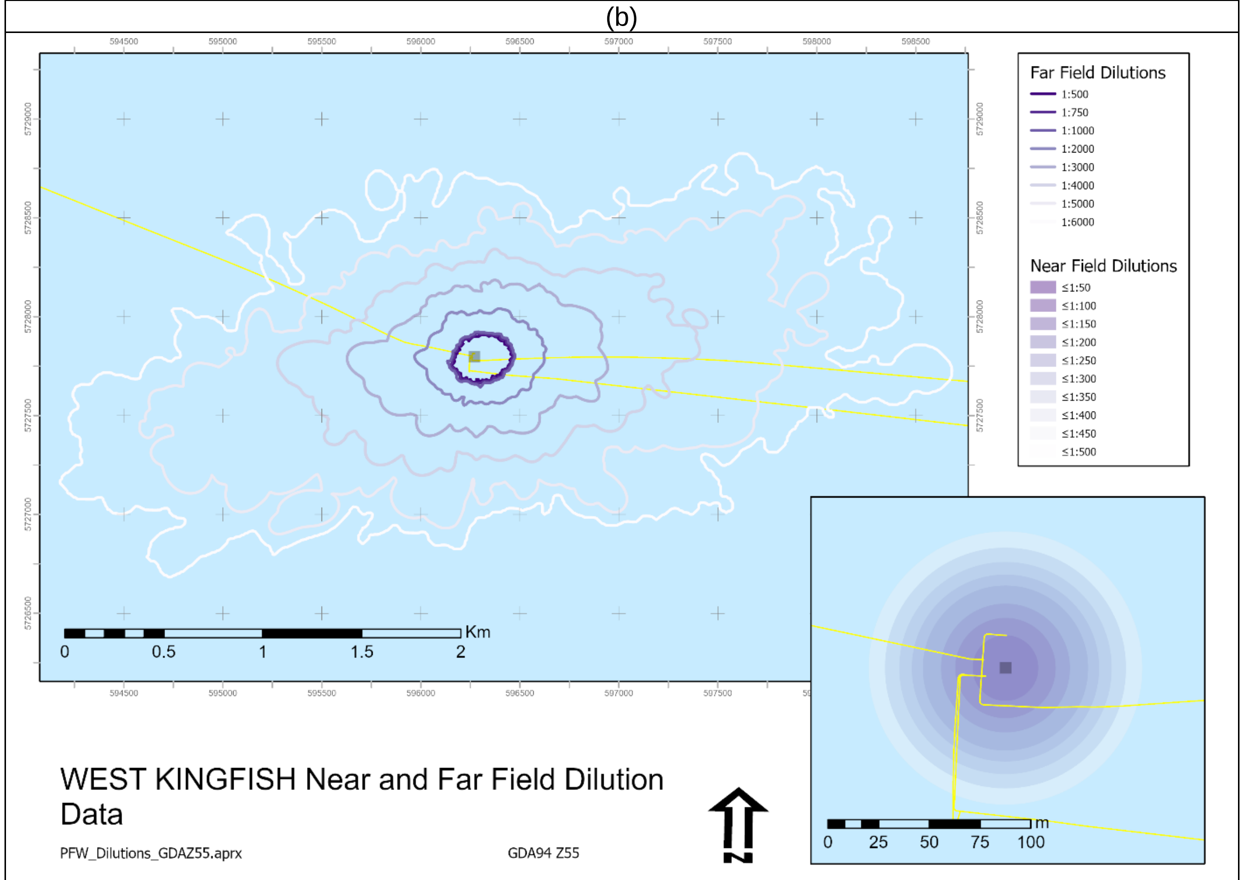
Figure F-16 shows the model outputs for the platform (dilution contours) with distance from the platform. The inset in Figure F-16(b) shows there is no physical interaction of the plume with the seabed and hence no direct exposure of the constituents of PFW with the sediment.



(a)



(b)



(c)

Figure F-16 **Dilution around the WKF platform and in the water column from PFW. (a) Snapshot of dilution of produced water plume around the platform, surface and cross-sectional view. (b) Summary of the dilution contours around the platform, conglomerated over one month (taking account of tide/current directions on any given day). (c) Yearly far-field dilution contours, inset are near-field contours.**

Table F-44 Dilution factors with distance from the WKF platform under typical currents. The distance to the highest required dilution factor to account for most and all potential PFW impacts to the marine environment is shown in italics.

Dilution factor	Distance from platform (m)
10	1.0
50	17
100	28
200	42
500	160
750	160
1000	180
2000	340
3000	680
4000	1140

Table F-45 Dispersion model outputs – water quality

Criteria	Dilution required (1:X)	Distance from platform
Meets physical parameters background levels	6	<1 m
Meets ANZECC 95% species protection water quality criteria	21	<17 m
Meets ANZECC 99% species protection water quality criteria	414	<160 m
Meets hydrogen sulphide background levels	224	<160 m
Meets TOC background levels	740	<160 m

Table F-46 Dispersion model outputs – fisheries

Criteria	Dilution required (1:X)	Distance from platform
Meets ANZECC seafood taint thresholds	14	<17 m

Table F-47 2014 results in percentage effluent of West Kingfish PFW for no effect concentration (NOEC), lowest effect concentration (LOEC), concentration with effects or inhibition of 10% species (E/IC10), and concentration with effects or inhibition of 50% species

Species	NOEC (% effluent)	LOEC (% effluent)	E/IC50 (% effluent)	E/IC10 (% effluent)
Heliocidaris tuberculata (sea urchin)	12.5	25	28.7	18.7
Mytilus galloprovincialis (Mediterranean mussel)	6.3	12.5	8.4	6.3
Nitzschia closterium (diatom algae)	12.5	25	30	15.8
Hormosira banksii (brown algae)	3.1	6.3	7.4	4.4
Allorchestes compressa (amphipod)	50	100	100	89.5
Lates calcarifer (barramundi)	50	100	73.5	76.6

Table F-48 2020 results in percentage effluent of West Kingfish PFW for no effect concentration (NOEC), lowest effect concentration (LOEC), concentration with effects or inhibition of 10% species (E/IC10), and concentration with effects or inhibition of 50% species

Test	NOEC (% effluent)	LOEC (% effluent)	E/IC50 (% effluent)	E/IC10 (% effluent)
72-hour microalgal growth (Tisochrysis lutea)	50	100	91.6	73.3
72-hour microalgal growth (Nitzschia closterium)	6.3	12.5	54.6	9.8
72-hour macroalgal germination success (Hormosira banksii)	25	50	54.7	31.4
1 hr sea urchin fertilisation success (Echinometra mathaei)	<3.1	3.1	10.9	4.17
72-hour sea urchin larval development (Heliocidaris tuberculata)	6.3	12.5	17.0	12.9
48-hour mollusc larval development (Mytilus edulis)	3.1	6.3	22.4	11.5
5-7 day copepod larval development (Gladioferens imparipes)	6.3	12.5	7.8	5.9
7-day fish larval development (Seriola lalandi)	<0.4	0.4	4.14	1.62

Table F-49 Species sensitivity distribution output species protection levels – WKF effluent

Species sensitivity distribution outputs	2014 WET test result (% effluent)	2020 WET test result (% effluent)
95% species protection level	3.2%	1.8%
Dilution to obtain 95% species protection	31	56
Maximum dilution to obtain 95% species protection	56	
99% species protection level	1.5%	0.82%
Dilution to obtain 99% species protection	67	122
Maximum dilution to obtain 99% species protection	122	

Table F-50 Dispersion model outputs – ecotoxicity

Criteria	Dilution required (1:X)	Distance from platform
Meets 95% species protection levels based on whole effluent toxicity	56	<28 m
Meets 99% species protection levels based on whole effluent toxicity	122	<42 m

Appendix F.5 Cobia Platform PFW Data

Table F-51 Cobia platform PFW physical and chemical composition data – 2014 to 2020

Parameter	Number records	2014	2020	2020	Mean	Std Error	Lower 95% confidence level	Upper 95% confidence level	Minimum detected (mg/l)	Maximum detected (mg/l)	Background levels	Dilution factor
Physical parameters												
Temperature (C)	3	85	87	84	85	5	75	96	84	87	14[a]	6
Conductivity (uS/cm)	3	64000	49000	51100	54700	3858	46968	62432	49000	64000	46500[b]	1
pH (units)	3	6.8	7.6	6.7	7.0	0.2	6.7	7.4	6.7	7.6	8.2[c]	1
Suspended solids	3	13	16	2	10	9	0	29	2	16	34[d]	0
Total dissolved solids	3	35000	34000	36000	35000	1692	31613	38387	34000	36000	N/A	N/A
Maximum dilution to reach background levels												**6**

a: Surface: 14-20°C, EP Volume 1
b: 35-36psu = 45,900uS/cm – 47,100uS/cm assuming 18°C, EP Volume 1
c: pH default trigger values given in ANZECC (2000) Table 3.3.2 Default trigger values for physical and chemical stressors for south-east Australia for slightly disturbed ecosystems (marine, offshore).
d: Non-detect to 34mg/L, from 19 reference site samples taken at BTW location prior to drilling.

Parameter	2014	2020	2020	% Detected	Number times detected	Mean	Std Error	Lower 95% confidence level	Upper 95% confidence level	Minimum detected (mg/l)	Maximum detected (mg/l)	ANZECC water quality criteria (95% species protection level), mg/L	ANZECC water quality criteria (99% species protection level), mg/L	Dilution factor to ANZECC water quality 95% criteria	Dilution factor to ANZECC water quality 99% criteria	ANZECC Seafood Taint threshold (mg/L)	Dilution factor to ANZECC Seafood taint threshold
Mono-aromatic hydrocarbons and derivatives																	
Benzene	1.1	0.48	0.67	100	3	0.75	0.66	0.00	2.07	0.48	1.10	0.7	0.5	2	2		
Toluene	2.6	0.74	1.2	100	3	1.51	1.12	0.00	3.76	0.74	2.60					0.25	10
Ethylbenzene	0.19	0.1	0.12	100	3	0.14	0.15	0.00	0.44	0.10	0.19					0.25	1
m&p-Xylenes	1.3	0.66	0.75	100	3	0.90	0.41	0.08	1.73	0.66	1.30						
o-Xylene	0.39	0.21	0.24	100	3	0.28	0.14	0.00	0.56	0.21	0.39						
1.2.4-Trimethylbenzene	0.14	0.087	0.11	100	3	0.11	0.05	0.01	0.21	0.09	0.14						
1.3.5-Trimethylbenzene	0.062	0.037	0.054	100	3	0.05	0.02	0.00	0.10	0.04	0.06						
Benzyl chloride	<0.005	<0.005		0	0	0	0	0	0	0	0						
Dibenzofuran	<0.005	0.007	<0.005	33	1	0.01	0.01	0.00	0.02	0.01	0.01						
Nitrobenzene		<0.05	<0.005	0	0	0	0	0	0	0	0						
1,2,4-trichlorobenzene	<0.005	<0.005	<0.001	0	0	0	0	0	0	0	0	0.08	0.02	Not detected	Not detected		
Poly-aromatic hydrocarbons and derivatives																	
Naphthalene	0.37	0.19	0.19	100	3	0.25	0.10	0.04	0.46	0.19	0.37	0.07	0.05	5	7	1	0
2-Methylnaphthalene	0.27	0.16	<0.002	67	2	0.22	0.10	0.02	0.41	0.16	0.27						
Fluorene	0.008	0.012	0.006	100	3	0.009	0.003	0.003	0.014	0.006	0.012						
Phenanthrene	0.006	0.012	0.009	100	3	0.009	0.003	0.003	0.015	0.006	0.012						
Acenapthene	<0.001	<0.001	<0.001	0	0	0	0	0	0	0	0					0.02	Not detected
Anthracene		<0.001	<0.002	0	0	0	0	0	0	0	0						
Pyrene	<0.001	<0.001	<0.002	0	0	0	0	0	0	0	0						
Flouranthene	<0.001	<0.001	<0.002	0	0	0	0	0	0	0	0						
Isopropyl Benzene		<0.01	0.01	50	1	0.01	0.00707	0	0.09985	0.01	0.01					0.25	0

Parameter	2014	2020	2020	% Detected	Number times detected	Mean	Std Error	Lower 95% confidence level	Upper 95% confidence level	Minimum detected (mg/l)	Maximum detected (mg/l)	ANZECC water quality criteria (95% species protection level), mg/L	ANZECC water quality criteria (99% species protection level), mg/L	Dilution factor to ANZECC water quality 95% criteria	Dilution factor to ANZECC water quality 99% criteria	ANZECC Seafood Taint threshold (mg/L)	Dilution factor to ANZECC Seafood taint threshold
Phenols																	
Phenol	0.53	0.21	0.79	100	2	0.66	0.40	0.00	1.45	0.53	0.79	0.4	0.27	2	3	1	1
m & p Cresol	0.48	0.24	0.39	100	3	0.37	0.26	0.00	0.88	0.24	0.48					0.2 [b]	2
m & p Cresol	0.48	0.24	0.39	100	3	0.37	0.26	0.00	0.88	0.24	0.48					0.1 [c]	5
o-Cresol	0.34	0.18	0.28	100	3	0.27	0.17	0.00	0.60	0.18	0.34					0.4	1
2,4-Dimethylphenol	0.12	0.049	<0.002	67	2	0.08	0.13	0.00	0.35	0.05	0.12					0.4	0
Pentachlorophenol	<0.01	<0.01	<0.01	0	0	0	0	0	0	0	0	0.022	0.011	Not detected	Not detected		
Total petroleum hydrocarbons																	
TRH C6-C9		3.2	3.8	100	2	3.5	5.4	0.0	14.4	3.2	3.8						
TRH C10-C14		3.3	2.7	100	2	3.0	8.2	0.0	19.6	2.7	3.3						
TRH C15 -C28		3.4	3.3	100	2	3.4	15.6	0.0	34.7	3.3	3.4						
TRH C29-C36		0.5	0.5	100	2	0.5	0.9	0.0	2.3	0.5	0.5						
1,1,2-trichloroethane	<0.02	<0.01	<0.001	0	0	0	0	0	0	0	0	1.9	0.14	Not detected	Not detected		
Oil, emulsifiable[1]											11					11	1
Inorganic constituents																	
Ammonia (as N)	9.6	11	14	100	3	11.5	2.7	6.2	16.9	9.6	14.0	0.91	0.5	15	28		
Phosphate	3.4	0.02	0.035	100	3	1.2	0.4	0.2	2.1	0.0	3.4						
Sulphide	12.0	<0.5	3.9	67	2	8.0	3.6	0.7	15.2	3.9	12.0						
Cyanide (total)	<0.002	<0.005	<0.004	0	0	0	0	0	0	0	0	0.004	0.002	Not detected	Not detected		
Nutrients																	
Total Nitrogen as N	9.8	11	14	100	3	12	154	0	321	10	14						
BOD	110	8.4	110	100	3	76	51	0	178	8	110						
Metals																	
Calcium	420	450	500	100	3	457	34	388	526	420	500						
Iron	0.5	0.49	0.51	100	3	0.5	0.8	0.0	2.1	0.5	0.5						
Manganese	1.6	1.5	1.7	100	3	1.60	0.10	1.40	1.80	1.50	1.70						
Arsenic	<0.001	<0.001	<0.0005	0	0	0	0	0	0	0	0						
Cadmium	<0.0002	< 0.0002	<0.0001	0	0	0	0	0	0	0	0	0.0055	0.0007	Not detected	Not detected		
Chromium	<0.0001	< 0.001	0.0006	33	1	0.001	0.147	0.000	0.378	0.001	0.001	0.0274 [b]	0.0077 [b]	0	0		
Chromium	<0.0001	< 0.001	0.0006	33	1	0.001	0.147	0.000	0.378	0.001	0.001	0.0044 [c]	0.00014 [c]	0	4		
Cobalt	<0.0001	< 0.001	0.00006	33	1	0.00006	0.000	0.000	0.000	0.00006	0.000	0.001	0.000005	0	12		
Copper	<0.0001	< 0.001	0.0003	33	1	0.0003	0.000	0.000	0.000	0.0003	0.000	0.0013	0.0003	0	1	1	0
Lead	<0.001	< 0.001	<0.0001	0	0	0	0	0	0	0	0	0.0044	0.0022	Not detected	Not detected		
Mercury	<0.0001	< 0.0001	<0.0001	0	0	0	0	0	0	0	0	0.0004	0.0001	Not detected	Not detected		
Nickel	<0.001	< 0.0001	0.0019	33	1	0.002	0.006	0.000	0.017	0.002	0.002	0.07	0.007	0	0		
Selenium	0.079	< 0.001	<0.001	33	1	0.079	0.009	0.055	0.103	0.079	0.079						
Silver	<0.0005	< 0.005	<0.0001	0	0	0	0	0	0	0	0	0.0014	0.0008	Not detected	Not detected		
Vanadium	<0.001	< 0.005	<0.0003	0	0	0	0	0	0	0	0	0.16	0.05	Not detected	Not detected		

Parameter	2014	2020	2020	% Detected	Number times detected	Mean	Std Error	Lower 95% confidence level	Upper 95% confidence level	Minimum detected (mg/l)	Maximum detected (mg/l)	ANZECC water quality criteria (95% species protection level), mg/L	ANZECC water quality criteria (99% species protection level), mg/L	Dilution factor to ANZECC water quality 95% criteria	Dilution factor to ANZECC water quality 99% criteria	ANZECC Seafood Taint threshold (mg/L)	Dilution factor to ANZECC Seafood taint threshold
Zinc	0.001	< 0.005	<0.001	33	1	0.001	0.026	0.000	0.059	0.001	0.001	0.015	0.007	0	0	5	0
Other chemicals																	
Total organic carbon (TOC)	67	170	73	100	3	103	68	0	239	67	170						
Surfactants (MBAS)	<0.5	0.3	2	67	2	1.15	0.46	0.11	2.19	0.30	2.00						
2-butanone (MEK)	<0.06	0.037		50	1	0.04	0.06	0.00	0.20	0.04	0.04						
2-propanone (acetone)	<0.02	0.057		50	1	0.06	0.19	0.00	0.48	0.06	0.06						
Bis-(2-ethylhexyl) phthalate	<0.005	< 0.005	<0.01	0	0	0	0	0	0	0	0						
Methylene chloride		<0.01	<0.005	0	0	0	0	0	0	0	0						
Acetophenone	<0.005	< 0.005	<0.005	0	0	0	0	0	0	0	0					0.5	Not detected
Methanol	<5	7.2	<1	33	1	7.2	57.033	0	165.55	7.2	7.2						
Glycol	<20	<20	15	33	1	15	.	.	.	15	15						
Maximum dilution to reach criteria														**15**	**28**		**10**

a = Total Chromium
b = Chromium III
c = Chromium VI
1: Taken to mean, TRH C6-C36
a = m&p Cresol
b: m-Cresol
c: p-Cresol

Table F-52 shows the levels of total sulphide in PFW, together with an approximate concentration of hydrogen sulphide based on conversions in ANZECC (2000). Per ANZECC, in general, studies reported show the observed effect concentrations of sulphide are consistent with the un-ionised H2S (hydrogen sulphide) form, not total sulphide.

Table F-52 Sulphide properties of CBA PFW relative to background levels, and dilution factor

Physical property	Maximum PFW characteristic	Percentage of hydrogen sulphide in total aqueous sulphide at 30C, pH 7.0-7.5 and 35% salinity#	Expected hydrogen sulphide concentration, mg/L	Background levels, mg/L*	Dilution factor
Sulphide	12.0	pH = 7.0: 22.4%	2.7	Minimum: <0.01	269
		pH = 7.5: 8.36%	1.0		100
		pH = 7.0: 22.4%	2.7	Average 0.015	179
		pH = 7.5: 8.36%	1.0		67
		pH = 7.0: 22.4%	2.7	Maximum: 0.03	90
		pH = 7.5: 8.36%	1.0		33
Maximum dilution to reach background levels					**269**

#From ANZECC, 2000, Table 8.3.10, p. 8.3-173
*Taken from 18 reference site samples taken away from Tuna platform location.

Table F-53 shows the TOC of produced water relative to background levels of TOC in sea water.

Table F-53 TOC properties of CBA PFW relative to background levels, and dilution factor

Physical property	Maximum PFW characteristic	Background levels*	Dilution factor
TOC	170	<1 to 2	170
Maximum dilution to reach background levels			**170**

*Taken from 18 reference site samples taken away from Tuna platform location.

Table F-54 Particle Size Distribution for CBA PFW

Wentworth Size Classifications	2020
Total Clay % (0-4 µm)	**43.50**
Very Fine Silt % (4-8 µm)	24.79
Fine Silt % (8-16 µm)	24.15
Medium Silt % (16-31 µm)	7.24
Course Silt % (31-63 µm)	0.32
Total Silt (4-63 µm)	**56.50**
Very Fine sand % (63-125 µm)	0.00
Fine sand % (125-250 µm)	0.00
Medium sand % (250-500 µm)	0.00
Coarse sand % (500-1000 µm)	0.00
Very Coarse sand % (1000-2000 µm)	0.00
Total Sand (63-2000 µm)	**0.00**
Total Gravels (>2000 µm)	**0.00**

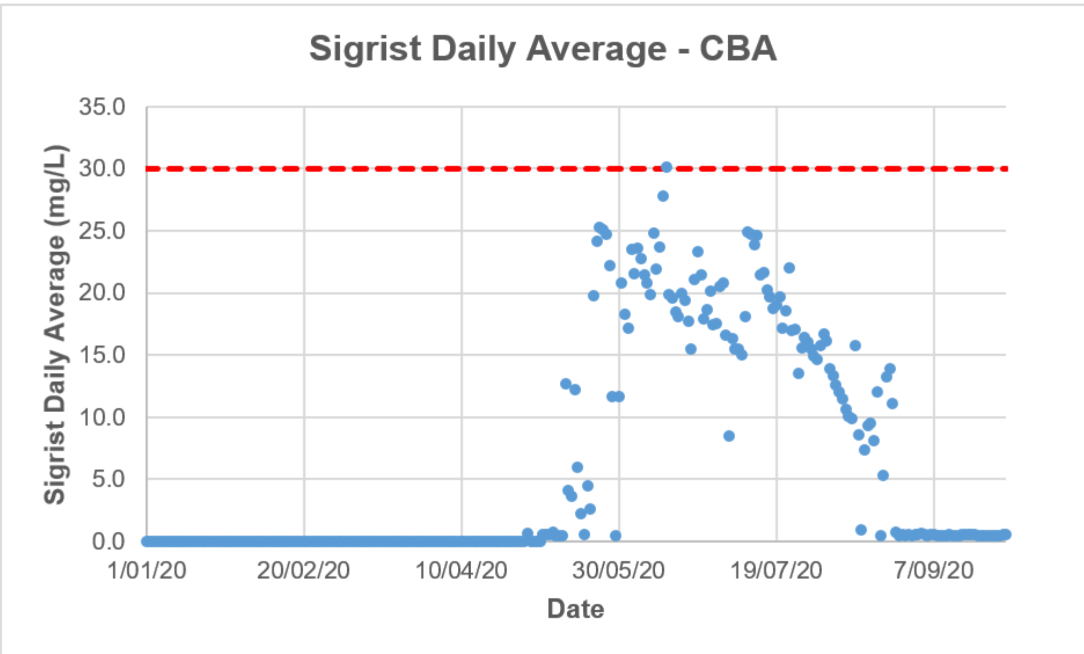


Figure F-17 Platform overboard discharge levels of oil in water (in mg/L) since 1 Jan 2020

A summary of Sigrist daily averages exceeding 30 mg/L on Cobia for the period of 1st January 2020 to 30th September 2020 is given below in Table F-55.

Table F-55 CBA Oil in water exceedances from January 2020 to September 2020

Date	Sigrist Daily Average (mg/L)	Total Oil Load (kg/day)	Comments
14/06/20	32.7	144.2	Exceedance suspected to have been caused by gas breakout due to a higher water flowrate. Reported to NOPSEMA in June monthly recordable incidents report.

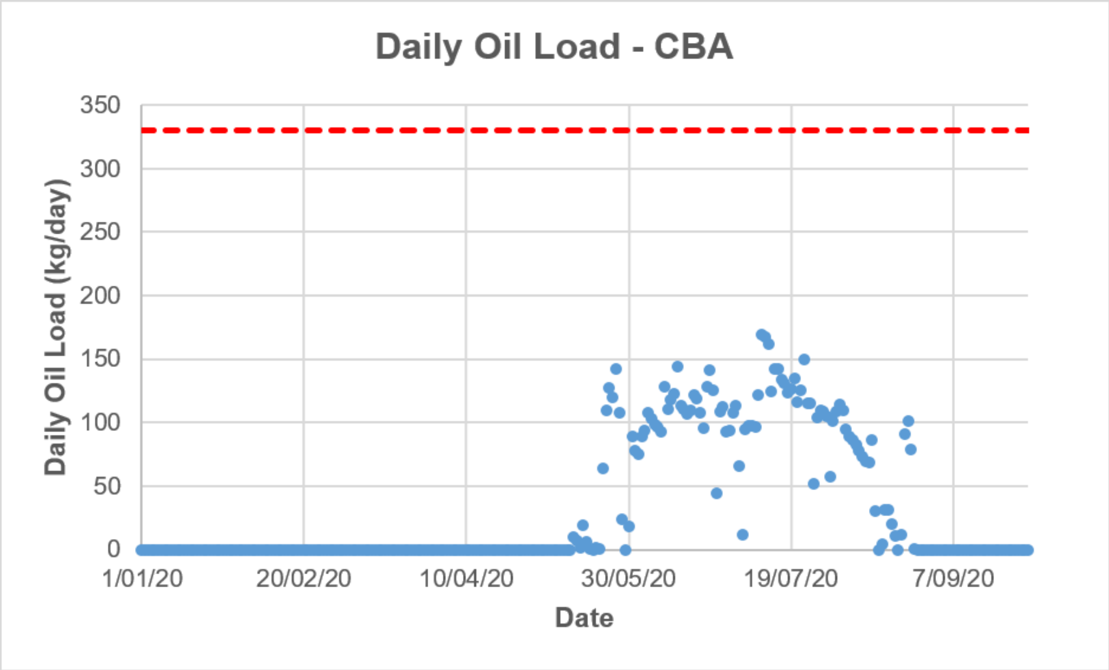


Figure F-18 Platform overboard oil load (in kg/d, mg/L oil concentration multiplied by volume discharged) since 1 Jan 2020

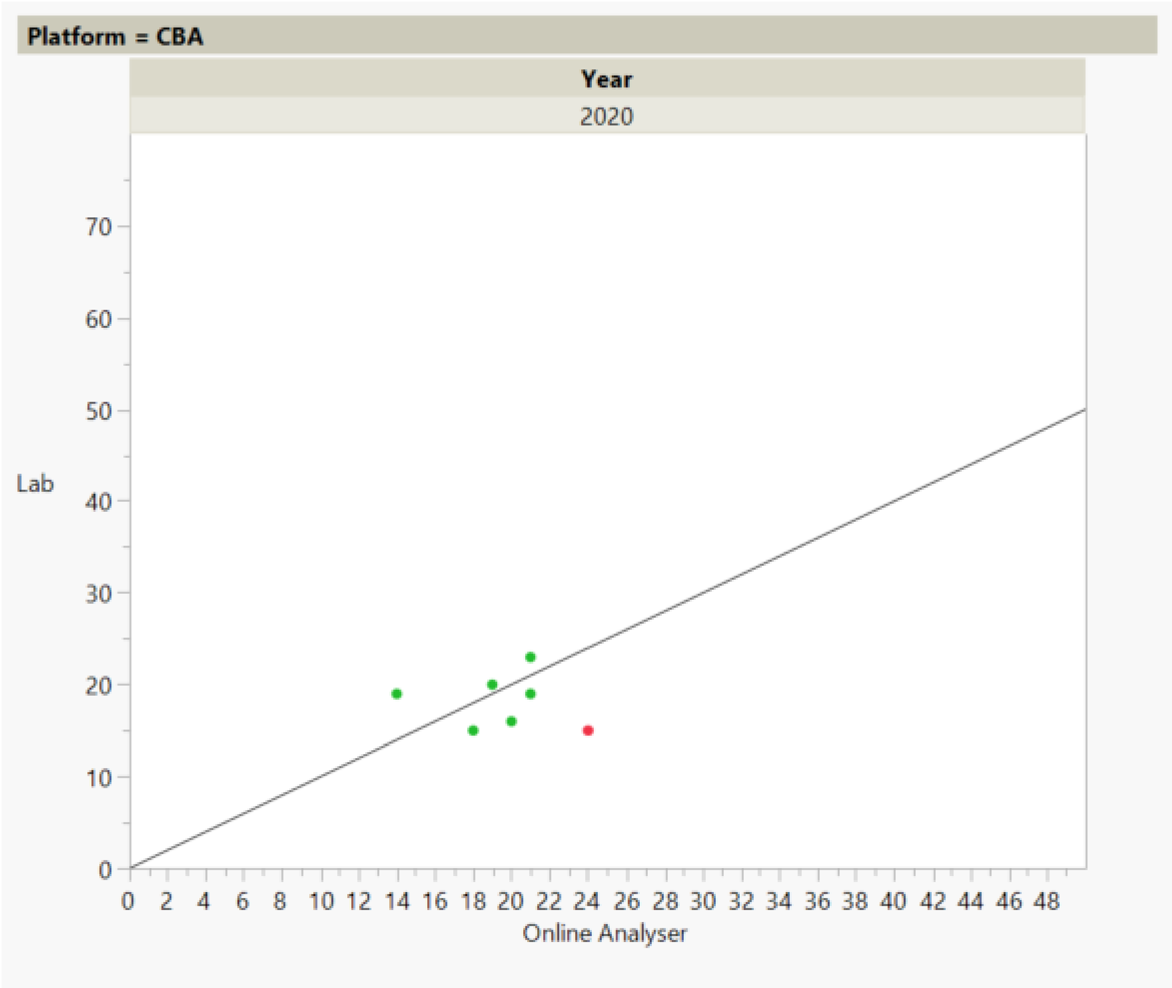


Figure F-19 Cross-check of platform online monitor readings with routine laboratory tests

Table F-56 Dispersion model inputs – Cobia platform

Parameter	Value
Discharge rate (kL/day)	15,009
Discharge temperature (°C)	53
Discharge salinity (ppt)	37
Internal diameter of outlet (inch) [m]	9.84 [0.25]
Outlet orientation	vertically downward
Depth of outlet below MSL (m)	27.7
Total water depth at site (m)	78

Figure F-24 show the model outputs for the platform (dilution contours) with distance from the platform. The inset in Figure F-24 (b) shows there is no physical interaction of the plume with the seabed and hence no direct exposure of the constituents of PFW with the sediment.

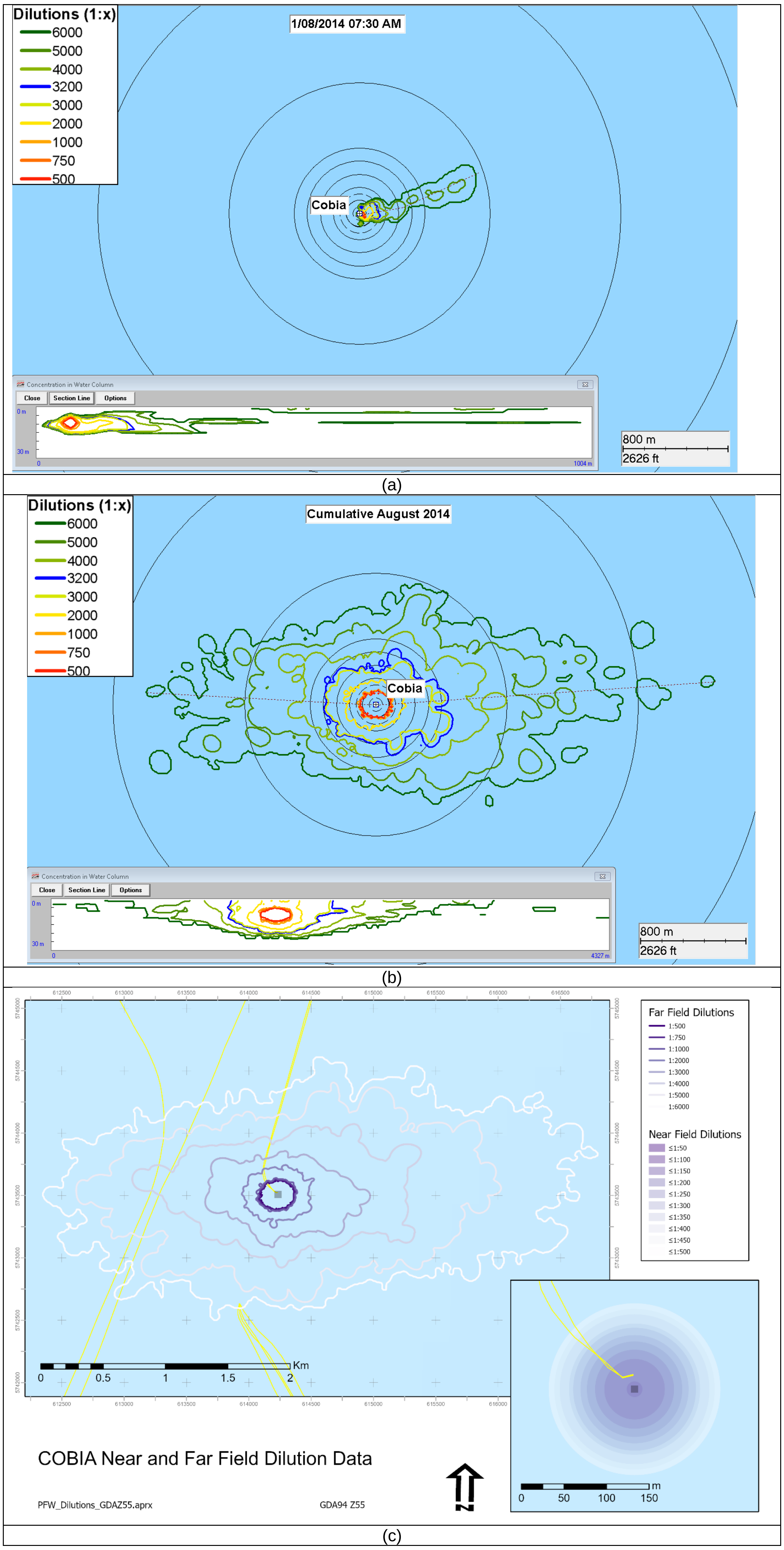


Figure F-20 **Dilution around the CBA platform and in the water column from PFW. (a) Snapshot of dilution of produced water plume around the platform, surface and cross-sectional view. (b) Summary of the dilution contours around the platform, conglomerated over one month (taking account of tide/current directions on any given day). (c) Yearly far-field dilution contours, inset are near-field contours.**

Table F-57 Dilution factors with distance from the CBA platform under typical currents.

Dilution factor	Distance from platform (m)
10	0.9
50	10
100	38
200	60
500	160
750	160
1000	180
2000	310
3000	740
4000	1200

Table F-58 Dispersion model outputs – water quality

Criteria	Dilution required (1:X)	Distance from platform
Meets physical parameters background levels	6	<0.9 m
Meets ANZECC 95% species protection water quality criteria	15	<10 m
Meets ANZECC 99% species protection water quality criteria	28	<10 m
Meets hydrogen sulphide background levels	269	<160 m
Meets TOC background levels	170	<60 m

Table F-59 Dispersion model outputs – fisheries

Criteria	Dilution required (1:X)	Distance from platform
Meets ANZECC seafood taint thresholds	10	0.9 m

Table F-60 2014 results in percentage effluent of Cobia PFW for no effect concentration (NOEC), lowest effect concentration (LOEC), concentration with effects or inhibition of 10% species (E/IC10), and concentration with effects or inhibition of 50% species (E/IC50)

Species	NOEC (% effluent)	LOEC (% effluent)	E/IC50 (% effluent)	E/IC10 (% effluent)
Heliocidaris tuberculata (sea urchin)	3.1	6.3	15.4	11.6
Mytilus galloprovincialis (Mediterranean mussel)	12.5	25	24.1	13
Nitzschia closterium (diatom algae)	12.5	25	18.2	N/A
Hormosira banksii (brown algae)	6.3	12.5	15.2	6.7
Allorchestes compressa (amphipod)	25	50	34.6	N/A
Lates calcarifer (barramundi)	50	100	55	50

Table F-61 2020 results in percentage effluent of Cobia PFW for no effect concentration (NOEC), lowest effect concentration (LOEC), concentration with effects or inhibition of 10% species (E/IC10), and concentration with effects or inhibition of 50% species (E/IC50)

Test	NOEC (% effluent)	LOEC (% effluent)	E/IC50 (% effluent)	E/IC10 (% effluent)
72-hour microalgal growth (Tisochrysis lutea)	50	100	65.7	59.4
72-hour microalgal growth (Nitzschia closterium)	25	50	36.3	23.4
72-hour macroalgal germination success (Hormosira banksii)	25	50	63.3	37.2
1 hr sea urchin fertilisation success (Echinometra mathaei)	<0.8	0.8	15.0	7.45
72-hour sea urchin larval development (Heliocidaris tuberculata)	12.5	25	20.9	15.7
48-hour mollusc larval development (Mytilus edulis)	<0.8	0.8	7.7	1.2
5-7 day copepod larval development (Gladioferens imparipes)	0.8	1.6	3.16	1.18
7-day fish larval development (Seriola lalandi)	1.6	3.1	2.7	1.8

Table F-62 Species sensitivity distribution output species protection levels – CBA effluent

Species sensitivity distribution outputs	2014 WET test result (% effluent)	2020 WET test result (% effluent)
95% species protection level	3.4%	0.88%
Dilution to obtain 95% species protection	29	114
Maximum dilution to obtain 95% species protection	114	
99% species protection level	1.7%	0.5%
Dilution to obtain 99% species protection	59	200
Maximum dilution to obtain 99% species protection	200	

Table F-63 Dispersion model outputs – ecotoxicity

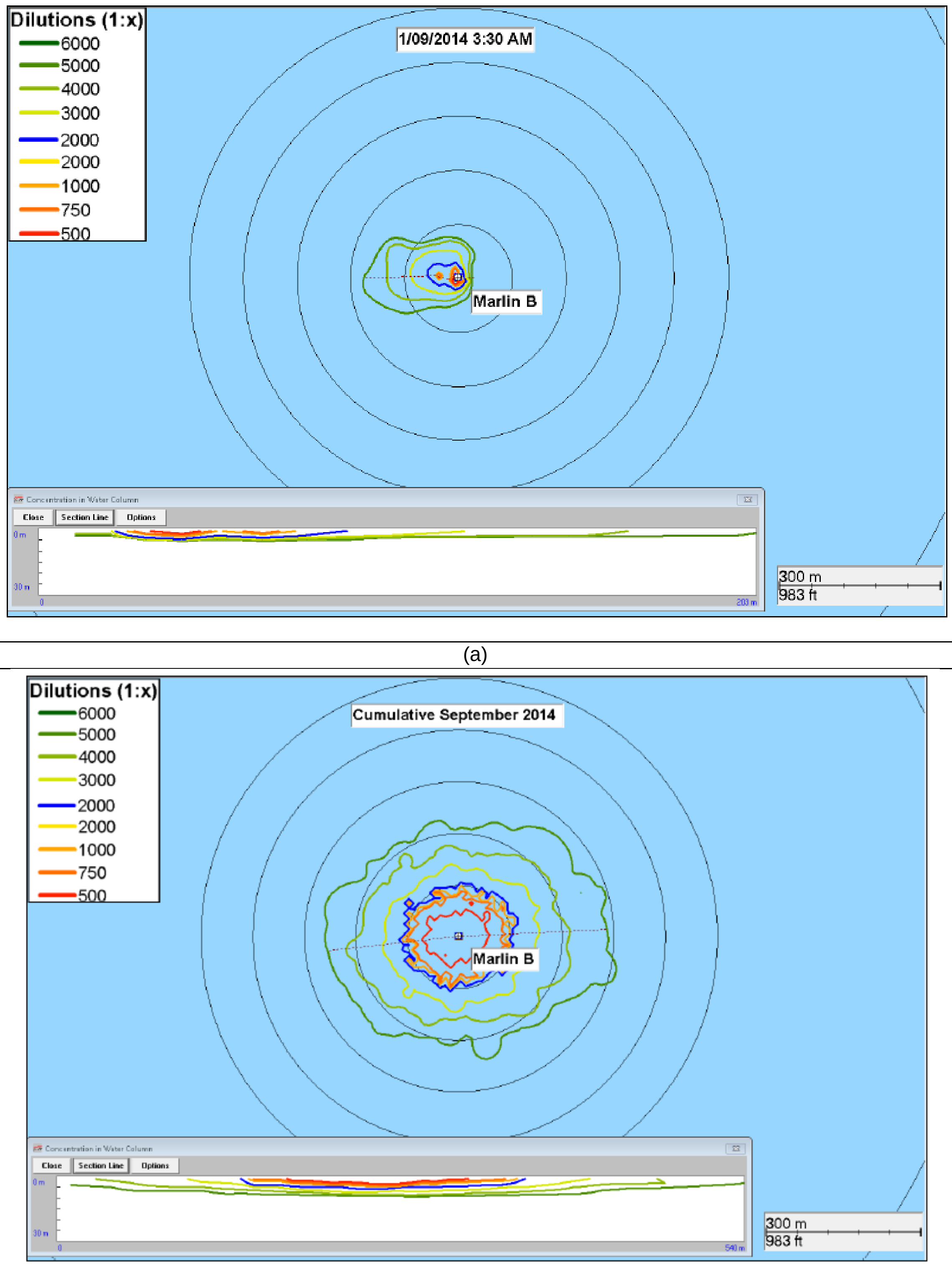
Criteria	Dilution required (1:X)	Distance from platform
Meets 95% species protection levels based on whole effluent toxicity	114	<60 m
Meets 99% species protection levels based on whole effluent toxicity	200	60 m

Appendix F.6 Marlin B Platform PFW Data

As Tuna is an analog for chemical composition, the Tuna platform dilution ratios hold. Together with the MLB-specific dispersion model outputs:

Table F-64 Dispersion model inputs – Marlin B platform

Parameter	Value
Discharge rate (kL/day)	4,800
Discharge temperature (°C)	80
Discharge salinity (ppt)	34
Internal diameter of outlet (inch) [m]	9.84 [0.25]
Outlet orientation	vertically downward
Depth of outlet below MSL (m)	11
Total water depth at site (m)	59



(a)

(b)

Figure F-21 Dilution around the MLB platform from PFW. (a) Snapshot of dilution of produced water plume around the platform, surface and cross-sectional view. (b) Summary of the dilution contours around the platform, conglomerated over one month (taking account of tide/current directions on any given day).

Table F-65 Dilution factors with distance from the MLB platform under typical currents.

Dilution factor	Distance from platform (m)
10	2.4
50	7.8
100	12
200	20
500	90
750	120
1000	140
2000	150
3000	180
4000	260

Table F-66 Dispersion model outputs – water quality

Criteria	Dilution required (1:X)	Distance from platform
Meets physical parameters background levels	6	<2.4 m
Meets ANZECC 95% species protection water quality criteria	51	<12 m
Meets ANZECC 99% species protection water quality criteria	91	<12 m
Meets hydrogen sulphide background levels	56	< 12 m
Meets TOC background levels	370	< 90 m

Table F-67 Dispersion model outputs – fisheries

Criteria	Dilution required (1:X)	Distance from platform
Meets ANZECC seafood taint thresholds	40	<7.8 m

As Tuna is an analogue for ecotoxicity, the Tuna platform dilution ratios hold. Together with the MLB-specific dispersion model outputs:

Table F-68 Dispersion model outputs – ecotoxicity

Criteria	Dilution required (1:X)	Distance from platform
Meets 95% species protection levels based on whole effluent toxicity	227	<90 m
Meets 99% species protection levels based on whole effluent toxicity	952	<140 m

Appendix F.7 Daily Oil Load Determination

Table F-69 Daily oil load allowances by platform

	OIW discharge limit (mg/L)	Max predicted discharge volume (kL/d)	Daily oil load (kg/d)	Actionable range* (k/g)
CBA	30	12000	360	300 – 360
HLA	30	10000	300	250 – 300
SNA	30	2000	60	50 – 60
TNA	30	3000	90	75 – 90
WKF	30	10000	300	250 – 300
MLB	30	2450	73.5	60 – 73.5

*(not inclusive)

Appendix G –PFW Breakout Boxes

Contents

4.1 Appendix G.1: Breakout Box 1 - Chemical Compounds Not Found in PFW Across Bass Strait

The following were not detected in any produced waters from platforms in Bass Strait (non-exhaustive):

- 2-nitrophenol,
- 2,4-dinitrophenol,
- 2-chlorophenol,
- 4-chloro-3-methylphenol,
- 2,4-dichlorophenol,
- 2,6-dichlorophenol,
- 2,4,6-trichlorophenol,
- 2,4,5-trichlorophenol,
- 2,3,4,6-tetrachlorophenol,
- pentachlorophenol,
- chlorobenzene,
- 1,2,-dichlorobenzene,
- 1-2-4 trichlorobenzene,
- 1-1-2 trichloroethane
- acenaphthylene

4.2 Appendix G.2: Breakout Box 2 - Background/Reference Data - Water

Three surveys of chemical analyses in marine water were taken at background, or reference sites during in-sea field surveys:

- Reference sites to Tuna platform
- Reference sites to West Kingfish platform
- Analysis of the West Barracouta site prior to drilling

In only one case did the background/reference ambient water quality for a chemical exceed any ANZECC water quality guideline trigger value. This was for the analyte lead, across one out of eight samples taken at Reference Site 1 and one out of eight samples taken at Reference Site 2. Lead values at these sample locations returned 3.4 μg/L and 57.3 μg/L respectively, over the ANZECC water quality 99% / 95% species protection criteria of 2.2 μg/L and 4.4 μg/L respectively. 11 samples returned non-detect (<2 μg/L) with the balance of samples (3 samples) returning between 0.3-0.8 μg/L. All other metals, hydrocarbons, phenols, nutrients etc. levels returned values below ANZECC water quality criteria.

4.3 Appendix G.3: Breakout Box 3 - Sampling of Phenols

The following phenols were not sampled however appear on the list of taint threshold values and could apply to chemicals in PFW, however, several of the more common morphs of the chemicals below were below detection thresholds and hence the less common morph is likely to also be below detection levels (e.g. 2,4-dinitrophenol was non-detect, hence 2,3-dinitrophenol as the lesser common morph is very likely also non-detect):

- 2,3-dinitrophenol,
- 2,4,6-trinitrophenol,
- 2,5-dichlorophenol,
- 3.4-dichlorophenol,
- 2-methyl-4-chlorophenol,
- 2-methyl-6-chlorophenol,
- o-phenylphenol,
- 2,3,5-trichlorophenol.

4.4 Appendix G.4: Breakout Box 4 - Whole Effluent Ecotoxicity Testing

The tests in the following table were run as part of the 2014 whole effluent ecotoxicity testing to evaluate produced water acute and chronic toxicity.

Table G-1 2014 whole effluent toxicity tests

Species	Acute / chronic test	Duration	Temperature (°C)	Test performed
Hormosira banksii (brown algae)	Chronic	72 h	18 ± 1	Macroalgal germination success
Heliocidaris tuberculata (sea urchin)	Chronic	72 h	20 ± 1	Sea urchin larval development test
Mytilus galloprovincialis (Mediterranean mussel)	Chronic	72 h	20 ± 1	Larval development test
Nitzschia closterium (diatom algae)	Chronic	72 h	20 ± 1	Marine algal growth
Allorchestes compressa (amphipod)	Acute	96 h	20 ± 1	Acute toxicity test
Lates calcarifer (barramundi)	Chronic	7 d	25 ± 1	Fish imbalance and biomass toxicity test

The tests in the following table were run as part of the 2020 whole effluent ecotoxicity testing to evaluate produced water acute and chronic toxicity.

Table G-2 2020 whole effluent toxicity tests

Species	Acute / chronic test	Duration	Temperature (°C)	Test performed
Vibrio fischeri	Acute	15 min	15	Microtox Bioassay
Tisochrysis lutea, previously called *Isochrysis galbana* (temperate strain)	Chronic	72-hour	22	Microalgal growth rate inhibition
Nitzschia closterium (temperate strain)	Chronic	72-hour	22	Microalgal growth rate inhibition
Hormosira banksii (temperate)	Chronic	72-hour	18	Macroalgal zoospore germination
Gladioferens imparipes (temperate)	Chronic	5-7-day	22	Copepod early life stage development test
Heliocidaris tuberculata (temperate)	Chronic	72-hour	20	Sea urchin larval development
Echinometra mathaei (tropical/sub-tropical)	Chronic	1-hour	25	Sea urchin fertilisation test
Mytilus edulis (temperate)	Chronic	48-hour	22	Mollusc larval development test
Seriola lalandi (tropical and temperate waters).	Chronic	7-day	22	Fish larval development

It should be noted that the most sensitive tests undertaken in 2020 for all facilities were the 7-day fish larval development (*Seriola lalandi*), the 5-7 day copepod larval development (*Gladioferens imparipes*) and the 1 hour sea urchin fertilisation (*Echinometra mathaei*). These tests were not undertaken in 2014. When comparing the tests that were undertaken in both 2014 and 2020 with exactly the same species, the majority of tests showed less toxicity in 2020 compared to 2014 (see Appendix F – PFW data file) suggesting that any observed increase in toxicity is related to the selection of tests rather than a change in toxicity of the PFW discharge streams.

Burrlioz was used to create the Species Sensitivity Distributions (SSD) with the 2020 data, however where the fit was poor ssdtools was used as an alternative. The program used for each platform was as follows:

- TNA: ssdtools
- HLA: Burrlioz
- SNA: ssdtools
- WKF: Burrlioz
- CBA: Burrlioz

4.5 Appendix G.6: Breakout Box 6 - Dispersion Model Setup and Calibration

Break Out Box 6

Setup of the model included the following components:

(1) Generate oceanographic data for the region that includes the combined influence of 3-dimensional ocean and high resolution tidal currents;

(2) Assess near-field mixing for the formation water discharge characteristics under representative annual conditions using low, moderate (typical) and high static current conditions;

(3) Establish and run a far-field passive tracer model simulating the likely mixing and dispersion of the plume under the influence of representative annual conditions;

(4) Estimate the dilution contours from the formation water discharge away from the discharge stream;

(5) Evaluate the potential for overlapping plume contours from nearby facilities.

MODELLED TIDAL CURRENTS

To accurately describe the variability in currents between the inshore and offshore region, a hybrid regional dataset was developed by combining ocean current predictions obtained from HYCOM with tidal currents developed by RPS APASA. The following sections provide a summary of the tidal currents and hybrid regional dataset and detailed hydrodynamic comparison of the modelled dataset and measured current speeds and surface elevation.

The effects of tides in the region were generated using ASA's advanced ocean/coastal model, HYDROMAP. HYDROMAP predicts the tides across the model domain due to the influence of astronomical forces, bottom friction and winds. The model employs a sophisticated nested-gridding strategy, supporting up to six levels of spatial resolution. This allows for higher resolution of tidal currents within areas of greater bathymetric coastline complexity, or a particular area of interest for a study. The methodology follows that of Davies (1977a; 1977b) with further developments for model efficiency by Owen (1980) and Gordon (1982). A detailed presentation of the model can be found in Isaji & Spaulding (1984). The HYDROMAP model has been thoroughly tested and verified using field measurements throughout the world over the past 30 years (e.g. Isaji & Spaulding 1984; Isaji et al. 2001; Zigic et al. 2003). HYDROMAP tidal current data has been used as input to forecast and hindcast oil spills in Australian waters and forms part of the Australian National Oil Spill Emergency Response System operated by AMSA (Australian Maritime Safety Authority).

Tidal amplitudes and phase data used along the open boundaries of the model grid were extracted from the Topex/Poseidon global tidal database (TPX07.2 [see Fu, Del Genio & Russow 1994; NASA 2013a; NASA 2013b]). This database is derived from long-term satellite measurements. Using the tidal data, surface heights were firstly calculated along the open boundaries, at each time step in the model, using the eight largest and most significant tidal constituents for the area (M_2, S_2, K_1, O_1, N_2, P_1, K_2, and Q_1). The model then circulated the water mass over the entire grid and calculated the sea heights and resulting tidal currents at each cell. The Topex/Poseidon tidal data has been widely used by the scientific community (e.g. Ludicone et al. 1998; Matsumoto, Takanezawa & Ooe 2000; Kostianoy et al. 2003; Yaremchuk & Tangdong 2004).

To ensure that tidal predictions were accurate in the study area and throughout the model domain, modelled surface elevations were compared against measured surface elevations at Kingfish B tide station.

Surface elevations measurements were measured at the Kingfish B platform, at 6 minute intervals, over a period of 109 days between 14 March and 31 July 2002. Figure 7 illustrates the locations of the measured tide station at Kingfish B and observed tide stations defined throughout the model domain.

The tidal model was run for 30 days (April 2002) to ensure that the phase and amplitudes of the modelled surface elevations were accurately replicated throughout the spring and neap tidal cycles. Figure 8 presents the comparison plot between the tidal model and measured surface elevation at Kingfish B during April 2002. The graph highlights the model's ability to accurately reproduce the tidal oscillations in the study area. Overall, the model predicted tidal range was over estimated by less than 15 cm over a maximum tidal range of 1.72 m.

Data describing the flow of ocean currents was obtained from HYCOM (Hybrid Coordinate Ocean Model, 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

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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.

Overall, the combined Ocean and tidal currents in the vicinity of the facilities were found quasi-consistent over the years from 2010 to 2014 (inclusive). Based on the strength and directionality similarities over the period from 2010 to 2014, the latest year of HYCOM currents available was selected for the modelling.

Current meter data was provided to assess the model's ability to accurately replicate the combined current speeds and directions within the study area. Current measurements in the surface layer (8m BMSL) were sampled at Barracouta, Kingfish B and Tuna A at 1 minute interval over periods of up to 4.5-5 months between March and July 2002. Additionally at the Barracouta platform, near seabed currents (40m BMSL) were also sampled at intervals of 20 minutes over a period of approximately 10 months from 25 September 2001 to 28 July 2002.

The combined modelled surface and seabed currents used in the comparison are a combination of the modelled depth-averaged tidal currents and HYCOM ocean currents at the 8-10m and 35-40m depth layer, respectively. Note that tides and ocean current data were combined to create an hourly output.

The time series plots demonstrated that in the surface layer the combined modelled current speeds and directions were in good agreement with the measured data at all three sites. The variability of ocean current speeds throughout the whole period was captured by the model. During the June and July period an excellent correlation between the directionality of the measured and modelled datasets was observed, at all three sites. Very good agreement was also observed between measured and modelled datasets near seabed currents at Barracouta. Measured current data demonstrated slightly stronger currents near the seabed than in the surface layer.

Overall, the strength of the currents was well represented by the model, meaning that the discharge plume would travel similar maximum distances using measured and modelled currents. The directionality of the modelled currents was also well represented. Therefore, over the entire period of the measured data, similar results should be expected for the predicted mixing zones using either measured or modelled currents. However, it should be noted that using point source currents will underestimate the potential for plume divergence as opposed to spatially varying currents as used in this study.

Three-dimensional salinity and temperature profiles were extracted from the World Ocean Atlas 2013 database.

NEAR FIELD MODEL

The near-field mixing of the discharged formation water was predicted using the fully three-dimensional flow model, Updated Merge (UM3) model. The model, UM3, is used for simulating single and multi-port submerged discharges and is part of the Visual Plumes suite of models maintained by the US Environmental Protection Agency (Frick et al., 2000).

The UM3 model was selected since it has been extensively tested for various discharges and found to predict the observed dilutions more accurately than other near-field models (e.g. RSB or CORMIX). In this model, the equations for conservation of mass, momentum, and energy are solved at each time step, giving the dilution along the plume trajectory. To determine the growth of each element, UM3 uses the shear (or Taylor) entrainment hypothesis and the projected-area-entrainment hypothesis. The flows begin as round buoyant jets issuing from a pipe or diffuser and can merge to a plane buoyant jet (Carvalho et al., 2002). Model output consists of plume characteristics, including centreline dilution, rise-rate, width, centreline height and diameter of the plume. Dilution is reported as the "effective dilution", which is the ratio of the initial concentration to the concentration of the plume at a given point, following Baumgartner et al. (1994).

The following parameters were used to set up the near-field models:

- The relative temperatures and salinities of the produced water plume and receiving waters;
- The produced water rate of discharge;
- The diameter and orientation of the discharge pipe;
- The depth of the discharge point relative to mean sea level;
- 3-dimensional static currents to represent local physical forcing; and

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- Ambient salinity and temperature profile.

FAR-FIELD MODEL

To quantify the likely far-field mixing and dispersion of the produced water, detailed modelling was carried out using an advanced three-dimensional plume model, MUDMAP. MUDMAP simulates produced water discharge as a conservative tracer (no reaction or decay applied) into a time-varying three-dimensional current field with the initial dilution set by the near-field modelling. The objective of the far-field modelling is to predict the extent to the mixing zones under representative annual conditions.

The far-field modelling takes into account the time-varying nature of currents as well as the potential for recirculation of the plume back to the release location for second dosing with fresh produced water. In the latter case, near-field concentrations can be occasionally increased due to the discharge plume mixing with the remnant plume from an earlier time; hence far-field modelling identifies the potential for far field accumulation under transient low mixing conditions that might occur at times in waters surrounding the release site.

MUDMAP is an industry standard computerised modelling system, which has been applied throughout the world to predict the dispersion of sediment (cuttings and muds) and liquid (produced water) discharges since 1994 (Spaulding, 1994). The model is a development of the Offshore Operators Committee (OOC) model and like the OOC model calculates the fates of discharges through three known distinct integrated stages which are the Convective decent/jet stage, dynamic collapse stage and dispersion stage (Koh and Chang, 1973; Khondaker, 2000; Brandsma and Sauer, 1983a, 1983b).

The version of the MUDMAP model applied to this study utilised only the final dispersive phase, as the initial two phases were simulated using the UM3 near-field model.

The produced water released is represented by placing a fixed number of "particles" at the release site on each model time-step. The particles represent a cloud of mass with a radius that grows in size over time, and these particles are moved on each subsequent time-step according to the horizontal and vertical components from the hydrodynamic model. The plume spread is dependent on the horizontal and vertical mixing coefficients.

The MUDMAP system is based on a conservative tracer (no reaction or decay) to examine the mixing and dilution of effluent plumes. The concentration distribution of the constituent in water is estimated using a 3-dimensional counting grid. The proportion of mass from each particle's cloud in a grid cell contributes to the total concentration in that grid cell.

The system has been extensively validated and applied for produced water discharge operations in the Northwest Shelf (e.g. Burns et. al., 1999; King and McAllister, 1997) and specifically in the Gippsland Basin for Esso's Kingfish B platform (King and McAllister, 1998).

ESTABLISHING DILUTION CONTOURS

The results of the UM3 model were analysed to provide predictions of the initial plume parameters for input into the far-field model MUDMAP, and to also provide estimates of the change in temperature and dilution of the plume.

Across all discharging platforms, the results showed that the plume would initially jet downwards before rising upward due to the lower density of the discharge plume compared to ambient receiving waters. In addition to rising vertically, the plume was also observed to travel laterally through the water column, and the speed of lateral travel was dependant on the current speed. Following the discharge, the near-field plume either reached the surface (typically under lower current conditions) or reached the end of the near-field mixing phase once their densities became equal to ambient conditions.

The maximum horizontal distance, and dilution (average and minimum (plume centre line)) upon reaching the end of near-field mixing phase, for each current speed conditions assessed was plotted.

The outputs from the near-field model were used as starting conditions in the far-field model, MUDMAP, to predict the extent to the mixing zones under typical environmental conditions. The far-field model was set up to simulate a continuous release of the designated rate of produced water during January to December 2014. The modelling results indicated that the discharge plume would flow in the direction of the ambient ocean currents, with a tidal oscillation that changed the direction with each flood and ebb tide event.

The transport of the discharged plume closely followed the direction of the tidal oscillations observed. Across all discharging platforms, on the flood tide, the plume was pulled in a westerly or south-

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westerly direction, momentarily paused and then forced towards the east, east-northeast, or east-southeast during the ebb tide. As a result of the change in directions and current velocities, the concentrations become more variable over time. Lower concentrations (higher dilution rates) were occurring during stronger currents, whereas patches of higher concentrations (lower dilution rates) tended to build up at the turn of the tide or weaker current events. The higher concentration patches were found to move as a unified group as the current speeds increased again and tended to be present within the wider plume at any one time.

Dilution zones were mapped for the month of August 2014, and then run across the entire year. The predicted minimum dilutions were calculated every 10 minutes for a continuous discharge of formation water during January to December 2014. The predominant directionality of the dilution contours were to the east to northeast and west to southwest.

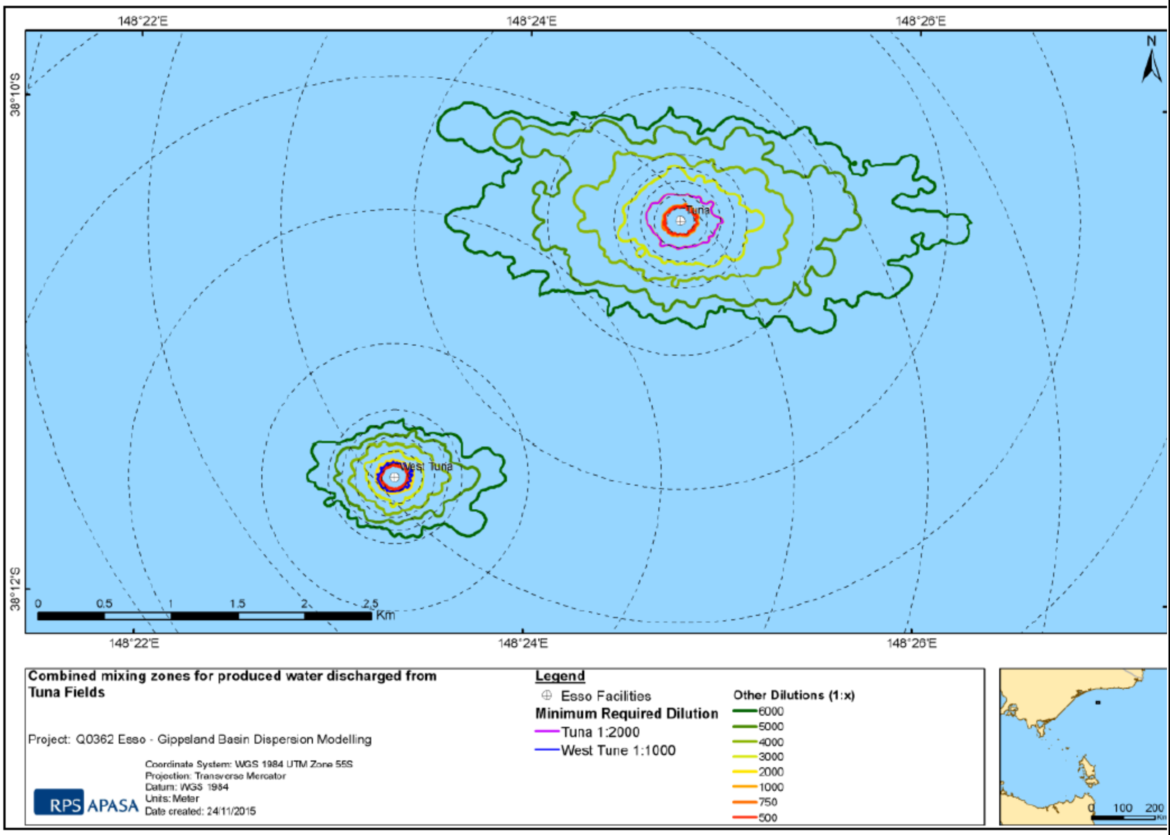
The year-long simulation aimed at capturing accumulation events during periods of prolonged slack currents that could result in highly concentrated plume adverted away from the platform when the current strength returns. Therefore, these results present the “worst case” potential areas of exposure from the discharge formation water and do not illustrate the area of exposure that could be observed at any single point in time. Maximum and minimum distance from the platform for each dilution contour was plotted.

POTENTIAL FOR OVERLAPPING PLUMES

Plumes were spatially and temporally aggregated for a subset of platforms discharging PFW in close proximity to each other.

Dilution contours out to 1:6000 for Tuna and West Tuna were plotted. The contours generally aligned parallel to each other and due to their proximity, they do not significantly influence each other.

Dilution contours for Fortescue and Halibut generally aligned with each other and their outer dilution contours (1:5000+) overlapped, whilst Cobia and Mackerel were both located further to the south of Fortescue and Halibut, and their dilution contours did not overlap with any other platform. (Note: Fortescue and Mackerel are not discharging PFW, hence any discharge plotted is theoretical).



(a)

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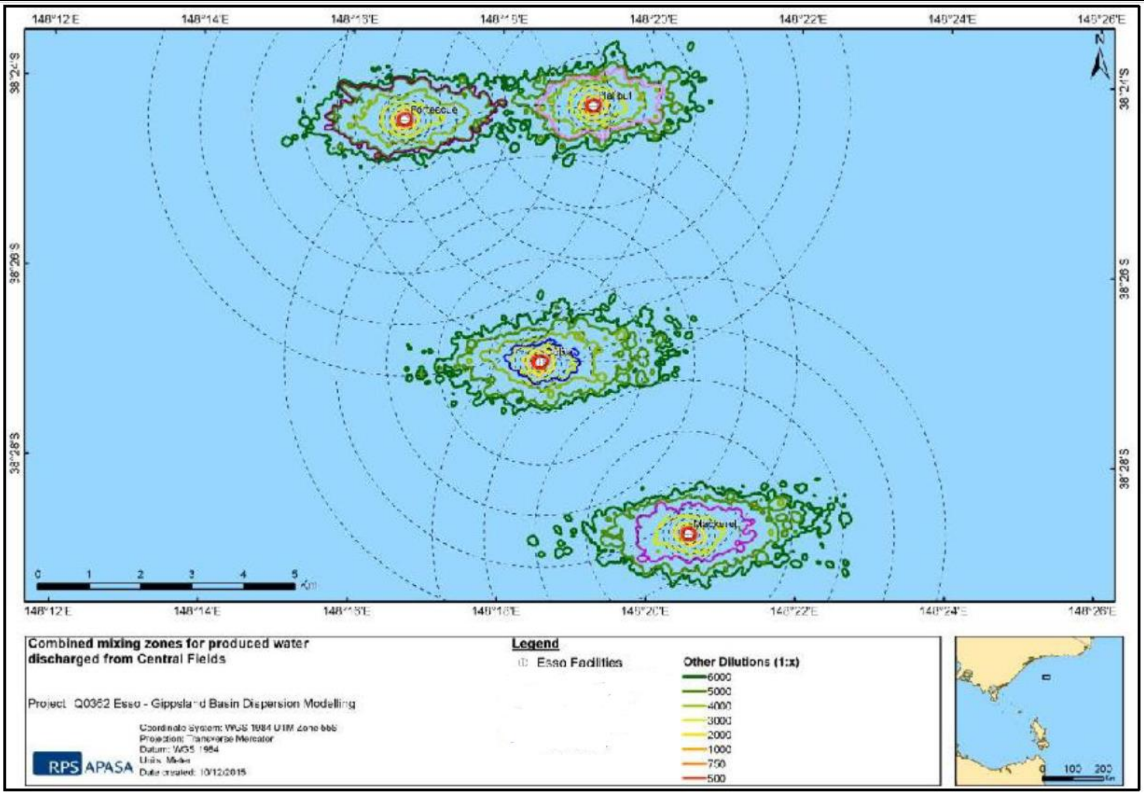

(b)

Figure G-1 (a) Dilution contours around TNA and WTN, showing no influence out to 1:6000 dilution (b) Dilution contours around FTA, HLA CBA and MKA (top to bottom and left to right), showing no influence of current HLA and CBA discharge contours out to 1:6000 dilution.

<u>MODEL RESULTS COMPARISON WITH MODELS PREVIOUSLY USED IN</u>* <u>BASS</u> *<u>STRAIT</u>

The Offshore Operators Committee Mud and Produced Water Discharge Model (OOC model) was developed by the Exxon Production Research Company, with additional support from the Offshore Operators Committee. The model provides estimates of plume behaviour resulting from cuttings and muds discharges and produced water discharges into the marine environment.

The governing equations and solution methodology for the model was originally developed by Koh and Chang (1973) and extended by the work of Brandsma and Smith (1995), Smith et al., (1994), and Brandsma and Sauer (1983) for the near-field convective phase and dynamic collapse phase of plume motion. The far-field (passive diffusion stage) employs a Lagrangian scheme of discrete clouds of particles with a defined mass. The model predicts the dynamics of the plume and concentrations in the near-field and in the far-field.

The OOC model simulates each of the three plume phases independently, but automatically links each of the phases to predict the transport and dispersion of the discharged produced water. The independent stages are necessary since the dilution of heated water occurs at different time scales and stages.

The OOC model has been used for studies worldwide, including the Gulf of Mexico, the North Sea, and in Australia at the Kingfish B platform, Bass Strait (Terrens and Tait, 1994), and Hariett A Platform, North West Shelf (King and McAllister, 1998).

The three phase simulation approach for the produced water plume is similar between both the MUDMAP/UM3 model and the OOC model. One of the key differences between the models lies in the way the dispersion coefficients are handled in the in the far-field dispersion components of the models. The MUDMAP model uses horizontal and vertical mixing coefficients, both in units of m2/s. The OOC model however, uses an ALAMDA diffusion parameter in the horizontal direction, which is a dissipation parameter and used to calculate horizontal dispersion using the 4/3 power law, with units of ft2/3/s. The vertical dispersion parameter used by the OOC model is similar to the MUDMAP vertical dispersion, but utilises the imperial system (ft^2/s).

Break Out Box 6

A review of both the MUDMAP and the OOC models was undertaken by King and McAllister (1998), where both models were used to simulate a PFW plume from the Kingfish B platform in Bass Strait. The model predictions were compared to in-water concentrations of aromatic hydrocarbons in the PFW stream, measured during operational discharge. The MUDMAP predictions of in-water concentration were found to be within a factor of 2 greater when compared to the actual in-water observations, whilst the OOC model predictions were found to be up to a factor of 3 smaller when compared to the observations.

Testing was carried out to compare the results at West Kingfish using the MUDMAP/UM3 and OOC models, when utilising the same input parameters and environmental conditions (i.e. PFW discharge characteristics, horizontal dispersion coefficients, water temperature and current speeds). The results of interest were the dilutions of the PFW stream at set distances from the facility, under static current conditions. A report by Smith (2015) outlined the expected PFW concentrations from the OOC model at 10, 25, 100 and 500 m from 12 of Esso's Bass Strait platforms. The plume dilution results were of similar magnitude as modelled by MUDMAP/UM3 and OOC model at the West Kingfish platform at the four distances specified.

MODEL RESULTS COMPARISON WITH IN-SEA STUDIES

The modelled dilution factors were validated with an in-situ water monitoring study at the Tuna platform, using a known concentration of rhodamine dye in the PFW effluent. Currents during the study were 0.2-0.3 m/s on Day 1 and 0.1-0.5 m/s on Day 2 (typical currents at Tuna platform in the model was 0.27 m/s). The actual dilution factor under typical currents were, at their smallest, 1:2286 at 72 m distance from the Tuna platform, compared to the dispersion model estimations of 1:1000 at 140 m and 1:2000 at 320 m distance from the Tuna platform.

Table G-3 Dilution factors resulting from in-situ water monitoring at Tuna

Day	Concentration in PFW (µg/L)	Maximum in-water concentration (µg/L)	Corresponding distance from the platform	Corresponding depth (m below MSL)	Dilution ratio
1	230,000 (1:5 dilution at 260 L/hr into 5422 kL/d discharge)	100.6	72	2.4	2286
		82.4	120	5.3	2791
		47.5	261	3.0	4842
		41.8	506	9.9	5502
2	240,000 1:5 dilution at 260 L/hr into 5204 kL/d discharge	57.4	115	1	4181
		32.2	358	0.02	7453
		24.3	1090	0.01	9877
		28.8	1565	0.01	8333
		21.6	2587	0.002	11111

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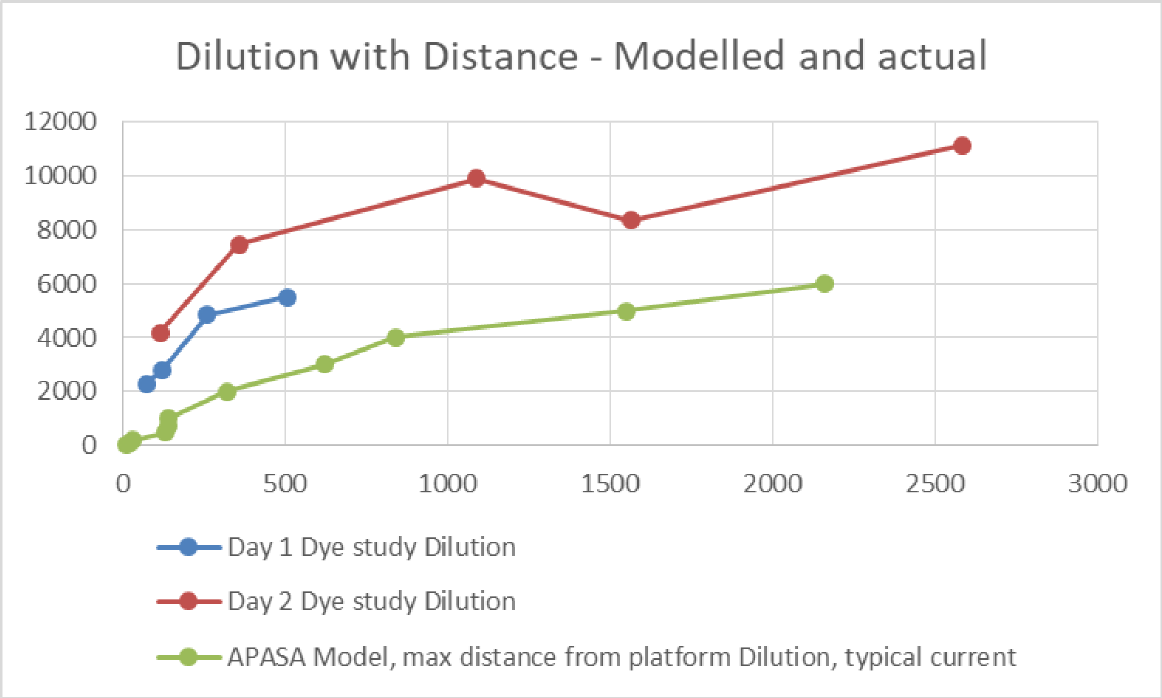


Figure G-2 Rhodamine dye dilution factors together with model dilution factors with distance from the platform.

4.6 Appendix G.7: Breakout Box 7 - In-Situ Water Studies Around the Tuna Platform

The postulate that ANZECC 2000 water guidelines would be able to be met, at worst, outside a relatively small areal extent from the PFW discharge were tested by taking in-situ measurements of water around the Tuna platform in 2018.

Of metals detected in PFW, zinc was detected over the guideline criteria in 1 out of 34 samples, with zinc at 20 m depth only at 59 m from the platform observed at the level of 40 µg/L (ANZECC 99% criteria is 7 µg/L) and it was not detected at other depths (with LOR 5 µg/L) or in any other samples out to the monitored distance of 1574 m from the platform. The raw PFW discharge showed concentrations of <5 µg/L hence this result is unlikely to have been due to the PFW discharge.

Chromium, cobalt and copper were detected at levels above the guideline criteria in 1 out of 34 samples at 1574 m and 5 m depth at the level of 10 µg/L (99% criteria is 8 µg/L), 0.4 µg/L (0.005), and 1 µg/L (0.3 µg/L) respectively (ANZECC 99% criteria shown in brackets). All three results above 99% water quality criteria were detected in the one sample, bringing the results into question. It should be noted that the ANZECC 95% level for cobalt (1 µg/L) was not exceeded. No other metals in water exceeded ANZECC 99% criteria at any other sites near the platform. The raw PFW discharge showed copper concentrations of <0.4 to 1 µg/L hence the result is unlikely to have been due to the PFW discharge. Chromium and cobalt have never been detected in TNA PFW.

All other metals were below ANZECC 99% criteria.

Cyanide was detected at above guideline criteria (0.009 mg/L) in one inter-lab duplicate at 973 m from the platform however its parent record and field duplicate record did not detect cyanide to less than half the reported interlab duplicate level. Hence this duplicate record should be discounted. Cyanide was also detected in 1 of 34 samples at 1574 m from the platform at 10m depth at the level of 0.006 mg/L (ANZECC 99% criteria is 0.002 mg/L).

All other metals, hydrocarbons (BTEX, TRH, MAH, PAH), phenols, phthalates, solvents, nutrients and other inorganics, were below ANZECC 99% criteria within all remaining samples taken between 59 m and 1574 m distance from the platform.

The isolated observations of zinc, chromium, cobalt, copper and cyanide above the ANZECC 99% guideline criteria within 1574 m from the Tuna platform, were either in question (sample QC), were not ubiquitous with depth according to the PFW plume prediction or did not show correlation with distance from the discharge point, or were higher than raw PFW effluent concentrations, indicating the low likelihood of any temporary and localised impacts to water quality from PFW.

4.7 Appendix G.8: Breakout Box 8 - In-Sea Sediment Monitoring Around Tuna and West Kingfish Platforms

Breakout Box 8

A sediment study around the TNA and WKF platforms was conducted to determine potential impacts to sediment from PFW and/or all other historical or active discharges.

Of all Bass Strait PFW-discharging platforms, WKF in particular has the highest loading of metals (discharge volume-weighted sum of metals cadmium, chromium, cobalt, copper, lead, mercury, nickel, silver, vanadium, zinc, manganese, iron) as well as the highest potential for PAHs adhered to solids (using discharge volume and suspended solids-weighted naphthalene), and hence was the most suitable candidate for the study.

Sediment samples were collected from two zones in the vicinity of TNA and WKF platforms (Zone 1:50–180 m and Zone 2: 180–1000 m from the platform) and from two reference locations between ~8 and 13 km from any one platform and away from other PFW-discharging platforms. At each location, 18 samples were collected using a Smith Macintyre grab sampler deployed from the sampling vessel. Sediments in each sample were homogenised and their pH and redox potential measured before they were transferred to sample containers for storage and delivery to the NATA accredited analytical laboratory.

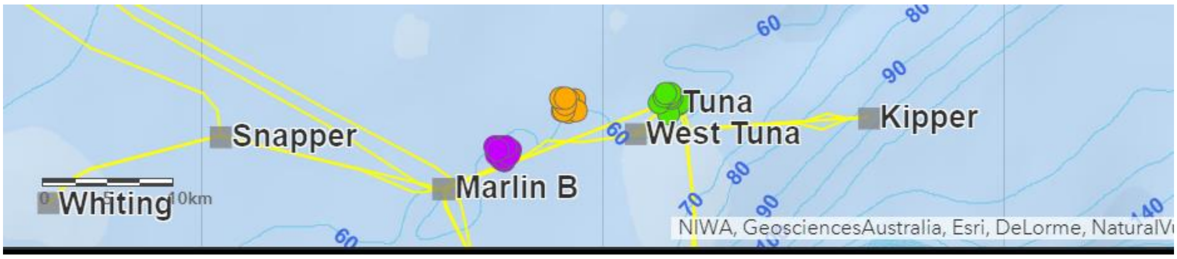


Figure G-3 Map showing sediment sample locations around Tuna platform (green), and two reference sites (orange and purple).

Figure G-4 Map showing sediment sample locations around West Kingfish platform (green), and two reference sites (orange and purple).

POTENTIAL IMPACTS FROM PFW TO SEDIMENT NEAR THE PLATFORMS

West Kingfish platform results

Overall, impacts to sediment from metals were shown to be confined to an area of 110 m around the West Kingfish platform.

Within 110 m of West Kingfish platform, only Zinc was present above the ANZECC 2013 “low” sediment quality guideline values, in a field duplicate only, in 1 of 18 samples, 109 m from the platform. No analytes were above guideline values elsewhere within Zone 1 (between 58 m and 144 m from the platform) or within Zone 2 (between 264 and 969 m). The detected zinc level was 1760m g/kg, above the “low” guideline value of 200 mg/kg and “high” guideline level of 410 mg/kg. Based on inconsistencies with the parent (non-duplicate source) of this sample for several metals (readings inconsistently high with the remainder of the data set), it can be concluded that the field duplicate analysis was corrupted and should be discounted for the study. Even if it is not discounted, zinc was

Breakout Box 8

not detected in WKF PFW between 2014-2019 and therefore is not expected to be a contributor to sediment zinc levels.

The samples showed gradients of nickel concentrations (together with other metals not present in WKF PFW - such as cobalt and lead; and other metals including barium, zinc, manganese and iron) decreasing with distance away from the platform. The overall levels of nickel and zinc in those gradients is indistinguishable from reference locations within 117 m and 83 m from the platform respectively. For all metals that showed a gradient away from the platform, no samples showed levels higher than ANZECC "low" ISQG criteria. Levels of nickel were, in 35 of 36 samples, less than 4mg/kg (ANZECC 2013 "low" criteria is 60 mg/kg), and levels of zinc were, in 32 of 36 samples, less than 45 mg/kg (ANZECC 2013 "low" criteria is 200 mg/kg).

Sediment guideline values were not exceeded anywhere around the platforms for other metals including - antimony, arsenic, cadmium, lead, manganese, mercury, or silver.

Sediment guideline values were not exceeded for hydrocarbons (speciated or total PAHs, and TRH C10-C36 levels) in samples recovered anywhere around West Kingfish platform.

The samples did not show gradients of chromium or PAHs away from the platform.

Tuna platform metals results

Overall, impacts to sediment were shown to be confined to an area of 120 m metres around the Tuna platform.

Within 120m of Tuna platform, Copper, Lead and Zinc were present above the ANZECC 2013 "low" sediment quality guideline values, with all other metals detected within guideline values.

Copper was detected above "low" guideline values in 1 of 18 samples 75 m from the platform. The levels of copper was less than two times above the guideline values at 106 mg/kg whilst the "low" guideline value is 65 mg/kg. It did not exceed the "high" guideline value of 270 mg/kg. There were no other detections in a further 18 samples elsewhere within Zone 1 (between 52 m and 129 m from the platform) and within Zone 2 (between 260 and 979 m). Copper is discharged in TNA PFW, however at less than two times the ANZECC water quality guideline in only one sample (all other samples are below detection), and hence is not expected to contribute significantly to sediment copper levels.

Lead was detected above guideline values in 2 of 18 samples at 75 m and 85 m from the platform. Lead was within guideline values elsewhere within Zone 1 (between 52 m and 129 m from the platform) and within Zone 2 (between 260 and 979 m). The levels of lead was only slightly above the "low" guideline values - lead was detected at 68.7 mg/kg and 112 mg/kg whilst the guideline value is 50 mg/kg. It did not exceed the "high" guideline value of 220 mg/kg. Lead was not detected in TNA PFW in 2014-2019, hence is not expected to be the cause of any higher lead levels in sediment.

Zinc was detected up to three times above "low" guideline values (200 mg/kg) in 2 of 18 samples at 62 and 76 m from the platform and over the "high" guideline (410 mg/kg) in 1 of 18 samples at 120 m from the platform (2260 mg/kg). There were no other detections in a further 18 samples elsewhere within Zone 1 (between 52m and 129m from the platform) and within Zone 2 (between 260 and 979 m). Zinc is discharged in TNA PFW, however it is rarely detected and at less than the ANZECC water quality guideline and hence is not expected to contribute significantly to sediment zinc levels.

The samples showed gradients of copper and zinc concentrations (together with other metals not present in TNA PFW - cobalt, lead, nickel; and other metals including barium and iron) decreasing with distance away from the platform. The overall levels of copper and zinc in those gradients is indistinguishable from reference locations within 129 m and 85 m from the platform respectively. The levels of contamination generally remain well below threshold levels – 35 of 36 samples were below 41 mg/kg for copper (the ISQL "low" threshold level is 65 mg/kg) and 34 of 36 samples were below 76 mg/kg for zinc (the ISQL "low" threshold level is 200 mg/kg) (Figure G-5(a) and Figure G-5(b)). For all other metals that showed a gradient away from the platform, only 2 of 18 samples (at 75 m and 85 m distance from the platform) showed levels of lead higher than ANZECC "low" ISQG criteria (lead is not present in TNA PFW).

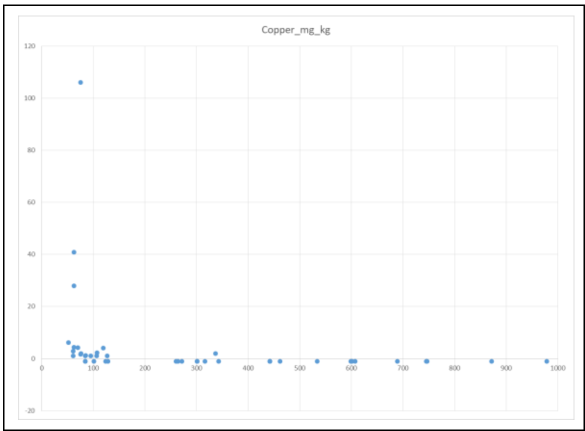
Breakout Box 8

It is likely that the isolated observations above ISQL criteria close to the platform are derived at least in part from galvanized steel structures (e.g. platform structure, and steel debris on the sea floor), especially given that cobalt, lead and nickel have never been detected in TNA PFW.

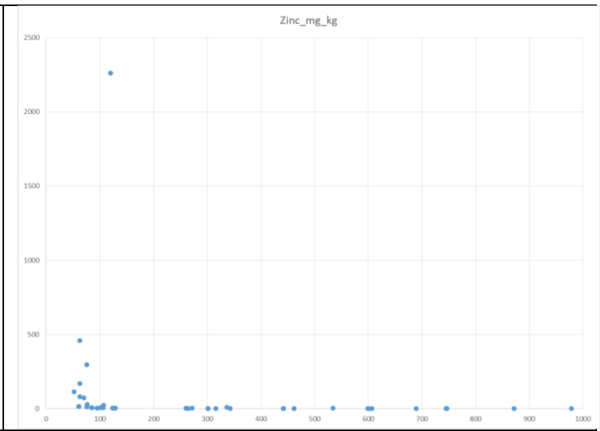
Sediment guideline values were not exceeded anywhere around the platforms for other metals including - antimony, arsenic, cadmium, lead, manganese, mercury, or silver.

Sediment guideline values were not exceeded for hydrocarbons (speciated or total PAHs, and TRH C10-C36 levels) in samples recovered anywhere around Tuna platform.

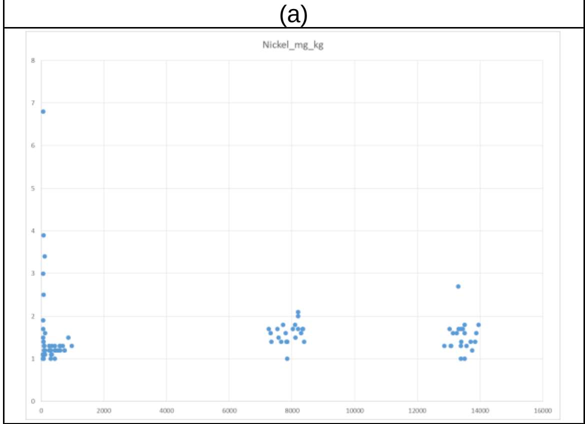
The samples did not show gradients of Arsenic or PAHs away from the platform.



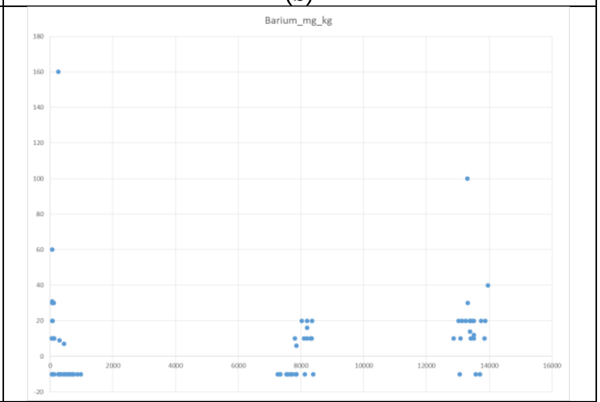
(a)



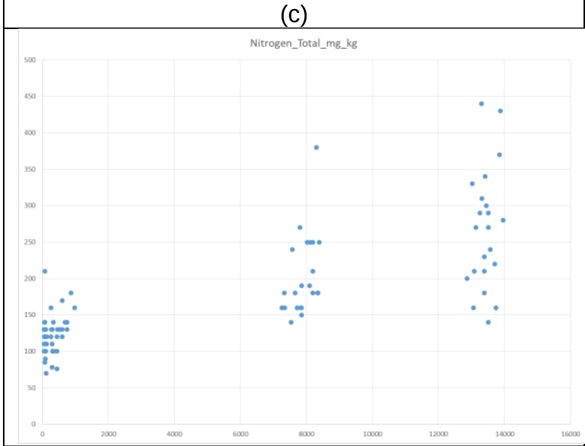
(b)



(c)



(d)



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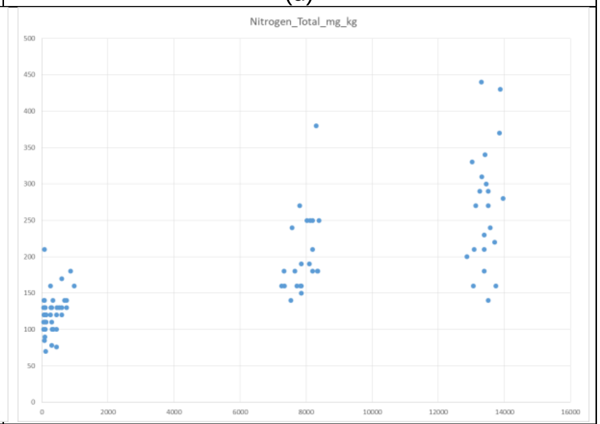


(f)

Figure G-5: Gradients around Tuna (mg/kg), x-axis is distance from the platform in metres. Note – negative values are where the contaminant was not detected. (a) copper; (b) zinc; Other contaminants at the platform and at reference sites: (c) nickel; (d) barium; (e) total nitrogen; (f) iron.

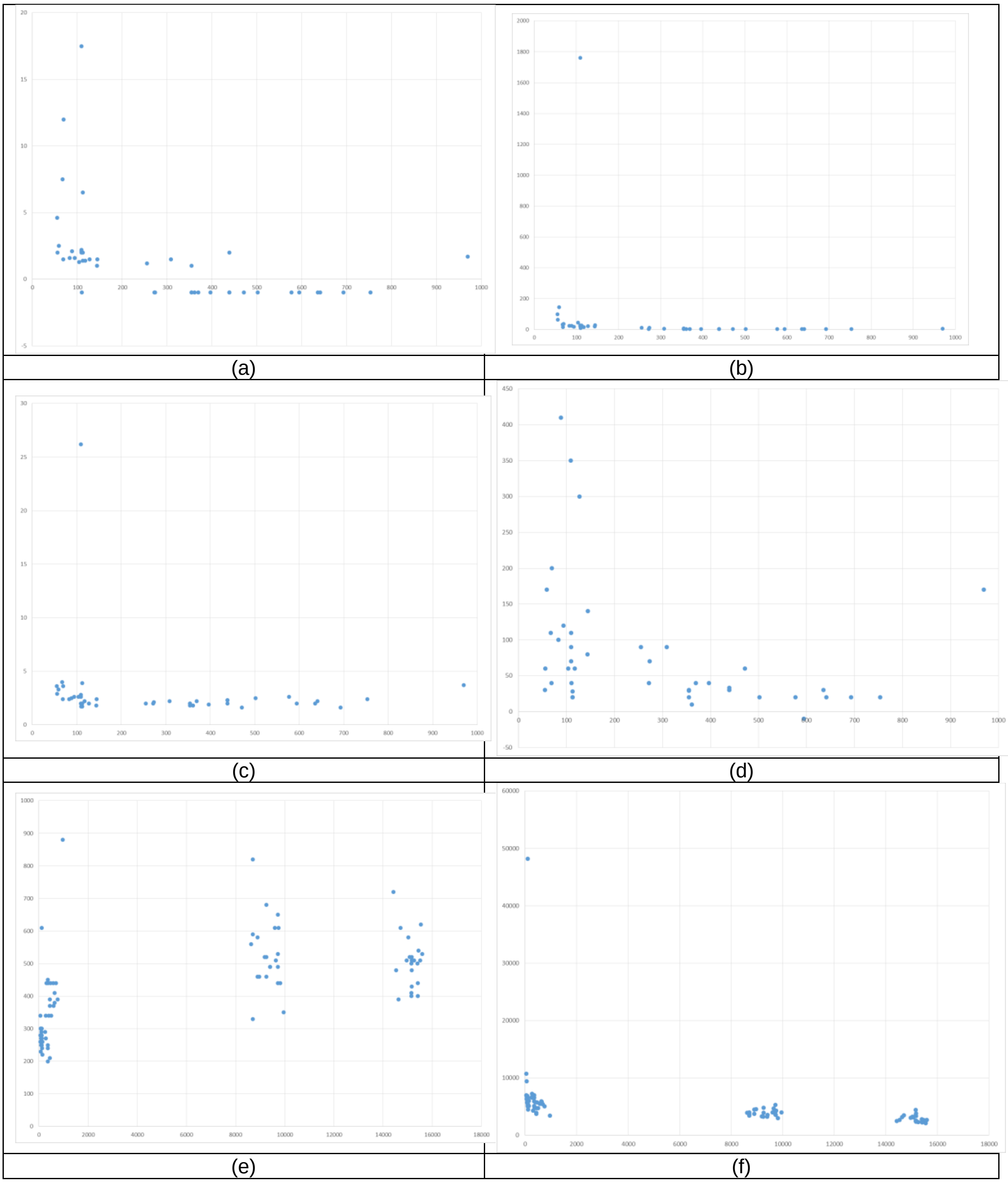


Figure G-6: Gradients around West Kingfish (mg/kg), x-axis is distance from the platform in metres. Note – negative values are where the contaminant was not detected. (a) copper; (b) zinc; (c) nickel; (d) barium; Other contaminants at the platform and at reference sites: (e) total nitrogen; (f) iron.

Changes to sediment quality near the platform versus open ocean reference sites can be expected as the platform is an industrial facility. Importantly, those analytes of primary concern in PFW (PAHs and some metals) in sediments are either non-existent (PAHs) or have been maintained at low and

Breakout Box 8

acceptable levels (metals), and changes that may be linked to PFW appear to be localised to the immediate vicinity of the platform.

SEDIMENT ENVIRONMENT AT REFERENCE SITES

Three surveys of chemical analyses in marine sediments were taken at background, or reference sites during in-sea field surveys:

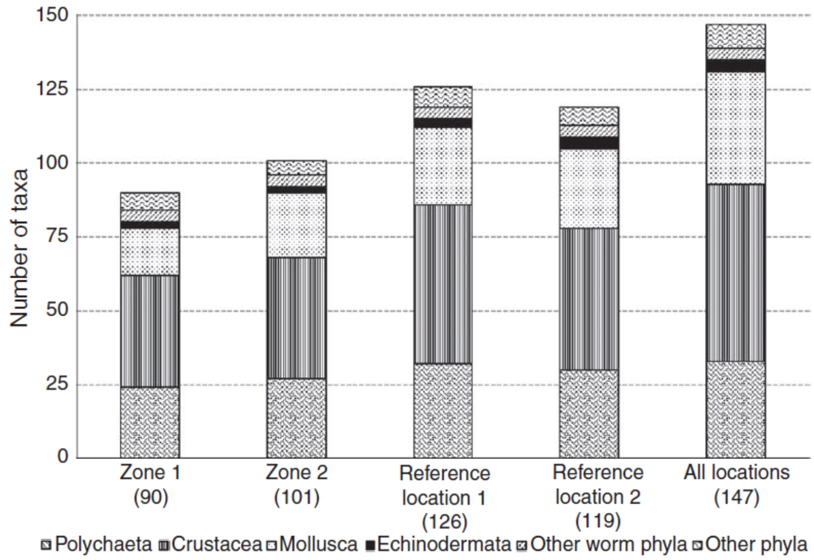
- Reference sites to Tuna platform
- Reference sites to West Kingfish platform
- Analysis of the West Barracouta site prior to drilling

In one case the background/reference sediment quality for a chemical exceeded ANZECC sediment quality guideline trigger value. This was for the analyte arsenic, across 2 out of 18 samples taken at Tuna Reference Site 1. Arsenic values at these sample locations returned 22.9 µg/L and 20.1 mg/kg respectively, marginally over the ANZECC sediment quality guideline criteria of 20 mg/kg. The balance of 16 samples at that site returned values between 12.9 mg/kg and 19.3 mg/kg. Therefore, the 2 out of 18 samples can be considered likely due to natural variation. All 18 samples at Tuna Reference Site 2, West Kingfish Reference sites 1 and 2, and West Barracouta site returned values under the ANZECC criteria for arsenic. All other metals, hydrocarbons, etc. levels returned values below ANZECC criteria.

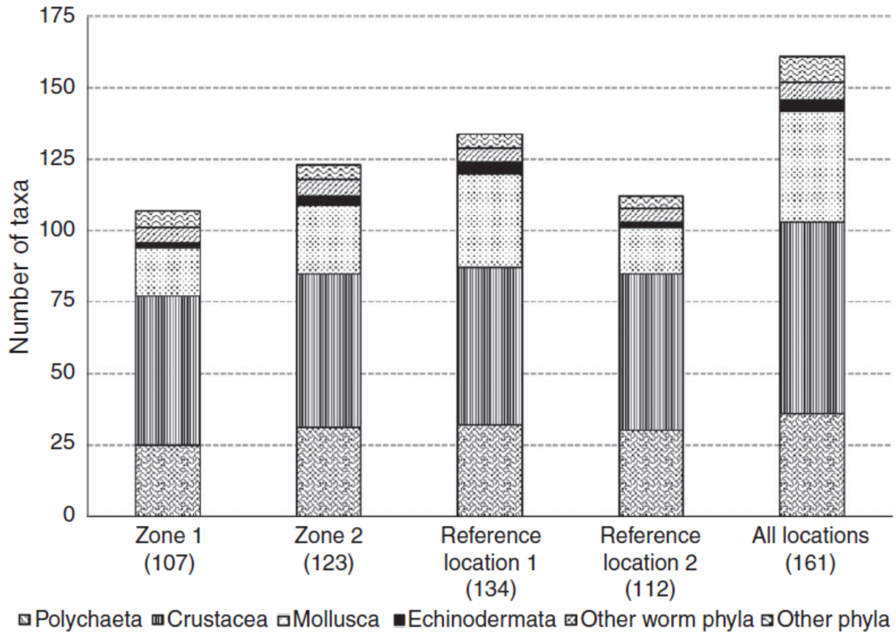
4.8 Appendix G.9: Breakout Box 9 - In-Sea Infauna Monitoring Around Tuna and West Kingfish Platforms

Breakout Box 9

Benthic infauna samples were taken around West Kingfish and Tuna platforms in 2018 as part of the in-situ monitoring study, and were analysed for number of taxa and distribution of taxa. At both platforms (both zones) and in all reference sites, crustaceans dominated the infauna, followed by polychaetes. On average, the total number of benthic infauna taxa found close to the platform in Zone 1 (50 to 150 m from WKF, 50 to 130 m from TNA) was slightly lower at the platforms than in Zone 2 (150 to 1000 m from WKF, 260 to 1000 m from TNA) and at the reference sites.



(a)



(b)

Figure G-7: Number and distribution of taxa at (a) Tuna platform and (b) West Kingfish platform.

A small fraction of around 20% total taxa (21 of more than 100 and 22 of more than 120 total taxa at TNA and WKF respectively), were significantly correlated by distance from the platform ($p<0.05$, either with decreasing/negative or increasing/positive correlation). These are shown below in Table

Breakout Box 9

G-4. Only 5 of these taxa (Amphinomidae, Onuphidae, Synopiidae, Aoridae, Nannastacidae) were present at both platforms for which Amphinomidae, Onuphidae, and Synopiidae had the same trend with distance at TNA and WKF (negative), and Aoridae and Nannastacidae had a different significant trend at TNA (negative) and WKF (positive) with distance from the platform. Differences in sediment grain size (particularly the higher proportion of gravel size particles) close to the platforms was the likely driver to the overall assemblage, due to changes in sediment particle size through altered current patterns and hydrodynamic regimes (Ambrose and Anderson 1990; Davis et al. 1982; Fabi et al. 2002; Zalmon et al. 2012), the input and entrapment of biogenic material leading to organic enrichment (Davis et al. 1982; Fabi et al. 2002; Wilding 2006), scour around structures or piles and persistence of drill cuttings in close proximity to platforms.

For 15 taxa at TNA (less than 15% of the total, 4 polychaeta, 7 crustacea, 1 mollusca and 3 worms), abundances significantly decreased with distance. Differences in sediment grain size (particularly the proportion of gravel size particles, Figure G-10) close to the platform is the main driver to the decreasing trends in abundance of these taxa at TNA with distance (Figure G-8 below). The change in abundance could not be accounted for by PFW contaminant gradients in sediments with distance from the platform.

At West Kingfish, there were no significant differences in the structure of the infaunal assemblages among Treatments; between Zone 1, Zone 2 and Reference locations. For 14 of the taxa (less than 12% of the total, 2 polychaeta, 10 crustacea, and 2 mollusca) saw significant increase in abundance with distance from WKF, which could be explained primarily by the presence of barium (a major constituent of drilling muds, the last drilling program on WKF in 2010 versus in 2005 for TNA), the presence of coarser grained sediment in very close proximity to the WKF platform (Figure G-11 below, also see Figure G-9). The change in abundance could not be accounted for by PFW contaminant gradients in sediments with distance from the platform.

Changes in infauna abundance due to natural variability of sediment particle size is a well-known phenomena (e.g. Neff, 1992; ANZECC 2000 p8.4-29).

Table G-4 Correlation of abundance of taxa with distance from TNA and WKF platforms

Group	Taxon	TNA trend with distance	P value	WKF trend with distance	P value
Polychaeta	Amphinomidae	Negative	<0.001	Negative	<0.001
Polychaeta	Glyceridae	N/A	N/A	Positive	0.007
Polychaeta	Lumbrineridae	Negative	0.001	N/A	N/A
Polychaeta	Onuphidae	Negative	<0.001	Negative	<0.001
Polychaeta	Polynoidae	N/A	N/A	Positive	<0.001
Polychaeta	Spionidae	N/A	N/A	Negative	<0.001
Polychaeta	Phyllodocidae	Negative	<0.001	N/A	N/A
Crustacea	Nebaliidae	N/A	N/A	Positive	<0.001
Crustacea	Ampeliscidae	N/A	N/A	Positive	<0.001
Crustacea	Aoridae	Negative	<0.001	Positive	<0.001
Crustacea	Atylidae	N/A	N/A	Positive	<0.001
Crustacea	Ischyroceridae	N/A	N/A	Positive	<0.001
Crustacea	Phoxocephalidae	N/A	N/A	Positive	<0.001
Crustacea	Podoceridae	N/A	N/A	Negative	0.041
Crustacea	Melitidae	Negative	<0.001	N/A	N/A
Crustacea	Platyischnopidae	Negative	<0.001	N/A	N/A
Crustacea	Synopiidae	Negative	<0.001	Negative	<0.001
Crustacea	Leptanthuridae	N/A	N/A	Positive	<0.001
Crustacea	Paratanaidae	N/A	N/A	Positive	<0.001
Crustacea	Cirolanidae	Negative	<0.001	N/A	N/A
Crustacea	Gnathiidae	Positive	0.001	N/A	N/A
Crustacea	Apseudidae	Positive	<0.001	N/A	N/A
Crustacea	Bodotriidae	Negative	<0.001	N/A	N/A
Crustacea	Diastylidae	Positive	<0.001	Positive	0.014
Crustacea	Nannastacidae	Negative	<0.001	Positive	0.001
Crustacea	Podocopida	Positive	<0.001	N/A	N/A
Crustacea	Pasiphaeidae	N/A	N/A	Negative	0.006

Breakout Box 9

Crustacea	Paguridae	N/A	N/A	Negative	<0.001
Mollusca	Trochidae	N/A	N/A	Negative	<0.001
Mollusca	Galeommatidae	N/A	N/A	Positive	<0.001
Mollusca	Tellinidae	N/A	N/A	Positive	0.029
Mollusca	Polyplacophora	Positive	<0.001	N/A	N/A
Mollusca	Hiatellidae	Negative	0.041	N/A	N/A
Mollusca	Veneridae	Positive	<0.001	N/A	N/A
Worm	Nematoda	Negative	0.049	N/A	N/A
Worm	Nemertea	Negative	<0.001	N/A	N/A
Worm	Oligochaeta	Negative	0.009	N/A	N/A

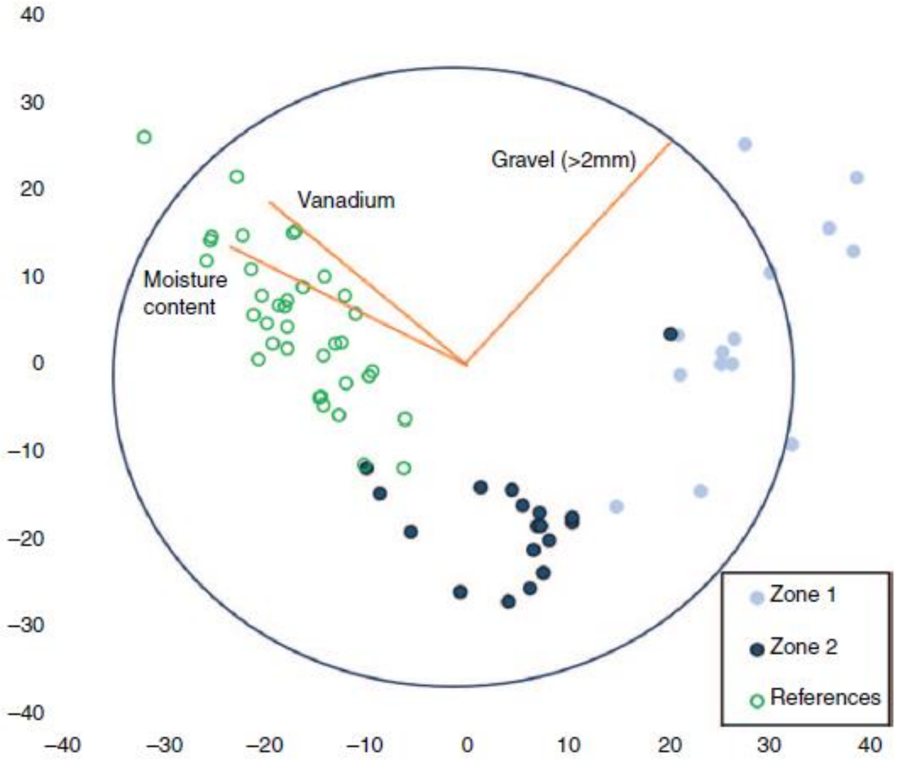


Figure G-8: Distance based Linear Model (DIstLM) of infauna multivariate assemblage structure at Tuna

Figure G-8 displays the disparity between the assemblages observed in each grab sample. The vectors (orange lines) indicate the environmental variables that contributed to the best fitted model. Note that mean particle size was larger closer to the platform than further away, with the proportion of gravel sized particles greater in sediments closer to each platform compared with locations further away (as with WKF). Moisture content and vanadium levels increased away from the platform.

Breakout Box 9

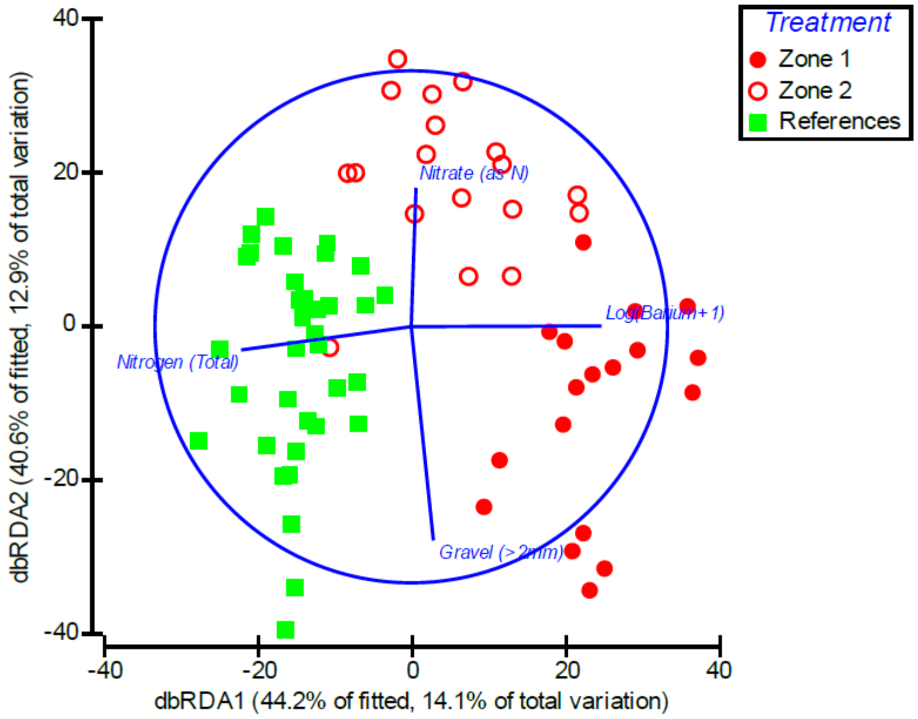


Figure G-9: Distance based Linear Model (DIstLM) of infauna multivariate assemblage structure at West Tuna

Figure G-9 displays the disparity between the assemblages observed in each grab sample. The vectors (blue lines) indicate the environmental variables that contributed to the best fitted model.

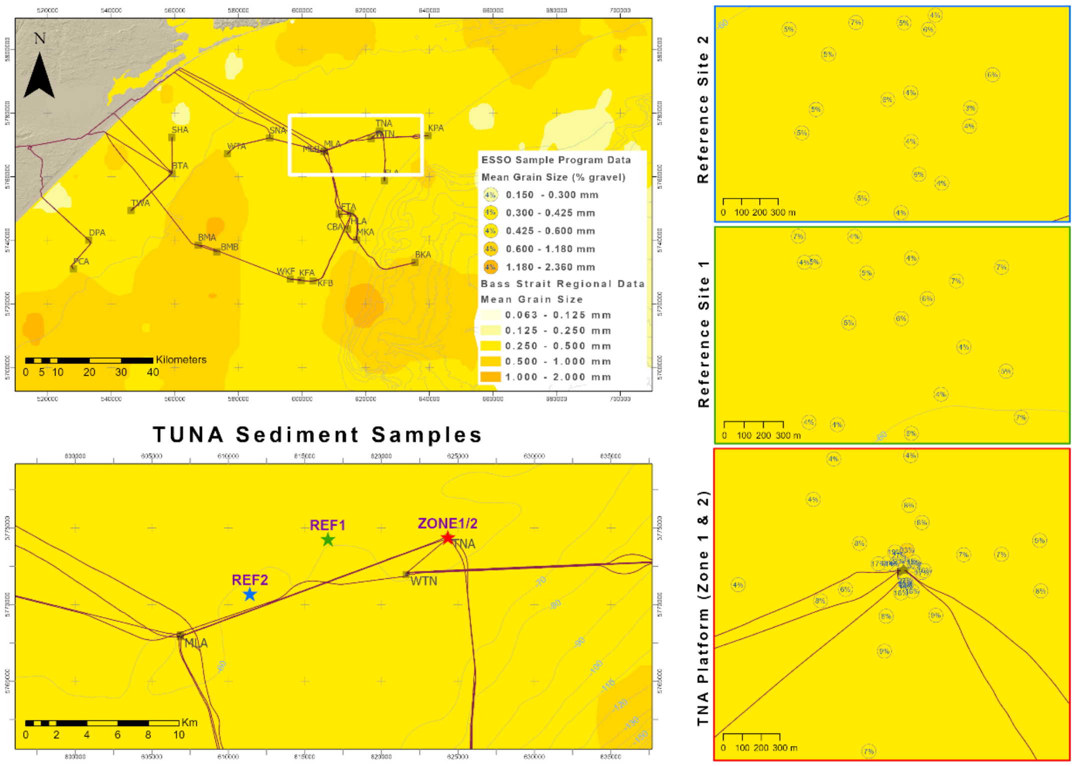


Figure G-10: Sediment grain size – TNA

Breakout Box 9

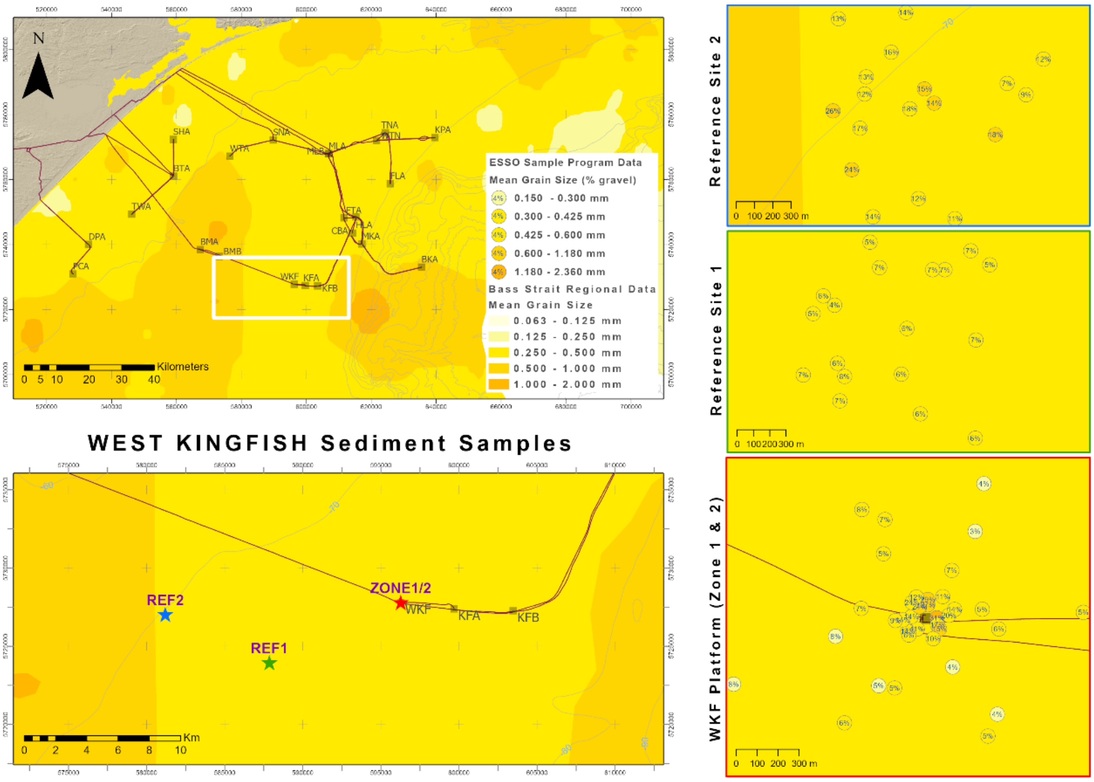


Figure G-11: Sediment grain size – WKF

4.9 Appendix G.10: Breakout Box 10 - Particle Size Distribution (PSD) and Sediment Impacts

Breakout Box 10

Grain size of sediment is generally classified in the following categories: clay (< 4 µm), silt (4 to < 63 µm), fine sand (63 to 250 µm), medium sand (250-500 µm), coarse sand (500-2000 µm) and coarse material (>2000 µm). Comparisons of the PSD in the produced water from the four facilities, showed that at least 97% of the particles are very small, of the size of clay or silt (≤63 µm). A very small percentage of PSD in the PFW is of a higher grain size, in the fine sand category (63 to < 250 µm; except for Cobia in which 100% of material is in the silt and clay sized fractions).

Further, the chemically active fraction of sediment is usually cited as that portion which is smaller than 63 µm (silt + clay) fraction (UNEP/WHO 1996). Problem contaminants are most often associated with these fine sediments because this fraction consists of particles with relatively large ratios of surface to volume and may be charged which increase the sorptive capacity for contaminants (Power and Chapman 1992). For phosphorus and metals, particle size is of primary importance due to the large surface area of very small particles. Phosphorus and metals tend to be highly attracted to ionic exchange sites that are associated with clay particles and with the iron and manganese coatings that commonly occur on these small particles. The coarse fractions are composed primarily of stable inorganic materials (e.g. quartz) and are not generally associated with chemical contamination (UNEP/WHO 1996).

Sediment deposition requires suitable hydrodynamic conditions, which depend on the type of sediment. Fine sediments cannot settle in high-energy environments (strong waves and/or strong currents). Temporary settling is possible when currents are weak (neap tide, slack tide) and in the absence of strong wave action. However, in situations where low-energy and high-energy conditions alternate, these temporary deposits will disappear. Although currents generally carry a mixture of different types of sediment, only one type of sediment will remain on the seabed after settling. This type of sediment corresponds to the most energetic conditions among the alternating conditions that occur at a specific location. In high energy environments the sediment is composed of medium to coarse sand (Van Oyen et al. 2013).

Measurements of particle size in the produced water discharge streams have shown that very high concentrations of particles are in the silt and clay sized fractions (≤63 µm), the factions in which contaminants in the produced water are most likely to be associated. This combined with the highly dynamic conditions of the water in the receiving environment suggests that these particles are not likely to settle anywhere near the sediments in the vicinity of the facility.

Actions of resuspension, bioturbation and microbial decay of those particulates in the water column and on the seabed will further reduce the concentration of settled sediments. Since the PFW plume is highly buoyant, and Bass Strait is a high energy environment, currents are likely to mobilise and disperse sediments around the platform, leading to lower overall concentrations in any one area.

Esso Australia Resources Pty Ltd

EMERGENCY PREPAREDNESS AND RESPONSE

BASS STRAIT ENVIRONMENT PLAN

Volume 3

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Abbreviations

ADIOS	Automated Data Inquiry for Oil Spills
AHS	Australian Hydrographic Service
ALARP	As Low As Reasonably Practicable
AMOSC	Australian Marine Oil Spill Centre
AMSA	Australian Maritime Safety Authority
APPEA	Australian Petroleum Production and Exploration Association
BBMT	Barry Beach Marine Terminal
BOP	Blowout Preventer
CSV	Construction Support Vessel
C&R	Containment and Recovery
DAWR	Department of Agriculture and Water Resources
DELWP	Department of Environment, Land, Water and Planning Victoria
DNA	Deoxyribonucleic Acid
DPAW	Department of Parks and Wildlife
EMBSI	ExxonMobil Biomedical Sciences
EMPLAN	NSW State Emergency Management Plan
EP	Environment Plan
EPA	Environmental Protection Agency
EPBC	Environmental Protection and Biodiversity Conservation Act
EPO	Environmental Performance Objectives
EPS	Environmental Performance Standards
ERT	Emergency Response Team
ESD	Ecologically Sustainable Development
FWADC	Fixed Wing Aerial Dispersant Contract
GIS	Global Information System

IMO	International Maritime Organisation
IMT	Incident Management Team
IPECA	International Petroleum Industry Environmental Conservation Association
ITOPF	International Tanker Owners Pollution Fund
JRCC	Joint Rescue Coordination Centre
KSAT	Kongsberg Satellite Services
MARPOL	International Convention for the Prevention of Pollution from Ships
MoU	Memorandum of Understanding
MC	Measurement Criteria
NAF	Non Aqueous Fluid
NATA	National Association of Testing Authorities
NEBA	Net Environmental Benefit Analysis
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NRDA	Natural Resource Damage Assessment
NSW	New South Wales
OIMS	Operations Integrity Management System (OIMS) Objectives.
OPEP	Oil Pollution Emergency Plan
OPGGS Act	Offshore Petroleum and Greenhouse Gas Storage Act 2006
OPGGS(E)R	Offshore Petroleum and Greenhouse Gas Storage Environment Regulations 2009
(OPGGS(S))	Offshore Petroleum and Greenhouse Gas Storage Regulations
OSMP	Operational and Scientific Monitoring Program
OSR	Oil Spill Response
OSRL	Oil Spill response Limited
OWR	Oiled Wildlife Response
PSZ	Petroleum Safety Zone
ROC	Oil Retained On Cuttings
ROV	Remotely Operated Vehicle
RPS	RPS Group PLC
SCAT	Shoreline Clean-up Assessment Technique
SFRT	Subsea First Response Toolkit
SOLAS	Safety of Life At Sea
SMEP	Victorian State Maritime Emergencies (non-search and rescue) Plan
SSDI	Subsea Dispersant Injection
Tas	Tasmania
TasPlan	Tasmanian Marine Oil Spill Contingency Plan
TasPorts	Tasmanian Ports Corporation
TRP	Tactical Response Plans

Vic	Victoria
VOC	Volatile Organic Compounds
WCDS	Worst Credible Discharge Scenario
WildPlan	Tasmanian Oiled Wildlife Response Plan

1. Introduction

This volume of the Environment Plan describes potential response options available for an oil spill occurring from any of Esso's activities within the Gippsland Basin as described in:

- Volume 2: Bass Strait Operations Environment Plan,
- Volume 2a: JUR Drilling Environment Plan,
- Volume 2b: Whiting Plug and Abandonment Environment Plan#
- Volume 2c: SHA / TWA Plug and Abandonment Environment Plan#
- Volume 2d: BTW Installation, Commissioning and Initial Operations Environment Plan

#Activities completed in 2020

This volume assesses and evaluates:

- Potential environmental impacts from implementing response options in accordance with Regulation 13(6); and
- Esso's capabilities for each response option in accordance with Regulation 14(8AA).

The Oil Pollution Emergency Plan (OPEP) details the initial and ongoing actions to take following a spill incident, the response framework and organisation structure, and step by step guides for key roles and responsibilities. The OPEP is an operational document which provides the response resources available for all levels of incidents, tools for spill response assessment, timeframes to initiate a response, notifications, and steps for response escalation, monitoring and stand down.

The Oil Spill Monitoring Plan (OSMP) outlines environmental monitoring that may be implemented in the event of an oil spill to the marine or coastal environment. Information from oil spill monitoring enables the Incident Management Team (IMT) to make informed decisions regarding response options. Oil spill monitoring provides the principle tools for determining the extent, severity and persistence of environmental impacts from a hydrocarbon spill and associated response and/or remediation activities.

2. Overview of Emergency Oil Spill Response Strategies

In an oil spill event, response options and tactics employed will vary depending on a number of factors related to the specific spill incident including: oil types, volumes, location of spill and whether it is a discrete spill or an ongoing flow.

The response options for the Bass Strait are listed below:

- Source Control;
- Surveillance and Monitoring;
- Application of Dispersant;
- Containment & Recovery (Offshore and Nearshore);
- Shoreline Protection and Clean-up; and
- Oiled Wildlife Response.

In-situ burning was considered however has not been included as a viable response strategy as:

- This response strategy is not approved as part of the national plan
- This response strategy has not been used previously in Australia
- Potential issues with local community and stakeholder engagement due to visual amenity

An effective response strategy may require a combination of different response options and may be scaled up or down depending on the oil spill event.

This Volume details the following information for each response option:

- Description of Response;
- Assessment of Environmental Impacts caused by Response Activities; and

- Assessment of required capability.

Environmental Performance Outcomes (EPOs), Standards (EPSs) and Measurement Criteria (MC) have been identified and put in place to ensure environmental impacts from response activities are acceptable and reduced to as low as reasonably practicable (ALARP).

In addition, EPOs, EPSs and MC have been identified to ensure resources remain current and available to respond to an oil spill event.

The EPOs, EPSs and MC are detailed in Volume 4 of the EP for emergency response capability and in Appendix C of the OPEP for oil spill response. These will be monitored and reported as per the implementation strategy.

2.1 Environmental Impact Assessment of Oil Spill Response

All oil spill response activities are implemented with the aim of reducing the overall environmental impact of the spill however, each activity in itself may also impact the environment, therefore it is important to understand impacts, assess the level and acceptability of impacts, and reduce impacts to ALARP.

This volume addresses assessment and evaluation of the consequence of mobilising the response strategies in the Bass Strait, which considers specific environmental aspects (Section 2.1.1) and receptors in the Bass Strait environment.

The environmental impact assessment of each response option has been undertaken in accordance with the following sections which can be found in Volume 2

- Environmental Impact Assessment (including assessment of consequence)
- Demonstration of ALARP
- Demonstration of Acceptability

The environmental receptors that may be impacted in a spill scenario have been described in the Description of Environment Volume 1 and summarised in the impact tables below.

2.1.1 Environmental Aspects

After identifying and describing the possible response options, an assessment was carried out to identify environmental receptors and potential interactions between the response activities and the receiving environment. The environmental receptors identified as occurring in the area are described in the Description of Environment Volume 1. The environmental aspects have been identified for each oil spill response option and are shown in Table 2-1.

Based upon an understanding of the environmental aspects, potential impacts were defined and ecological and social receptors identified enabling a systematic evaluation to be undertaken. Many aspects align with those already described in the activity specific Impacts and Risks Volume (i.e. Volume 2, 2a, 2b etc.) such as aspects associated with vessels, therefore this volume only evaluates aspects and impacts that are unique to oil spill response activities.

Table 2-1 Applicable Environmental Aspects

Environmental Aspect	Response Strategies	Environmental Impact Assessment
Vessel related aspects		
Emissions to Air (as a result of support operations)	• Source Control • Monitoring and Surveillance • Dispersant Application • Containment and Recovery • Shoreline Protection and Clean-up	Vessel and helicopter impacts are assessed within Volume 2.

Environmental Aspect	Response Strategies	Environmental Impact Assessment
	• Oiled Wildlife Response	
Physical Interaction - Other Marine Users	• Source Control • Monitoring and Surveillance • Containment and Recovery • Shoreline Protection and Clean-up • Dispersant Application	Vessel and helicopter impacts are assessed within Volume 2.
Planned Discharge – Treated Bilge	• Source Control • Monitoring and Surveillance • Dispersant Application • Containment and Recovery	Vessel impacts assessed in Volume 2.
Planned Discharge - Deck Drainage	• Source Control • Monitoring and Surveillance • Dispersant Application • Containment and Recovery	Vessel operations impact assessment in Volume 2
Planned Discharge - Food waste	• Source Control • Monitoring and Surveillance • Dispersant Application • Containment and Recovery	Vessel impacts assessed in Volume 2.
Planned Discharge - Sewage and Greywater	• Source Control • Monitoring and Surveillance • Dispersant Application • Containment and Recovery	Vessel impacts assessed in Volume 2.
Other Aspects		
Planned Discharge – Cement	• Source Control	Impact assessment for drilling a relief well within this volume.
Planned Discharge - Drilling Muds & Cuttings	• Source Control	Impact assessment for drilling a relief well within this volume.
Planned Discharge - Operational Fluids (surface and subsurface)	• Source Control	Impact assessment for drilling a relief well ~~/ capping stack installation~~ within this volume.
Physical Presence - Seabed Disturbance	• Source Control	Impact assessment for drilling a relief well ~~/ capping stack installation~~ within this volume.
Sound Emissions	• Source Control	Impact assessment for drilling a relief well within this volume

Environmental Aspect	Response Strategies	Environmental Impact Assessment
Planned Discharge of Dispersant (subsea and surface)	• Dispersant Application	Impact assessment within this volume.
Socioeconomic (fisheries, tourism, culture)	• Dispersant Application • Containment and Recovery • Shoreline Protection and Clean-up • Oiled Wildlife Response	Impact assessment within this volume.
Water quality – from decanting	• Containment and Recovery	Impact assessment within this volume.
Physical Presence - Interaction with Fauna and Flora	• Dispersant Application • Containment and Recovery • Shoreline Protection and Clean-up • Oiled Wildlife Response	Impact assessment within this volume.
Physical Presence - Sensitive and protected areas and parks	• Dispersant Application • Containment and Recovery • Shoreline Protection and Clean-up • Oiled Wildlife Response	Impact assessment within this volume.
Waste Management and Secondary Contamination	• Dispersant Application • Containment and Recovery • Shoreline Protection and Clean-up • Oiled Wildlife Response	Impact assessment within this volume.

2.2 Assessment of Oil Spill Response Strategies and Required Capabilities

Oil pollution preparedness and response arrangements should be commensurate with the identified risk and be fit for purpose, performance based, adaptable, scalable, sustainable, and clearly identify roles and responsibilities. All necessary arrangements to support timely response to foreseeable oil pollution emergencies must be in place prior to an activity commencing, and be maintained for the duration of the activity.

As per the IPIECA & OGP (2013) guidelines, the results from the spill modelling and impact assessment of the worst case discharge scenarios (see Volume 2) provide important input related to the likelihood of different spill scenarios, the ecological and socio-economic consequences of the scenarios, and the likelihood of exposure and oil volumes in geographical areas. Such information supports response planning analysis including NEBA, establishing response strategies and assessing resource needs across all response tiers.

Assessment of Oil Spill Response Strategies aims to identify:

- Viable strategies for delivering a response with the greatest net environment benefit

- Tactical measures required to implement the identified response strategies, considering technical, practical and safety factors
- Tiered resources required to mount the tactical measures and achieve an effective and realistic response

In order to address these items, Esso engaged AMOSC to conduct a detailed review of the selected worst case discharge scenarios in order to establish:

- Response strategies and required capability to respond to each worst case discharge scenario;
- Resource and personnel requirements for mobilisation and implementation of each response strategy;
- Consideration of resources and personnel for mobilisation and implementation of applicable Tactical Response Plans (TRPs); and
- Assessment of the availability of resources from Tier I, II, III equipment stockpiles.

The results from the AMOSC assessment have been used to generate a summary of resources required, resources available and expected timeframes to mobilise the personnel and equipment for each response option within this Volume.

2.2.1 Response Strategies

For each worst case discharge scenario, a full range of response strategies were considered. Strategies which were not viable (e.g. due to oil type or proximity to sensitive receptors) were identified. The details of response strategies applicable to each worst case discharge scenario can be found in OPEP Appendix D – Quick Reference Information.

Note that these are the proposed response strategies based on the available spill response modelling information. Actual response strategies implemented will be decided using the process described in Section 2.3 and in consultation with relevant state agencies. Guidance will be sought from relevant state agencies as to external factors which may influence the implementation of planned response strategies (e.g. natural disasters, pandemics).

2.2.2 Resource Requirements and Timeframe

Resource requirements were determined for each response strategy applicable to each worst case discharge scenario. Resource and personnel requirements are determined based on modelling outputs which indicate the location and intensity of the impact. Both deterministic and stochastic modelling was referenced to understand the overall resource requirements and where these resources may need to be located.

Considerations for resource requirements for each response strategy are outlined in Table 2-2.

Table 2-2 Considerations of resource requirements for response strategies

Response Strategy	Considerations for resource requirements
Surveillance and monitoring	Time to shoreline impact Location and type of oil
Dispersant Application	Type of oil Location of spill in proximity to sensitive receptors Surface oil loading
Containment and recovery	Type of oil Location and loading to sensitive receptors Surface oil loading
Source control	Well and facility design Reservoir characteristics Release rates

Response Strategy	Considerations for resource requirements
Shoreline protection and clean-up	Time to shoreline impact Type of oil Shoreline loading Geographical distance of impact Location and loading to sensitive receptors Shoreline characteristics
Oiled wildlife response	Time to shoreline impact Type of oil Shoreline loading Potential for protected species to be located in the area

2.2.3 Assessment of required resource availability

An assessment of required resource availability has been completed based on the greatest requirements and the fastest required response time. For example, the MLA spill scenario has the greatest surface volume of oil and requires the largest volume of dispersant, therefore, resources for dispersant application have been determined based on this scenario. Details of which scenario is relevant to assessment of resource availability for each response strategy is outlined in Table 2-3. The assessments can be found in the relevant sections of this Volume 3.

Resource needs were assessed against resources available using a tiered response model, i.e. Tier 1 – Esso; Tier 2 – AMOSC; Tier 3 - National Plan / international resources to identify any gaps in capability. State owned equipment was not considered in this assessment and so provides additional capability.

A summary of the required capabilities is included in the relevant Quick Reference Guides (see OPEP Appendix D – Quick Reference Information).

Table 2-3 Applicable WCDS to Response Strategy resource requirements

Response Strategy	Relevant WCDS	
	Resources	Timeframe
Surveillance and monitoring	Applicable to all scenarios	
Dispersant Application	MLA	MLA
Containment and recovery	MLA / TNA	MLA
Source control	Specific to parameters of relevant scenario	
Shoreline protection and clean-up	SHA[1]	SHA
Oiled wildlife response	Applicable to all scenarios	

2.2.4 Demonstration of ALARP

An ALARP assessment has been completed to confirm that risks continue to be reduced to ALARP and all alternative options to meet resource requirements have been considered. Additional, alternative or improved controls considered but not adopted have also been included in the ALARP assessment.

[1] Note that the SHA well was abandoned in October 2020. However the modelling for this 'workover' discharge scenario was used to represent an oil spill close to shore

This ALARP assessment applies an 'Engineering Risk Assessment' in which a comparative assessment of risks, costs, and environmental benefit is conducted (OGUK, 2014). The cost–benefit analysis shows the balance between the environmental benefit and the cost of implementing the identified measure.

2.2.5 Ongoing monitoring and maintenance of capability

To ensure risks continue to be reduced to ALARP throughout the lifetime of the activity, performance standards and outcomes have been established to monitor response capability and ensure it is maintained.

For each response strategy, all activities have been provided a standard of performance and a performance outcome. These EPOs and EPSs will be monitored in accordance with the relevant measurement criteria (e.g. through tests and drills or validation of agreements). Refer to Volume 4 for further details.

If external factors are identified to have a potential to impact spill response capability (e.g. natural disasters, pandemics) a review of available capability against required capability will be completed to ensure risks continue to be reduced to ALARP. The management of change process will be used to make required changes or updates to capability, if required.

2.2.6 Selection of Protection Priorities

To inform prioritisation and implementation of response strategies in the event of an incident, resources at risk have been identified for each worst case scenario. These are listed in the relevant Quick Reference Guides. Protection priorities are selected based on:

- sensitivity and predicted consequence (as assessed in Volume 2)
- protected / actionable areas
- minimum time to exposure
- feedback from stakeholder engagement

In the event of an incident, the NEBA process (refer to Section 2.3) will be applied to the protection priorities defined in the Quick Reference Guides to assist in planning the response.

2.3 Net Environmental Benefit Analysis

A process known as Net Environmental Benefit Analysis (NEBA) considers the advantages and disadvantages of oil spill response options in terms of their respective impacts on the environment. NEBA recognises that oil spill response activities have the potential to cause environmental impacts but may be justifiable due to overriding benefits and/or the avoidance of further impacts. The NEBA process can be applied to offshore and nearshore spill response, and to shoreline cleanup. An effective Net Environmental Benefit Analysis is a three-step process (Table 2-4).

The Esso NEBA process has been developed using guidance documents *Response Strategy Development Using Net Environmental Benefit Analysis (NEBA)* (IPIECA, 2015) and *Guidelines on implementing spill impact mitigation assessment (SIMA)* (IPIECA, 2017).

Table 2-4 Steps of the NEBA process

Step	Activities
1	Identify and prioritise an area's ecological, socioeconomic, and cultural resources according to environmental sensitivity.
2	Evaluate feasible response options and compare them to each other in addition to the option of natural recovery in order to define environmental benefits and drawbacks for all options.
3	Select the response option or combination of options that result in the greatest environmental benefit and/or least adverse effects on key resources.

2.3.1 Identifying and categorising sensitivities

Esso has undertaken a 'preparedness NEBA' which is essentially a draft of Step 1 & 2 of the NEBA Process (Table 2-4). This tool has identified resources at risk in over 40 geographic areas in an oil spill event which are located within the Bass Strait Described Area (DA) (refer to Volume 1). The resources identified span Victoria, Tasmania, New South Wales and Queensland.

The protection priorities defined in the Quick Reference Guides and the preliminary preparedness NEBA can be referenced in the event of an incident and used as a template during the response. In the event of an incident, it will be necessary to confirm the priorities are current and supported by stakeholders, and check the response strategies are indeed feasible given the specifics of the situation.

Each resource at risk has been subdivided further into resource types e.g. sandy beach, shipwrecks, fisheries, estuaries, rocky shores etc. Each of these resource types has been allocated:

1. Intrinsic Protection Priority (IPP)
2. Spill Impact Ranking; and (SIR)
3. Protection Priority Ranking (PPR).

The Intrinsic Protection Priority is calculated through:

- Irreplaceability / Significance of a Resource (Navigatus 2011)
- Vulnerability of a resource to oiling (NOAA ESI)
- Influence (criticality to human beings, ecosystems or their components)

The Spill Impact Ranking is determined based on the following impacts:

- Time before exposure;
- Duration of exposure;
- Size/scale;
- Intensity;
- Surface thickness;
- Dissolves aromatics; and
- Entrained hydrocarbons.

The IPP and the SIR are combined to give an overall PPR.

In a spill incident, the preparedness NEBA will be updated to reflect overall incident specific PPR for each resource at risk. This is achieved by:

- Determining SIR using data from incident-specific trajectory modelling; and
- Review of the IPP with stakeholders who have current and local knowledge of the resource areas.

Once this has been completed, the NEBA can be updated to select response strategies to protect the highest priority resources at risk.

2.3.2 Evaluate feasible response options

A summary of the outcomes of potential response options for each hydrocarbon type i.e. diesel, light crude and condensate is provided in the OPEP. The preparedness NEBA details the pros and cons for each response strategy based on each resource type, taking into account the impact of the response itself on the resource. The potential effects of response options (both positive and negative) are assessed compared to the 'no intervention' option and identified as:

- Proposed;
- Viable;
- Not recommended;
- Not applicable; and
- Not viable.

The potential response options for a spill have been categorised as one of the above in the preparedness NEBA for each of the resource types within each resource area. This information is summarised in OPEP Appendix D – Quick Reference Information. In an actual incident, the spill responses should be reviewed and updated to consider fluid type, safety, feasibility, timing, current and local and knowledge of the resource areas.

2.3.3 Selecting the best or a combination of response options

This step requires a range of stakeholders to reach consensus on the relative priority of the environmentally-sensitive resources and to understand the trade-offs associated with available response technologies (IPIECA-IOGP, 2015).

Two trade-off aspects are balanced in this step (i.e., protection and response, and the benefits and drawbacks of selected response options). For the former, this priority may be influenced by the ease of protection and response, recovery times, and the importance for subsistence, economic value, and seasonal changes (IPIECA-IOGP, 2015).

Once the response options and priorities have been selected, this should be reviewed by relevant IMT members and considerations to logistics, safety and resources finalised. The NEBA is an ongoing process and should be updated on a regular basis for the duration of the spill to allow for "real-time" alignment with changing field conditions and address the health of response personnel, community health, and socioeconomic considerations (e.g. beach closures). Further, these tools should be used to gain stakeholder input on local or regional priorities, expand awareness, and gain trust in the decision-making process.

Net environmental benefit should always be a key factor when making decisions on the optimum spill response options to implement.

3. Source Control

3.1 Response Option Description

Source control activities are implemented to prevent or minimise the release of hydrocarbons into the marine environment. The release of hydrocarbons may occur from one of the following scenarios:

- Operational spills (overfills, transfers and process equipment and drains system);
- Storage tank or piping leak/rupture;
- Pipeline leak/rupture;
- Well blowout (surface and subsea).

The origin and nature of hydrocarbon spill will determine the type of source control activities required and the duration of the response. Source control activities may include:

- Isolation of tanks / pipes;
- Remote Operated Vehicle (ROV) intervention;
- Well capping;
- Relief well;
- Use of the Well Kill Equipment Skid;
- Use of resources from a third party response provider (e.g. Wild Well Control);
- Pipeline isolation, depressuring and repair.

The source of the spill will be assessed and evaluated by the Emergency Response Team (ERT) and Incident Management Team (IMT) on a case by case basis. The origin and nature of the spill (wells, pipeline or vessel) and metocean conditions will influence the source control response options selected based on technical feasibility.

An advantage of Source Control:

- Stops / minimises the flow of hydrocarbons into the environment.

Disadvantages of Source Control:

- Increase in environmental impacts from response activities e.g. planned discharges; and

- Presents safety risks.

Potential source control options are detailed below.

3.1.1 Isolation of Tanks / Pipes

Isolation provides a way for separating process systems and equipment from one another and may be used to prevent flow of hydrocarbons. Many types of isolations exist on subsea infrastructure, pipelines, wells and vessels. Isolation of a pipeline is the primary source control of containing a pipeline rupture/failure.

3.1.2 Remote Operated Vehicle (ROV) Intervention

ROVs can be used subsea to inspect the condition of wellheads, pipelines and subsea equipment and have arms which may be used to manipulate valves and manually isolate equipment. Specialist ROVs can be fitted with a range of equipment including: debris clearing tools, specialist tooling, subsea dispersant spraying capabilities, cameras and cutting tools.

Note that per NOPSEMA Guidance Note GN166, vessels remotely supporting a ROV that is being used in connection with inspection, the operation of a valve and/or the recovery of debris are not required to have a safety case. Per NOPSEMA Guidance Note GN166, if other activities are undertaken where a vessel is subject to the Australian Offshore Petroleum Safety Legislation, vessels will comply with duties of an operator and safety case.

3.1.3 Well Capping Stack

A “capping stack” is a piece of equipment that is placed over the blown-out well as a “cap.” Its purpose is to stop or redirect the flow of hydrocarbons, establishing a barrier to the marine environment. Once subsea, the capping stack is installed on the wellhead/subsea BOP to stop flow. The capping stack provides a safe barrier until the well can be permanently sealed. This option will require the use of a Construction Support Vessel (CSV) to install the capping stack.

A well capping stack has limited applicability on subsea facilities. OSRL’s offset capping stack system is limited due to minimum depth requirements (>75 m) and long mobilisation times. As described in Volume 2, Section 6.7.6, use of a capping stack is not technically feasible for any producing facilities and is not considered a viable response option.

3.1.4 Well Kill Equipment Skid

The Well Kill Equipment Skid can be used for bullhead killing or lubricating production wells in the event of a critical well failure. The dedicated Well Kill Equipment Skid is a standalone hydraulic / diesel drive unit which requires minimal platform facility support. The Well Kill Equipment Skid is stored at BBMT when it is not in use offshore.

Use of the platform based well kill equipment skid is accounted for in platform specific safety cases as part of the Well Kill Contingency Plan.

3.1.5 Third Party Well Control Equipment

In the event of a loss of well control in which flowrates are too great to be able to use the Well Kill Equipment Skid, but not great enough to warrant drilling a relief well, resources from a third party well control can be used to control a loss of containment from the well (e.g. Wild Well Control).

3.1.6 Relief Well

A relief well is constructed like a standard well, and is directionally drilled to intersect the original well to allow specialised fluids to be pumped into the well to overcome reservoir pressure and stop the flow of the original well.

3.1.7 Pipeline depressuring and watering out

Pipelines can be depressured and watered out to reduce the flow of hydrocarbons released from a pinhole. Watering out pipelines replaces hydrocarbons with produced water and reduces the volume of hydrocarbons released to sea.

Pipeline depressuring procedures are in place for each pipeline which provide guidance on how to safely depressure a pipeline at the relevant end and start platforms. Watering out procedures are also available.

3.1.8 Pipeline repair

Pipeline repair activities will be dependent on the type of initiating event and the feasible engineering solutions to repair the hole. Repairs to stem the flow of hydrocarbons would be completed using ROV from a vessel and may require the use of:

- Cap
- Plug
- Clamp
- Repair sleeve

Caps or plugs may be feasible for use to repair a pipeline after rupture however are less likely to be feasible given the difficulty in installation over a large area.

Once the hydrocarbon flow has been stemmed (or the pipeline pressure has reached equilibrium with the water if repair is not feasible), the pipeline will be repaired to reinstate production. For pinhole leaks and minor holes this could involve operation with the cap/plug/clamp/sleeve in place.

For a full rupture, a DSV with divers or a construction or pipe lay barge fitted with a dive spread will be required. This would need to mobilise from SE Asia or Europe and would likely need a number of regulatory documents prepared including a safety case, a dive safety management system and a dive project plan. Repair time is estimated to be a minimum of 3 months. Note that this is not considered a source control response option as repair of the pipeline to reinstate production will not reduce the volume of hydrocarbon released.

3.1.9 New Technologies under investigation

ExxonMobil continues to study new offshore drilling technologies including ways to mitigate the potential impacts of an uncontrolled flow of hydrocarbons to the environment for a well incident (LOWC). The following strategies are not proposed to be use as part of this Environment Plan but demonstrate ExxonMobil's commitment to continually improving knowledge and technology for source control.

- **Seawater Injection Method (SWIM**) (Jain, Nedwed, Kulkarni, Mitchell, & Meeks) utilises seawater pumped at a high rate into a failed and leaking blow out preventer (BOP) to generate enough back pressure to overcome reservoir pressure and stop the flow of oil and gas.
- **Rapid Crosslinking Polymer Injection** (Nedwed, et al., 2019) is a method that mixes monomers and a catalyst that causes a rapid polymerisation reaction, resulting in a stable solid. The reaction can occur under extreme temperatures and pressures and can withstand significant contamination from other fluids and solids.

3.2 Environmental Impact Assessment of Source Control Response

Many environmental aspects associated with implementing source control activities (e.g. aspects associated with vessels, ROV and subsea installation) apply to multiple activities and are assessed in Volume 2. Environmental aspects associated with drilling a relief well ~~and capping stack~~ are assessed below. These include:

- Physical Presence – Seabed disturbance;
- Planned Discharge – Cement;

- Planned Discharge – Drilling muds and cuttings; and
- Sound Emissions.

Further assessment of the acceptability of these impacts in an oil spill response context and controls identified for minimising the environmental impact of mobilising a source control response are described below.

Table 3-1 Environmental Impact Assessment of Source Control Options

Environmental Aspect:	Impact Assessment	Consequence Level
Relief well drilling		
Physical Presence – Seabed Disturbance	Smothering and alteration to benthic habitats can occur as a result of seabed disturbance. The type of damage that could be sustained due to smothering may include destruction of habitat. Benthic habitats and communities within the Bass Strait show natural small scale variation, however the area is mostly considered homogenous. Studies conducted by Esso (Cardno, 2019) demonstrate similarities in taxa but variation in composition between different sites. Seabed disturbance from relief well drilling activities will be limited to close proximity to existing infrastructure, and typically in areas which have previously been disturbed during installation of infrastructure. Benthic habitats and communities within the Operational Area show natural small scale variation, however, are mostly homogenous, with no particular areas of value or sensitivity. It is possible that activities will produce a slight alteration of the local habitat and community structure due to the small amount of changed substrate in an area of uniform soft sediments; however the naturally homogenous nature of the habitats and communities in the Operational Area will result in quick recovery, and no long-term changes to ecosystem are expected. Any impacts will be inconsequential or have no adverse effects. No additional controls identified.	IV
Planned Discharge – Cement	Impacts to ambient water quality from planned discharge of cement will be highly localised and temporary, with turbidity and chemical toxicity impacts quickly ceasing following discharge. Any impacts will be inconsequential or have no adverse effect, and impacts to pelagic organisms (such as plankton, fish, and marine fauna) are not expected. Once cement has hardened, the sediment quality will be permanently changed. Any impacts to ambient sediment quality will be inconsequential or have no adverse effect and impacts to benthic habitats and communities are not expected. No additional controls identified.	IV
Planned Discharge – Drilling muds and cuttings	Chemicals will be discharged to the marine environment resulting in a change in water quality. Due to the high energy marine environment, discharges will quickly dissipate. Impacts to ambient water quality will be localised and temporary, and any impacts will be inconsequential or have no adverse effect. Prior to discharge the chemicals will be assessed using the Esso Chemical Discharge Assessment Process (described as part of the Implementation Strategy in Volume 4) which uses the OCNS ranking in conjunction with toxicity, biodegradation and bioaccumulation data to determine potential impacts to the environment and acceptability of planned discharges. No additional controls identified.	IV
Sound Emissions	Gales (1982), cited in NCE (2007), reports that underwater sound measured from fixed drilling platforms did not exhibit markedly different characteristics from those engaged in production, and that none of the measured sound could be directly related to the mechanical action of the drill bits. It is therefore believed that most sound associated with drilling is created by the operation of the rig itself.	IV

Environmental Aspect:	Impact Assessment	Consequence Level
	No additional controls identified.	

Acceptability of Environmental Impact from Source Control

Factor	Demonstration Criteria	Criteria Met	Rationale
Principles of Ecologically Sustainable Development (ESD)	No potential to affect biological diversity and ecological integrity.	✓	All aspects related to source control activities, including EPO's, EPS's and controls have been detailed in Volume 2 or have been evaluated as having the potential to result in a Level IV consequence.
	Activity does not have the potential to result in serious or irreversible environmental damage.	✓	All oil spill response activities are implemented with the aim of reducing the overall environmental impact from a spill incident. Source control activities are implemented to stop the flow of oil and minimise safety risks and environmental damage. Impacts associated with source control are offset by the broader positive effects of reducing the impact of a spill incident on coastal and marine sensitivities and socio-economic receptors (e.g. fishing, tourism).

Legislative and Other Requirements	Legislative and other requirements have been identified and met.	✓	• The Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009 (OPGGS(S)) requirements for NOPSEMA approved facility Safety Case.
			  • Protection of the Sea (Prevention of Pollution from Ships) Act 1983.
			  • Navigation Act 2012.
			  • Marine Order 96 (Marine pollution prevention – sewage) 2013.
			  • Marine Order 95 (Marine pollution prevention - garbage) 2013.
			All well specific source control activities will have an approved WOMP and comply with:
			  • Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011.

Internal Context	Consistent with Esso's Environment Policy.	✓	Proposed control measures are consistent with Esso's Environment Policy, in particular, to "comply with all applicable environmental laws and regulations and apply responsible standards where laws and regulations do not exist".
	Meets ExxonMobil Environmental Standards.	✓	Proposed controls meet the requirements of the ExxonMobil Drilling Emergency Preparedness and Response Manual.
	Meets ExxonMobil Operations Integrity Management System (OIMS) Objectives.	✓	Proposed control measures meet: • OIMS System 6-5 objective to identify and assess environmental aspects; significant aspects are addressed and controlled consistent with policy and regulatory requirements; and

Factor	Demonstration Criteria	Criteria Met	Rationale
			• OIMS System 8-1 objective to clearly define and communicate OI requirements to contractors. • OIMS System 10-2 objective to ensure effective response to emergencies and business disruptions that threaten the safety, security and health of the public, contractors and employees, the environment, asset integrity, and critical business operations
External Context	Stakeholder concerns have been considered / addressed through the consultation process.	✓	No specific stakeholder concerns have been raised.

Table 3-2 ALARP Demonstration of Environmental Impacts from Source Control

ALARP Decision Context and Justification	Decision Context A. Source control equipment and resources (ROVs, ~~capping stacks~~, vessels and rigs for relief well drilling) are standard practices that have been accepted for use in the Australian and International Offshore Petroleum Industry in the event of a hydrocarbon spill. Impacts associated with source control activities are well understood and source control response activities have been initiated and managed by industry previously. Source control activities are aligned with company and partner values. Good Practice control(s) have been identified to ensure environmental impacts associated with implementing this response are reduced to ALARP, these controls will be implemented in a response scenario and have been included in the OPEP. Esso believes ALARP Decision Context A should apply.		
Good Practice	**Adopted**	**Control**	**Rationale**
Vessel compliant with MARPOL Annex I, IV, V and VI as appropriate to vessel class.	✓	Vessel Requirements.	The vast majority of commercial ships are built to and surveyed for compliance with the standards (i.e. Rules) laid down by classification societies. The role of vessel classification and classification societies has been recognised by the International Maritime Organisation (IMO) across many critical areas including the International Convention for the Safety of Life at Sea, (SOLAS), the 1988 Protocol to the International Convention on Load Lines and the International Convention for the Prevention of Pollution from Ships (MARPOL).
AMSA JRCC notified before operations commence to enable AMSA to distribute an AUSCOAST warning.	✓	Pre-start Notification.	Under the Navigation Act 2012, the Australasian Hydrographic Society is responsible for maintaining and disseminating hydrographic and other nautical information. Details for AUSCOAST warning will be provided to the JRCC (24<48 hours) prior to commencing operations.
All planned drilling discharges are evaluated in accordance with the Chemical Discharge Assessment Process.	✓	Chemical Discharge Assessment Process.	All cements, drill fluids, additives and/or their components planned for discharge are evaluated as acceptable.

Cuttings are treated to reduce Residual Oil on Cuttings (ROC).	✓	Solids Control Equipment.	It is industry standard practice to remove Non Aqueous Fluid (NAF) muds from cuttings using a combination of shale shakers and/or cuttings driers to minimise the residual oil on cuttings.

3.3 Capability Assessment of Source Control

A detailed capability assessment has been undertaken to ensure that Esso has access to sufficient resources to complete source control activities in a timely manner.

This section summarises outcomes of the capability assessment.

Table 3-3 Source Control Resource Availability

Activity	Resource Required	Resource Availability	Expected Timeframes
Specialist ROV	1 x ROV for subsea well pipelines intervention / SFRT and surveillance.	Resource Agreements in place with ROV specialists.	Estimated 5 days from call out request to arrival in Victoria.
Construction Support Vessel (CSV)	1 x CSV to assist in source control activities: Specialist ROV subsea well /pipelines interventions and surveillance Deployment of SFRT	Resource A construction support vessel with a current Australian safety case sourced from the Australasian region.	Estimated 32 days from spill occurring to arrival in field.
Relief Well	1 x rig per relief well.	Resource A rig will be mobilised from the Australasian region.	Estimated 98 days to drill the relief well.
Well Kill Skid	1 x well kill skid (including all relevant equipment as defined in the response plan)	Resource A well kill skid will be mobilized from BBMT or platform. Personnel Trained wellwork personnel available to operate wellwork skid	The well kill skid can be at the platform within 48 hours with appropriately trained personnel (24 hour pack up time and moved on the next available boat)
Third party well control equipment	Specialised well control equipment	Resource Agreement with Wild Well Control	Estimated time to contain well release incident is 14 days
Pipeline de-pressuring and watering out	1 x Competent operators on relevant platform	Personnel Trained personnel available to operate facilities	As soon as practicable once location of spill has been confirmed
Pipeline repair	Pipeline repair equipment Specialist ROV equipment (as above)	Resource Agreements in place with pipeline repair equipment specialists Agreements in place with ROV specialists	Available within 45 days

Table 3-4 Source Control Capabilities

Good Practice	Adopted	Control	Rationale

Established Incident Management Team.	✓	Esso Incident Management Team (IMT).	Esso's IMT includes trained personnel able fulfil Incident Commander, Operations Section Chief, Planning Section Chief, Logistics Section Chief, Safety Officer, Source Control Branch Director and Environmental Unit Lead roles.
Pre-arranged agreement with ROV provider.	✓	Agreements with ROV providers.	ExxonMobil's global agreements provides Esso with access to ROVs.
For Rig Activities: Identification of suitable support vessels and their location prior to the commencement of rig activities.	✓	Support vessel identification process.	Support vessel identification process enables understanding of the availability of suitable vessels which may reduce response time. In the event that a vessel safety case must be revised to complete the activities, Esso will work with vessel contractors to revise and resubmit the vessel safety case within one week of the incident occurring.
Pre-arranged access to Subsea First Response Toolkit (SFRT).	✓	Agreement with AMOSC for SFRT.	The agreements with AMOSC provide access to SFRT designed with the following capabilities: Survey and provide a detailed image of condition of subsea infrastructure Ability for subsea intervention
Ability to access drilling rigs in an emergency event.	✓	MoU with APPEA.	APPEA Memorandum of Understanding (MoU) states that signatories will make best endeavors to make drilling units available for transfer between operators when requested for emergency response.
Existing arrangements with source control contractors	✓	Agreement with Wild Well Control	Agreements with Wild Well Control provide access to specially trained personnel and equipment to assist in the event of a LOWC.

Table 3-5 Consideration of Additional/ Alternative/ Improved Capability for Source Control

Additional, Alternative, Improved Controls	Benefit	Cost / Feasibility	Adopted
Pre-drilling top holes	This option may result in a reduction of 1-2 days for drilling a relief well, however due to the uncertainly of the location and trajectory it is unknown if the top hole could get utilised in specific spill scenarios. This option may result in unnecessary environmental impacts, including: • Discharge drill cuttings; • Discharge of chemicals; • Discharge of muds; and • Benthic habitat disturbance.	The position of a relief well vary in location and trajectory according to the actual conditions at the time the loss of containment event occurs. Limited reduction in days (potentially 1-2), this equates to approximately 2% of the time it would take to drill a relief well.	Not adopted.

Additional, Alternative, Improved Controls	Benefit	Cost / Feasibility	Adopted
Standby rig during drilling activities	A rig on standby may reduce the time required to drill a relief well.	Significant costs are associated with having a standby rig. Given the high potential cost, implementing this control measure is considered grossly disproportionate, given that the source control event has an extremely low likelihood of occurrence.	Not adopted.
Purchase and have available pipeline repair equipment locally	Having pipeline repair equipment available locally may reduce the time taken to repair a pipeline and reduce the overall volume of oil released.	Pipeline repair equipment to be used is specific to the type of pipeline failure and must be determined at the time incident. Significant cost associated with having access to a wide variety of pipeline repair equipment.	Partially adopted. Some pipeline repair equipment for higher likelihood scenarios (e.g. clamps for pinhole leaks) are available locally.

4. Surveillance and Monitoring

4.1 Response Option Description

Surveillance and monitoring activities are essential in an oil spill response strategy to characterise and quantify volumes and determine the movement of the slick. This information is fundamental to mobilising an effective oil spill response strategy and critical in determining the scale and nature of the oil spill incident.

To understand the scale and fate of the oil, the spill should be observed as soon as possible and monitored throughout the response until the decision has been made to stand down.

Advantages of Surveillance and Monitoring:

- Validate trajectory and weathering models;
- Determine effectiveness of response techniques; and
- Outputs will be used to guide decision making on the use of other monitoring or response options.

Disadvantages of Surveillance and Monitoring:

- Increase in environmental impacts from response activities e.g. vessels; and
- Increase in safety risks.

A variety of surveillance and monitoring techniques can be used to gather information required to support the ongoing response. These may include:

4.1.1 Aerial and/or vessel observation

Aerial and vessel observation provides the IMT with real time data of magnitude, direction of travel, and visual characteristics of surface oil. This information can be used in response planning and forming the incident specific NEBA.

4.1.2 Computer-based modelling software

Computer software can generate maps that show predictions for the path of the oil spill. It can also forecast the effects that currents, winds, and other physical processes have on the movement of oil in the ocean. This information can be used in response planning and the incident specific NEBA.

4.1.3 Utilisation of satellite tracking buoys

Satellite tracking buoys provide real time current data to use to predict forecasts of surface behaviour of the oil and direction of travel.

4.1.4 Remote sensing from aircraft and/or satellites

Airborne remote sensing equipment supplements visual observations by using sensors which detect radiation outside of the visible spectrum.

Satellite imagery can provide real time imagery over large areas and assist with determining the movement of the slick and determining response activities

4.1.5 Water quality and oil sampling

Water sampling will confirm the properties of oil. These details can be inputted into computer based modelling for increased accuracy and assist with determining response activities.

When oil enters the marine environment, a proportion of it will float and spread out on the sea surface where it will be influenced by the wind and ocean currents. In some situations, where natural dispersion and weathering processes are considered the most appropriate response, surveillance and monitoring may be the primary response strategy.

In this case, the response will monitor the oil as it undergoes the natural weathering processes of evaporation and dispersion, in which wind and wave action breaks the oil into small droplets in the water column increasing bioavailability and allowing the oil to be naturally degraded. Higher levels of surveillance such as vessel/aircraft surveillance, oil spill trajectory modelling and deployment of satellite tracking drifter buoys are options to be considered for Level 2/3 spills given the nature and scale of the spill risk.

4.2 Environmental Impact Assessment of Surveillance and Monitoring Response

Environmental aspects associated with surveillance and monitoring were identified and evaluated in Table 4-1. All associated environmental impacts have been described and assessed within Volume 2 and no additional environmental impacts have been identified as a result of surveillance and monitoring response activities.

Table 4-1 Acceptability of Environmental Impacts from Surveillance and Monitoring

Factor	Demonstration Criteria	Criteria Met	Rationale
Principles of Ecologically Sustainable Development (ESD)	No potential to affect biological diversity and ecological integrity.	✓	All aspects related to surveillance and monitoring activities are assessed in Volume 2 and have been evaluated as having the potential to result in a Level IV consequence.
	Activity does not have the potential to result in serious or irreversible environmental damage.	✓	All oil spill response activities are implemented with the aim of reducing the overall environmental impact. Surveillance and monitoring response activities are critical in determining the scale and nature of the oil spill incident. This information is fundamental to mobilising an effective oil spill response

Factor	Demonstration Criteria	Criteria Met	Rationale
			strategy to minimise potential environmental damage from a spill incident.
Legislative and Other Requirements	Legislative and other requirements have been identified and met.	✓	The proposed control measures align with the requirements of: • OPGGS Act 2006; • Protection of the Sea (Prevention of Pollution from Ships) Act 1983; • Navigation Act 2012 – Chapter 4 (Prevention of Pollution); • Marine Order 96 (Marine pollution prevention – sewage) 2013; and • Marine Order 95 (Marine pollution prevention - garbage) 2013.
Internal Context	Consistent with Esso's Environment Policy.	✓	Proposed control measures are consistent with Esso's Environment Policy, in particular, to "comply with all applicable environmental laws and regulations and apply responsible standards where laws and regulations do not exist".
	Meets ExxonMobil Environmental Standards.	✓	There is no standard related to the Surveillance and Monitoring however the controls proposed meet the strategic objectives of the Upstream Environmental Standards.
	Meets ExxonMobil Operations Integrity Management System (OIMS) Objectives.	✓	Proposed control measures meet: • OIMS System 6-5 objective to identify and assess environmental aspects; significant aspects are addressed and controlled consistent with policy and regulatory requirements; and • OIMS System 8-1 objective to clearly define and communicate OI requirements to contractors. • OIMS System 10-2 objective to ensure effective response to emergencies and business disruptions that threaten the safety, security and health of the public, contractors and employees, the environment, asset integrity, and critical business operations.
External Context	Stakeholder concerns have been considered / addressed through the consultation process.	✓	No specific stakeholder concerns have been raised.

Table 4-2 ALARP Demonstration of Environmental Impacts from Surveillance and Monitoring

ALARP Decision Context and Justification	Decision Context A. The potential environmental aspects associated with mobilising a Surveillance and Monitoring response have been evaluated and no new impacts have been identified.

	Surveillance and monitoring response activities are standard practices that are routinely used in the Australian and International Offshore Petroleum Industry as well as many other industries. Impacts associated with surveillance and monitoring are well understood and well implemented by the industry. Good Practice control(s) have been identified to ensure environmental impacts associated with mobilising this response are reduced to ALARP, these controls will be implemented in a response scenario and have been included in the OPEP. Esso believes ALARP Decision Context A should apply.		
Good Practice	**Adopted**	**Control**	**Rationale**
Vessel compliant with MARPOL Annex I, IV, V and VI as appropriate to vessel class.	✓	Vessel Requirements	The vast majority of commercial ships are built to and surveyed for compliance with the standards (i.e. Rules) laid down by classification societies. The role of vessel classification and classification societies has been recognised by the International Maritime Organisation (IMO) across many critical areas including the International Convention for the Safety of Life at Sea, (SOLAS), the 1988 Protocol to the International Convention on Load Lines and the International Convention for the Prevention of Pollution from Ships (MARPOL).

Table 4-3 Engineering Risk Assessment

Additional, Alternative, Improved Controls	Benefit	Cost / Feasibility	Adopted
None Identified.			

4.3 Capability Assessment of Surveillance and Monitoring

A detailed capability assessment has been undertaken to ensure that Esso has access to sufficient resources to complete surveillance and monitoring activities in a timely manner. The assessment concluded sufficient resources are available within acceptable timeframes to conduct this response.

This section summarises outcomes of the capability assessment.

Table 4-4 Surveillance and Monitoring Resource Availability

Activity	Resource Required	Resource Availability	Expected Timeframe
Visual Observation - Aerial Surveillance	1x observer per aircraft. Aircraft to have 100nm range and 3 hour duration.	Resource Esso helicopters can assist in aerial surveillance. Agreement with third party to provide fixed wing aircraft. AMSA Search and Rescue Aircraft. Personnel 4x Trained spill observers provided by Esso.	Initial overflight <4 hours service requested. Trained observer <12 hours of spill occurring. Twice daily aerial surveillance. *(Note: Assumes good visibility, daylight hours and suitable flying conditions).*

Activity	Resource Required	Resource Availability	Expected Timeframe
		Supplemented by AMOSC staff, AMOSC core group and OSRL.	
Visual Observation – Vessel or Asset	An observer to conduct 2 hour watch from staffed assets.	Resource Platform /Drilling Rig /Vessel Personnel 1x Observer and /or available crew.	<2 hours, from time of spill.
Manual Oil Spill Trajectory Modelling	1x trained person.	Resource Trajectory vectoring. Relevant set of marine charts for Bass Strait. GIS mapping. Personnel IMT member trained trajectory vectoring. Internal Esso GIS mapping specialists.	<4 hours of service requested.
Oil Spill Trajectory Modelling	1x contract with specialist.	Resource AMOSC - Access to RPS modelling services. OSRL – Access to modelling services. ExxonMobil EMBSI (USA) – Access to modelling (available 24/7).	<4 hours of service requested.
ADIOS - Weathering Modelling	1x trained person.	Resource Automated Data Inquiry for Oil Spills 2 (ADIOS2) installed on IMT computers. Personnel IMT personnel trained in ADIOS.	<4 hours of the service requested.
Satellite Tracking Drifter Buoys	1x buoy available.	Resource 2x tracking buoys within 12 hours. 2x Tracking buoy available 24-48 hours.	Deployed <12 hours of spill occurring (dependent on weather conditions) (Level 2 & 3 spill).
Remote Observation Using Satellite Imagery	1x contract with specialist.	Resource AMOSC agreement with KSAT. OSRL Agreement with Radiant Solutions. ExxonMobil Geospatial Emergency Response Service (available 24/7).	Initiated <24 hours of Level 3 spill occurring.
Initial Oil in Water Sampling	1x vessel. 1x initial sampling kit. 1x contract with laboratory.	Resource Vessel and crew (Esso). Initial Sampling kits available at various Esso locations. Personnel Field Service technician.	Samples obtained <24 hours of spill occurring. Analysis initiated <24 hours of receipt in laboratory. Results <5 days.

Activity	Resource Required	Resource Availability	Expected Timeframe
		Laboratory services and experienced analyst provided by NATA accredited lab as per OSMP.	
Ongoing Oil in Water Monitoring	1x vessel. 1x sampling services contract.	Resource Vessel contractor/ crew (Esso). Sampling services via environmental consultancy. Personnel Sampling services via environmental consultancy. Laboratory services and experienced analyst provided by NATA accredited lab as per OSMP.	Samples obtained 48 hours hrs. of spill occurring. Analysis initiated <24 hours of receipt in laboratory Results within 5 days.
ExxonMobil	Personnel Trained and capable Esso IMT Regional Response Team	Available to fulfil roles in accordance with requirements and timeframes in OPEP Table 3-2. Remote support <12 hours from notification. In-country support <72 hours from notification.	ExxonMobil

Table 4-5 Surveillance and Monitoring Capabilities

Good Practice	Adopted	Control	Rationale
• Pre-arranged access to helicopters for aerial surveillance.	✓	Esso helicopter fleet.	Esso owns and operates its own helicopter fleet that can be used for surveillance and monitoring.
• Pre-arranged access to fixed wing aircrafts for aerial surveillance.	✓	Arrangement with third party for provision of fixed wing aircraft.	Arrangement with third party enables provision of fixed wing aircraft.
• Pre-arranged access to vessels for Surveillance and Monitoring activities.	✓	Support vessel.	The support vessel that is used for ongoing Esso operations can be used for surveillance and monitoring.
	✓	Agreement with third party suppliers for provision of additional vessels.	Agreement with supplier of vessel services has provision for supply of additional vessels
• Pre-arranged access to trajectory modelling capabilities.	✓	Agreement with AMOSC for trajectory modelling.	Agreement with AMOSC, and the associated service level statement, includes provision for trajectory modelling.
• Pre-arranged access to satellite tracking buoys.	✓	Esso owned tracking buoys.	Esso owns satellite tracking buoys to enable quick deployment.
• Pre-arranged access to satellite imagery	✓	Agreements in place to access satellite imagery.	Agreements in place with satellite imagery provider enables access to satellite imagery services.

Good Practice	Adopted	Control	Rationale
• Pre-arranged access to water testing services.	✓	Agreement with service provider for monitoring and sampling.	Agreement with third party service provider enables access to monitoring and sampling services.
• Pre-arranged access to personnel to support Tier III response activities.	✓	ExxonMobil Regional Response Team	ExxonMobil have a global team available to assist response for Tier III activities.

Table 4-6 Consideration of Additional/ Alternative/ Improved Capability for Surveillance and Monitoring

Additional, Alternative, Improved Controls	Benefit	Cost / Feasibility	Adopted
Night-time monitoring - infrared.	Enable night time monitoring of the location of oil on the water's surface.	Infrared may be used to provide aerial monitoring at night time, however the benefit is minimal given trajectory monitoring (and infield monitoring during daylight hours) will give good operational awareness. Safety considerations may also restrict night time operations.	Not Adopted.
Initial sampling kits available on supply vessels and rigs.	Enable rapid sampling from supply vessels and rigs	• Sampling kits on-board vessels and rigs will enable rapid sampling of the oil. • The results from the testing will provide details of the oil properties and confirm the properties of oil, assist with source identification. • Results can be used in the modelling for increased accuracy and assist with determining response activities.	Adopted.

5. Dispersant Application

5.1 Response Option Description

Dispersants enhance the rate and extent of natural dispersion in an oil spill event. The surfactants in dispersants allow wave energy to rapidly break oil slicks into small oil droplets. These droplets are pushed into the upper water column by wave action and maintained there by turbulence. The dispersed oil droplets are much more available to naturally-occurring, hydrocarbon-degrading microorganisms.

The principal ecological benefit of dispersant use is to keep oil from entering near-shore bays and estuaries, or stranding on shorelines, thereby protecting sensitive coastal habitats and the species that inhabit them. In previous oil spill incidents elsewhere in the world, it is the species in the areas near or onshore that have been most affected by an oil spill event (National Academies of Science, Engineering and Medicine, NASEM, 2019).

The mixture of solvents and surfactants that comprise typical commercial dispersants (Place et al., 2010) contain compounds with different physicochemical properties and therefore potential fates in the environment. Once introduced to open ocean waters, dispersant mixtures will be quickly diluted and subjected to degradation processes including biodegradation and photodegredation (NASEM, 2019).

For maximum effectiveness, dispersants should be applied as close to the source and as soon as possible to avoid losing the "window of opportunity". Dispersant can be applied either subsea at the source of a subsurface spill or directly to any surface slicks from aircraft or vessels.

Dispersants may be applied in a broad range of weather conditions including high winds and rough seas that may not be suitable for other strategies, e.g., mechanical containment and recovery. Dispersants are mainly amenable to certain oil types and are generally not considered to be suitable for Group I and lighter Group II oils, including diesel. The oil type and the metocean conditions (e.g. temperature, wave height, swell) will dictate the effectiveness of dispersant application.

The main objectives of dispersant application are:

- Reduce environmental impacts;
- Rapidly reduce oil toxicity through dilution;
- Enhance the natural dispersion processes;
- Enhance natural microbial biodegradation;
- Minimise impacts to shoreline habitats;
- Reduce the requirement for shoreline clean up; and
- Reduce concentrations of Volatile Organic Compounds (VOCs) at the sea surface.

The decision whether or not to use dispersants will be made after considering the potential effects of dispersed oil versus undispersed oil, i.e. after employing a Net Environmental Benefit Analysis (NEBA) process which provides a methodology for comparing the base case of no spill response to those where individual response tools (mechanical containment and recovery, subsea and surface dispersants) are considered (IPIECA, 2017). Dispersants will only be considered for use at specific locations/times where testing shows oil to be amenable and decision is supported by the spill specific conditions.

5.1.1 Surface Application

Dispersants can be applied to surface oil from vessels or aircraft. Aerial application allows wide coverage for treatment of large volumes of oil. Potential advantages include; minimal human resource, enhanced biodegradation, and ability to spray large areas in a timely manner through the use of aircraft. A potential constraint is the limited time-frame for dispersant application; there is a relatively short “window of opportunity” for treating the spilled oil before it weathers and may become too viscous, although this can vary depending on specific oil properties and environmental conditions. Aerial dispersant operations are limited to appropriate weather conditions (e.g., visibility, ceiling and winds), daylight hours, and sufficient turbulence (from waves) to mix the dispersant into the oil.

Aircrafts

Aerial application of dispersant requires aircrafts to be fitted with dispersant spraying equipment. For best effectiveness, aerial dispersant should be administered at steady airspeeds (150 kts) and low altitudes, generally 50 – 100 ft above the sea level. Aerial platforms include those available through the fixed wing aerial contract and additional aircrafts are available through OSRL.

Vessels

Vessels can be fitted with dispersant spraying equipment for surface application. For best effectiveness the dispersant should be applied to the thickest concentrations of oil, via spray arm systems or specialised dispersant spraying equipment.

5.1.2 Subsea Application

Subsea dispersant injection is the process of injecting dispersants directly into the stream of oil that is leaving the well, ideally before the oil leaves the wellhead. The process allows the dispersant to come into contact with a much greater proportion of the oil and uses the turbulent jet effect of the force of the exiting oil to mix the dispersant effectively. SSDI can be operated continuously by offshore vessels, which can locate themselves offset from the position of the well release or by using the Subsea First Response Toolkit (SFRT) located in Perth.

Subsea dispersant injection (SSDI) operations can take place continuously and are effective in ongoing spill scenarios e.g. well blow outs.

Advantages of SSDI include:

- Requires less manpower than other response options and may reduce the VOCs at the surface improving health and safety of responders;
- Delivery of the dispersant directly to the release;
- At depth, dispersed oil will be subject to greater loss of soluble components and increased dispersion than surface application;
- Subsea injection operations can take place continuously, while surface application is limited to daylight hours and favourable wind and sea state conditions.

Potential disadvantages of SSDI include the need for specialised equipment to deliver the dispersant and to monitor effectiveness, although this equipment is available from Tier 3 response organisations (NASEM, 2019).

Use of subsea dispersant is highly dependent on the specifics of the release. In the event of an incident, a number of factors will be considered to inform the use of subsea dispersant. These include:

- Release type (surface or subsea)
- Release rate
- Oil type
- Location to sensitive receptors
- Water depth
- Safety of personnel in proximity to the release location

The decision to mobilise the SFRT and to use subsea dispersant will be taken based on advice from the Source Control Branch in consultation with relevant technical, environmental and regulatory stakeholders.

ROVs

Vessels can be fitted with specialist ROVs that have SSDI capabilities for subsea dispersant application. SSDI treats oil released at the point of release which reduces the volume of dispersant required and can be applied continuously in all-weather scenarios.

5.2 Types of Dispersant Available to Esso in an Oil Spill Incident

Since the 2010 Deep Water Horizon (Macondo) spill response, the petroleum industry has invested significantly in the purchase of the most studied, modern products (Dasic Slickgone NS, Finasol® OSR 52, Corexit® EC9500A) and their placement in strategic global locations to facilitate rapid response in an event where dispersants represent a viable response option (NASEM, 2019). The Corexit products remain the most studied products available and there is a wealth of information regarding their effectiveness (high) and relative toxicity (low). As a result of this, industry continues to work toward maintaining/reinstating their status as products approved for possible use.

Several types of dispersant are available to Esso and are proposed for use during an oil spill incident. A summary of each is given in Table 5-1.

5.2.1 Dispersant Testing

Esso undertook dispersant efficacy testing on five Bass Strait crudes against two of the available dispersants (Dasic Slickgone NS and COREXIT 9500). Testing was also conducted on a third dispersant COREXIT 9527, although this is no longer available for use as it is not accepted by AMSA on the National Plan.

The testing was carried out on fresh crude, 12 hour weathered, 24 hour weathered and 48 hour weathered under Bass Strait summer and winter conditions. Each dispersant was tested at an application rate of 20:1 (oil: dispersant). A summary of the results is provided in OPEP Appendix E – Dispersant Testing Results. Key findings from the dispersant efficacy testing include:

- Testing shows that dispersant is highly effective on most types of fresh oil, but not all Esso crudes tested are amenable to dispersant;
- Non-spreading oils are considered to be non-dispersible;
- Effectiveness of dispersant decreases significantly on weathered oils;

- Once pour point of the oil is above temperature of the seawater, the dispersability rapidly drops off; and
- Dispersability of the oil generally increases at higher temperatures.

Table 5-1 Summary of dispersant stock available to Esso

Dispersant	Details	Stockpiled	AMSA OSCA Accepted	Dispersant tested on Esso Crude
Dasic Slickgone NS	Slickgone is widely used in the offshore industry worldwide and meets the requirements of the UK, French, Norwegian and Australian dispersant protocols. Extensive field trials in the UK indicate that an effective treatment rate for dispersants is approximately 1 part dispersant to 20-30 parts of oil and can be effective when applied from aircraft, vessels and directly on shorelines.	AMOSC, AMSA, OSRL	✓	✓** ✓***
Dasic Slickgone EW	Slickgone EW is the latest addition to the Dasic International product range and is exceptionally efficient on a broad spectrum of oils. It is also effective on water-in-oil emulsions (mousses) and will even delay the formation of such emulsions if applied early enough. It is highly effective at emulsifying crude oils, fuel oils and water-in-oil emulsions even at low temperatures, producing oil droplets minute enough to be retained beneath the sea surface where they are rapidly diluted by subsurface mixing and are eventually biodegraded by micro-organisms.	AMSA	✓	
Total Finasol OSR52	Finasol OSR52 provides a rapid and effective breakdown of hydrocarbons. It was the first product on the market to comply with all three major international regulations; EPA, MMO and CEDRE. It can be applied either neatly or at 10% by aircraft, boats or by hand held sprayers with backpack spray units.	OSRL	✓	
Nalco Corexit 9500A	COREXIT EC9500A contains an improved oleophilic solvent delivery system than that used in earlier formulations of Corexit. Aircraft provide the most rapid method of applying dispersants to an oil spill for aerial spraying. Corexit is a solvent-based "concentrate" dispersants, which may either be applied undiluted (neat) or sprayed in a stream of seawater. COREXIT 9500 can be used during early stages of a response and may be ~~is~~ more effective on viscous, emulsified, and weathered spills than alternative options.	Esso, BHP, AMOSC OSRL	✓	✓**

**2019 Crudes tested: Snapper, Moonfish, Flounder, West Kingfish and Halibut
*** 2012 Crudes tested: Tuna, Halibut and West Kingfish

5.2.2 Acceptance of Dispersant Application

AMSA

An oil spill clean-up agent (OSCA) is defined as a chemical, or any other substance, used for removing, dispersing, or otherwise cleaning up oil or any residual products. The Australian Maritime Safety Authority (AMSA) have products on the OSCA register which are considered to have met the requirements of acceptable practice for the National Plan.

All existing stocks of previously accepted Oil Spill Control Agents held within the National Plan (AMSA and AMOSC) inventories, as of 1 January 2012, remain acceptable for National Plan use until used or disposed of. They are listed in the OSCA Register as 'transitional OSCAs' and almost exclusively comprise the AMSA, AMOSC and Esso's pre-2012 stockpiles of dispersants

NOPSEMA

The EP submission process provides the mechanism for Esso to gain 'acceptance' for the use of location, activity or OPEP specific oil spill dispersant products and deployment strategies (e.g. surface and/or subsea application) prior to any incidents.

Any dispersant use in response to a pollution incident from an offshore petroleum activity must be carried out in accordance with an accepted EP and no additional 'approvals' are required to implement response arrangements.

State Waters

Any dispersant application within state waters (<3 nm) must be approved by the state control agency prior to use.

5.3 Environmental Impact Assessment of Dispersant Application

5.3.1 Dispersant Toxicity

Modern dispersant products (e.g., Dasic Slickgone NS, Finasol® OSR 52, Corexit® EC9500A) are a mixture of solvents and surface active agents (surfactants) with different physicochemical properties and therefore potential fates in the environment. Once released into the aquatic environment, dispersants are subject to rapid dilution, dissolution, biodegradation, and photodegradation processes (NASEM, 2019). Consequently, there is a brief time window in which marine organisms will be subject to the full toxicity of the dispersant and dispersed oil.

When a dispersant is introduced at depth by subsea injection, dispersant components will differentially dilute and dissolve, with some being retained at depth. In this situation, biota could be exposed to dilute concentrations of the more persistent and water-soluble dispersant components, such as the anionic surfactant di (2-ethyhexyl) sodium sulfosuccinate (DOSS). The US EPA benchmark for the protection of aquatic life is 40 µg/L. A study conducted by the Operational Science Advisory Team (OSAT) following the Macondo spill investigated the footprint of Corexit at sea by measuring the concentrations of DOSS. It was found that DOSS was more persistent at depth however no dispersant water quality exceedances were measured in the OSAT program (OSAT, 2010) and only one sample was found that exceeded the US EPA guideline for aquatic organisms (Gray et al., 2014). Both DOSS and the solvent used in Corexit (dipropylene glycol butyl ether) are expected to rapidly degrade following application at the cool, shallow Gippsland waters, as they are known to rapidly degrade in light (Gray et al., 2014; Glover et al., 2014), and Corexit has been shown to be microbially degraded at 5 and 20 degrees (Campo et al., 2013).

The current protocols for registering an Oil Spill Control Agent for use in Australia (described in detail by AMSA (2011)) use NATA-accredited standardised toxicity tests on a variety of taxa. These tests include lethal and sub-lethal endpoints and to be registered in Australia, the LC50 values must be greater than 10 mg/L for the tested fish larvae and crustaceans. This is considered is considered "slightly toxic" by the US EPA (Hemmer et al., 2011).

Dispersants currently used in the industry are less toxic than oil (EMSA, 2010) and recent studies have found that Corexit 9500 is not more acutely toxic in standardized tests than common household cleaning products (Word et al., 2014). All dispersants proposed to be used by Esso in the event of an incident are accepted on to the National Plan OSCA Register meaning they meet toxicology requirements for use.

CSIRO (2015) also noted that modern dispersants are much less toxic than spilled oil. However, their use can increase localised oil toxicity, but this is very short-lived due to the dilution effects and will result in much lower exposure and dosage than without dispersant use.

In laboratory experiments, dispersant components (including the solvents and surfactants) degrade rapidly, within hours to days. In field conditions, the few studies on the effects of dilution on dispersant fate and transport have shown that concentrations of dispersants reach a maximum of 5-13 ppm after surface applications and generally decrease to less than 1 ppm within minutes to hours (NASEM, 2019).

Products available today are low in toxicity and do not increase the toxicity of the dispersed oil because they are present in the water column at very low concentrations (Lessard, 2000). The toxicities of dispersants are usually lower than those of the soluble fractions of oils and this, together with the lower concentrations of dispersant in the dispersed oil, indicates that the toxicity of dispersed oil is predominantly due to the toxic components of the oil, and not the dispersant (NRC, 1989).

5.3.2 Increase in Dispersed Oil in the Water Column

The application of dispersants will increase the amount of oil that is entrained and dissolved in the water column, reducing exposure of coastal ecosystems to floating weathered oil, as well as reducing the risk of exposure of seabird and marine mammal populations to the floating oil (Bock et al. 2018; French-McCay et al. 2018; NRC 2005, 2013). It also has the potential to reduce contamination of sensitive intertidal habitats such as mangroves, coral reefs, salt marshes and sandy shores (recreational and tourist areas) through the reduction in shoreline impacts. However, in open ocean environments, the processes involved in dispersion will rapidly dilute the oil droplets and the soluble components of the oil (NRC, 2005). In fact, in deep waters, dispersants are thought to have minimal ecotoxicological effects because of dilution (NRC, 2005).

The application of surface dispersants may result in a greater risk that water column and subtidal habitats could be exposed to elevated concentrations of dispersed hydrocarbons. Surface dispersant application is usually restricted to greater than 3 nm from shorelines and in water depths greater than 10 meters. Maximum dispersed oil concentrations could reach 100-200 ppm in the top 10 meters initially, but it is expected to decrease to 1 ppm or less within 5-10 hours (Lessard, 2000).

A negative effect of subsurface dispersant injection is that the surfactants increase the bioavailability of oil components in the water column and more oil may remain at depth, potentially increasing the toxicity risk to deep-water fauna although dilution will reduce concentrations below toxicity thresholds rapidly (French-McCay et al. 2018).

Similarly, there is a potential for exposure of planktonic, pelagic, demersal and benthic organisms to increased levels of dispersed or dissolved oil components, although dilution is expected to be a significant factor (Hook & Lee, 2015).

5.3.3 Subsea Dispersant Injection (SSDI)

A variety of studies in the aftermath of the Macondo spill response in the Gulf of Mexico have shown that the dispersants that were developed for use on surface spills are also effective when applied during a subsea well response via Sub-Sea Dispersant Injection (SSDI). Research funded by the American Petroleum Institute (API) through a Joint Industry Task Force (JITF) and IPIECA/International Maritime Organization (IMO) through a Joint Industry Program (JIP) demonstrated that Dasic Slickgone NS, Finasol® OSR 52, Corexit® EC9500A are all effective at significantly reducing oil droplet size, a key measure of successful dispersant application. The work was performed at a number of independent research facilities in Europe (CEDRE, Sintef) and the US (Southwest Research Institute) and in conjunction with a number of universities including MIT and the University of Hawaii.

As a result of a reduction of oil droplet size, the surface expression of released oil is expected to be significantly reduced (NASEM, 2019), especially directly above the point of subsea release. This can help protect birds and aquatic mammals since less oil will be present in their habitats. Less surface oil will also be beneficial to response workers since there is an expectation of reduced volatile organic compounds (VOC) in the area in which they work, especially in the early stages of a response (French-McKay *et al*., 2019).

The reduction of oil droplet sizes in the water column will lead to dispersion at depth where concentrations are expected to decrease to levels well below aquatic toxicity thresholds and microbial biodegradation will be significant, even over extended periods of SSDI. A number of studies support these findings (including reports by T. Hays; R. Prince; K. Lee; D. French-McKay; NASEM 2019).

5.3.4 Impact Assessment

The application of dispersant in the event of a loss of well control and major spill will result in an increase in the proportion of spilled hydrocarbons in the water column as either dissolved or entrained oil. This has the effect of decreasing surface and shoreline loading, but increasing exposure to pelagic biota in offshore waters and possibly localised sedimentation of hydrocarbons to the seabed in the deep offshore waters.

An impact assessment has been completed to assess the impacts to receptors following the use of dispersant to mitigate a spill. The impact assessment considers the effects of increased exposure to hydrocarbons in the water column due to dispersant use and addresses any additional or reduced potential impacts from the use of dispersants, as compared to the unmitigated scenario described in Volume 2, Section 6.7.2.

This assessment has been completed based on the proposed response scenario described in Table 5-6 for dispersant application in response to the LOWC in the Northern region, as represented by the Marlin scenario (from the TRA A10 well) as described in Volume 2, Section 6.7.

This scenario has been selected as it results in the largest volume of oil spilled to surface and therefore, requires the largest volume of dispersant in response. Consistent with the assessment of dispersant toxicity described in Section 5.3.1, the impact assessment provided in Table 5-2 has been prepared based on the response scenario which results in the most oil being dispersed into the water column. Given the use of surface dispersants, this aligns with the scenario which uses the most dispersant. This being the surface and SSDI scenario described in Table 5-6.

Note that application via SSDI results in a greater volume of oil being dispersed into the water column. However, following the abandonment of SHA, TWA and BKA subsea facilities, there are no subsea oil wells producing in the Gippsland region. All producing oil wells are located on platforms and therefore, any spills from a loss of well control are assumed to occur at surface.

Remaining subsea facilities (KPA and BTW) produce gas and condensate (See Volume 2, Table 6-21). Discharge of gas with condensate is highly volatile and natural weathering processes will disperse oil and dispersant application is not considered a recommended response option. Therefore, SSDI is not considered to be a primary response option.

Through the use of surface dispersants, in-water hydrocarbon levels are likely to increase above high levels in areas predicted to be impacted by in water oil (see Volume 2, Table 6-7 and 6-8 for likelihood of impacts from LOWC) however, shoreline impacts are expected to be reduced.

Surface application of dispersant will be directed to the thickest part of the slick and to fresh oil which will be found close to the release location in water with sufficient depth to allow dilution of hydrocarbons and dispersant throughout the water column. Dispersants will only be used in Commonwealth waters, in waters of >10m depth and outside of Australian Marine Parks. Use of dispersants in State waters would only be with the approval of the State control agency.

Table 5-2 Aspect: Planned Discharge of Dispersant

Affected Receptor	**Unmitigated LOWC Consequence** (per Volume 2, Table 6-9)	**Consequence of LOWC mitigated through use of dispersant**	**Consequence Level**
Plankton	The impact to plankton is predicted to be **Level III** with potential effects on the food web recognised.	Plankton, specifically zooplankton, are vulnerable to hydrocarbons (Hook et al., 2016). Water column organisms that come into contact with oil and chemicals risk exposure through ingestion, inhalation and dermal contact (NRDA, 2012), which can cause immediate mortality or declines in egg production and hatching rates along with a decline in swimming speeds (Hook et al., 2016). Plankton are at their highest concentrations below surface waters (e.g. 60 m water depth for phytoplankton during the day) and undertake a vertical migration which would likely reduce their potential for (and duration of) exposure to dissolved hydrocarbons in the surface layer of the water column. Plankton are typically abundant in the upper layers of the water column and decline with depth. Once background water quality is re-established, plankton takes weeks to months to recover (ITOPF, 2011). Following use of dispersant, plankton are likely to be exposed to in-water hydrocarbons above the high exposure threshold along the Gippsland coastline. However, once background water quality is re-established, plankton takes only weeks to months to recover (ITOPF, 2011). Further, plankton found in open waters of the exposure zone is expected to be widely represented within waters of the wider Bass Strait region and generally across all waters in the south eastern offshore region, which aids in the re-establishment of communities. Exposure to greater concentrations of dissolved and entrained hydrocarbons due to the use of dispersants is predicted to result in short-term impacts to local plankton populations.	The impact to plankton is predicted to be consistent with the assessed LOWC scenario described in Volume 2, Table 6-9 being **Level III**.
Benthic Habitats and Communities - – Bare Substrate, Coral,	The consequence of a LOWC on benthic habitats is assessed as **Level II.**	Species residing in offshore locations are more likely to be exposed to increased ~~significant~~ levels of in-water hydrocarbons with the application of surface dispersant application depending on their water depth and location with	The consequence of a LOWC mitigated through use of dispersant application on benthic habitats is assessed as **Level II.**

Affected Receptor	Unmitigated LOWC Consequence (per Volume 2, Table 6-9)	Consequence of LOWC mitigated through use of dispersant	Consequence Level
Seagrass, Macroalgae, Subtidal Rocky Reef		respect to the spill. Impacts to deep water benthic sediments are not expected as a result of surface dispersant application. Known areas of seagrass which may be exposed to increased concentrations of dispersed oil include Corner Inlet, Lakes Entrance, Bemm River Estuary and Tamboon Inlet. There is the potential that exposure could result in sub-lethal impacts however seagrass in this region isn't considered a significant food source for marine fauna. Suitable hard substrate for macroalgal around Gabo Island and within the Bemm River Estuary may be impacted by increased concentrations of dispersed oil however are suggested to be some of the least sensitive marine species to oil exposure. Benthic invertebrate species closer to shore may be affected by increased in-water oil concentrations. Invertebrates of value (i.e. target species for fisheries) have been identified to include squid, crustaceans (rock lobster, crabs) and molluscs (scallops, abalone). While exposure can lead to impacts including mortality, recovery of benthic invertebrates exposed to in-water hydrocarbons would be expected to return to background water quality conditions within weeks to months of contact. Several studies have indicated that rapid recovery rates may occur even in cases of heavy oiling (Burns et al., 1993; Dean et al., 1998). Acute or chronic exposure, through both surface contact, and/or ingestion can result in toxicological risks. However, the presence of an exoskeleton (e.g., crustaceans) will reduce the impact of hydrocarbon absorption through the surface membrane. Other invertebrates with no exoskeleton and larval forms may be more prone to impacts from pelagic hydrocarbons. Complex assemblages (e.g. sponge habitat) or deep-water slow-growing sessile invertebrates are likely to recover much more slowly. Exposure to in-water hydrocarbons poses the greatest threat to sensitive macroalgal assemblages, specifically the Giant Kelp Forests TEC. These grow on rocky reefs from the sea floor 8 metres below sea level and deeper growing towards the sea surface. Benthic invertebrates are potentially at risk of toxic impacts of exposure to in-water hydrocarbons. While exposure can lead to impacts including mortality, recovery of benthic	

Affected Receptor	Unmitigated LOWC Consequence (per Volume 2, Table 6-9)	Consequence of LOWC mitigated through use of dispersant	Consequence Level
		invertebrates exposed to entrained hydrocarbons would be expected to return to background water quality conditions within weeks to months of contact. Several studies have indicated that rapid recovery rates may occur even in cases of heavy oiling (Burns et al., 1993; Dean et al., 1998). It is possible that injury or mortality associated with acute or chronic exposure could result in a slight alteration of the local habitat and community structure, however no long-term changes to ecosystem are expected. Offshore benthic habitats are more likely to be exposed to increased ~~significant~~ levels of in-water hydrocarbons although this is expected to be limited to very shallow waters (e.g., 10 to 50m) due to the nature of surface application. These areas of highly mobile sediment, where diversity and abundance are relatively low, will likely recover quickly.	
Fish	The consequences to fish and sharks are assessed as **Level II**, taking into consideration the potential impacts to threatened species such as the White and Grey nurse sharks.	Exposure to dissolved / entrained hydrocarbons and chemicals in the water column can be toxic to fishes. Studies have shown a range of impacts including changes in abundance, decreased size, inhibited swimming ability, changes to oxygen consumption and respiration, changes to reproduction, immune system responses, DNA damage, visible skin and organ lesions, and increased parasitism. However, many fish species can metabolise hydrocarbons, which reduces the risk of bioaccumulation (NRDA, 2012). Shallow inshore fish species including various syngnathids (seahorses, pipefish, pipehorses and seadragons) are less likely to be able to move away from in-water oils and therefore may be exposed to elevated levels or for longer periods. Their habitats are typically widespread however any impacts are expected to be local on individual organism levels. Fish are most vulnerable to hydrocarbon discharges during their embryonic, larval and juvenile life stages. Oil and chemical exposure may result in decreased spawning success and abnormal larval development. Impacts on eggs and larvae entrained in the upper water column are expected to be short term given the temporary period of water quality impairment, and the limited areal extent of the spill. As egg/larvae is widely distributed in the upper layers of the water column it is expected that current induced drift will rapidly replace any affected populations.	Consequences to fish and sharks are assessed as **Level II**, taking into consideration the potential impacts to threatened species such as the White and Grey nurse sharks.

Affected Receptor	Unmitigated LOWC Consequence (per Volume 2, Table 6-9)	Consequence of LOWC mitigated through use of dispersant	Consequence Level
		Pelagic free-swimming fish and sharks are unlikely to suffer long-term damage from exposure because dissolved/entrained hydrocarbons in water are not expected to be sufficient to cause harm (ITOPF, 2010). Pelagic free-swimming fish and sharks are also generally highly mobile and as such are not likely to suffer extended exposure (e.g. >96 hours) at concentrations that would lead to chronic effects due to their patterns of movement. Demersal fish are more likely to be exposed to significant levels of in-water hydrocarbons associated with the application of ~~subsea~~ dispersant application. Predicted zones of moderate exposure to dissolved hydrocarbons contacting the White shark distribution and breeding BIAs and Grey nurse shark foraging and migration BIAs may increase to high exposure levels following use of dispersant. These species are widely distributed and areas of increased impact due to dispersed oil are not considered significant compared to overall species distribution.	
Marine Reptiles - Turtles	Although the effects of hydrocarbons on marine reptiles, specifically turtles can be severe, the low density of turtles expected in the region (due to lack of BIA or aggregations) suggests that a LOWC would affect individuals rather than population level. Consequently, the potential impacts to marine reptiles are considered to be Consequence **Level II.**	Effects to marine turtles have been assessed to be most significant for surface oil and shoreline oil (See Volume 2, Table 6-9). Marine turtles are vulnerable to the effects of oil at all life stages; eggs, hatchlings, juveniles, and adults. Marine turtles can be exposed to oil externally (e.g. swimming through oil slicks) or internally (e.g. swallowing the oil, consuming oil affected prey, or inhaling of volatile oil related compounds). Effects of oil on turtles include increased egg mortality and developmental defects; direct mortality due to oiling in hatchlings, juveniles, and adults; and negative impacts to the skin, blood, digestive and immune systems, and salt glands. French-McCay 2018 performed a comparative risk assessment for a large blowout in the Gulf of Mexico and found that turtles are the marine species that undergo the most benefit from dispersing oil because of their vulnerability to surface slicks and their long lives and slower reproduction. While marine turtles, including threatened species, are known to occur in the area potentially exposed to in-water dispersed oils they are not noted to reside or aggregate in significant numbers, and there are no recognized BIAs in the region.	Although the effects of hydrocarbons on turtles is driven by surface and shoreline oils, the low density of turtles expected in the region (due to lack of BIA or aggregations) suggests that additional in-water oil would affect individuals rather than population level. Consequently, the potential impacts to marine reptiles are considered to be **Consequence Level II.**

Affected Receptor	Unmitigated LOWC Consequence (per Volume 2, Table 6-9)	Consequence of LOWC mitigated through use of dispersant	Consequence Level
		It should be noted that the threat and relative impacts of an oil / pollution on some marine reptile species are considered less damaging than other stressors. Report cards produced on protected marine reptiles in Australia generally ranked oil pollution as either 'not of concern' or 'of less concern' depending on the marine region (DSEWPAC 2012). Impacts from increased concentrations of in-water dispersed oil are expected to be largely consistent with that of the assessed LOWC scenario described in Volume 2, Table 6	
Birds	The potential consequence of risks to seabirds and shorebirds from a LOWC are considered to be **Level II.**	Birds foraging at sea have the potential to directly interact with oil on the sea surface some considerable distance from breeding sites in the course of normal foraging activities. Seabird species most at risk include those that readily rest on the sea surface (e.g. shearwaters) and surface plunging species (e.g. terns, boobies). As seabirds are a top order predator, any impact on other marine life (e.g. pelagic fish) may impact food supply both for the maintenance of adults and the provisioning of young. However, it is likely that the use of dispersant will be offset by the decrease in surface oil and reduction in the consequences for smothering of birds feeding at the surface. For the unmitigated scenario (see Volume 2, Section 6.7.2) oil concentrations at the moderate to high threshold are predicted to accumulate on the shorelines of Gabo Island, which supports the world's largest Little penguin colony, The Skerries and Tasmanian Bass Strait islands such as Curtis Island potentially impacting local populations. Under certain metocean conditions the zone of moderate surface exposure is predicted to overlap with the Little penguin breeding BIA. Impacts to these colonies are expected to be reduced following use of dispersant due to reduced shoreline loading. There are many listed threatened and migratory shorebird species likely to occur in the area overlapping the extent of exposed shoreline. However, in the event of a LOWC, these birds are potentially at risk of shoreline exposure and are not likely to be significantly affected by in-water concentrations of hydrocarbons due to their limited exposure time in the water column. Reduction in shoreline oil as a result of dispersant application is expected to reduce impacts to shorebird species.	Given the potential impacts to birds from oil spills are largely driven by shoreline and surface impacts, the potential impacts to birds due to a LOWC mitigated through use of dispersant application is assessed to be a **Consequence Level III**

Affected Receptor	Unmitigated LOWC Consequence (per Volume 2, Table 6-9)	Consequence of LOWC mitigated through use of dispersant	Consequence Level
Marine Mammals (Pinnipeds)	The consequence of a LOWC on pinnipeds is assessed as Level II.	There may be physical impacts from ingestion of in-water and surface oil. However, as mammals are highly mobile species, it is very unlikely that these animals will be continuously exposed to elevated concentrations of dispersed hydrocarbons for extended durations (e.g. >96 hours) that could lead to chronic effects. Both the New Zealand fur-seal (*Arctocephalus forsteri*) and the Australian fur-seal (*Arctocephalus pusillus doriferus*) are listed marine species with habitat and breeding sites known to occur in areas potentially exposed to surface, in-water and shoreline oil above the moderate threshold. Both the Australian and New Zealand fur seals are at risk to surface oil while at sea and shoreline accumulated oil at haul out sites or rookeries. While some individuals may be affected, population level effects on these other transient species are considered unlikely. It is likely that the use of dispersant will be offset by the decrease in surface oil and reduction in the consequences for whales feeding at the surface. French-McCay 2018 found that marine mammals in the Gulf of Mexico also were protected by use of dispersants for the same reason as turtles. As described in Volume 2, Table 6-9, the potential impacts to pinnipeds from oil spills are largely driven by surface and shoreline impacts.	Given the potential impacts to pinnipeds from oil spills are largely driven by shoreline and surface impacts, the potential impacts to pinnipeds due to a LOWC mitigated through use of dispersant application is assessed to be a **Consequence Level III**
Marine Mammals (Cetaceans)	The consequence of a LOWC on cetaceans is assessed as **Level II**.	There may be physical impacts from ingestion of in-water and surface oil. However, as mammals are highly mobile species, it is very unlikely that these animals will be continuously exposed to elevated concentrations of dispersed hydrocarbons for extended durations (e.g. >96 hours) that could lead to chronic effects. While some individuals may be affected, population level effects on these other transient species are considered unlikely. It is likely that the use of dispersant will be offset by the decrease in surface oil and reduction in the consequences for whales feeding at the surface. Impacts from increased concentrations of in-water dispersed oil are expected to be largely consistent with that of the assessed LOWC scenario described in Volume 2, Table 6-9.	The potential impacts to cetaceans are considered to be Consequence **Level II**.
Coastal Habitats and Communities– Sandy	The impact of LOWC is assessed conservatively as a **Consequence Level II**	There are different types of shorelines found along the Gippsland and southern NSW coast and offshore islands	Given the potential impacts to coastal habitats from oil spills are largely driven by shoreline oil loading, the

Affected Receptor	Unmitigated LOWC Consequence (per Volume 2, Table 6-9)	Consequence of LOWC mitigated through use of dispersant	Consequence Level
Shoreline, Rocky Shoreline, Mangroves and Saltmarsh		(including Tasmanian islands), however this coastline is dominated by wide sandy beaches with intermittent rocky shores, and salt marshes and isolated mangroves within tidal estuaries, coastal lakes and bays. The impacts to these coastal habitats (as described in Volume 2, Table 6-9) are influenced by the volume of hydrocarbon that could be stranded ashore and its thickness before the shoreline saturation point occurs (ITOPF, 2014). Use of dispersant is expected to reduce the volume of oil that reaches the shoreline and therefore reduce impacts to coastal habitats and communities, compared to impacts assessed in Volume 2, Table 6-9.	potential impacts to coastal habitats due to a LOWC mitigated through use of dispersant application is assessed to be a **Consequence Level III**
Wetlands	The consequence of LOWC is assessed as **Level III.**	As described in Volume 2, Table 6-9, wetlands of international importance which may be impacted (e.g., Corner Inlet Ramsar Site) have minimal risk of receiving oil following a LOWC because they have no, or very narrow and/or seasonal, connections to the sea. Under certain conditions shoreline oil is predicted to accumulate at high – moderate thresholds along the shoreline of Corner Inlet, however, following use of dispersant, it would be expected that surface oil will be significantly reduced.	The consequence is assessed as **Level III.**
National Parks and Reserves	The consequence is assessed as **Level II** taking into consideration the length of shoreline potentially impacted and the extent of oil accumulation predicted.	Spill modelling predicted that no AMPs would experience exposure to surface oil at or above the moderate threshold. However, modelling indicated that six AMPs (East Gippsland, Beagle, Flinders, Jervis, Freycinet and Central Eastern), could be exposed to moderate thresholds of dissolved oil. Impacts to National Parks and Reserves along the area of shoreline exposure (as identified in Volume 2, Table 6-7 and Table 6-8) are expected to be reduced following the use of dispersant due to decreased shoreline loading. This decrease in impact to Marine Parks is consistent with the conservation management aims of the South East Marine Reserves Network Management Plan. The East Gippsland and Beagle Marine Parks are ranked as Category VI protected areas meaning they should be	The consequence is assessed as **Level III** taking into consideration the reduction in shoreline impacts due to dispersant use.

Affected Receptor	**Unmitigated LOWC Consequence** (per Volume 2, Table 6-9)	**Consequence of LOWC mitigated through use of dispersant**	**Consequence Level**
		managed mainly for ecosystem protection and passive recreation. The Flinders and Freycinet Marine Parks are ranked as Category II protected areas meaning they should be managed mainly for the ecologically sustainable use of natural ecosystems. The application of surface dispersant aims to protect and minimise the impacts to ecosystems from hydrocarbon spill releases thereby allowing future sustainable use of the ecosystems in the region.	
AMPs	The consequence is assessed as **Level III.**	Although initial spill modelling indicated that no AMPs would be exposed to moderate thresholds of in water (dissolved) oil, it may be expected that in water exposure to hydrocarbons is increased to high levels following the use of dispersant. Surface and in-water (dissolved) oil entering these AMPs will degrade water quality until the oil is broken down and or currents shift the weathering oil outside the boundaries of the AMPs. Thus, water quality effects are predicted to persist only over the short to medium term in the AMPs.	The overall consequence is assessed as **Level III.**
KEFs	The consequence is assessed as **Level III**.	While a spill would not affect the KEF Upwelling East of Eden itself, if the spill occurs at the time of an upwelling event, it may result in krill being exposed to in-water phase hydrocarbons. Pygmy blue whales feeding at this time may suffer from reduced availability of prey however, even with increased in-water hydrocarbon concentrations due to dispersant use, these impacts are expected to be localised and temporary.	The consequence is assessed as **Level III**
Cultural –Indigenous and Historic	The consequence level is considered **Level III** based on public impact consequence considerations	Use of dispersant is expected to reduce shoreline impacts to the visual or cultural (including activities such as camping, rituals and ceremonies) amenity of cultural heritage sites such as historic (e.g. shipwreck) or indigenous protected areas It is expected that use of dispersant will reduce the duration of impacts from degraded aesthetics of sites as a result of reduced shoreline loadings. Parts of the Gippsland coast over which the Gunai-Kurnai people hold native title would be exposed to lesser impacts	The consequence level is considered **Level III** taking into consideration the reduction in shoreline impacts due to dispersant use

Affected Receptor	Unmitigated LOWC Consequence (per Volume 2, Table 6-9)	Consequence of LOWC mitigated through use of dispersant	Consequence Level
		than compared to the unmitigated spill described in Volume 2, Table 6-9.	
Commercial Fisheries	The potential economic impacts to commercial fisheries from LOWC are considered to be Public Impact Consequence **Level I** based on public impact consequence considerations	Several commercial fisheries may operate within the area potentially exposed in the event of a LOWC. For the unmitigated scenario (see Volume 2, Section 6.7.2), floating oil is predicted to extend 10's of kilometers outside the subsea facility PSZ (from which fishing vessels are already excluded) making it likely that in these situations an exclusion zone (or fisheries closure) would be established. Fishing areas may be closed for fishing for shorter or longer periods because of the risks of the catch being tainted by oil. Increased oil in water concentrations could result in increased fish taint and prolonged fishing restrictions. As described in Volume 2, Table 6-9, a temporary fisheries closure and the flow on losses from the lack of income derived from these fisheries based on reduced market confidence and the potential for extended media coverage (potentially greater than 3 months) has the possibility of exceeding medium community disruption (> 100 – 1000 people) such as reduced employment (in fisheries service industries and the seafood supply chain).	The potential economic impacts to commercial fisheries from LOWC are considered to be Public Impact **Consequence Level I** based on public impact consequence considerations (media coverage, the scope of the disruption (personal, commerce, transportation or socio-economic) and the size of the population affected) as per ExxonMobil Risk Matrix Application Guide, 2018 (Refer Section 3.5, Table 3 5).
Tourism and Recreation	The potential economic impacts to tourism and recreation from LOWC are considered to be Public Impact Consequence **Level I** based on public impact consequence considerations.	Impacts to tourism and recreation are driven by visual oil leading to reduced amenity of areas used by coastal tourists and recreational visitors, temporary health implications and possible closures. Use of dispersant is expected to reduce volume of shoreline oil meaning impacts to tourism and recreation are expected to be reduced. Modelling in Volume 2, Section 6.7 predicts visible oil extending into nearshore Victorian waters (including waters of Ninety Mile Beach, Point Hicks and Cape Howe Marine National Parks and Beware Reef Marine Sanctuary) and a number of National Parks and Reserves including the very popular Wilsons Promontory and (Gippsland) Lakes National Parks. It is expected that use of dispersant will reduce the duration of impacts from degraded aesthetics of sites as a result of reduced shoreline loadings.	Despite taking into consideration the reduction in shoreline impacts due to dispersant use, the consequence level is considered **Level I**. This is based on public impact consequence considerations (media coverage, the scope of the disruption (personal, commerce, transportation or socio-economic) and the size of the population affected) as per ExxonMobil Risk Matrix Application Guide, 2018 (Refer Section 3.5, Table 3 5).

Affected Receptor	**Unmitigated LOWC Consequence** (per Volume 2, Table 6-9)	Consequence of LOWC mitigated through use of dispersant	Consequence Level
		As described in Volume 2, Table 6-9, the extent of potential impacts to tourism and recreation depends on when the spill occurs, size and where it comes ashore.	

Table 5-3 Acceptability of Environmental Impacts from Dispersant Application

Factor	Demonstration Criteria	Criteria Met	Rationale
Principles of Ecologically Sustainable Development (ESD)	No potential to affect biological diversity and ecological integrity.	✓	The activities were evaluated as having the potential to result in a Level III to IV consequence.
	Activity does not have the potential to result in serious or irreversible environmental damage.	✓	The application of dispersants will decrease the volume of oil on the surface which may reduce exposure to coastal sensitives and seabird and marine mammal populations to floating oil. Dispersant application will only be a selected following an incident NEBA, which must demonstrate potential environment impacts from dispersant outweigh the potential for shoreline, fauna and marine sensitivity impacts.
Legislative and Other Requirements	Legislative and other requirements have been identified and met.	✓	The proposed control measures align with the requirements of the: • OPGGS Act 2006 • Protection of the Sea (Prevention of Pollution from Ships) Act 1983. • Navigation Act 2012 – Chapter 4 (Prevention of Pollution). • Marine Order 96 (Marine pollution prevention – sewage) 2013 • Marine Order 95 (Marine pollution prevention - garbage) 2013.
Internal Context	Consistent with Esso's Environment Policy	✓	Proposed control measures are consistent with Esso's Environment Policy, in particular, to "comply with all applicable environmental laws and regulations and apply responsible standards where laws and regulations do not exist".
	Meets ExxonMobil Environmental Standards.	✓	Proposed controls meet the requirements of the ExxonMobil Dispersant Guidelines 2008.
	Meets ExxonMobil Operations Integrity Management System (OIMS) Objectives.	✓	Proposed control measures meet: • OIMS System 6-5 objective to identify and assess environmental aspects; significant aspects are addressed and controlled consistent with policy and regulatory requirements; and • OIMS System 8-1 objective to clearly define and communicate OI requirements to contractors. • OIMS System 10-2 objective to ensure effective response to emergencies and business disruptions that threaten the safety, security and health of the public, contractors and employees, the environment, asset integrity, and critical business operations
External Context	Stakeholder concerns have been considered / addressed through the consultation process.	✓	No specific stakeholder concerns have been raised.

Table 5-4 ALARP Demonstration of Environmental Impacts from Dispersant Application

ALARP Decision Context and Justification	Decision Context B Dispersant application is a standard response strategy that has been accepted for use in the Australian and International Offshore Petroleum Industry. Impacts associated with dispersant application are well understood and have been implemented by industry. The application of dispersants must be supported by an incident NEBA in commonwealth waters or have approval from state control agency within state waters. Dispersant application activities are aligned with company and partner values. Good Practice control(s) have been identified to ensure environmental impacts associated with mobilising this response are reduced to ALARP, these controls will be implemented in a response scenario and have been included in the OPEP. Esso believes ALARP Decision Context B should apply.		
Good Practice	**Adopted**	**Control**	**Rationale**
Vessel compliant with MARPOL Annex I, IV, V and VI as appropriate to vessel class.	✓	Vessel Requirements.	The vast majority of commercial ships are built to and surveyed for compliance with the standards (i.e. Rules) laid down by classification societies. The role of vessel classification and classification societies has been recognised by the International Maritime Organisation (IMO) across many critical areas including the International Convention for the Safety of Life at Sea, (SOLAS), the 1988 Protocol to the International Convention on Load Lines and the International Convention for the Prevention of Pollution from Ships (MARPOL).
NEBA completed prior to conducting dispersant application operations.	✓	Incident specific NEBA.	The NEBA takes into account the circumstances of spill, fate of the oil, potential environmental and social impacts and relative oil spill response options. NEBA will take into account IUCN Ranking of relevant Marine Parks.
Halting dispersant use if operational monitoring detects protected or migratory species at the water surface in the path or vicinity of spraying operations.	✓	Halt dispersant application if wildlife are identified in the area	If EPBC Act listed migratory species (e.g. whales) are observed in the immediate vicinity of dispersant operations, aerial dispersant operations will cease until the animal has not been sighted for 30 minutes or unless otherwise advised by the relevant state authority.
Dispersant pre-selection and assessment.	✓	Dispersant pre-selection and assessment.	Only dispersants listed in Section 5.2 will be utilized in the event of an incident, unless otherwise endorsed by a Statutory Authority
Pre-incident dispersant effectiveness testing	✓	Laboratory dispersant effectiveness testing.	Laboratory testing of five Gippsland crude oils against three types of dispersant has been completed under summer and winter conditions. Testing shows that dispersant is highly effective on most types of fresh oil. Effectiveness

			of dispersant decreases significantly on weathered oils.
Effectiveness of dispersant confirmed prior to application.	✓	Basic field dispersant effectiveness test.	Testing effectiveness of the dispersant on the oil spill will inform the response option strategy and assist IMT determining response activities.
Dispersant application is only accepted for: • Commonwealth waters • >10 m water depth • Outside Australian marine parks	✓	Exclusion zones	Defined area of where the application of dispersant is acceptable to reduce potential environmental impacts to marine fauna and flora.
Continuous monitoring of dispersed oil plume and visual monitoring of effectiveness.	✓	Monitoring of dispersant effectiveness	The OSMP implementation modules detail the requirement to monitor an oil slick for the effectiveness of the dispersants.
Monitoring of dispersant concentrations in water	✓	Monitoring of dispersant in water	Operational module O2 provides for monitoring of dispersant concentrations in water.
A record of the volumes of dispersant used in both subsea and surface application will be kept throughout the response.	✓	Records of dispersant volumes	The OPEP instructs IMT to record daily dispersant operations (types, volume and locations).
Dispersants will be targeted at areas of thickest oil and considerations of oil type, amenability and volume will be assessed prior to any dispersant application.	✓	Targeted dispersant application	The Exxon Mobil Oil Spill Response Field Manual details techniques for aerial and vessel ~~and to a lesser extent, subsea~~ dispersant application.
Surface dispersants only applied in daylight hours	✓	Surface dispersant only applied within daylight hours	Spraying surface oil slicks in daylight hours ensures that dispersants are targeted in areas where the oil is the thickest and helps prevent overdosing or application of dispersants in areas that will not be effective. Response during daylight hours also has significant benefits in reducing safety risks (e.g. night time flying) to personnel.
Verify effectiveness of dispersant application	✓	Additional monitoring will be implemented to verify dispersant use is effective and implemented as expected	Water monitoring (as in OSMP Module O2) will be used to monitor concentrations of hydrocarbons and dispersant in the water column.

Table 5-5 Engineering Risk Assessment

Additional, Alternative, Improved Controls	Benefit	Cost / Feasibility	Adopted
Lab based efficacy testing for surface application on all Esso crudes against all of the dispersants detailed in table.	Provide a better understanding of the amenability of each Esso crude in relation to each dispersant stock.	The rationale for the selected 5 crudes for laboratory testing was that they represent a cross-section of the types of	Not Adopted

Additional, Alternative, Improved Controls	Benefit	Cost / Feasibility	Adopted
		crudes produced in the Bass Strait. Results of testing can be found in OPEP Appendix E. Laboratory experiments and modeling are often limited by their inability to capture the complexity or scale found in the field. In the event of a spill, verification of incident specific dispersant effectiveness will be done before ongoing dispersant use occurs.	
Lab based efficacy testing for subsea dispersant injection using Esso Gippsland crudes. As part of a joint industry project, SINTEF and Cedre developed lab scale tests for measuring dispersed oil droplet distributions. Test results have shown that droplet size distributions are affected by crude type, different dispersant products and dispersant concentrations. The overall outcome was that increased SSDI effectiveness was indicated by the formation of smaller droplets. The tests have not been broadly employed.	Provide a better understanding of the effectiveness of SSDI for specific crudes and dispersant to oil (DOR) ratios	Dispersant efficacy testing has not been undertaken for subsea conditions, but industry experience estimates a subsea amenability to dispersant of approximately 50-70% effectiveness. Laboratory experiments for SSDI effectiveness testing is not as mature and available as those used for surface dispersant effectiveness measurement. The use of modeling to estimate effectiveness is often limited by an inability to capture the complexity or scale found in the field.	Not Adopted
Dispersants are selected from the Oil Spill Control Agents (OSCA) Register, including grandfathered stocks, unless otherwise endorsed by the Statutory Authority.	Dispersants which have been pre-approved for use in Australia by AMSA are placed on the Oil Spill Control Agent (OSCA) Register. The AMSA Efficacy Test Protocol for the Register (AMSA 2012) lists the toxicity testing requirements that ensure products meet the requirements of acceptable practice for the National Plan, and products with a high acute toxicity (LC50 < 10 ppm, 96 hrs.) or containing prohibited substances are not permitted.	All dispersants proposed for use meet the OSCA requirements and are listed on the National Plan Register. Capability assessments have been completed based on the use of approved dispersants and have confirmed enough dispersant is available for the proposed response.	Adopted

5.4 Capability Assessment of Dispersant Application

A detailed capability assessment has been undertaken to ensure that Esso has access to sufficient resources to complete dispersant application activities in a timely manner. Calculations of needs are conservative and could be overstating requirements by 25-50%. The reason for this is that capability needs have been calculated based on treating all surface oil, and do not take into account that oil will quickly disperse and spread below the ideal thickness required for spraying. Using a combination of surface (aerial or vessel application) and subsea dispersant injection significantly reduces the overall volume of dispersants required as summarised in Table 5-6. The assessment concluded sufficient resources are available within acceptable timeframes to conduct this response. This section summarises outcomes of the capability assessment.

Dispersants will be sourced from Esso's own stock in addition those available from AMOSC, AMSA National Plan Stock and OSRL. There is potential to obtain additional stock from mutual aid, and dispersant manufacturers would be requested to increase dispersant production.

Based on the capability assessment for the scenario with the highest dispersant requirement (45 m^3/day), continuity of supply can be maintained drawing on stocks as follows in Table 5-7.

Table 5-6 Dispersant source

	Surface Application only	
	Surface (Day 1-98)	**Total (98 day)**
# Aircraft	4	-
Sorties	15 / day	1455
Aerial dispersant (m^3)	42 / day	4080
Vessel dispersants (m^3)	3 / day	294
SSDI (m^3)	N/A	N/A
Total volume (m^3)	45 / day	4371
Planning assumptions:	~~Day 1:~~ 1 x air tractor available on Day 1 with 2 additional aircraft available from Day 2. Fourth aircraft from Day 3. Day 1-98. Aerial dispersant needs based on treating 100% release volume @ 20:1 application rate. No allowance made for natural weathering. Day 1-98. Vessel dispersant volume based on treating 10% of release volume @ 20:1 application rate Capability requirements based on MLA workover WCDS scenario (Refer Volume 2, Section 6.7.2) which results in the largest spill volume.	

Table 5-7 Dispersant source

Source	Location	Day
Esso	Victoria	1 to 2
AMOSC (surface)	Australia - various	3 to 7
AMOSC SFRT (50%)	Western Australia	8 to 13
AMSA	Australia – various	14 to 20
Mutual Aid	Australia – various	21
OSRL	Singapore	22 to 42
OSRL	Southampton	43 to 83
GRN	Worldwide	84+

Figure 5-1: Dispersant Supply chain

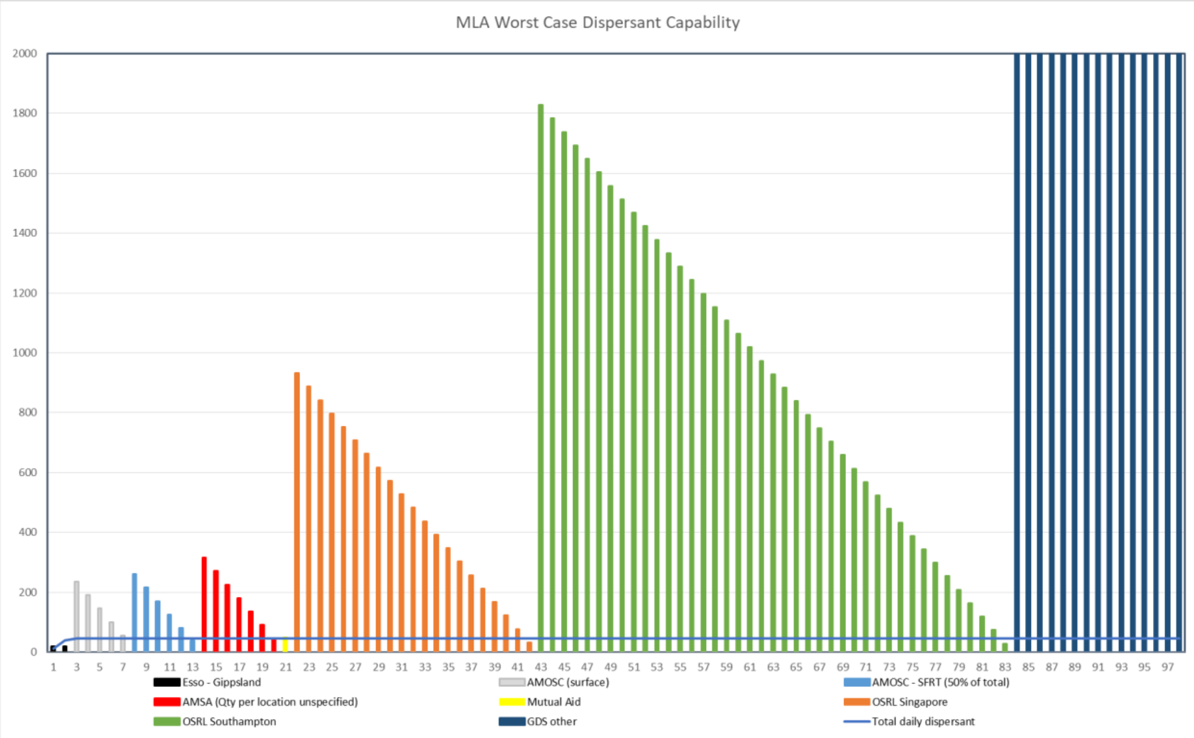


Table 5-8 Dispersant Application Resource Availability

Activity	Resource Required	Resource Availability	Expected Timeframe
Dispersant Stocks Available	4371 m^3 of dispersant based on the MLA WCDS using surface application only.	Dispersant stockpiles available in Australia between Esso, AMOSC, mutual aid and AMSA. Additional dispersant available from OSRL Global Dispersant Stockpile (GDS). GDS required after 21 days.	Victoria stockpiles <24 hours. National stockpiles <48 hours.
Dispersant Application from Aircraft*1	Ability to spray 42 m^3 of dispersant per day.	AMOSC (AMSA Fixed Wing Aerial Dispersant Contract (FWADC)) NatPlan. Air Attack Supervisor to be sourced under NatPlan arrangements to direct overhead spraying operations. Additional dispersant aircraft via OSRL.	Mobilisation of FWAD aircraft <4 hours of request for service. Dispersant application ability <24 hours. (*Note: Assumes good visibility, daylight hours and suitable flying conditions).*
Dispersant Application from Vessels	Ability to spray 4-6 m^3 of dispersant per day per strike team.	Esso Production support vessels loaded with dispersant and spraying equipment from BBMT. Agreements third party vessel operators. Vessels of opportunity are available at Barry Beach Marine Terminal, Lakes Entrance, Port Albert, Port Welshpool, Port Franklin and Mallacoota and Hobart.	1st team dispersant application ability <48 hours of request for service. 2nd team dispersant application ability <72 hours of request for service.

Activity	Resource Required	Resource Availability	Expected Timeframe
Testing Dispersant	Dispersant effectiveness test kit.	Access to 3 x test kits.	Available locally and within less than 48 hours of request.
ExxonMobil	Personnel Trained and capable Esso IMT Regional Response Team	Available to fulfil roles in accordance with requirements and timeframes in OPEP Table 3-2. Remote support <12 hours from notification. In-country support <72 hours from notification.	ExxonMobil

Table 5-9 Dispersant Application Capabilities

Good Practice	Adopted	Control	Rationale
Access to dispersant and dispersant application equipment for initial response.	✓	Esso owned dispersant stocks.	Esso owns stock of dispersant volume (estimated 12m^3) is available to mobilise for the first 24 hours of a response.
		Esso owned dispersant application equipment.	Esso have dispersant application equipment in Victoria and available to mobilise when required.
Pre-arranged access to additional dispersant stockpiles and equipment for applying dispersant.	✓	Agreement with AMOSC for dispersant capabilities.	Response capabilities maintained per service level statement including access to mutual aid and the National Plan (which provides dispersant stockpiles).
		Agreement with OSRL for dispersant capabilities.	Response capabilities maintained and available per OSRL service level statement.
Pre-arranged access to vessels for dispersant application.	✓	Support vessel.	The support vessel that is used for ongoing Esso operations can be used for dispersant application.
	✓	Agreement with third party suppliers for provision of additional vessels.	Agreement with supplier of vessel services has provision for supply of additional vessels
Pre-arranged access to personnel to support Tier III response activities.	✓	ExxonMobil Regional Response Team	ExxonMobil have a global team available to assist response for Tier III activities.

Table 5-10 Consideration of Additional/ Alternative/ Improved Capability for Dispersant Application

Additional, Alternative, Improved Controls	Benefit	Cost / Feasibility	Adopted
Quarterly AMOSC equipment availability review.	Provides status update on available equipment.	No cost associated with this control.	Adopted.
Dispersant and application equipment stored on vessel.	Reduce time to apply dispersant.	No cost associated with control.	Adopted.

6. Containment & Recovery

6.1 Response Option Description

Containment and recovery involves controlled collection and recovery of oil from the water's surface. The response typically involves the deployment of booms and oil skimmers from suitable vessels, as well as the collection, transfer and disposal of oil and oily water recovered during the response. Floating barriers or booms are used to enclose the spilled oil on the sea surface into a suitable surface thickness, to allow its mechanical removal using a recovery device such as a skimmer, which pumps the oil from the water surface into temporary storage. The oil and water mix are stored temporarily in vessel tanks on the deck or in internal tanks. Recovered sea water may need to be decanted and returned to the sea to free up storage capacity and enable greater volumes of oil to be recovered without making the potentially long voyage back to port, increasing the effectiveness of the Containment and Recovery. The decanted water will contain traces of hydrocarbons and cannot be discharged unless approval has been provided by AMSA.

Effective containment and recovery can reduce the potential risks and impacts associated with:

- Marine fauna;
- Sensitive shoreline environments;
- Shoreline response; and
- Waste generation.

Containment and recovery is often considered the primary or preferred response option due to the minor impact of its operation on the environment, however, the overall effectiveness of containment and recovery can be limited by a combination of operational constraints and the fate of the oil on the surface (e.g. thickness and patchiness) which may include but not limited to:

- Weather: suitable weather and sea state conditions, which is estimated at <50% of the time in the Bass Strait
- Logistics: availability of suitably equipped vessels, aerial surveillance support and adequate facilities for the storage and disposal of oil and water;
- Personnel: availability of competent responders;
- Location: accessibility and transit time;
- Health and Safety: health effects from exposure to the oil and ability to safety deploy and use equipment; and
- Environment: increased environmental risks and impacts from increased vessels/ aircraft use and treatment/disposal of oily waste.

Experience has shown that the efficiency of at-sea containment and recovery operations can vary widely depending on the above constraints, and recovery is usually limited to between 5% and 20% of the initial spilled volume (IPECA /IOGP – At Sea Recovery - Good Practice Guidance). Esso propose to use containment and recovery as a targeted strategy to mitigate impacts of oil contact with sensitive receptors where other strategies have been ineffective (e.g. dispersants) or may not be viable (e.g. shoreline clean up where there are access issues).

Estimated recovery rates have been calculated based on the encounter rate of strike teams utilising 400 metre of boom with a 120 m swath width travelling at 0.5 knots. Upper and lower recovery rates were calculated based on Bonn appearance code thickness of 50 to 200 micron.

Advantages of containment and recovery:

- Containment and recovery removes hydrocarbon from the environment
- Reduces exposure to surface wildlife e.g. cetaceans, birds

Disadvantages of containment and recovery:

- Labour intensive
- Presents safety risks
- Generation of large volumes of contaminated water
  Increase in environmental impacts from response activities e.g. vessels

6.2 Environmental Impact Assessment of Containment and Recovery

Resources for offshore containment and recovery activities will include offshore vessels that will be mobilised from established ports. Nearshore containment and recovery activities are likely to be undertaken from smaller crafts that may be launched from a number of different locations along the coastline. Access to the crafts, equipment and transit to the affected areas may disturb local port operations, recreational activities, fauna and sensitive habitats.

The collection, handling and disposal of hydrocarbons introduces potential environmental impacts from the oily waste generated. The oily waste must be handled and disposed of correctly to prevent secondary contamination from contaminated equipment and decanting activities.

Environmental aspects associated with implementing containment and recovery were identified and evaluated in Table 6-1 and Table 6-2. Implementing this response option introduces new environmental aspects which are not assessed within Volume 2:

- Physical Presence - Nearshore and Shoreline Users (Socioeconomic)
- Physical Presence - Interaction with Fauna and Flora
- Waste generation and Secondary Contamination

6.2.1 Impact Assessment

An impact assessment for each environmental aspect has been undertaken and additional controls have been identified to minimise the environmental impacts associated with containment and recovery which are detailed within the ALARP assessment. Further assessment of the acceptability of these impacts in an oil spill response context and controls identified for minimising the environmental impact of containment and recovery activities are described below.

Change to the function, interests or activities of other users could occur through disruption to recreational and commercial activities from vessel operations and site access is assessed in Table 6-1.

Table 6-1 Environmental Aspect: Physical Presence - Nearshore and Shoreline Users

Affected Receptor	Impact Assessment	Consequence Level
Socioeconomic (fisheries, tourism, culture)	Recreational fishing is generally concentrated inside the Gippsland Lakes or along the Ninety Mile Beach coastline. Additional vessels and personnel in the area may cause disruption to fishing activities. The movement of personnel, vehicles and equipment may disturb or damage cultural heritage artefacts or sites. The mobilisation of equipment and personnel for containment and recovery operations will be localised. The Oil Spill Tactical Response Plans (TRPs) detail socioeconomic sensitives for each location. The response activities will be in accordance with state response agency directions and Esso will provide the incident specific NEBA, TRPs and Shoreline Protections Plan and support where requested. The additional presence of vessels and personnel will only be short-term and in localised area for the response period. Once the response has been stood down nearshore socioeconomic activities can resume without disruptions, therefore the consequence of the impacts of the response activity is considered to be Level III.	III

The environmental impacts associated with containment and recovery operations include:

- Water Quality – Decanting
- Physical Presence - Interaction with Fauna and Flora
- Physical Presence – Sensitive and protected areas and parks
- Waste generation and Secondary Contamination

Table 6-2 Environmental Aspect: Physical Presence - Interaction with Fauna and Flora

Affected Receptor	Impact Assessment	Consequence Level
Water Quality	Containment and recovery operations will generate large volumes of oily water. Within Australia, the recovered water may be decanted and returned to the sea with approval from AMSA. This frees up valuable storage capacity in the temporary storage device which would otherwise have to be emptied before response operations can continue. The discharge of the oil and water mix may lead to localised, short-term impacts. The consequence to the marine environment is considered inconsequential as the decanted water will have removed much larger volumes of the oil in the marine environment than was present from the spill incident.	III
Physical Presence - Interaction with Fauna and Flora	The sandy beaches, mangroves and salt marshes in the Bass Strait provide potential foraging and breeding habitat for numerous bird species and benthic communities. The flora and fauna within these habitats have the potential to be trampled due to increased numbers of personnel accessing sites. However, containment and recovery response activities primarily occur in the ocean with exception of haul outs and waste and equipment storage. Response activities should avoid sensitive areas unless they have been selected specifically for clean-up or OWR activities. Exclusion zones can be set up to protect these areas and minimise environmental impacts. Haul out sites will use existing road and paths for access to reduce environmental impacts associated with increased foot and vehicle traffic. Shoreline impacts are expected to be inconsequential and have no adverse effects.	IV
	Containment and recovery operations utilise booms which sit on the water's surface, therefore fauna capable of diving, such as cetaceans and pinnipeds can avoid contact. Pinnipeds are likely to be present in the largest number. Impacts to species that inhabit the water column such as sharks and fish are not expected. The noise of the vessel motors may have a positive effect on scaring marine fauna from the immediate area. The additional presence of vessels, equipment and personnel will only be short-term and in localised area for the response period, therefore, the consequence of the impacts of the response activity is considered to be Level III.	III
Physical Presence - Sensitive and protected areas and parks	Potential impacts to sensitive and protected areas may be impacted from containment and recovery activities. Human presence in sensitive areas may adversely affect important natural behaviors of biota, e.g. nesting of shorebirds and seabirds, or pinnipeds. Haul out sites for containment and recovery activities will use existing road and paths for access, therefore, the impacts to sensitive and protected areas and parks are expected to be inconsequential and have no adverse effects.	IV
Waste Management and Secondary Contamination	The Esso Bass Strait Oil Spill Response Waste Management Plan, details requirement for selecting waste management options, and equipment and storage to be utilised to prevent secondary contamination. The Tactical Response Plan - Shoreline Protection & Clean-Up and site specific Tactical Response Plans include information on staging areas and access points. The location of waste will be within the specified exclusion zone. The generation of waste will be short-term and is localised to the response area, for the duration of the response. Therefore, the	III

Affected Receptor	Impact Assessment	Consequence Level
	consequence of the impacts of the response activity is considered to be Level III.	

Table 6-3 Acceptability of Environmental Impacts from Containment and Recovery

Factor	Demonstration Criteria	Criteria Met	Rationale
Principles of Ecologically Sustainable Development (ESD)	No potential to affect biological diversity and ecological integrity	✓	All the aspects related to containment and recovery have been evaluated as having the potential to result in a maximum Level III consequence.
	Activity does not have the potential to result in serious or irreversible environmental damage.	✓	All oil spill response activities are implemented with the aim of reducing the overall environmental impact. Containment and recovery activities may limit the volume of oil that could impact the shoreline and marine sensitivities.
Legislative and Other Requirements	Legislative and other requirements have been identified and met.	✓	Activities will comply: • OPGGS Act 2006. • Protection of the Sea (Prevention of Pollution from Ships) Act 1983. • Marine Order 96 (Marine pollution prevention – sewage) 2013. • Marine Order 95 (Marine pollution prevention - garbage) 2013.
Internal Context	Consistent with Esso's Environment Policy.	✓	Proposed control measures are consistent with Esso's Environment Policy, in particular, to "comply with all applicable environmental laws and regulations and apply responsible standards where laws and regulations do not exist".
	Meets ExxonMobil Environmental Standards.	✓	There is no standard related to the containment and recovery however the controls proposed meet the strategic objectives of the Upstream Environmental Standards.
	Meets ExxonMobil Operations Integrity Management System (OIMS) Objectives.	✓	Proposed control measures meet: • OIMS System 6-5 objective to identify and assess environmental aspects; significant aspects are addressed and controlled consistent with policy and regulatory requirements; and • OIMS System 8-1 objective to clearly define and communicate OI requirements to contractors. • OIMS System 10-2 objective to ensure effective response to emergencies and business disruptions that threaten the safety, security and health of the public, contractors and employees, the environment, asset integrity, and critical business operations
External Context	Stakeholder concerns have been considered /	✓	No specific stakeholder concerns have been raised.

	addressed through the consultation process.		

Table 6-4 ALARP Demonstration of Environmental Impacts from Containment and Recovery

ALARP Decision Context and Justification	Decision Context A. Containment and recovery activities are standard practice for hydrocarbon spills to reduce hydrocarbons in the marine environment and minimise impacts to shorelines and marine sensitivities. There is a good understanding of potential impacts from containment and recovery. This response option would be supported by an incident specific NEBA. All activities undertaken in state waters will be led by the state control agency. Good Practice controls have been identified to ensure environmental impacts associated with mobilising this response are reduced to ALARP, these controls will be implemented in a response scenario and have been included in the OPEP. Esso believes ALARP Decision Context A should apply.		
Good Practice	**Adopted**	**Control**	**Rationale**
Vessel compliant with MARPOL Annex I, IV, V and VI as appropriate to vessel class.	✓	Vessel Requirement.	The vast majority of commercial ships are built to and surveyed for compliance with the standards (i.e. Rules) laid down by classification societies. The role of vessel classification and classification societies has been recognised by the International Maritime Organisation (IMO) across many critical areas including the International Convention for the Safety of Life at Sea, (SOLAS), the 1988 Protocol to the International Convention on Load Lines and the International Convention for the Prevention of Pollution from Ships (MARPOL).
NEBA completed prior to conducting containment and recovery activities.	✓	Incident specific NEBA.	The NEBA takes into account the circumstances of spill, fate of the oil, potential environmental and social impacts and relative oil spill response options.
Containment and recovery operations only undertaken within daylight hours	✓	Containment and recovery operations only undertaken within daylight hours	Containment and recovery activities will only be undertaken in daylight hours to monitor the boom to ensure trapped fauna are released as soon as possible. Response during daylight hours also has significant benefits in reducing safety risks (e.g. injury) to personnel.
Ensure daily Containment and Recovery operations are recorded (location, estimated amount of oil recovered, estimated amount of water recovered)	✓	Daily records of oil recovered	Daily logs and records of containment and recovery operations demonstrate that CAR equipment was deployed safely, effectively and following consideration of environmental conditions.
Exclusion zones established	✓	Exclusion zones	The OPEP requires that exclusion zones are put in place which consider health and safety and environment risks. These exclusion zones are determined in consultation with the state control agency.
Discharge of de-oiled water (decanting) must meet MARPOL requirements.	✓	Decanting performed in commonwealth waters in accordance with MARPOL requirements.	MARPOL sets out requirements for discharge of de-oiled water (decanting) to avoid undue environmental impact. Decanting performed in commonwealth waters in accordance

			Prevention of Pollution from Ships) Act 1983, Section 9, subsection (2) (e)
Incident specific Waste Management Plan.	✓	Bass Strait Oil Spill Response Waste Management Plan	The Esso Emergency Response Waste Management Plan will assist in the development of an incident specific Waste Management Plan.

6.3 Capability Assessment of Containment and Recovery

A detailed capability assessment has been undertaken to ensure that Esso has access to sufficient resources to complete containment and recovery activities in a timely manner. The assessment concluded sufficient resources are available within acceptable timeframes to conduct this response.

This section summarises outcomes of the capability assessment.

Table 6-5 Containment and Recovery Resource Availability

Task	Resource Required	Resource Availability	Expected Timeframe
Containment & Recovery - Vessels	8 x vessels available for 4 x strike teams based on the MLA crude WCDS	Esso Support vessel. Agreement with third party vessel operators to supply additional vessels. Vessels of opportunity are available at Barry Beach Marine Terminal, Lakes Entrance, Port Albert, Port Welshpool, Port Franklin and Mallacoota and Hobart.	1x Vessel C&R strike team will be on site <48 hours of service request. 2x Vessel C&R strike teams will be on site <72 hours of service request.
Containment & Recovery Equipment	Equipment for 4 x vessel strike teams.	AMOSC Geelong stockpile 3x C&R systems. Fremantle stockpile 3 x C&R strike systems. OSRL Additional equipment available through OSRL. AMSA Additional equipment available through AMSA.	Load out from Geelong <4 hours service request. 7 C&R systems available in Victoria Additional 3 C&R systems available in Australia that can be mobilised to Gippsland within 72 hours.
Containment & Recovery Personnel	2 x trained and 4 x personnel per strike team.	Esso Core Group (10) AMOSC Staff (6) Core Group (50) OSRL Response Technicians (18)	Esso <24 hours from request AMOSC <24 hours from request of service
Waste Management	Onshore waste management arrangements.	Esso have a contract with a third party waste management service to provide transport and disposal of solid and liquid wastes. Refer Section 9.3.	<24 hours of service request.

Task	Resource Required	Resource Availability	Expected Timeframe
ExxonMobil	Personnel Trained and capable Esso IMT	Available to fulfil roles in accordance with requirements and timeframes in OPEP Table 3-2.	ExxonMobil
	Regional Response Team	Remote support <12 hours from notification. In-country support <72 hours from notification.	

Table 6-6 Containment and Recovery Resource Availability

Good Practice	Adopted	Control	Rationale
Pre-arranged access to vessels for containment and recovery activities.	✓	Support vessel.	The support vessel that is used for ongoing Esso operations can be used for containment and recovery.
	✓	Agreement with third party suppliers for provision of additional vessels.	Agreement with supplier of vessel services has provision for the supply of additional vessels.
Pre-arranged access to additional equipment for containment and recovery.	✓	AMOSC agreement.	Agreement with AMOSC provides access to additional containment and recovery equipment.
Pre-arranged access to additional labour.	✓	Personnel trained for containment and recovery activities	Agreement with AMOSC provides access to additional containment and recovery personnel.
Pre-arranged Waste facilities.	✓	Agreement with waste management contractor.	Waste arrangements for removal of waste to approved disposal or treatment facilities in accordance with EPA requirements.
Pre-arranged access to personnel to support Tier III response activities.	✓	ExxonMobil Regional Response Team	ExxonMobil have a global team available to assist response for Tier III activities.

Table 6-7 Consideration of Additional/ Alternative/ Improved Capability for Source Control for Containment and Recovery

Additional, Alternative, Improved Controls	Benefit	Cost / Feasibility	Adopted
Standby dedicated emergency response vessel.	A dedicated standby emergency response vessel may reduce time required to implement containment and recovery activities and increase recovery capacity.	Significant costs are associated with leasing a suitable vessel. Given the high potential costs to the program, implementing this control measure is considered grossly disproportionate, given that the event has an extremely low likelihood of occurrence.	Not adopted.

7. Shoreline Protection and Clean-up

7.1 Response Option Description

Shoreline protection and clean-up consists of different techniques to prevent or reduce exposure of shoreline sensitives.

This shoreline response strategy is based on:

- Protection and deflection; and
- Shoreline response operations.

Advantages of Shoreline protection and clean-up:

- Deflection prevents oiling of sensitivities areas
- Clean-up removes hydrocarbon from the environment
- Reduces hydrocarbon exposure to wildlife e.g. cetaceans, birds

Disadvantages of Shoreline protection and clean-up:

- Presents safety risks
- Labour intensive response
- Increase in environmental impacts from response activities e.g. vessels
- May generate large volumes of waste

7.1.1 Protection and Deflection

Protection - Booms may be used to exclude slicks from targeted sensitive shorelines and/or amenities where it is safe and conditions permit access and effective deployment.

Deflection - Booms may be deployed at an angle to a drifting slick to divert oil away from targeted sensitive areas or to a collection point where it is safe to contain and recover.

Containment and Recovery – Near shore containment and recovery (refer to Section 6) may be deployed when there is little or no current and the sea-state permits.

This response is restricted by specific weather and metocean conditions and site accessibility. In strong winds, currents and/or waves this option may not be effective. In the event of an incident, the preparedness NEBA shall be updated with incident specific information to identify the priority sites for protection. Shoreline protection and clean-up will only be used as directed by state agencies.

7.1.2 Shoreline Clean-up

If a spill has reached or is predicted to reach the shoreline, an assessment of the area will be undertaken using the Shoreline Clean-up Assessment Technique (SCAT). This consists of a series of consistent and repeatable shoreline assessments that prioritise clean-up response based upon shoreline type. The assigned team will identify the appropriate shoreline clean-up technique, report the potential for, or any incidents of, oiled wildlife and undertake routine assessments throughout the response in terms of rehabilitation progress.

Shoreline clean-up consists of different manual and mechanical recovery techniques to remove oil and contaminated debris from the shoreline to reduce ongoing environmental contamination and impact.

Esso Australia and Cooper Energy have developed a Shoreline Protection and Clean-Up Plan and site specific Tactical Response Plans for Gippsland Basin oil and gas activities.

The plans outline the strategies that may be adopted and actions required to undertake safe and effective shoreline protection and clean-up response. The area assessed ranges from Port of Eden to Wilsons Promontory to Flinders Island in the Bass Strait (Figure 7-1).

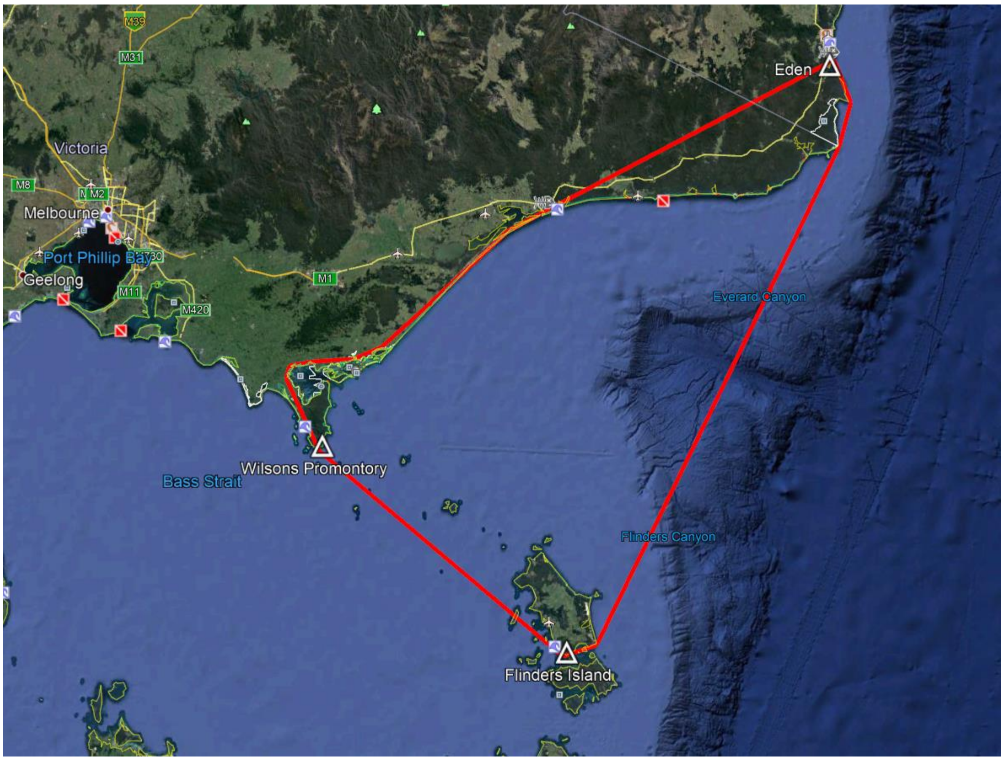


Figure 7-1 Overview of Gippsland Basin field locations

Tactical Response Plans (TRPs) are available for primary, secondary and tertiary sites that have been assessed and chosen based on appropriate access for shoreline response, shoreline type and key sensitive receptors. The application of Global Information Systems (GIS), cross referenced with the Oil Spill Response Atlas sensitivity mapping was carried out prior to site visits to validate both the identification of specific sites as ‘high priority’, and the strategies proposed for shoreline response.

The TRPs are designed to be used by both the Incident Management Team and field responders. The TRPs include the following information:

- Site description;
- Site access;
- Site constraints;
- Main sensitivities;
- Facilities / services i.e. food / accommodation / medical facilities / vessel and equipment hire;
- Key local contacts i.e. land manager, local emergency services, port authority; and
- Images / diagrams marked with staging areas, access points and tactics to be implemented.

TRPs set out a series of tasks to be executed by responders and a breakdown of resources (personnel and equipment) required to implement each task.

The locations shown in Table 7-1 have pre-drafted TRPs which should be used to guide response planning. Development of additional incident specific response plans may be required for locations without a pre-determined plan.

The collection, handling and disposal of hydrocarbons introduces potential environmental impacts from the oily waste generated. The oily waste must be handled and disposed of correctly to prevent secondary contamination from contaminated equipment and decanting activities.

Table 7-1 Tactical Response Plan sites

SITE NAME	Site Type	Latitude	Longitude
Primary Sites			
VICTORIA			
Corner Inlet	Inlet	38°47'49.23"S	146°30'3.86"E
Lakes Entrance	Inlet	37°53'26.16"S	147°58'23.12"E
Snowy River (Marlo)	River mouth	37°48'12.25"S	148°32'56.62"E
Wingan Inlet	Inlet	37°44'56.97"S	149°30'48.22"E
Betka River	River mouth	37°35'6.32"S	149°44'21.58"E
Mallacoota	Inlet	37°33'47.59"S	149°45'53.47"E
NEW SOUTH WALES			
Wonboyn River	River/Lake	37°14'57.55"S	149°57'59.54"E
Bittangabee Bay	Inlet	37°12'54.16"S	150° 0'57.51"E
Towamba River	River mouth	37° 6'44.56"S	149°54'45.62"E
Nullica River	River mouth	37° 5'26.91"S	149°52'20.21"E
FLINDERS ISLAND			
North East River	River mouth	39°43'51.81"S	147°57'38.73"E
Samphire River	river mouth	40°13'10.56"S	148°11'47.93"E
Secondary Sites			
VICTORIA			
Merriman Creek (Seaspray)	River mouth	38°22'56.18"S	147°11'4.26"E
Lake Bunga	Inlet	37°56'50.00"S	147°48'18.98"E
Lake Tyers	Inlet	37°51'33.78"S	148° 5'18.55"E
Yeerung River	River mouth	37°47'28.02"S	148°46'26.67"E
Sydenham Inlet (Bemm River)	River mouth	37°46'49.61"S	149° 1'11.26"E
Tamboon Inlet (Cann River)	Inlet	37°46'39.31"S	149° 9'11.11"E
Thurra River	River mouth	37°46'56.67"S	149°18'45.94"E
Mueller River	River mouth	37°46'44.51"S	149°19'41.29"E
Shipwreck Creek	River mouth	37°38'51.45"S	149°41'58.05"E
Davis Creek	River mouth	37°34'43.46"S	149°44'59.14"E
NEW SOUTH WALES			
Saltwater & Woodburn Creek	Woodburn Creek	37°10'15.46"S	150° 0'17.18"E
	Saltwater Creek	37°10'8.25"S	150° 0'9.11"E
Fisheries Creek	Creek	37° 6'38.72"S	149°55'47.31"E
Boydtown Creek	River mouth	37° 6'9.86"S	149°52'51.59"E
FLINDERS ISLAND			
Foochow Inlet	Inlet	39°53'53.77"S	148° 7'20.71"E
Melrose Road Inlet	Inlet	39°55'34.85"S	148° 9'18.30"E
Patriarch Inlet	Inlet	39°56'45.22"S	148°11'0.45"E
Cameron Inlet	Inlet	40° 4'14.54"S	148°17'10.36"E
Reddins Creek	Creek mouth	40°15'44.19"S	148° 9'5.00"E
Cronleys Creek	Creek mouth	40°14'54.22"S	148° 3'32.09"E

SITE NAME	Site Type	Latitude	Longitude
Fotheringate Creek	Creek mouth	40°12'51.95"S	148° 2'15.05"E
Nalinga Creek	Creek mouth	40° 8'10.47"S	148° 1'1.70"E
Pats River	River mouth	40° 5'51.62"S	147°59'40.77"E
Arthur Bay Conservation Area	Bay	40° 5'12.38"S	147°58'1.53"E
Lughrata Salt Marsh	Marsh entrance	39°54'31.82"S	147°52'30.33"E
Mines Creek	Creek mouth	39°54'13.00"S	147°51'59.85"E
Boat Harbour Creek	Creek mouth	39°51'3.29"S	147°47'22.15"E
Killiecrankie Creek	Creek mouth	39°50'9.47"S	147°50'23.83"E
Edens Creek	Creek mouth	39°45'40.28"S	147°53'3.65"E
Tertiary Sites			
Gabo Island	Island	37°33'44.75"S	149°54'39.07"E

7.1.3 State Government Agencies

In response to a spill, a shoreline protection and clean-up response will be led by the respective state response agency.

The National Plan also provides guidance on shoreline clean-up techniques as outlined in National Plan Guidance Response, assessment and termination of cleaning for oil contaminated foreshores (AMSA 2015).

The State Governments of Victoria, Tasmania and New South Wales will ultimately decide, through their control agencies, how oil spill response operations will occur on these shorelines, however, Esso will make the Shoreline Protection Plan and Tactical Response Plans, incident specific NEBA and resources to support the response available. Liaison Officers will be exchanged between IMTs to manage a coordinated response.

7.2 Environmental Impact Assessment of Shoreline Protection and Clean-up

Nearshore shoreline protection activities are likely to be undertaken from smaller crafts that may be launched from a number of different locations along the coastline. Access to the crafts, equipment and transit to the affected areas may disturb local fauna, sensitive habitats, and cultural heritage areas and disrupt local recreational activities.

Shore clean-up activities may disturb a number of nearshore habitats as identified in the prepared Shoreline Protection Plans. The collection, handling and disposal of hydrocarbons introduces potential environmental impacts from the oily waste generated.

7.2.1 Impact Assessment

An impact assessment for each environmental aspect has been undertaken and additional controls have been identified to minimise the environmental impacts associated with shoreline protection and clean-up which are detailed within the ALARP assessment. Further assessment of the acceptability of these impacts in an oil spill response context and controls identified for minimising the environmental impact of shoreline protection and clean-up activities are described below.

Change to the function, interests or activities of other users could occur through disruption to recreational and commercial activities from vessel operations and site access, Table 7-2.

Table 7-2 Environmental Aspect: Physical Presence - Nearshore and Shoreline Users

Affected Receptor	Impact Assessment	Consequence Level

Socioeconomic (fisheries, tourism, culture)	Recreational fishing is generally concentrated inside the Gippsland Lakes or along the Ninety Mile Beach coastline. Additional vessels and personnel in the area may cause disruption to fishing activities. The movement of personnel, vehicles and equipment may disturb or damage aboriginal and non-aboriginal cultural heritage artefacts or sites). The presence of stranded oil and clean-up operations may require temporary beach closures. The mobilisation of equipment and personnel for shoreline protection and clean-up activities will be localised. The Oil Spill Tactical Response Plans (TRPs) detail socioeconomic sensitives for each location. The response activities will be are in accordance with state response agency directions and Esso will provide the incident specific NEBA, TRPs and Shoreline Protections Plan and support where requested. The additional presence of vessels and personnel will only be short-term and in localised area for the response period. Once the response has been stood down nearshore socioeconomic activities can resume without disruptions, therefore the consequence of the impacts of the response activity is considered to be to be Level III.	III

The environmental impacts associated with containment and recovery operations include:

- Physical Presence - Interaction with Fauna and Flora
- Physical Presence – Sensitive and protected areas and parks
- Waste generation and Secondary Contamination

Table 7-3 Environmental Aspect: Physical Presence - Interaction with Fauna and Flora

Affected Receptor	Impact Assessment	Consequence Level
Physical Presence - Interaction with Fauna and Flora	Shoreline clean-up activities could lead to damage to shoreline habitats from high-pressure washing, trampling of shoreline sediments, flora and fauna from vehicles and mechanical recovery techniques, and disturbance of shoreline biota by human responders and vehicles. The sandy beaches, lakes, mangroves and salt marshes in the Bass Strait provide potential foraging and breeding habitat for numerous bird species and benthic communities. Environmental impacts to intertidal shoreline habitats and communities may have indirect effects on the food chains, affecting the macro fauna communities which they support. In addition, the removal of habitat (such as sand from beaches) may also make them more vulnerable to ongoing erosion. The Tactical Response Plans (TRPs) detail environmental sensitives for each location and the OPEP states the requirement for setting up exclusion zones in conjunction with the state control agency. Response activities should avoid these exclusion zones, unless they have been selected specifically for clean-up or OWR activities. Shoreline clean-up activities may adversely affect important natural behaviors of biota, e.g. nesting of shorebirds and seabirds, or pinnipeds. Human presence may also cause ground disturbance due to manual raking and turnover of sandy beaches or intertidal flats to remove accumulations of weathered oil, which could affect sediment infauna, cultural heritage sites. The consequences will be localised and short term, it will recover quickly once activities cease.	III

Affected Receptor	Impact Assessment	Consequence Level
	Protection and Deflection activities utilise booms which sit on the water's surface, therefore fauna capable of diving, such as cetaceans and pinnipeds can avoid contact. Pinnipeds are likely to be present in the largest number. Impacts to species that inhabit the water column such as sharks and fish are not expected. The noise of the vessel motors may have a positive effect on scaring marine fauna from the immediate area. Protection and Deflection response activities primarily occur in the ocean with exception of haul outs sites. The mobilisation of equipment and personnel for shoreline protection and clean-up activities will be localised. The Oil Spill Tactical Response Plans (TRPs) detail environmental sensitives for each location and the OPEP states the requirement for setting up exclusion zones in conjunction with the state control agency. Haul out sites will use existing road and paths for access, therefore, the shoreline impacts are expected to be inconsequential and have no adverse effects. The additional presence of vessels, equipment and personnel will only be short-term and in localised area for the response period, therefore, the consequence of the impacts of the response activity is considered to be Level III.	III
Physical Presence - Sensitive and Protected Areas and Parks	Potential impacts to sensitive and protected areas may be impacted from Shoreline protection and clean-up activities. Human activity in sensitive areas may adversely affect important natural behaviors of biota, e.g. nesting of shorebirds and seabirds, or pinnipeds. Human presence may also cause ground disturbance due to manual raking and turnover of sandy beaches or intertidal flats to remove accumulations of weathered oil, which could affect sediment infauna, cultural heritage sites, temporary exclusion of residents and tourists from amenity beaches. Haul out sites for protection and deflection activities will use existing road and paths for access, therefore, the impacts to sensitive and protected areas and parks are expected to be inconsequential and have no adverse effects. The Oil Spill Tactical Response Plans (TRPs) detail environmental sensitives for each location and the OPEP states the requirement for setting up exclusion zones in conjunction with the state control agency. The consequence to sensitive areas is assessed as localised and short term, it will recover quickly once activities cease.	III
Waste Management and Secondary Contamination	Accidental loss of waste during recovery, transport and disposal activities may result in secondary contamination. The Esso Bass Strait Oil Spill Response Waste Management Plan, details requirement for selecting waste management options and equipment and storage to be utilised to prevent secondary contamination. The Shoreline Protection and Clean-Up Plan and site specific Tactical Response Plans include information on staging areas and access points. The generation of waste will be short-term and is localised for the response period, therefore, the consequence of the impacts of the response activity is considered to be to be Level III.	III

Table 7-4 Acceptability of Environmental Impacts from Shoreline Protection and Clean-up

Factor	Demonstration Criteria	Criteria Met	Rationale
Principles of Ecologically Sustainable Development (ESD)	No potential to affect biological diversity and ecological integrity	✓	All aspects related to shoreline protection and clean-up activities have been evaluated as having the potential to result in a maximum Level III consequence.
	Activity does not have the potential to result in serious or irreversible environmental damage.	✓	All oil spill response activities are implemented with the aim of reducing the overall environmental impact. The purpose of shoreline protection and clean-up activities is to minimise the environmental impacts resulting from an oil spill.
Legislative and Other Requirements	Legislative and other requirements have been identified and met.	✓	The proposed control measures align with the requirements of: • OPGGS Act 2006. • Emergency Management Act 2013 (Vic). • Emergency Management Act 1989 (NSW). • Emergency Management Act 2006 (Tas). • Wildlife Act 1975 (Vic). • EPBC Act. • Wildlife Act 1975 (Vic). • Nature Conservation Act 2002 (Tas). • National Parks and Wildlife Act 1974 (NSW).
Internal Context	Consistent with Esso's Environment Policy.	✓	Proposed control measures are consistent with Esso's Environment Policy, in particular, to "comply with all applicable environmental laws and regulations and apply responsible standards where laws and regulations do not exist".
	Meets ExxonMobil Environmental Standards.	✓	There is no standard related to the shoreline protection and clean-up however the controls proposed meet the strategic objectives of the Upstream Environmental Standards.
	Meets ExxonMobil Operations Integrity Management System (OIMS) Objectives.	✓	Proposed control measures meet: • OIMS System 6-5 objective to identify and assess environmental aspects; significant aspects are addressed and controlled consistent with policy and regulatory requirements; and • OIMS System 8-1 objective to clearly define and communicate OI requirements to contractors. • OIMS System 10-2 objective to ensure effective response to emergencies and business disruptions that threaten the safety, security and health of the public, contractors and employees, the environment, asset integrity, and critical business operations
External Context	Stakeholder concerns have been considered / addressed through the consultation process.	✓	No specific stakeholder concerns have been raised.

Table 7-5 ALARP Demonstration of Environmental Impacts from Shoreline Protection and Clean-up Activities

ALARP Decision Context and Justification	Decision Context A Shoreline protection and clean-up activities are standard practice for hydrocarbon spills to reduce hydrocarbons in the marine environment and minimise impacts to shoreline sensitivities. There is a good understanding of potential impacts from shoreline protection and clean-up activities. This response option would be supported by an incident specific NEBA. All activities undertaken in state waters will be led by the State Control Agency. Good Practice controls have been identified to ensure environmental impacts associated with mobilising this response are reduced to ALARP. These controls will be implemented by the state led control agency in a response scenario and have been included in the OPEP. Note that the response must be led by State Control Agencies, with Esso providing support and resources when requested. Esso believes ALARP Decision Context A should apply.		
Good Practice	**Adopted**	**Control**	**Rationale**
NEBA completed prior to conducting shoreline protection and clean-up activities application operations.	✓	Incident specific NEBA.	The NEBA takes into account the circumstances of spill, fate of the oil, potential environmental and social impacts and relative oil spill response options.
Environmental consideration of Gippsland basin local shorelines.	✓	Primary & Secondary Shoreline Tactical Response Plans (TRPs).	Shoreline Protection Plan & Tactical Response Plans (TRPs) describe the shoreline types and have categorised primary and secondary sites which have been assessed and chosen based on appropriate shoreline response options, shoreline type and key sensitive receptors. These plans will be made available to the control agency.
Incident specific Waste Management Plan.	✓	Bass Strait Oil Spill Response Waste Management Plan	The Esso Emergency Response Waste Management Plan will assist in the development of an incident specific Waste Management Plan.
Ensure daily Containment and Recovery operations are recorded (location, estimated amount of oil recovered, estimated amount of water recovered)	✓	Daily records of oil recovered	Daily logs and records of containment and recovery operations demonstrate that CAR equipment was deployed safely, effectively and following consideration of environmental conditions.
Exclusion zones established	✓	Exclusion zones	The OPEP requires that exclusion zones are put in place which consider health and safety and environment risks. These exclusion zones are determined in consultation with the state control agency.

Table 7-6 Engineering Risk Assessment

Additional, Alternative, Improved Controls	**Benefit**	**Cost / Feasibility**	**Adopted**
Shoreline protection and clean up only undertaken within daylight hours	Undertaking shoreline protection and clean up during daylight hours to ensure personnel can see sensitive environmental receptors and minimize impacts cause by unplanned interactions with flora and fauna.	Response duration will be extended.	Yes

Additional, Alternative, Improved Controls	Benefit	Cost / Feasibility	Adopted
	Response during daylight hours also has significant benefits in reducing safety risks (e.g. injury) to personnel.		

7.3 Capability Assessment of Shoreline Protection and Clean-up

A detailed capability assessment has been undertaken to ensure that Esso has access to sufficient resources to support the State Control Agency with an effective response in a timely manner. The assessment concluded sufficient resources are available within acceptable timeframes to conduct a response should it be required. The shoreline protection and clean-up capability assessment has been completed for planning and preparedness purposes. The State Control Agency will ultimately decide what strategies are to be implemented and the quantity and source of resources to be used during an incident.

7.3.1 Shoreline protection

Tactical response plans are used to assist in determining capability requirements, taking into account the specifics of the receiving environment.

Spill modelling is used to determine required resources to undertake shoreline protection and clean up. The ExxonMobil Oil Spill Response Field Manual [2014 edition], Section 12, Tables 12-1 to 12-23 is used to calculate resources for shoreline protection and clean-up including:

- Primary equipment required
- Size/type/description of equipment
- Numbers required
- Likely treatment rates and capacities

The above information is then aligned with shoreline protection planning based on location specific tactical response plans (TRPs) that have been developed for pre-identified priority locations (see Table 7-1). There exists the potential requirement to implement multiple TRPs during a single incident. EAPL considers the numbers and response timing requirements are conservative given that:

a. Modelling of the worst case minimum time to shoreline contact has been used, and;
b. Stochastic modelling results have been used to identify the potential TRP's that may need to be implemented concurrently, and;
c. Secondary TRP locations will not necessarily require a response, should the incident occur when the estuaries are closed.

The sum of resources required to implement the identified TRPs is summarised in the activity specific Quick Reference Guides. EAPL has also considered the concurrent implementation of the worst case scenario shoreline protection requirements which include the bulk of the TRPs, totalling 22 sites with the highest resource requirements, which are summarised in Table 7-10. While these calculations consider overall requirements, modelling demonstrates that oil will accumulate on different sections of the coast over time requiring a phased approach to resource deployment and implementation of TRP's. The below table provides an example of progressive personnel requirements using the phase of response concept as detailed in the OPEP. This approach has also been used to assess phased equipment needs and availability.

Table 7-7 Progressive Personnel Required - Shoreline Impact and TRP Activation

Assessment based on Seahorse Crude WCDS Modelling as a representative example of near shore loss of well control. Seahorse has now been plugged and abandoned.

Shoreline Receptor	hrs. to impact (>100 g/m^2)	Phase of Response	TRP Activated		Trained personnel based on TRPs			
					Trained	General	Special	Total
Ninety Mile Beach	36	24hr						
Wellington	42							
Seaspray	42		2	Merriman Creek (Seaspray)	16	48	44	108
Ocean Grange	43		-					
Lakes Entrance (West)	45	Initial Response	-					
Woodside Beach	45		-					
Lakes Entrance	47	48hr	3	Lakes Entrance	15	48	40	103
Lake Tyers Beach	50		4 5	Lake Bunga, Lake Tyers	34	102	73	209
Marlo	53		6	Snowy River (Marlo)	25	76	60	161
Cape Conran	54		7	Yeerung River	36	108	76	220
Golden Beach	55		-					
McLoughlins Beach	59	Planned Phase – Decision Making Stage	-					
Point Hicks	72		10 11	Mueller River Thurra River	38	112	82	232
Corringle	87		-					
Cape Howe	89		-					
Cape Howe / Mallacoota	89		16	Mallacoota	78	230	178	486
Gabo Island	90	96hr						
Sydenham Inlet	99							
Croajingolong (West)	101		12	Wingan Inlet	45	130	98	273
Croajingolong (East)	114		13 14 15	Shipwreck Creek Bekta River Davis Creek	84	245	189	518
East Gippsland	171							
Bega Valley	235	Planned Phase – Project Implementation	17 18 19 20 21 22 23	Wonboyn River Bittangabee Bay Woodburn & Saltwater Creeks Fisheries Creek Towamba River Boydtown Creek Nullica River	74	218	167	459
Clonmel Island	276		-					
Snake Island	296							
Corner Inlet	299		1	Corner Inlet	86	251	202	539
Wilsons Promontory (NE)	323		-					
Eurobodalla	338		-					

Shoreline Receptor	hrs. to impact (>100 g/m²)	Phase of Response	TRP Activated	Trained personnel based on TRPs			
				Trained	General	Special	Total
Montague Island	340		-				
Wilsons Promontory (East)	341		-				
Shoal Haven	734		-				

7.3.2 Shoreline protection

Strategies and resource needs for shoreline clean up have been assessed based on the shoreline type within each sector of the coastline with >100 gm/m^3 predicted shoreline loading based on stochastic modelling outputs. An indication of the level of resources required is provided using spill resource calculations. The spill resource calculations provide an indication of the levels of resources required to respond based on a number of estimates and assumptions, taking into account best practice and utilising detailed data on the shorelines involved. A detailed explanation of the resource calculations is provided in Section 7.3.3. The figures provided represent a target resource estimate and can be applied across a variety of scenarios. The resource numbers indicated are for response on a continuous basis and do not reflect a rapid initial demand for resources with slow taper off over the duration of the response. Initial resource requirements can be scaled up as required to achieve quicker results on a smaller scale response, while a larger scale response may continue to escalate.

As well as the numbers provided through resource calculations, a capability assessment for shoreline clean up was conducted based on stochastic modelling using the maximum predicted shoreline loading for each sector. This method provides an understanding of the potential resource needs for all sectors of coastline that maybe impacted, however, significantly over estimates the resources likely to be required for an individual incident.

The modelling provides an indication of the outer limits of a response however additional resources may be required for locations beyond the identified Sub-LGAs. These resources have not been considered within the scope of the capability assessment and TRP's have not been prepared for locations with low probability of moderate shoreline impact (<10%) or where shoreline impact is predicted in a minimum contact time of >7 days. Operational monitoring will be used to inform the need for incident specific response plans for these locations.

7.3.3 Shoreline clean up capability methodology

Oil spill trajectory modelling based on worst case discharge scenarios has been used to calculate shoreline response capability requirements. The modelling outputs included a summary of potential shoreline impacts, probability of impact, maximum load on the shoreline, length of shoreline affected at > 10 gm/m^2, and the length of shoreline affected at > 100 gm/m^2.

A resource ccalculator was designed using the resultant shoreline impacts, lengths of shoreline affected, degree of oiling, and best practice spill response tactics and resourcing estimates to undertake those tactics. Calculations have been based on no other interventions, such as containment & recovery or chemical dispersants, being utilised and so represent resource needs significantly greater than would be likely in an actual response where a range of strategies would be utilised in combination.

The ExxonMobil Oil Spill Response Field Manual provides industry best practice guidelines and information which was utilised as the basis for typical resources required for particular strategies and recognised shoreline types.

The resource calculator spreadsheet uses the shoreline type to determine the response strategies, then calculates the recommended number of personnel and equipment to enact the strategy. Each shoreline type may require a combination of response strategies, so each strategy per shoreline type was assigned a likelihood percentage that it would be applied. The below table shows the shoreline type, along with the strategies and percentages used in the calculations.

Table 7-8 Shoreline Clean-up – Shoreline type and methodology used for clean-up

Shoreline Type	***Clean-up method to be used***	***% of oiled shoreline type for clean-up method***
1. Manmade structures	flooding	10%
	HP, ambient-water flushing	60%
	hot water flushing	10%
	natural recovery	20%
2. Rocky Shores (sheltered)	natural recovery	100%
3. Rocky platform / cliff face (exposed)	natural recovery	100%
4. Sandy beach (mixed sand/shell)	manual removal - light oil	20%
	manual removal - heavy oil	30%
	flooding	20%
	mechanical removal	10%
	natural recovery	20%
5. Tidal flats (mud/sand) and vegetative salt/brackish marsh	LP, ambient-water flushing	30%
	natural recovery	70%
6. Shallow seagrass	natural recovery	100%
7. Reef	natural recovery	100%
8. Mangroves	LP, ambient-water flushing	20%
	natural recovery	80%

The Resource Calculator provides for calculating resources for an entire stretch of affected coastline to be cleaned in a single day. Corresponding numbers for the resources required were very large and do not take into account:

(1) External factors that act as constraints on the effective deployment or control of these resources, or secondary damage that they could cause, or

(2) The fact that these resources take time to ‘ramp-up.’

Given that a response will commence with a first strike plan and escalate from lower initial numbers to those required to manage the clean-up in the longer term, having 100% of resources from an early stage is an inaccurate representation of resources required.

In a large-scale response it has been demonstrated that 100% of the resources are unable to be applied within 7 to 10 days as the sheer numbers and the scale of the operation would be unmanageable.

Based on examples of incidents, estimates, and physical comparison of the numbers that would be both manageable and reasonably required to clean up known sections of beach within the boundaries of the modeling output, a conservative figure of 10% was applied to the calculator to best represent a target resource estimate across the variety of scenarios.

The outputs from the calculator, while indicating the level of possible resources, are not an upper limit and the reduction factor can be adjusted. Scaling up a response quickly to affect a faster resolution for a smaller scale spill can be managed through multiplication of the original resource requirements. A more accurate, detailed analysis of the resources required during an escalating response could be produced by the Logistics Section.

The table below shows estimates from the ExxonMobil Oil Spill Field Manual versus output of the Resource Calculator and indicates a reasonable correlation between the two:

Table 7-9 Comparison between ExxonMobil Oil Spill Field Manual resource recommendations and Resource Calculator output requirements for SHA shoreline cleanup

ExxonMobil Oil Spill Response Field Manual					
		lightly oiled shoreline		heavily oiled shoreline	
No timeframe	Resources Required	2 km	100 km	2 km	100 km
	Workers	10 - 20	100 – 200	50 - 100	500 – 1,000
	Foremen	1 - 2	10 - 20	5 - 10	50 - 100
Resource Calculator					
	Resources Required	2 km shoreline		100 km shoreline	
10% capacity per day for duration of spill	Foreman	2		44	
	Worker	10		420	
	Specialised Operators	2		26	
	Total People	14		490	
100% capacity per day for duration of spill	Foreman	10		440	
	Worker	84		4200	
	Specialised Operators	6		260	
	Total People	100		4900	

If relative short section of shoreline is affected, then a valid response would be the allocation of 100% of the resources available to clean it up in a day. Conversely, if hundreds of kilometres of shoreline is affected, the allocation of 100% of the required resources immediately would present a number of practical problems that could not be overcome including:

- Exceeding span of control through the divisions, branches, and clean up teams at one or more Forward Operating Bases and staging areas,
- Overloading the carrying capacity of the regional community support resources (Accommodation, messing, ablutions, etc.),
- Overloading the response location environment (Crowded carparks, traffic on beaches, etc.), and

- Under COVID-19 conditions, exceeding the ability to maintain social distancing or accommodation/isolation arrangements.
- Managing the safety and security of personnel.

Contained within the Resource Calculator is an interface which requires the input of length affected and % of shoreline type for the affected area. From these it then produces a resource list, as per below table.

Total Oiled Shoreline (km)	21
% of shoreline cleaned in 1 day.	10
Shoreline Type	**%**
Manmade Structures	0
Rocky Shorelines (Sheltered)	0
Rocky Platform / Cliff Face (Exposed)	40
Sandy Beach (mixed sand/shell)	60
Tidal Flats (Mud/Sand) and Vegetative salt/Brackish Marsh	0
Shallow Seagrass	0
Reef	0
Mangroves	0
Shoreline Total	100.00%

Resources Needed					
Personnel	**14 days**	**28 days**	**56 days**	**84 days**	**112 days**
Foreman	3	6	6	6	6
Worker	27	54	54	54	54
Specialised Operators	2	4	4	4	4
Total People	**32**	**64**	**64**	**64**	**64**
Vehicles/Vessels					
ATV	3	3	3	3	3
Truck/Vehicle	3	3	3	3	3
Vac Truck	0	0	0	0	0
Tank Truck	0	0	0	0	0
Front End Loader/Dozer	1	1	1	1	1
Scraper/Grader	1	1	1	1	1
Dump Truck	1	1	1	1	1
Landing Craft/Barge	1	1	1	1	1
Oil Spill Equipment					
Pump	1	1	1	1	1
Skimmer w/pump	1	1	1	1	1
Inshore Boom (m)	46	46	46	46	46
Sorbent Boom/snares (m)	46	46	46	46	46
Washing Unit (Low Pressure)	0	0	0	0	0
Pressure Washer	0	0	0	0	0
Steam Cleaner	0	0	0	0	0
Shoreline flushing pipe length (m)	8	8	8	8	8
Manual Equipment					
Shovels	43	86	172	258	344
Rakes	43	86	172	258	344
Picks	43	86	172	258	344
Plastic Bags	2142	4284	8568	12852	17136
Wheel Barrows	9	18	36	54	72

Figure 7-2 Oil Spill Response Calculator extract

Analysis of the modelling allowed determination of shoreline areas that would be impacted. Potential impact zones with a probability of impact <10% were eliminated, leaving a comprehensive list of sites with 10% or greater probability of being impacted at or above the 10 g/m^2.

Comprehensive shoreline surveys using Google Earth imagery and cross referenced with a VIC DOT layer of shoreline types was used to categorise the shoreline makeup in each Sector. Shoreline types specified were then utilised in the calculations to determine strategies and resourcing requirements.

The combined total for the sectors affected in each scenario provides total resources required for that scenario.

In addition to personnel, the Resource Calculator estimates other required resources and is based on a number of assumptions. Taken from the ExxonMobil Oil Spill Response Field Manual for each of the recommended response strategies, the following have been applied relating to the personnel columns:

- Based on 14 day shifts of workers
- Based on oil stranding daily/Continuously
- Based on 1 primary crew and a replacement crew in rotation.
- Based on heavily oiled shorelines and resources required per km.
- Based on average of shoreline strategies for each shoreline type (described previously)

For the vehicles & vessels section, all totals were based on the resources required for a stretch of shoreline affected based on the strategy used as described above in the master calculations spreadsheet.

For the Manual equipment section:

- Shovels based on 1 per worker per week

- Rakes based on 1 per worker per week
- Pick based on 1 per worker per week
- Plastic bags based on 50 per worker per day (50*20 kg each = 1000 kg/day)
- Wheel Barrows based on 1 per team (5 persons) per week then replaced

Adjustment of the percentage of shoreline cleaned per day, or the percentage of shoreline strategy applied to a given shoreline type, the resultant resources required will change, however it must be pointed out that where a range has been presented, we have erred to the worst-case scenario to produce conservative figures.

Table 7-10 Shoreline Protection and Clean-up Resource Availability

Task	Resource requirement	Resource Availability	Expected Timeframe
O3: Shoreline Assessment Personnel	SCAT teams will comprise of: • 2 shoreline assessment trained (SAT) personnel (for primary TRPs) or 1 shoreline assessment trained person (for secondary TRPs) • State representatives • Operations and safety officers as needed Trained shoreline assessment personnel needed: • 3 in first 48 hrs • 9 in hours 48 – 96 • Up to 18 post 96 hrs Based on simultaneous implementation of all TRPs described in Table 7-7.	OSMP consultant has the following trained personnel available to respond. • 12 SAT personnel available within 24 hrs. of activation. • An additional 12 SAT staff are available within 14 days of activation. SAT personnel completing SCAT assessments in the first 48hrs will be made available to complete more assessments once initial SCAT assessments are complete.	12 field personnel to be mobilised within 24 hours of activation. Additional 12 field personnel to be mobilised within 14 days of activation.
Vessels for Shoreline Protection	12 x vessels* based on SHA crude WCDS.	Gippsland Ports have suitable vessels for nearshore response activities. Agreements with third party vessel operators to supply additional vessels. Vessels of opportunity are available at Barry Beach Marine Terminal, Lakes Entrance, Port Albert, Port Welshpool, Port Franklin and Mallacoota and Hobart.	6x vessels required within 24 hours
Shoreline Protection Response Equipment	3,250 m x Shoreboom 2,025 m x Near shore boom 1 x Offshore skimming system Anchor kits + accessories Based on simultaneous implementation of all TRP's from Merriman Creek (Vic) through to Nullica River (NSW)	<u>Esso/AMOSC (Geelong)</u> Shoreboom: 2,025m Near Shore boom: 6500m Anchor kits + accessories: 47 Offshore skimming system: 8 Temporary waste storage: 12 <u>AMOSC/AMSA/Mutual Aid</u>: Shoreboom: 5750 m	Esso/AMOSC (Geelong) <48 hours of request for service. Additional equipment <5 days of request of service

Task	Resource requirement	Resource Availability	Expected Timeframe
		Near Shore boom: 10975 m Anchor kits + accessories: 112 Offshore skimming system: 30 Temporary waste storage: 65	Refer to Quick Reference Guides for scenario specific requirements
Shoreline Protection Response Personnel	Up to 518 personnel based on the SHA crude WCDS.	State Response Team >200 trained personnel. AMOSC Core group <120 trained personnel (inc Esso). Esso Esso responders Agreements in place with labour hire companies.	State Response Team Notify <2 hours of incident. Initiate request to call out core group <3 hours.
Shoreline Clean-up Personnel	Up to 1926 personnel based on the SHA crude WCDS	Esso Esso responders Agreements in place with labour hire companies. AMOSC Core group >140 trained personnel (including Esso). State Response Team >200 trained personnel.	<48 hours of request for service. Refer to Quick Reference Guides for scenario specific requirements
Waste Management	Onshore waste management arrangements.	Esso have a contract with a third party waste management service to provide transport and disposal of solid and liquid wastes.	<48 hours of service request.
ExxonMobil	Personnel Trained and capable Esso IMT Regional Response Team	Available to fulfil roles in accordance with requirements and timeframes in OPEP Table 3-2. Remote support <12 hours from notification. In-country support <72 hours from notification.	

Table 7-11 Shoreline Protection and Clean-up Capabilities

Good Practice	Adopted	Control	Rationale
Pre-arranged access to personnel for O3 Shoreline Assessment	✓	Agreement with Third Party OSMP Consultant for personnel and resources required for implementation of OSMP.	Esso has an agreement in place with a Third Party OSMP Consultant who can provide access to personnel with the required training/experience for SCAT under OSMP module O3.
Pre-arranged access to vessels for shoreline protection.	✓	Agreement with third party suppliers for provision of additional vessels.	Agreement with supplier of vessel services has provision for the supply of additional vessels.

Good Practice	Adopted	Control	Rationale
Shoreline protection and deflection equipment available.	✓	Esso owned shoreline protection and deflection equipment.	Esso owns its own equipment that can be utilised for shoreline protection and clean up
Pre-arranged access to additional equipment for shoreline protection and deflection.	✓	AMOSC agreement.	Agreement with AMOSC provides access to additional equipment for shoreline protection and clean up equipment
Pre-arranged access to additional labour.	✓	Personnel hiring agreements.	Esso has personnel hiring agreements in place which can be utilised to provide personnel for shoreline protection and clean up activities.
Pre-arranged Waste facilities.	✓	Agreement with waste management contractor.	Waste arrangements for removal of waste to approved disposal or treatment facilities in accordance with EPA requirements.
Pre-arranged Heavy Plant Equipment	✓	Agreement with contractor for heavy lift equipment	Agreement with third party provides access to heavy plant equipment for shoreline protection and clean up.
Pre-arranged access to personnel to support Tier III response activities.	✓	ExxonMobil Regional Response Team	ExxonMobil have a global team available to assist response for Tier III activities.

Table 7-12 Consideration of Additional/ Alternative/ Improved Capability for Shoreline Protection and Clean-up

Additional, Alternative, Improved Controls	Benefit	Cost / Feasibility	Adopted
Reconfigure and relocate equipment	Reduce mobilisation times.	Relocation of equipment will be costly. The current equipment location allows for rapid mobilisation to the priority shorelines which are most likely to be impacted based on modelling. Relocation of shoreline protection and clean up equipment will only bring minimal, if any, benefits in response capability. Esso has assessed that sufficient equipment is available in Tier I & II equipment stockpiles located in Victoria to support shoreline protection and response requirements during the initial response phase (first 48hrs).	Not adopted
Resource to implement shoreline protection strategies prior to minimum shoreline contact time.	Reduce environmental impacts to estuaries.	Stochastic modelling of 100 weather and current scenarios indicates a minimum time to shore of 20hrs (Lakes Entrance / Seaspray) at low threshold and 30hrs (Lakes Entrance) at moderate threshold, with other weather combinations indicating longer times to shore. Given the complexity of implementing tactical response plan at Lakes Entrance an estimated 103 personnel are required to implement the response strategies in up to five locations. Additional cost in maintaining response capacity of this size to implement TRP's prior to shoreline impact is disproportionate to the risk.	Not adopted

Additional, Alternative, Improved Controls	Benefit	Cost / Feasibility	Adopted
		Esso has assessed that sufficient equipment is available in Tier I & II equipment stockpiles located in Victoria to support shoreline protection and response requirements during the initial response phase (first 48hrs).	
Agreement with response company	Access to additional shoreline protection and clean-up equipment and personnel.	Esso owns equipment that can be used for shoreline protection and clean-up and has an agreement in place with AMOSC and OSRL to allow access to AMOSC/OSRL equipment. Esso can provide some of its own responders, has agreements in place with labour hire companies and has access to personnel from AMOSC core group and OSRL. The cost of having an agreement in place with additional response companies outweighs the small benefit that would come from such an agreement.	Not adopted
Additional agreements in place with monitoring providers	Access to additional personnel for implementation of O3 Shoreline Assessment	There would be added costs associated with having additional agreements in place and assessing and maintaining the capability to respond. While the length of shoreline to be assessed is significant, the number of field teams only needs to be enough to stay 2-3 days ahead of the shoreline operations (IPIECA, 2014) in order to support the effective and timely implementation of shoreline cleanup and protection. The Third Party OSMP Consultant has access to up to 24 staff with shoreline assessment experience. Logistics planning based on the SHA WDCS ~~and TWA P&A WCDSs~~ affected TRP's indicates that based on a scaling up of resources this would be sufficient for the implementation of the OSMP O3 module. The resources available through the existing agreement easily meet this requirement. In the case of a Level 3 incident, Esso would draw upon relationships and/or agreements with SCAT specialists that will be called upon on a best endeavours basis.	Not adopted
Increase number of trained personnel	Additional trained personnel available who could direct untrained laborers.	There is a significant cost associated with increasing the number of trained personnel and maintaining training status. Esso has access to AMOSC core group and State Response Team trained personnel in addition to agreements with labour hire companies which is sufficient to meet required the capability. Should additional personnel be required to support a response, just in time training can be utilised to train labourers and management staff for these laborers.	Not adopted
Agreements with vessel operators	Rapid and guaranteed access to vessels in the event of a spill.	As described above, Gippsland Ports can provide suitable vessels for nearshore response activities. Some agreements are in place with third party vessel operators to supply additional vessels. Capability assessment indicates that vessel requirements are able to be met so the costs	Not adopted

Additional, Alternative, Improved Controls	Benefit	Cost / Feasibility	Adopted
		of additional agreements with vessel operators are not justified.	
TRP / GRPs for the whole coastline	Increased understanding of capability requirements beyond the areas currently covered by TRPs.	TRPs have been developed for priority sites that are appropriate for shoreline response, covering a large stretch of coastline. TRP's are supported by the Shoreline Protection & Clean Up Plan which provides non-location specific guidance. Given the low likelihood for shoreline exposure beyond this area, the benefit of addition TRPs is considered minimal.	Not adopted

8. Oiled Wildlife Response

8.1 Response Option Description

Coastal areas are most likely to have the largest number of affected wildlife from an oil spill given that coastal areas provide habitat for breeding and foraging as well as protection from the elements. The scale of the impacts to wildlife does not correlate with the amount of oil spilled but is dependent on factors such as the timing and location of an incident, the product type, oceanography and weather patterns, and the corresponding movements of species that feed, nest or generally inhabit a particular area.

Oiled wildlife response (OWR) is a combination of activities with the objective to minimise the impacts of an oil spill on wildlife (such as birds, mammals and reptiles) by both prevention of oiling where possible and mitigating the effects on individuals following an oil spill incident.

Oiled wildlife response consists of a three-tiered approach involving:

- Primary: Situational understanding of the species/populations potentially affected (NEBA, SCAT, aerial surveillance);
- Secondary: Deterrence or displacement strategies (e.g. hazing, visual flags/balloons, barricade fences; or pre-emptive capture); and
- Tertiary: Recovery, construction of operating unit, transport, waste management, veterinary examination, triage, stabilisation, cleaning/washing, rehabilitation, release.

The oiled wildlife response may lead to the survival of vulnerable wildlife populations. The level of oiled wildlife response required can be scaled up or down based on the predicted number of wildlife affected.

Site-specific wildlife reconnaissance would be undertaken on foot, by vehicle, by vessel or by aircraft, and should be conducted across areas potentially at risk. This activity is key to gather baseline information on the numbers of wildlife present and/or individuals oiled.

Information from the reconnaissance is then used to inform the NEBA and assist the IMT to select suitable response options.

Ongoing surveillance and monitoring may utilise surveillance and monitoring aircraft and vessel resources.

An Area Response Plan has been developed for Gabo Island which provides guidance on initial oiled wildlife response actions. A number of Species Response Plans have also been developed to provide responders with guidance on appropriate response strategies for individual species.

Advantages of oiled wildlife response:

- Protection / hazing methods may minimise oiling of wildlife;
- Reduces hydrocarbon exposure to wildlife e.g. cetaceans, birds

Disadvantages of oiled wildlife response:

- Presents safety risks;
- Distress caused to wildlife;
- Labour intensive
- Increase in environmental impacts e.g. generates waste and potential for secondary contamination

8.1.1.1 Protection of nesting/haul-out sites

Sensitive areas may be protected from the spill using protection and deflection (Section 7.1.1) and containment and recovery (Section 6) response options.

8.1.1.2 Hazing and deterrence

Hazing and deterrence are terms used for activities that are undertaken to prevent or discourage wildlife from entering contaminated sites or move them away from areas that are likely to be affected by the spill. A potential negative outcome of hazing can be disturbance of target biota with potential for behavioural impacts and stress-related responses.

8.1.1.3 Pre-emptive capture

Pre-emptive capture is the capture of healthy, unoiled wildlife and transporting them to an area that is unlikely to be affected by the spill. Potential negative impacts of this method is inadequate capture techniques that have potential to cause stress, exhaustion or injury to wildlife and pre-emptive capture could cause undue impacts when oiling is not certain.

8.1.1.4 Triage assessments

Depending on the numbers and species of animals affected from the spill, a triage assessment may be required to ensure the best chance of long term survival. The assessment process is typically undertaken by a veterinarian under direction of the state agency.

8.1.1.5 Rehabilitation centres for oiled wildlife

Rehabilitation methods have been developed that aim to effectively reverse the effect of oiling, and return the health of an oiled animal back to an assumed pre-oiling state. The key stages associated with rehabilitation are:

- Capture;
- Transportation;
- Stabilisation;
- Decontamination;
- Conditioning; and
- Release.

Potential negative impacts of wildlife rehabilitation are inefficient techniques at any of the above key stages can have the potential to cause injury, stress and pressures to wildlife.

8.1.2 Waste ~~management~~

OWR generates large volumes of waste contaminated with hydrocarbon attributed to large volumes of water associated with cleaning, washing and rehabilitating the oiled wildlife. Estimated volumes are provided in Table 8-1. Refer to Section 9.3 for waste handling.

Table 8-1 Estimated Waste Types and Volumes

Waste Type	Waste Volume	No. of Units	Estimated Volume
Waste Water	1 m^3 per unit (1 unit per bird)	50[1]	50 m^3
PPE	5 kg per unit	50[1]	250 kg, ~2 m^3

[1]Number of units based upon a Level 3 incident as described in DPAW (2014). This was considered to provide a suitable indication as to the number of units potentially exposed in lieu of any other appropriate estimation tool.

8.1.3 State Government Agencies

In response to a spill, an Oiled Wildlife Response will be led by the respective state response agency.

The State Governments of Victoria, Tasmania and New South Wales will ultimately decide, through their control agencies, how oiled wildlife spill response operations will occur on these shorelines, however, Esso will make the Shoreline Protection Plan and Tactical Response Plans and resources to support the response available.

8.1.3.1 Victoria

The DELWP (Department of Environment, Land, Water and Planning) has primary responsibility for wildlife impacted by marine pollution in Victorian state waters, which will be defined in the Victorian Emergency Wildlife Plan for Marine Pollution (under development) and the Victorian State Maritime Emergencies (non-search and rescue) Plan (SMEP).

8.1.3.2 Tasmania

The control agencies within Tasmania are Tasmanian Ports Corporation (Tasports) within port waters and the Tasmanian EPA outside of port waters. The state Tasmanian Marine Oil Spill Contingency Plan (TasPlan) is administered by the EPA and is integrated with the National Plan, the Tasports Oil Spill Contingency Plan, the Tasmanian Emergency Management Plan and the Tasmanian Oiled Wildlife Response Plan (WildPlan).

8.1.3.3 New South Wales

New South Wales Maritime is the control agency for marine pollution control incidents within state waters in accordance with the NSW State Emergency Management Plan (EMPLAN) and the NSW State Waters Marine Oil and Chemical Spill Contingency Plan which is a sub-plan of the EMPLAN.

If an incident occurs in Commonwealth waters and has the potential to enter state waters, State Agencies must be immediately notified and Esso will support and provide resources when requested. Esso personnel may also be deployed under the direction of State to undertake wildlife response activities, however only trained people can interact with oiled fauna species.

8.2 Environmental Impact Assessment of Oiled Wildlife Response

Nearshore OWR activities are likely to be undertaken on foot or by smaller crafts that may be launched from a number of different locations along the coastline. Access to the crafts, equipment and transit to the affected areas may disturb local fauna and sensitive habitats.

A number of activities associated with this response involve direct contact with wildlife e.g. pre-emptive capture, rehabilitation and cleaning animals, and their release. These activities will only be undertaken by trained personnel and vets.

Wildlife rehabilitation centres will be constructed where required and should include reliable systems for the supply of potable water, electricity, heating or cooling, and ventilation that meet the specific wildlife requirements as well as amenities for personnel including food and lodging, waste disposal and communications. The construction of rehabilitation centres for OWR activities will be controlled by the state agency.

One of the disadvantages of running a rehabilitation centre is that it generates large volumes of waste. There is also a potential for secondary contamination through the handling of oiled wildlife and waste generation. The oily waste must be handled and disposed of correctly to prevent secondary contamination from contaminated equipment and PPE.

8.2.1 Impact Assessment

An impact assessment for each aspect has been undertaken and additional controls have been identified to minimise the environmental impacts associated with Oiled Wildlife Response which are detailed within the ALARP assessment. Further assessment of the acceptability of these impacts in an oil spill response context and controls identified for minimising the environmental impact of OWR activities are described below.

Change to the function, interests or activities of other users that could occur through disruption to recreational and commercial activities from an OWR are provided in Table 8-2.

Table 8-2 Environmental Aspect: Physical Presence - Nearshore and Shoreline Users

Affected Receptor	Impact Assessment	Consequence Level
Socioeconomic (fisheries, tourism, culture)	Recreational fishing is generally concentrated inside the Gippsland Lakes or along the Ninety Mile Beach coastline. Additional vessels and personnel in the area may cause disruption to fishing activities. The movement of personnel, vehicles and equipment may disturb or damage aboriginal or non-aboriginal cultural heritage artefacts or sites. The mobilisation of equipment and personnel for OWR activities will be localised. The Oil Spill Tactical Response Plans (TRPs) detail socioeconomic sensitives for each location. The response activities will be in accordance with state response agency directions and Esso will provide the incident specific NEBA, TRPs and Shoreline Protections Plan and support where requested. The additional presence of vessels and personnel will only be short-term and in localised area for the response period. Once the response has been stood down nearshore socioeconomic activities can resume without disruptions, therefore the consequence of the impacts of the response activity is considered to be Level III.	III

The environmental impacts associated with containment and recovery operations include:

- Physical Presence – Interaction with Fauna and Flora
- Physical Presence – Sensitive and protected areas and parks
- Waste generation and Secondary Contamination

Table 8-3 Environmental Aspect: Physical Presence - Interaction with Fauna and Flora

Affected Receptor	Impact Assessment	Consequence Level
Physical Presence - Interaction with Fauna and Flora	The sandy beaches, mangroves and salt marshes in the Bass Strait provide potential foraging and breeding habitat for numerous bird species and benthic communities. The flora and fauna within these habitats have the potential to be disturbed due to large numbers of personnel accessing sites. Human presence may also cause ground disturbance due to construction of OWR rehabilitation centers. Fauna casualties from OWR techniques have the potential to result in an incremental effect on fauna populations (though oiling is expected to pose a greater risk). However, there is still the potential for the techniques to result in localised degradation of the environment or effects on individuals as opposed to population level. Hazing and pre-emptive capture of wildlife may result in the prevention of species accessing their preferred resources. This approach may also result in additional disturbance/handling stress without any benefit as many species tend to return to sites from which they have been moved. This may result in reduced reproduction and reduced energy stored for migratory animals. The incorrect handling of fauna may also result in increased stress levels and therefore increased fauna casualties. OWR activities will generally be conducted onshore. Wildlife rehabilitation centers will be set up in areas which have site access, electricity and amenities for personnel including food and lodging,	III

Affected Receptor	Impact Assessment	Consequence Level
	waste disposal and communications. The Shoreline Protection and Clean-Up Plan and site specific Tactical Response Plans include information on staging areas and access points, personnel shall use existing road and paths for access to minimise the impacts of increased foot and vehicle traffic. Fauna and flora interactions as a result of oiled wildlife response and shoreline clean-up techniques will be localised and short term. Flora and fauna are expected to recover quickly once activities cease.	
Physical Presence - Sensitive and protected areas and parks	Potential impacts to sensitive and protected areas may be impacted from OWR activities. There is a potential that personnel may have to travel through sensitive areas to access wildlife or conduct hazing, wildlife deterrence activities. The OWR activities may adversely affect natural behaviors of biota, e.g. nesting of shorebirds and seabirds. Human presence may also cause ground disturbance due to construction of OWR rehabilitation centers. The mobilisation of equipment and personnel for OWR activities will be localised. The Oil Spill Tactical Response Plans (TRPs) detail environmental sensitives for each location. Temporary exclusion zones can be set up to avoid sensitive areas. The environmental consequence to sensitive marine areas is assessed as localised and short term, it will recover quickly once activities cease.	III
Waste Management and Secondary Contamination	Wildlife response activities, specifically running a rehabilitation center, generates large volumes of waste. There is a potential for secondary contamination through the handling of oiled wildlife and waste generation. The Esso Bass Strait Oil Spill Response Waste Management Plan, details requirement for selecting waste management options and equipment and storage to be utilised to prevent secondary contamination. The Shoreline Protection and Clean-Up Plan and site specific Tactical Response Plans include information on staging areas and access points. The generation of waste will be short-term and is localised for the response period, therefore, the consequence of the impacts of the response activity is considered to be Level III.	III

Table 8-4 Acceptability of Environmental Impacts from Oiled Wildlife Response

Factor	Demonstration Criteria	Criteria	Rationale
Principles of Ecologically Sustainable Development (ESD)	No potential to affect biological diversity and ecological integrity	✓	All the aspects related to oiled wildlife response have been evaluated as having the potential to result in a maximum Level III consequence.
	Activity does not have the potential to result in serious or irreversible environmental damage.	✓	All oil spill response activities are implemented with the aim of reducing the overall environmental impact. Mobilising an OWR is an inherent part of minimising the impacts from an oil spill incident on wildlife.
Legislative and other Requirements	Legislative and other requirements have been identified and met.	✓	Legislation and other requirements have been considered as relevant and include: • OPGGS Act 2006;

			• Protection of the Sea (Prevention of • EPBC Act; • Wildlife Act 1975 (Vic); • Nature Conservation Act 2002 (Tas); and • National Parks and Wildlife Act 1974 (NSW).
Internal Context	Consistent with Esso's Environment Policy.	✓	Proposed control measures are consistent with Esso's Environment Policy, in particular, to "comply with all applicable environmental laws and regulations and apply responsible standards where laws and regulations do not exist".
	Meets ExxonMobil Environmental Standards.	✓	There is no standard related to oiled wildlife response, however the controls proposed meet the strategic objectives of the Upstream Environmental Standards.
	Meets ExxonMobil Operations Integrity Management System (OIMS) Objectives.	✓	Proposed control measures meet: • OIMS System 6-5 objective to identify and assess environmental aspects; significant aspects are addressed and controlled consistent with policy and regulatory requirements; and • OIMS System 8-1 objective to clearly define and communicate OI requirements to contractors. • OIMS System 10-2 objective to ensure effective response to emergencies and business disruptions that threaten the safety, security and health of the public, contractors and employees, the environment, asset integrity, and critical business operations
External Context	Stakeholder concerns have been considered / addressed through the consultation process.	✓	No specific stakeholder concerns have been raised.

Table 8-5 ALARP Demonstration of Potential Impacts of Oiled Wildlife Response

ALARP Decision Context and Justification	Decision Context A Oiled wildlife response activities are standard practice for hydrocarbon spills to minimise the impacts resulting from an oil spill on wildlife. There is a good understanding of potential impacts from oiled wildlife response activities. This response option would be supported by an incident specific NEBA. All activities undertaken in state waters will be led by the state control agency. Good Practice control(s) have been identified to ensure environmental impacts associated with mobilising this response are reduced to ALARP, these controls will be implemented by the State Control Agency in a response scenario and have been included in the OPEP. Esso believes ALARP Decision Context A should apply.		
Good Practice	**Adopted**	**Control**	**Rationale**

NEBA completed prior to conducting OWR operations.	✓	Incident specific NEBA.	The NEBA supports the implementation of the response strategies, and an operational NEBA is undertaken throughout the emergency response.
Minimise impacts to coastal environmental sensitivities.	✓	Primary & Secondary Shoreline Tactical Response Plans (TRPs).	Shoreline Protection Plan & Tactical Response Plans (TRPs) that consider local environmental sensitivities and habitats are provided to the control agency.
Incident specific Waste Management Plan.	✓	Bass Strait Oil Spill Response Waste Management Plan.	The Esso Emergency Response Waste Management Plan will assist in the development of an incident specific Waste Management Plan.
Ensure daily OWR operations are recorded (numbers, type and status of fauna)	✓	Daily OWR Records	Daily logs and records of oiled wildlife response operations demonstrate that OWR was deployed safely, effectively and following consideration of environmental conditions.
Exclusion zones established	✓	Exclusion zones	The OPEP requires that exclusion zones are put in place which consider health and safety and environment risks. These exclusion zones are determined in consultation with the state control agency.

8.3 Capability Assessment of Oiled Wildlife Response

A detailed capability assessment has been undertaken to ensure that Esso has access to sufficient resources to complete oiled wildlife response activities in a timely manner. The assessment concluded sufficient resources are available within acceptable timeframes to conduct this response.

Oiled wildlife is led by the state government and a variety of organisations will provide resources to assist the response, therefore

Table 8-6 details the resources available by organisation.

Table 8-6 Oiled Wildlife Resources Availability

Organisation	Resource Availability	Expected Timeframe
DELWP	<u>Resources</u> 1 x OWR Kit Bairnsdale) 1 x OWR Kit (Colac) 1 x OWR Kit (Port Phillip) 1 x OWR Kit (Warrnambool) 1 x State-wide Trailer <u>Agreement - Phillip Island Nature Park</u> 6 x staff - Wildlife emergency response. 17 x Wildlife Team Leaders. 5 x IMT Members. Approx. 45 volunteers – Collection/Facility Operations/Rehabilitation. Approx. 20 staff – Animal Feeding.	DELWP will make the decision to stand up resources which are based in Victoria. They are expected to be available <24 hours from request for services.
ExxonMobil	<u>Personnel</u> 6 x Esso Australia IMT members with OWR training Regional Response Team - OWR Core Team 12 x Trained Personnel	Remote support <12 hours from notification.

Organisation	Resource Availability	Expected Timeframe
		In-country support <72 hours from notification.
AMOSC	Resources 2 x OWR Containers (Geelong and Fremantle). 4 x OWR Box Kits. Personnel OWR Coordinator 18 x OWR Industry Team Contingency Agreements Memorandum of Understanding with Phillip Island Nature Park Call off Contract with DWYERtech NZ. A minimum of two personnel teams, to fulfil role of facilities manager and facilities coordinator.	Geelong container available onsite <24 hours of request for services. Kits would be available at site <24 hours of request for services. OWR Coordinator <24 hours OWR Industry Team <48 hours DWYERtech available <24 hours of AMOSC request for service.
OSRL	Resources 3 x OWR Search and Rescue kits 1 x OWR Intake and Triage kit 4 x Cleaning and Rehabilitation kits 1 x Wildlife Rehabilitation Unit 50% of the above inventory is available during an incident. Agreements Sea Alarm 1 x Full time availability of one Sea Alarm expert for advice and potential mobilisation to the affected site. 1 x Full time availability of one Sea Alarm expert for advice and response support. This expert will not be mobilised but provide advice and support from Sea Alarm office in Brussels or OSRL Premises.	Singapore based equipment can be mobilized to Melbourne airport <72 hours. Can be activated 24/7 as part of a wider OSRL mobilization.
AMSA	Resources 4 x OWR Containers Personnel National Plan: State/NRT Personnel (>100 persons)	Available through NATPLAN. Containers process approximately 100 units per day. Deployment of such resources to the Gippsland region would be expected to take 48-72 hours (road travel) from request for services.
NSW Maritime	Resources 1 x OWR Container	Available through NATPLAN. Containers process approximately 100 units per day. Deployment to the Gippsland region would be expected to take 48-72 hours (road travel) from request for service.
WA Department of Biodiversity and Attractions	Resources 1 x OWR Container	Deployment to the Gippsland region would be expected >72 hours (road travel) from request for service.
Waste Management Contractor	Onshore waste management arrangements.	Esso have a contract with a third party waste management service to provide transport and disposal of solid and liquid wastes.

Organisation	Resource Availability	Expected Timeframe
		4,500 m^3 bulk hard waste (soil/sand). 3,000,000 L of liquid waste (oil in water).

Table 8-7 Oiled Wildlife Resources Availability

Good Practice	Adopted	Control	Rationale
Pre-arranged access to equipment and personnel to support OWR.	✓	Agreement in place with AMOSC.	Agreement with AMOSC provides resources and equipment required for OWR activities.
Pre-arranged access to equipment and personnel to support OWR.	✓	Agreement in place with OSRL.	Agreement with OSRL will provide equipment and personnel for OWR activities.
Pre-arranged access to personnel to support oiled wildlife response.	✓	ExxonMobil Regional Response Team	ExxonMobil have a global team available for OWR activities.
Agreement with waste contractor in place.	✓	Agreement with waste management contractor.	Waste arrangements for removal of waste to approved disposal or treatment facilities in accordance with EPA requirements.

Table 8-8 Consideration of Additional/ Alternative/ Improved Capability for Oiled Wildlife Response

Additional, Alternative, Improved Controls	Benefit	Cost / Feasibility	Adopted
Develop OWR Management Plan for the Bass Strait.	Reduced time to implement strategy.	Regulations establish that the State is responsible for management of wildlife impacted by marine pollution and the State has established plans and arrangements for this hazard. In consultation with State agencies, Esso has developed an oiled wildlife area response plan for Gabo Island and also Species Response Plans to provide supplementary information for management of oiled wildlife.	Not Adopted.

9. Waste Management

9.1 Response Option Description

The response to an oil spill often results in the rapid generation and accumulation of large quantities of oily waste. Waste generated from an oil spill response may come in many forms including; oily solid and liquid wastes, contaminated equipment and wash water from recovery activities and a range of mixed consumables required by the response team and activities.

Emulsified oil, oiled sand, gravel and entrained debris can increase the volume of waste to many times the volume of oil originally spilt. This waste often exceeds the capacity of the locally available waste management infrastructure.

The quantity of waste produced from a spill is influenced by many factors, principally the quantity of oil spilled, the environmental fate of that oil and the clean-up strategy and techniques adopted.

Waste management within Australia is regulated and managed by each state independently through each states Environmental Protection Agency (EPA). The majority of waste management activities associated with an oil spill response from a Bass Strait operation would be undertaken within Victoria.

9.2 Impact Assessment of Waste Management

Impacts from the containment and recovery of waste offshore and from clean-up of shorelines impacted by oil have been described in Section 6.2 and Section 7.2 respectively.

Accidental loss of waste during recovery, transport and disposal activities may result in secondary contamination. Secondary contamination is the spread of oil to otherwise unpolluted areas via response activities associated with people, transport and equipment. Secondary contamination could lead to pollution of the environment adjacent to storage areas or runoff of waste into waterways.

The Esso Bass Strait Oil Spill Response Waste Management Plan, details requirement for selecting waste management options and equipment and storage to be utilised to prevent secondary contamination. The Shoreline Protection and Clean-Up Plan and site specific Tactical Response Plans include information on staging areas and access points (refer Section 9.3.2 for details).

The generation of waste will be short-term and is localised for the response period, therefore, the consequence of the impacts of the response activity is considered to be Level III.

Table 9-1 Acceptability of Environmental Impacts from Waste Management

Factor	Demonstration Criteria	Criteria Met	Rationale
Principles of Ecologically Sustainable Development (ESD)	No potential to affect biological diversity and ecological integrity	✓	The impacts associated with generation of waste during oil spill cleanup activities have been evaluated to have a potential Level III consequence.
	Activity does not have the potential to result in serious or irreversible environmental damage.	✓	The potential impact associated with this aspect is limited to a localised short-term impact, which is not considered as having the potential to affect biological diversity and ecological integrity.
Legislative and Other Requirements	Legislative and other requirements have been identified and met.	✓	The proposed control measures align with the requirements of: • OPGGS Act 2006. • Emergency Management Act 2013 (Vic). • Emergency Management Act 1989 (NSW). • Emergency Management Act 2006 (Tas). • Wildlife Act 1975 (Vic).

Factor	Demonstration Criteria	Criteria Met	Rationale
			• EPBC Act. • Wildlife Act 1975 (Vic). • Nature Conservation Act 2002 (Tas). • National Parks and Wildlife Act 1974 (NSW). • Environment Protection Act 2018 (Vic) • Environmental Management and Pollution Control Act 1994 (Tas)
Internal Context	Consistent with Esso's Environment Policy.	✓	Proposed control measures are consistent with Esso's Environment Policy, in particular, to "comply with all applicable environmental laws and regulations and apply responsible standards where laws and regulations do not exist".
	Meets ExxonMobil Environmental Standards.	✓	The responsible management of waste collected from oil spills meets the Upstream Waste Management Standards which calls for consideration of the waste hierarchy. Further, the use of piles meets expectations of the Upstream Water Management Standard The Upstream Water Management Standards and standards for appropriate disposal of contaminated water.
	Meets ExxonMobil Operations Integrity Management System (OIMS) Objectives.	✓	Proposed control measures meet: • OIMS System 6-5 objective to identify and assess environmental aspects; significant aspects are addressed and controlled consistent with policy and regulatory requirements; and • OIMS System 8-1 objective to clearly define and communicate OI requirements to contractors. • OIMS System 10-2 objective to ensure effective response to emergencies and business disruptions that threaten the safety, security and health of the public, contractors and employees, the environment, asset integrity, and critical business operations
External Context	Stakeholder concerns have been considered / addressed through the consultation process.	✓	No specific stakeholder concerns have been raised.

Table 9-2 ALARP Demonstration of Environmental Impacts from Waste Management Activities

ALARP Decision Context and Justification	Decision Context A Waste management is a standard practice resulting from hydrocarbon spills cleanup. There is a good understanding of potential impacts from waste management activities and the regulatory requirements to manage waste in accordance with State based regulations. Good Practice controls have been identified to ensure environmental impacts associated with mobilising this response are reduced to ALARP. These controls

	will be implemented by the state led control agency in a response scenario and have been included in the OPEP. Note that the response must be led by State Control Agencies, with Esso providing support and resources when requested. Esso believes ALARP Decision Context A should apply.		
Good Practice	**Adopted**	**Control**	**Rationale**
Implement measures to minimise secondary contamination at temporary storage locations	✓	Implement measures to minimise secondary contamination at temporary storage locations	In order to minimise the potential impacts from secondary contamination at waste storage locations, each hot zone temporary holding site will have • bunding adequate to hold the daily bagged totals • will be initially sampled to establish baseline 'clean' levels for final restoration • access for waste removal vehicles to transit from cold to hot zones

9.3 Capability Assessment of Waste Management

A detailed capability assessment has been undertaken to ensure that Esso has access to sufficient resources available to manage waste as a result of spill clean up operations (both offshore containment and recovery (Section 6) and shoreline protection and clean-up (Section 7)) to ensure that waste is removed from clean-up sites and disposed of in a timely manner.

The availability of resources is assured through contractual arrangements with waste handling and processing providers, response agencies, industry bodies and labour hire organisations. Incident response planning is done in accordance with the Esso Waste Management Plan. These good practice measures are summarised in Table 9-3 with additional considerations shown in Table 9-4.

Table 9-3 Waste Management Resources Availability

Good Practice	Adopted	Control	Rationale
Pre-arranged access to vessels for waste management	✓	Agreement with third party suppliers for provision of additional vessels.	Agreement with supplier of vessel services has provision for the supply of additional vessels.
Pre-arranged access to additional equipment for waste management	✓	AMOSC agreement.	Agreement with AMOSC provides access to additional resources and operational personnel for shoreline protection and clean up equipment. Temporary waste storage, decontamination stations, PPE stockpile containers and transfer pumps are included
Pre-arranged access to additional labor.	✓	Personnel hiring agreements.	Esso has personnel hiring agreements in place which can be utilised to provide personnel for waste management activities.
Reduction of solid waste volumes	✓	Training / induction of response personnel in shoreline cleanup operations	Waste volumes can be reduced through provision of just in time training to response personnel with oversight by experienced personnel.
Pre-arranged Waste facilities.	✓	Agreement with waste management contractor.	Waste arrangements for removal of waste to approved disposal or treatment facilities in accordance with EPA requirements.

Good Practice	Adopted	Control	Rationale
			Pre-planning for transport, temporary storage and scale up of waste management arrangements.
Pre-arranged Heavy Plant Equipment	✓	Agreement with contractor for heavy lift equipment	Agreement with third party provides access to heavy plant equipment for shoreline protection and clean up.
Pre-arranged access to personnel to support Tier III response activities.	✓	ExxonMobil Regional Response Team AMOSC Team & Core group OSRL	ExxonMobil have a global team available to assist response for Tier III activities. ExxonMobil has an agreement with AMOSC and OSRL to provide highly trained personnel from within AMOSC's core group and staff.
Access to Shoreline Response Trailers	✓	2 x Shoreline Response Trailers owned by Esso	Trailers equipped with shoreline cleanup first strike equipment available for immediate deployment.
Incident specific Waste Management Plan.	✓	Bass Strait Oil Spill Response Waste Management Plan	The Esso Emergency Response Waste Management Plan will assist in the development of an incident specific Waste Management Plan.

Table 9-4 Consideration of Additional/ Alternative/ Improved Capability for Waste Management

Additional, Alternative, Improved Controls	Benefit	Cost / Feasibility	Adopted
Additional, Alternative, Improved Controls were considered but none identified.			

9.3.1 Waste capability methodology

Waste management capability assessment is based on deterministic outcomes from modelling of the worst case discharge from the facility/field with the worst-case potential. For solid waste the Seahorse workover scenario of 127 kbbl total spill volume representing a LOWC from a crude well close to shore (Refer Volume 2, Section 6.7.2), is the scenario which resulted in the largest volume of oil ashore and is used to demonstrate capability of waste handling from shoreline cleanup. For liquid waste the Marlin (MLA) workover scenario of 519 kbbl total spill volume representing LOWC from a crude well in the northern fields (Refer Volume 2, Section 6.7.2), is the scenario which results in the largest spill volume and is also the scenario used to demonstrate capability of dispersant application in Section 5.4.

The assessments are conservatively based on an unmitigated amount of oil stranding on the shoreline for solid waste and for surface oil for liquid waste. While unmitigated volumes have been used for the capability assessments, the volumes of stranded oil and surface oil will be significantly reduced in a response situation through the use of offshore response strategies such as dispersant application which will reduce the amount of surface oil for offshore containment and recovery and will therefore also result in reduced volume of oil being stranded ashore and the quantity of waste generated as a result of cleanup.

Whereas capability has been demonstrated on this SHA scenario, Esso's capability to respond is not limited to the areas described by this scenario. The response capability is designed to enable response to the areas that could be affected by a spill from the Bass Strait activities described in Volume 2.

Capability for handling waste is determined for the duration of the spill scenario (98 days), however it is important to note ~~noting~~ that:

- Victoria DoT will have a major influence on waste streams after the first 7 days,
- Victoria EPA and EM VIC will also impact waste stream decisions after 7 days.

Solid Waste

Table 9-5 shows the volume and distribution of oil ashore resulting from the SHA workover WCDS (deterministic model scenario [run 35]) which represents the largest volume of oil ashore for the Bass Strait operations activity. The total volume (without bulking) to be stranded ashore is predicted to be 3,123 m^3 affecting 14 sub-Local Government Areas, with a total shoreline length of 254 kms. The minimum time to contact is predicted to be 36 hrs, occurring at Ninety Mile Beach. Each location has been assessed based on the shoreline type (sand, rock, cliff, tidal flats etc.) to determine what proportion can be accessed to clean. The volume of oil ashore accessible to clean has been calculated based on the accessibility and a bulking factor of 10 times the volume of oil has been incorporated to allow for volume of sand and other material which is collected with the oil. The resources required to respond to this scenario spill are shown in the SHA Quick Reference Guide (QRG) (Refer Appendix A, OPEP). The QRG shows 1614 workers would be allocated for beach clean-up (807 per shift) and the table shows the workers distributed proportionally to the volume ashore at each location. Based on the assumption that the oil is stranded at a constant rate over the 98 day scenario period, the volume of waste generated per day is shown, assuming that 1 m^3 per/person/day is able to be cleaned per guidance provided in the ExxonMobil Oil Spill Response Field Manual. The volume of waste generated determines the number of trucks required per day at each location (based on 25T capacity per truck); for this worst case scenario this amounts to 13 trucks per day.

Table 9-5 Total shoreline waste volumes that may occur from a WCD Scenario (SHA crude deterministic [run 35]) - Basis for calculating resource needs

Location	Minimum time before shoreline accumulation (hours) >100 g/m^2	Max vol ashore deterministic m^3	Max length shoreline contacted deterministic	Sand %	Rock % (Sheltered)	Rock % (Cliff face/reef)	% Accessible	Avg onshore loading per day m^3	Avg onshore bulked to clean/day m^3	No of people cleaning	m^3 cleaned /day	Number of trucks needed per day	Days till full truck load collected
Ninety Mile Beach	36	10.13	3.00	100	0	0	100	0.1	1.0	3	1	0.04	24.19
Seaspray	42	46.08	24.00	100	0	0	100	0.5	4.7	12	5	0.2	5.32
Ocean Grange	43	426.77	25.50	100	0	0	100	4.4	43.5	110	44	1.7	0.57
Lakes Entrance (West)	45	278.17	27.00	100	0	0	100	2.8	28.4	72	28	1.1	0.88
Woodside Beach	45	16.24	12.00	100	0	0	100	0.2	1.7	4	2	0.1	15.08
Lakes Entrance	47	159.14	19.50	100	0	0	100	1.6	16.2	41	16	0.6	1.54
Lake Tyers Beach	50	371.31	21.00	98	0	2	100	3.8	37.9	96	38	1.5	0.66
Marlo	53	543.74	18.00	100	0	0	100	5.5	55.5	141	55	2.2	0.45
Cape Conran	54	147.24	13.50	50	0	50	50	1.5	15.0	38	15	0.6	1.66
Golden Beach	55	126.06	21.00	100	0	0	100	1.3	12.9	33	13	0.5	1.94
Point Hicks	72	222.93	19.50	90	0	10	90	2.3	22.7	58	23	0.9	1.10
Corringle	87	448.28	18.00	100	0	0	100	4.6	45.7	116	46	1.8	0.55
Sydenham Inlet	99	280.55	19.50	100	0	0	100	2.9	28.6	72	29	1.1	0.87
Croajingolong (West)	101	46.35	12.00	80	0	20	80	0.5	4.7	12	5	0.2	5.29
Totals		**3123**					**91%**	**3123**	**31,230**	**808**	**318**	**13**	

OWR Waste

Where oiled wildlife response (OWR) is required, it is managed by the state response agency with support from Esso through provision of resources such as fully equipped OWR containers including washing / storage facilities. The need for waste handling would be managed via the state. Based on Section 8.1.2 which identifies that for a Level 3 incident spill, per this scenario, an estimated total of 52 m^3 of OWR waste would be generated across the affected locations. This corresponds to approximately 2 – 5 trucks for handling non-flammable liquids over the duration and 1-2 trucks for solid wastes. Temporary storage would be provided at beach head control points at each impacted location and transferred to layup areas such as Longford if required before being transported to waste processing facilities.

Liquid Waste

The volume of liquid waste is calculated based on the volume of oil which is estimated to be recovered through the offshore containment and recovery strategy as described in Section 6 above. The resourcing requirements in each Quick Reference Guide (QRG) show the number of strike teams required for each spill, for the MLA Crude scenario (the scenario which results in the largest spill volume) used here to demonstrate capability, the QRG shows four strike teams will be needed to respond for offshore containment and recovery. The maximum volumes of oil and waste recovered is based on the highest volume (upper range) of oil that is predicted to be recovered each day by each strike team; therefore, the maximum volume of liquid waste per day is predicted to be 160 m^3, equivalent to 160 kL (40 m^3 x 4 strike teams). Table 9-6 shows the total waste liquid volume accumulated daily and over the duration of the spill scenario.

Table 9-6 Total liquid waste volumes that may occur from Containment & Recovery - Basis for calculating waste resource needs

Containment and Recovery	**Liquid Volume**		**Transport Needs**
	Lower range kL	Upper range kL	Trucks per day needed (Upper range)
Cleanup volume/ strike team/ day	5	40	
Number of strike teams	4	4	
Volume collected per day	20	160	6
Number of days of cleanup*	96	96	
Total amount liquid waste collected over 96 days	**1920**	**15360**	

*A conservative 96 days of cleanup is assumed with 4 strike teams, in practice the first strike team will be available within 48 hrs however the activation of 4 teams will take longer therefore reducing the volume of oil that is recovered in the initial days of the response.

Transport, storage and processing - VIC

Transportation of waste is provided by the waste contractor; Table 9-7 below shows the availability of trucks per day and their capacity. Table 9-8 provides additional equipment and temporary storage which is available within 48 hours and can be used in layup or temporary storage sites to facilitate the waste management process. Additional equipment will be hired by contractors through equipment hire services.

Table 9-7 Solid and Liquid Transport Capability Victoria

Transport**	Liquids		Solids
	ISO (Flammable)	Non Flammable	
Trucks per day	10	10	20
Volume per truck	30 kL	20 kL	25 T
Volume transported /day (1 trip each)*	300 kL	200 kL	500 T

** The number of trucks per day is based on 48 hrs+ from spill occurring, trucks are available prior to the 48 hrs but are not likely to be needed in that timeframe

*Capability is conservatively based on one trip per day per truck, multiple trips would be possible depending on the specific logistics requirements, although not needed for the scenarios presented in this EP.

Table 9-8 Additional equipment and temporary storage capability

Additional Resources	Resource		Available within 48 hours
Equipment	Cleanaway	EPA approved walking floor truck 24 t loads	3
	Fergusons	Rough terrain forklift	2
Temporary solid waste storage	Esso	Plastic drums (~200 liter)	70
		Skips approx. 15 m^3 (not suitable for transport when loaded)	5
	Cleanaway	Bulk bins hook lift 10 t pay loads;	2
Temporary liquid waste storage	Esso	Fast Tanks	5
		Stainless Steel IBC (2 kL)	15
		Plastic drums (~200 liter)	70
	AMOSC	Lancer barge (25 kL capacity)	4
		Deck Bladders (25 kL capacity)	6
		Viko Tanks (13 kL capacity)	2
		Fast Tanks	6
		Collapsible storage tank	4
		IBC (1 kL)	13
	Cleanaway	Poly Tanks (50 kL)	10

Accumulated waste is taken directly to designated waste facilities where waste can be stored and processed. Where waste volume exceeds processing rate, it is stored at the waste facility (where possible) or at offsite storage facilities where it can be progressively transported for processing.

Table 9-9 shows the storage and processing facilities available to Esso to handle solid and liquid waste. The table shows that waste facilities have capacity to store solid waste (up to 33,500 T) on site, however not liquid wastes. Where daily liquid waste volume generated exceeds the daily liquid waste processing capacity, the waste must be stored at offsite facilities and transported from there for processing. Esso's Long Island Point (LIP) facility has the capacity to store up to 63,000 kL in two separate tanks.

Table 9-9 Solid and Liquid Storage and Processing Facilities in Victoria

Facility	Liquids			Solids		
	Storage	Processing	Trucks/day	Storage	Processing	Trucks/day
	kL	kL /day	able to be processed	Tonne	Tonne/day	able to be processed
Waste Facility						
Dutson Downs		40	1.3			
Cleanaway Campbellfield		60	2			
Cleanaway Laverton		60	2			
Cleanaway Dandenong		60	2	200	60	2.4
Veolia Treatment Plant		60	2	2500	50	2
Renex Treatment Facility				25000	215	8.6
Environpacific				5500	725	29
Storage Facility						
Esso LIP Crude Oil Tank	60000					
Esso LIP Ballast Tank	3000					
Barry Beach Marine Terminal				300		
Total	**63000**	**280**	**9**	**33500**	**1050**	**42**

*The Esso Longford site can temporarily store solid waste subject to attaining an amendment to its existing licence for emergency purposes. Two separate areas have been identified that could store minimum 300 m^3 and 25,000 m^3 of solid waste respectively. Longford site would be used if required (primarily as a layup facility before transporting to waste facility) and its storage capacity would be in addition to that shown in the table above.

Figure 9-1 shows the storage and processing locations in Victoria in relation to the potential locations for shoreline accumulation per the modelling scenario. In this case, and as shown in Table 9-5, the highest volumes are accumulated at Marlo, Corringle, Ocean Grange and Lake Tyers.

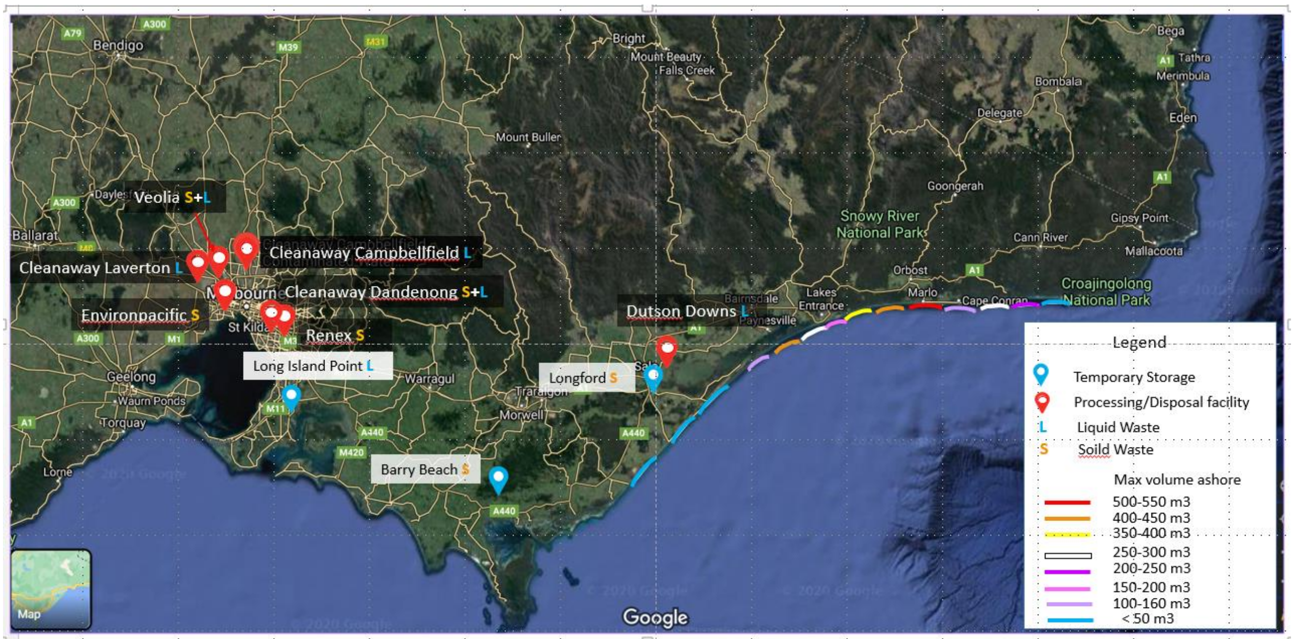


Figure 9-1 Waste storage and processing facility locations in Victoria, proximity to accumulation sites from worst case oil ashore scenario

Transport, storage and processing- NSW

If a spill reached shorelines in NSW, waste from beach clean-up would need to be processed in NSW. As offshore containment and recovery occurs near the source of the spill, it is unlikely that oily water waste collection/processing would be needed in the NSW. Table 9-10 shows transport availability in NSW. The locations available for storage and processing solids and liquids are shown in Figure 9-2. Processing capacity for NSW is shown in Table 9-11.

Table 9-10 Solid and Liquid Transport Capability NSW

Transport	Liquids		Solids
	ISO (Flammable)	Non Flammable	
Trucks per day	4	10	20
Volume per truck	20 kL	20 kL	25 T
Volume transported /day (1 trip each)	80 kL	200 kL	500 T

Figure 9-2 Waste storage and processing facilities in NSW

Table 9-11 Solid and Liquid Storage and Processing Facilities in NSW

Facility	Liquids			Solids		
	Storage	Processing	Trucks/day	Storage	Processing	Trucks/day
	kL	kL /day	able to be processed	Tonne	Tonne/day	able to be processed
Waste Facility						
Envirogard Erskine Park					3000	120
Suez Kemps Creek					460	18
Unanderra Oily Water Treatment Plant	640	80	4			
Port Kembla Oily Water Treatment Plant		300	15			
Windsor	100	200	10			
Total	**740**	**580**	**29**		**3460**	**138**

9.3.1.1 Capability Summary Solid Waste

The theoretical worst case spill scenario for oil ashore (SHA workover scenario which represents the largest volume of oil ashore) predicts that 32,230 m^3 of bulked solid waste would accumulate over 14 locations on the Gippsland coast (refer Table 9-5). The daily quantities of waste collected is equivalent to the predicted amount of oil deposited ashore at each location each day, as sufficient workers for cleaning have been allocated to clean all of the oil stranded per day. Based on the daily quantity of waste collected each day (318 m^3), the number of trucks required for transporting the waste per day is 13 (refer Table 9-5). With twenty trucks being available each day for transportation of solids (refer Table

9-7), waste can be transported directly to waste processing facilities (refer Table 9-9) which have the capacity to process up to 1050 m^3 per day, or store up to 33,500 m^3 if processing was not limited. As also shown in Table 9-9, additional temporary or layup storage of solids is available at Longford, or Barry Beach Marine Terminal, closer to the affected receptor sites providing additional logistical flexibility (Refer Figure 9-1).

9.3.1.2 Capability Summary Liquid Waste

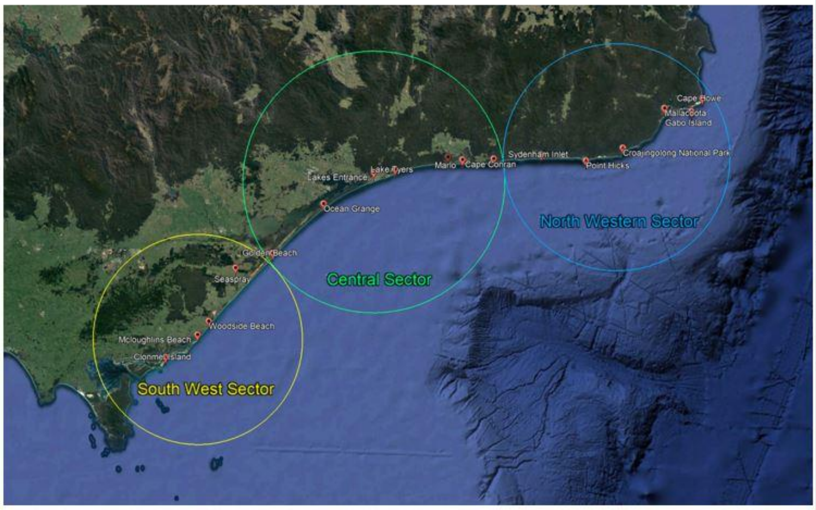
The QRG for the MLA theoretical spill scenario (the scenario which results in the largest spill volume) allocates four strike teams to enact offshore containment and recovery. The number of strike teams have been used to determine the upper range of liquid waste that would be generated, indicating that 160 kL/day would need to be handled each day for 96 days (refer Table 9-6). Liquid waste will be shipped to Barry Beach Marine Terminal where it will be offloaded directly into trucks. Table 9-6 shows that 6 trucks per day are needed to transport 160 kL, which can all be transported by ISO trucks able to handle flammable liquids if this was needed, without having to use the non-dangerous goods rated trucks. Esso would work with the transport company and the authorities to classify the liquid waste stream, however it is unlikely that all waste would be classified as flammable given it would be mixed with seawater and would have undergone some degree of evaporation and weathering.

As the waste facilities are able to process up to 280 kL/day (9 truckloads) of liquid waste, the waste would be taken directly to the facilities for processing without needing temporary storage (refer Table 9-9). If processing was not able to occur at this rate, liquids would be temporarily stored at the Esso LIP facility until such time as it could be processed.

9.3.2 Response Planning

The Waste Management Plan outlines collection and transfer methodology for the two primary waste streams – oil/water liquid stream (from offshore C&R activities) and oil/solid stream (from shorelines) as has been shown in Section 9.3.1 above. The waste plan would be enacted from Day 2 of a response to allow operational response strategies to be employed. This is consistent with the resourcing needs being shown from the 48 hr timeframe. Unmitigated marine oil spill modelling would be conducted at the time of the spill to evaluate shoreline response clean up requirements based on time of impact and geographic sectors that would likely be impacted by ~~an~~ the unmitigated marine oil spill, producing a listing and analysis of the receptors, likely volume ashore with time of predicted impact and accessibility at each location per the information provided in Table 9-5. This will form the basis for the development of incident specific response plans outlining shoreline sector designations, expected waste volumes and waste transfer processes for specific locations in each sector. The shoreline sector designations provide an overview of the scale of the response and allow a breakdown of the tasks into segments. Location specific plans within each sector describe the waste transfer process at that location with consideration given to site specific access points, hotspot storage locations and site specific equipment and resource needs. Figure 9-3 to Figure 9-5 show the overall sector designations and the central sector example for the SHA workover scenario (which represents the largest volume of oil ashore per Section 9.3) and an example of a corresponding Tactical Response Plan for one of the locations within the sector. While Esso has assessed resource requirements and has plans and necessary agreements in place to be able to execute those plans, the State Control Agency will ultimately determine how waste will be managed for any waste collected in State waters and shorelines. Through use of liaisons, Esso will coordinate access to plans and resources for waste management.

Waste Management – Overview FOR SHA WORKOVER SCENARIO	
Proposed Activity	Waste generated by shoreline clean-up teams will be collected from multiple coastal locations, transferred to centralised distribution points and then transported to designated waste treatment facilities.
Shoreline Sector Designations	The following sectors have been identified as likely to be impacted by oil from the Seahorse workover WCDS spill well location: **Sector 1 - Central Sector** **Sector 2 - South West Sector** **Sector 3 - North East Sector**



Sector Boundaries	
Map Extent	**Lat/Long**
Clonmel Is	**38°42'41.93"S** **146°42'9.00"E**
Cape Howe	**37°30'8.17"S** **149°58'42.51"E**
Potential Impacted Shoreline (kms)	**275 kms**
Predicted Total Waste Volume (WCD)	**31,230m³**

Figure 9-3 Example overall sector designations for SHA workover WCDS

Overview – Central Sector

Sector Boundaries	
Map Extent	**Lat/ Long**
Golden Beach	**38°13'41.69"S** **147°22'28. 11"E**
Cape Conran	**37°48'44.00"S** **148°43'41.85 E**
Potential Impacted Shoreline (kms)	**165 kms**
Predicted Waste Volume (WCD – 96 days)	**23,040m³**

Expected waste volumes (Per day)*			
Lakes Entrance	16m³	Lake Tyers Beach	28m³
Golden Beach	13m³	Marlo	55m³
Ocean Grange	44m³	Cape Conran	15m³
Lakes Entrance West	28m³		
Corringle	44m³	**Total**	245m³

Figure 9-4 Example Central sector designation for SHA workover WCDS

Lakes Entrance

	Waste Transfer process
1	Waste accumulated on shoreline is transported to collection points along each beach. Depending on local logistics and access for vehicles between shoreline locations, additional collection points may be used between beaches and vessel collection point.
2	Waste at collection points are transferred out of the hot zones and onto the vehicle access points at each decontamination station – vehicles are jet-washed to eliminate secondary contamination (into a bunded area) and the vehicle departs.
3	Hazardous waste is stockpiled at laydown area adjacent to both Lakes Entrance heads for transfer to B-Double.
4	Waste is either transferred to the nominated treatment facility or onto Longford waste temporary holding.

Logistics	Location	Requirements/Considerations
Primary Collection Point/s	Lakes Entrance beach (~34km) Various locations	Accessible by vehicle
Transfer Point/Laydown (Lakes Entrance East)	Eastern Beach road West of golf course 	Manual handling/mechanical lift capacity for offloading. Waste transfers to B-Double for onward movement to designated Waste Treatment Facility.
Transfer Point/Laydown (Lakes Entrance West)	Ocean Grange Track Beach Access Track 	4WD vehicles and trailers to be used for transport on Ocean Grange track, no B-Double access. Only road access to Lakes Entrance West.
Waste Treatment Facility	Primary: Dutson Downs waste treatment plant Secondary: Cleanaway Longford Gas Plant temporary storage	Pending acceptance of waste.
Personnel transfer	Great Lakes Airport (YGRL)	Regional airfield 6km North of Lakes Entrance
	Vehicle from Melbourne	~320km 4hrs.

Equipment	Units	Requirements/Considerations
25kg heavy duty plastic bags	1,760	= (27m^3/day x 40 per 1m^3) + (16m^3/day x 40 per 1m^3)
B-double truck and trailer combination	2	30t (m^3) per unit. 2 loads required per day.
Rough terrain forklift	2	One either side of the Inlet for each collection area.
UTV	2	Personnel transport in addition to 4WD and local vehicles
FOB/Sector command post	1	Facility portable office, or cabin onsite to coordinate movements

Figure 9-5 Example Tactical Response Plan for one response location within the Central sector for the SHA workover WCDS *continued overleaf*

1. Waste Management: Lakes Entrance			
Desired Outcome	Teams access the shoreline using appropriate vehicles/vessels at pre-determined sites (from SCAT recommendations) to remove waste accumulated by shoreline clean-up teams.		
Conduct	**Transport**	Vehicles/vessels capable of providing access to Lakes Entrance for team or teams of personnel (up to 25 pax) to manually or mechanically remove accumulated waste.	
		Vehicle (or potentially vessels) capable of transporting teams and equipment to and from pre-determined sites, and waste (plastic bag waste) from Lakes entrance West to Lakes Entrance East collection point.	
	Equipment		
	Offshore – for all vessels	Waste storage – sealed skips or containers capable of holding collected hazardous waste	
		Decontamination equipment – full decontamination of personnel and shoreline equipment	
		HSSE and First Aid equipment (May include specialist safety equipment related to the treatment of issues related to local region or environment)	
	Onshore	Waste storage – heavy duty plastic bags (Max 25lt)	
		Shoreline response tools and equipment (appropriate collection and cleaning equipment will require validation prior to or during deployment)	
		Site setup and site management equipment	
		Communications equipment (UHF, VHF, Satphone, Spot gen3, BGAN)	
		HSSE equipment including PPE and First Aid	
		Decontamination equipment – personnel decontamination to reduce potential for secondary contamination as personnel leave the shoreline.	
	Personnel	Divisional Command	HSE Safety Officers
		Sector Commands	General labourers
		Team Leads	Local Ranger
		Decontamination Teams	
	Method	All-terrain vehicles are used to transport personnel and equipment to pre-determined locations along the Lakes Entrance shoreline. Teams transfer by day from vehicle to the shoreline and conduct waste recovery operations. Welfare, equipment movements and waste collection are managed with ongoing vessel & vehicle support and teams are returned to the mainland overnight.	

Figure 9-5 Example Tactical Response Plan for one response location within the Central sector for the SHA workover WCDS

10. References

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Appendix A – Bass Strait Oil Pollution Emergency Plan

Esso Australia Resources Pty Ltd

Bass Strait

Oil Pollution Emergency Plan

Document Number: AUGO-EV-ELI-001

OIMS MANUAL - DOCUMENT CONTROL DETAILS

TITLE:	Bass Strait Oil Pollution Emergency Plan
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APPROVALS:

Rev 8.1	Name	Position	Signature	Date
Endorsed By:	Hena Kalam	Offshore Risk, Env. & Regulatory Supervisor	On File	27 Aug 2020
Document Owner:	Hena Kalam	Offshore Risk, Env. & Regulatory Supervisor	On File	27 Aug 2020
Approved By:	Simon Kemp	Offshore Asset Manager	On File	27 Aug 2020

Endorsed / approved by Esso Australia Pty Ltd, for and on behalf of Esso Australia Resources Pty Ltd.

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DOCUMENT REVIEW AND UPDATE:

The Document Owner is responsible for maintaining and controlling changes to this document in accordance with the Document Management Manual (AUGO-PO-DMM-001). In the course of using this document, users may identify opportunities to improve its content. They are requested to provide suggestions to the Document Owner.

This document should be reviewed for accuracy and currency on a 5 yearly basis commencing from the original formal issue date. Major revisions to this manual are to comply with the OIMS System Manual/Process Management of Change procedures.

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Definitions and Abbreviations

ADIOS2	Automated Data Inquiry for Oil Spills 2
ALARP	As low as reasonably practicable
AMOSC	Australian Marine Oil Spill Centre
AMOSPlan	Australian Marine Oil Spill Plan
AMSA	Australian Maritime Safety Authority
BBMT	Barry’s Beach Marine Terminal
BIA	Biologically important area
CA	Control agency
CG	AMOSC core group
CMR	Commonwealth Marine Reserve
CoP	Common Operating Picture
DA	Described Area (see Volume 1 – Description of the Environment)
DELWP	Department of Environment, Land, Water and Planning
DPIPWE	Department of Primary Industries, Parks, Water and Environment (Tasmania)
DODI	Diamond Offshore Drilling Inc
DoEE	Department of the Environment and Energy (Cth)
DOT	Department of Transport (Vic)
DRET	Department of Resources, Energy and Tourism (Cth)
EAPL	Esso Australia Pty Ltd
EMBSI	ExxonMobil Biomedical Sciences Inc
EMD	Emergency Management Division (part of DOT)
EMMV	Emergency Management Manual Victoria
EP	Environment plan
EPA	Environment Protection Authority
EP&R	Emergency preparedness and response
ERM	Emergency response manual
ERR	Earth Resource Regulation (part of the DJPR)
ERT	Emergency response team
ESG	Emergency support group
EUL	Environment unit lead
EWMS	Esso Work-Method Statement
FWADC	Fixed-wing aerial dispersant capability
GOR	Gas–oil ratio
IAP	Incident action plan
IC	Incident commander
ICP	Incident command post

ICS	Incident command system
IMH	Incident management handbook
IMT	Incident management team
IPIECA	International Petroleum Industry Environmental Conservation Association
JSA	Job safety analysis
JSCC	Joint Strategic Coordination Committee
KEF	Key ecological feature
LIP	Long Island Point
LSC	Logistics Section Chief
LCM	Lead Country Manager
LOC	Loss of containment
LOWC	Loss of well control
MDO	Marine diesel oil
MENSRP	Maritime Emergency (Non-search and Rescue) Plan
MES	Monitoring, evaluation and surveillance
MOH	Medical and occupational health personnel
MNES	Matter of National Environmental Significance
NATIONAL PLAN	National Plan for Maritime Environmental Emergencies.
NEBA	Net environmental benefit analysis (Items of)
NES	National environmental significance
NM	Nautical mile (also M, nmi)
NOAA	National Oceanographic and Atmospheric Administration (USA)
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
OIM	Offshore installation manager
OSC	Operations section chief
OPEP	Oil Pollution Emergency Plan
OPGGSA	Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth)
OSA	Oiled shoreline assessment
OSMP	Oil Spill Monitoring Program
OSR	Oil spill response
OSRA	Oil Spill Response Atlas
OSRL	Oil Spill Response Limited
OSTM	Oil spill trajectory modelling
OWR	Oiled wildlife response
PCR	Production control room
PEAR	People, environment, assets, reputation
P&GA	Public & Government Affairs

PPE	Personnel protective equipment
PSC	Planning section chief
PSZ	Petroleum safety zone
POLREP	Pollution report form
POWBONS	Pollution of Waters by Oil and Noxious Substances Act 1987 (Cth)
RRT	Regional response team
SC	Section chief
SCAT	Shoreline clean-up assessment technique
SDS	Safety data sheet (formerly MSDS)
SERP	Victorian State Emergency Response Plan
SMV	Surveillance Monitoring and Visualisation
SO	Safety Officer
SSH&E	Safety, security, health, and environment
SITREP	Situational report
SITL	Situation unit lead
SITU	Situation unit of the incident management team
SMPC	State Marine Pollution Controller
SOPEP	Shipboard Oil Pollution Emergency Plan
SREC	Safety Resilience and Emergency Coordination (part of DoT)
TASPLAN	Tasmanian Marine Oil Spill Contingency Plan
TRP	Tactical response plan (see Volume 3)
WCDS	Worst Case Discharge Scenario
WOMP	Well operations management plan
WMP	Waste management plan
WMM	Waste management manual
WWV	ExxonMobil Drilling Worldwide Ventures
VM	Vessel Master

1 Spill Response Operations

This section of the plan details the actions that Esso will undertake in the event of a hydrocarbon spill resulting from an Esso activity.

All staff are to be guided by the spill response incident flow chart in Figure 1-1.

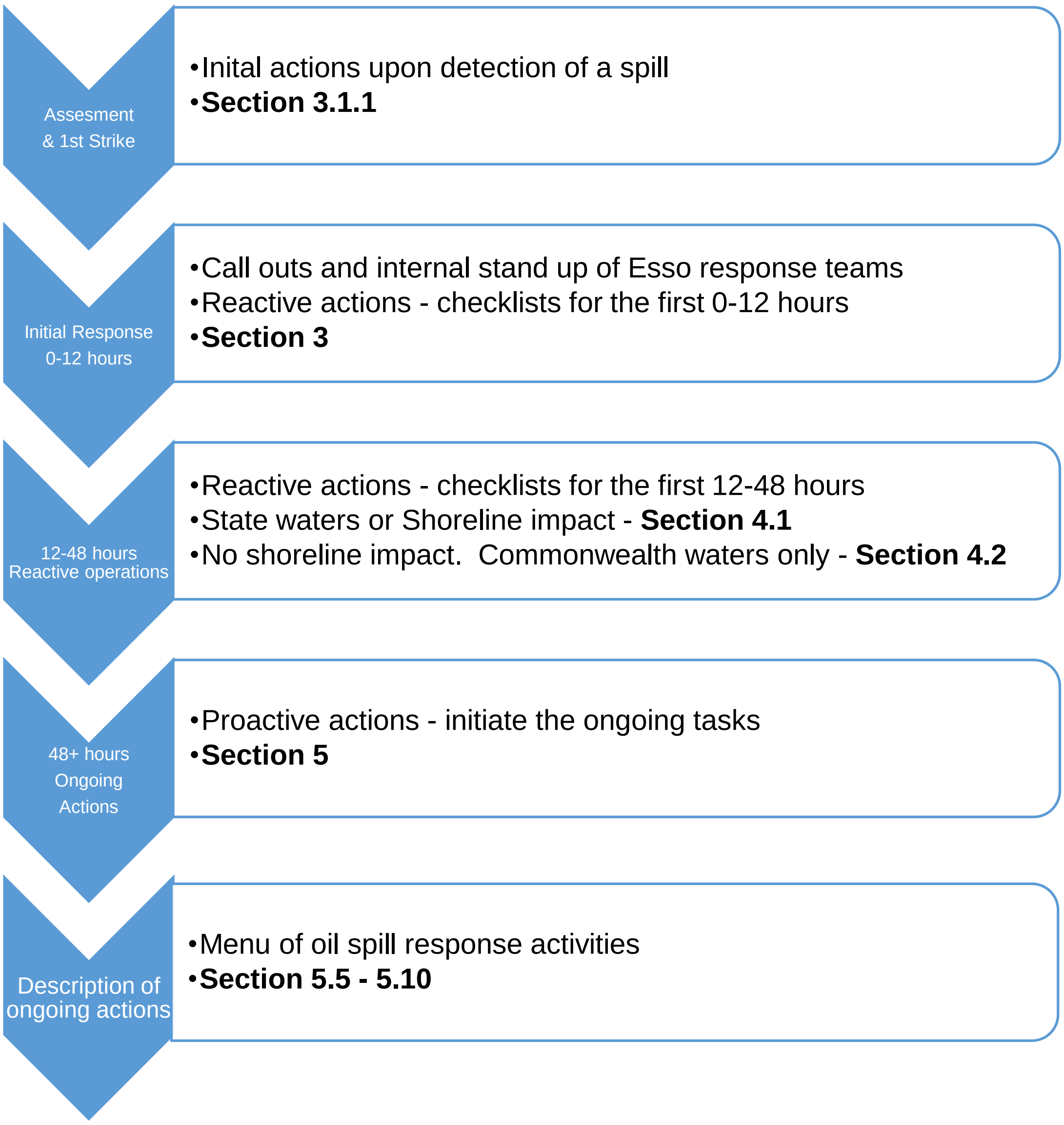


Figure 1-1 Spill Response Incident Flow Chart

Sustain spill response until termination end points (refer to Section 5) and environmental performance objectives are reached for each activity.

2 Quick Reference OPEP Information

2.1 Location

This OPEP applies to spills from petroleum activities linked to Esso's Gippsland Basin operations and project activities as described in Volume 2 (and Volumes 2a, 2b, 2c, 2d etc., hereafter referred to as Volume 2) of the Environment Plan.

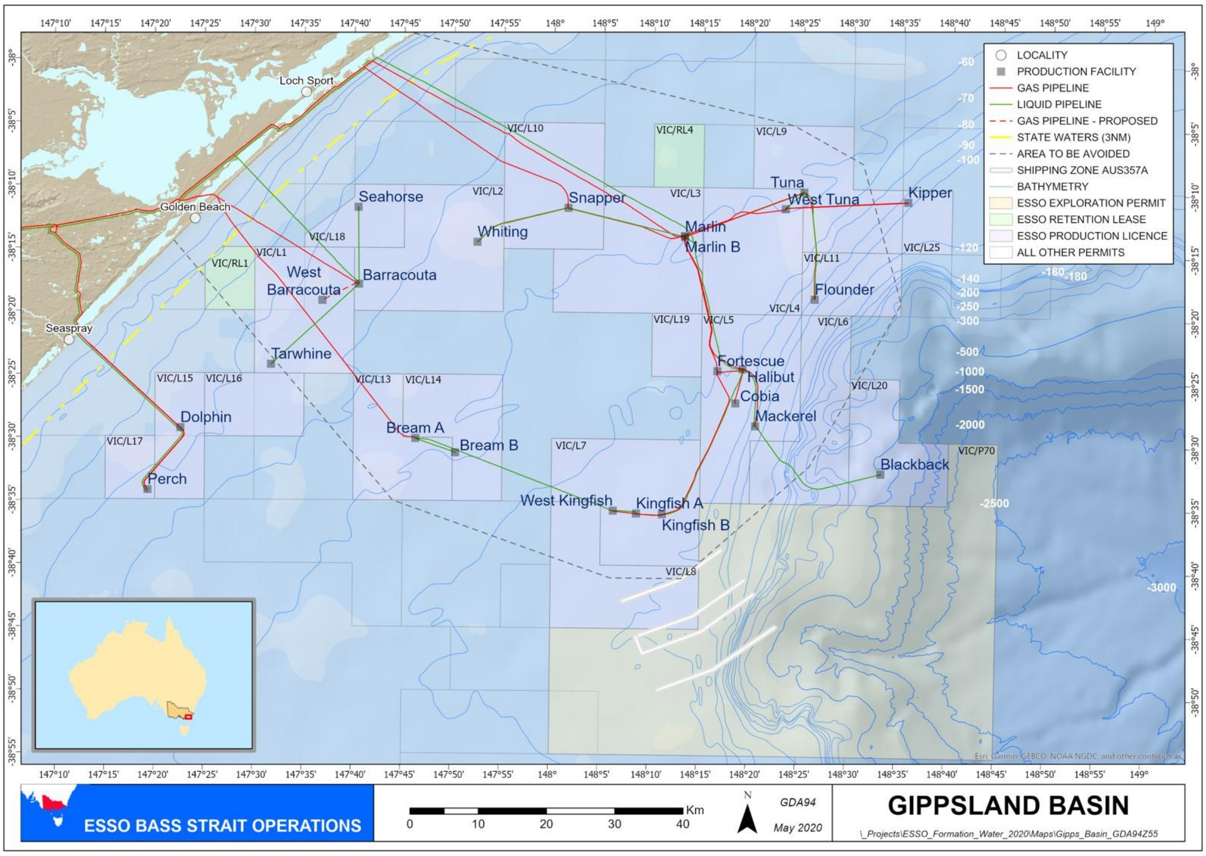


Figure 2-1 Asset Location

2.2 Potential Oil Types

- Condensates (Group I)
- Marine Diesel Oil (Group II)
- Light Crude (Group II)
- Persistent Crude (Group IV)

Properties of hydrocarbons used for modelling are detailed in Section 7.2.2.

2.3 Potentially Exposed Area

Stochastic spill trajectory modelling has been conducted to evaluate the effect of worst case discharge scenarios from Esso's Bass Strait petroleum activities.

In addition to the stochastic modelling, deterministic runs were also assessed and presented based on the following criteria;

1. largest volume of oil on shorelines;
2. longest length of shoreline contacted at or above 100 g/m^2 (actionable shoreline oil);

3. minimum time before contact to nearby shoreline by visible oil (0.5 g/m^2); and
4. largest swept area of oil on the sea surface above 10 g/m^2 (actionable sea surface oil).

The criteria listed above were determined for the "worst case" simulation between the modelled scenarios.

Appendix D - Quick Reference Guides provides maps and a descriptions of predicted impacts of the representative worst case scenarios.

An extensive description of the different types of sensitivities can be found in Volume 2 of the Environment Plan related to each activity.

3 Initial Oil Spill Response Actions – Assessment & Escalation 0–12 hours

3.1 Flowchart of Initial Processes

Upon detection of a spill, Esso will undertake a three-step process, as follows:

1. Assessment of Spill

↓

2. Notifications and Immediate Actions

↓

3. Stand Down or Monitoring or Escalation

Each step is outlined in greater detail below.

3.1.1 Assessment of Spill – Emergency Response Incident Management Teams

Upon detection of a spill, Esso will form a field-based Emergency Response Team (ERT), which will undertake the following actions:

- Begin a risk assessment in order to determine (and then execute) safety mitigations,
- Determine the size, bearing/trajectory and fate (weathering) of the spill,
- Judge the potential environmental impacts and the appropriate actions necessary to reduce those impacts,
- Execute any available source control options/first-strike response actions, and
- Notify the shore-based Esso duty IC of the incident await further instructions as to the appropriate actions to take.

The ERT is to use the following checklist as a way to direct these immediate steps.

Table 3-1 ERT Immediate Actions

ERT Immediate Actions			
Who	**What**	**Minimum time to implement**	**✓/✗**
Observer of Spill	Report the spill to the Offshore Installation Manager (OIM) or Vessel Master (VM).	ASAP	☐
OIM/VM	Secure operations, assess and report damage. Isolate spill source if it is safe to do so – implement pipeline de-pressurisation or leak response procedures. Refer to ERM V2-052-008 for response to unknown source.	ASAP	☐
OIM/VM	Ensure that all personnel are accounted for.	ASAP	☐
OIM/VM	Conduct a hazard assessment to determine the potential for fire, explosion, and hazardous/toxic vapours as well as to define the personal protective equipment (PPE) needed by responders.	ASAP	☐

ERT Immediate Actions			
OIM/VM	Implement spill mitigation measures to prevent further oil from entering the water, providing it is safe to do so. Activate the ERT as required.	ASAP	☐
OIM/VM	Report the incident to the Field Superintendent. The Field Superintendent is then to initiate upward internal communications to the Duty Incident Commander. Observe and include the following information in the brief: • Number of injuries. • Note ongoing immediate hazards to life (such as risk of fire or explosion). • Description of incident. • Location of the incident. • Status of source. • Time of incident. • People and assets involved in the incident. • Current field objectives/actions. • Details of support required from the Esso IMT.	ASAP	☐
OIM/VM	Observe and report on weather and sea states, including: • Current/tide-stream speed, direction and period • Wind speed, direction and period • Wave height and direction • Swell height and direction.	ASAP	☐
OIM/VM	Observe and determine the spill trajectory (manual estimation), noting: • The speed and direction of the spill.	ASAP	☐
OIM/VM	Observe and determine the likely spill type and volume: • Is the source contained, ongoing, isolated or stopped? • Provide a visual description of the slick (e.g. is it breaking up, floating, sinking, etc.) • What type of spill is it (diesel, gas, condensate, slops, light crude or waxy crude oil)? • Calculate/estimate the spill volume	ASAP	☐
OIM/VM	Observe and note any immediate sensitivities in the area at risk from the spill: • Note the presence of people, environmental sensitives (e.g. fauna, reef, etc.), as well as any of Esso's or other organisations' assets.	ASAP	☐
OIM/VM	Request helicopter overflight and commence regular surveillance of the spill. Evaluate spill weathering.	ASAP	☐
OIM/VM	Remain available to update the Offshore Incident Management Team.	Ongoing	☐
OIM/VM	Evaluate the incident and determine the incident classification/level based on the below national plan levels (refer to Table 3-3). Confirm this level with the on-call/duty Incident Commander.	ASAP	☐
OIM/VM	Report the incident to NOPSEMA as per Table 3-4.	ASAP and within 2hours	☐

Once the Duty IC has been notified of the spill, go to Table 3-2.

Table 3-2 IMT Immediate Actions

IMT Immediate Actions			
Who	What	Minimum time to implement	✓/✗
Duty IC	Establish communications with the Platform/Vessel/ERT Leader, obtain situational awareness briefing and determine the next steps. Confirm the following details with the field-based team: • Incident details – what happened? • What are the current field operations? • What are the immediate incident objectives and priorities? • What support is required from the Esso IMT in order to execute the immediate objectives?	ASAP	☐
IC	Activate the Esso IMT – Deputy IC, OSC, PSC, LSC, SO and EUL, following which: • Provide an initial incident briefing to the Esso IMT • Commence the incident action-planning process • Commence the size-up of the incident • Establish incident response aim and objectives and offer support to the affected facility. • Begin working to meet incident and oil spill response objectives.	< 60 mins	☐
IC	Notify the ESG Leader of the incident and request ESG support as required.	ASAP	☐
IC	Notify SHE&S, P&GA and security of the incident.	ASAP	☐
IC	In conjunction with the PSC, EUL and the SHE&S team, determine and confirm the appropriate response level. Use the *Response Level Assessment* Table 3-3 below to drive this process.	4 hours	☐
IC, PSC and OSC	Determine the response required of Esso: • Stand down – no spill/no oil left • Level One – monitoring of site-based response until completion • Level Two or Three – significant field and IMT escalation with significant additional resources required.	5 hours	☐
Once ERT- and IMT-based assessment tasks are completed, move on to Section 3.1.2			

3.1.2 Notifications and Immediate Actions

Once a spill has occurred, the Esso IMT is required to complete several statutory notifications, which vary based on the spill level. Notifications and immediate actions are to be concurrently completed by different members and sections of the IMT.

As these tasks are completed, the Esso IMT should be aiming to mobilise resources in line with the following guide:

Table 3-3 Response Level Assessment & Resourcing Guide

Response Level Assessment

On the basis of information gathered by the ERT/IMT, and in conjunction with the PSC/SHE&S team, a spill level is to be determined using the following indicators:

Criteria	Level One Indicators	Level Two Indicators	Level Three Indicators
Type	Non-persistent oils (>50% loss after 24 hours)	Persistent oils (<50% loss after 24 hours)	Persistent oils (<25% loss after 24 hours)
Location	Located within a 3 NM radius of the spill location	Spreading/moving into adjacent waters, presenting a threat to state waters	Spreading/moving into state waters and shorelines
Direction/heading	Not moving/heading offshore	Heading onshore/towards state waters	
Spill status	Small single release	Ongoing/large single release	
Ecological impact	Isolated impacts/no impact; natural recovery expected within days/weeks	Significant impacts across a single area; natural recovery may take weeks/months	Significant impacts across a large area; recovery may take months/years
If any one of the above criteria are triggered, adopt the higher-level response until de-escalation can occur.			

Resourcing Guide by Level		
Level 1 Response	Level 2 Response	Level 3 Response
• Dealt with predominantly by the ERT, using existing Esso business-as-usual resources*. • Supported by Victoria-based Esso resources; may involve the use of AMOSC technical advice or resources. • Of short duration. • Requires Tier One (local) resources.	• Requires assistance external to the site and a formal command and control structure. • IMT and ERT stood up; planning ‘P’ process implemented as soon as possible. • ERT resources supplemented by AMOSC resources, Victoria State and NatPlan resources. • Of short or medium-term duration. • Potential for significant state government engagement (shoreline and P&GA). • Requires both Tier One and Tier Two resources.	• Requires expanded IMT and full use of ICS processes with multiple planning periods. • Planning ‘P’ process used fully. • Extensive external national and (potentially) global resources (both in terms of personnel and technical and equipment-based resources). • Results in a lasting campaign/project duration. • Requires significant state and Australian government engagement. • Tiers One, Two and Three resources mobilised.

**Esso activities involving other facility operators (e.g., MODU for a drilling campaign) may form agreements through bridging documents to coordinate Level 1 response activities within the assigned operating area (usually 500m radius from location).*

The required notifications are outlined in Table 3-4.

Table 3-4 Notifications

Notifications			
Who	**What**	**Minimum time to implement**	**✓/✗**
IC or Deputy IC	A reportable incident is one that has caused, or has the potential to cause, moderate to significant environmental damage (interpreted as the following): • Unplanned release of hydrocarbon liquid or chemicals exceeding > 80 L into the marine environment caused by, or suspected to have been caused by, petroleum activities. • Unplanned injury or death of a cetacean or listed threatened/migratory/marine species caused by, or suspected to have been caused by, petroleum activities. Required for: all spills > 80 L Ensure the NOPSEMA Duty Officer has been notified: Tel: 1300 674 472 Relay the known key facts of the spill – location, source, size and type – as well as incident factors causing the spill, and current assessed spill level.	<2 hours	☐
EUL	Follow up with a written record of the oral notification to NOPSEMA as soon as practicable.	As soon as practicable	☐
EUL	A written report must be provided to NOPSEMA as soon as practicable, but in any case within 3 days[1] of a reportable environmental incident (as described above) unless otherwise agreed by NOPSEMA. This report can be made on NOPSEMA report form N-03000-FM0831. A copy of the written report must be given to both NOPTA and DJPR ERR within 7 days of giving the written report to NOPSEMA.	<3 days < 7 days after report given to NOPSEMA	☐
Vessel Master	Required for: all spills from vessels. Notify the Rescue Coordination Centre: Tel: 1800 641 792 Follow up with the completion and submission of a pollution report. https://www.amsa.gov.au/forms/harmful-substances-report-polrep-oil Relay the known key facts of the spill – location, source, size and type – as well as incident factors causing the spill, and current assessed spill level.	<2 hours <24 hours	☐
EUL	Required for: all spills > 80 L Notify the DJPR ERR and NOPTA via email: Email: DJPR: Operational.reports@ecodev.vic.gov.au Email: NOPTA: reporting@nopta.gov.au Relay the known key facts of the spill – location, source, size and type – as well as incident factors causing the spill, and current assessed spill level.	<6 hours	☐

[1] As per Schedule 3 of the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (Cth) and as outlined in the NOPSEMA Notification and Reporting of Environmental Incidents Guidance Note N-03000-GN0926.

Notifications			
Who	**What**	**Minimum time to implement**	**✓/✗**
IC or Deputy IC	Requirement: all spills that could impact Victorian state waters (> 80 L). Notify the DOT SREC State Duty Officer: Tel: 0409 858 715 Email: semdincidentroom@ecodev.vic.gov.au Relay the known key facts of the spill – location, source, size and type – as well as incident factors causing the spill, and current assessed spill level. For Level Two and Level Three spills, exchange liaison officers between Esso and the DOT SREC.	<6 hours	☐
	Required for: all spills that could impact NSW waters. Notify the *Transport for NSW* Duty Officer of the need to stand-up state response arrangements. Transport for NSW Duty Officer: Tel: 02 9962 9074		☐
	Required for: all spills that could impact Tasmanian waters. Notify the Tasmanian DPIPWE of the need to stand-up state response arrangements. Tasmanian DPIPWE Pollution Incidents and Complaints: Tel: 1800 005 171 The initial verbal notification must be followed up by an email containing a more detailed Pollution Incident Report to incidentresponse@epa.tas.gov.au		☐
EUL	Required for: all spills that are within a marine park, or could impact a marine park. Notify the Director of National Parks via the 24-hour Marine Compliance Duty Office: Tel: 0419 293 465	<12 hours	☐
EUL	Required for: all spills that impact or have the potential to impact on matters of national environmental significance (NES) including protected and migratory species, Commonwealth Marine Reserves and Ramsar Wetlands. Notify the Department of Agriculture, Water and the Environment: Tel: 1800 803 772	< 12 hours	☐
Once all appropriate authorities have been notified, move onto the appropriate immediate actions tables, for levels **one, two** or **three** below, depending on severity.			

Following the notifications, immediate actions by spills level are as follows coded by planning, operations, and logistics sections/areas:

Table 3-5 Level One - 0-12 hour Actions

Level One 0-12 hours			
Who	**What**	**Minimum time to implement**	**✓/✗**
IC	In conjunction with the ESG leader, ensure all necessary regulatory notifications have been made.	12 hours	☐
IC	Commence the planning cycle (the 'stem' of the planning 'P'): • Establish incident aim • Establish incident response aim and objectives • Determine appropriate initial strategies and tactics to achieve objectives.	ASAP – <2 hours	☐
OSC	If the source is not controlled, establish a Source Control Branch to develop and implement the Source Control Plan.	ASAP	☐
OSC	Undertake aerial surveillance: • Deploy surveillance by crew change or contracted aircraft. • Initiate mobilisation of a trained aerial observer – Esso or AMOSC. • Obtain photographs or video footage. • Obtain completed aerial observer's report and pass to the PSC/SITL.	ASAP, then 2x daily	☐
OSC	Deploy a regular watch of the affected assets/vessel – confirm heading/changes to the situation.	ASAP then by reporting exception.	☐
LSC	Confirm the location of aerial and marine assets currently contracted to Esso.	4 hours	☐
PSC	Initiate specific elements of O1 of OSMP, including the tasks below.	ASAP	☐

PSC	Monitor and predict weather and sea states:
	• Consult meteorology services to determine water current and wind speed data, either from http://www.bom.gov.au, http://www.marineweather.net.au, or MetConnect (http://www.metconnect.co.nz):
	  ○ Username: Esso
	  ○ Password: basswx.
		4 hours	☐

PSC	Conduct a manual forecast of the spill trajectory: • Determine the direction of the spill. • Determine if the spill is likely to cross into state waters or shorelines or if it might impact other sensitivities.	4 hours	☐
PSC	Should oil cross into state waters or impact shorelines, organise third-party trajectory modelling of the spill trajectory: • Organise urgent oil-spill trajectory modelling via AMOSC, OSRL, or EMBSI.	4 hours	☐
SITL	Establish a common operating picture – a graphical representation of the spill and its location. • Display overflight, OSTM/manual vectoring data on CoP.	4 hours	☐

Level One 0-12 hours			
Who	**What**	**Minimum time to implement**	**✓/✗**
PSC	Prepare and disseminate SITREPs as more information becomes available. The IC is responsible for determining the frequency of these updates.	Ongoing	☐
PSC	Consult the preparedness NEBA and Appendix D – Quick Reference Information to identify potential exposed environmental sensitivities based on spill trajectory, and develop an incident action plan, including a spill-specific NEBA (ref OPEP 5.2).	12 hours	☐
EUL	Activate the OSMP 'O' modules 1.1, 1.2, 1.3 and 4.1	ASAP	☐
EUL	Review the OSMP to determine which other modules may need to be initiated.	ASAP	☐
Once these actions are complete, please move to **Section Four** of this plan			

* Ability to deploy subject to available daylight and weather conditions

Table 3-6 Level Two - 0-12 hour Actions

Level Two 0-12 hours			
Who	**What**	**Minimum time to implement**	**✓/✗**
IC	Seek alignment on incident objectives from the ESG.	ASAP	☐
IC	In conjunction with the ESG leader, confirm all necessary regulatory notifications have been made.	<2 hours	☐
IC	Commence the planning cycle (the 'stem' of the planning 'P'): • Establish the incident response aim. • Establish the incident objectives. • Determine appropriate strategies and tactics to achieve objectives.	ASAP – <6 hours	☐
IC	Establish a locally based Esso IMT, including representatives from the Deputy IC, Ops SC, Aviation Unit, Log SC, Planning SC, Environmental Unit and Situation Unit.	<2 hour	☐
IC	Establish a line of communications with DOT IMT and exchange Liaison Officers.	ASAP – <2 hours	☐
IC/OSC/PSC	Determine and agree on the need for a separate Source Control Branch	ASAP	☐
OSC	If the source is not controlled, establish a Source Control Branch to develop and implement the Source Control Plan.	ASAP	☐
OSC	Undertake aerial surveillance: • Initiate aerial surveillance using the crew change helicopter or contracted aircraft. • Initiate the mobilisation of a trained aerial observer – Esso or AMOSC • Obtain photographs or video footage of the incident • Obtain a completed aerial observer's report and pass to the PSC/SITL.	ASAP, then twice daily	☐
OSC	Mobilise a satellite tracking buoy to spill location (weather dependent).	ASAP – <12 hours	☐
LSC	Confirm the location of aerial and marine assets currently contracted to Esso. Confirm the location and availability of vessels of opportunity in Victoria, as follows: • Contact Atoll Offshore on 03 5116 1511 or 0409 803 588. • Contact Bhagwan Marine on +61 7 3907 3111 or 0409 979 551. • Confirm the location and availability of aerial assets that may be used for aerial observation. • Contact Bairnsdale Air Charter on 03 5152 4617. • Consider utilisation of idle fishing vessels (which meet required specifications) by calling Gippsland Ports on 0427 610 025 (Harbour Master) or 0427 833 388 (Chief Executive Officer)	4 hours	☐
LSC	Notify the waste contractor of potential resource needs.	<12 hours	☐

Level Two 0-12 hours			
Who	**What**	**Minimum time to implement**	**✓/✗**
LSC	Notify the marine and aviation FOBs of the need to conduct spill response operations and prepare area and hardstand. Marine bases • BBMT Marine Supervisor 0407 846 457 • Lakes Entrances 03 5116 1511 (Atoll Offshore) • Airfields • Esso Longford Heliport 03 5143 4256 • Bairnsdale Airport 0447 132 980	<6 hours	☐
LSC	Identify and call-out Esso Core Group members – establish current location and timeframe to deploy to field-based ICP.	<6 hours	☐

LSC	Request that the AMOSC Technical Advisor come to the site (IMT) and that the AMOSC Operations Officer enters the field (ICP).
	Request that AMOSC undertake the call-out of CG resources (these should be mobilised in the Gippsland region).
	Request that AMOSC hire and mobilise x 6 satellite tracking buoys to Longford Heliport.
	Discuss potential equipment and service needs (Must be spill-size and type specific) with AMOSC, consisting of:
	• Equipment for three x offshore containment & recovery strike teams, each comprising:
	  ○ 3 reels of Ro-boom (or a single high speed sweep system)
	  ○ Skimmer package comprising an LWS500 or similar
	  ○ Temporary vessel storage (deck bladders, intermediate bulk containers or towable barges)
	• Equipment to execute the shoreline TRPs
	  ○ Shore seal boom; fence boom; anchor kits and ancillaries.
	• Dispersant and National Plan aerial dispersant spraying capability.
	• Liaison to National Plan for the use of Victorian based C&R equipment
		<3 hours	☐

LSC	Stage BBMT-based dispersant and offshore containment and recovery equipment for deployment, consisting of: • 1 x AFEDO dispersant spray sets. • 10m^3 IBCs of Corexit 9500a • Waste liquid storage (vessel dependent). Move equipment package to wharf face, ready for load out.	<6 hours	☐
LSC	Prepare LIP-based nearshore/shoreline oil spill response equipment for deployment.	<24 hours	☐
LSC/PSC	Contact the waste management provider. Refer to PSC for advice on potential volumes and types of waste.	<24 hours	☐
PSC	Initiate specific elements of O1 of OSMP, including the tasks below.	ASAP	☐

PSC	Monitor and predict weather and sea states:
	• Consult meteorology services to determine water current and wind speed data, either from http://www.bom.gov.au, http://www.marineweather.net.au, or MetConnect (http://www.metconnect.co.nz):
	  ○ Username: Esso
	  ○ Password: basswx.
		4 hours	☐

Level Two 0-12 hours			
Who	**What**	**Minimum time to implement**	**✓/✗**
PSC	Conduct ADIOS2 forecasting of oil weathering and conduct manual vectoring of the spill trajectory, as follows: • Determine the direction of the spill. • Determine if the spill is likely to cross into state waters or shorelines or if it might impact other sensitivities.	4 hours	☐
PSC	Conduct a third-party trajectory modelling of the spill trajectory: • Organise urgent oil spill-trajectory modelling using AMOSC, OSRL, or EMBSI.	4 hours	☐
SITL	Establish a common operating picture – a graphical representation of the spill and its location. Display overflight and OSTM/manual vectoring data on the CoP.	6 hours	☐
PSC	Prepare and disseminate SITREPs as more information becomes available. The IC is responsible for determining the frequency of these updates.	Ongoing	☐
EUL	Consult the NEBA (Ref OPEP Section 5.2), identify potential exposed environmental sensitivities based on spill trajectory, and develop an incident action plan, including a spill-specific NEBA (ref OPEP 5.2).	ASAP	☐
EUL	Activate the OSMP 'O' modules 1.1, 1.2, 1.3, 2.1, 2.3 and 4.1	ASAP	☐
EUL	Review the OSMP to determine which other modules may need to be initiated.	ASAP	☐
EUL	Liaise with the States Scientific Support Coordination if it is anticipated that state waters or shorelines will be impacted.	6 hours	☐
EUL	Assess the need for and coordinate additional personnel to support the environmental unit.	12 hours	☐
EUL	Assess the need for and coordinate the development of specific plans, including the following: • Wildlife Management Plan • SCAT Plan • WMP • Sample Plan • Dispersant Plan • Remediation Plan. Monitor the environmental consequences of any actions. Participate in the development of plans for the next operational period.	12 hours	☐
Once these actions are complete, please move to **Section Four** of this plan.			

Table 3-7 Level Three - 0-12 hour Actions

Level Two 0-12 hours			
Who	**What**	**Minimum time to implement**	**✓/✗**
IC	Seek alignment on incident objectives from the ESG.	ASAP	☐
IC	In conjunction with the ESG leader, confirm all necessary regulatory notifications have been made.	<2 hours	☐
IC	Commence the planning cycle (the 'stem' of the planning 'P'): • Establish the incident response aim. • Establish the incident objectives. • Determine appropriate strategies and tactics to achieve objectives.	ASAP – <6 hours	☐
IC	Establish full, locally-based Esso IMT including representatives from Deputy IC, Ops SC, Aviation Unit, Log SC, Planning SC, Environmental Unit and Situation Unit.	<2 hours	☐
IC	Establish a line of communications with the Control Agency IMT and exchange Liaison Officers.	<2 hours	☐
IC	Offer a line of communication with the AMSA and swap liaison officers.	<2 hours	☐
IC / ESG	Initiate the activation of the ExxonMobil Regional Response Team. Tel: +44 1372 223 232	<24 hours	☐
IC/OSC/PSC	Determine and agree on the need for a separate Source Control Branch.	<2 hours	☐
OSC	If the source is not controlled, establish a Source Control Branch to develop and implement the Source Control Plan (this should be made up of pipeline or well engineering teams).	ASAP	☐
OSC	Undertake aerial surveillance: • Initiate aerial surveillance using the crew change helicopter or contracted aircraft. • Initiate the mobilisation of a trained aerial observer – Esso or AMOSC. • Obtain photographs or video footage of the incident. • Obtain a completed aerial observer's report and pass to the PSC/SITL.	ASAP, then twice daily	☐
OSC	Mobilise a satellite tracking buoy to spill location (weather dependent).	ASAP – <12 hours	☐
OSC	Deploy a twice-daily watch from assets/vessel – confirm heading/changes to the situation.	ASAP then by reporting exceptions.	☐
OSC/LSC	On the advice of the Drilling Engineer/Source Control Branch, mobilise the Subsea First Response Toolkit (SFRT) via the AMOSC.	4 hours	☐

Level Two 0-12 hours			
Who	**What**	**Minimum time to implement**	**✓/✗**
LSC	Confirm the location of aerial and marine assets currently contracted to Esso. Confirm the location and availability of vessels of opportunity in Victoria, as follows: • Contact Atoll Offshore on 03 5116 1511 or 0409 803 588 • Contact Bhagwan Marine on +61 7 3907 3111 or 0409 979 551. Confirm the location and availability of aerial assets of opportunity that are suitable for aerial observation tasks. • Contact Bairnsdale Air Charter on 03 5152 4617.	<3 hours	☐

LSC	Request that 3 x AMOSC Technical Advisors come to the site (IMT) and that 3 x AMOSC Operations Officers are deployed to enter the field (Marine or aviation ICPs).
	Request that AMOSC undertake the call-out of CG resources (these should be mobilised in the Gippsland region).
	Request that AMOSC hire and mobilise x 6 satellite tracking buoys to Longford Heliport.
	Discuss potential equipment and service needs (spill-type specific) with AMOSC, consisting of:
	• Equipment for three x offshore containment & recovery strike teams, each comprising:
	  ○ 3 reels of ro-boom (or high speed sweep system)
	  ○ Skimmer package comprising and LWS500 or similar
	  ○ Temporary vessel storage (deck bladders, intermediate bulk containers or towable barges)
	• Equipment to execute the shoreline TRPs
	  ○ shore seal boom; fence boom; anchor kits and ancillaries
	• Dispersant – 50 m^3 of Corexit 9500A to be moved to Bairnsdale Airport.
	For worse case loss of well containment scenarios:
	• Additional booming and skimming equipment from Fremantle and Exmouth for a further three x C & R strike teams
	• Liaison to National Plan for the use of Victorian, NSW and South Australian based C&R equipment, sufficient for a further four Strike teams.
	• Refer to Quick Reference Guides in Appendix D for further detail
		<3 hours	☐

LSC	Notify the marine and aviation FOBs of the need to conduct spill response operations and prepare area and hardstand. Marine bases • BBMT Marine Supervisor 0407 846 457 • Lakes Entrances 03 5116 1511 (Atoll Offshore) • Airfields • Esso Longford Heliport 03 5143 4256 • Bairnsdale Airport 0447 132 980	<6 hours	☐

Level Two 0-12 hours			
Who	**What**	**Minimum time to implement**	**✓/✗**
LSC	Identify and call-out Esso Core Group members – establish current location and timeframe to deploy to field-based ICP	<6 hours	☐
LSC	Request OSRL technical resources and notify the OSRL Duty Manager of the potential need for resources, as follows: • Contact the OSRL Duty Manager in Singapore +65 6266 1566. • Request 5 x Technical Advisors to mobilise and join the IMT.	<6 hours	☐
LSC	Stage BBMT-based dispersant and offshore containment and recovery equipment for deployment: • 1 x AFEDO dispersant spray sets. • 10m^3 IBCs of Corexit 9500a • Waste liquid storage (vessel dependent). Move equipment package to wharf face, ready for load out.	<6 hours	☐
LSC	Notify waste contractors to prepare for potential liquid, and solid wastes – specific amounts and types to be determined.	<12 hours	☐
LSC	Prepare LIP-based nearshore/shoreline oil-spill response equipment for deployment.	<24 hours	☐
LSC/PSC	Contact the waste management provider PSC for advice on potential volumes and types of waste.	<24 hours	☐
PSC	Initiate specific elements of O1 of OSMP, including the tasks below.	ASAP	☐

PSC	Monitor and predict weather and sea states:
	• Consult meteorology services to determine water current and wind speed data, either from http://www.bom.gov.au, http://www.marineweather.net.au, or MetConnect (http://www.metconnect.co.nz):
	  ○ Username: Esso
	  ○ Password: basswx.
		4 hours	☐

PSC	Conduct ADIOS2 forecasting of oil weathering and conduct manual vectoring of the spill trajectory, as follows: • Determine the direction of the spill. • Determine if the spill is likely to cross into state waters or shorelines or if it might impact other sensitivities.	4 hours	☐
PSC	Conduct third-party trajectory modelling of spill trajectory: • Organise urgent oil-spill trajectory modelling via Esso/APASA/AMOSC. • Does the spill cross into state waters, shorelines or impact other sensitivities?	4 hours	☐
SITL	Establish a common operating picture – a graphical representation of the spill and its location. Display overflight and OSTM/manual vectoring data on the CoP.	4 hours	☐
PSC	Prepare and disseminate SITREPs as more information becomes available. The IC is responsible for determining the frequency of these updates.	Ongoing	☐

Level Two 0-12 hours			
Who	**What**	**Minimum time to implement**	**✓/✗**
EUL	Consult the NEBA (Ref OPEP section 5.2), identify potential exposed environmental sensitivities based on spill trajectory, and develop an incident action plan, including a spill-specific NEBA (ref OPEP 5.2).	ASAP	☐
EUL	Activate the OSMP 'O' modules 1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3 and 4.1.	ASAP	☐
EUL	Review the OSMP to determine which other modules may need to be initiated.	ASAP	☐
EUL	Liaise with the States Scientific Support Coordination if it is anticipated that state waters or shorelines will be impacted.	6 hours	
EUL	Assess the need for and coordinate additional personnel to support the environmental unit.	12 hours	☐
EUL	Assess the need for and coordinate the development of specific plans, including the following: • Wildlife Management Plan • SCAT Plan • Waste Management Plan • Sample Plan • Dispersant Plan • Remediation Plan. Monitor the environmental consequences of any actions. Participate in the development of plans for the next operational period.	12 hours	☐
Once these actions are complete, please move to **Section Four** of this plan.			

4 Initial Oil Spill Response Actions: Reactive Operations 12–48 hours

Following the immediate action and assessment process, Esso will establish an IMT structure appropriate to mount actions as required for the response. Recommended minimum IMT structures are as below in Figure 4-1.

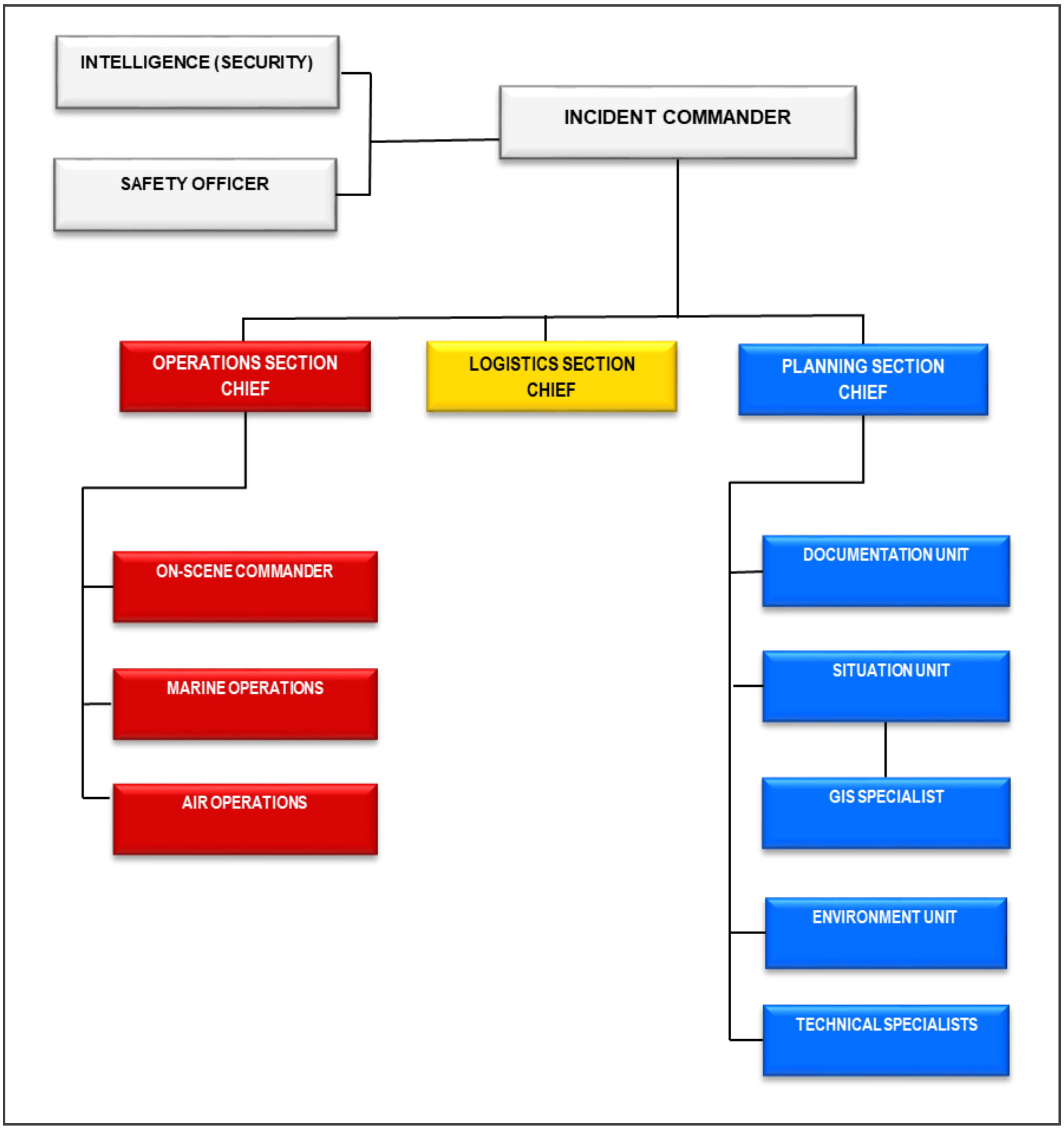
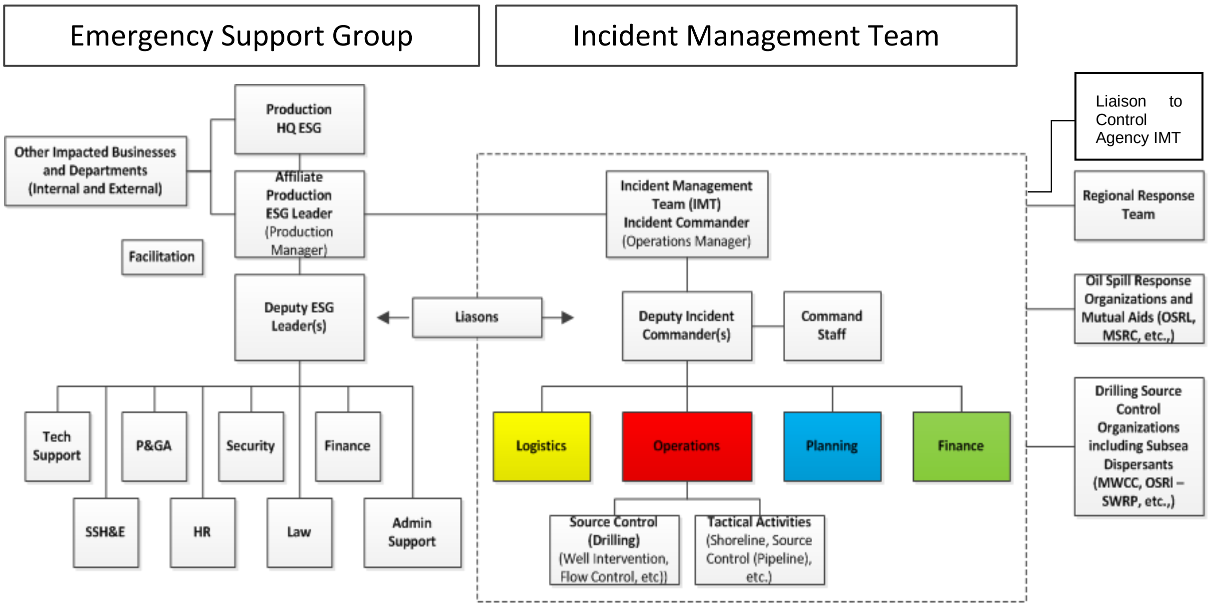


Figure 4-1 Level one – IMT for Localised Response Activities and Impacts (Offshore Incident Management Team)



(Note: Source control and operational divisions to be added/retired as required by incident objectives).

Figure 4-2 Level Two/Three – Esso IMT for Expanded Multi-Jurisdictional Impacts

Once the IMT is established, the following checklists are to be used by the functional areas of the IMT to assist each area to execute tasks in support of spill response strategies:

Spill Classification	Relevant Section
Level Two/Three Spills: State water & predicted shoreline impacts.	Section 4.1
Level Two/Three Spills: Commonwealth water impacts & no predicted State water or shoreline impacts.	Section 4.2
Level One Spills: localised	Section 4.3

4.1 Level Two and Three Spills – State Water and Shoreline Impacts.

In Victoria, DOT will assume responsibility for marine pollution incidents in coastal waters, up to 3 nautical miles from shore. Esso, as the petroleum titleholder, is the control agency for marine pollution incidents in Commonwealth waters resulting from an offshore petroleum activity. In the event of a marine pollution incident originating in Commonwealth waters that impacts or threatens State waters, DOT assumes jurisdictional control for such incidents within coastal waters from a State consequence management perspective. Esso will work with DOT to ensure an adequate response, including provision of personnel, equipment and other response resources.

DOT's role of control agency will not extend to response operations in Commonwealth waters including those directly associated with source control or relief well drilling; management of these operations will be performed by Esso. Emergency Management Liaison Officers (EMLOs) may be required between DOT's and Esso's Incident Management Team (IMT).

In the event of a cross-jurisdictional marine pollution incident, the Esso and DOT will work collaboratively, sharing response resources and providing qualified personnel to the DOT IMT. To facilitate effective coordination between the two control agencies and their respective IMTs, a Joint Strategic Coordination Committee (JSCC) will be established. The control and coordination arrangements for cross-jurisdictional maritime emergencies is outlined in Figure 4-3.

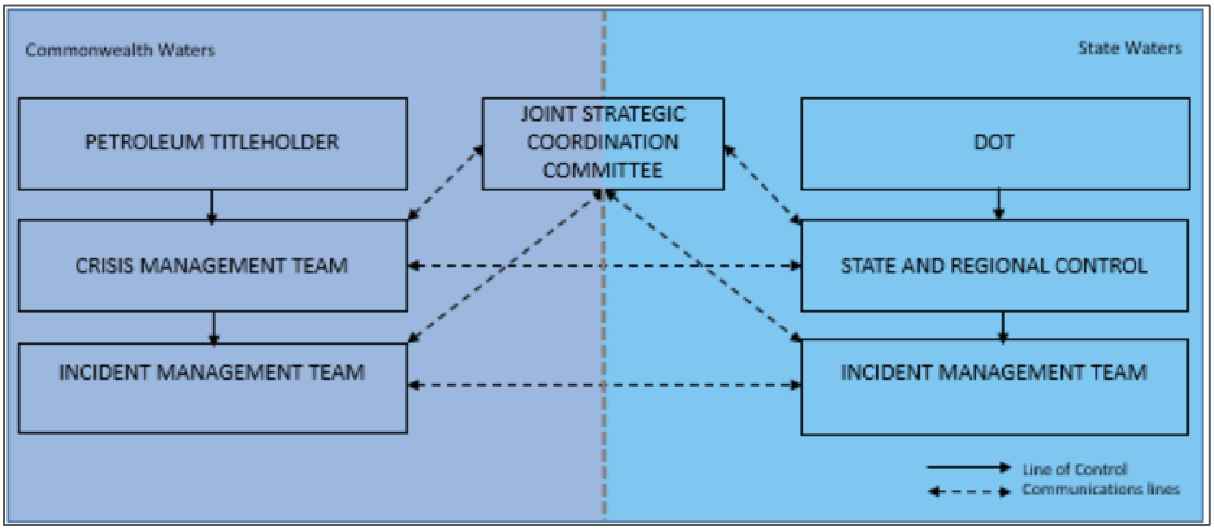


Figure 4-3 Joint Strategic Coordination Committee arrangements

The role of the JSCC is to ensure appropriate coordination between the respective IMTs established by multiple control agencies. The key functions of the JSCC include:

- Ensuring key objectives set by multiple IMTs in relation to the marine pollution incident are consistent and focused on achieving an effective coordinated response.
- Resolving competing priorities between multiple IMTs.
- Resolving competing requests for resources between the multiple IMTs, including those managed by Australian Maritime Safety Authority (AMSA), such as national stockpile equipment, dispersant aircraft and the National Response Team.
- Resolution of significant strategic issues as they arise during the incident response.
- Ensuring that there is a shared understanding of the incident situation and its meaning amongst all key stakeholders.
- Ensuring there is agreement on how information is communicated to the public, particularly those issues that have actual or perceived public health implications.
- Ensuring adequate coordination and consistency is achieved in relation to access and interpretation of intelligence, information and spill modelling to promote a common operating picture.

The JSCC is a committee, not a team operating from a specified location. The JSCC will be administered by DOT and the inaugural JSCC meeting will be convened by the State Controller Maritime Emergencies (SCME) once both the titleholder and DOT formally assume the role of control agency in respective jurisdictions.

The JSCC will be jointly chaired by the SCME and Esso's nominated senior representative, who will determine whom will sit in the committee for a coordinated response. As the relevant jurisdictional authority in Commonwealth waters, NOPSEMA may opt to participate in the JSCC as they see fit.

While the above arrangements described are specific to Victoria, Esso will work with other NSW or Tasmania State government IMT's in a similar manner should their State waters or shorelines be impacted.

For further information on Tasmanian cross jurisdiction arrangements, refer to EPA Tasmania - Offshore Petroleum Industry Guidance Note

Table 4-1 Incident Management Team Tasking

<table>
<tr><th colspan="3">Incident Management Team Tasking</th></tr>
<tr><td colspan="3">Establish an Incident Management Team that oversees the implementation of oil spill response measures – Unity of Command Model with DOT</td></tr>
<tr><td colspan="2">Tactic: Establish and staff a full Esso IMT</td><td>Completed?</td></tr>
<tr><td>IC / ESG Lead</td><td>Nominate Liaison Officers for Control Agency IMT

Nominate senior company representative to participate in JSCC</td><td>☐

☐</td></tr>
<tr><td>PSC

Day One</td><td>Establish full Esso IMT
• Call out IC/OSC/LSC/PSC/Situation & Enviro Units.
• Staff each function with teams – actual and virtual.</td><td>☐</td></tr>
<tr><td>PSC

Day two</td><td>• Review team make up for current, and future operational period.
• Ensure that functional areas are aligned with the needs of the response.</td><td>☐</td></tr>
<tr><td colspan="2">Tactic: Draft and execute an Incident Action Plan</td><td>Completed?</td></tr>
<tr><td>IC lead</td><td>Commence planning cycle ('stem of P')</td><td>☐</td></tr>
<tr><td>PSC

Day One</td><td>• Complete the initial IAP (ICS 201s);
  ○ Establish current operational period aim, objectives, strategy, tactics & resources.
  ○ Draft 24, 48 & 72 incident potential worksheet (size up).
  ○ Complete NEBA.
  ○ Determine the potential <u>shoreline impact</u>.
  ○ Assess weather and sea state for the next 48 hours for suitability to conduct <u>marine response</u> and/or <u>aviation response</u> activities.
• NEBA outcomes to drive the selection of strategies from Table 4-3 onwards.
• Exchange Liaison Officers between Control Agency IMT and Esso IMT.
• Use Liaison Officers to inform Control Agency IMT of Esso ICS201 outputs.</td><td>☐</td></tr>
<tr><td>EUL

Day One / Two</td><td>• Undertake an environmental risk assessment of each proposed tactical execution of strategy (below actions – shoreline/marine/aviation operations).</td><td>☐</td></tr>
<tr><td>PSC

Day Two</td><td>• Review the ICS201 from the previous day
  ○ Are the aim, objectives, strategies, tactics & resources still current given the current conditions for the operational period?
  ○ Review response organisation and staffing needs.
  ○ Continue execution of previous day's plan.
  ○ Modify the plan.
• In consultation with IC, assess readiness to move into the Proactive Planning Phase.
• IMT commences proactive planning cycle (Planning 'P')</td><td>☐</td></tr>
<tr><td>OSC

Day One</td><td>• Plan and execute immediate/first strike operations (as per the list below), and include the following:
• Shoreline operations
  ○ Close off sensitive areas through the implementation of Tactical Response Plans (TRP).
  ○ Provide materials and personnel to state response teams to undertake shoreline SCAT surveys.
  ○ Provide materials and personnel to state response teams to undertake further shoreline protection.</td><td>☐</td></tr>
</table>

Incident Management Team Tasking		
	○ Marine operations – vessel-based dispersant and containment & recovery operations, ○ Vessels – direct vessel of opportunity fleets. ○ Equipment – source from Esso, AMOSC, NatPlan and OSRL. ○ Personnel – source from Esso, AMOSC, AMOSC Core Group, NatPlan CG, ExxonMobil Regional Response Team, OSRL. • Aviation operations – surveillance and dispersant operations. • Operations to follow the relevant section of ExxonMobil Field Response Manual and/or Shoreline Treatment Plans.	
Safety Officer Day One	• Complete Safety Risk Assessment of all operational activities. • Incorporate Safety Risk Assessment into a Safety Plan.	☐
OSC / Source Control Branch Director Day one	• Execution of source control arrangements as required: ○ Activate Australia Wells Team Tier II/III Emergency Response Plan. ○ Pipeline response plan. • Activate source control resource contracts/assistance contracts: ○ SFRT – AMOSC ○ SWIS – OSRL ○ Wild Well Control • Activate pipeline repair • Activate marine salvers	☐
LSC Day Two	• Request and stage resources into Gippsland to enable long-term operations to occur: ○ Integration of Level Two and Level Three resources into the response. • Execute the waste management plan: ○ Call out the third-party contractor (Cleanaway), ○ Liaise with EPA for ongoing waste management requirements (temporary storage and transportation). • Equipment mobilisation for temporary storage and decontamination.	☐

Table 4-2 Surveillance Monitoring & Visualisation (SMV) Strategy

Surveillance Monitoring & Visualisation (SMV) Strategy		
Tactic: Satellite tracking buoys will be deployed to monitor the leading edge of the slick and deployed in 24-hour intervals to indicate swept pathways.		Completed?
OSC Day one	• Deploy satellite tracking buoys (STBs) from Longford (via helicopter or vessel). Place on the leading edge of the spill • Tracking Buoy Deployment Instructions	☐
	• Request AMOSC for all available STBs to be contracted to Esso • STBs moved to Longford ASAP	☐
Day two +	• Monitor location of deployed STBs ○ At last light, deploy STB close to the spill source	☐
• Tactics: Twice daily manned overflights will be undertaken to monitor the spreading, location, and weathering of the slick.		Completed?
OSC Day One	• Commence twice daily aerial overflights to determine size/bearing ○ Obtain a completed aerial observer's report and pass to the PSC/SITL. ○ Use crew change helicopter where possible.	☐

Surveillance Monitoring & Visualisation (SMV) Strategy		
	○ If Esso asset unavailable, contact and contract the use of third-party aircraft.	
OSC / PSC/LSC	• Activate Bairnsdale Air Charter for overflight duties • Request aircraft to fly over the Gippsland shoreline, noting the status (closed/open) of the following intermittently open estuaries: ○ Davis Creek - 37°34'43.46"S, 149°44'59.14"E, ○ Bunga Arm - 37°56'50.00"S, 147°48'18.98"E ○ Lake Tyers - 37°51'33.78"S, 148° 5'18.55"E ○ Merrimen Creek - 38°22'56.18"S, 147°11'4.26"E ○ Mueller River - 37°46'44.51"S, 149°19'41.29"E ○ Shipwreck Creek - 37°38'51.45"S, 149°41'58.05"E ○ Sydenham Inlet - 37°46'49.61"S, 149° 1'11.26"E ○ Tamboon Inlet - 37°46'39.31"S, 149° 9'11.11"E ○ Thurra River - 37°46'56.67"S 149°18'45.94"E ○ Yeerung River - 37°47'28.02"S, 148°46'26.67"E • Report this data back to the EUL/PSC	☐
OSC Day two	• Continue twice daily aerial overflight to determine size/bearing ○ Use crew change helicopter where possible). ○ If Esso asset unavailable, contact and contract the use of third-party aircraft. ○ Aircraft over slick 30 mins after first light. • Use the location of deployed satellite tracking buoys as initial extents for aircraft bearing	☐
Tactics: Daily oil spill trajectory modelling will be used to predict the weathering and direction that the oil will spread.		Completed?
PSC Day One; then each day	• Request OSTM runs to verify data gained through manual means via AMOSC twice daily. The request should include: ○ 12/24/36/48/60/72 hour outlook deterministic trajectory modelling. ○ Shoreline loadings (1, 10 and 100 gm p/sqm) – time frames, volumes and locations. ○ Request via initial phone call and completion of Oil Spill Trajectory Modelling request form . ○ Data to be relayed back to the Situation Unit. ○ Via AMOSC, request the Technical Officer to be deployed to the Esso IMT to provide direct support to the Situation Unit. • For facility coordinates, refer to Gippsland platform location coordinates	☐
Tactics: Set a twice-daily watch to confirm the extent and spreading of the spill from the assets.		Completed?
OSC Day One; then each day	• If there is a spill from a manned asset, set a two-hourly watch to confirm the bearing/size. • Have observers take photographs or video. Where possible, include vessels or other objects in photos to provide scale.	☐
Tactics: Establish the Esso Common Operating Picture in the Esso IMT.		Completed?
OSC / SITL Day one, then for the duration of the spill	• Establish Esso's Common Operating Picture • Commence data capture and graphical display. • Key data to be displayed include: ○ Spill location, ○ Spill extent, direction and trajectory, ○ Environmental sensitives , ○ Bass Strait oil & gas facilities, ○ Location of the staging area and forward operating base ○ Esso-controlled contracted resources – aircraft and vessels, and ○ Third-party-controlled potential resources of opportunity – aircraft and vessels.	☐

Surveillance Monitoring & Visualisation (SMV) Strategy		
Tactics: OSMP as triggered.		Completed?
	Activate the various Operational Monitoring Programmes contained within the OSMP: ○ O1 – O5 as per triggers in OSMP	☐
For Level Three Spills only		
Tactics: Obtain satellite imagery of the spill location.		Completed?
PSC/ SITL	• Request satellite imaging of spill ○ Refer to ExxonMobil Production Geospatial Emergency Response Service) • Alternative options: ○ Request satellite imagery via AMOSC. ○ Request satellite imagery via OSRL – Agreement in place with Radiant Solutions	☐

Table 4-3 Shoreline Protection and Clean up Strategy

Shoreline Protection and Clean up Strategy		
Note: Implementation is dependent on NEBA and oil trajectory.		
Tactic: Inform and agree with Control Agency IMT tactical execution of shoreline planning.		Completed?
PSC/Esso LO Day one, then each day	• Inform DOT/ Control Agency IMT of Esso's intention to undertake planning for shoreline impacts. • Using data from SMV, establish shoreline planning: ○ Shoreline extents. ○ Nearest potential Incident Command Points. ○ Shoreline incident control structure (sectors, segments & divisions). ○ Draft a sector command structure. ○ Shoreline access points - people and vehicles. • Share this data with DOT Control Agency IMT for implementation.	☐
Tactics: Commence pre-impact surveys and pre-impact shoreline cleaning.		Completed?
OSC Day 1	• Commence pre-impact surveys ○ Shoreline surveys by foot – AMOSC and Esso personnel. ○ Shoreline surveys by air – UAV / contracted platforms.	☐
OSC Day 2	• Implement operations ○ Commence shoreline pre-cleaning for areas at immediate risk (first light of day 2).	☐
Tactics: Implement Shoreline TRP's to reduce oil impact on sensitive receptors.		Completed?
PSC Day one	• Based on trajectory, agree with Control Agency IMT regarding the shoreline TRPs to be implemented	☐
LSC Day One	• Esso to tally equipment and personnel required for the selected TRPs ○ Mobilise equipment from (i) Esso stockpiles, (ii) AMOSC Geelong stockpile & (iii) Gippsland Ports/State equipment cache.	☐

Shoreline Protection and Clean up Strategy		
	○ Request personnel from Esso CG and operational workforces; AMOSC Staff/Core Group & Gippsland Ports. • Decide upon ICP's and shoreline staging areas (east and west extents) for equipment. • Commence the mobilisation of equipment and personnel to the staging area (Lakes Entrance – Bullock Island or BBMT).	
OSC Day One,	• Liaise with Gippsland Ports (on ground 1st strike agency) to commence execution of TRPs. • Commence TRP implementation (based on the agreement with Control Agency IMT/Gippsland Ports).	☐
Tactics: Mass mobilisation of equipment, personnel and support for large-scale shoreline operations.		Completed?
LSC Day 1	• Activate supply and service contracts for ground support; • Establish equipment staging areas, • Use a third-party to identify accommodation providers (hotels, motels, caravan parks, and campsites), • Select ground transport providers (bus charter), • Use a third-party to identify remote camp options including: ○ Locations ○ Services ○ Catering ○ Laundry ○ Water treatment options	☐
LSC Day 1	• Activate specialised labour and OSR equipment support ○ Request AMOSC core group projections. ○ Request AMOSC immediate deployment of availed CG to lead shoreline clean up teams (<24 hours). ○ Include PPE, shoreline consumables, and other shoreline kits. ○ Request OSRL shoreline team leaders (operations).	☐

Table 4-4 Marine Dispersant, and Containment & Recovery Operations

Marine Dispersant, and Containment & Recovery Operations		
Note: Dependant on NEBA and oil trajectory.		
Tactic: Establish strike teams able to undertake containment and recovery, and/or dispersant operations.		Completed?
LSC Day One	• Establish BBMT as initial Marine FOB. • Secure four vessels for marine operations – if not engaged in other safety critical mission. • Direct vessels to BBMT to load out equipment. • Direct AMOSC to shift C&R equipment from Geelong to BBMT: ○ 6 x offshore boom reels. ○ 2 x offshore skimmer unit. • If vessel tanks are <500 m3 arrange temporary storage units. • Move BBMT offshore vessel based dispersant systems to wharf edge: ○ 2 x afedo dispersant spray systems. ○ 20 m^3 dispersant (10 per vessel). • Request available Esso Core group recall for duty – vessel-based operations from day two. • Load out vessel for operations.	☐
OSC	• Prepare ICS204 for vessel-based C&R and dispersant operations: ○ Refer to Appendix A draft ICS204 for operations.	☐

Marine Dispersant, and Containment & Recovery Operations		
Day One		
OSC Day Two	• Brief teams to the two separate ICS204. • Direct strike teams (each strike team comprises a pair of vessels) to area of operations: • For dispersant operations, field test must be conducted prior to operational spraying, with results reported to the IMT. • Report back of OSMP O2.2 to validate dispersant effectiveness. • PSC to confirm based on the field dispersant testing move to large scale operational spraying. • Volume of dispersant used to be reported to SITL	☐
Tactic: Establish Marine Forward Operating Base for ongoing large-scale marine operations.		Completed?

LSC
 	
Day Two
	• Based on shoreline impacts, plan for either/or BBMT and Lakes Entrance as marine FOB for ongoing C&R operations:
	  ○ Offshore C&R operations (large vessel operations – wharf considerations - under keel clearance, width, vessel availability).
	  ○ Nearshore/shoreline vessel support operations.
	• Demarcate in each location:
	  ○ OSR Equipment receipting and laydown areas.
	  ○ Office and briefing space.
	  ○ Temporary waste storage area (coming off vessel, after shift).
		☐

Tactics: Request and contract extended offshore response support – escalated resourcing.		Completed?

LSC
 	
Day two
	• Contract additional vessels for C&R:
	  ○ Nearshore/shoreline needs – marine surveyed vessels.
	  ○ Coastal/offshore needs – marine surveyed.
	• Shift all Esso OSR equipment to BBMT/Lakes Entrance:
	  ○ Boom reels.
	  ○ Skimmer units.
	  ○ Temp storage.
	  ○ Dispersant spray sets.
	• Operations and Planning to advise how many strike teams are required. Refer to applicable Quick Reference Guide in Appendix D for guidance on resource requirements for worst case scenarios
	• Request and shift AMOSC nearshore and offshore C&R equipment, and all shoreline equipment to BBMT/Lakes Entrance:
	  ○ Offshore booms reels.
	  ○ Offshore skimmer packages (in addition to TRP requirements)
	  ○ Nearshore/shoreline booming equipment.
	  ○ Nearshore/shoreline skimming packages.
	  ○ Shoreline surveillance equipment – drone, unmanned aerial vehicle.
		☐

Table 4-5 Aviation Dispersant Operations

<table>
<tr><th colspan="3">Aviation Dispersant Operations</th></tr>
<tr><td colspan="3">Note: dependant on NEBA, oil type and oil trajectory</td></tr>
<tr><td colspan="2">Tactic: Mobilise tier two aviation dispersant operations and dispersant resupply.</td><td>Completed?</td></tr>
<tr><td>LSC

Day One</td><td>Source domestic dispersant spraying aircraft via AMOSC (AMSA Fixed Wing Aerial Dispersant) NatPlan link:
Aircraft to move to Bairnsdale as nominated airfield.
Request re-location of dispersant stockpiles to Bairnsdale from Esso BBMT (10 m^3).
Request AMOSC Geelong to move all available Corexit 9500a and Slickgone NS to Bairnsdale airfield.</td><td>☐</td></tr>
<tr><td>OSC/Aviation Branch Director

Day One</td><td>Complete actions per checklists in the Aerial Dispersant Operations Plan for Oil Spills in Bass Strait
1st spraying operation – Victoria-based aircraft to fly to Bairnsdale as the nominated airfield
Secondary overhead coverage aircraft to be provided by third party contractor.
2nd and subsequent operations to be undertaken from Bairnsdale Airport.
2nd and 3rd aircraft arriving during day two of operation.
Establish communications links with AMSA air base manager and dispersant loading operator.
Volume of dispersant used to be reported to SITL</td><td>☐</td></tr>
<tr><td>OSC/Aviation Branch Director

Day One</td><td>Prepare and brief on ICS204 for aerial dispersant operations:
Refer to attached draft ICS204 for operations.
Field test spray to be conducted prior to operational spraying, with results reported to the IMT.
Field test spray to be reported via visual efficacy results from overhead aircraft and on-scene vessels.</td><td>☐</td></tr>
<tr><td>PSC /EUL</td><td>- Ensure ongoing OSMP deployment of O2.2</td><td>☐</td></tr>
<tr><td>OSC/Aviation Branch Director

Day Two</td><td>Prepare and brief on ICS204 for aerial dispersant operations with additional aircraft.
Update Aerial Dispersant Operations Plan with additional aircraft:
Refer to attached drafted ICS204 for operations
Field test spray to be conducted prior to operational spraying, with positive results reported to the IMT.
Field test spray to be reported via visual efficacy results from overhead aircraft and on-scene vessels.
Mount on-going operations of dispersant based
Volume of dispersant used to be reported to SITL</td><td>☐</td></tr>
<tr><td colspan="3">For level three crude oil spills only</td></tr>
<tr><td colspan="2">Tactic: Consider tier three aviation dispersant resupply</td><td></td></tr>
<tr><td>LSC

Day Two</td><td>Based on dispersant dosage rates per day, predict future ten day dispersant needs. If AMOSC and Esso forward stockpiles are <50 m^3, request dispersant via OSRL:
Request OSRL activation of Global Dispersant Stockpiles:
Develop mobilisation plan with OSRL to shift dispersant to Australia utilising freight aircraft operating from Singapore.</td><td>☐</td></tr>
</table>

Table 4-6 Oiled Wildlife Response Strategy

Oiled Wildlife Response Strategy		
Note: Dependant on NEBA and oil trajectory		
Tactic: Through the DOT/ Control Agency IMT, liaise with DELWP and aid their Concept of Operations for *Oiled Wildlife Response*.		Completed?
PSC/EUL Day 1	• Based on the NEBA, fates and trajectory modelling, ascertain likely wildlife impacts – provide this data to DOT/ Control Agency IMT. • Send Liaison Officer to Control Agency IMT. • Propose tactics to Control Agency IMT that may reduce wildlife impacts. Refer to Area Response Plan or Species Response Plans for guidance.	☐
OSC Day 1	• Establish Industry OWR coordinator (from AMOSC) to oversee Esso OWR activity.	☐
LSC Day 1	• As requested, or directed by DELWP and based on the advice of the OWR Coordinator, stand up AMOSC OWR resources: ○ Facility support contract ○ Equipment and clean-up resources from Geelong ○ Equipment and clean-up resources from Perth ○ AMOSC OWR support team • Establish availability of ExxonMobil RRT personnel trained in OWR. • Coordinate ground transport, accommodation, and other support needs for industry response personnel.	☐
LSC Day 2	• Deploy requested OWR resources to the DELWP OWR ICP/field facility.	☐
OSC/Industry OWR coordinator Day 2	• Execute Esso OWR response operations as required or directed by Control Agency IMT.	☐

4.2 Level Two and Three Spills – Commonwealth Waters, No Predicted Shoreline Impacts

Table 4-7 Incident Management Team

<table>
<tr><th colspan="2">Level two and three spills - Commonwealth Waters, No Predicted Shoreline Impacts
Incident Management Team</th><th></th></tr>
<tr><td colspan="2">Tactic: Establish and staff a full Esso IMT that oversees the implementation of oil spill response measures.</td><td>Completed?</td></tr>
<tr><td>IC
Day One</td><td>• Establish Esso IMT:
o Call out IC/OSC/LSC/PSC/Situation and Environmental Unit.
o Staff each function with teams – actual and virtual.</td><td>☐</td></tr>
<tr><td>IC
Day two</td><td>• Review team make up for current, and future operational period.
• Assess if the functional areas aligned with the needs of the response.</td><td>☐</td></tr>
<tr><td colspan="2">Tactic: Draft and execute an incident action plan</td><td>Completed?</td></tr>
<tr><td>IC lead</td><td>• Commence planning cycle (‘stem of P’).</td><td>☐</td></tr>
<tr><td>PSC
Day One</td><td>• Complete the initial IAP (ICS 201’s):
o Establish current operational period aim, objectives, strategy, tactics and resources
o Draft 24, 48 and 72 incident potential worksheet (size up)
o Complete NEBA
o Confirm the low potential for shoreline impact, or shoreline impact for monitoring only (>10gm/sqm.)
• Assess weather and sea state for the next 48 hour for suitability to conduct marine response and/or aviation response activities.
• Exchange Liaison Officers between Control Agency IMT, AMSA and Esso.
• Use Liaison Officers to inform Control Agency IMT of Esso ICS201 outputs and SitReps.
• Undertake risk assessment of each proposed tactical execution of strategy (below actions – marine/aviation operations).</td><td>☐</td></tr>
<tr><td>PSC
Day Two</td><td>• Review the ICS201 from the previous day. Assess :
o The aim, objectives, strategies, tactics and resources suitability against the current conditions for the operational period.
o Review response organization and staffing needs.
o Continue execution of previous day’s plan
o If needed, modify the plan.
• In consultation with IC, assess readiness to move into Proactive Planning Phase.
• IMT commences planning cycle (planning ‘p’).</td><td>☐</td></tr>
<tr><td>OSC
Day Two</td><td>• Plan and execute immediate/first strike operations (as per following checklist). Include:
• Marine operations – dispersant, containment and recovery.
o Vessels – Vessels of Opportunity.
o Equipment – Esso, AMOSC, NatPlan and OSRL.
o Personnel – Esso, AMOSC, AMOSC CG, NatPlan CG, Esso RRT, OSRL.
• Aviation operations – surveillance, and dispersant operations
o Aircraft.</td><td>☐</td></tr>
<tr><td>OSC/SC Branch Manager</td><td>• As needed execution Source Control arrangements:
o Activate Australia Wells Team Tier II/III Emergency Response Plan.
o Pipeline Emergency Response Plan.</td><td>☐</td></tr>
</table>

Level two and three spills - Commonwealth Waters, No Predicted Shoreline Impacts Incident Management Team		
Day one	○ Containment contracts/assistance contracts: ○ Subsea first response toolkit– AMOSC, Oceaneering and AdEnergy ○ Subsea well intervention service - OSRL ○ Wild Well Control. • Activate pipeline repair. • Activate marine salvers.	
LSC Day Two	• Request and stage resources into Gippsland to enable long term operations to occur: ○ Integration of tier two and tier three resources into the response. • Execute waste management plan: ○ Call out third party contractor (Cleanaway) ○ Estimate volumes of liquid waste consistent with large scale containment and recovery. • Equipment mobilization – temporary storage and decontamination. • Supporting resources for response personnel.	☐

Table 4-8 Surveillance Monitoring and Visualisation Strategy

Level two and three spills - Commonwealth Waters, No Predicted Shoreline Impacts Surveillance Monitoring and Visualisation Strategy		
Tactic: satellite tracking buoys will be deployed to monitor the leading edge of the slick; and deployed in 24-hour intervals to indicate swept pathways.		Completed?
OSC Day one	• Deploy STB from Longford (helicopter or vessel) – place on leading edge of spill. • Tracking Buoy Deployment Instructions	☐
	• Request AMOSC all available STB's to be contracted to Esso: STBs move to Longford as soon as possible. At last light, deploy STB from the spill source.	☐
Day two +	• Monitor location of deployed STBs: At last light, deploy STB from the spill source.	☐
Tactics: twice daily manned overflights will be undertaken to monitor the spreading, location, and weathering of the slick.		Completed?
OSC Day One	• Commence twice daily aerial overflights to determine size/bearing: Divert aircraft to track spill (or use of scheduled crew change helicopter routing). If Esso asset unavailable, contact and contract the use of third-party aircraft.	☐
OSC Day two	• Continue twice daily aerial overflight to determine size/bearing: Divert vessel/aircraft to track spill (or use of scheduled crew change helicopter routing). If Esso asset unavailable, contact and contract the use of third-party aircraft. Aircraft over slick 30 mins after first light	☐

Level two and three spills - Commonwealth Waters, No Predicted Shoreline Impacts Surveillance Monitoring and Visualisation Strategy		
	Use location of deployed satellite tracking buoys as initial extents for aircraft bearing.	
Tactics: daily oil spill trajectory modelling will be used to predict the weathering and direction that the oil will spread.		Completed?
PSC Day One; then each day	• Request through AMOSC twice daily OSTM runs to verify data gained through manual means, request to include: 12/24/36/48/60/72-hour outlook deterministic trajectory modelling. Potential for shoreline or state water contact • Data to be relayed back to the SITU. • Request through AMOSC for OSTM third party be deployed into the Esso IMT to provide direct support to the SITU. • Monitor movement of tracking buoys. Fastwave Dashboard - User guide	☐
Tactics: Set a twice daily watch to confirm the extent and spreading of the spill from the assets.		
OSC Day One; then each day	• If spill from a manned asset, set two hourly watch to confirm bearing/size.	☐
Tactics: OSMP as triggered		Completed?
	Activate the various Operational Monitoring Programmes contained within the OSMP: • O1 – O5 as per triggers in OSMP	☐
Tactics: Establish the Esso Common Operating Picture in the Esso IMT		Completed?
OSC/SITL Day one, then for the duration of the spill	• Establish Esso's CoP. • Commence data capture and graphical display. • Key data to be displayed includes: Spill location. Spill extent, direction and trajectory. Environmental sensitives. Bass Strait oil and gas facilities. Passing ships. Esso controlled contracted resources – aircraft and vessels. Third party controlled potential resources of opportunity – aircraft and vessels.	☐
For Level Three Spills only		
Tactics: Request satellite imagery of the spill location.		Completed?
PSC/ SITL	• Request satellite imaging of spill Refer ExxonMobil Production Geospatial Emergency Response Service Alternative options: • Request satellite imagery via AMOSC. • Request satellite imagery via OSRL – Agreement in place with Radiant Solutions.	☐

Table 4-9 Marine Dispersant, and Containment & Recovery Operations

Level two and three spills - Commonwealth Waters, No Predicted Shoreline Impacts Marine Dispersant, and Containment & Recovery Operations		
Note: This strategy is dependent on NEBA outcomes and oil trajectory		
Tactic: Establish strike teams able to undertake containment and recovery, and/or dispersant operations.		Completed?
LSC Day One	• Establish BBMT as initial Marine FOB. • Secure four vessels for marine operations – if not engaged in other safety critical mission. • Direct vessels to BBMT to load out equipment. • Direct AMOSC to shift C&R equipment from Geelong to BBMT: 6 x offshore boom reels. 2 x offshore skimmer unit. If vessel tanks are <500 m3 arrange temporary storage units. • Move BBMT offshore vessel based dispersant systems to wharf edge: 2 x afedo dispersant spray systems. 30 m3 dispersant (15 per vessel). • Request available Esso Core group recall for duty – vessel-based operations from day two. • Load out vessel for operations.	☐
OSC Day One	• Prepare ICS204 for C&R and dispersant operations: Refer to draft ICS204 for operations Appendix A.	☐
OSC Day Two	• Brief teams on the two separate ICS204. • Direct strike teams (each strike team comprises a pair of vessels) to area of operations: For dispersant operations, field test must be conducted prior to operational spraying, with positive results reported to the IMT. PSC to confirm based on the field dispersant testing move to large scale operational spraying.	☐
Tactic: Establish Marine FOBs for ongoing large-scale marine operations.		Completed?
LSC Day Two	• Based on shoreline impacts, plan for either/or BBMT and Lakes Entrance as marine FOB for ongoing C&R operations: Offshore C&R operations (large vessel operations – wharf considerations - under keel clearance, width, tug availability). Nearshore/shoreline vessel support operations. • Demarcate in each location: OSR Equipment receipting and laydown areas. Office and briefing space. Temporary storage of waste management (coming off of vessel after shift).	☐
Tactics: Request and contract level three offshore response support – escalated resourcing.		Completed?
LSC	• Contract additional vessels for C&R: Nearshore/shoreline need – marine surveyed vessels.	☐

Level two and three spills - Commonwealth Waters, No Predicted Shoreline Impacts Marine Dispersant, and Containment & Recovery Operations		
Day two	Coastal/offshore need – marine surveyed. • Shift all Esso OSR equipment to BBMT/Lakes Entrance: Boom reels. Skimmer units. Temp storage. Dispersant spray sets. • Request and shift AMOSC nearshore and offshore C&R equipment, and all shoreline equipment to BBMT/Lakes Entrance: Offshore booms reels. Offshore skimmer packages. Shoreline surveillance equipment – drone, Unmanned aerial vehicles.	

Table 4-10 Aviation Dispersant Operations

Level two and three spills - Commonwealth Waters, No Predicted Shoreline Impacts Aviation Dispersant Operations		
Note: This strategy is dependent on NEBA outcomes and oil trajectory.		
Tactic: Mobilise tier two aviation dispersant operations and dispersant resupply.		Completed?
LSC Day One	• Source domestic dispersant spraying aircraft Via AMOSC (AMSA Fixed Wing Aerial Dispersant) NatPlan link: Victorian based aircraft move to Bairnsdale as nominated airfield. • Request re-location of dispersant stockpiles to Bairnsdale from Esso BBMT (10 m^3). • Request AMOSC Geelong to move Corexit 9500a and Slickgone NS to Bairnsdale airfield.	☐
OSC/Aviation Branch Director Day One	• Complete actions per checklists in the *Aerial Dispersant Operations Plan for Oil Spills in Bass Strait*: ○ 1st spraying operation – Victoria-based aircraft to fly to Bairnsdale as the nominated airfield. ○ Secondary overhead coverage aircraft to be provided by third party contractor. ○ 2nd and subsequent operations to be undertaken from Bairnsdale Airport. ○ 2nd and 3rd aircraft arriving during day two of operation. ○ Volume of dispersant used to be reported to SITL • Establish communications links with AMSA air base manager and dispersant loading operator.	☐
OSC/Aviation Branch Director Day One	• Prepare and brief on ICS204 for aerial dispersant operations: Refer to draft ICS204 for operations- Appendix A Field test spray to be conducted prior to operational spraying, with positive results reported to the IMT. Field test spray to be reported via visual efficacy results from overhead aircraft and on-scene vessels.	☐
PSC/EUL	• Ensure ongoing OSMP deployment of O2.2	
OSC/Aviation Branch Director	• Prepare and brief on ICS204 for aerial dispersant operations with additional aircraft. • Update *Aerial Dispersant Operations Plan* with additional aircraft:	☐

Level two and three spills - Commonwealth Waters, No Predicted Shoreline Impacts Aviation Dispersant Operations		
Day Two	Refer to attached draft ICS204 for operations Field test spray to be conducted prior to operational spraying, with positive results reported to the IMT. • Field test spray to be reported via visual efficacy results from overhead aircraft and on-scene vessels. • Mount ongoing operations.	
Tactic: Consider the mobilisation of tier three dispersant resupply		Completed?
LSC Day Two	• Calculate dispersant 'burn rate' and if it exceeds Australian national stockpiles, request OSRL activation of Global Dispersant Stockpiles. Refer to Quick Reference Guide in Appendix D for WCDS resource requirements. • Develop mobilization plan with OSRL and Chapman Freeborn to shift dispersant to Australia – freight aircraft operating from Singapore.	☐

Table 4-11 Oiled Wildlife Response Strategy

Level two and three spills - Commonwealth Waters, No Predicted Shoreline Impacts Oiled Wildlife Response Strategy		
Note: This strategy is dependent on NEBA outcomes and direction with the DELWP.		
Tactic: Through the DOT/Control Agency IMT, engage with DELWP and provide assistance to their Concept of Operations for *Oiled Wildlife Response*.		Completed?
PSC/EUL Day 1	• Based on the NEBA, fates and trajectory modelling, ascertain likely wildlife impacts – provide this data to DELWP and DOT. Refer to Area Response Plan and Species Response Plan for guidance. • Send Liaison Officer Control Agency IMT. • Advise ExxonMobil RRT Coordinator of potential resource needs. • Determine likely tactics to reduce wildlife impacts: Hazing Trans-location Other OSR tactics.	☐
OSC Day 1	• Establish Industry OWR coordinator (from AMOSC) to oversee Esso OWR activity.	☐
LSC Day 1	• As requested, or directed by DELWP and on the basis of advice of the OWR Coordinator, stand up AMOSC OWR resources: Facility support contract. Equipment and clean-up resources from Geelong. Equipment and clean-up resources from Perth. AMOSC OWR support team.	☐
LSC Day 2	• Deploy requested OWR resources to the DELWP OWR ICP/field facility.	☐
OSC/Industry OWR coordinator	• Execute Esso OWR response operations as required or directed by DELWP.	☐

Level two and three spills - Commonwealth Waters, No Predicted Shoreline Impacts Oiled Wildlife Response Strategy		
Day 2		

4.3 Level One Spills – Commonwealth Waters, Localised Impacts Only

Table 4-12 Incident Management Team

Level one spills - Commonwealth Waters, Localised Impacts Only Incident Management Team		
Tactic: Establish and staff the Esso IMT that oversees the implementation of oil spill response measures		Completed?
IC Day One	• Establish IMT: Identify IC/OSC/ PSC and Environmental Units.	☐
IC Day two	• Review team make up for current, and future operational period. • Are the functional areas aligned with the needs of the response?	☐
Tactic: Draft and execute an Incident Action Plan		Completed?
IC lead	• Commence planning cycle ('stem of P').	☐
PSC Day One	• Complete the initial IAP (ICS 201 sheet): Establish current operational period aim, objectives, strategy, tactics and resources. Draft 24- and 48-hours incident potential worksheet (size up). Complete NEBA. Confirm the potential for sensitivity impacts. Confirm feasibility of 1st strike marine response for C&R or Dispersant operations. Confirm feasibility of 1st strike aviation response. • Inform DOT of Esso intent – provide ICS201 and SitRep. • Undertake risk assessment of any proposed tactical execution of strategy (below actions – marine/aviation operations).	☐
PSC Day Two	• IMT continues planning cycle (stem of the planning 'p'). • Review the ICS201 from the previous day: Confirm suitability of the aim, objectives, strategies, tactics and resources for the operational period? Review the appropriateness of the spill response level. Continue execution of previous day's plan and modify as needed.	☐
OSC Day Two	• Plan and execute immediate/first strike operations (as per following checklist) as determined appropriate: • Marine operations – dispersant and containment and recovery, Vessels - Vessels of Opportunity, Equipment – Esso, AMOSC, Personnel – Esso/Esso CG, AMOSC. • Aviation operations – surveillance operations: Aircraft.	☐

Level one spills - Commonwealth Waters, Localised Impacts Only Incident Management Team		
OSC/SC Branch Manager Day one	• As needed execution Source Control arrangements: Activate Australia Wells Team Tier II/III Emergency Response Plan. • Containment contracts/assistance contracts. • Activate pipeline repair. • Activate marine salvers.	☐
LSC Day Two	• Monitor asset staging: Confirm that business as usual locations and assets are adequate for the response.	☐

Table 4-13 Surveillance Monitoring and Visualisation Strategy

Level one spills - Commonwealth Waters, Localised Impacts Only Surveillance Monitoring and Visualisation Strategy		
Tactics: twice daily manned overflights will be undertaken to monitor the spreading, location, and weathering of the slick.		Completed?
OSC Day One	• Commence twice daily aerial overflights to determine size/bearing: Divert aircraft to track spill (or use of scheduled crew change helicopter routing). If Esso asset unavailable, contact and contract the use of third-party aircraft.	☐
OSC Day two	• Continue twice daily aerial overflight to determine size/bearing: Divert vessel/aircraft to track spill (or use of scheduled crew change helicopter routing). If Esso asset unavailable, contact and contract the use of third-party aircraft.	☐
Tactics: daily oil spill vectoring and weathering analysis to predict the direction that the oil will spread, and its degradation.		Completed?
PSC Day One; then each day	• EUL to undertake vectoring (manual trajectory) and weathering: 12/24-hour outlook. Weathering based on the ADIOS2 computer programme. Data to be relayed back to the SITU. • Should analysis show state water/shoreline impacts, request of AMOSC OSTM through third party.	☐
Tactics: Set a twice daily watch to confirm the extent and spreading of the spill from the assets.		Completed?
OSC Day One; then each day	• If spill from a manned asset, set two hourly watch to confirm bearing/size.	☐
Tactics: OSMP as triggered		Completed?
OSC / EUL	• Activate the various Operational Monitoring Programmes contained within the OSMP.	☐

Level one spills - Commonwealth Waters, Localised Impacts Only Surveillance Monitoring and Visualisation Strategy		
Day One; then each day		
Tactics: Establish the Esso Common Operating Picture in the Esso IMT		Completed?
OSC/SITL Day one, then for the duration of the spill	• Establish Esso's COP. • Commence data capture and graphical display. • Key data to be displayed includes: Spill location. Spill extent, direction and trajectory. Environmental sensitives. Bass Strait oil and gas facilities. Passing ships. Esso controlled contracted resources – aircraft and vessels. Third party controlled potential resources of opportunity – aircraft and vessels.	☐

Table 4-14 Marine Dispersant, and Containment & Recovery Operations

Level one spills - Commonwealth Waters, Localised Impacts Only Marine Dispersant, and Containment & Recovery Operations		
Note: This strategy is dependent on NEBA outcomes and oil trajectory		
Tactic: Establish one x strike team to undertake containment and recovery, and/or dispersant operations.		Completed?
LSC Day One	• Establish BBMT/Lakes Entrance (Bullock Island) as initial Marine FOB. • Secure two vessels for marine operations – if not engaged in other safety critical mission. • Direct vessels to BBMT to load out equipment. • Direct AMOSC C&R offshore boom to BBMT wharf edge and load out: 3 x offshore boom reels 1 x offshore skimmer unit If vessel tanks are <500 m3 arrange for temporary storage units. • Move BBMT offshore vessel based dispersant systems to wharf edge: 1 x afedo spray system. 10 m^3 dispersant. • Mobilise satellite track buoy to platform and/or vessel • Request available Esso Core group recall for duty – vessel-based operations from day two. • Load out vessel for operations.	☐
OSC Day One	• Prepare ICS204 for C&R and dispersant operations: Refer to draft ICS204 for operations - Appendix A	☐
OSC Day Two	• Brief teams to the two separate ICS204. • Direct strike teams to area of operations: For dispersant operations, field test must be conducted prior to operational spraying, with positive results reported to the IMT. PSC to confirm based on the field dispersant testing move to large scale operational spraying.	☐

Table 4-15 Oiled Wildlife Response

Level one spills - Commonwealth Waters, Localised Impacts Only Oiled Wildlife Response		
Note: This strategy is dependent on NEBA outcomes and oil trajectory.		
Tactic: Through the DOT, engage with DELWP and provide support to their Concept of Operations for *Oiled Wildlife Response*.		Completed?
PSC/EUL Day 1	• Based on the NEBA, fates and trajectory vectoring, ascertain likely wildlife impacts – provide this data to DELWP and DOT. • Refer to Area Response Plan and/or Species Response Plans to determine likely tactics to reduce wildlife impacts: Hazing Trans-location Other OSR tactics.	☐
LSC Day 1	• As requested, or directed by DELWP and based on advice of the OWR Coordinator, stand up AMOSC OWR resources: Facility support contract. Equipment and clean-up resources from Geelong. Equipment and clean-up resources from Perth. AMOSC OWR support team.	☐
OSC/Industry OWR coordinator Day 2	• Execute Esso OWR response operations as required or directed by DELWP.	☐

5 Ongoing Incident Management Activities 48 hours +

Note: From this point forward, IMT members are to utilise their Incident Management handbooks and IMT role descriptions to guide their daily activities, with this OPEP informing the subject matter expertise.

By following the checklists in section three and four, an appropriately sized and resourced IMT will have been set up, with operational resources deployed and pre-moved to execute confirmed and likely time-sensitive response strategies.

Sections of the OPEP continue to be colour coded to provide section-specific guidance to command, planning, operations, and logistics sections/areas.

Spill response operations are to continue during each operational period to put in place desired environmental outcomes until termination criteria can be applied to the tactical implementation of each spill response strategy.

Esso's Operational Monitoring Programme will inform the application of measures, and the Scientific Monitoring Programme will need to continue parallel to the response operations until such time as its own independent termination criteria have been met.

Once Esso has moved through the first 48 hours of response, laying the foundation for an ongoing response, the IMT and spill response operations will settle on a planning and operations implementation cycle, based on the ICS planning 'p'.

This section describes the (1) process used to evaluate oil spill response strategies by the Environmental Unit of the planning section and the (2) guidelines for the operations section to execute the chosen strategies.

The IMT is expected to go through the planning 'p' on a daily basis, even if the outcome of that process is to validate the current Incident Action Plan as appropriate for multiple operational periods.

5.1 Incident Action Planning Process

Once established, the task of the IMT is to establish situational awareness by gathering information, analysing this data, and applying the appropriate, defensible procedures and processes listed in the OPEP and EP to reduce harm to the environment.

The cornerstone document to guide the response to this end is the production and execution of the 'Incident Action Plan' – the business plan for the response.

In its basic form, an IAP is a simple document that tells responders what they need to do to resolve/mitigate an unplanned incident. It will include an aim, objectives, description of the situation, a worst case 'size up' consequence description, a NEBA, a description of what resources are at risk, and the activities that will be undertaken to resolve the situation/minimise environmental impacts.

For all oil spills, a level one IAP will comprise the completion of the following documents that comprise the Initial IAP:

- Weather report
- ICS201-1 Incident Briefing Map/Sketch
- ICS201-2 Summary of Current Actions
- ICS201-3 Organisation Chart
- ICS201-4 Resource Summary
- Notification Status Report

Additional forms may be used as required. Refer to Incident Management Handbook – IAP Preparation Guidance – Initial IAP Listing.

For level two and level three spills, a more comprehensive IAP is to be developed. This will require significant IMT resources to ensure that the plan is developed properly and that operations are simultaneously undertaken. The content of the IAP will be determined by the Incident Commander in consultation with the Planning Section Chief. Typically required components include

- Weather Report
- Incident Map
- ICS 202 Incident Objectives
- ICS 203 Organisation Assignment List
- ICS 204 Assignment List
- ICS 205 Communications Plan
- ICS 206 Medical Plan
- ICS 207 Organisation Chart

Note: Refer to Incident Management Handbook – IAP Preparation Guidance – Detailed IAP Listing for further guidance.

Note: The IAP must also include two additional pieces of analysis specific to the oil spill response

A description of the ICS 232 – Resources at Risk (derived from the execution of the SMV strategy)

An analysis of the benefits and dis-benefits of executing oil spill response strategies – the NEBA (derived from the execution of the SMV strategy).

The typical daily work pattern for the production of the IAP is as follows:

Time	Meeting [ICS 230]	Attendance
ASAP (<4hours)	• Initial Incident Brief • Initial incident IC/UC meeting	• IC Command Staff reps; General Staff reps • Handover meeting/brief
0800	• Objectives Meeting • Review/ identify objectives for the next operational period.	• Esso IC; Command Staff reps; General Staff reps
1000	• Command & General Staff Meeting • IC/UC gives direction to Command & General staff including incident objectives and priorities.	• Incident Commander • Public Information Officer • Liaison Officer • Safety Officer • Legal • Security / Intelligence Officer • Operations Section Chief • Planning Section Chief • Logistics Section Chief • Finance Section Chief • Documentation Unit Lead • Situation Unit Lead
1100	• Strategic stakeholder briefing • Brief OPICC/NOPSEMA/States	• Esso ESG Leader • Esso Incident Commander • Liaison Officer • OPICC • NOPSEMA • DOT
1300	• Tactics Meeting • Develop/Review primary and alternate strategies to meet Incident Objectives for the next Operational Period.	• Operations Section Chief • Planning Section Chief • Logistics Section Chief • Finance Section Chief • Resource Unit Lead • Documentation Unit Lead • Situation Unit Lead • Env. Unit Lead • Safety Officer • Documentation Unit Lead

Time	Meeting [ICS 230]	Attendance
1500	• Planning Meeting • Review status and finalize strategies and assignments to meet Incident Objectives for the next Operational Period.	• Esso Incident Commander • Agency Representative • Public Information Officer • Liaison Officer • Security/Intelligence Officer • Legal Officer • Operations Section Chief • Planning Section Chief • Logistics Section Chief • Finance Section Chief • Resource Unit Lead • Documentation Unit Lead • Situation Unit Lead • Env. Unit Lead • Safety Officer • Documentation Unit Lead
1700	• Operations Brief • Present IAP and assignments to the Supervisors / Leaders for the next Operational Period.	• Esso Incident Commander • Operations Field leadership • Safety Officer • Public Information Officer • Liaison Officer • Security Officer • Legal Officer • Section Chiefs • Documentation Unit Lead • Resource Unit Lead • Situation Unit Lead • Environment Unit Lead

This cycle is represented in the planning ‘p’ below, Figure 5-1, with key written outputs noted by the arrows.

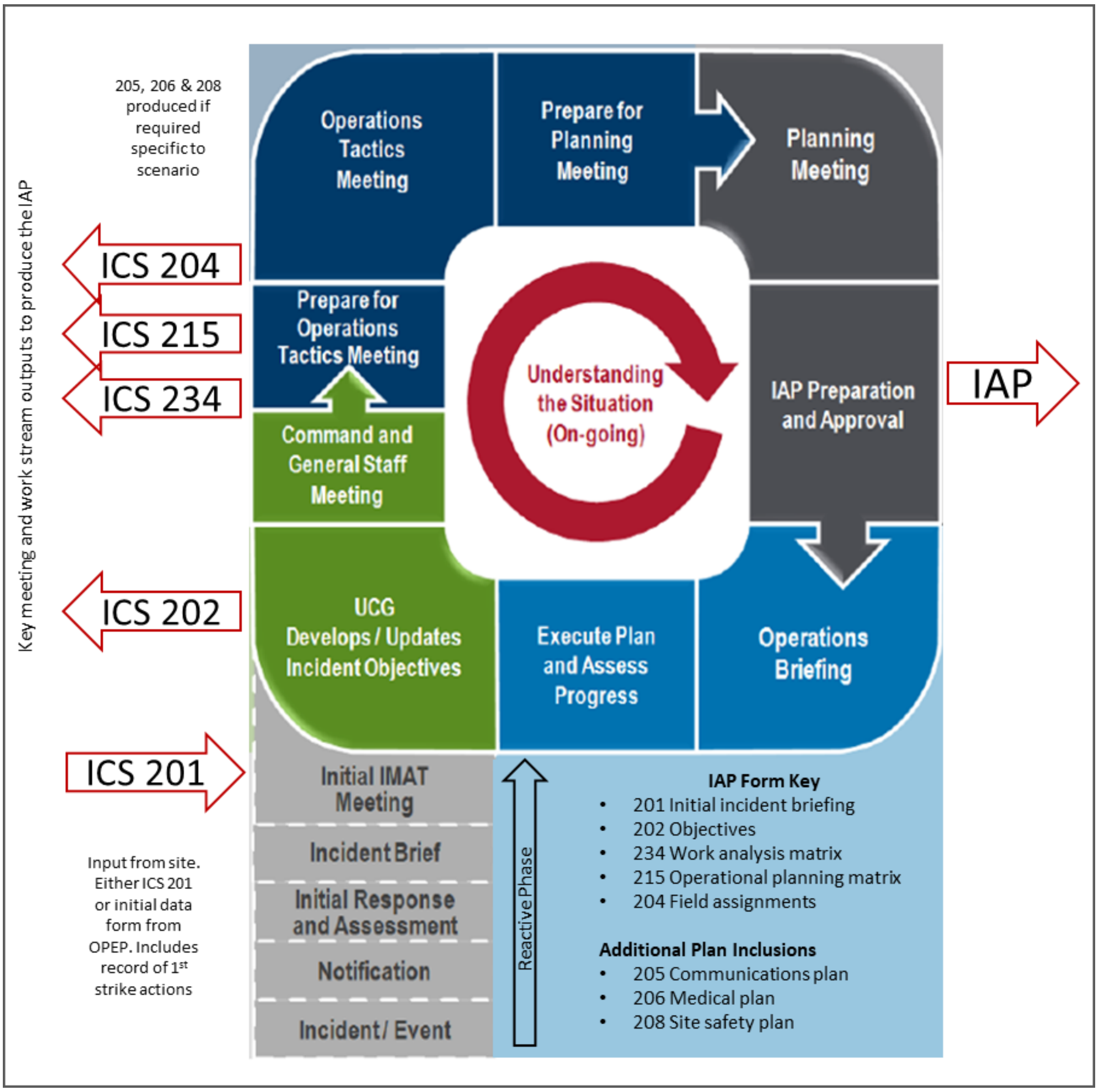


Figure 5-1 Incident Planning

5.2 Selection of Response Strategies – Net Environmental Benefit Analysis

Activity specific protection priorities and selection of response options are summarised in Appendix D – Quick Reference Information.

A 'preparedness NEBA' (which is essentially a draft of Step 1 & 2 of the NEBA Process described in Volume 3, Table 2-4) can be referenced in the event of an incident and used as a template during the response.

A summary of potential applicable response options for different types of hydrocarbon spills has also been provided below.

In the event of an incident, it will be necessary to check the priorities defined in the Quick Reference Guides (Appendix D) are current and supported by stakeholders, and check the response strategies are indeed feasible given the specifics of the situation.

Key:

P	Proposed	The tactic will be deployed where safe to do so and where the NEBA indicates the strategy will result in net environmental benefit, and if the response or the spill is likely to impact State waters, the response will be approved by the State Authority.
V	Viable	The tactic will be considered as a viable option, but deployment may not be warranted because of the size of spill, conditions, and other factors at the time of the spill.
NR	Not recommended	The tactic may be viable but is not recommended either due to safety considerations or impacts of the tactic itself.
NV	Not viable	The potential to deploy the tactic effectively is limited.
NP	Not practical	The tactic cannot be implemented for the resource type; e.g., resource type is inaccessible.
NA	Not applicable	The resource type does not warrant this response.

NEBA Summary - Diesel Spill

Offshore receptor	Exclusion zone	Hazing to deter wildlife	Monitoring and natural dispersion	Marine-based containment and recovery	Protection deflection	Chemical treatment, e.g., dispersant application (surface)
1. Open marine environment	P	V	P	NV	NR	NR
2. Seabed	NA	NA	P	NV	NA	NR
3. Subtidal rocky reefs	V	NA	P	NV	NA	NR
4. Estuaries	V	V	P	NV	P	NR
5. Shipwrecks	V	NA	P	NV	NA	NR
6. Fisheries: Southern shark and scalefish	P	NA	P	NV	NR	NR
7. Fisheries: Southeast fishery	P	NA	P	NV	NR	NR
8. Fisheries: Southern scallop	P	NA	P	NV	NR	NR
9. Fisheries: Southern rock lobster	P	NA	P	NV	NR	NR
10. Fisheries: Abalone	NA	NA	P	NV	NR	NR
11. Shoreline	P	P	P	NR	P	NR

NEBA Summary - Light Crude Spill

Offshore resource type	Exclusion zone	Hazing to deter wildlife	Monitoring and natural dispersion	Marine-based containment and recovery	Protection deflection	Chemical treatment, e.g., dispersant application (surface)
1. Open marine environment	P	V	P	V	V	V
2. Seabed	NA	NA	P	NA	NA	NA
3. Subtidal rocky reefs	P	NA	P	V	NR	NR
4. Estuaries	V	V	P	NA	P	NR
5. Shipwrecks	P	NA	P	V	NR	NA
6-10. Fisheries	P	NA	P	V	NA	P except in shallow water over sessile aquaculture.
11. Shoreline	P	P	P	V	V	NR

NEBA Summary - Condensate Spill

Offshore resource type	Exclusion zone	Hazing to deter wildlife	Monitoring and natural dispersion	Marine-based containment and recovery	Protection deflection	Chemical treatment, e.g., dispersant application (surface)
1. Open marine environment	P	V	P	NR	NR	NR
2. Seabed	NA	NA	P	NA	NA	NA
3. Subtidal rocky reefs	P	NA	P	NR	NR	NR
4. Estuaries	P	V	P	NR	NR	NR
5. Shipwrecks	P	NA	P	NR	NR	NR
6-10. Fisheries	P	NA	P	V	NA	NR
Shoreline impacts	P	P	P	V	V	V

Where shoreline impacts are predicted, a response-specific NEBA will be undertaken, in conjunction with DOT, to determine and agree on the appropriate response strategies.

A simple grouping of these tactics by location / hydrocarbon type:

Location	Loss of diesel, lubricating, condensate or mechanical oils	Crude oil releases
All locations	• Surveillance, monitoring, and visualisation • Exclusion zones, considering health and safety and environment risks are determined in consultation with the control agency. • Oiled wildlife response	
Spill site	• Source control (BOP intervention, relief well drilling, pipeline engineering efforts)	
Offshore environment (Commonwealth waters)	• Mechanical dispersion	• Chemical dispersant • Containment and recovery
Offshore and nearshore environments (Commonwealth and coastal waters)		• Containment and recovery
Coastlines and islands	• Protection deflection • Containment and recovery • Shoreline response – assessment and clean-up • Oiled wildlife response	

Each tactic will be applied in a manner as determined by a dynamic planning process, adapted at the time to the current weather and sea conditions.

NEBA instructions:

For all spills, a spill-specific NEBA needs to be developed as outlined in Figure 5-2 and summarised as follows:

a. Select the appropriate NEBA worksheets from http://ishareteam1.na.xom.com/sites/EMPC0263/EPP/Environment%20Plans/6_NEBA.xlsx by oil type.

b. Refer to OSRA[2] maps and cull non-relevant Resource Types according to the areas of the environment that are predicted to be impacted.

c. Review the protection priority of the remaining resources (using relevant sections of EP Volume 2 Section (Loss of Containment / Loss of Well Control). Also refer to Quick Reference Information for specific activities OPEP- Appendix D.

d. Review and expand on each of the benefits and disbenefits within the NEBA worksheet according to incident-specific details and further response considerations.

e. Assess the effectiveness of the response strategies in protecting the resources at risk.

f. Summarise the preferred strategy into the Incident Action Plan.

[2] The Oil Spill Response Atlas (OSRA) is a national database and decision support system in a computerised GIS format. It is designed to provide comprehensive information about Australia's coastal resources and spill response logistics. OSRA includes information on: shoreline geomorphology, marine habitats, environmental resources, cultural and heritage sites, commercial resources, logistics and infrastructure information to support spill response. OSRA is accessed through AMSA in emergency situations.

Detailed information on priorities for protection, potential impacts, and preferred response strategies will be used in conjunction with incident-specific trajectory modelling and real-time conditions to determine the most appropriate incident-specific response.

Using the outputs of the NEBA as a feed into the planning 'P' process, the IMT will then draft/validate tactical plans for specific areas and execute those plans.

A link to the NEBA tool can be found here:

NEBA Tool

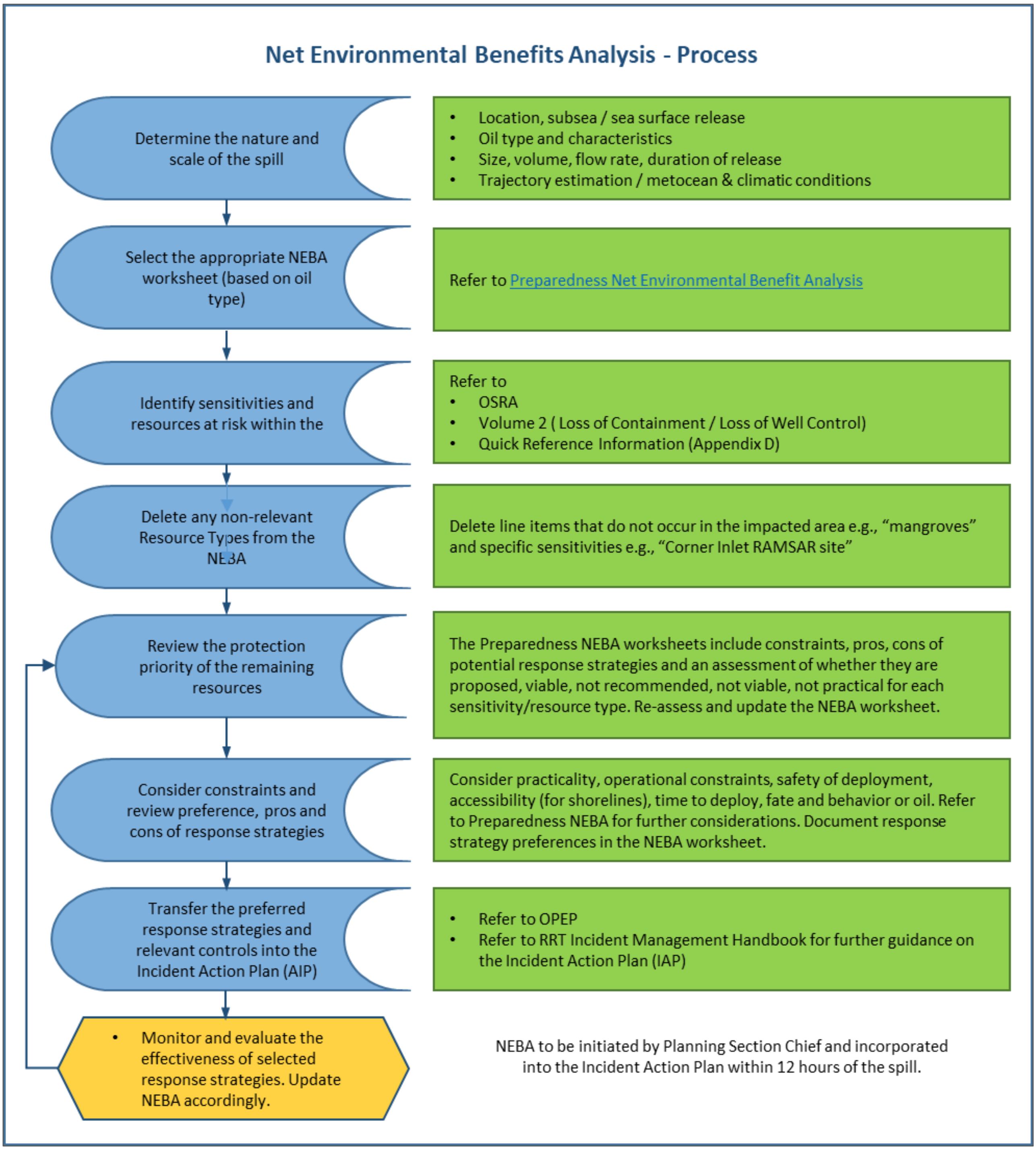


Figure 5-2 NEBA Process Flowchart

5.3 Cone of Response

For all offshore spills, Esso will utilise a 'cone of response' approach to spill response operations. This means proportioning resources to the spill response strategies that have a bulk removal/treatment affect closest to the source of the spill. The 'cone' is visually depicted below:

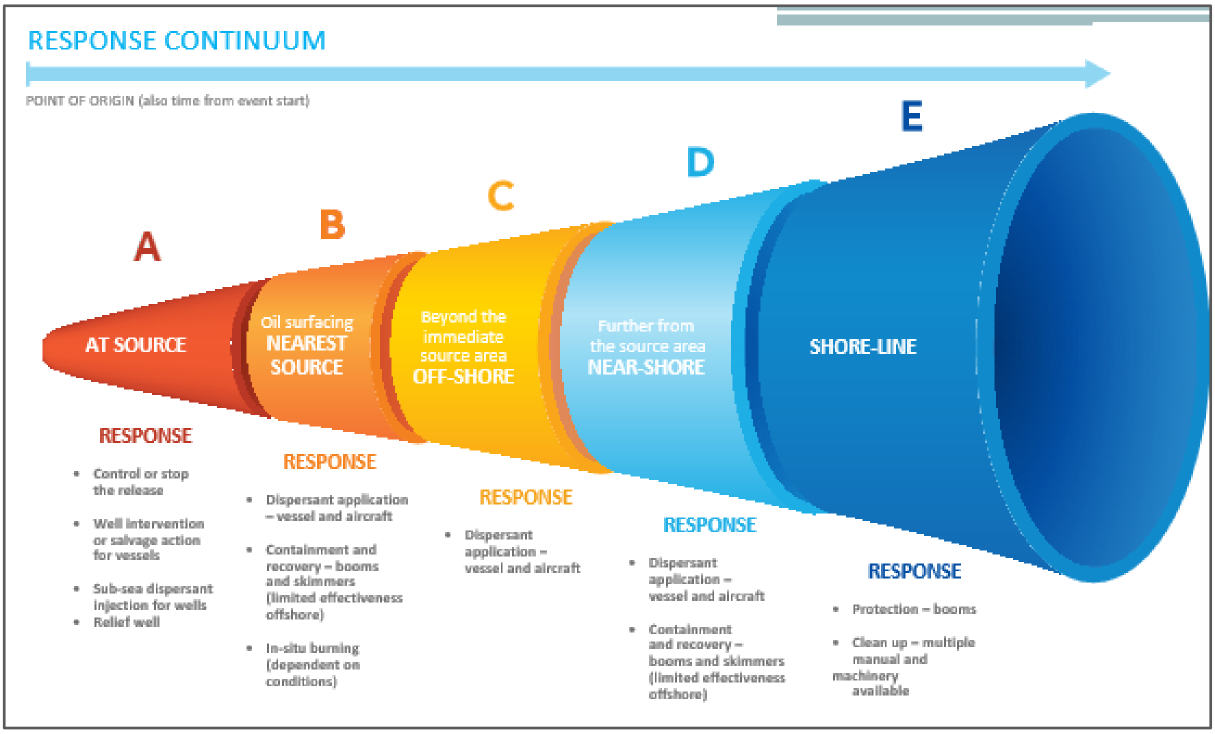


Figure 5-3 Cone of Response

For spills in near-shore waters or where shoreline impacts are imminent (<48 hours), the cone will be modified – Esso's efforts will focus on minimising impacts to sensitives, particularly the shoreline, while also prioritising control of the source of the spill. Once shoreline protective/response measures are in place, efforts will revert back other areas of the 'cone'.

The 'cone' directs response resources to where maximum effectiveness will occur. Using this methodology, each tactic or strategy is executed cogniscent of the volume of remaining oil to be treated from the previous strategy.

In practical terms this means that Esso will, in priority order:

1. Capitalise on window of opportunity for dispersant application with appropriate type and quantity of dispersant to reduce bulk surface and shoreline loading; and then
2. Utilise offshore and nearshore containment & recovery strike teams to recover oil not dispersed, so as to reduce bulk surface and shoreline loadings; and then
3. In coordination with control agency, execution of shoreline protection measures, to reduce volumes of remaining oil from reaching and impacting shore-based sensitivities.

The following is a description of each oil spill response strategy that Esso will put in place where applicable to the incident:

5.4 Source Control

Strategy Description:

Well intervention, subsea infrastructure repairs, pipeline repair and vessel salvage will be used as appropriate to the source of the spill to control and cease the uncontrolled flow of hydrocarbons into the environment.

Relevant environmental performance outcomes and standards are provided in Appendix C.

Source Control	
Response Objective	To prevent further uncontrolled release of hydrocarbons into the marine environment.
Critical Outputs	Wells/drilling: All source control operations will be done in accordance with the Esso Gippsland Well Kill Contingency Plan (for source control using the Well Kill Skid) and the Drilling Emergency Preparedness and Response Manual (where required) relevant to that particular well and the source control options within that plan. Depending on the circumstances, the plans outlines the following options that will be followed: • Blowout preventer intervention • Seabed debris clearance • Rig for relief well drilling. Pipeline/subsea infrastructure: All pipeline/subsea infrastructure will be done in accordance with [Pipeline Management Plan]. Pipeline repairs include the use of ROVs with cutting or working tools, valve interventions, and pipeline de-pressurisation. Vessel salvage: Esso will provide support to AMSA or Marine Safety Victoria to ensure appropriate salvage operations.
Planning Section Instructions	As per individual source control plan/incident action plan.
Operations Section Instructions	
Logistics Section Instructions	

5.5 Surveillance and Monitoring

Strategy Description:

Using field observations and modelling, the IMT will assess the incoming data to plan and tailor spill response operations to the scenario of the day. This process will continue for the duration of the response.

Relevant environmental performance outcomes and standards are provided in Appendix C.

Surveillance and Monitoring	
Response Objective	To gather information and validate planning assumptions to adjust response plans as appropriate to the scenario. To quantitatively assess the extent, severity, persistence, and recovery environmental values and sensitivities affected by the spill.
Critical Outputs	Level One Spills: • Aerial Surveillance • Oil Spill Trajectory Monitoring (Vectoring + ADIOS). Level Two Spills (in addition to the above) • Twice daily Oil Spill Trajectory Modelling. • Continuous monitoring from Oil Spill Tracking Buoys. • Surveillance from: Production assets – 4 hourly watch Aircraft – 2 x daily overflights Vessels – Opportunistically to sense check aerial observations. • Shoreline surveys (pre-emptive and post impact). • Operational and Scientific Monitoring programmes. Level Three Spills (in addition to the above) • Satellite photography runs as requested by the SITU.

Surveillance and Monitoring	
Planning Section Instructions	The Planning Section – Environment and Situational units in particular – needs to receive and interpret field/modelling data to inform • The Net Environmental Benefit Assessment. • The list of Resources at Risk from the spill. • The development of the ICS 201 and IAP (for level two and three spills). Critical Daily Tasking: • Drive the planning process (refer to IMH schedules and timings). • Liaise with OSC to ensure field activities are in place to gather field data. • Liaise with LSC to activate and then receive the OSTM. • Establish and activate the OSMP with data reporting back to the SITU. • Gather data, establish, and keep up to date Status Boards and CoP GIS (refer to IMH Section 6). The Planning Section will ensure that the SMV strategy is scaled up or down to provide sufficient information for the IMT to plan and execute appropriate oil spill response activities. All data gathered through remote means are to be captured and displayed in the Common Operating Picture (Esso GIS) so that all members of the IMT have situational awareness. For level two or three spills, the Planning Section includes coordination of SCAT teams on shorelines, feeding data directly into the SITU.
Operations Section Instructions	The Operations Section is to task assets (marine and aviation divisions; shoreline) to gather data that can be used by the Planning Section to inform the development of the IAP and the operational response. This is done as a part of the execution of the IAP developed the previous day. Critical Daily Tasking: • Execute the IAP for the current Operational period. • Liaise with the PSC to ensure that field tasking (ICS 204) is drafted and used for SMV proposes. • All Spills:

Surveillance and Monitoring	
	• Direct aviation assets to complete aerial surveillance consistent with aerial observer guides and standard operating procedures. Spill Level Two and Above • Deploy satellite tracking buoys (Longford and third party). • Direct dedicated aviation assets to undertake surveillance with trained aerial observers. • Direct marine assets to undertake surveillance. • Set watch from manned platforms (4-hour report back). • Deploy vessel for OSMP activities.
Logistics Section Instructions	The Logistics Section is to activate contracts and provide ongoing services and supply (from in-house resources or from third parties) in support of the execution of this strategy. Critical Daily Tasking: All Spills: • Business-As-Usual assets to be redeployed as per operational requirements – Dispersant spraying strike team. • Shift dispersant to BBMT as per 1st strike checklist. Activate contract with AMOSC and request dispersant. Spill Levels Two and Three • Maintain Air Operations base at Bairnsdale • Activate contracts with third-party aircraft providers. • Marine Operations Base at BBMT or Lakes Entrance. • Activate contract with AMOSC, request aerial observers for daily sorties, satellite tracking buoys to Longford, and twice-daily OSTM. Spill Level Three Only • Activate contract with AMOSC/internal for the provision of Satellite photography services.
Termination Criteria	Detectable oils are below the thresholds outlined in the OSMP

5.6 Dispersant Operations

Strategy Description:

Dispersant will be applied to ongoing crude oil spills using, aircraft and/or vessel.

Relevant environmental performance outcomes and standards are provided in Appendix C.

Dispersant Operations	
Response Objective	To reduce consequences to surface and shoreline values and sensitivities. To increase the bioavailability of oil for microbial breakdown.
Critical Outputs	Level One Spills: Based from BBMT; one vessel-based dispersant strike team. Daily dispersant spray capacity will be based on amount spilled. Levels Two and Three Spills (surface) Based from BBMT; two vessel-based dispersant strike teams Based from Bairnsdale Airfield; up to three air tractor aircraft (AT502 & AT802) flying multiple daily sorties to spray oil located in Commonwealth waters. Surge Resources – Dependent on observations of dispersant effectiveness and additional need determined by the IMT at the time For dispersant operations that project the exhaustion of Australia's dispersant supplies, global dispersant stockpiles from Singapore, may be air freighted to Australia and shifted to the operating airfields Based on the WCDS daily dispersant maximum spray requirements is calculated to be no greater than 42 m^3 per day.
Planning Section Instructions	The Planning Section – Environment Unit in particular – needs to assess on a daily basis that dispersant use will demonstrably achieve net positive outcomes. Chemical dispersants are not recommended for diesel or Group 1 oil spills. Demonstrable positive outcomes include reduction in large-scale shoreline loadings, particularly on remote coastlines such as the Bass Strait Islands, the wilderness areas of far-east Gippsland, Corner Inlet, and surrounding estuaries, and sensitivity specific positive impacts as demonstrated by the daily NEBA. Dispersants are only to be used in Commonwealth waters, where water depths (>10M) and currents will encourage mixing and dispersion. Dispersants are <u>not</u> to be used in State waters without approval of the Control Agency IMT. The state must be notified if dispersants used offshore have the potential to enter state waters. Critical Daily Tasking: • Develop incident specific dispersant operations plans based on the *Aerial Dispersant Operations Plan for Oil Spills in Bass Strait* plan (controlled copy available on AMOSC website).

Dispersant Operations	
	• Establish through a daily Net Environmental Benefit Assessment the ongoing benefit of dispersant spraying. • Ensure that operational and scientific monitoring programmes are in place, with data being collated and sent back to the EUL and SITU • Ensure daily dispersant operations are recorded (types, volumes, and locations). • Predict future dispersant ‘consumption/burn rates’ across all delivery means. • Assist operations to draft daily ICS 204 operations orders used by the aviation branch and complete the AMSA/AMOSC JSOP for the deployment of the FWADC. • The Planning Section needs to continuously monitor dispersant operations and scale them up or down to the number of daily sorties required to provide 100% spray coverage of slightly weathered (24 hours) crude oil. Dispersant selection will preference: • Dispersants listed on the AMSA Oil Spill Control Agents Register. • Those with highest efficacy testing against Esso Bass Strait crudes. Refer to 2019 Esso Dispersant Testing Report for details of laboratory analysis of a range of dispersants on Gippsland crude oils. A summary of the results is provided in Table E-1 in Appendix E. All data gathered through the OSMP in relation to dispersant operations are to be captured and displayed in the Common Operating Picture (Esso GIS) so that all members of the IMT have situational awareness.
Operations Section Instructions	The Operations Section, Marine, Aviation, and Source Control Branch Directors will task assets under their command to undertake daily dispersant operations as a part of the execution of the IAP developed the previous day. • Aviation operations will be split between: • Bairnsdale (AMSA/NatPlan-provided small air tractor aircraft and attack aircraft) • Longford Heliport. • Operational planning needs to assert control around the two distinct aircraft types. Safety planning to include separate, dedicated search and rescue (SAR) capability. Operational planning for aerial surface application will be based on the *Aerial Dispersant Operations Plan for Oil Spills in Bass Strait* and the completion of the AMSA / AMOSC FWADC JSOP available at www.amosc.com.au. Vessel spraying operations will come out of BBMT/Lakes Entrance on 3-4 day swings, dependent on deck space for dispersant and waste. Resupply will occur at these locations. Critical Daily Tasking: All Spills: • Execute the IAP for the current operational period. • Liaise with the PSC to ensure that field tasking (ICS 204) is drafted and used for dispersant operations. – Maintain records of dispersant application including quantities, types, and locations of spraying. Refer Appendix A for draft ICS 204. • Direct-vessel-based dispersant operations. • Spill Levels Two and Above (in addition to the above):

Dispersant Operations	
	• Operations are to be directed to the thickest part of the slick, to fresh oil. • De-confliction of aerial and vessel-based dispersant spraying – SimOps planning needs to be part of the daily tasking. • Vessel assigned for the OSMP water sampling/monitoring activities.
Logistics Section Instructions	The Logistics Section is to activate contracts and provide ongoing services and supply (Esso resources and/or from third parties) in support of the execution of this strategy. This is focused on aerial operations from Essendon and Bairnsdale and vessels from BBMT and Lakes Entrance. For level two and three spills, the key tasks are to Ensure correct activation with AMOSC of the AMSA fixed wing aerial dispersant spraying contract – aircraft is to move to Bairnsdale airfield for ongoing operations Ensure internal (Esso-owned stockpiles) dispersants are moved to the aerial and marine operational points Ensure AMOSC and NatPlan stockpiles of dispersant are moved to aerial and marine operational points If needed, ensure activation of OSRL for large dispersant aircraft and transfer by air of additional dispersant to Australia. Critical Daily Tasking: • Monitoring dispersant rate of use. • Sustaining marine/aviation operations with contractors and third parties to ensure that operations can continue: • Operational bases, • Services and supply for operations. • Anticipate future needs of the operations
Termination Criteria	Dispersant operations will cease based on any of the below triggers: • NEBA determines that dispersant operations no longer provide demonstrable environmental benefits. • Oil is too weathered for effective operations.

5.7 At-Sea Containment and Recovery (Vessel Based)

Strategy Description:

Using containment boom and skimmers, strike teams will corral fresh oil and then mechanically recover it into vessel tanks and temporary storage.

Relevant environmental performance outcomes and standards are provided in Appendix C.

At-Sea Containment and Recovery (Vessel Based)	
Response Objective	To recover spilt oil before shoreline or other sensitivity contact. To remove bulk floating oil and improve water quality.
Critical Outputs	For Level One Spills (subject to NEBA): • Using a pair of large vessels, offshore booms will be towed in the optimal configuration to concentrate and collect floating oil. Alternatively, single vessel high speed booming systems may be used. • The optimal mechanical skimmer for the type and condition of oil will be used to recover as much oil as possible from the pocket of the boom. • Refer to the *ExxonMobil Oil Spill Response Handbook* s. 5 for more information on booming configurations. For level two and above spills (subject to NEBA): • Based from BBMT and Lakes Entrance, up to six strike teams (each comprising two vessels) may be needed considering the volume of oil required to be collected via this method. Each will use the configurations noted above. In ideal conditions, 'advanced' booming techniques will be used to concentrate oil using two pairs of vessels per strike team. • Vessels of opportunity from fishing and offshore service fleets will be sourced from around southern Australia. • Equipment and trained personnel will come from Esso, AMOSC, AMOSC Mutual Aid and Australian National Plan (government) stockpiles. These will be cascaded in from stockpiles across Australia. • Daily calculated volumes of oil to be contained and recovered through this method will be between 150 m^3 and 450 m^3 of oil in total.
Planning Section Instructions	The Planning Section to determine through the NEBA, and surveillance and monitoring inputs, that Containment and Recovery operations should be conducted. In particular, Containment and Recovery operations will be used to reduce shoreline loadings, particularly on remote coastlines such as the Bass Strait Islands, the wilderness areas of far-east Gippsland, Corner Inlet, and surrounding estuaries, and sensitivity-specific positive impacts as demonstrated by the daily NEBA. Weather conditions in Bass Strait are known to be volatile and challenging, so forward 24-48-hour forecasts (wave and swell height; wind speed) must be within operational limits for this tactic to proceed.

At-Sea Containment and Recovery (Vessel Based)	
	Containment and recovery activities should only be carried out during daylight hours. Critical Daily Tasking: • Establish through a daily Net Environmental Benefit Assessment the ongoing benefit of Containment and Recovery • Ensure that weather conditions are amenable to safe and effective operations • Ensure that the operational and scientific monitoring programme is in place, with data being collated and sent back to the EUL and SITU • Ensure daily Containment and Recovery operations are recorded (location, estimated amount of oil recovered, estimated amount of water recovered) • Assist operations to draft daily ICS 204 operations orders used by the marine division for Containment and Recovery. Refer Appendix A for draft ICS 204 • Seek approval from AMSA to decant separated water to increase waste storage of recovered oil (refer to decanting IPEICA Good Practise Guide #17 http://www.oilspillresponseproject.org/wp-content/uploads/2016/02/JIP-17-Decanting.pdf) and National Plan Guidance NP-GUI016 for further details. • Working with the safety officer, ensure that WHS risks are appropriately identified and managed. • Plan temporary waste reception facilities at BBMT and Lakes Entrance. • Activate long-term waste treatment contracts from temporary waste storage sites. All data gathered through the OSMP in relation to Containment and Recovery operations are to be captured and displayed in the Common Operating Picture (Esso GIS) so that all members of the IMT have situational awareness. The Planning Section needs to continuously monitor Containment and Recovery operations and scale them up or down as needed when compared to the other spill response strategies. As the oil changes over time (weathering) Containment and Recovery will likely become favoured over dispersant operations.
Operations Section Instructions	The Operations Section and Marine Branch Directors will task assets under their command to undertake Containment and Recovery operations as part of the execution of the IAP developed the previous day. Vessels will operate in pairs, focusing on different sections of the thickest part of the slick within the Containment and Recovery zone. Utilise overhead aerial assets to provide real-time direction to the vessel strike teams. Where approved, regular de-canting by strike teams is to be done to maximise the volume of oil recovered from the vessel’s waste tanks. Safety planning for this strategy must focus on de-confliction with aerial or vessel based dispersant operations. Operational planning will be based on *ExxonMobil Oil Spill Response Handbook* s. 5.

At-Sea Containment and Recovery (Vessel Based)	
	Critical Daily Tasking: All Spills: • Execute the IAP for the current Operational period. • Liaise with the PSC to ensure that field tasking (ICS 204) is drafted and used for C&R operations. Refer Appendix A for draft ICS 204 • Ensure daily Containment and Recovery operations are recorded (location, estimated amount of oil recovered, estimated amount of water recovered. • Operations are to be directed to continuous parts of the slick to maximise effectiveness. • SimOps planning needs to be a part of the daily tasking. • Vessels assigned for the OSMP water sampling/monitoring activities.
Logistics Section Instructions	The Logistics Section is to activate contracts and provide ongoing services and supply (from Esso resources and/or third parties) in support of the execution of this strategy. This is focused on supporting Containment and Recovery strike team operations from BBMT and Lakes Entrance. Vessels of opportunity are to be sourced and wet chartered through Esso's marine team. Oil spill response equipment is to be sourced from AMOSC, NatPlan sources, and OSRL if required. Logistics is to use the technical advice of AMOSC LO/OSRL LO as to the best equipment selection for the operation at the time. Factors to be considered include • Known and anticipated weather conditions. • Weathering of oil. • Anticipated volumes of oil. • Length of operation/swing. Only large/heavy offshore booms are to be ordered from providers (i.e. 1.5 metres in height or greater), or advanced booming single vessel systems (i.e. NOFI Current buster 2/4/6/8/ or SpeedSweep Systems) with skimmer selection focusing on high capacity, high volume oil removal (i.e. greater than 30 m^3 per hour pumping capacity). For Level One Spills: • Utilise the chartered Esso vessels to load out equipment from BBMT with Esso OSR trained personnel. • Contract AMOSC personnel and AMOSC CG personnel if needed.

At-Sea Containment and Recovery (Vessel Based)	
	For Levels Two and Three: • Request additional skimming equipment, booms, and temporary storage from AMOSC to match the need, as directed by the planning section – quantities and types of equipment. • Request AMOSC personnel and AMOSC CG in numbers suitable for equipment deployment. • Contract offshore surveyed vessels suitable for strike team duties – deck size and bollard 'pull'. • Ensure that temporary storage facilities at BBMT and Lakes Entrance are in place to receive the volume of waste that will be offloaded from the strike teams. • Ensure that waste contractors are in place to remove the temporary waste from BBMT and Lakes Entrance to final waste storage/disposal sites or processing. Critical Daily Tasking: • Sustain the activities for the duration of the spill with contractors and third parties to ensure that operations can continue Marine Bases. Services and supply for operations – vessel consumables, goods, and resupply. • Track vessels for compliance with Esso marine requirements. • Track volumes of oil recovered by strike teams and anticipate temporary storage requirements at marine bases.
Termination Criteria	Containment and Recovery operations will cease based on any of the below triggers: • NEBA determines that Containment and Recovery operations no longer provide demonstrable environmental benefits. • OSMP triggers are met. • Oil is too thin for effective booming and containment to take place • Weather/sea conditions make Containment and Recovery operations unsafe or ineffective.

5.8 Protection of Sensitive Shoreline Resources

Strategy Description:

Booms will be used to protect shoreline resources and to corral oil for skimming.

Relevant environmental performance outcomes and standards are provided in Appendix C.

Protection of Sensitive Shoreline Resources	
Response Objective	To recover spilt oil before shoreline or other sensitivity contact. To remove bulk floating oil and improve water quality.

Critical Outputs	For All Spills
	• Modelling predicts shoreline impacts over time
	• Where shoreline impact is predicted a Tactical Response Plan (TRP) will be implemented
	• TRPs consist of detailed response information and resources required including the equipment and personnel to carry out identified taskings related to the protection of specific sensitivities
	• Taskings within the TRPs include:
	  ○ SCAT
	  ○ Pre-cleaning of shoreline
	  ○ Protection and deflection booming
	  ○ Containment and recovery
	• Primary TRP sites identify sensitivities permanently exposed which will require a definitive response. The TRP identifies specific tasks aimed at minimising environmental impact.
	• Secondary TRP sites identify sites at which exposure is seasonal or irregular and require confirmation of a requirement prior to response. The TRP identifies sensitivities, site information, likely response strategies, and resources required that would require validation based on conditions at time of event
	• Secondary TRP sites that do not require a response would allow additional resources to be directed towards other response activities

Protection of Sensitive Shoreline Resources

Planning Section Instructions

The Planning Section EUL to provide advice about whether there are any specific sections of coastline with high-value sensitivities – in these areas, specific tactical planning should be put in place.

All planning for protection of coastlines is to be done in conjunction with the Control Agency IMT.

The following locations have pre-drafted TRPs which should be used to guide response planning.

Primary Sites

SITE NAME	Site Type	Latitude	Longitude
VICTORIA			
Corner Inlet	Inlet	38°47'49.23"S	146°30'3.86"E
Lakes Entrance	Inlet	37°53'26.16"S	147°58'23.12"E
Snowy River (Marlo)	River mouth	37°48'12.25"S	148°32'56.62"E
Wingan Inlet	Inlet	37°44'56.97"S	149°30'48.22"E
Betka River	River mouth	37°35'6.32"S	149°44'21.58"E
Mallacoota	Inlet	37°33'47.59"S	149°45'53.47"E
NEW SOUTH WALES			
Wonboyn River	River/Lake	37°14'57.55"S	149°57'59.54"E
Bittangabee Bay	Inlet	37°12'54.16"S	150° 0'57.51"E
Towamba River	River mouth	37° 6'44.56"S	149°54'45.62"E
Nullica River	River mouth	37° 5'26.91"S	149°52'20.21"E
FLINDERS ISLAND			
North East River	River mouth	39°43'51.81"S	147°57'38.73"E
Samphire River	river mouth	40°13'10.56"S	148°11'47.93"E

Protection of Sensitive Shoreline Resources

Secondary sites

SITE NAME	Site Type	Latitude	Longitude
VICTORIA			
Merriman Creek (Seaspray)	River mouth	38°22'56.18"S	147°11'4.26"E
Lake Bunga	Inlet	37°56'50.00"S	147°48'18.98"E
Lake Tyers	Inlet	37°51'33.78"S	148° 5'18.55"E
Yeerung River	River mouth	37°47'28.02"S	148°46'26.67"E
Sydenham Inlet (Bemm River)	River mouth	37°46'49.61"S	149° 1'11.26"E
SITE NAME	Site Type	Latitude	Longitude
Tamboon Inlet (Cann River)	Inlet	37°46'39.31"S	149° 9'11.11"E
Thurra River	River mouth	37°46'56.67"S	149°18'45.94"E
Mueller River	River mouth	37°46'44.51"S	149°19'41.29"E
Shipwreck Creek	River mouth	37°38'51.45"S	149°41'58.05"E
Davis Creek	River mouth	37°34'43.46"S	149°44'59.14"E
NEW SOUTH WALES			
Saltwater & Woodburn Creek	Woodburn Creek	37°10'15.46"S	150° 0'17.18"E
	Saltwater Creek	37°10'8.25"S	150° 0'9.11"E
Fisheries Creek	Creek	37° 6'38.72"S	149°55'47.31"E
Boydtown Creek	River mouth	37° 6'9.86"S	149°52'51.59"E

Protection of Sensitive Shoreline Resources

SITE NAME	Site Type	Latitude	Longitude
FLINDERS ISLAND			
Foochow Inlet	Inlet	39°53'53.77"S	148° 7'20.71"E
Melrose Road Inlet	Inlet	39°55'34.85"S	148° 9'18.30"E
Patriarch Inlet	Inlet	39°56'45.22"S	148°11'0.45"E
Cameron Inlet	Inlet	40° 4'14.54"S	148°17'10.36"E
Reddins Creek	Creek mouth	40°15'44.19"S	148° 9'5.00"E
Cronleys Creek	Creek mouth	40°14'54.22"S	148° 3'32.09"E
Fotheringate Creek	Creek mouth	40°12'51.95"S	148° 2'15.05"E
Nalinga Creek	Creek mouth	40° 8'10.47"S	148° 1'1.70"E
Pats River	River mouth	40° 5'51.62"S	147°59'40.77"E
Arthur Bay Conservation Area	Bay	40° 5'12.38"S	147°58'1.53"E
Lughrata Salt Marsh	Marsh entrance	39°54'31.82"S	147°52'30.33"E
Mines Creek	Creek mouth	39°54'13.00"S	147°51'59.85"E
Boat Harbour Creek	Creek mouth	39°51'3.29"S	147°47'22.15"E
Killiecrankie Creek	Creek mouth	39°50'9.47"S	147°50'23.83"E
Edens Creek	Creek mouth	39°45'40.28"S	147°53'3.65"E

Tertiary site

Protection of Sensitive Shoreline Resources

SITE NAME	Site Type	Latitude	Longitude
VICTORIA			
Gabo Island (Mallacoota)	Island	37°33'44.75"S	149°54'39.07"E

TRPs may need to be drafted in conjunction with the operations section for locations without existing TRPs. Shoreline TRPs and shoreline clean-up more generally should be executed consistent with guidance in the Tactical Response Plan - Shoreline Protection & Clean Up and/or the *ExxonMobil Oil Spill Response Handbook* s.12.

Critical Daily Tasking:

- Establish through a daily Net Environmental Benefit Assessment and SMV the ongoing benefit of shoreline booming.
- Ensure that weather conditions are amenable to safe and effective operations.
- Ensure that an operational and scientific monitoring programme is in place, with data being collated and sent back to the EUL and SITU.
- Ensure daily operations are recorded (location, estimated amount of oil recovered, estimated amount of water recovered).
- Assist operations to draft daily ICS 204 operations orders used by the shoreline and nearshore division for booming.
- Work with the DOT LO to ensure agreement on the location of specific tactical operations.
- Work with the safety officer to ensure that WHS risks are appropriately identified and managed.
- Plan local temporary waste reception facilities co-located with shoreline recovery.
- Activate long-term waste treatment contracts from temporary waste storage sites.

Operations Section Instructions

The Operations Section and Shoreline Protection Branch Director will need to coordinate with the DOT to ensure that resources under Esso command undertake shoreline protection tactics consistent with the requirements of the DOT.

Protection of Sensitive Shoreline Resources	
	The Shoreline Protection Branch must work closely with the Planning Section to draft and 'truth' tactical response plans. Plan drafting will be prioritized based on time frame of impacts – with soonest and most critical sensitivities being done first. All operations are to be consistent with the IAP developed the previous day. The Shoreline Protection Branch is to divide the tasking between teams that are geographically focused – each with a number of plans to execute. For protection / deflection booming, teams will need to continuously monitor boom for effectiveness and adjust for changes in tide, current, and weather. When booming is used for containment with recovery operations, effective temporary waste storage must also be put in place. Safety planning for this strategy must focus on remote operations, the use of manual handling risks, and potential for exposure to hydrocarbons. Operational planning will be based on Tactical Response Plan - Shoreline Protection & Clean Up and/or the *ExxonMobil Oil Spill Response Handbook* s.12. Critical Daily Tasking: All spills • Execute the IAP for the current operational period. • Liaise with the planning section to ensure that field tasking (ICS 204's) is drafted and used for shoreline protection operations. • Booming operations are to be continuously monitored to ensure ongoing effectiveness. • SimOps planning needs to be part of the daily tasking. Operations must also adhere to good practice decontamination practices, establishing and keeping to hot, warm, and cold zones as well as personnel and equipment washdown facilities. Site setup must follow the practices outlined in the *ExxonMobil Oil Spill Response Handbook*.
Logistics Section Instructions	The Logistics Section is to activate contracts and provide ongoing services and supply (from in-house resources or from third parties) in support of the execution of this strategy.

Protection of Sensitive Shoreline Resources	
	Shoreline protection strike teams may be directed to put in place tactics along any part of the mainland, Bass Strait, or Tasmanian Islands. Logistical support will be required at each of these locations to support spill response – moving operators in and out of these locations and supporting them while they are there. In extreme non-assessable locations, this could require rotary wing aircraft moving personnel and freight and equipment lifts/movement. The logistics section must ensure the correct type and volume of spill response equipment is divided into caches for each of the tactical response plans. This includes • Appropriate lengths of shoreline and shore seal booms, including land and sea anchoring systems. • Smaller portable skimming systems. • Temporary waste storage (on-site) of a volume equivalent to anticipated recovery. Support and services for on ground operators must also be provisioned, including • Shelter • Sustenance • Ablutions • Transport. The Logistics Section is to liaise with DOT on the shoreline needs and then utilise Esso standing support contractors for the provision of these services where there are gaps between what the DOT is able to provide and the need. Logistics is to also use the technical advice of AMOSC LO/OSRL LO as to the best equipment selection for the operation at the time. Factors to be considered include • Known and anticipated weather conditions. • Weathering of oil. • Anticipated volumes of oil. • Duration of operation. The logistics section is to prioritise Esso and AMOSC equipment for deployment for the execution of shoreline protection booming, with NatPlan/DOT/OSRL equipment to be deployed if there is a shortfall.

Protection of Sensitive Shoreline Resources	
	For All Spills: • Tally up the total amount of booms, number of skimmers, and ancillaries required based on the recommended tactical response plans and those that are drafted at the time. These totals are to be tallied, and requests made to Esso, AMOSC and to AMSA for equipment as required. • Tally up the amount of personnel required to implement and monitor the tactical response plans: Source these personnel from the same sources as above – Esso and AMOSC, AMSA (NatPlan), and OSRL – and divide these personnel into appropriate teams. • Source the required transport and accommodation appropriate to the number of responders. Critical Daily Tasking: • Validate the quantities of oil spill equipment and personnel – adjust as needed. • Monitor that transfers, accommodation and provisioning arrangements are fit for the purpose. • Validate that temporary waste management storage capacity at each site is sufficient.
Termination criteria	Oil no longer threatens sensitive receptors. DOT directs that Esso is to demobilise from sites.

5.9 Shoreline Clean-up

Strategy Description:

Shorelines will be (1) assessed using SCAT and (2) shoreline treatment recommendations put in place.

Relevant environmental performance outcomes and standards are provided in Appendix C.

Shoreline Cleanup	
Response Objective	To remove bulk stranded oil from accessible shorelines and speed up natural recovery of habitats.
Critical Outputs	<u>Initial Response</u> - EAPL coordinate with contractors (GHD / AMOSC) and jurisdiction (Vic DoT) to mobilise SCAT teams to conduct shoreline assessment - EAPL mobilise Shoreline Response Planning function - SCAT feedback initiates development of initial Shoreline Treatment Recommendations (STRs) - EAPL/AMOSC/Vic DoT support initial shoreline clean-up operations <u>Planned Phase – Decision Making</u> - EAPL resources support jurisdiction in maintaining ongoing SCAT program and development of STRs - EAPL resources support jurisdiction in development of Shoreline Response Plan (SRP) <u>Planned Phase – Project Implementation</u> - EAPL resources support jurisdiction in implementation of SRP and support operations <u>Response Completion/Termination</u> - EAPL resources continue to support SCAT inspections
Planning Section Instructions	All planning for protection of coastlines is to be done in conjunction with the Control Agency IMT. The Planning Section will oversee two distinct elements of the shoreline response: (1) Gathering data through the SCAT function (using Esso's or the State's collector application) and, (2) Using this data to plan for an extended shoreline clean-up.

Shoreline Cleanup	
	Shoreline surveys will ideally be done in conjunction with jurisdictional control agencies. Shoreline clean-up operations must be performed under the control and coordination of jurisdictions, unless this has been formally devolved to Esso or another group. Data Collection SCAT teams undertaking field surveys need to consistently gather data on shoreline type, oiling description, and clean-up recommendations. This data gathering is a planning, not operations, function, so it becomes a prominent field component of the planning section. Ideally, teams will be multi-disciplinary/multi-agency and include an oil spill operator (for practical clean-up recommendations) combined with an environmental advisor/scientist. SMEs should be consulted for specialist shoreline types or where there are specific sensitivities exist (e.g. indigenous heritage areas). Data will be fed back from these teams to the Esso GIS CoP, allowing (close to) real-time data sharing with the IMT and forward planning for future operations. Critical Daily Tasking: • SCAT teams form up in the morning, head out to the fields, and report back on data collected. • Shoreline Treatment Recommendations to be issued for the section of the shoreline where oiling has occurred. These form the basis of the ICS204 for shoreline clean-up operations. • Where oil is likely to affect the shoreline, SCAT teams should be recommending the pre-cleaning of beaches to reduce future organic waste. Shoreline Clean-up Based on the data collected from the SCAT surveys, work assignments (ICS 204 or similar) to be drafted that guide clean-up teams to execute the shoreline treatment recommendations. Shoreline divisions based on a span of control adequate to manage clean-up teams will need to be agreed on and established with the jurisdictional control agency. Pre-defined shoreline sectors have been developed for the Victorian coastline and should form the basis of planning. The EUL to provide advice on whether there are any specific sections of coastline with high-value sensitivities – in these areas, specific separate shoreline cleaning will be required. Refer to Tactical Response Plan - Shoreline Protection & Clean Up and/or the *ExxonMobil Oil Spill Response Handbook* for further guidance. Critical Daily Tasking: • Establish through a daily Net Environmental Benefit Assessment and SMV the ongoing benefits of shoreline clean-up.

Shoreline Cleanup	
	• Ensure that weather conditions are amenable to safe and effective operations. • Ensure that the operational and scientific monitoring programme is in place, with data being collated and sent back to the EUL and SITU. • Ensure daily operations are recorded (location, estimated amount of oil recovered, estimated amount of water recovered) • Assist operations to draft daily ICS 204 operations orders used by the shoreline clean-up operations. • Work with the DOT LO to ensure agreement on the location of specific tactical operations. • Work with the safety officer to ensure that WHS risks are appropriately identified and managed. • Plan local temporary waste reception facilities co-located with the shoreline clean-up. • Activate long-term waste treatment contracts from temporary waste storage sites.
Operations Section Instructions	Based on the advice received from Esso by DOT, the Operations Section, Shoreline Clean-Up Branch, will work along with DOT to ensure that resources under Esso command undertake shoreline clean-up consistently and under the control of the DOT. With no marine, aviation, or other spill response/source control interventions, the predicted shoreline loadings for all discharge scenarios are provided in Appendix D Quick Reference Information. These volumes will be reduced with spill response measures, but oil is still very likely to be stranded along the coastline in the majority of modelled scenarios. Shoreline divisions based on a span of control adequate to manage these clean-up teams will need to be agreed on and established with the jurisdictional control agency. Esso's resources are likely to work in a blended teams with State resources. Teams to execute the shoreline treatment recommendations developed by the SCAT teams in the planning section. Shorelines within the Potentially Exposed Area are predominantly fine, medium, and coarse-grained beaches, interspersed with rocky headlands. There also exists a number of estuarine systems which shelter much higher sensitivity shorelines. The principle issue for response will be accessing the more isolated portions of coastline (far-east Victoria) and how to manage and stage large work forces working in these areas. Safety planning for this strategy must focus on remote operations, manual handling risks, and potential for exposure to hydrocarbons. Operational planning should be based on the Tactical Response Plan - Shoreline Protection & Clean Up and/or the ExxonMobil Oil Spill Response Field Manual s 12, and the instructions given by the Control Agency. Critical Daily Tasking: All Spills: • Execute the IAP for the current operational period. • Liaise with the planning section to ensure that field tasking (ICS 204's – Shoreline Treatment Recommendations) is drafted and used for shoreline protection operations. • Work closely with the DOT Operations Officer as required to ensure ongoing unity of command. • Shoreline clean-up is continuously monitored to ensure ongoing effectiveness. • SimOps planning needs to be a part of the daily tasking.

Shoreline Cleanup	
	Operations must also adhere to good practice decontamination practices, establishing and keeping to hot, warm, and cold zones, as well as personnel and equipment washdown facilities.
Logistics Section Instructions	Based on the advice received from Esso by DOT, the Logistics Section will work alongside with DOT to ensure that resources are deployed to assist in the shoreline clean-up consistent with the request of the jurisdictional control agency DOT. With no marine, aviation, or other spill response/source control interventions, the predicted shoreline loadings for all discharge scenarios are provided in Appendix D Quick Reference Information. These volumes will be reduced with spill response measures, but oil is still very likely to be stranded along the coastline in the majority of modelled scenarios. Shoreline divisions based on a span of control adequate to manage these clean-up teams will need to be agreed on and established with the jurisdictional control agency. Key support from Esso in this task includes • Activation of labour hire contracts* to provide 50 – 500 personnel available for medium-term (2–4 months) shoreline clean-up tasking. • AMOSC CG personnel to supervise and oversee clean-up teams. • Safety and Security personnel to support response activities • Working with the EPA and Esso's waste management contractor to come up with acceptable bunded temporary storage areas for recovered waste. • Deployment of all AMOSC, mutual aid, and NP temporary storage equipment to points along the coastline as directed by the DOT. • Activation of accommodation, transport, and sustenance. * *Utilise base business contractor or escalate to ExxonMobil Contingent Worker Contractors team to coordinate hire of additional personnel. Critical Daily Tasking: All Spills: • Execute the IAP for the current operational period; • Liaise with the planning/operations section to ensure that support and services for the ICS 204's – Shoreline Treatment Recommendations are delivered. • Work closely with the DOT logistics section to deliver services and supply under a unity of command. • Ensure that recovered waste is efficiently managed. • Develop a forward plan of rotations for shoreline staff engaged in physical labouring activity.
Termination Criteria	• Shoreline operations will cease once pre-spill levels are returned, and/or by direction of the jurisdiction control agency.

5.10 Oiled Wildlife Response

Strategy Description:

Esso will assist the state-led OWR response with equipment and technical personnel as requested.

Relevant environmental performance outcomes and standards are provided in Appendix C.

Oiled Wildlife Response	
Response Objective	Esso assists state government efforts through the timely provision of industry OWR resources.
Critical Outputs	For All Spills: • Esso will activate the OWR resources of AMOSC and OSRL, equipment, personnel, and technical. • These resources will be provided to the Control Agency led IMT for use in reducing the impact of oil on wildlife.
Planning Section Instructions	Allocate an Esso IMT member to act as Liaison Officer to Control Agency IMT. A dedicated Liaison Officer for oiled wildlife response will likely be required. This role may be filled by the AMOSC OWR Coordinator. Details of numbers, type, status and type of fauna impacted by marine pollution to be collated by SITU. Daily ICS 204 work assignments to be developed in consultation with Operations, Logistics and Control Agency IMT. Utilise Area Response Plans and/or Specied Response Plans to assist with incident specific response planning.
Operations Section Instructions	Support OWR activities as directed by Control Agency IMT and per ICS 204 work assignments
Logistics Section Instructions	On request from Control Agency IMT, mobilise OWR equipment from AMOSC and/or OSRL. AMOSC • 2x OWR Containers (Geelong and Fremantle) • 4x OWR Box Kits • OWR Facilities support via DwyerTech contract • OWR Industry Team • AMOSC OWR Coordinator OSRL* • 3x OWR Search and Rescue kits • 1x OWR Intake and Triage kit • 4x Cleaning and Rehabilitation kits

Oiled Wildlife Response	
	• 1x Wildlife Rehabilitation Unit * 50% of the above inventory is available during an incident. Sea Alarm (via OSRL) • 1x Full time availability of one Sea Alarm expert for advice and potential mobilisation to the affected site. • 1x Full time availability of one Sea Alarm expert for advice and response support (based in Brussels). ExxonMobil RRT • RRT OWR Core Team • Third party OWR specialists Equipment owned by State agencies will be requisitioned via the Control Agency IMT under NatPlan arrangements.
Termination Criteria	Resources are no longer required/requested by the State government.

5.11 Waste Management

An oil spill waste management plan AUGO-EV-ELI-011 has been developed which provides guidance on contractor activation, equipment available, waste segregation, storage and disposal options. This document should be referenced to develop an incident specific waste management plan.

Esso holds a number of waste management contracts with third parties that will be called upon in the event of a spill. These parties will be used to:

- Provide a waste subject matter expert to the logistics section of the IMT;
- Work with the EPA to put in place waste management chains from point of collection to final disposal; and
- Ensure that the waste management practises put in place are ethical, legal and follow Australian best practise waste management principles.

Different wastes will be generated from a variety of different sources including:

- Liquid wastes (oil / water) – collected offshore by vessels from the shoreline through booming operations;
- Bulk hard wastes (oils mixed with organic materials, sand, rocks, pebbles, etc.) collected in bulk from shorelines by mechanical and manual means;
- Sundry wastes generated as a result of employing a large temporary workforce including PPE, waste from catering, etc.

Esso's waste management resource capability is described in detail in Section 9.3.1 of Volume 3. Relevant environmental performance outcomes and standards are provided in Appendix C.

6 Concept of Plan

6.1 Purpose

The purpose of the Esso Bass Strait Oil Pollution Emergency Plan (OPEP) is to describe the actions and arrangements Esso Australia has in place to respond to an oil pollution incident from any one of the company's Bass Strait petroleum activities (refer Figure 2-1).

Spills can range from Tier One, small single event releases, to Tier Two-Three, ongoing/large releases. This plan is designed to provide the full range of available response options and plans for all spills, regardless of the Tier level and is therefore, not specific to a particular activity or scenario.

It is designed such that the Incident Management Team and Emergency Response Team have immediate access to the full suite of response action plans (from Tier One to Tier Two-Three) and can select and implement the appropriate plan based on the specific emergency situation.

This OPEP provides the processes and tools to be able to select and apply the viable response options (and therefore eliminate options that are not viable) for the specific spill event.

6.2 Objectives

The objectives of this OPEP are to:

- Define the roles and responsibilities for Esso to assess and then respond to an oil spill;
- Describe the process for deployment of oil spill response strategies that will be used by Esso (and its partners);
- Describe the procedures for mobilising company, industry and national support resources to support these spill response strategies;
- Clearly outline guidance to plan-users on how the above is to be undertaken, consistent with regulatory requirements;
- Integrate Esso's response with relevant government and industry plans:
- National Plan for Maritime Environmental Emergencies (National Plan)[3]
- Victorian Maritime Emergencies (Non-Search & Rescue) Plan (SERP [NSR]) [4]
- NSW State Waters Marine Oil and Chemical Spill Contingency Plan4
- Tasmanian Marine Oil Spill Contingency Plan (TASPLAN) [5]
- The Australian Industry Cooperative Oil Spill Arrangements (AMOSPlan)[6] and
- Describe how Esso will implement its Incident Management System in responding to oil spills; and
- Describe the link for ExxonMobil's global resources and services to be deployed as part of Esso's local response.

6.3 Scope

This OPEP provides oil spill response plans to respond to any spill from Esso's Bass Strait operations and project activities. Project activities which could result in a spill to environment have been identified as:

- Drilling
- Well operations (platforms, both manned and unmanned)
- Workovers of wells
- Workovers of subsea, seabed or platform infrastructure

[3] https://www.amsa.gov.au/forms-and-publications/Publications/national_plan.pdf.

[4] https://www.emv.vic.gov.au/responsibilities/state-emergency-plans/state-maritime-emergencies-non-search-and-rescue-plan

[4] http://www.rms.nsw.gov.au/documents/about/environment/oil-spill-contingency-plan-nsw-state-waters.pdf

[5] http://epa.tas.gov.au/Documents/TasPlan.pdf

[6] http://www.amosc.com.au/amosc.php

- Pipelines running from offshore fields to coastlines, and
- Plug and abandonment activities.

Specifics of the scope of accepted activities is contained in relevant Environment Plans applicable to this OPEP. This OPEP has been prepared to be applicable to the following Environment Plans:

- Jack Up Rig Drilling
- Bass Strait Operations
- West Barracouta Installation, Commissioning and Initial Operations

For vessel activities that enable Esso's petroleum activities, the OPEP includes arrangements for Esso to respond to such spills under the direction of the relevant control agency.

The geographic scope of activities as directed by the OPEP (particularly for level two and three hydrocarbon spills) would likely apply to an area significantly beyond Esso's petroleum titles. This includes Commonwealth waters off south eastern Australia, and state waters of Victoria, New South Wales (NSW) and Tasmania. Staging areas for activities as far as practicable will be based in Victoria.

6.4 Division of Responsibilities

Spill response activities in the zones outlined above are shared between a number of parties, known as control agencies (organisations leading response activities) and support agencies (organisations that help with the provision of labour, platforms, or services). The (legal) obligation to respond is outlined as below:

Table 6-1 Control Agencies

Location of spill	Source	Control Agency for oil spills	Supporting Agency
Commonwealth Waters (>3NM from shorelines)	Petroleum activity	Esso	AMSA
	Ship associated with petroleum activity	Esso as first responder, under the direction of the Australian Maritime Safety Authority	Esso
State waters or shorelines (<3NM of coastline)	Petroleum activity / Ship	State Government (Vic — DOT; NSW — Transport for NSW; Tas — EPA) with Esso supporting operations	Esso, local state port authorities, AMSA, state-based wildlife agencies

In all instances of spills from Esso's petroleum activities, Esso's response activities should be considered to be regulated by NOPSEMA and directed by this OPEP, until such time as another control agency verifies its intention to stand up and assert control.

As a response grows in size and complexity, a range of other parties and agencies may become involved, either to acquit a legislative obligation, or to provide support to a control agency.

In all cases, for spills originating from Esso assets and activities, Esso will facilitate the provision of resources to the control agency for their use in mitigating the consequences of the spill.

6.5 Safety, Health and Environment Policy

Oil spill response activities under the control of Esso shall be implemented in a manner that reflects Esso's legal commitments to best practice workplace health and safety (WHS). That is, in accordance with (1) Esso's Safety, Health and Environmental policies and consistent with the outcomes sought from the (2) National Plan guidance paper *NP–GUI–026: Marine oil spill response health and safety*.

Prior to implementing spill response operations, for activities that are outside Esso's business as usual operations, activities will be risk assessed and should additional consequences be introduced, these shall be mitigated as appropriate.

Esso will develop and implement a spill safety plan which documents this process.

Safety risk mitigation measures, using a mix of process and personnel safety, will be put in place using the established hierarchy of control methods, as shown below in the Fig 10:

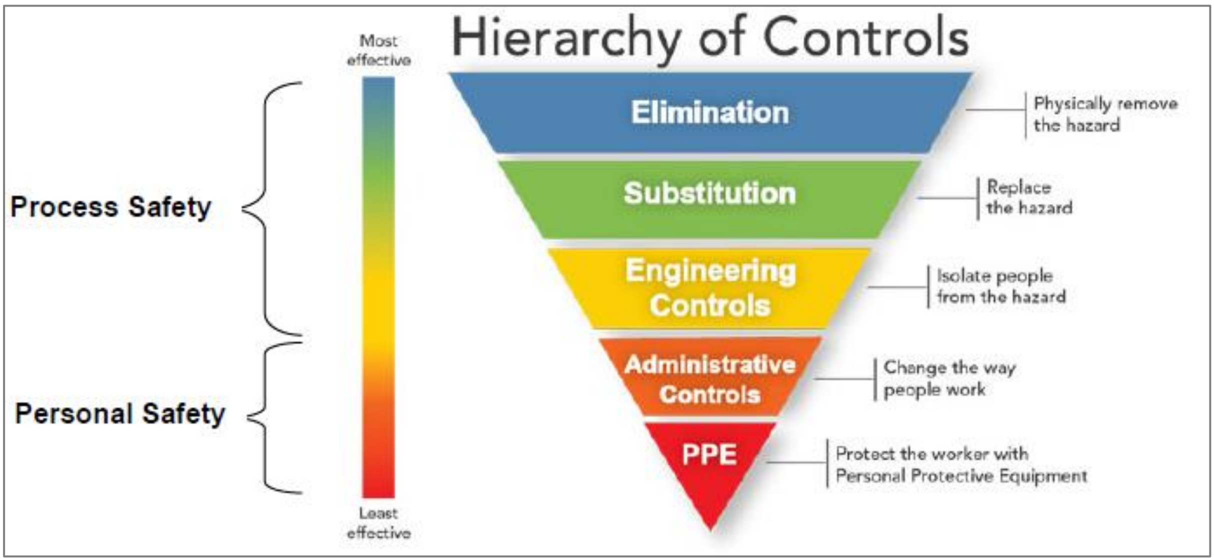


Figure 6-1 Workplace Health and Safety Hierarchy of Controls for Risk Mitigation

'Baseline' measures such as establishing controlled entry at polluted sites, wearing personal protective equipment and the use of safe working practices supported by suitable training, will be an integral part of response operations.

In cases where available measures to reduce the risk of injury or detrimental health implications cannot be lowered to an acceptable level, that activity or specific response strategy will not be viable until conditions change. Examples of this include situations where fresh hydrocarbons are releasing vapours, where sea conditions prevent safe working on the deck of a vessel, or where platforms and assets no longer present stable safe working platforms.

In implementing spill response activities, Esso, its contractors, and other parties supporting the response, shall always be mindful of the company's emergency response priorities, using the acronym 'PEAR':

P – People, E – Environment, A – Assets, R – Reputation

6.6 Interface with Other Documentation and Plans

This OPEP is a component of the EP in force for the specific Esso petroleum activity taking place and outlines the measures that Esso will put in place for hydrocarbon spills from that activity.

The OPEP also has a relationship with a number of other key Esso documents as outlined below:

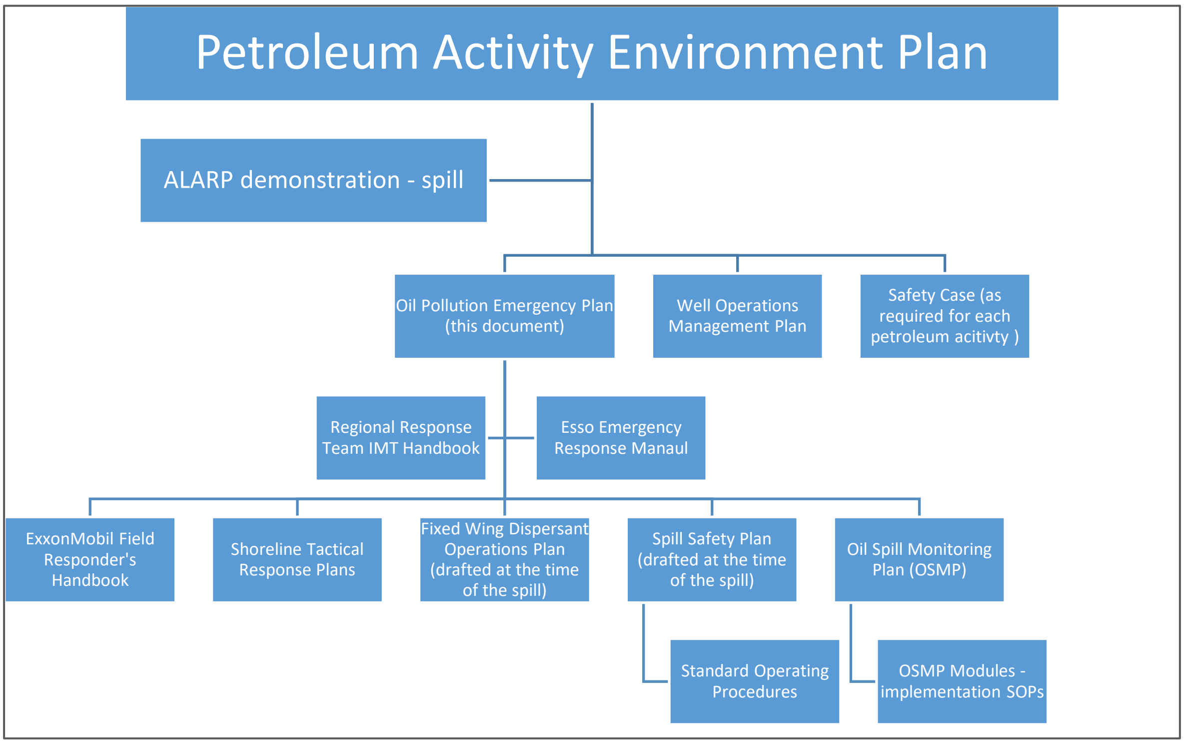


Figure 6-2 OPEP Relationship With Other Key Esso Environmental Documentation

This OPEP also has a number of linkages to external third-party spill response plans or documents. These outline how Esso is to engage with national and state government agencies for the provision of assistance to Esso, or from Esso to those parties, for spill response activities, and who is ultimately ‘in charge’ of clean up efforts in a particular geographical area. These links are detailed below:

Table 6-2 External Plans That Inform and Influence Actions Under This OPEP

Plan / Document
National Plan for Maritime Environmental Agencies (National Plan) (AMSA, 2020) National Plan for Maritime Environmental Emergencies 2020 (amsa.gov.au)
Outlines the resources and services that may be provided by AMSA and other government agencies to assist Esso Details nationally consistent processes and procedures spill response management and tactics and Outlines a range of guidance documents on the same.
Victorian Maritime Emergencies (Non-Search & Rescue) Plan https://www.emv.vic.gov.au/responsibilities/state-emergency-plans/state-maritime-emergencies-non-search-and-rescue-plan
Specifies control agency responsibilities and obligations under Victorian laws in Victorian waters. Specifies the mechanism by which Esso will engage to support the state for oil spill response and wildlife affected by marine pollution.
Victorian State Emergency Management Plan Victorian State Emergency Management Plan (SEMP).pdf (emv.vic.gov.au)
Outlines agency obligations for emergency management in Victorian state waters and shorelines.
Tasmanian Marine Oil Spill Contingency Plan (TASPLAN) https://epa.tas.gov.au/Pages/Document.aspx?docid=558
Specifies response agency responsibilities and obligations under Tasmanian laws in Tasmanian waters Specifies the mechanism by which Esso will support the state for oil spill response.
NSW State Waters Marine Oil and Chemical Spill Contingency Plan https://www.emergency.nsw.gov.au/Pages/publications/plans/sub-plans/state-waters-marine-oil-and-chemical-spill-contingency-plan.aspx
Specifies control agency responsibilities and obligations under NSW laws in NSW waters Specifies the mechanism by which Esso will support the state for oil spill response.
AMOSPlan www.amosc.com.au
Outlines the support (people, services and equipment) from AMOSC to Esso. Outlines the mutual aid (people, services and equipment) available from AMOSC's members to Esso. Details process to access surge spill response people, services and equipment.

7 Concept of Spill Response Operations

Esso's concept of operations for responding to spills is based on Esso's environmental commitment detailed in the ExxonMobil Environment Policy.

This translates to a series of commitments by Esso for each occasion that a loss of containment occurs or is suspected. Esso will undertake

1. To conduct early and accurate identification of split hydrocarbons
2. To conduct an assessment and identification of defensible and proportionate spill response strategies
3. To tactically implement identified spill response strategies in a timely fashion and
4. To monitor the effectiveness of those strategies in order to achieve Esso's stated environmental performance outcomes for this OPEP.

Esso will mobilise its significant national and global processes, services, contracts and resources to achieve the above.

7.1 Reactive and Proactive Response Stages

This OPEP is broken into two broad sections: (1) background, contextual and supporting information; and (2) response processes. Response processes are then broken down into two further stages: (A) assessment / reactive planning and (B) proactive planning stages.

(A) Assessment/reactive planning are the actions that Esso will undertake in the field by the Esso IMT based on a first-pass assessment of the situation. They are the best planned, reactive actions that can be reasonably expected to assist in achieving Esso's Environmental Performance Outcomes (EPO). Should the assessment indicate a Level Two or Three spill, many of these actions will be focused on the mobilisation of resources likely to be used in future operational periods for the tactical spill response.

(B) Proactive planning is the more settled, longer term project planning mode that Esso will undertake. It requires the mobilisation and setup of a full incident management team and will be supported by Esso's Emergency Support Group for strategic support.

7.1.1.1 Incident Management System

Esso Australia has adopted the global ExxonMobil standard of the incident control system (ICS) as its internal incident management system. ICS maps well onto, and is compatible with, the Australian interagency incident management system (AIIMS) adopted by Australian governments under the National Plan.

At the core of ICS is the concept of the 'planning p'. This is a standardised, systemic process used to identify and then action all incidents. It follows a basic five-step process outlined below:

1. Understand the situation
2. Establish incident objectives and strategy
3. Develop the plan that details the tactics to achieve the strategy/(ies)
4. Prepare and disseminate the plan
5. Execute, evaluate, and revise the plan

These steps are turned into the flow diagram below. This OPEP has the assessment/reactive and proactive stages mapped onto this diagram:

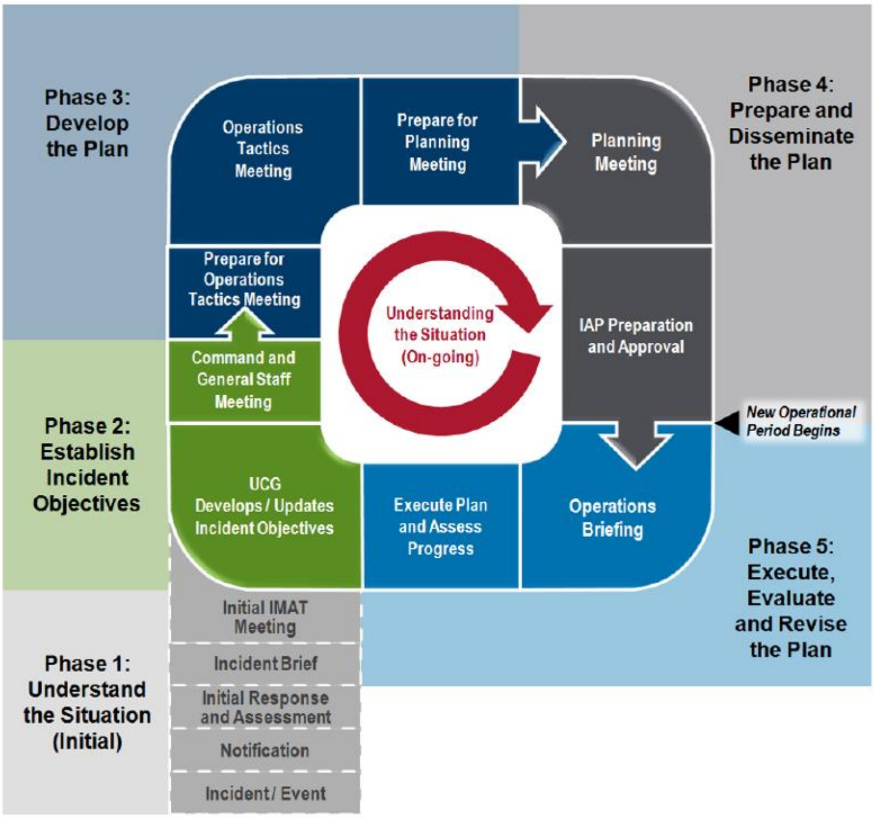


Figure 7-1 ICS Planning 'P'

Esso considers the use of ICS as one of the key controls to develop a robust and defensible incident action plan, which in turn is critical to achieve the best environmental outcomes at the time of the spill.

7.2 Banding of Responses Based on Control Agency Triggers and Stakeholder Interfaces with Esso

To hasten the implementation of appropriate spill response measures, Esso has developed three different action lists for use by the incident management team, based on the proximity of spilt oil to Victorian coastal waters and shorelines. The intent behind this 'banding' is to establish response measures which quickly establish the structure of and implement the most time critical responses using available resources.

Figure 7-2 outlines this intent:

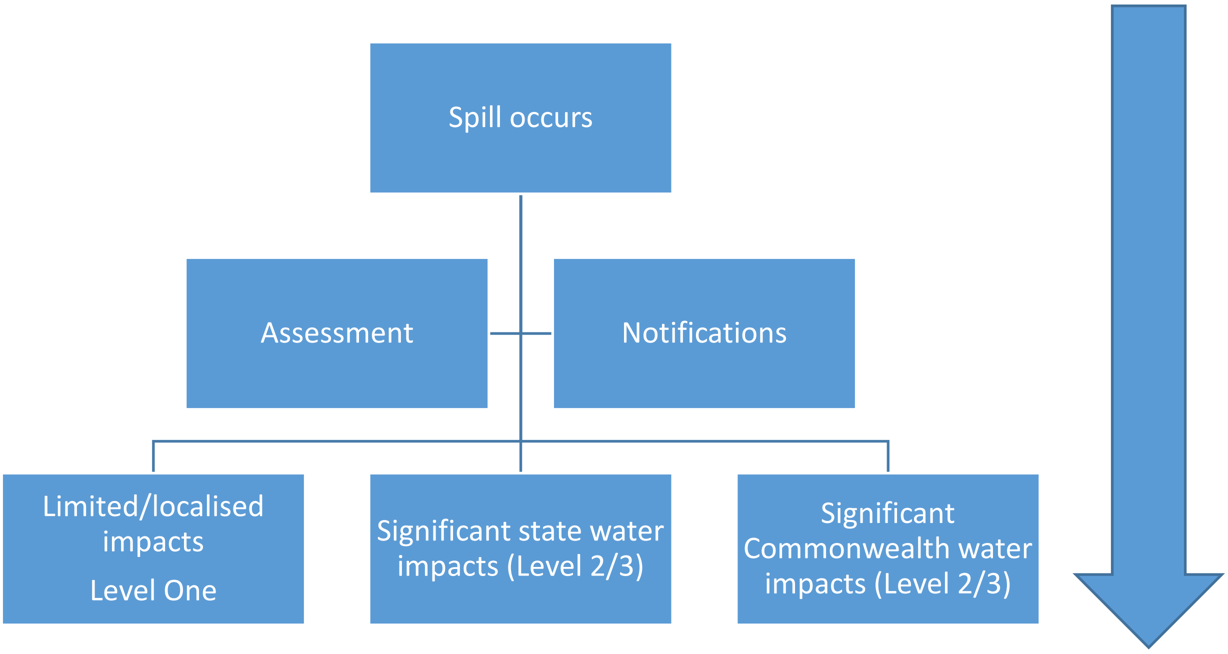


Figure 7-2 Banding Responses

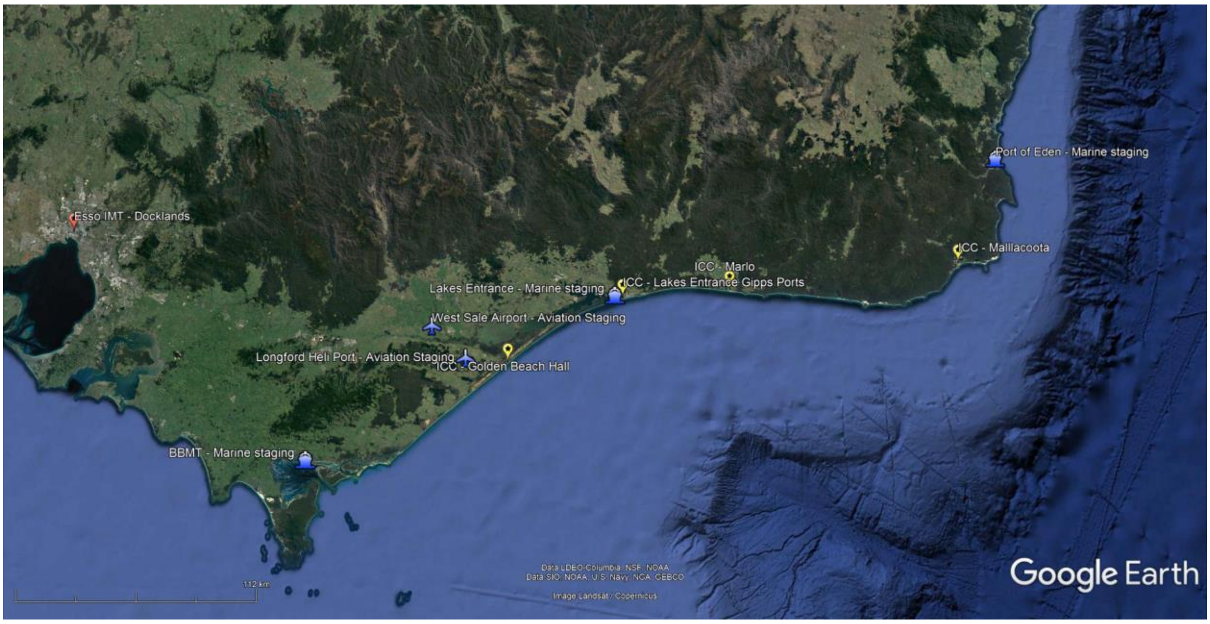
7.2.1 Command Points, Staging and Locations

Esso has a number of operational hubs located in metropolitan Melbourne and Gippsland, which have been predetermined as suitable areas to stage marine, aviation and personnel operations. If available for use, incident command points will be located in Victorian government identified regional ICCs (ref: Victorian Emergency Operations Handbook, pp 117).

These are as below:

Type of area	Location	Address
Incident Command Centre	Esso HQ, Docklands Melbourne	9/644 Collins Street Melbourne, VIC
Gippsland Incident Command Points	Bullock Island, Lakes Entrance	2 Bullock Island Lakes Entrance, VIC
Equipment staging area	Longford Plants, Longford	Garretts Rd, Longford, Vic
	Barry Beach Marine Terminal	Main Access Rd, Agnes VIC
Marine staging areas	Barry Beach Marine Terminal	Main Access Rd, Agnes VIC
	Bullock Island, Lakes Entrance	2 Bullock Island Lakes Entrance, VIC
Fixed wing staging areas & heliports	Bairnsdale Airport	345 Bengworden Road, Bairnsdale, Vic
	Longford Heliport	Garretts Rd, Longford, Vic

The relative location of these points is show on the map below:



7.2.2 Oil Characteristics

The main physical properties that affect the behaviour of spilt oil are specific gravity, distillation characteristics, viscosity and pour points.

In the event of a spill, these oils will weather, or degrade, differently depending on the oil type and its physical / chemical properties as well as on the weather, the sea conditions and the length of time it is exposed to these conditions.

7.2.2.1 Diesel

Diesel is loaded from supply vessels onto all offshore platforms and is stored on platforms and vessels in bulk tanks. It is used in vessel and platform engines and operating equipment such as cranes.

Diesel (Group[7] 2 Oil) is a common marine fuel and is classed as a medium petroleum distillate. Marine diesel is a mixture of both volatile and persistent hydrocarbons.

Behaviour when spilt generally, rapid spreading, rapid evaporation and some dispersion or dissolution. Diesel may emulsify at low temperatures when fresh, but the emulsification is likely to be ‘unstable’.

Marine diesel contains 95% light hydrocarbons (or non-persistent constituents) that are likely to evaporate when exposed to the atmosphere. The remaining 5% is composed of heavy hydrocarbons (or persistent compounds) that may persist on the sea-surface for extended periods.

The viscosity of marine diesel does not change significantly over time and hence has a strong tendency to physically entrain into the upper water column as oil droplets in the presence of waves but can refloat to the surface if wave energies abate (APASA, 2013).

7.2.2.2 Condensate

Condensate is a Group 1 liquid hydrocarbon resulting from a change in pressure and or temperature of gas — ‘liquid gas’.

[7] Classification of petroleum-based oils or ‘oil groups’ are compiled from various IMO, ITOPF, US EPA and US Coastguard publications. Ref AMSA 2012 Table 8 for classification criteria.

When spilt, condensate behaves in a manner similar to diesel, with generally rapid spreading, rapid evaporation and dispersion/dissolution. There is a low likelihood of emulsification. However, it may contain inert, relatively non-toxic waxes which will persist for some time as they degrade.

Condensates comprise a very high content of volatile (or non-persistent) constituents (~97–99%). Therefore, it is expected that any hydrocarbons reaching the sea-surface would quickly be lost to the atmosphere via evaporation. Smaller droplets may remain in the water column for a longer period undergoing microbial degradation over time. Any persistent (heavy) hydrocarbons may persist longer in the form of small solid relatively non-toxic waxy flakes on the sea-surface or entrained in the water column in turbulent waters given the rough environmental conditions of the region.

7.2.2.3 Light Crude

Light crude oil is produced from a number of fields in the Gippsland Basin. .

Analysis of crudes indicates volatiles and semi to low volatile compounds constitute 84.8 - 86.3%. The remaining heavy hydrocarbons (or persistent compounds) will persist in the environment for a longer period of time as a liquid or semi-solid state, either on the sea surface, entrained in the water column or on shore. The nature of the weathered residues is likely to be a sticky, waxy paste-like oil that will become more crystalline over time as it weathers further.

The loss of volume through evaporation for some crude oils may be offset by tendency to form viscous emulsions ('water in oil'). Oils with more than 3% by weight of asphaltenes create 'stable emulsions' while oils containing less than 3% by weight of asphaltenes only develop unstable emulsions (Fingas and Fieldhouse, 2004).

The maximum value of asphaltenes present in the light crude oils are all less than 0.05%wt so are unlikely to form stable emulsions that would impact on shoreline response and clean-up strategies. It is more likely that only temporary emulsions are likely to be generated and only at sea.

7.2.2.4 Waxy Crude

Waxy crudes are produced from some reservoirs, including Flounder and Moonfish. These crudes contain a high proportion of wax–with a corresponding high pour point. Waxy crudes are likely to solidify in the environment as it weathers over time.

The properties of these crudes classify them as a Group IV oil due to the high pour point (above ambient temperature) according to ITOPF (2014).

Given the tendency to form solid masses at ambient sea temperatures, the opportunity to use and effectiveness of chemical dispersants is diminished.

7.2.2.5 Summary of Hydrocarbon Characteristics Used in Oil Spill Trajectory Models

The physical characteristics of the oil types that were used for modelling are as follows:

	Density @ 15˚C	API	Dynamic Viscosity	Pour Point	Wax Content	Oil Property Category
Marine Diesel Oil (MDO)	829 kg/m^3	37.6	4.0 cP @ 25°C	-14 ºC	-	Group II (light persistent oil)
Condensate (surrogate)	770.6 kg/m^3	52.15	0.14 cP @ 25ºC	-3 ºC	-	Group I (non-persistent oils)
Barracouta Condensate	772.3 kg/m^3	51.6	1.291 @ 20ºC	-39 ºC	1.8%	Group I (non-persistent oils)
Kipper Condensate	760.6 kg/m^3	54.5	0.91 @ 20ºC	-39 ºC	2.3%	Group I (non-persistent oils)

	Density @ 15˚C	API	Dynamic Viscosity	Pour Point	Wax Content	Oil Property Category
West Seahorse 3 Crude	792.5 kg/m^3	48.0	2.0 cP @ 20ºC	-15 ºC	-	Group II (light persistent oil)
West Kingfish Crude	798.1 kg/m^3	45.7	2.4 cP @ 20°C	9°C	25%	Group II (light persistent oil)
Halibut Crude	821.5 kg/m^3	40.6	3.4 cP @ 20°C	0°C	23.7%	Group II (light persistent oil)
Flounder Crude	799.9 kg/m^3	45.3	2.8 cP @ 20°C	18°C	32%	Group IV oil due to the high pour point
Moonfish Crude	887.6 kg/m^3	27.8	5.14 (at 40 °C)	27°C	38.5%	Group IV oil due to the high pour point

8 Supporting Activities to Operations

8.1 Tiered Response Arrangements – Equipment, People and Staging Areas

Logistical and support arrangements for the supply of people, equipment and resources will operate in a tiered approach as below:

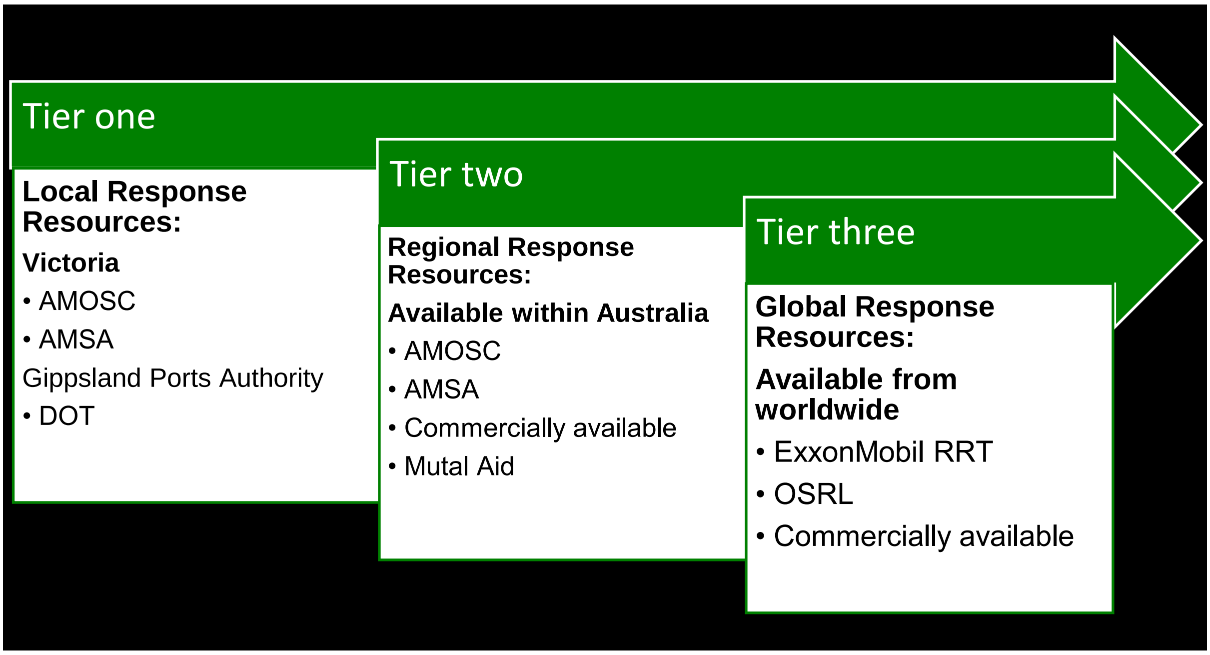


Figure 8-1 Tiered Response Arrangements

8.1.1 Tier 1 – Local Response Resources

EAPL maintains two stockpiles of oil spill response equipment based in the Gippsland region of Victoria at the Barry Beach Marine Terminal and the Long Island Point Fractionation Plant. The stockpiles include equipment suitable for offshore operations, dispersant application, shoreline and nearshore protection, and shoreline clean-up. Quantities of equipment held between the two locations are sufficient, based on the activation of TRPs in line with modeling indications of impact, to provide an initial response and include:

- shoreline protection/deflection boom
- shoreline skimming systems
- offshore booming packages
- offshore skimming systems
- shoreline temporary storage units,
- dispersant and
- decontamination kits

EAPL's immediate spill response equipment will come from its own tier one stockpiles and additional detail of capability in the initial phase of response is included in the Quick Reference Guides. For an up to date list of EAPL's oil spill response equipment refer to ***EAPL OSR Equipment List.***

EAPL maintain trained oil spill response personnel to mobilise an initial response to support the enactment of TRPs, SCAT, and shoreline clean-up.

8.1.2 Tier 2 – Regional Response Resources

Response is conducted by Esso using resources available from within Australia.

In response to a Tier 2 activation EAPL has the capability to mobilise sufficient oil spill response specific resources via AMOSC, AMSA (National Plan), third party contractors, and mutual aid (Industry stockpiles via AMOSPlan). A tiered response would evolve from the 'Initial Response Phase' into a 'Planned Phase – Decision Making', before graduating to a 'Planned Phase – Project implementation'. Staffing requirements for the initial phase would be met by the following with additional support continuing to be provided based on jurisdictional requirements in later phases.

AMOSC
As a member of AMOSC, equipment and resources from the Geelong, Fremantle, Broome, and Exmouth stockpiles are available for mobilisation to Gippsland. The bulk of the equipment, based in Geelong, is available within <12 hours. Additional equipment in Fremantle, Exmouth and Broome can be mobilised to Gippsland as needed by road or air.
A full inventory of AMOSC equipment is available from the AMOSC website
http://www.amosc.com.au/equipment.php

In addition to the AMOSC stockpiles, membership of AMOSC provides access through AMOSPlan to equipment, personnel, and resources owned or held by other oil companies within Australia. Further details of mutual aid capability is available through the AMOSC website above.

AMSA / National Plan Equipment
EAPL has access to AMSA equipment Australia-wide through AMOSC and the National Plan. AMSA maintains significant stockpiles of equipment in Melbourne, Adelaide, Brisbane, Dampier, Darwin, Devonport, Fremantle, Sydney, and Townsville. The closest National Plan stockpile is located in Melbourne, less than 7hours from the furthest point of eastern Gippsland in Victoria. A full inventory of AMSA equipment is available from the AMSA website:
https://amsa-forms.nogginoca.com/public/equipment.html?loc=%2Fapi%2Fv1%2Fasset%2F2615901

Oil Spill Response Personnel
In addition to the Tier 1 capacity provided by trained EAPL oil spill response personnel, EAPL can activate and mobilise AMOSC staff and AMOSC Core Group, and, through National Plan arrangements, state and national response team personnel.

General Personnel
Surge labour hire personnel can be accessed through local providers and EAPL contractors.

ExxonMobil also has a Singapore based Contingent Worker Contractors Team who can coordinate hire of additional personnel through a number of labour hire firms that ExxonMobil routinely work with to fulfil additional capacity requirements for longer term shoreline clean-up of a Tier 2 spill.

8.1.3 Tier 3 – Global Response Resources

Response is conducted by Esso using internationally available resources.

Additional resources, personnel and equipment shall be sourced internationally from Oil Spill Response Ltd through the Singapore base, and then from its other bases around the world to Gippsland. Esso global resources — such as the Regional Response Team — can also be mobilised to Gippsland or the IMT.

ExxonMobil Regional Response Team

The ExxonMobil Regional Response Team (RRT) is a Tier 3 Incident Management Team and is made up of approximately 500 trained personnel from across all business and service lines. The RRT is managed as two sub-teams, with one for the Americas and the other covering the rest of the world. Resources can be shared across regions as needed.

RRT Activation: +44 1372 223 232 (24/7 hotline)

The RRT's structure and processes are based on the Incident Command System (ICS). All RRT members receive initial training in the ICS and oil spill response through participation in the ExxonMobil University of Spill Management course. Additional training is provided based on role and function.

In the event of a major incident, the RRT can provide personnel and expertise to the Business Line to undertake an effective and sustained response. Services that can be provided by the RRT include, and are not limited to, the following:

Command

- Provide experienced Incident Commanders and Facilitators to work with the local Business Line in coordinating the response.

Operations

The RRT is able to provide experienced response team and coordination of third party experts for activities including:

- On water recovery
- Protection / deflection
- Shoreline clean up
- SCAT
- Waste Management
- Surveillance and monitoring
- Dispersant application
- Oiled wildlife response

Planning

- Development of the Incident Action Plan
- Resource Tracking
- Volunteer Management
- Situation mapping / Common Operating Picture
- Modelling
- Environmental specialist
- SCAT coordination
- Documentation and translation services

Logistics

- Mobilisation of Equipment & Personnel (including third party equipment)
- Customs/Freight Clearance advice
- Staging Area set up
- Security of impacted sites
- Personnel Transportation
- Accommodation for Response Personnel
- Food and Beverage for Response Personnel
- Procurement Services of Required Materials and Services
- Communications Equipment and Services
- Establish and manage large Incident Command Centre

Finance

- Claims Handling
- Time & Cost tracking
- Guidance on ExxonMobil's System of Management Controls
- Response Inquiry Centre - establish and manage a call centre to handle these inquiries in the local language.

Safety, Security & Health

- Industrial hygiene professionals to assist with establishing a safe working environment.
- Safety plans - undertake task risk assessment and implementing mitigating measures.
- Medical professionals to ensure the well-being of the responders.
- Security specialist to assist with planning and monitoring security in the areas of operations.

Public & Government Affairs

- Media and Social Media Monitoring
- Develop Communications Materials and Incident Website
- Organise Press Conferences, Town Hall Meetings and Official Visits

Law

- Provide guidance on all matters of a legal nature

OSRL

From the Esso global Tier 3 response contractor (OSRL) Esso can access 50% of the available stock. To this end the figures quoted for OSRL are representative of 50% of the total stockholding. A full inventory of OSRL equipment is available from the OSRL website http://www.oilspillresponse.com/activate-us/response-equipment

OSRL (UK) mobilisation to Gippsland, 3–5 days. OSRL (Singapore) mobilisation to Gippsland 2–4 days

Ambipar

ExxonMobil has an agreement with Ambipar Response (Ambipar) for provision of emergency response support.

During an incident Ambipar can support the ExxonMobil by providing up to 9 trained responders, per the contract, organized as a Tactical Team and Operational Team. These include:

- Tactical Team: Incident and Crisis Management Advisor and Technical Advisor to liaise with RRT leadership and direct the Ambipar Operational Team;
- Operational Team: Team Leader and 6 Response Specialists who can provide a range of intervention services including clean-up, assessment, remediation, confined space entry and decontamination.

Provision also exists to increase the number of Ambipar personnel, subject to availability.

Ambipar also maintain their own response equipment stockpile. The existing agreement does not provide assured access to equipment.

Activation and coordination of Ambipar is the responsibility of the RRT.

9 Templates and Forms

Situation Report (SitRep)

Oil Spill Volume Calculator

Oil Spill Trajectory Modelling request form

ICS forms

ICS 201-1 Map and situation summary

ICS 201-2 Current objectives and actions

ICS 201-3 Current organisation

ICS 201-4 Resource Summary

Refer to EMPC Australia - SSHE portal for additional ICS forms. EP&R Tools, Forms and Guide

Appendix A - ICS 204 Work Assignment Templates

ICS 204 Aerial Dispersant Application - Air Tractor

ICS 204 Offshore Containment and Recovery

ICS 204 Vessel Dispersant Application

Appendix B – OPEP Consultation Plan

Relevant control agencies

The OPGGS Environmental Regulation 11A establishes that titleholders (and those with access authority) detail consultation arrangements with relevant control agencies within the potentially exposed area as described in the Environment Plan.

To address this, control agencies within the potentially exposed area as described in the Environment Plan shall be consulted to inform content of the OPEP (see Table B-1).

Relevant control agencies will act as a single point of contact for their jurisdiction and may coordinate review and comment from other agencies.

Table B-1 Relevant control agencies (includes but not limited to)

Control Agency	Relevance
Australian Maritime Safety Authority	Commonwealth government agency responsible for maritime safety, protection of the marine environment including marine pollution and maritime aviation search and rescue.
Department of Transport (VIC)	Relevant for unplanned events. A branch of Transport Safety Victoria, working closely with vessel operators and waterway and port managers to provide expert knowledge, education, support and direction
Transport for NSW (NSW)	Relevant for unplanned events. The control agency for marine pollution incidents impacting NSW state waters. NSW waters could potentially be affected by an extended duration unplanned event.
Department of Primary Industries, Parks, Water and Environment (TAS)	Relevant for unplanned events as the control agency for marine pollution in Tasmanian state waters.

Sufficient time

Four to six weeks is generally considered sufficient time for relevant control agency to complete an internal review, based on prior feedback.

Relevant information

The following information may be provided to relevant control agencies:

- Brief description of activity, including the intended schedule, location, distances to nearest landfall and map
- Worst case discharge volumes
- Known or indicative oil type/properties
- Amenability of oil to dispersants
- Brief description of existing environment and protection priorities
- Key inputs and outputs of the environmental risk assessment
- Outcomes of oil spill trajectory modelling, including predicted times to enter State waters and contact shorelines
- Details on initial response actions and key activation timeframes
- Potential Incident Control Centre arrangements
- Potential staging areas / Forward Operating Base
- Details on response strategies
- Details on proposed IMT structure
- Details on exercise and testing arrangements of OPEP/OSCP

This list has been extracted from the EPA Tasmania – Offshore Petroleum Industry Guidance Note – Annex 3 and forms the basis of information provided. Additional information may be requested by individual agencies.

The information may be provided in summary form or through the provision of a draft EP or OPEP.

Ongoing consultation

The methods and content of ongoing consultation will be determined with relevant stakeholders and may include meetings, exercises, forums or written communication (see Table B-2).

Table B-2 Ongoing consultation with relevant stakeholders

Stakeholder	Meeting	Exercises	Collaborative Forums	Ad-hoc
Victoria State Control Agency **Department of Transport (DoT)**	Annual meeting	Annual review of Esso OSR exercise plan Participation in Esso and/or State exercises	Regional Marine Pollution Reference Group	Prior to commencement of new activities Changes to risk
Victoria Department Environment, Land, Water & Planning	Annual meeting	Annual review of Esso OSR exercise plan Participation in Esso and/or State exercises	Regional Marine Pollution Reference Group	-
NSW State Control Agency	Annual meeting	Participation in Esso and/or State exercises	-	Prior to commencement of new activities Changes to risk
Tasmania State Control Agency **Department of Primary Industries, Parks, Water and Environment**	Annual meeting	Participation in Esso and/or State exercises	-	Prior to commencement of new activities Changes to risk
Australian Maritime Safety Authority	Annual meeting	Participation in Esso, National Plan and/or State exercises	ES&T Workshops	Prior to commencement of new activities Changes to risk
Gippsland Ports	-	Participation in Esso, Regional and/or State exercises	Regional Marine Pollution Reference Group Esso Community Day	-
East Gippsland Shire Council	-	-	Regional Marine Pollution Reference Group Esso Community Day	-
Victorian Environmental Protection Authority	-	-	Regional Marine Pollution Reference Group	-

Consultation during an unplanned event

In the occurrence of an unplanned event, the methods and content of consultation with relevant stakeholders may be determined by notification requirements and can include meetings, phone calls or written communication (see Table B-3).

Table B-3 Consultation with relevant stakeholders during an unplanned event

Stakeholder	Incident Notification Requirement	Trigger	Method
Australian Maritime Safety Authority	Required for all spills from vessels	Notification requirement met NatPlan resources needs Impact to shipping	PolRep / SitRep Liaison Officer JSCC
Department of Agriculture, Water and the Environment **Parks Australia - Director of National Parks**	Required for all spills that are within a marine park, or could impact a marine park.	Notification requirement met	Verbal
Department of Agriculture, Water and the Environment	Required for all spills that impact or have the potential to impact on matters of national environmental significance (NES)	Notification requirement met	Verbal
Aboriginal Affairs Victoria		Planned shoreline protection or clean-up activities	Via Control Agency IMT
NSW State Control Agency **Transport for NSW**	Required for: all spills that could impact NSW waters.	Notification requirement met	SitRep Liaison Officer JSCC
VIC Department of Environment, Land, Water and Planning (Wildlife)		Potential impact to wildlife	Via Control Agency IMT OWR Coordinator / Liaison
VIC Department of Environment, Land, Water and Planning (Energy Emergency)		Potential impact to supply	Via ESG
TAS State Control Agency **Department of Primary Industries, Parks, Water and Environment**	Required for: all spills that could impact Tasmanian waters.	Notification requirement met	SitRep Liaison Officer JSCC
TAS Parks and Wildlife Service			Via Control Agency IMT
VIC State Control Agency **Department of Transport - SREC**	All spills that could impact Victorian state waters (> 80 L).		SitRep Liaison Officer JSCC
VIC Environment Protection Authority			Via Control Agency IMT
Transport Safety Victoria - Maritime Safety			Via Control Agency IMT
Parks Victoria		Impact to State waters or shoreline	Via Control Agency IMT

Stakeholder	Incident Notification Requirement	Trigger	Method
		ParksVic resources required	
NSW Department of Primary Industries		Impact to NSW State waters or shoreline	Verbal
VIC Department Jobs, Precincts & Regions - Earth Resources Regulation	Required for: all spills (80 L).	Notification requirement met	SitRep Liaison Officer JSCC
East Gippsland Shire Council			Via Control Agency IMT
Victorian Regional Channels Authority			Via Control Agency IMT
East Gippsland Catchment Management Authority			Via Control Agency IMT
National Offshore Petroleum Titles Administrator	Required for: all spills (80 L).		SitRep
National Offshore Safety Environmental Management Authority	Required for: all spills (80 L).		SitRep

Appendix C – Oil Spill Response Implementation

Table C-1: Environmental Performance – Oil Spill Response

Performance Outcome	Strategy	Control	Performance Standard	Measurement Criteria
To coordinate spill response operations in a timely manner to minimise impact to the environment	Incident Management	Incident Management Team	Trained personnel are available to fulfil Incident Commander, Operations Section Chief, Planning Section Chief, Logistics Section Chief, Safety Officer and Environmental Unit Lead roles within <1 hour of call out.	• IMT log records timing of events/assigned tasks
		Regional Response Team	Esso will assess requirement to mobilise RRT to support response activities for tier III response. If assessed to be required, RRT support will be made available: • <12 hours from notification for remote support • <72 hours for in country support	• IMT log records • Incident Action Plan
		Initial Oil Spill Response Actions: Assessment & Escalation 0–12 hours	Actions are implemented per timeframes detailed in OPEP Table 3-1 ERT Immediate Actions, Table 3-2 IMT Immediate Actions.	• IMT log • Common Operating Picture • Completed OPEP checklists
		Notifications	Notify authorities in accordance with regulatory requirements per Table 3-4 of OPEP	• IMT log (with supporting ICS forms) • Notification records /reports
To prevent further unplanned releases to the environment	Source control	Relief well drilling	Tier II / III ER Planning - Preliminary Relief Well Plan is completed before relief well is drilled with incident specific details. Including (estimate of cumulative days shown in brackets): • Site survey (ROV) conducted to confirm predetermined well location • Predetermined requirement for personnel and equipment mobilised (10 days to confirm and start mobilisation)	• Incident Specific Tier II / III Relief Well Plan • IMT Log • Incident Action Plan • Daily Drilling reports

Performance Outcome	Strategy	Control	Performance Standard	Measurement Criteria
			• Predetermine Dynamic Kill program confirmed or modified • Relief rig requested under Mutual Aid Agreement (or from Singapore – whichever is faster) mobilised with accompanying tug (or heavy lift vessel) (Relief Rig sourced within 10 days with plans to mobilise) • Relief Well specialist/SFRT/ROV contractors mobilised • Mobilisation of materials and equipment for relief well per confirmed drill program (Rig and equipment on location within 53 days) • Relief well drilling (35 days to drill) • Well secured within total estimate 98 day period	
		Well Kill Skid	Well Kill Skid is mobilised to platform within 48hours of first response. Well Kill is executed in accordance with the Esso Bass Strait Well Kill Contingency Plan.	• IMT Log • Incident Action Plan
		Third Party Well Control Equipment	Incident specific well control plan is developed by Third Party Well Control contractor. Equipment is mobilised to platform and response executed in accordance with well control plan (estimated 14 days).	• Incident Specific response plan • IMT Log • Incident Action Plan
		Pipeline de-pressuring and watering out	Pipelines are de-pressured and/or watered out in accordance with the relevant procedures as soon as practicable once a spill is identified.	• IMT Logs • Platform logs
		Pipeline repair	Where feasible, pipeline repair activities are undertaken in accordance with relevant repair procedures (estimated 45 days).	• IMT Logs • Incident Action Plan

Performance Outcome	Strategy	Control	Performance Standard	Measurement Criteria
		Vessel Requirements	Vessel compliant with MARPOL Annex I, IV, V and VI as appropriate to vessel class. Where applicable: • Vessels with class certification are verified by International Association of Classification Societies (IACS) member. • Vessels comply with AMSA Domestic Commercial Vessel (DCV) requirements	• Vessel class certificates where applicable • Records of compliance with DCV requirements
		Chemical Discharge Assessment Process	All cement, drill fluids and additives planned for discharge are evaluated as acceptable in accordance with the Chemical Discharge Assessment Process.	Chemical assessment records confirm cements, drill fluids, additives, and/or their components are evaluated as acceptable prior to use / discharge.
		Solids Control Equipment	Solids control equipment (shale shakers and centrifuge/dryer) will treat cuttings to a level below 10% retained oil on dry weight basis; averaged over each well section, where Non Aqueous Fluid is used.	Retort test reports document residual oil on cuttings (ROC) measured.
Gather information and validate planning assumptions for current action plan and understand the extent, severity, persistence of the oil and potential environmental sensitives at risk.	Surveillance Monitoring & Visualisation (SMV) Strategy	Oil spill trajectory modelling (OSTM)	Implement OSMP module: • O1.2 Trajectory estimation Module to be implemented within 4 hours of initiation criteria.	• IMT log • Incident Action Plan • Oil spill trajectory modelling reports • Operational monitoring reports
		Oil Spill Tracking Buoys (STB)	Implement OSMP module: • O1.4 Remote observation Module to be implemented in accordance with requirements and timeframes in Section 3.1 of the OSMP. Satellite tracking buoys will be deployed in 24 hour intervals.	• IMT log • Incident Action Plan • OPEP checklist • Operational monitoring reports
		Satellite Imagery	Implement OSMP module: • O1.5 Satellite imagery Module to be implemented in accordance with requirements and timeframes in Section 3.1 of the	• IMT log • Incident Action Plan • Imagery reports • Operational monitoring reports

Performance Outcome	Strategy	Control	Performance Standard	Measurement Criteria
			OSMP (within 24 hours of initiation criteria being met).	
		Aircraft Surveillance	Implement OSMP module: • O1.3 Aerial or underwater observation Module to be implemented in accordance with requirements and timeframes in Section 3.1 of the OSMP (within 4 hours of initiation criteria being met).	• IMT log • Incident Action Plan • Observation reports • Operational monitoring reports
		Water and Oil quality monitoring	Implement OSMP modules: • O2.2 Fluorometry • O2.3 Water samples; Modules to be implemented in accordance with Section 3.2 of the OSMP.	• IMT log • Incident Action Plan • Laboratory reports • Operational monitoring reports
		OMSP Termination Criteria	Monitoring under OSMP modules O1 and O2 continued until termination criteria set out in Sections 3.1 and 3.2 of the OSMP are met.	• IMT log • Final operational monitoring reports
To prevent further unplanned releases to the environment		Vessel Requirements	Vessel compliant with MARPOL Annex I, IV, V and VI as appropriate to vessel class. Where applicable: • Vessels with class certification are verified by International Association of Classification Societies (IACS) member. • Vessels comply with AMSA Domestic Commercial Vessel (DCV) requirements	• Vessel class certificates where applicable • Records of compliance with DCV requirements
To reduce consequences to surface and shoreline values and sensitivities and increase the bioavailability of oil for microbial breakdown.	Dispersant Application	Dispersant spraying aircraft	Mobilise dispersant spraying Fixed Wing Aerial Dispersant (FWAD) aircraft within <4 hours of request for service. Dispersant application ability within <24 hours with up to 4 flights per day.	• IMT log • Incident Action Plan • Completed OPEP checklists
		Dispersant spraying vessels	Mobilise dispersant spraying vessels within the following timeframes;	• IMT log

Performance Outcome	Strategy	Control	Performance Standard	Measurement Criteria
			• 1st team dispersant application ability <48 hours of request of service • 2nd team dispersant application ability <72 hours of request for service Vessels can spray up to $3m^3$ of dispersant per day.	• Incident Action Plan • Completed OPEP checklists
		Incident specific NEBA	NEBA assessment is completed prior to dispersant use.	• IMT log • Incident Action Plan • Incident specific NEBA
		Halt dispersant application if wildlife are identified in the area	If EPBC Act listed migratory species (e.g. whales) are observed in the immediate vicinity of dispersant operations, aerial dispersant operations will cease until the animal has not been sighted for 30 minutes or unless otherwise advised by the relevant state authority.	• Observation reports • IMT log
		Vessel Requirements	Vessel compliant with MARPOL Annex I, IV, V and VI as appropriate to vessel class. Where applicable: • Vessels with class certification are verified by International Association of Classification Societies (IACS) member. • Vessels comply with AMSA Domestic Commercial Vessel (DCV) requirements	• Vessel class certificates where applicable • Records of compliance with DCV requirements
		Dispersant pre-selection and assessment	Only dispersants listed in Volume 3 Section 5.1 will be utilised, unless otherwise endorsed by the Statutory Authority	• IMT log • Incident Action Plan • Records stating dispersant types, locations, types and volumes
		Laboratory dispersant effectiveness testing	Laboratory dispersant effectiveness test results will be used to inform if use of dispersant is likely to reduce environmental impacts giving	• IMT log • Incident Action Plan

Performance Outcome	Strategy	Control	Performance Standard	Measurement Criteria
			consideration to elapsed time, weathering and selection of dispersant with highest efficacy.	
		Basic field dispersant effectiveness test	Dispersants will be test sprayed on all crude oil spills for efficacy prior to operational.	• IMT log • Report records
		Exclusion zones	Dispersant application is only accepted for: • Commonwealth waters, and • >10 m water depth, and • Outside Australian marine parks Dispersants are <u>not</u> to be used in State waters without approval of the Control Agency IMT.	• IMT log • Incident Action Plan • Incident specific NEBA • Approvals from Control Agency IMT
		Monitoring of dispersant in water and effectiveness	Implement OSMP module: • O2: Water and Oil Sampling In accordance with requirements and timeframes in Section 3.2 of the OSMP.	• IMT log • Incident Action Plan • Common Operating Picture • Operational monitoring reports
		Records of dispersant volumes	A record of the volumes of dispersant used in surface application will be kept throughout the response.	• IMT log • Incident Action Plan • Records stating dispersant types, locations, types and volumes • Completed OPEP checklist
		Surface dispersant only applied within daylight hours	Surface dispersants only applied in daylight hours	• IMT log • Incident Action Plan • Records stating dispersant types, locations, types and volumes

Performance Outcome	Strategy	Control	Performance Standard	Measurement Criteria
		Targeted dispersant application	Dispersants will be targeted at areas of thickest oil and considerations of oil type, amenability and volume will be assessed prior to any dispersant application.	• IMT log • Incident Action Plan • Records stating dispersant types, locations, types and volumes
To recover spilt oil before shoreline or other sensitivity contact.	Containment and recovery	Vessel Requirements	Vessel compliant with MARPOL Annex I, IV, V and VI as appropriate to vessel class. Where applicable: • Vessels with class certification are verified by International Association of Classification Societies (IACS) member. • Vessels comply with AMSA Domestic Commercial Vessel (DCV) requirements	• Vessel class certificates where applicable • Records of compliance with DCV requirements
		Incident specific NEBA	A incident specific NEBA is completed.	• IMT log • Incident Action Plan • Incident specific NEBA
		Containment and recovery operations only undertaken within daylight hours	Containment and recovery activities will only be undertaken in daylight hours to ensure trapped fauna are released as soon as possible.	• IMT log • Incident Action Plan • Records of fauna released
		Daily records of oil recovered	Daily Containment and Recovery operations are recorded (location, estimated amount of oil recovered, estimated amount of water recovered)	• IMT log • Incident Action Plan • Records stating locations, types and volumes of oil recovered
		Exclusion Zones	Exclusion zones are put in place which consider health and safety and environment risks. These exclusion zones are determined in consultation with the relevant statutory agency.	• IMT log • Incident Action Plan • Records stating exclusion zones

Performance Outcome	Strategy	Control	Performance Standard	Measurement Criteria
		Decanting performed in commonwealth waters in accordance with MARPOL requirements	AMSA must approve all decanted separated water to increase waste storage of recovered oil.	• IMT log • Incident Action Plan • Records of decanted water (oil in water) concentrations • Approval from AMSA
		Bass Strait Oil Spill Response Waste Management Plan	An incident specific Waste Management Plan is developed to ensure management of waste in accordance to Australian best practices and principals.	• IMT log records • Incident Action Plan • Incident specific waste management plan
		Containment & Recovery vessels	Mobilise containment and recovery vessels in accordance with the following timeframes; • 1x vessel C&R strike team on site <48 hours of service request • 2x vessel C&R strike team on site <72 hours of service request.	• IMT log records • Incident Action Plan • OPEP checklists
Reduce oil impact on shoreline environmental sensitivities	Shoreline Protection and Clean-up	Shoreline Assessment	Implement OSMP modules: • O3.1 Shoreline segmentation • O3.2 Shoreline character • O3.3 Oil on shorelines • O3.4 Shoreline profile In accordance with requirements and timeframes in Section 3.3 of the OSMP. Up to 12 trained shoreline assessment field personnel will be available in the first 24 hours. Up to an additional 12 trained shoreline assessment field personnel will be available in the first 14 days.	• IMT log • Incident Action Plan • Operational monitoring reports • Field reports

Performance Outcome	Strategy	Control	Performance Standard	Measurement Criteria
		Shoreline Tactical Response Plans (TRPs)	Where shoreline contact is predicted, implement shoreline TRPs in consultation with control agency	• IMT log • Incident Action Plan • OPEP checklist
		Incident specific NEBA	A incident specific NEBA is completed	• IMT log • Incident Action Plan • Incident specific NEBA
		Daily records of oil recovered	Daily Shoreline Protection and Clean-up operations are recorded (location, estimated amount of oil recovered, estimated amount of water recovered)	• IMT log • Incident Action Plan • Records stating locations, types and volumes of oil recovered
		Exclusion Zones	Exclusion zones are put in place which consider health and safety and environment risks. These exclusion zones are determined in consultation with the control agency.	• IMT log • Incident Action Plan • Records stating exclusion zones
		Shoreline clean up personnel	Where shoreline contact is predicted from operational monitoring to be accumulations >100m/m^3, shoreline clean up personnel will be mobilised in the first 48 hours including up to • 4 Foreman • 20 Labourers • 4 Specialised Operators The shoreline clean up personnel will be mobilised up to: • 188 Foreman • 1614 Labourers • 124 Specialised Operators	• IMT log • Incident Action Plan • OPEP Checklists

Performance Outcome	Strategy	Control	Performance Standard	Measurement Criteria
		Shoreline protection equipment	Where shoreline contact is predicted from operational monitoring to be accumulations >100m/m^3, shoreline clean up equipment is mobilised from closest stockpile in the first 48 hours including up to • 650m Shoreboom • 650m x Nearshore boom • 1x Offshore skimmer system • 12 x Fast Tanks • Anchor kits + accessories The shoreline clean up equipment to be mobilised from State/AMOSC/AMSA/OSRL stockpiles up to the following • 3,250m x Shoreboom • 2,025m x Nearshore boom • 1x Offshore skimmer system • 12 x Fast Tanks • Anchor kits + accessories	• IMT log • Incident Action Plan • OPEP Checklists
		Shoreline protection personnel	Where shoreline contact is predicted, shoreline protection personnel will be mobilised in the first 48 hours including up to • 27 Foreman • 82 Labourers • 63 Specialised Operators The shoreline clean up personnel will be mobilised up to: • 84 Foreman • 245 Labourers • 189 Specialised Operators	• IMT log • Incident Action Plan • OPEP Checklists

Performance Outcome	Strategy	Control	Performance Standard	Measurement Criteria
		Shoreline protection and clean-up operations only undertaken within daylight hours	Shoreline protection and clean-up activities will only be undertaken in daylight hours to minimise impacts caused by unplanned interactions with flora and fauna.	• IMT log • Incident Action Plan
		Bass Strait Oil Spill Response Waste Management Plan	An incident specific Waste Management Plan is developed to ensure management of waste in accordance to Australian best practices and principals.	• IMT log records timing of events/assigned tasks • Incident specific waste management plan
		Waste Management transport and disposal	Where shoreline contact is predicted from operational monitoring to be accumulations >100g/m^2, shoreline clean up equipment is mobilised from closest stockpile from 48 hours including up to Solid and Liquid storage and processing of waste available is up to: • 63000 KL of liquid storage • 280 KL/day of liquid processing • 10 iso flammable liquid trucks/ day • 10 non flammable liquid truck/ day • 33500 Tonne of solids storage • 1050 Tonne/day of solid processing • 20 Tonne solids trucks/ day	• IMT log • Incident Action Plan
		Implement measures to minimise secondary contamination at temporary storage locations	Soil will be initially sampled to establish baseline “clean” levels. Establish bunding adequate to hold the daily bagged totals	• IMT log • Incident Action Plan • Final operational monitoring reports

Performance Outcome	Strategy	Control	Performance Standard	Measurement Criteria
		OSMP Termination Criteria	Monitoring under OSMP module O3 continued until termination criteria set out in Section 3.3 of the OSMP are met.	• IMT log • Final operational monitoring reports
Change in water quality is limited to that allowed under MARPOL		Vessel Requirements	Vessel compliant with MARPOL Annex I, IV, V and VI as appropriate to vessel class. Where applicable: • Vessels with class certification are verified by International Association of Classification Societies (IACS) member. • Vessels comply with AMSA Domestic Commercial Vessel (DCV) requirements	• Vessel class certificates where applicable • Records of compliance with DCV requirements
Monitor, evaluate and reduce environmental impact on fauna	Oiled Wildlife Response (OWR)	Incident specific NEBA	A incident specific NEBA is completed	• IMT log • Incident Action Plan • Incident specific NEBA
		Shoreline Tactical Response Plans (TRPs)	Where OWR is predicted: • Inform and agree with Control Agency IMT tactical execution of planning OWR • Based on trajectory, agree with Control Agency IMT regarding applicable Shoreline TRPs. • Commence mobilisation of equipment, personnel and support for OWR	• IMT log • Incident Action Plan
		Daily OWR Records	Daily OWR operations are recorded (numbers, type and status of fauna)	• IMT log • Incident Action Plan • Records stating numbers, type and status of fauna
		Exclusion Zones	Exclusion zones are put in place which consider health and safety and environment risks. These exclusion zones are determined in consultation with the control agency.	• IMT log • Incident Action Plan

Performance Outcome	Strategy	Control	Performance Standard	Measurement Criteria
				• Records stating exclusion zones
		Fauna Observation	Where oiled wildlife impacts are predicted, implement OSMP modules: • O4.1 Fauna observation (at sea) • O4.2 Fauna observations (onshore) Modules to be implemented in accordance with requirements and timeframes in Section 3.4 of the OSMP.	• IMT log • Incident Action Plan • Operational monitoring reports
		Oiled wildlife personnel and subject matter expertise	Esso will consult with Control Agency IMT on requirements for OWR clean-up personnel, for all spills that impact wildlife. Esso will mobilise OWR personnel from own, AMOSC and tier three providers to meet DELWP requests	• IMT log records • Incident Action Plan • Record of oiled wildlife personnel and subject matter expertise
		Bass Strait Oil Spill Response Waste Management Plan	An incident specific Waste Management Plan is developed to ensure management of waste in accordance to Australian best practices and principals.	• IMT log records • Incident Action Plan • Incident specific waste management plan
		OSMP Termination Criteria	Monitoring under OSMP module O4 continued until termination criteria set out in Section 3.4 of the OSMP are met.	• IMT log • Final operational monitoring reports
Monitor and evaluate environmental impact and recovery from the spill and response activities.	Scientific Monitoring	Oil Spill Monitoring Program	Implement OSMP modules S1-S9, as required: • S1: Hydrocarbons in intertidal sediments and water • S2: Hydrocarbons in offshore sediments and water • S3: Fish and shellfish taint and toxicity for human consumption • S4: Short-term impacts to oiled fauna and flora	• IMT log • Incident Action Plan • Scientific monitoring reports

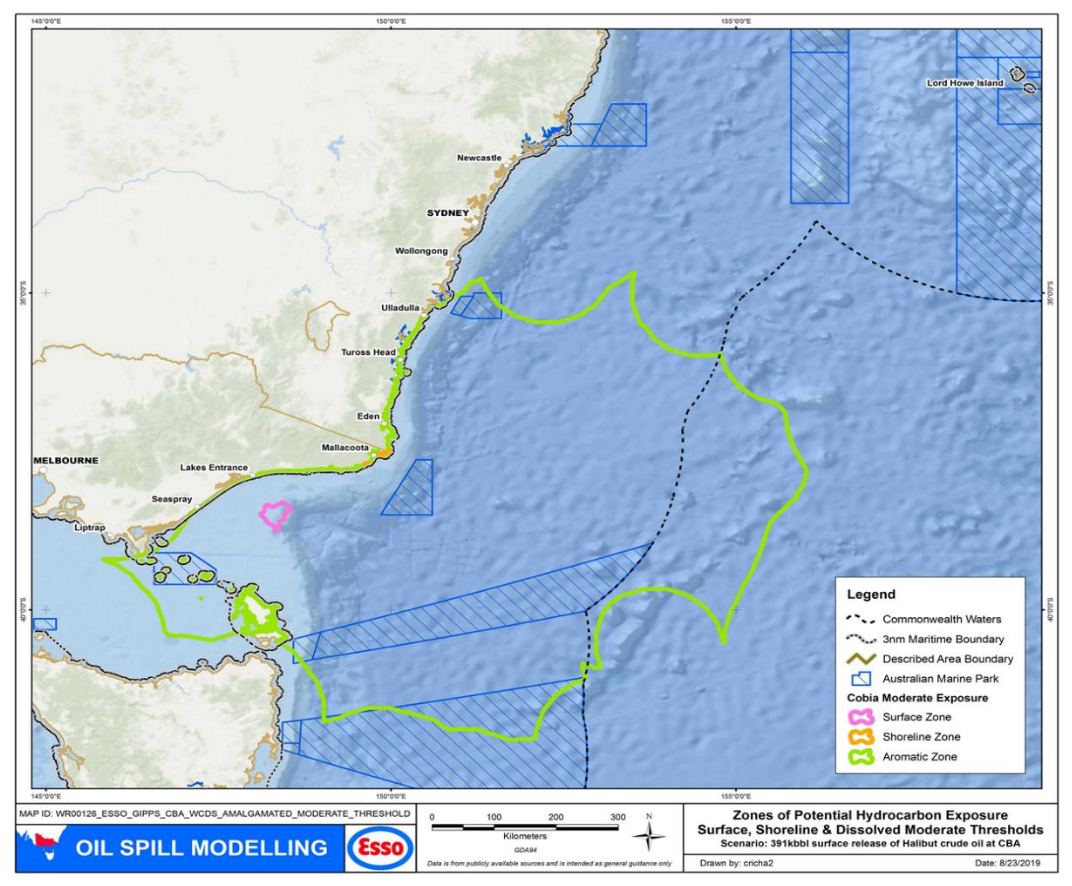
Performance Outcome	Strategy	Control	Performance Standard	Measurement Criteria
			• S5: Recovery of commercial and recreational fisheries • S6: Recovery of fauna • S7: Recovery of subtidal and intertidal benthic habitat • S8: Recovery of coastal flora • S9: Recovery of Ramsar values Modules to be implemented in accordance with requirements and timeframes in Section 4 of the OSMP.	
		OSMP Termination Criteria	Monitoring under OSMP module S1-9 continued until termination criteria set out in Section 4 of the OSMP are met.	• IMT log • Final operational monitoring reports

Appendix D – Quick Reference Information

Information specific to a well blowout (WCDS) from a platform during base business operations is provided below. For further details, refer to the Bass Strait Environment Plan (AUGO-EV-EMM-002 & AUGO-EV-EMM-004).

1. Field Location / Oil properties

Location / operational area



Production Licence No.	VIC/L5 Cobia (CBA) platform
Coordinates	Latitude 38° 27’ 04” S
	Longitude 148° 18’ 28” E

Oil type and name	**Halibut Crude***	
	Density @ 15˚C (kg/m^3)	821.5
	API	40.6
	Dynamic Viscosity (cP @ 25°C)	3.4
	Pour Point (ºC)	0
	Oil Property Category	Group II light persistent oils

	Composition	
	Aromatics (%)[1]	23.2%
	Emulsion Water Content (%)	7%
	Saturates (%)	71.9%
	Wax Content (%)	23.7%
	Volatile (%) (BP <180°C)	15.2
	Semi-volatile (%) (BP 180 - 265°C)	25.6
	Low volatility (%) (BP 265 - 380°C)	41.6
	Residual (%) (BP> 380°C)[2]	17.6

*****Leeder Analytical Report No. L190131 Chemical and Physical Testing of Seven Crudes and Condensates dated 31 May 2019.

1 *Soluble, aromatic, hydrocarbons, (including BTEX), tend to evaporate into the atmosphere.*

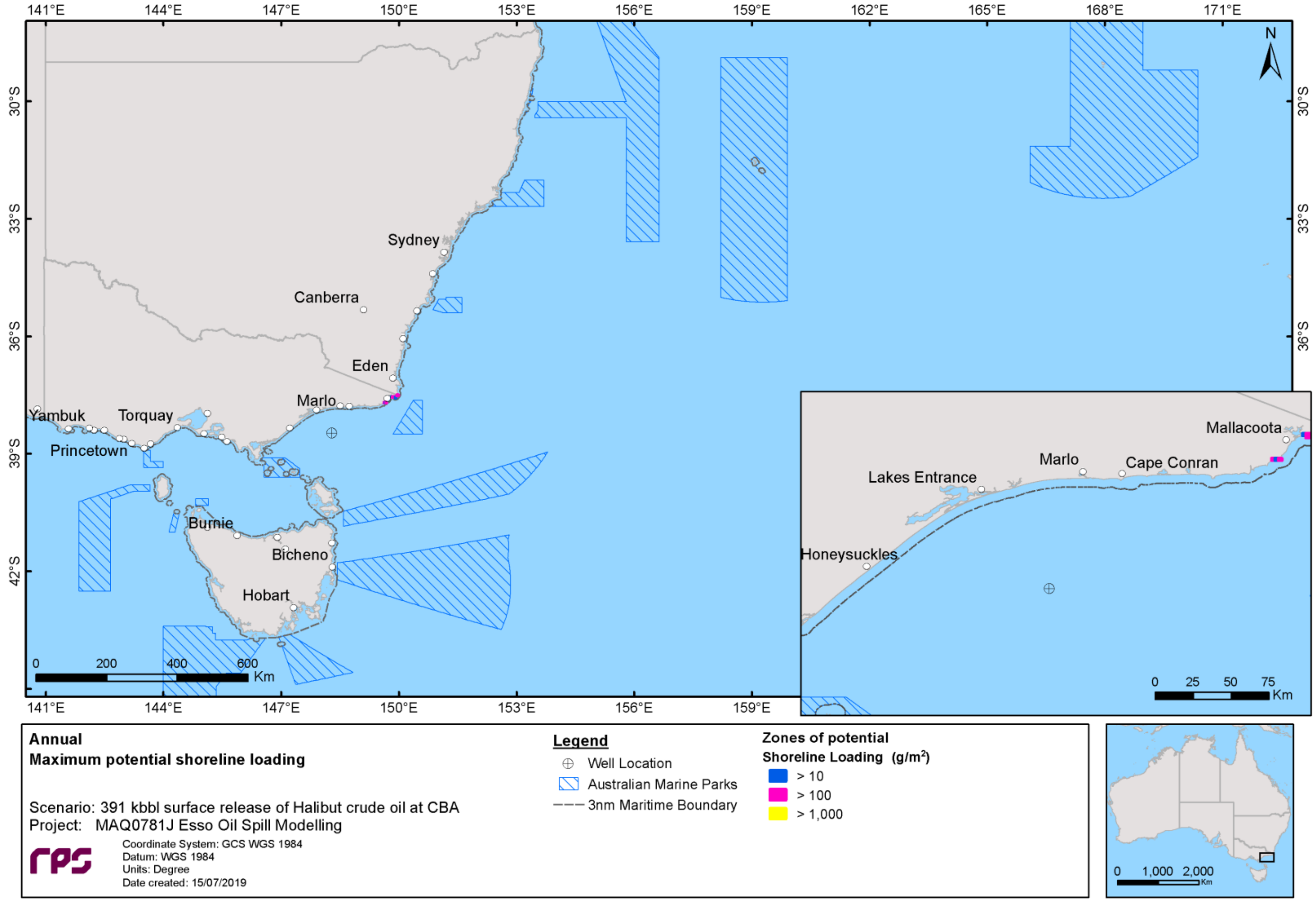
2 *Residual Hydrocarbons will persist in the marine environment. It will remain in a liquid state when released into the environment over the annual temperatures observed in the Gippsland Basin*

2. What's the worst that could happen?

	Cobia (CBA)
Modelled Oil Pollution Scenario (WCDS)**	Level 3 Spill A complete loss of well control (tubing flow to surface only) resulting in a release of crude until source control is effective (98 days – based on worst case scenario where relief well drilling is required).
Oil type and name	Halibut Crude
Release rate (bbl/day)	3,990
Spill Volume (bbl)	391,000
Dominant Weathering process	Evaporation
Approximate evaporation rate (depending on temperature)	
within the first 12 hours	10.7%
within the first 24 hours	a further 34.1%
over several days.	a further 41.8%
Probability of contact to any shoreline (%)	23 (at Cape Howe / Mallacoota)
Absolute minimum time for visible oil to shore (hrs)	210 (at Gabo Island)
Maximum volume ashore (m^3)	46
Maximum length of the shoreline (km) **at 10 g/m^2** **at 100 g/m^2** **at 1,000 g/m^2**	 17 12 -
Weathering over the duration of LOWC (98 days) (based on deterministic modelling)	
Evaporation (%)	50%
Decay (%)	43%
Water column (%)	7%
Surface/Shoreline (%)	<1%

**RPS Report No. MAQ0781J Gippsland Basin Production Activities Oil Spill Modelling dated 7 August 2019

Exposure - Shoreline



Maximum potential shoreline loading for the low (≥ 10 g/m^2), moderate (≥ 100 g/m^2) and high (≥ 1,000 g/m^2) thresholds. Results are based on a 391,000 bbl surface release of Halibut Crude over 98 days at Cobia Platform, tracked for 118 days. The results were calculated from 100 spill trajectories.

3. Resources at Risk

	Receptor	<12 hrs	12-48 hrs	>48 hrs	>1week (hrs)
Minimum time to oil exposure on sea surface at moderate threshold	BIAs: • Seabirds – Foraging • Pygmy Blue Whale – Distribution/Foraging • Southern Right Whale – Migration • Great White Shark – Distribution KEFs: • Upwelling East of Eden Note: no predicted contact with State waters	 ✓ ✓ ✓ ✓ 		 ✓	
Minimum time to shoreline accumulation of oil at moderate threshold	• Bega Valley (southern NSW) • Cape Howe/Mallacoota • Croajingalong				296 296 968

Protection priorities based on sensitivity and predicted consequence (as per EP Volume 2), protectable/actionable areas, and minimum time to exposure in this area are:

Gabo Island due to high sensitivity and significant fauna populations (Little penguins, Storm petrels, Hooded plover, Fur seals).

Mallacoota due to sensitivity of estuary mouth, Hooded plover habitat

Nadgee Lake and Nadgee River due to pristine coastal landscape within the Nadgee Nature Reserve (NSW) and significant Wilderness Area.

4. Strategic NEBA and selection of response options

Response Option	Benefits	Effectiveness on Light Crude Spill	Viable Response?	Net Benefit?
Source Control	Limit flow of hydrocarbons to environment.	Only viable option to stop flow of crude oil to the marine environment.	Yes	✓
Surveillance and Monitoring	Although surveillance is not an active intervention to treat or remove oil pollution, it is critical to effective response both in the initial stages of an incident and during ongoing response operations.	Surveillance and monitoring used to observe the direction of movement of the spill and natural break-up and dissipation of spill. Monitoring will also be used to assess the need for, and effectiveness of, active intervention.	Yes	✓
Dispersant Application	Dispersants act by allowing hydrocarbons to be mixed into the upper layers of the water column, which accelerates the biodegradation process. Removes oil from the water surface, protecting leeward shorelines and providing benefit to sea-surface air breathing fauna. Use of dispersants may eliminate, or minimise oil impacting sensitive resources including Gabo Island.	Over 40% of the Halibut crude should evaporate within the first 24 hrs. However, about 13.6% of the crude is considered persistent and so use of dispersant may reduce volume of oil impacting shorelines. Laboratory testing has shown dispersant to be highly effective on fresh Bass Strait crude (48-99% effective), with effectiveness decreasing significantly after 12 hours of weathering. Dispersants should be applied to fresh oil closest to the source to maximize effectiveness.	Yes	✓
Containment & Recovery (Vessel Based)	Booms and skimmers to contain surface oil where there is a potential threat to environmental sensitivities. Relies on calm sea conditions, thicknesses >10µm to collect and adequate deployment timeframes. Targeted containment and recovery can be utilised to reduce impact to sensitive areas such as Gabo Island where access for shoreline protection is limited (see below: Protection of Sensitive Shoreline Resources).	Suitable thickness for recovery will be present making containment and recovery viable but likely of low effectiveness. In Bass Strait sea conditions likely to be suitable for containment and recovery operations only 50% of the time.	Yes	✓
Protection of Sensitive Shoreline Resources	Booms and skimmers deployed to protect environmental sensitivities. Environmental conditions (e.g. current, waves) limit application.	Light crude released at the CBA platform may contact the shoreline along the far east Gippsland coast and the southern coast of NSW, with modelling predicting shortest time of recoverable levels to shore as more than a week. Tactical Response Plans have been developed to protect Gabo Island and sensitive estuary openings along this section of coastline.	Yes	✓
Shoreline Clean-up	Last response strategy to remove oil from the environment due to potential impact.	There are various shoreline techniques that are appropriate for this type of hydrocarbon, a shoreline clean-up may be effective for reducing shoreline loadings where access is possible, to be assessed on a case-by-case basis	Yes	✓
Oiled Wildlife Response (OWR)	Consists of capture, cleaning and rehabilitation of oiled wildlife. May include hazing or pre-emptive captive management.	OWR is likely to be required. Although the distance of the platform from the coast reduces likelihood of extensive wildlife oiling onshore, individuals may become oiled in the vicinity of the spill. Operational monitoring will be used to inform the need for OWR to be implemented.	Yes	✓

6. Response Resources Required

Response Option	Strategy	Resource	Timeframe
Source Control	ROV debris clearing / subsea intervention	1 x ROV and 1 x vessel SFRT (via AMOSC) and 1 x vessel 1 x contract well control specialists (WWC/OSRL)	Estimated 5 days (from call out request to arrival in Victoria) Estimated 7 days (from Perth to BBMT via road transport) 2 days (from Singapore)
	Relief well	1 x MODU (via APPEA mutual aid agreement) 1 x contract engineering support (WWC/OSRL) Well construction material	Estimated 85 days (via HLV from Singapore)
Surveillance and Monitoring	OSMP O1.1 Weather and Sea State	N/A	
	OSMP O1.2 Trajectory Estimation	1 x contracted modeller.	
	OSMP Module O1.3 and O4.1 Aerial surveillance	1x observer per aircraft. Aircraft to have 100nm range and 3 hour duration.	Initial overflight <4 hours service requested. Trained observer <12 hours of spill occurring.
	OSMP Module O1.4 Tracking buoy	1x buoy available.	Deployed <12 hrs of spill occurring (dependent on weather conditions) (Level 2 & 3 spill).
	OSMP O1.5 Satellite Imagery	1 x contract.	
	OSMP Module O2.1 and O2.3 Water and Oil Sampling	1x vessel. 1x initial sampling kit. 1x contract with laboratory.	Samples obtained <24 hrs of spill occurring. Analysis initiated <24 hours of receipt in laboratory.
Aerial dispersant	Dispersant Aircraft	Maximum 32 m^3/day Total volume 3,111 m^3 3 x AT-802 Air Tractors carrying out 11 sorties per day 1 x observation platform	1 x Air Tractor required within 24 hours
Offshore Containment & Recovery	Boom Skimming system Vessels	6 x 200m 3 6 (3 strike teams)	1 strike team required within 48 hours

Response Option	Strategy	Resource	Timeframe
Protection of Sensitive Shoreline Resources[*1]	Personnel	59 Personnel (Peak)	Required within 8 days
	OSR Equipment	450m x Shoreboom Anchor kits + accessories	Required within 8 days
	Vehicles and Vessels	2 x UTV 3 x Front End Loader / Dozer	Required within 8 days
Shoreline Clean-up[*2]	Personnel	6 Foreman 40 Labourers 6 Specialised Operators	50% required within 8 days
	Vehicles and Vessels	3 x ATV 3 x Truck/Vehicle 2 x Front End Loader / Dozer 2 x Dump Truck	Required within 8 days
	OSR Equipment	2 x Pump 35m x Inshore Boom 35m x Sorbent boom/snares 6m x Shoreline flushing pipe	Required within 8 days
	Manual Equipment	66 x Shovels 66 x Rakes 66 x Picks 3200 x Plastic Bags 14 x Wheel barrows	50% Required within 8 days
Oiled Wildlife Response[*3]	Personnel	1 Foreman 8 Specialised Operators	4 x Specialised Operators within 7 days
	Equipment	1 x OWR First Strike Kit 2 x IBC 1 x Response Toolkit	
	Vehicles and Vessels	2 x UTV 1 x Vessel – personnel /equipment	

[*1-3] Calculated resources requirement are for planning purposes only. Actual response strategies and resource needs to be determined in consultation with the State control agency.

[*1] Based on simultaneous implementation of all TRP's from Shipwreck Creek through to Mallacoota

[*2] Based on peak volume on shoreline with predicted loading of 100 mg/m^3 or greater and >10% probability shoreline impact within the sub-local government area Assumed 10% of the shoreline being cleaned up in any 1 day (and a continuous re-oiling of the shoreline). 10% shoreline clean up used for planning purposes only. Actual resources to be determined in consultation with State control agency

[*3] Refer Gabo Island TRP and applicable Species Response Plans for additional guidance.

Relevant Tactical Response Plan (TRP)	Gabo Island Mallacoota

7. Oil Spill Monitoring

		0-10m	10-20m
Sensitivities – **Probability of contact with dissolved hydrocarbons at moderate threshold**	> 90%	White Shark distribution/foraging BIA Southern Right Whale migration BIA Pygmy Blue Whale distribution and foraging BIA Little penguin foraging BIA Seabirds foraging BIAs KEF: Upwelling East of Eden Cape Howe MNP	White Shark distribution/foraging BIA Pygmy Blue Whale distribution and foraging BIA Southern Right Whale migration BIA Seabirds foraging BIAs KEF: Upwelling East of Eden
	75 - 90%	Humpback whale foraging BIA Indo-pacific bottlenose dolphin breeding BIA Point Hicks MNP	Little penguin foraging BIA Cape Howe MNP
	50 – 75%	Grey nurse shark foraging / migration BIA Seabirds foraging BIAs KEF: Big Horseshoe Canyon **Sub –LGA** • Bega Valley • Cape Howe/Mallacoota • Croajingolong (West)	Grey nurse shark foraging BIA Humpback whale foraging BIA Indo-pacific bottlenose dolphin breeding BIA Seabirds foraging BIAs Point Hicks MNP **Sub –LGA** • Bega Valley • Cape Howe/Mallacoota
	25 – 50%	Beagle AMP East Gippsland AMP White Shark breeding BIA Seabirds foraging/breeding BIAs Kent Group NP **Sub –LGA** • Croajingolong (East) • Point Hicks	East Gippsland AMP Grey nurse shark migration BIA **Sub –LGA** • Croajingolong (West) • Croajingolong (East)

		0-10m	10-20m
	10 – 25%	Little penguin breeding BIA Seabirds foraging/breeding BIAs KEF: Canyons on the eastern continental slope KEF: Shelf rocky reefs Batemans MP **Sub –LGA** • Eurobodalla • Marlo • Sydenham Inlet	Beagle AMP Seabirds foraging/breeding BIAs Little penguin breeding BIA KEF: Shelf rocky reefs Batemans MP Kent Group NP **Sub –LGA** • Point Hicks
	< 10%	Flinders AMP Jervis AMP Ninety Mile Beach MNP Seabirds breeding / foraging /migration BIA Beware Reef MS **Sub –LGA** • Cape Conran • Corringle • Lake Tyers • Lakes Entrance • Shoal Haven	Flinders AMP Freycinet AMP Jervis AMP Little penguin foraging BIA Seabirds breeding /foraging/ migration BIA KEF: Canyons on the eastern continental slope Beware Reef MS **Sub –LGA** • Cape Conran • Eurobodalla • Marlo • Shoal Haven • Sydenham Inlet
		0-10	**10-20**
Marine Parks – Probability of contact with entrained hydrocarbons at the low threshold	> 90%	East Gippsland AMP Cape Howe MNP Point Hicks MNP	Nil
	75 - 90%	Nil	Nil

		0-10m	10-20m
	50 - 75%	Beagle AMP Flinders AMP Batemans MP Beware Reef MS	Nil
	25 - 50%	Jervis Bay AMP/ MP	Nil
	10 – 25%	Freycinet AMP Ninety Mile Beach MNP	East Gippsland AMP Cape Howe MNP
	< 10%	Hunter AMP Central Eastern AMP Corner Inlet Ramsar Wetland Corner Inlet MNP Wilsons Promontory MNP/MP/MR Port Stephens Great Lakes MP Flood Plain Lower Ringarooma River Ramsar Wetland Gippsland Lakes Ramsar Wetland Nooramunga Marine and Coastal Park	Beagle AMP Flinders AMP Point Hicks MNP Batemans MP Beware Reef MS

Sufficient resources are available to undertake monitoring and these are detailed in the OSMP.

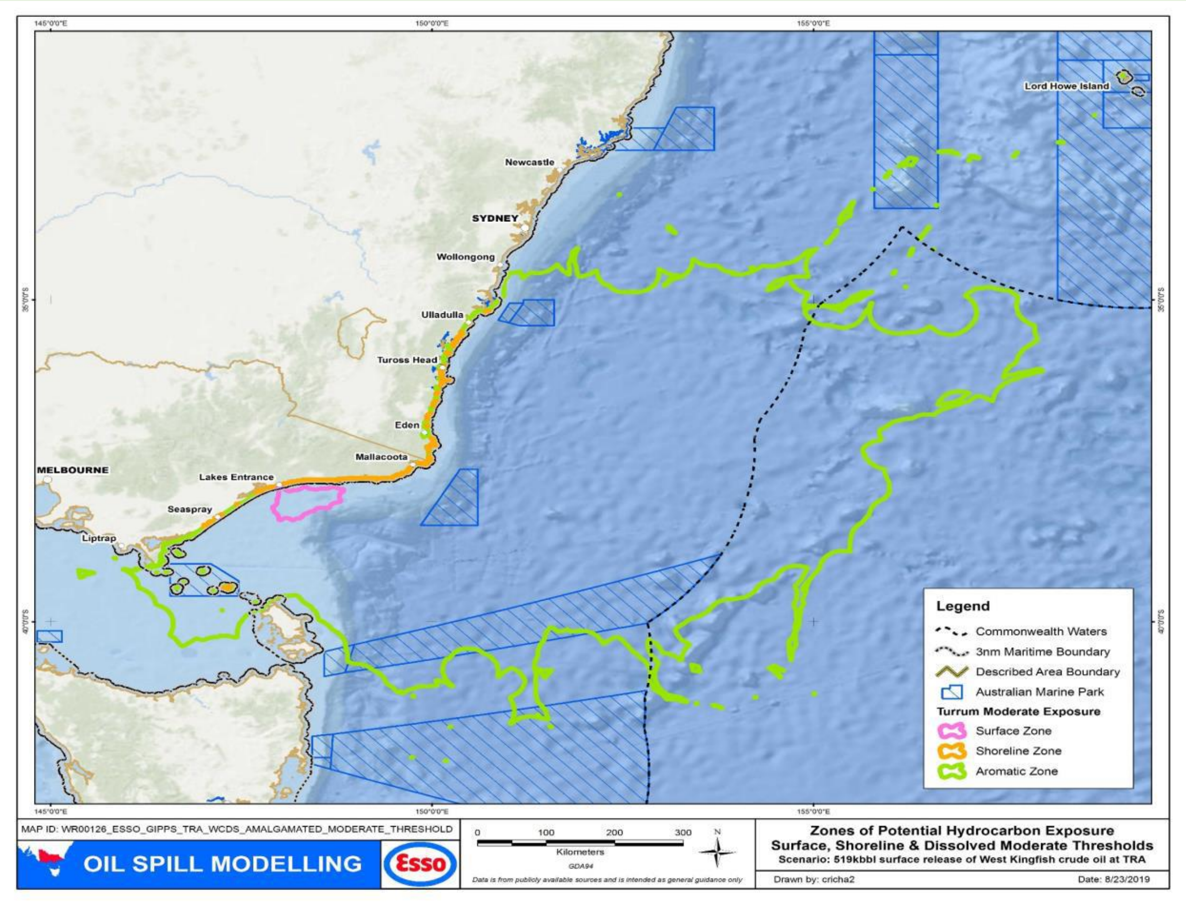
Modelling indicates that the spill does **not** intersect the coastline until after 1 week.

However in the unlikely event of a spill, should trajectory modelling predict shoreline contact, sufficient resources are available to be initiated within 48 hours (in most cases sooner). Modules in addition to those required to monitor the spill may be initiated and resources mobilised to priority monitoring locations as determined at the time.

Information specific to a well blowout (WCDS) from a platform during base business operations is provided below. For further details, refer to the Bass Strait Environment Plan (AUGO-EV-EMM-002 & AUGO-EV-EMM-004).

1. Field Location / Oil properties

Location / operational area



Production Licence No.	VIC/L03 Marlin A (MLA) platform
Coordinates	Latitude 38° 13’ 54” S
	Longitude 148° 13’ 09” E

Oil types and name	**West Kingfish Crude**	
	Density @ 15˚C (kg/m^3)	798.1
	API	45.7
	Dynamic Viscosity (cP @ 25°C)	2.4
	Pour Point (ºC)	9
	Oil Property Category	Group II light persistent oils

	Composition	
	Aromatics (%)[1]	23%
	Emulsion Water Content (%)	27%
	Saturates (%)	72%
	Wax Content (%)	25%
	Volatile (BP <180°C)	13.6 %
	Semi-volatile (BP 180 - 265°C)	35.9 %
	Low volatility (BP 265 - 380°C)	36.8 %
	Residual (BP> 380°C)[2]	13.7%

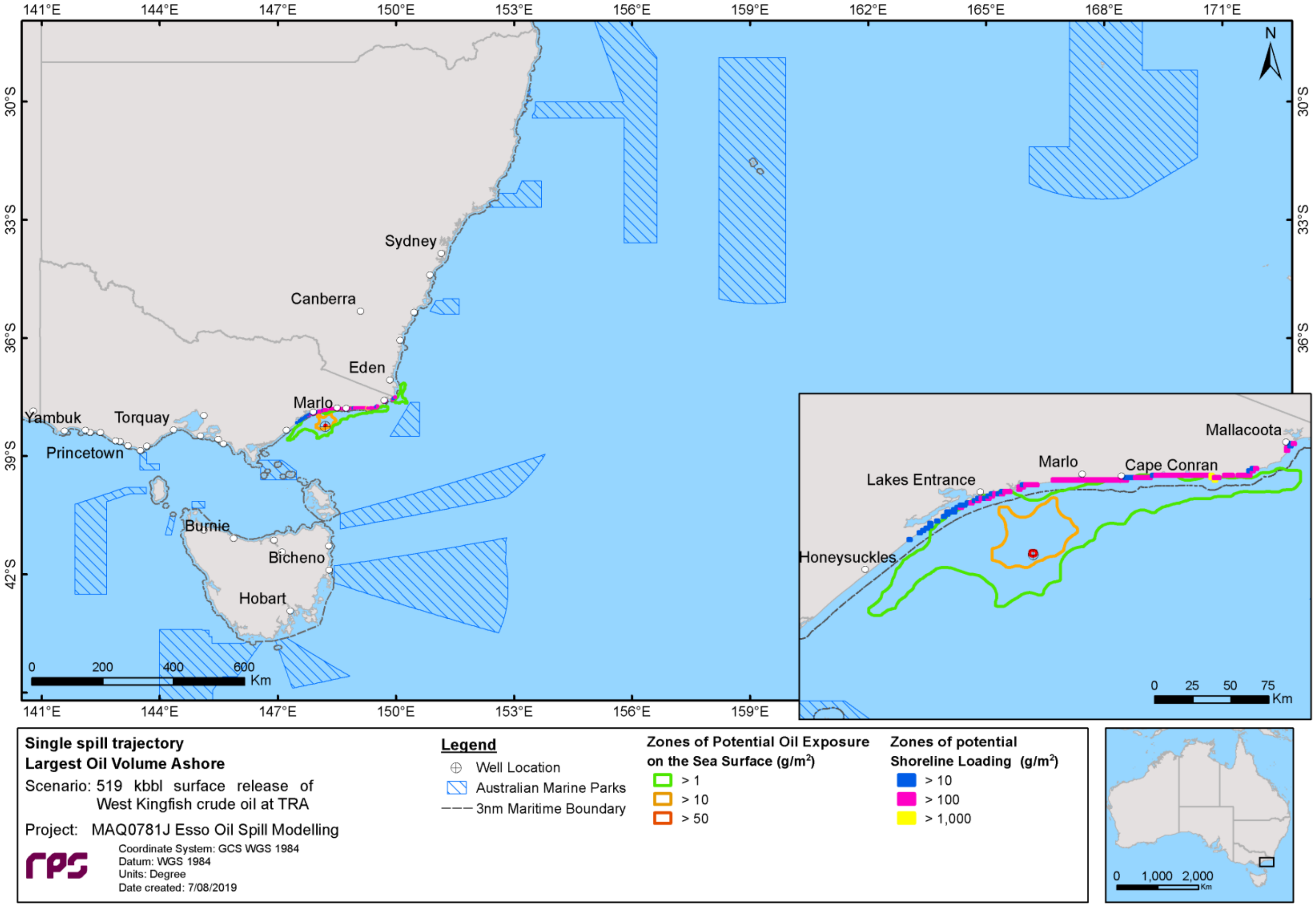
1 *Soluble, aromatic, hydrocarbons, (including BTEX), tend to evaporate into the atmosphere.*

2 *Residual Hydrocarbons will persist in the marine environment. It will remain in a liquid state when released into the environment over the annual temperatures observed in the Gippsland Basin*

2. What's the worst that could happen?

	Marlin A (MLA)
Modelled Oil Pollution Scenario (WCDS)	Level 3 Spill A complete loss of well control (tubing flow to surface only) resulting in a release of crude until source control is effective (98 days – based on worst case scenario where relief well drilling is required).
Oil types and name	West Kingfish Crude
Release rate (bbl/day)	5,296
Spill Volume (bbl)	519,000
Dominant Weathering process	Evaporation
Approximate evaporation rate (depending on temperature)	
within the first 12 hours	13.6%
within the first 24 hours	a further 35.9%
over several days.	a further 36.8%
Probability of contact to any shoreline (%)	94 (East Gippsland – at Gabo Island, Point Hicks)
Absolute minimum time for visible oil to reach shoreline (hrs)	62 (at Point Hicks)
Maximum volume ashore (m^3)	563.3
Maximum length of the shoreline (km) at 10 g/m^2 at 100 g/m^2 at 1,000 g/m^2	 221 150 15
Weathering over the duration of LOWC (98 days) (based on deterministic modelling)	
Evaporation (%)	64%
Decay (%)	29%
Water column (%)	6%
Surface/Shoreline (%)	<1%

Exposure – Shoreline



Zones of potential exposure on the sea surface and shoreline for the trajectory with the largest volume of shoreline loading. Results are based on a 519,000 bbl surface release of West Kingfish Crude over 98 days at Marlin A Platform, tracked for 118 days.

3. Resources at Risk

	Receptor	<12 hrs	12-48 hrs	>48 hrs	>1week (hrs)
Minimum time to oil exposure on surface at moderate threshold	**BIAs:** • Seabirds – Foraging • Pygmy Blue Whale – Distribution/Foraging • Southern Right Whale – Migration • White Shark – Distribution/Breeding **KEFs:** • Upwelling East of Eden Note not predicted to contact State waters	 ✓ ✓ ✓ ✓/- ✓		 - /✓	
Minimum time (hrs) to shoreline accumulation of oil at moderate threshold	• Point Hicks			62	
	• Gabo Island			70	
	• Kent Island Group			136	
	• Cape Conran			134	
	• Corringle			134	
	• Wellington			142	
	• Croajingalong			158	
	• Ocean Grange			154	
	• Lake Tyers Beach			162	
	• Cape Howe/Mallacoota			168	
	• Marlo				176
	• Lakes Entrance				180
	• Bega Valley (southern NSW)				188
	• Seaspray				232
	• Sydenham Inlet				246
	• Woodside Beach				274
	• Eurobodalla (NSW)				526
	• Shoal Haven (NSW)				530
	• Montague Island (NSW)				830

Protection priorities based on sensitivity and predicted consequence (as per EP Volume 2), protectable/actionable areas, and minimum time to exposure in this area are:

Gabo Island due to high sensitivity and significant fauna populations (Little Penguins, Storm Petrels, Fur seals, Hooded plover).

Mallacoota due to sensitivity of estuary mouth, Hooded plover habitat.

Nadgee Lake and Nadgee River due to pristine coastal landscape within the Nadgee Nature Reserve (southern NSW) and significant Wilderness Area,

Croajingolong National Park including **Sydenham Inlet, Betka Inlet, Wingan Inlet.**

Marlo due to sensitivity of Snowy River estuary / mouth.

Lake Tyers due to sensitivity of waterway, Hooded plover habitat

Lakes Entrance permanently open river mouth to the Gippsland Lakes being a recognised Ramsar site, marine flora and fauna, marshes, wetlands, estuarine habitat, shorebird/seabird colonies, amenity beaches, surf club, commercial fishing, tourism, dive sites, recreational aquatic activities, waterway amenity access.

4. Strategic NEBA and selection of response options

Response Option	Benefits	Effectiveness on Light Crude Spill	Viable Response?	Net Benefit?
Source Control	Limit flow of hydrocarbons to environment.	Only viable option to stop flow of crude oil to the marine environment.	Yes	✓
Surveillance and Monitoring	Although surveillance is not an active intervention to treat or remove oil pollution, it is critical to effective response both in the initial stages of an incident and during ongoing response operations.	Surveillance and monitoring used to observe the direction of movement of the spill and natural break-up and dissipation of spill. Monitoring will also be used to assess the need for, and effectiveness of, active intervention.	Yes	✓
Dispersant Application	Dispersants act by allowing hydrocarbons to be mixed into the upper layers of the water column, which accelerates the biodegradation process. Removes oil from the water surface, protecting leeward shorelines and providing benefit to sea-surface air breathing fauna. Use of dispersants may eliminate, or minimise oil impacting sensitive resources including Gabo Island.	Over 40% of the West Kingfish crude should evaporate within the first 24 hrs. However, about 13.7% of the crude is considered persistent and so use of dispersant may reduce volume of oil impacting shorelines. Laboratory testing has shown dispersant to be highly effective on fresh Bass Strait crude (48-99% effective), with effectiveness decreasing significantly after 12 hours of weathering. Dispersants should be applied to fresh oil closest to the source to maximize effectiveness.	Yes	✓
Containment & Recovery (Vessel Based)	Booms and skimmers to contain surface oil where there is a potential threat to environmental sensitivities. Relies on calm sea conditions, thicknesses >10µm to collect and adequate deployment timeframes.	Suitable thickness for recovery will be present for only a very short period, making containment and recovery viable but likely of low effectiveness. In Bass Strait sea conditions likely to be suitable for containment and recovery operations only 50% of the time.	Yes	✓
Protection of Sensitive Shoreline Resources	Booms and skimmers deployed to protect environmental sensitivities. Environmental conditions (e.g. current, waves) limit application.	Light crude released at the MLA platform may contact the shoreline along the Gippsland coast and the southern coast of NSW, with modelling predicting shortest time of recoverable levels to shore as approximately 3 days. Tactical Response Plans have been developed to protect Gabo Island and sensitive estuary openings along this section of coastline.	Yes	✓
Shoreline Clean-up	Last response strategy to remove oil from the environment due to potential impact.	There are various shoreline techniques that are appropriate for this type of hydrocarbon, a shoreline clean-up may be effective for reducing shoreline loadings where access is possible, to be assessed on a case-by-case basis	Yes	✓
Oiled Wildlife Response (OWR)	Consists of capture, cleaning and rehabilitation of oiled wildlife. May include hazing or pre-emptive captive management.	OWR is likely to be required as a result of extensive shoreline oiling. Operational monitoring will be used to inform the need for OWR to be implemented.	Yes	✓

5. Response Resources Required

Response Option	Strategy	Resource	Timeframe
Source Control	ROV debris clearing / subsea intervention	1 x ROV and 1 x vessel SFRT (via AMOSC) and 1 x vessel 1 x contract well control specialists (WWC/OSRL)	Estimated 5 days (from call out request to arrival in Victoria) Estimated 7 days (from Perth to BBMT via road transport) 2 days (from Singapore)
	Relief well	1 x MODU (via APPEA mutual aid agreement) 1 x contract engineering support (WWC/OSRL) Well construction material	Estimated 85 days (via HLV from Singapore)
Surveillance and Monitoring	OSMP O1.1 Weather and Sea State	N/A	
	OSMP O1.2 Trajectory Estimation	1 x contracted modeller.	
	OSMP Module O1.3 and O4.1 Aerial surveillance	1x observer per aircraft. Aircraft to have 100nm range and 3 hour duration.	Initial overflight <4 hours service requested. Trained observer <12 hours of spill occurring.
	OSMP Module O1.4 Tracking buoy	1x buoy available.	Deployed <12 hrs of spill occurring (dependent on weather conditions) (Level 2 & 3 spill).
	OSMP O1.5 Satellite Imagery	1 x contract.	
	OSMP Module O2.1 and O2.3 Water and Oil Sampling	1x vessel. 1x initial sampling kit. 1x contract with laboratory.	Samples obtained <24 hrs of spill occurring. Analysis initiated <24 hours of receipt in laboratory.
Aerial dispersant	Dispersant Aircraft	Maximum 42 m^3/day Total volume 4,125 m^3 4 x AT-802 Air Tractors carrying out 15 sorties per day. or 1 x OSRL 727 carrying out 3 sorties per day 1 x observation platform	1 x Air Tractor required within 24 hours

Response Option	Strategy	Resource	Timeframe
Offshore Containment & Recovery	Boom Skimming system Vessels	8 x 200m 4 8 (4 strike teams)	1 strike team required within 48 hours
Protection of Sensitive Shoreline Resources*1	Personnel	84 Foreman 245 Labourers 189 Specialised Operators	Required within 6 days*3 27 Foreman 82 Labourers 63 Specialised Operators
	OSR Equipment	3,250m x Shoreboom 2,025m x Near shore boom 1 x Offshore skimming system 12 x Fast Tanks Anchor kits + accessories	Required within 6 days *3 650m x Shoreboom 650m x Near shore boom 1 x Offshore skimming system 12 x Fast Tanks Anchor kits + accessories
	Vehicles and Vessels	1 x offshore/nearshore (Ro-Boom) 1 x Nearshore C&R 5 x workboat – equipment transport 5 x workboat – shallow draft 15 x UTV 14 x Front End Loader / Dozer	Required within 6 days *3 1 x offshore/nearshore (Ro-Boom) 1 x Nearshore C&R 2 x workboat – equipment transport 2 x workboat – shallow draft 1 x UTV 1 x Front End Loader / Dozer
Shoreline Clean-up*2	Personnel	92 Foreman 790 Labourers 64 Specialised Operators	Required within 60 hours 4 x Foreman 20 x Labourers 4 x Specialised Operators
	Vehicles and Vessels	37 x ATV 37 x Truck/Vehicle 13 x Front End Loader / Dozer 21 x Dump Truck	Required within 60 hours 2 x Truck/Vehicle
	OSR Equipment	13 x Pump 13 x skimmer w/pump 669m x Inshore Boom 669m x Sorbent boom/snares 116m x Shoreline flushing pipe	
	Manual Equipment	1,270 x Shovels 1,270 x Rakes 1,270 x Picks 62,000 x Plastic Bags 270 x Wheel barrows	Required within 60 hours 2 x Shoreline Response Trailers
Oiled Wildlife Response*4	Personnel	1 Foreman 8 Specialised Operators	4 x Specialised Operators within 48 hours
	Equipment	1 x OWR First Strike Kit 2 x IBC 1 x Response Toolkit	
	Vehicles and Vessels	2 x UTV 1 x Vessel – personnel /equipment	

*1-4 Calculated resources requirement are for planning purposes only. Actual response strategies and resource needs to be determined in consultation with the State control agency.

*1 Based on simultaneous implementation of all TRP's from Merriman Creek (Vic) through to Nullica River (NSW)

*2 Based on peak volume on shoreline with predicted loading of 100 mg/m^3 or greater and >10% probability shoreline impact within the sub-local government area Assumed 10% of the shoreline being cleaned up in any 1 day (and a continuous re-oiling of the shoreline). 10% shoreline clean up used for planning purposes only. Actual resources to be determined in consultation with State control agency.

*3 Based on simultaneous implementation of all TRP's with shoreline impact predicted within 142hrs, that is Lakes Entrance to Snowy River (Marlo).

*4 Initial OWR response resources. Additional resource needs to be determined by State control agency.

Relevant Tactical Response Plan (TRP)	Victoria	NSW
	Merriman Creek (Seaspray)	Wonboyn River
	Lakes Entrance	Bittangabee Bay
	Lake Bunga	Woodburn & Saltwater Creek
	Lake Tyers	Fisheries Creek
	Snowy River (Marlo)	Towamba River
	Yeerung River	Boydtown Creek
	Sydenham Inlet (Bemm River)	Nullica River
	Tamboon Inlet	
	Mueller River	
	Thurra River	
	Wingan Inlet	
	Shipwreck Creek	
	Bekta River	
	Davis Creek	
	Mallacoota	

6. Oil Spill Monitoring

		0-10m	10-20m
Sensitivities – **Probability of contact with dissolved hydrocarbons at moderate threshold**	> 90%	White Shark distribution/foraging BIA Southern Right Whale migration BIA Pygmy Blue Whale distribution and foraging BIA Little penguin foraging BIA Seabirds foraging BIAs KEF: Upwelling East of Eden Cape Howe MNP	White Shark distribution/foraging BIA Pygmy Blue Whale distribution and foraging BIA Southern Right Whale migration BIA Seabirds foraging BIAs KEF: Upwelling East of Eden
	75 - 90%	Humpback whale foraging BIA Indo-pacific bottlenose dolphin breeding BIA Point Hicks MNP	Little penguin foraging BIA Cape Howe MNP
	50 – 75%	Grey nurse shark foraging / migration BIA Seabirds foraging BIAs KEF: Big Horseshoe Canyon **Sub –LGA** • Bega Valley (southern NSW) • Cape Howe/Mallacoota • Croajingolong (West)	Grey nurse shark foraging BIA Humpback whale foraging BIA Indo-pacific bottlenose dolphin breeding BIA Seabirds foraging BIAs Point Hicks MNP **Sub –LGA** • Bega Valley (southern NSW) • Cape Howe/Mallacoota
	25 – 50%	Beagle AMP East Gippsland AMP White Shark breeding BIA Seabirds foraging/breeding BIAs Kent Group NP **Sub –LGA** • Croajingolong (East)	East Gippsland AMP Grey nurse shark migration BIA **Sub –LGA** • Croajingolong (West) • Croajingolong (East)

		0-10m	10-20m
		• Point Hicks	
	10 – 25%	Little penguin breeding BIA Seabirds foraging/breeding BIAs KEF: Canyons on the eastern continental slope KEF: Shelf rocky reefs Batemans Marine Sanctuary **Sub –LGA** • Eurobodalla (NSW) • Marlo • Sydenham Inlet	Beagle AMP Seabirds foraging/breeding BIAs Little penguin breeding BIA KEF: Shelf rocky reefs Batemans MP Kent Group NP **Sub –LGA** • Point Hicks
	< 10%	Flinders AMP Jervis AMP Ninety Mile Beach MNP Seabirds breeding / foraging /migration BIA Beware Reef MS **Sub –LGA** • Cape Conran • Corringle • Lake Tyers • Lakes Entrance • Shoal Haven (NSW)	Flinders AMP Freycinet AMP Jervis AMP Little penguin foraging BIA Seabirds breeding /foraging/ migration BIA KEF: Canyons on the eastern continental slope Beware Reef MS **Sub –LGA** • Cape Conran • Eurobodalla (NSW) • Marlo • Shoal Haven (NSW) • Sydenham Inlet

		0-10	10-20
Marine Parks – **Probability of contact with entrained hydrocarbons at the low threshold**	> 90%	East Gippsland AMP Cape Howe MNP Point Hicks MNP New Zealand Star Bank	Nil
	75 - 90%		Nil
	50 - 75%	Beagle AMP Flinders AMP Batemans MP Beware Reef MS Kent Group MR	Nil
	25 - 50%	Jervis Bay AMP/ MP	
	10 – 25%	Freycinet AMP Ninety Mile Beach MNP	East Gippsland AMP Cape Howe MNP
	< 10%	Hunter AMP Central Eastern AMP Corner Inlet Ramsar Wetland Corner Inlet MNP Corner Inlet NP Wilsons Promontory MP Wilsons Promontory MR Port Stephens Great Lakes MP Flood Plain Lower Ringarooma River Ramsar Wetland Gippsland Lakes Ramsar wetland Nooramunga Marine and Coastal Park	Beagle AMP Flinders AMP Point Hicks MNP Batemans MP Beware Reef MS Kent Group MR

Modelling predicts that a light crude spill may intersect the coastline after approximately 3 days at locations around:

- Point Hicks (Croajingolong National Park)
- Gabo Island

As such, and in addition to the modules that are required to monitor the spill, within 48 hours the following modules may be initiated and resources mobilised to the **priority monitoring locations** listed above:

- O3 Shoreline assessment
- O4 Fauna observations
- O5 Air quality sampling
- O6 Sediment sampling
- S1 Hydrocarbons in intertidal sediments and water
- S4 Short term impacts to oiled flora and fauna

These modules are to be implemented to allow any potential impacts to identified natural values that are present in the area at which intersection of the coastal zone may occur. All identified environmental receptors in the area will be subject to monitoring. Sufficient resources are available to undertake monitoring and these are detailed in the OSMP.

In accordance with the timeframes for module implementation outlined in the OSMP, all of the above modules can be implemented within 48 hours (in most cases, sooner) at the priority monitoring locations. Timing for implementation of the remaining scientific modules will be as detailed in the module.

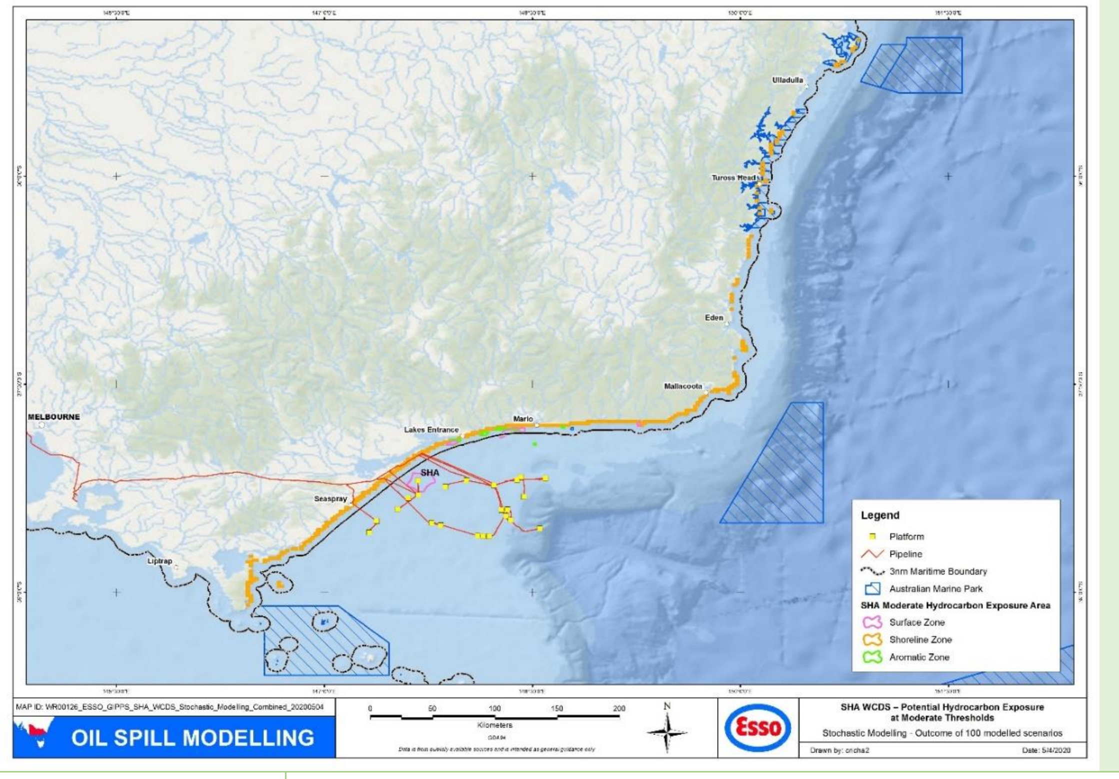
NOTE:

Seahorse wells were plugged and abandoned in 2020 and so this scenario is no longer possible, however, this scenario has been retained as an example of a crude oil spill close to shore

Information specific to a well blowout (WCDS) from the Seahorse subsea facility during base business operations is provided below. For further details, refer to the Bass Strait Environment Plan (AUGO-EV-EMM-002 & AUGO-EV-EMM-004).

1. Field Location / Oil properties

Location / operational area

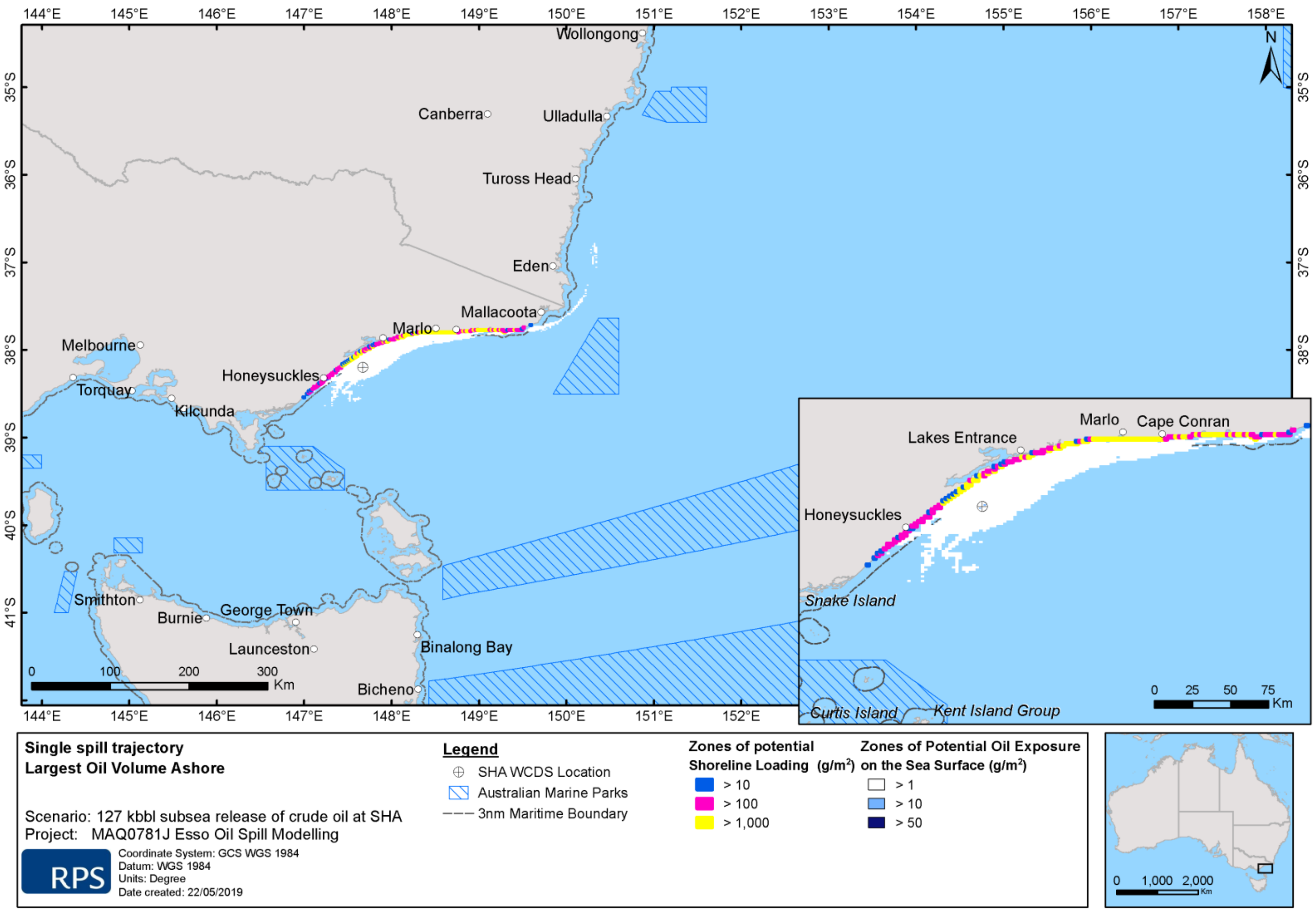


Production Licence No.	VIC/L18 Seahorse (SHA) subsea facility				
Coordinates	Latitude 38° 11' 42" S				
	Longitude 147° 40' 27" E				
Water Depth	43 m				
Oil types and name		West Seahorse - 3			
	Density @ 15˚C (kg/m³)	792.5 kg/m³			
	API	48			
	Dynamic Viscosity (cP @ 20°C)	2.0 cP @ 20ºC			
	Pour Point (ºC)	-15 ºC			
	Oil Property Category	Group II light persistent oils			
	Boiling Point Distribution (°C)	Volatile (<180°C) 36.0 %	Semi-volatile (180-265°C) 17.5 %	Low volatility (265-380°C) 34.0 %	Residual (>380°C) 12.5%

2. What's the worst that could happen?

	Seahorse (SHA)
Modelled Oil Pollution Scenario (WCDS)	Level 3 Spill A complete loss of well control (tubing flow only) resulting in a subsea release of crude until source control is effective (98 days – based on worst case scenario where relief well drilling is required).
Oil types and name	West Seahorse-3 crude
Release rate (bbl/day)	1296
Spill Volume (bbl)	127,000
Dominant Weathering process	Evaporation
Probability of contact to any shoreline (%)	100 (East Gippsland)
Absolute minimum time for visible oil to reach shoreline (hrs)	36 (at Ninety Mile Beach)
Maximum volume ashore (m^3)	3,123
Maximum length of the shoreline (km) at 10 g/m^2 at 100 g/m^2 at 1,000 g/m^2	 286 277 99
Weathering over the duration of LOWC (98 days) (based on deterministic modelling)	
Evaporation (%)	74 - 63
Decay (%)	18
Water column (%)	2
Surface/Shoreline (%)	6 – 15

Exposure –Shoreline



Zones of potential exposure on the sea surface and shoreline loading (over the 118 day simulation) for the trajectory with the largest oil volume ashore. Results are based on a 127,000 bbl subsea release of crude oil over 98 days at the Seahorse Subsea Facility, tracked for 118 days, 8 pm 7th of November 2008.

3. Resources at Risk

	Receptor	<12 hrs	12-48 hrs	>48 hrs	>1week (hrs)
Minimum time to oil exposure on surface at moderate threshold	BIAs:				
	• Seabirds – Foraging		✓		
	• Pygmy Blue Whale – Distribution/Foraging		✓		
	• Southern Right Whale – Migration		✓		
	• White Shark – Distribution/Breeding		✓		
	KEFs:				
	• Upwelling East of Eden				✓
	• Lakes Entrance				✓
	• Point Hicks				✓
Minimum time (hrs) to shoreline accumulation of oil at moderate threshold	• Ninety Mile Beach		36		
	• Seaspray		42		
	• Lakes Entrance		47		
	• Lake Tyers Beach			50	
	• Marlo			53	
	• Cape Conran			54	
	• Golden Beach			55	
	• McLoughlins Beach			59	
	• Point Hicks			72	
	• Cape Howe/Mallacoota			89	
	• Gabo Island			90	
	• Sydenham Inlet			99	
	• Croajingolong			101	
	• Bega Valley (southern NSW)				235
	• Clonmel Island				276
	• Snake Island				296
	• Wilsons Promontory				323
	• Eurobodalla (NSW)				338
	• Montague Island (NSW)				340
	• Shoal Haven (NSW)				734

Protection priorities based on sensitivity and predicted consequence (as per EP Volume 2), protectable/actionable areas, and minimum time to exposure in this area are:

Lakes Entrance permanently open river mouth to the Gippsland Lakes being a recognised Ramsar site, marine flora and fauna, marshes, wetlands, estuarine habitat, shorebird/seabird colonies, amenity beaches, surf club, commercial fishing, tourism, dive sites, recreational aquatic activities, waterway amenity access.

Lake Tyers due to sensitivity of waterway, Hooded plover habitat, recreational activities.

Marlo due to sensitivity of Snowy River estuary / mouth, recreational activities.

Mallacoota due to sensitivity of estuary mouth, Hooded plover habitat, nature based tourism, recreational activities.

Gabo Island due to high sensitivity, significant fauna populations (Little penguin colony, Seabird rookery, Fur seal colony), Giant Kelp.

Croajingolong National Park including **Sydenham Inlet, Betka Inlet, Wingan Inlet** (and The Skerries Fur seal colony).

Nadgee Lake and Nadgee River due to pristine coastal landscape within the Nadgee Nature Reserve (southern NSW), nature based tourism and significant Wilderness Area.

Wilsons Promontory very popular nature based tourism and recreational location, significant wetland and riparian habitats, Seabird rookery, Fur seal colony, Shorebird habitat, seagrass communities.

4. Strategic NEBA and selection of response options

Response Option	Benefits	Effectiveness on Light Crude Spill	Viable Response?	Net Benefit?
Source Control	Limit flow of hydrocarbons to environment.	Only viable option to stop flow of crude oil to the marine environment.	Yes	✓
Surveillance and Monitoring	Although surveillance is not an active intervention to treat or remove oil pollution, it is critical to effective response both in the initial stages of an incident and during ongoing response operations.	Surveillance and monitoring used to observe the direction of movement of the spill and natural break-up and dissipation of spill. Monitoring will also be used to assess the need for, and effectiveness of, active intervention.	Yes	✓
Dispersant Application	Dispersants act by allowing hydrocarbons to be mixed into the upper layers of the water column, which accelerates the biodegradation process. Removes oil from the water surface, protecting leeward shorelines and providing benefit to sea-surface air breathing fauna. Use of dispersants may eliminate, or minimise oil impacting sensitive resources including Gabo Island, Wilsons Promontory	A considerable proportion of the West Seahorse-3 crude should evaporate within the first 24 hrs. However, about 12.5% of the crude is considered persistent and so use of dispersant may reduce volume of oil impacting shorelines. Laboratory testing has shown dispersant to be highly effective on fresh Bass Strait crude (48-99% effective), with effectiveness decreasing significantly after 12 hours of weathering. Dispersants should be applied to fresh oil closest to the source to maximize effectiveness.	Yes	✓
Containment & Recovery (Vessel Based)	Booms and skimmers to contain surface oil where there is a potential threat to environmental sensitivities. Relies on calm sea conditions, thicknesses >10µm to collect and adequate deployment timeframes.	Suitable thickness for recovery will be present for only a short period, making containment and recovery viable but likely of low effectiveness. In Bass Strait sea conditions likely to be suitable for containment and recovery operations only 50% of the time.	Yes	✓
Protection of Sensitive Shoreline Resources	Booms and skimmers deployed to protect environmental sensitivities. Environmental conditions (e.g. current, waves) limit application.	Light crude released at the SHA platform may contact the shoreline along the Gippsland coast from Wilsons Promontory to the NSW border and extending along the southern coast of NSW with modelling predicting shortest time of recoverable levels to shore as approximately 1.5 days. Tactical Response Plans have been developed to protect Gabo Island and sensitive estuary openings along this section of coastline.	Yes	✓
Shoreline Clean-up	Last response strategy to remove oil from the environment due to potential impact.	There are various shoreline techniques that are appropriate for this type of hydrocarbon, a shoreline clean-up may be effective for reducing shoreline loadings where access is possible, to be assessed on a case-by-case basis	Yes	✓
Oiled Wildlife Response (OWR)	Consists of capture, cleaning and rehabilitation of oiled wildlife. May include hazing or pre-emptive captive management.	OWR is likely to be required as a result of extensive shoreline oiling.	Yes	✓

5. Response Resources Required

Response Option	Strategy	Resource	Timeframe
Source Control	ROV debris clearing / subsea intervention	1 x ROV and 1 x vessel SFRT (via AMOSC) and 1 x vessel 1 x contract well control specialists (WWC/OSRL)	Estimated 5 days (from call out request to arrival in Victoria) Estimated 7 days (from Perth to BBMT via road transport) 2 days (from Singapore)
	Relief well	1 x MODU (via APPEA mutual aid agreement) 1 x contract engineering support (WWC/OSRL) Well construction material	Estimated 85 days (via HLV from Singapore)
Surveillance and Monitoring	OSMP O1.1 Weather and Sea State	N/A	
	OSMP O1.2 Trajectory Estimation	1 x contracted modeller.	
	OSMP Module O1.3 and O4.1 Aerial surveillance	1x observer per aircraft. Aircraft to have 100nm range and 3 hour duration.	Initial overflight <4 hours service requested. Trained observer <12 hours of spill occurring.
	OSMP Module O1.4 Tracking buoy	1x buoy available.	Deployed <12 hrs of spill occurring (dependent on weather conditions) (Level 2 & 3 spill).
	OSMP O1.5 Satellite Imagery	1 x contract.	
	OSMP Module O2.1 and O2.3 Water and Oil Sampling	1x vessel. 1x initial sampling kit. 1x contract with laboratory.	Samples obtained <24 hrs of spill occurring. Analysis initiated <24 hours of receipt in laboratory.
Aerial dispersant	Dispersant Aircraft	Maximum 10.3 m^3/day Total volume 1,014 m^3 1 x AT-802 Air Tractors carrying out 4 sorties per day. 1 x observation platform	1 x Air Tractor required within 24 hours
Offshore Containment & Recovery	Boom Skimming system Vessels	1 x 200m 1 2 (1 strike teams)	1 strike team required within 48 hours

Response Option	Strategy	Resource	Timeframe
Protection of Sensitive Shoreline Resources*1	Personnel	84 Foreman 245 Labourers 189 Specialised Operators	Required within 48 hours*3 27 Foreman 82 Labourers 63 Specialised Operators
	OSR Equipment	3,250m x Shoreboom 2,025m x Near shore boom 1 x Offshore skimming system 12 x Fast Tanks Anchor kits + accessories	Required within 48 hours*3 650m x Shoreboom 650m x Near shore boom 1 x Offshore skimming system 12 x Fast Tanks Anchor kits + accessories
	Vehicles and Vessels	1 x offshore/nearshore (Ro-Boom) 1 x Nearshore C&R 5 x workboat – equipment transport 5 x workboat – shallow draft 15 x UTV 14 x Front End Loader / Dozer	Required within 48 hours*3 1 x offshore/nearshore (Ro-Boom) 1 x Nearshore C&R 2 x workboat – equipment transport 2 x workboat – shallow draft 1 x UTV 1 x Front End Loader / Dozer
Shoreline Clean-up*2	Personnel	188 Foreman 1,614 Labourers 124 Specialised Operators	Required within 24 hours 4 x Foreman 20 x Labourers 4 x Specialised Operators
	Vehicles and Vessels	78 x ATV 78 x Truck/Vehicle 24 x Front End Loader / Dozer 41 x Dump Truck 24 x Landing craft / barge	Required within 24 hours 2 x Truck/Vehicle
	OSR Equipment	25 x Pump 25 x skimmer w/pump 1,400m x Inshore Boom 1,400m x Sorbent boom/snares 240m x Shoreline flushing pipe	
	Manual Equipment	2,600 x Shovels 2,600 x Rakes 2,600 x Picks 130,000 x Plastic Bags 540 x Wheel barrows	Required within 24 hours 2 x Shoreline Response Trailers
Oiled Wildlife Response*4	Personnel	1 Foreman 8 Specialised Operators	4 x Specialised Operators within 24 hours
	Equipment	1 x OWR First Strike Kit 2 x IBC 1 x Response Toolkit	
	Vehicles and Vessels	2 x UTV 1 x Vessel – personnel /equipment	

*1-4 Calculated resources requirement are for planning purposes only. Actual response strategies and resource needs to be determined in consultation with the State control agency.

*1 Based on simultaneous implementation of all TRP's from Merriman Creek (Vic) through to Nullica River (NSW).

*2 Based on peak volume on shoreline with predicted loading of 100 mg/m^3 or greater and >10% probability shoreline impact within the sub-local government area. Assumed 10% of the shoreline being cleaned up in any 1 day (and a continuous re-oiling of the shoreline). 10% shoreline clean up used for planning purposes only. Actual resources to be determined in consultation with State control agency.

*3 Based on simultaneous implementation of all TRP's with shoreline impact predicted within 48hrs, that is Lakes Entrance to Snowy River (Marlo).

*4 Initial OWR response resources. Additional resource needs to be determined by State control agency.

Relevant Tactical Response Plan (TRP)	**Victoria**	**NSW**
	Merriman Creek (Seaspray)	Wonboyn River
	Lakes Entrance	Bittangabee Bay
	Lake Bunga	Woodburn & Saltwater Creek
	Lake Tyers	Fisheries Creek
	Snowy River (Marlo)	Towamba River
	Yeerung River	Boydtown Creek
	Sydenham Inlet (Bemm River)	Nullica River
	Tamboon Inlet	
	Mueller River	
	Thurra River	
	Wingan Inlet	
	Shipwreck Creek	
	Bekta River	
	Davis Creek	
	Mallacoota	
	Gabo Island	

6. Oil Spill Monitoring

		0-10m	10-20m
Sensitivities – **Probability of contact with dissolved hydrocarbons at moderate threshold**	> 90%	Nil	Nil
	75 - 90%	Nil	Nil
	50 – 75%	Nil	Nil
	25 – 50%	Nil	Nil
	10 – 25%	Nil	Nil
	< 10%	Pygmy Blue Whale distribution and foraging BIA Southern Right Whale migration BIA Seabirds foraging BIAs KEF: Upwelling East of Eden **Sub-LGA** • Corringle • Lake Tyers Beach • Marlo	White Shark distribution/breeding BIA Pygmy Blue Whale distribution and foraging BIA Southern Right Whale migration BIA Seabirds foraging BIAs KEF: Upwelling East of Eden **Sub-LGA** • Corringle • Lake Tyers Beach • Lakes Entrance
		0-10	**10-20**
Marine Parks – **Probability of contact with entrained hydrocarbons at the low threshold**	> 90%	Cape Howe MNP Point Hicks MNP Beware Reef Marine Sanctuary	Nil
	75 - 90%	Nil	Nil
	50 - 75%	Nil	Nil
	25 - 50%	East Gippsland AMP Ninety Mile Beach MNP Gippsland Lake Ramsar wetland	Nil
	10 – 25%	Beagle AMP Batemans MP	Nil

		0-10m	10-20m
	< 10%	Flinders AMP Kent Group NP	Nil

Modelling predicts that a light crude spill may intersect the coastline after approximately 36 hours at:

- Ninety Mile Beach

And after approximately 48 hours at locations around:

- Lakes Entrance
- Lake Tyers Beach
- Marlo
- Cape Conran

As such, and in addition to the modules that are required to monitor the spill, within 48 hours the following modules may be initiated and resources mobilised to the **priority monitoring locations** listed above:

- O3 Shoreline assessment
- O4 Fauna observations
- O5 Air quality sampling
- O6 Sediment sampling
- S1 Hydrocarbons in intertidal sediments and water
- S4 Short term impacts to oiled flora and fauna

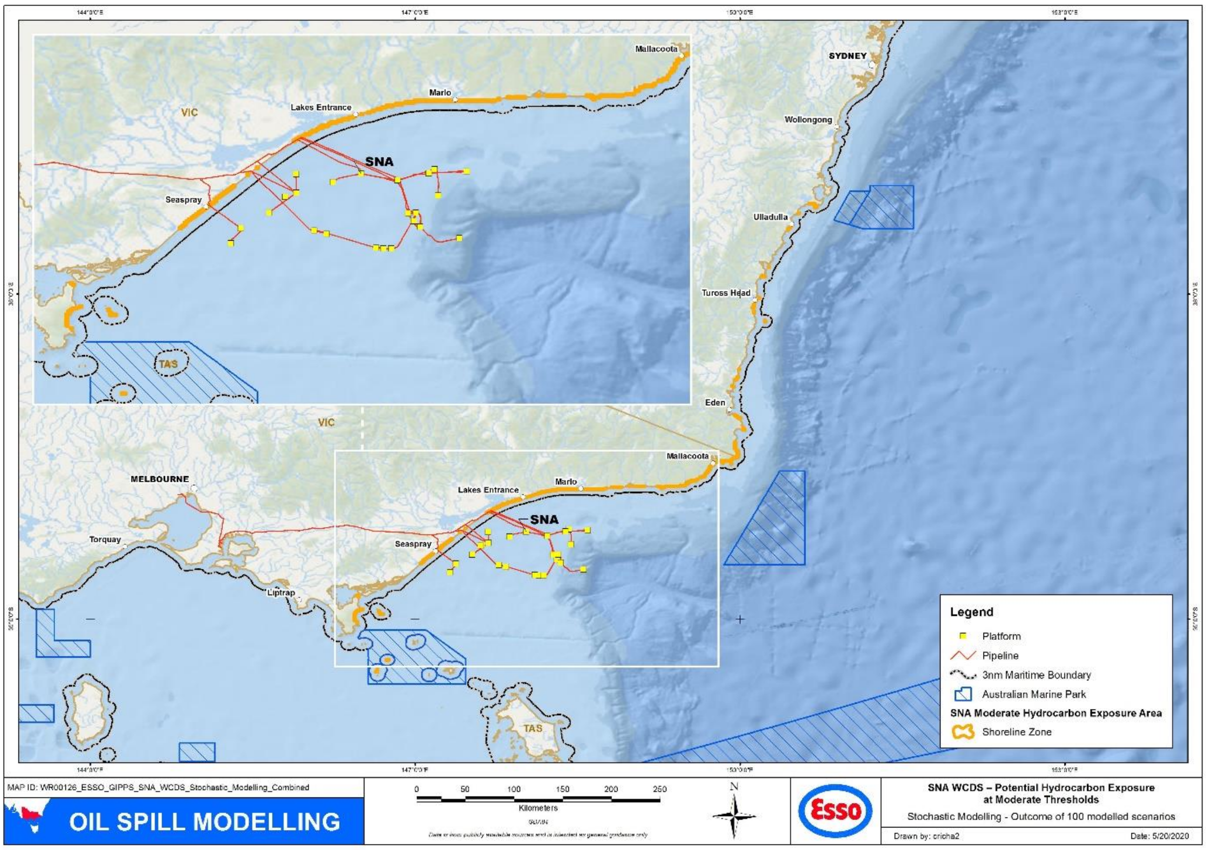
These modules are to be implemented to allow any potential impacts to identified natural values that are present in the area at which intersection of the coastal zone may occur. All identified environmental receptors in the area will be subject to monitoring. Sufficient resources are available to undertake monitoring and these are detailed in the OSMP**.**

In accordance with the timeframes for module implementation outlined in the OSMP, all of the above modules can be implemented within 48 hours (in most cases, sooner) at the priority monitoring locations. Timing for implementation of the remaining scientific modules will be as detailed in the module.

Information specific to a well blowout (WCDS) from the Snapper platform during base business operations is provided below. For further details, refer to the Bass Strait Environment Plan (AUGO-EV-EMM-002 & AUGO-EV-EMM-004).

1. Field Location / Oil properties

Location / operational area



Production Licence No.	VIC/L10 Snapper (SNA) platform
Coordinates	Latitude 38°11' 42" S
	Longitude 148° 01' 26 E

Oil type and name	**Moonfish Crude***	
	Density @ 15˚C (kg/m³)	833.5
	API	38.2
	Dynamic Viscosity (cP @ 40°C)	4.562
	Pour Point (ºC)	33
	Oil Property Category	Group IV heavy persistent oils

	Composition	
	Aromatics (%)[1]	17.4
	Saturates (%)	43.0
	Wax Content (%)	39.6
	Volatile (%) (BP <180°C)	30.5
	Semi-volatile (%) (BP 180 - 265°C)	19.09
	Low volatility (%) (BP 265 - 380°C)	35.15
	Residual (%) (BP> 380°C)	15.26

*Leeder Analytical Report No. L190353 Physical Testing on Moonfish Crude Oil dated 16 December 2019

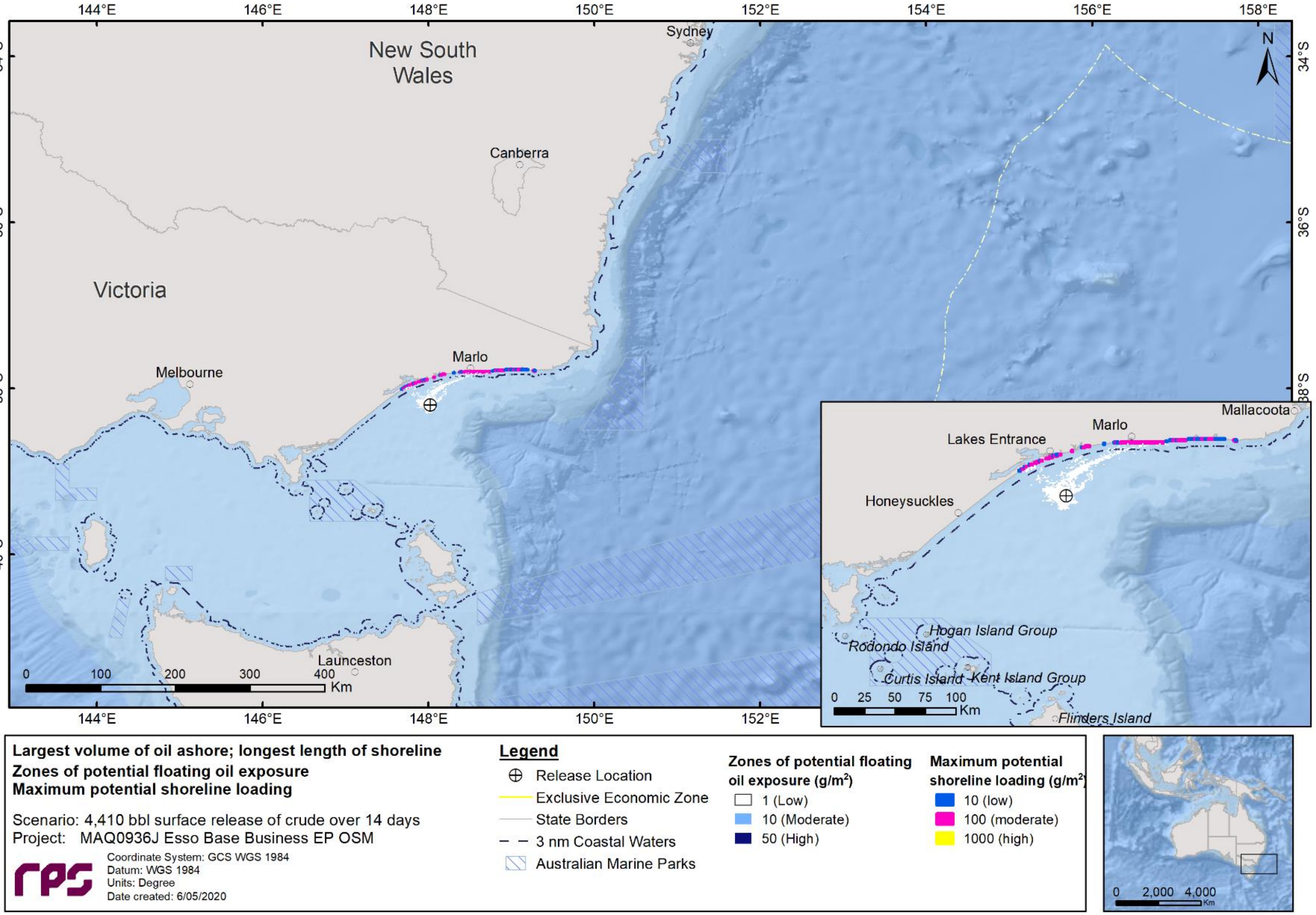
[1] *Soluble, aromatic, hydrocarbons, (including BTEX), tend to evaporate into the atmosphere.*

2. What's the worst that could happen?

	Snapper (SNA)
Modelled Oil Pollution Scenario (WCDS)**	<u>Level 3 Spill</u> A complete loss of well control (tubing flow to surface only) resulting in a release of crude until source control is effective (14 days).
Oil type and name	Moonfish Crude
Release rate (bbl/day)	315
Spill Volume (bbl)	4,410
Dominant Weathering process	Evaporation
Approximate evaporation rate (depending on temperature)	
within the first 12 hours	7.15%
within the first 24 hours	a further 28.75%
over several days.	a further 46.9%
Probability of contact to any shoreline (%)	64 (East Gippsland in particular Gabo Island)
Absolute minimum time for visible oil to shore	3 days (at Gabo Island)
Maximum volume ashore (m^3)	183
Maximum length of the shoreline (km) **at 10 g/m^2** **at 100 g/m^2** **at 1,000 g/m^2**	 98 66 5
Weathering over the duration of LOWC (98 days) (based on deterministic modelling)	
Evaporation (%)	62 - 55
Decay (%)	9 - 16
Water column (%)	3 - 6
Surface (%)	1 - 32
Shoreline (%)	25 - 0

**RPS Report MAQ0936J Base Business Operations in the Gippsland Basin Oil Spill Modelling dated 18 May 2020. Note this modelling used results from Leeder Analytical Report No. L190131 Chemical and Physical Testing of Seven Crude and Condensates dated 31 May 2019.

Exposure - Shoreline



Zones of potential exposure on the sea surface and shoreline for the trajectory with the largest volume of shoreline loading and longest length of shoreline contact. Results are based on a 4,410 bbl surface release of Moonfish Crude over 14 days at Snapper Platform, tracked for 44 days. 6 am 21st January 2011.

3. Resources at Risk

	Receptor	<12 hrs	12-48 hrs	>48 hrs	>1week (days)
Minimum time to oil exposure on surface at moderate threshold	There is no predicted oil exposure on the sea surface at the moderate threshold.				
Minimum time to shoreline accumulation of oil at moderate threshold	• Montague Island (NSW)				14 days
	• Shoal Haven (NSW)				19 days
	• Eurobodalla (NSW)				19 days
	• Bega Valley (southern NSW)			144 hrs	
	• Croajingolong			144 hrs	
	• Gabo Island			96 hrs	
	• Cape Howe / Mallacoota			144 hrs	
	• Point Hicks			84 hrs	
	• Sydenham Inlet				11 days
	• Cape Conran				9 days
	• Marlo			144 hrs	
	• Corringle				9 days
	• Lake Tyers Beach				7 days
	• Lakes Entrance				7 days
	• Ocean Grange				20 days
	• Seaspray				13 days
	• Golden Beach				20 days
	• Woodside Beach				13 days
	• Seal Islands				10 days
	• Wilsons Promontory				21 days
	• Corner Inlet				21 days

Protection priorities based on sensitivity and predicted consequence (as per EP Volume 2), protectable/actionable areas, and minimum time to exposure in this area are:

Gabo Island due to high sensitivity and significant fauna populations (Little penguins, Storm petrels, Hooded plover, Fur seals).

Croajingolong National Park including **Sydenham Inlet, Betka Inlet, Wingan Inlet** (and The Skerries Fur seal colony).

Mallacoota due to sensitivity of estuary mouth, Hooded plover habitat

Nadgee Lake and Nadgee River due to pristine coastal landscape within the Nadgee Nature Reserve (southern NSW), nature based tourism and significant Wilderness Area.

Marlo due to sensitivity of Snowy River estuary / mouth, recreational activities.

Lakes Entrance permanently open river mouth to the Gippsland Lakes being a recognised Ramsar site, marine flora and fauna, marshes, wetlands, estuarine habitat, shorebird/seabird colonies, amenity beaches, surf club, commercial fishing, tourism, dive sites, recreational aquatic activities, waterway amenity access.

Lake Tyers due to sensitivity of waterway, Hooded plover habitat, recreational activities.

4. Strategic NEBA and selection of response options

Response Option	Benefits	Effectiveness on Light Crude Spill	Viable Response?	Net Benefit?
Source Control	Limit flow of hydrocarbons to environment.	Only viable option to stop flow of crude oil to the marine environment.	Yes	✓
Surveillance and Monitoring	Although surveillance is not an active intervention to treat or remove oil pollution, it is critical to effective response both in the initial stages of an incident and during ongoing response operations.	Surveillance and monitoring used to observe the direction of movement of the spill and natural break-up and dissipation of spill. Monitoring will also be used to assess the need for, and effectiveness of, active intervention.	Yes	✓
Dispersant Application	Dispersants act by allowing hydrocarbons to be mixed into the upper layers of the water column, which accelerates the biodegradation process. Removes oil from the water surface, protecting leeward shorelines and providing benefit to sea-surface air breathing fauna. Use of dispersants may eliminate, or minimise oil impacting sensitive resources including Gabo Island.	Pour point of this oil is 33ºC and so solid masses are likely to form at ambient sea temperature limiting the ability to apply dispersant. Laboratory test of dispersant effectiveness on fresh Moonfish crude indicates low efficacy (<4%). Modelling indicates no surface accumulation of oil at moderate (or actionable) threshold of 10g/m^2	Not viable	X
Containment & Recovery (Vessel Based)	Booms and skimmers to contain surface oil where there is a potential threat to environmental sensitivities. Relies on calm sea conditions, thicknesses >10µm to collect and adequate deployment timeframes. Targeted containment and recovery can be utilised to reduce impact to sensitive areas such as Gabo Island where access for shoreline protection is limited (see below: Protection of Sensitive Shoreline Resources).	Modelling indicates no surface accumulation of oil at moderate (or actionable) threshold of 10g/m^2, however, containment and recovery maybe a viable strategy should operational monitoring indicate the sufficient quantities of oil. In Bass Strait sea conditions likely to be suitable for containment and recovery operations only 50% of the time.	Unlikely	✓
Protection of Sensitive Shoreline Resources	Booms and skimmers deployed to protect environmental sensitivities. Environmental conditions (e.g. current, waves) limit application.	Crude is predicted to impact shorelines in east Gippsland within 3 days. Tactical Response Plans have been developed to protect sensitive estuary openings along this section of coastline.	Yes	✓
Shoreline Clean-up	Last response strategy to remove oil from the environment due to potential impact.	There are various shoreline techniques that are appropriate for this type of hydrocarbon, a shoreline clean-up may be effective for reducing shoreline loadings where access is possible, to be assessed on a case-by-case basis	Yes	✓
Oiled Wildlife Response (OWR)	Consists of capture, cleaning and rehabilitation of oiled wildlife. May include hazing or pre-emptive captive management.	OWR is likely to be required as a result of shoreline oiling.	Yes	✓

5. Response Resources Required

Response Option	Strategy	Resource	Timeframe
Source Control	ROV debris clearing / subsea intervention	1 x ROV and 1 x vessel SFRT (via AMOSC) and 1 x vessel 1 x contract well control specialists (WWC/OSRL)	Estimated 5 days (from call out request to arrival in Victoria) Estimated 7 days (from Perth to BBMT via road transport) 2 days (from Singapore)
	Relief well	1 x MODU (via APPEA mutual aid agreement) 1 x contract engineering support (WWC/OSRL) Well construction material	Estimated 85 days (via HLV from Singapore)
Surveillance and Monitoring	OSMP O1.1 Weather and Sea State	N/A	
	OSMP O1.2 Trajectory Estimation	1 x contracted modeller.	
	OSMP Module O1.3 and O4.1 Aerial surveillance	1x observer per aircraft. Aircraft to have 100nm range and 3 hour duration.	Initial overflight <4 hours service requested. Trained observer <12 hours of spill occurring.
	OSMP Module O1.4 Tracking buoy	1x buoy available.	Deployed <12 hrs of spill occurring (dependent on weather conditions) (Level 2 & 3 spill).
	OSMP O1.5 Satellite Imagery	1 x contract.	
	OSMP Module O2.1 and O2.3 Water and Oil Sampling	1x vessel. 1x initial sampling kit. 1x contract with laboratory.	Samples obtained <24 hrs of spill occurring. Analysis initiated <24 hours of receipt in laboratory.
Aerial dispersant		Not Required	
Offshore Containment & Recovery	Boom Skimming system Vessels	1 x 200m 1 2 (1 strike teams)	1 strike team required within 48 hours
Protection of Sensitive Shoreline Resources[*1]	Personnel	57 Foreman 165 Labourers 129 Specialised Operators	Required within 72 hours[*3] 19 Foreman 49 Labourers 44 Specialised Operators

Response Option	Strategy	Resource	Timeframe
	OSR Equipment	2,225m x Shoreboom 1,1755m x Near shore boom Anchor kits + accessories	Required within 72 hours*3 1000m x Shoreboom 100m x Near shore boom 12 x Fast Tanks Anchor kits + accessories
	Vehicles and Vessels	3 x workboat – equipment transport 6 x workboat – shallow draft 13 x UTV 11 x Front End Loader / Dozer	Required within 72 hours*3 1 x workboat – shallow draft 7 x UTV 6 x Front End Loader / Dozer
Shoreline Clean-up*2	Personnel	38 Foreman 318 Labourers 28 Specialised Operators	Required within 24 hours 2 x Truck/Vehicle
	Vehicles and Vessels	16 x ATV 16 x Truck/Vehicle 6 x Front End Loader / Dozer 8 x Dump Truck 6 x Landing craft/barge	
	OSR Equipment	6 x Pump 6 x skimmer w/pump 272m x Inshore Boom 272m x Sorbent boom/snares 47m x Shoreline flushing pipe	Required within 24 hours 2 x Shoreline Response Trailers
	Manual Equipment	500 x Shovels 500 x Rakes 500 x Picks 25,000 x Plastic Bags 110 x Wheel barrows	4 x Specialised Operators within 24 hours
Oiled Wildlife Response*4	Personnel	1 Foreman 8 Specialised Operators	4 x Specialised Operators within 24 hours
	Equipment	1 x OWR First Strike Kit 2 x IBC 1 x Response Toolkit	
	Vehicles and Vessels	2 x UTV 1 x Vessel – personnel /equipment	

*1-4 Calculated resources requirement are for planning purposes only. Actual response strategies and resource needs to be determined in consultation with the State control agency.

*1 Based on simultaneous implementation of all TRP's with >10% moderate shoreline contact.

*2 Based on peak volume on shoreline with predicted loading of 100 mg/m^3 or greater for sectors with >10% probability of shoreline loading. Assumed 10% of the shoreline being cleaned up in any 1 day (and a continuous re-oiling of the shoreline). 10% shoreline clean up used for planning purposes only. Actual resources to be determined in consultation with State control agency.

3* Based on simultaneous implementation of all TRP's with shoreline impact predicted within 48hrs, that is Mueller River to Mallacoota.

4* Initial OWR response resources. Additional resource needs to be determined by State control agency.

Relevant Tactical Response Plan (TRP)	**Victoria** Merriman Creek (Seaspray) Lakes Entrance Lake Bunga Lake Tyers Snowy River (Marlo) Yeerung River Sydenham Inlet (Bemm River) Tamboon Inlet Mueller River Thurra River Wingan Inlet Shipwreck Creek Bekta River Davis Creek Mallacoota	**NSW** Wonboyn River Bittangabee Bay Woodburn & Saltwater Creek Fisheries Creek Towamba River Boydtown Creek Nullica River

6. Oil Spill Monitoring

		0-10m	10-20m
Sensitivities – **Probability of contact with dissolved hydrocarbons at the moderate threshold**	> 90%	nil	nil
	75 - 90%	nil	nil
	50 – 75%	nil	nil
	25 – 50%	nil	nil
	10 – 25%	nil	nil
	< 10%	nil	nil

		0-10	10-20
Marine Parks – **Probability of contact with entrained hydrocarbons at the low threshold**	> 90%	nil	nil
	75 - 90%	Point Hicks MNP	nil
	50 - 75%	Cape Howe MNP	nil
	25 - 50%	nil	nil
	10 – 25%	East Gippsland AMP Beware Reef Marine Sanctuary	nil
	< 10%	Beagle AMP Batemans MP Jervis Bay MP Kent Group NP	nil

Modelling predicts that a light crude spill may intersect the coastline after approximately 3 days at locations around:

- Point Hicks (Croajingolong National Park)
- Gabo Island

As such, and in addition to the modules that are required to monitor the spill, within 48 hours the following modules may be initiated and resources mobilised to the **priority monitoring locations** listed above:

- O3 Shoreline assessment
- O4 Fauna observations
- O5 Air quality sampling
- O6 Sediment sampling
- S1 Hydrocarbons in intertidal sediments and water
- S4 Short term impacts to oiled flora and fauna

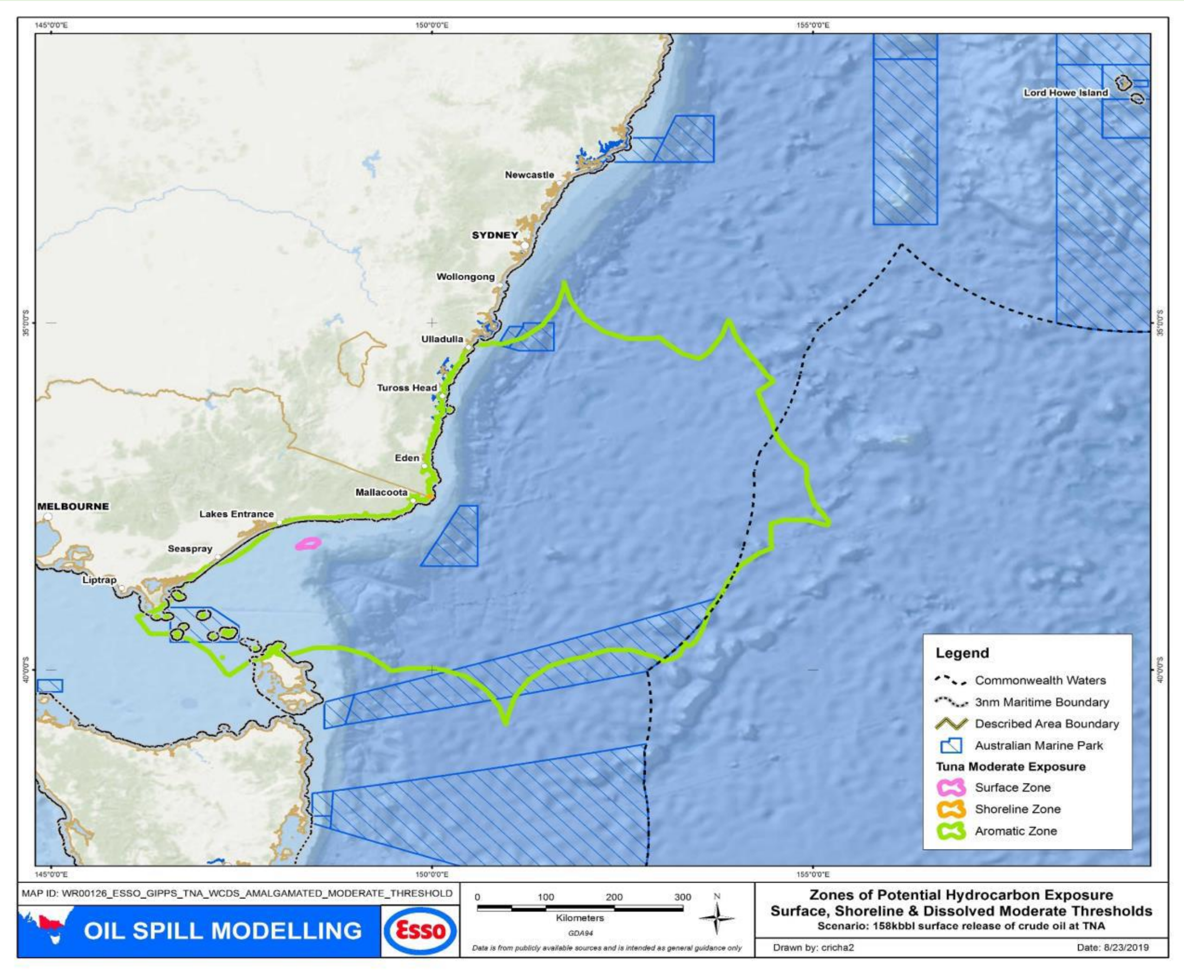
These modules are to be implemented to allow any potential impacts to identified natural values that are present in the area at which intersection of the coastal zone may occur. All identified environmental receptors in the area will be subject to monitoring. Sufficient resources are available to undertake monitoring and these are detailed in the OSMP**.**

In accordance with the timeframes for module implementation outlined in the OSMP, all of the above modules can be implemented within 48 hours (in most cases, sooner) at the priority monitoring locations. Timing for implementation of the remaining scientific modules will be as detailed in the module.

Information specific to a well blowout (WCDS) from the Tuna platform during base business operations is provided below. For further details, refer to the Bass Strait Environment Plan (AUGO-EV-EMM-002 & AUGO-EV-EMM-004).

1. Field Location / Oil properties

Location / operational area



Production Licence No.	VIC/L09 Tuna (TNA) platform	
Coordinates	Latitude 38°10' 16" S	
	Longitude 148° 25’ 05” E	

Oil types and name		**Flounder Crude**
	Density @ 15˚C (kg/m^3)	799.9
	API	45.3
	Dynamic Viscosity (cP @ 25°C)	2.8
	Pour Point (ºC)	18
	Oil Property Category	Group IV heavy persistent oils

	Composition	
	Aromatics (%)[1]	15.6%
	Emulsion Water Content (%)	22%
	Saturates (%)	82.6%
	Wax Content (%)	32%
	Volatile (BP <180°C)	9.1%
	Semi-volatile (BP 180 - 265°C)	36.6%
	Low volatility(BP 265 - 380°C)	39.1%
	Residual (BP> 380°C)[2]	15.0%

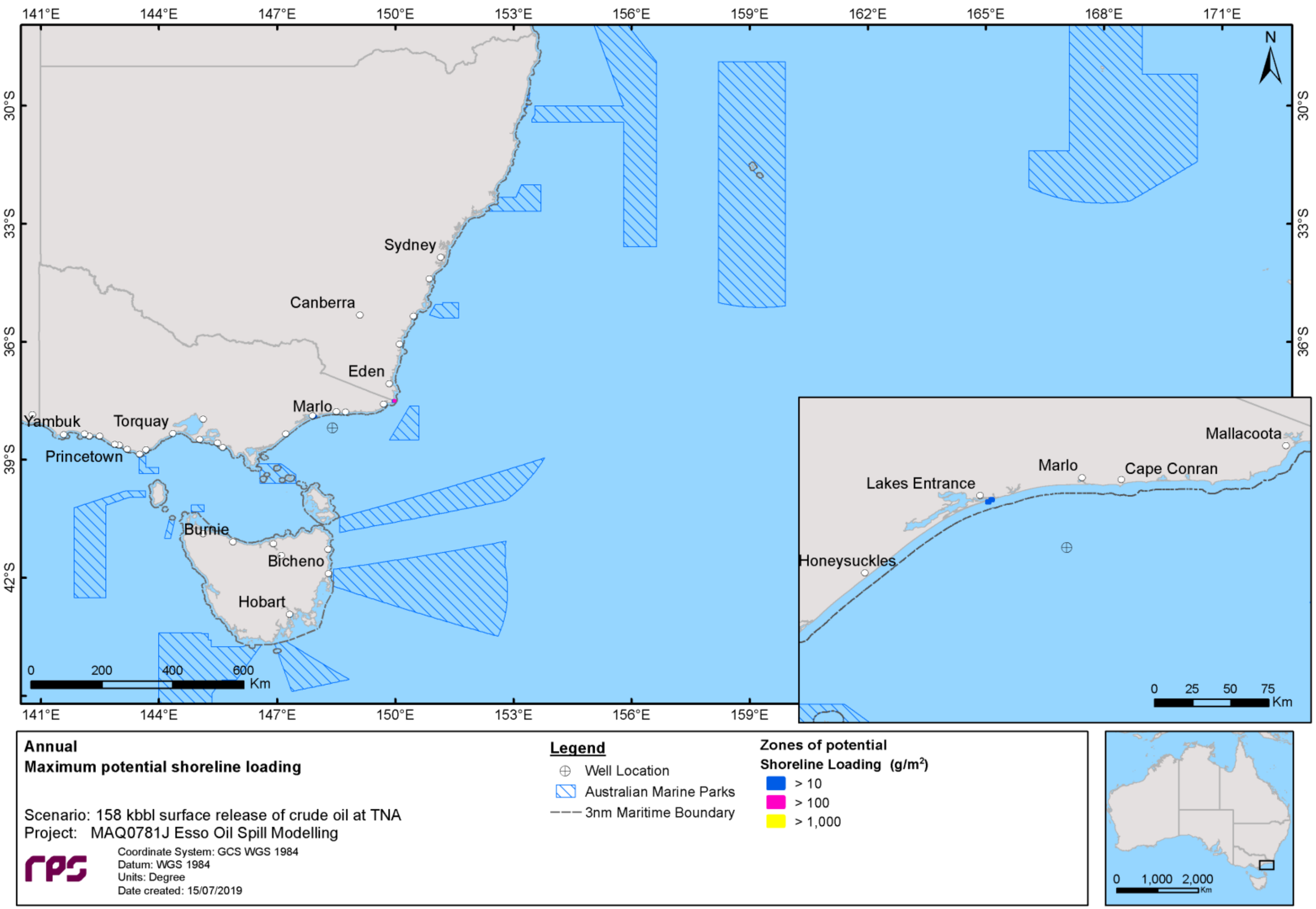
1 *Soluble, aromatic, hydrocarbons, (including BTEX), tend to evaporate into the atmosphere.*

2 *Residual Hydrocarbons will persist in the marine environment. It will remain in a liquid state when released into the environment over the annual temperatures observed in the Gippsland Basin*

2. What's the worst that could happen?

	Tuna (TNA)
Modelled Oil Pollution Scenario (WCDS)	Level 3 Spill A complete loss of well control (tubing flow to surface only) resulting in a release of crude until source control is effective (98 days – based on worst case scenario where relief well drilling is required).
Oil types and name	Flounder Crude
Release rate (bbl/day)	1,612
Spill Volume (bbl)	158,000
Dominant Weathering process	Evaporation
Approximate evaporation rate (depending on temperature)	
within the first 12 hours	9.1%
within the first 24 hours	36.6%
over several days.	39.1%
Probability of contact to any shoreline (%)	10 (East Gippsland – at Cape Howe/Mallacoota)
Absolute minimum time for visible oil to reach shoreline (hrs)	596 (East Gippsland – at Cape Howe/Mallacoota)
Maximum volume ashore (m^3)	6
Maximum length of the shoreline (km) at 10 g/m^2 at 100 g/m^2 at 1,000 g/m^2	 5 2 -
Weathering over the duration of LOWC (98 days) (based on deterministic modelling)	
Evaporation (%)	53%
Decay (%)	39%
Water column (%)	8%
Surface/Shoreline (%)	<1%

Exposure - Surface



Maximum potential shoreline loading for the low (≥ 10 g/m²), moderate (≥ 100 g/m²) and high (≥ 1,000 g/m²) thresholds. Results are based on a 158,000 bbl surface release of Flounder Crude over 98 days at Tuna Platform, tracked for 118 days. The results were calculated from 100 spill trajectories.

3. Resources at Risk

	Receptor	<12 hrs	12-48 hrs	>48 hrs	>1week (hrs)
Minimum time to oil exposure on surface at moderate threshold	BIAs: • Seabirds – Foraging • Pygmy Blue Whale – Distribution/Foraging • Southern Right Whale – Migration • White Shark – Distribution KEFs: • Upwelling East of Eden Note not predicted to contact State waters	 ✓ ✓ ✓ ✓ ✓			
Minimum time (hrs) to shoreline accumulation of oil at the moderate threshold	• Bega Valley (southern NSW)				596

Protection priorities based on sensitivity and predicted consequence (as per EP Volume 2), protectable/actionable areas, and minimum time to exposure in this area are:

Nadgee Lake and Nadgee River due to pristine coastal landscape within the Nadgee Nature Reserve (NSW) and significant Wilderness Area

4. Strategic NEBA and selection of response options

Response Option	Benefits	Effectiveness on Light Crude Spill	Viable Response?	Net Benefit?
Source Control	Limit flow of hydrocarbons to environment.	Only viable option to stop flow of crude to the marine environment.	Yes	✓
Surveillance and Monitoring	Although surveillance is not an active intervention to treat or remove oil pollution, it is critical to effective response both in the initial stages of an incident and during ongoing response operations.	Surveillance and monitoring used to observe the direction of movement of the spill and natural break-up and dissipation of spill. Monitoring will also be used to assess the need for, and effectiveness of, active intervention.	Yes	✓
Dispersant Application	Dispersants act by allowing hydrocarbons to be mixed into the upper layers of the water column, which accelerates the biodegradation process. Removes oil from the water surface, protecting leeward shorelines and providing benefit to sea-surface air breathing fauna.	Over 40% of the Flounder crude should evaporate within the first 24 hrs. Pour point of this oil is 18C and so solid masses are likely to form in cold water/weather limiting the opportunity to apply dispersant, however, laboratory testing has shown dispersant to be highly effective on fresh Flounder crude (48-99% effective), with effectiveness decreasing significantly after 12 hours of weathering. Dispersants should be applied to fresh oil closest to the source to maximize effectiveness. Note: the TNA platform is located far enough offshore for modelling to predict that a worst-case crude oil spill poses only a minor threat to the coastline or sensitivities within State waters.	Unlikely	x
Containment & Recovery (Vessel Based)	Booms and skimmers to contain surface oil where there is a potential threat to environmental sensitivities. Relies on calm sea conditions, thicknesses >10µm to collect and adequate deployment timeframes.	Modelling indicates that suitable thickness of oil will be available for making containment and recovery viable but likely of low effectiveness. In Bass Strait sea conditions likely to be suitable for containment and recovery operations only 50% of the time.	Yes	✓
Protection of Sensitive Shoreline Resources	Booms and skimmers deployed to protect environmental sensitivities. Environmental conditions (e.g. current, waves) limit application.	Light crude released at the TNA platform may contact the shoreline along the far east Gippsland coast and the southern coast of NSW, with modelling predicting shortest time of recoverable levels to shore as more than a week.	Yes	✓
Shoreline Clean-up	Last response strategy to remove oil from the environment due to potential impact.	There are various shoreline techniques that are appropriate for this type of hydrocarbon, a shoreline clean-up may be effective for reducing shoreline loadings where access is possible, to be assessed on a case-by-case basis	Unlikely	x
Oiled Wildlife Response (OWR)	Consists of capture, cleaning and rehabilitation of oiled wildlife. May include hazing or pre-emptive captive management.	Although the distance of the platform from the coast reduces likelihood of extensive wildlife oiling onshore, individuals may become oiled in the vicinity of the spill. Operational monitoring will be used to inform the need for OWR to be implemented.	Yes	✓

5. Response Resources Required

Response Option	Strategy	Resource	Timeframe
Source Control	ROV debris clearing / subsea intervention	1 x ROV and 1 x vessel SFRT (via AMOSC) and 1 x vessel 1 x contract well control specialists (WWC/OSRL)	Estimated 5 days (from call out request to arrival in Victoria) Estimated 7 days (from Perth to BBMT via road transport) 2 days (from Singapore)
	Relief well	1 x MODU (via APPEA mutual aid agreement) 1 x contract engineering support (WWC/OSRL) Well construction material	Estimated 85 days (via HLV from Singapore)
Surveillance and Monitoring	OSMP O1.1 Weather and Sea State	N/A	
	OSMP O1.2 Trajectory Estimation	1 x contracted modeller.	
	OSMP Module O1.3 and O4.1 Aerial surveillance	1x observer per aircraft. Aircraft to have 100nm range and 3 hour duration.	Initial overflight <4 hours service requested. Trained observer <12 hours of spill occurring.
	OSMP Module O1.4 Tracking buoy	1x buoy available.	Deployed <12 hrs of spill occurring (dependent on weather conditions) (Level 2 & 3 spill).
	OSMP O1.5 Satellite Imagery	1 x contract.	
	OSMP Module O2.1 and O2.3 Water and Oil Sampling	1x vessel. 1x initial sampling kit. 1x contract with laboratory.	Samples obtained <24 hrs of spill occurring. Analysis initiated <24 hours of receipt in laboratory.
Aerial dispersant	Dispersant Aircraft	Maximum 12.85 m^3/day Total volume 1,259 m^3 2 x AT-802 Air Tractors carrying out 5 sorties per day. 1 x observation platform	1 x Air Tractor required within 24 hours
Offshore Containment & Recovery	Boom Skimming system Vessels	8 x 200m 4 8 (4 strike teams)	1 strike team required within 48 hours

Response Option	Strategy	Resource	Timeframe
Protection of Sensitive Shoreline Resources	Personnel OSR Equipment Vehicles / Vessels	Nil	Unlikely to be required
Shoreline Clean-up[*1]	Personnel	2 Foreman 6 Labourers 2 Specialised Operators	Required within 24 hours 2 x Foreman 6 x Labourers 2 x Specialised Operators
	Vehicles and Vessels	1 x ATV 1 x Truck/Vehicle 1 x Front End Loader / Dozer 1 x Dump Truck	Required within 24 hours 1 x Truck/Vehicle
	OSR Equipment	1 x Pump 1 x skimmer w/pump 6m x Inshore Boom 6m x Sorbent boom/snares 1m x Shoreline flushing pipe	
	Manual Equipment	10 x Shovels 10 x Rakes 10 x Picks 500 x Plastic Bags 2 x Wheel barrows	Required within 24 hours 1 x Shoreline Response Trailers

*1 Calculated resources requirement are for planning purposes only. Actual response strategies and resource needs to be determined in consultation with the State control agency.Based on peak volume on shoreline with predicted loading of 100 mg/m^3 or greater. Assumed 10% of the shoreline being cleaned up in any 1 day (and a continuous re-oiling of the shoreline). 10% shoreline clean up used for planning purposes only. Actual resources to be determined in consultation with State control agency

Relevant Tactical Response Plan (TRP)	Nil

6. Oil Spill Monitoring

		0-10m	10-20m
Sensitivities - **Probability of contact with dissolved hydrocarbons at moderate threshold**	> 90%	White Shark distribution/foraging BIA Southern Right Whale migration BIA Pygmy Blue Whale distribution and foraging BIA Seabirds foraging BIAs KEF: Upwelling East of Eden	nil
	75 - 90%	Little penguin foraging BIA Cape Howe MNP	nil
	50 – 75%	Humpback whale foraging BIA Indo-pacific bottlenose dolphin breeding BIA Seabirds foraging BIAs **Sub –LGA** • Cape Howe/Mallacoota	Humpback whale foraging BIA Pygmy Blue Whale distribution and foraging BIA Little penguin foraging BIA Southern Right Whale migration BIA White Shark distribution/foraging BIA Seabirds foraging BIAs KEF: Upwelling East of Eden
	25 – 50%	Seabirds foraging/breeding BIAs Point Hicks MNP **Sub –LGA** • Bega Valley (southern NSW) • Croajingolong (West) • Point Hicks	Grey nurse shark migration BIA Indo-pacific bottlenose dolphin breeding BIA Seabirds foraging BIAs Cape Howe MNP **Sub –LGA** • Bega Valley • Cape Howe/Mallacoota
	10 – 25%	East Gippsland AMP Little penguin breeding BIA Seabirds foraging/breeding BIAs KEF: Shelf rocky reefs	Seabirds foraging BIAs Point Hicks MNP

		0-10m	10-20m
		KEF: Big Horseshoe Canyon **Sub –LGA** • Croajingolong (East) • Marlo • Sydenham Inlet	
	< 10%	Beagle AMP Flinders AMP Jervis AMP Seabirds breeding / foraging /migration BIA KEF: Canyons on the eastern continental slope Batemans Marine Park Beware Reef MS Kent Group MR **Sub –LGA** • Corringle • Eurobodalla (NSW) • Lake Tyers Beach • Shoal Haven (NSW) • Woodside Beach	Flinders AMP East Gippsland AMP Central Eastern AMP Beagle AMP Little penguin breeding BIA White Shark breeding BIA Seabirds breeding /foraging/ migration BIA KEF: Canyons on the eastern continental slope KEF: Shelf rocky reefs KEF: Tasman Front and eddy field Batemans MP Kent Group MR Beware Reef MS **Sub –LGA** • Cape Conran • Eurobodalla (NSW) • Marlo • Shoal Haven (NSW) • Sydenham Inlet • Corringle • Croajingolong (East) • Croajingolong (West) • Point Hicks

		0-10m	10-20m
		0-10	**10-20**
Marine Parks – Probability of contact with entrained hydrocarbons at the low threshold	> 90%	East Gippsland AMP Cape Howe MNP Point Hicks MNP	Nil
	75 - 90%		Nil
	50 - 75%	Batemans MP Beware Reef MS	Nil
	25 - 50%	Beagle AMP Flinders AMP Jervis Bay AMP/ MP Kent Group MR Gippsland Lakes Ramsar wetland	Nil
	10 – 25%	Freycinet AMP Ninety Mile Beach MNP Wilsons Promontory MNP Wilsons Promontory MR	Nil
	< 10%	Central Eastern AMP Lord Howe AMP Corner Inlet Ramsar Wetland Corner Inlet MNP Corner Inlet NP Booderee NP Nooramunga Marine and Coastal Park	Nil

Sufficient resources are available to undertake monitoring and these are detailed in the OSMP.

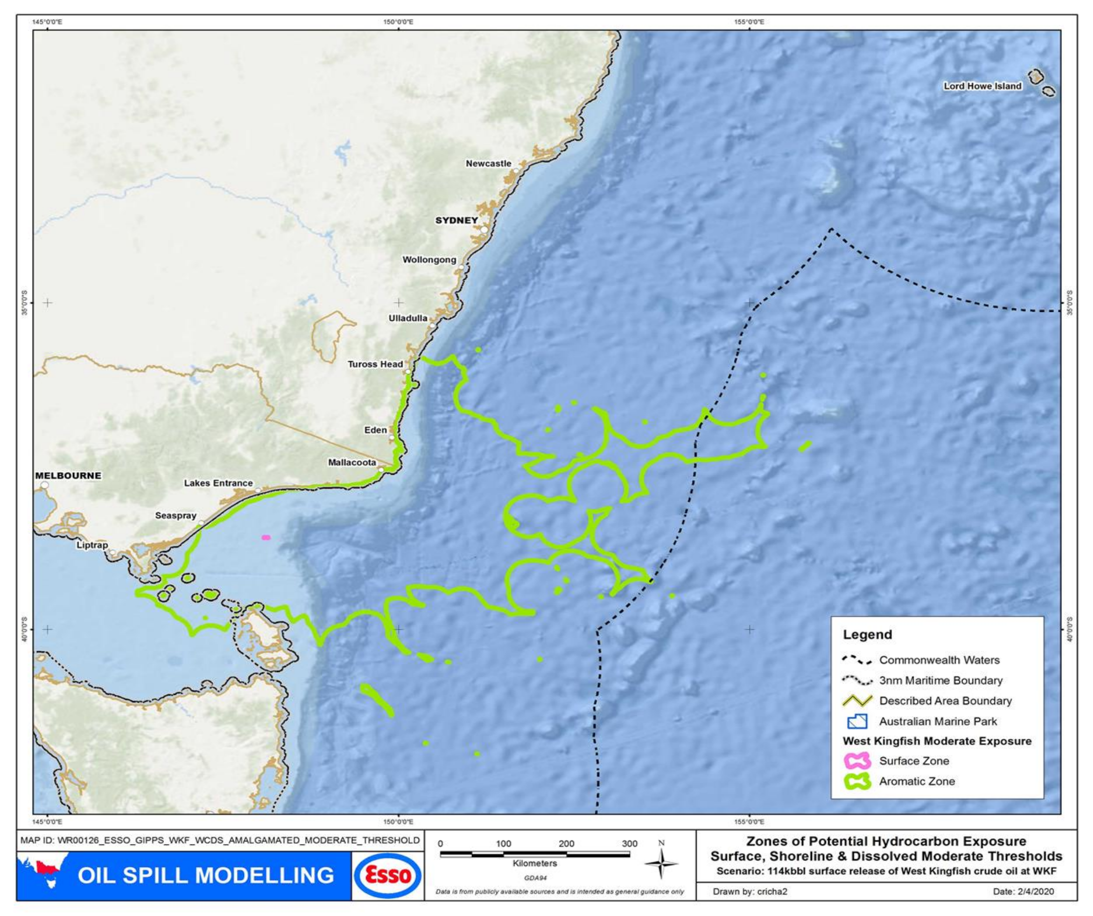
Modelling indicates that the spill does **not** intersect the coastline until after 1 week.

However in the unlikely event of a spill, should trajectory modelling predict shoreline contact, sufficient resources are available to be initiated within 48 hours (in most cases sooner). Modules in addition to those required to monitor the spill may be initiated and resources mobilised to priority monitoring locations as determined at the time.

Information specific to a well blowout (WCDS) from the West Kingfish platform during base business operations is provided below. For further details, refer to the Bass Strait Environment Plan (AUGO-EV-EMM-002 & AUGO-EV-EMM-004).

1. Field Location / Oil properties

Location / operational area



Production Licence No.	VIC/L07 West Kingfish (WKF) platform	
Coordinates	Latitude 38° 35' 39" S	
	Longitude 148° 06' 15" E	

Oil types and name	**West Kingfish Crude**	
	Density @ 15°C (kg/m³)	798.1
	API	45.7
	Dynamic Viscosity (cP @ 25°C)	2.4
	Pour Point (ºC)	9
	Oil Property Category	Group II light persistent oils

	Composition	
	Aromatics (%)[1]	23
	Emulsion Water Content (%)	27
	Saturates (%)	72
	Wax Content (%)	25
	Volatile (BP <180°C)	13.6 %
	Semi-volatile (BP 180 - 265°C)	35.9 %
	Low volatility (BP 265 - 380°C)	36.8 %
	Residual (BP> 380°C)[2]	13.7%

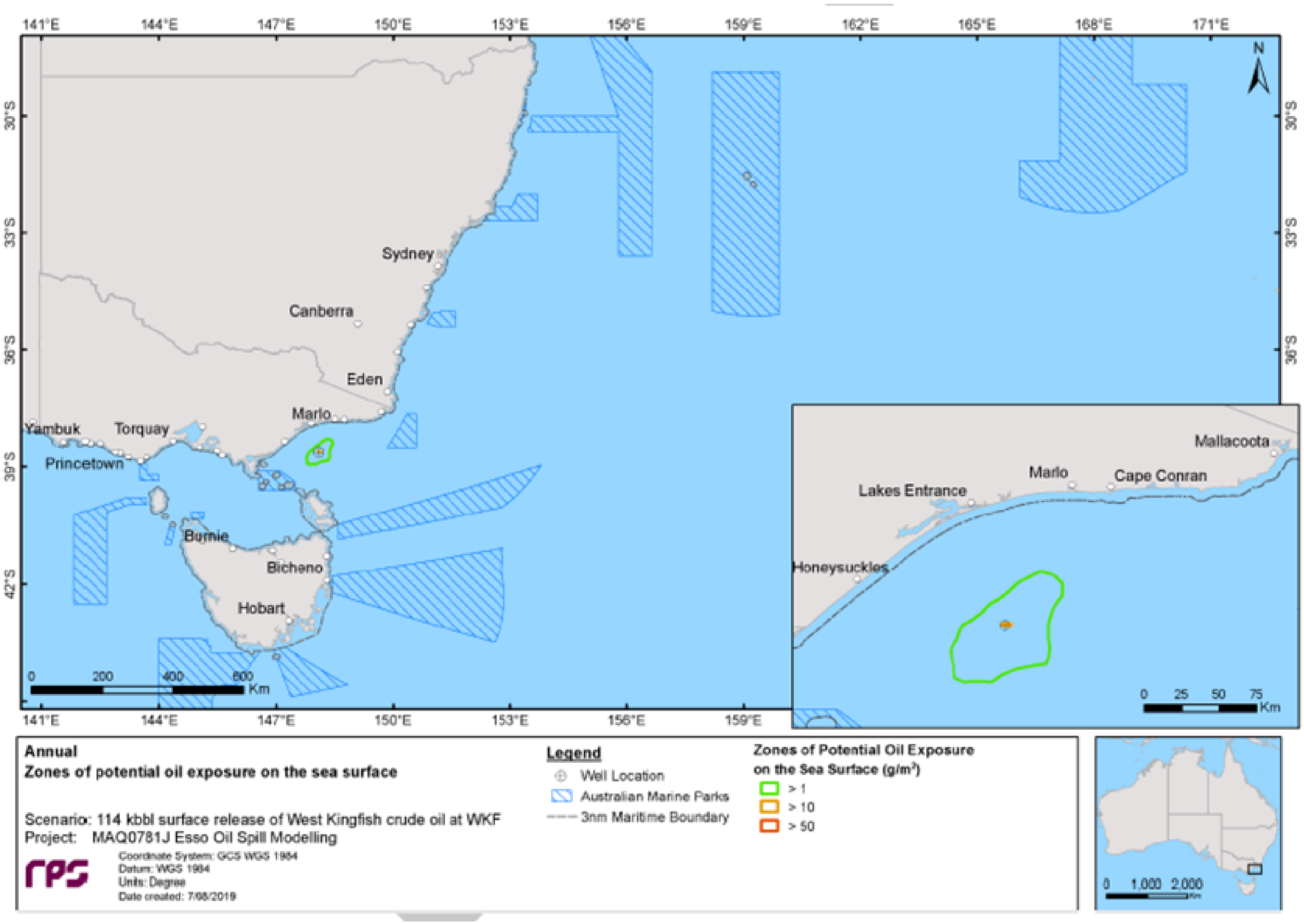
1 *Soluble, aromatic, hydrocarbons, (including BTEX), tend to evaporate into the atmosphere.*

2 *Residual Hydrocarbons will persist in the marine environment. It will remain in a liquid state when released into the environment over the annual temperatures observed in the Gippsland Basin*

2. What's the worst that could happen?

	West Kingfish (WKF)
Modelled Oil Pollution Scenario (WCDS)	Level 3 Spill A complete loss of well control (tubing flow to surface only) resulting in a release of condensate until source control is effective (98 days – based on worst case scenario where relief well drilling is required).
Oil types and name	West Kingfish Crude
Release rate (bbl/day)	1,163
Spill Volume (bbl)	114,000
Dominant Weathering process	Evaporation
Approximate evaporation rate (depending on temperature)	
within the first 12 hours	13.6%
within the first 24 hours	a further 35.9%
over several days.	a further 36.8%
Probability of contact to any shoreline (%)	0
Weathering over the duration of LOWC (98 days) (based on deterministic modelling)	
Evaporation (%)	50%
Decay (%)	33%
Water column (%)	6%
Surface/Shoreline (%)	3%

Exposure - Surface



Zones of potential oil exposure on the sea surface, in the event of a 114,000 bbl surface release of West Kingfish Crude over 98 days at West Kingfish Platform, tracked for 118 days. The results were calculated from 100 spill trajectories.

3. Resources at Risk

	Receptor	<12 hrs	12-48 hrs	>48 hrs	>1week
Minimum time to oil exposure on sea surface at moderate threshold	BIAs: • Seabirds – Foraging • Pygmy Blue Whale – Distribution/Foraging • Southern Right Whale – Migration • Great White Shark – Distribution Note: no predicted contact with State waters		✓ ✓ ✓ ✓		
Minimum time to shoreline accumulation of oil	Nil				

4. Strategic NEBA and selection of response options

Response Option	Benefits	Effectiveness on Light Crude Spill	Viable Response?	Net Benefit?
Source Control	Limit flow of hydrocarbons to environment.	Only viable option to stop flow of crude oil to the marine environment.	Yes	✓
Surveillance and Monitoring	Although surveillance is not an active intervention to treat or remove oil pollution, it is critical to effective response both in the initial stages of an incident and during ongoing response operations.	Surveillance and monitoring used to observe the direction of movement of the spill and natural break-up and dissipation of spill. Monitoring will also be used to assess the need for, and effectiveness of, active intervention.	Yes	✓
Dispersant Application	Dispersants act by allowing hydrocarbons to be mixed into the upper layers of the water column, which accelerates the biodegradation process. Removes oil from the water surface, protecting leeward shorelines and providing benefit to sea-surface air breathing fauna.	Over 40% of the West Kingfish crude should evaporate within the first 24 hrs. However, about 13.7% of the crude is considered persistent and so use of dispersant may enhance natural weathering and dispersion. Laboratory testing has shown dispersant to be highly effective on fresh West Kingfish crude (48-99% effective), with effectiveness decreasing significantly after 12 hours of weathering. Dispersants should be applied to fresh oil closest to the source to maximize effectiveness. Note: the WKF platform is located far enough offshore for modelling to predict that a worst-case crude oil spill not to pose a threat to the coastline or sensitivities within State waters.	Yes	x
Containment & Recovery (Vessel Based)	Booms and skimmers to contain surface oil where there is a potential threat to environmental sensitivities. Relies on calm sea conditions, thicknesses >10µm to collect and adequate deployment timeframes.	Suitable thickness for recovery will be present for only a very short period, making containment and recovery viable but likely of low effectiveness. In Bass Strait sea conditions likely to be suitable for containment and recovery operations only 50% of the time.	Yes	✓
Protection of Sensitive Shoreline Resources	Booms and skimmers deployed to protect environmental sensitivities. Environmental conditions (e.g. current, waves) limit application.	Coastline contact is not predicted	Not required	x
Shoreline Clean-up	Last response strategy to remove oil from the environment due to potential impact.	Coastline contact is not predicted	Not required	x
Oiled Wildlife Response (OWR)	Consists of capture, cleaning and rehabilitation of oiled wildlife. May include hazing or pre-emptive captive management.	Although the distance of the platform from the coast reduces likelihood of extensive wildlife oiling onshore, individuals may become oiled in the vicinity of the spill. Operational monitoring will be used to inform the need for OWR to be implemented.	Yes	✓

5. Response Resources Required

Response Option	Strategy	Resource	Timeframe
Source Control	ROV debris clearing / subsea intervention	1 x ROV and 1 x vessel SFRT (via AMOSC) and 1 x vessel 1 x contract well control specialists (WWC/OSRL)	Estimated 5 days (from call out request to arrival in Victoria) Estimated 7 days (from Perth to BBMT via road transport) 2 days (from Singapore)
	Relief well	1 x MODU (via APPEA mutual aid agreement) 1 x contract engineering support (WWC/OSRL) Well construction material	Estimated 85 days (via HLV from Singapore)
Surveillance and Monitoring	OSMP O1.1 Weather and Sea State	N/A	
	OSMP O1.2 Trajectory Estimation	1 x contracted modeller.	
	OSMP Module O1.3 and O4.1 Aerial surveillance	1x observer per aircraft. Aircraft to have 100nm range and 3 hour duration.	Initial overflight <4 hours service requested. Trained observer <12 hours of spill occurring.
	OSMP Module O1.4 Tracking buoy	1x buoy available.	Deployed <12 hrs of spill occurring (dependent on weather conditions) (Level 2 & 3 spill).
	OSMP O1.5 Satellite Imagery	1 x contract.	
	OSMP Module O2.1 and O2.3 Water and Oil Sampling	1x vessel. 1x initial sampling kit. 1x contract with laboratory.	Samples obtained <24 hrs of spill occurring. Analysis initiated <24 hours of receipt in laboratory.
Aerial dispersant	Dispersant Aircraft	Maximum 9.25 m^3/day Total volume 906m^3 1 x AT-802 Air Tractors carrying out 4 sorties per day. 1 x observation platform	1 x Air Tractor required within 24 hours
Offshore Containment & Recovery	Boom Skimming system Vessels	6 x 200m 3 6 (3 strike teams)	1 strike team required within 48 hours

Relevant Tactical Response Plan (TRP)	Nil

6. Oil Spill Monitoring

		0-10m	10-20m
Sensitivities – **Probability of contact with dissolved hydrocarbons at moderate threshold**	> 90%	White Shark distribution BIA Southern Right Whale migration BIA Pygmy Blue Whale distribution and foraging BIA Seabirds foraging BIAs KEF: Upwelling East of Eden	nil
	75 - 90%	Seabirds foraging BIAs	nil
	50 – 75%	Seabirds foraging BIAs	nil
	25 – 50%	White Shark foraging BIA Seabirds foraging BIAs	Pygmy Blue Whale distribution and foraging BIA Southern Right Whale migration BIA White Shark distribution BIA Seabirds foraging BIAs KEF: Upwelling East of Eden
	10 – 25%	Cape Howe MNP Kent Group NP Humpback whale foraging BIA Indo-pacific bottlenose dolphin breeding BIA Seabirds foraging BIAs	Cape Howe MNP Seabirds foraging BIAs Little penguin foraging BIA White Shark foraging BIA
	< 10%	Beagle AMP East Gippsland AMP Flinders AMP Freycinet AMP Ninety Mile Beach MNP Point Hicks MNP Croajingolong Batemans Marine Sanctuary Grey nurse shark foraging / migration BIA Little penguin breeding / foraging BIA	Beagle AMP East Gippsland AMP Flinders AMP Freycinet AMP Point Hicks MNP Croajingolong Batemans MP Kent Group NP Grey nurse shark foraging / migration BIA Little penguin breeding / foraging BIA

		0-10m	10-20m
		Seabirds breeding / foraging /migration BIA White Shark breeding BIA KEF: Big Horseshoe Canyon KEF: Canyons on the eastern continental slope KEF: Shelf rocky reefs	Humpback whale foraging BIA White shark breeding BIA Seabirds breeding /foraging/ migration BIA KEF: Big Horseshoe Canyon KEF: Canyons on the eastern continental slope KEF: Shelf rocky reefs
		0-10	**10-20**
Marine Parks – **Probability of contact with entrained hydrocarbons at the low threshold**	> 90%	Cape Howe MNP Point Hicks MNP	Nil
	75 - 90%	East Gippsland AMP	Nil
	50 - 75%	Batemans MP	Nil
	25 - 50%	Beagle AMP Flinders AMP Beware Reef MS Kent Group MR	Nil
	10 – 25%	Freycinet AMP Wilsons Promontory MNP Wilsons Promontory MR	Nil
	< 10%	Ninety Mile Beach MNP Gippsland Lakes Ramsar wetland Jervis Bay MP Booderee NP	Nil

Sufficient resources are available to undertake monitoring and these are detailed in the OSMP.

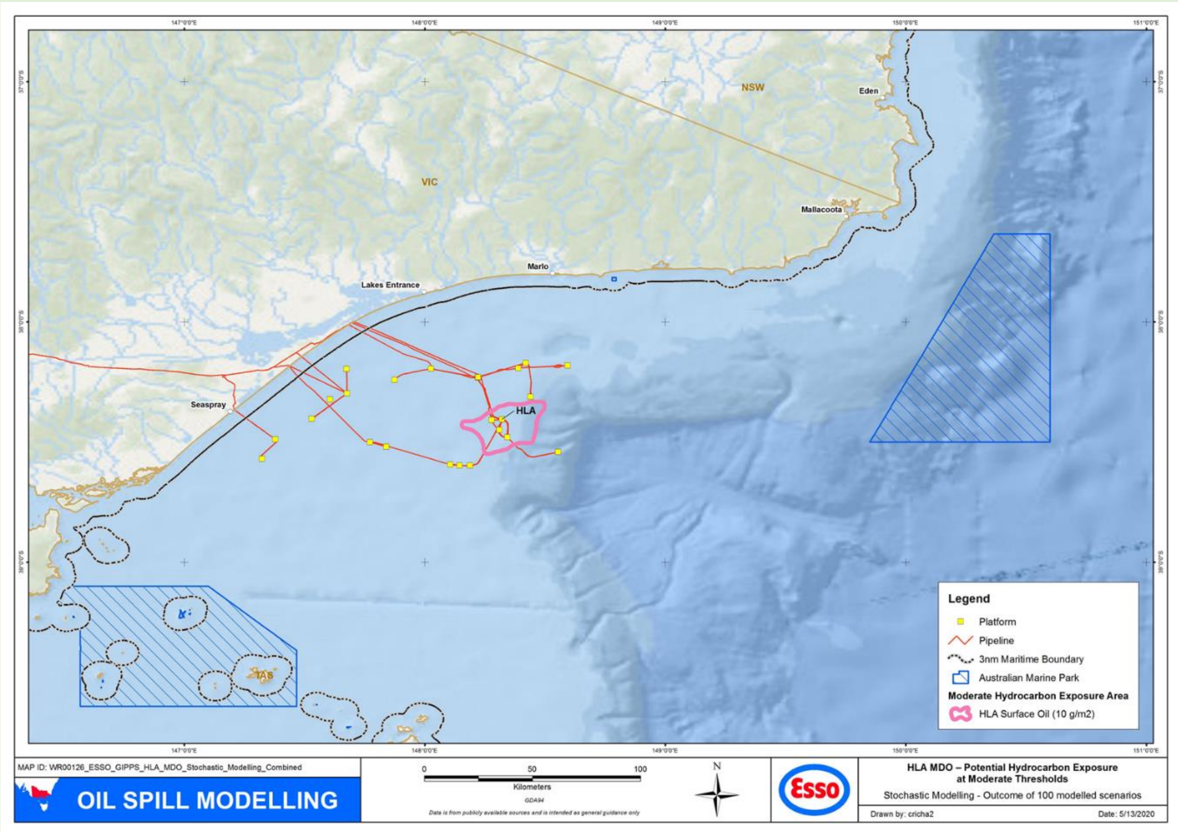
Modelling indicates that the spill does **not** intersect the coastline.

However in the unlikely event of a spill, should trajectory modelling predict shoreline contact, sufficient resources are available to be initiated within 48 hours (in most cases sooner). Modules in addition to those required to monitor the spill may be initiated and resources mobilised to priority monitoring locations as determined at the time.

Information specific to a MDO spill from a vessel collision at the Halibut platform during Bass Strait Operations is provided below. For further details, refer to the Bass Strait Operations Environment Plan.

1. Field Location / Oil properties

Location / operational area



Production Licence No.	VIC/L05 Halibut (HLA) platform	
Coordinates	Latitude	38°24’15.30” S
	Longitude	148°19’12.91” E
Oil types and name		Marine Diesel Oil (MDO)
	Density @ 15˚C	829 kg/m^3
	API	37.6
	Dynamic Viscosity	4.0 cP @ 25°C
	Pour Point	-14 ºC
	Wax Content	-
	Oil Property Category	Group II light persistent oil

2. What's the worst that could happen?

Halibut	
Worst case oil pollution scenario	Level 2 Vessel collision (220 m^3 of MDO over 6 hours) at HLA location
Dominant Weathering process	Evaporation
Approximate weathering predicted (from deterministic modelling)	Based on deterministic modelling, approximately: • 68% MDO is predicted to evaporate* • 15% MDO is predicted to remain in the water column* • 17% MDO is predicted to have decayed* • Nil shoreline impacts predicted for this scenario

*Evaporation, in water and decay results based on WKF predicted data

Exposure – Sea Surface HLA MDO

No shoreline contact is predicted at any threshold.

The maximum distance and direction travelled by hydrocarbon on the sea surface at each threshold from the release location is shown below:

Moderate threshold (10–50 g/m2): 15.5 km east-north east

High threshold (>50 g/m2): 3 km east

3. Resources at Risk

Halibut		
Minimum time to oil exposure on the sea surface at moderate threshold	< 12 hours	Great White Shark distribution BIA Southern Right Whale migration BIA Pygmy Blue Whale distribution and foraging BIAs Seabirds foraging BIAs
	12 – 48 hours	KEF – Upwelling East of Eden
	> 48 hours	nil
Minimum time to shoreline accumulation of oil at moderate threshold	< 12 hours	nil
	12 – 48 hours	nil
	> 48 hours	nil

4. Strategic NEBA and selection of response options

Response Option	Benefits	Effectiveness on MDO Spill	Viable Response?	Net Benefit?
Source Control	Limit flow of hydrocarbons to environment.	Only viable option to stop flow of oil to the marine environment.	Yes	✓
Surveillance and Monitoring	Although surveillance is not an active intervention to treat or remove oil pollution, it is critical to effective response both in the initial stages of an incident and during ongoing response operations.	Surveillance and monitoring used to observe the natural break-up and dissipation of a MDO spill without the need for active intervention.	Yes	✓
Dispersant Application	Dispersants act by allowing hydrocarbons to be mixed into the upper layers of the water column, which accelerates the biodegradation process. Removes oil from the water surface, protecting leeward shorelines and providing benefit to sea-surface air breathing fauna.	Dispersant application is not recommended for MDO as it spreads rapidly to a thin layer. Insufficient time to respond while suitable surface thicknesses are present. Dispersant droplets are known to penetrate through the thin oil layer and cause 'herding' of the oil. This creates areas of clear water but is not successful dispersion. Application of dispersant can contribute to water quality degradation through chemical application, without removing surface oil. Considered not to add sufficient benefit.	Not viable	x
Containment & Recovery (Vessel Based)	Booms and skimmers to contain surface oil where there is a potential threat to environmental sensitivities. Relies on calm sea conditions, thicknesses >10µm to collect and adequate deployment timeframes.	MDO spreads rapidly to a thickness of less than 10 µm. Containment is ineffective at these thicknesses.	Not viable	x
Protection of Sensitive Shoreline Resources	Booms and skimmers deployed to protect environmental sensitivities. Environmental conditions (e.g. current, waves) limit application.	No shoreline contact predicted	Not required	x
Shoreline Clean-up	Last response strategy to remove oil from the environment due to potential impact.	No shoreline contact predicted	Not required	x
Oiled Wildlife Response (OWR)	Consists of capture, cleaning and rehabilitation of oiled wildlife. May include hazing or pre-emptive captive management.	Given limited size and rapid spreading of the MDO spill large scale OWR is unlikely to be required. Distance from coastline also reduces likelihood of extensive wildlife oiling, however individuals may become oiled in the vicinity of the spill. OWR may be implemented if required, to be assessed on case-by-case basis.	Yes	✓

5. Response Resources Required

Response Option	Strategy	Resource	Timeframe
Source Control	As per vessel SOPEP	-	-
Surveillance and Monitoring	OSMP O1.1 Weather and Sea State	1 x observer (to conduct 2 hour watch)	<2 hours from time of spill
	OSMP O1.2 Trajectory Estimation	1 x contracted modeller.	< 4 hours of service requested.
	OSMP Module O1.3 and O4.1 Aerial surveillance	1x observer per aircraft. Aircraft to have 100nm range and 3 hour duration.	Initial overflight <4 hours service requested. Trained observer <12 hours of spill occurring.
	OSMP Module O1.4 Tracking buoy	1x buoy available.	Deployed <12 hrs of spill occurring (dependent on weather conditions) (Level 2 & 3 spill).
	OSMP Module O2.1 and O2.3 Water and Oil Sampling	1x vessel. 1x initial sampling kit. 1x contract with laboratory.	Samples obtained <24 hrs of spill occurring. Analysis initiated <24 hours of receipt in laboratory.
Protection of Sensitive Shoreline Resources	Shoreline protection	N/A - No shoreline contact	
Oiled Wildlife Response	DELWP will make the decision to stand up resources which are based in Victoria	To be determined by DELWP	Available <24 hours from request for services

Relevant Tactical Response Plan (TRP)	N/A

6. Oil Spill Monitoring

HLA		
Sensitivities – Probability of contact with dissolved hydrocarbons at moderate threshold	> 90%	nil
	50 - 90%	nil
	50 – 75%	nil
	25 – 50%	nil
	10 – 25%	nil
	< 10%	nil
Marine Parks – Probability of contact with entrained hydrocarbons at low threshold (0-10m)	> 90%	nil
	75 - 90%	nil
	50 - 75%	nil
	25 - 50%	nil
	10 – 25%	Cape Howe MNP Point Hicks MNP
	< 10%	Beagle AMP East Gippsland AMP Flinders AMP Wilsons Promontory MNP Beware Reef MS Kent Group NP

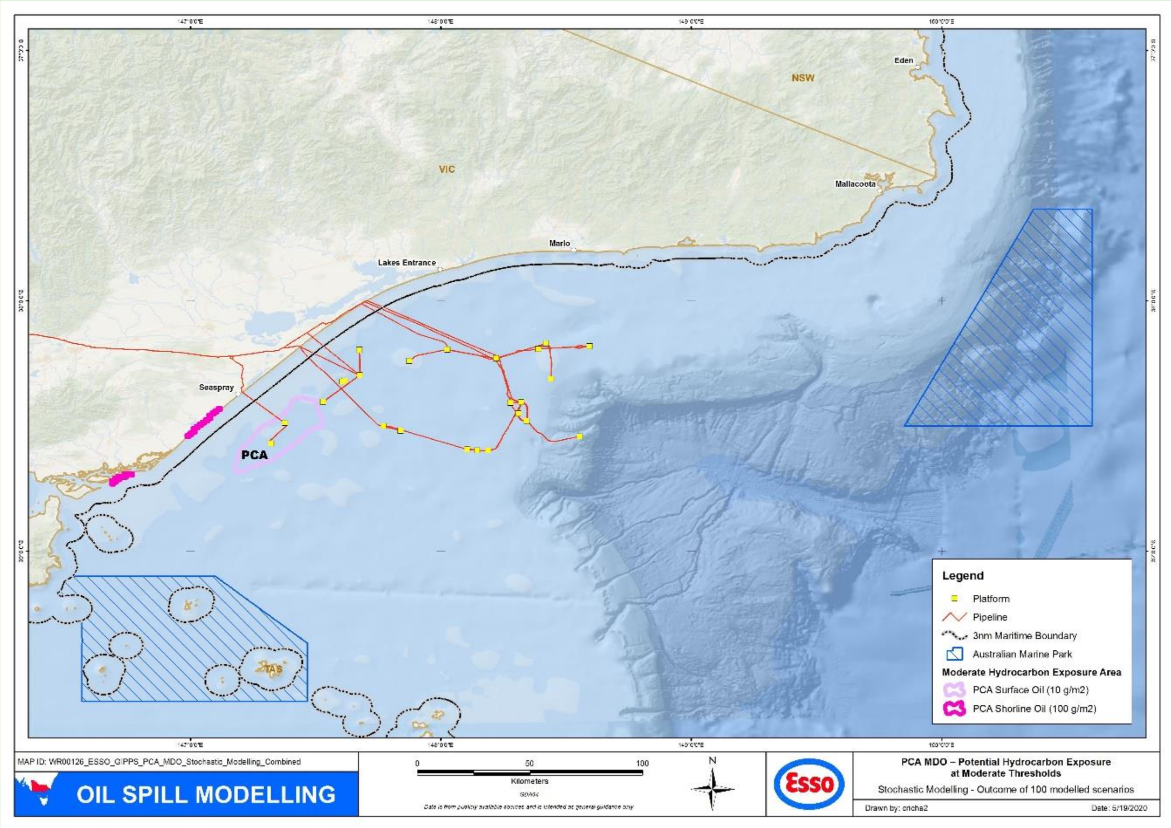
Sufficient resources are available to undertake monitoring and these are detailed in the OSMP.

Modelling does not predict any shoreline contact at the moderate threshold. However in the unlikely event of a spill, should trajectory modelling predict shoreline contact, sufficient resources are available to be initiated within 48 hours (in most cases sooner). Modules in addition to those required to monitor the spill may be initiated and resources mobilised to priority monitoring locations as determined at the time.

Information specific to a MDO spill from a vessel collision at the Perch platform during Bass Strait Operations is provided below. For further details, refer to the Bass Strait Operations Environment Plan.

1. Field Location / Oil properties

Location / operational area

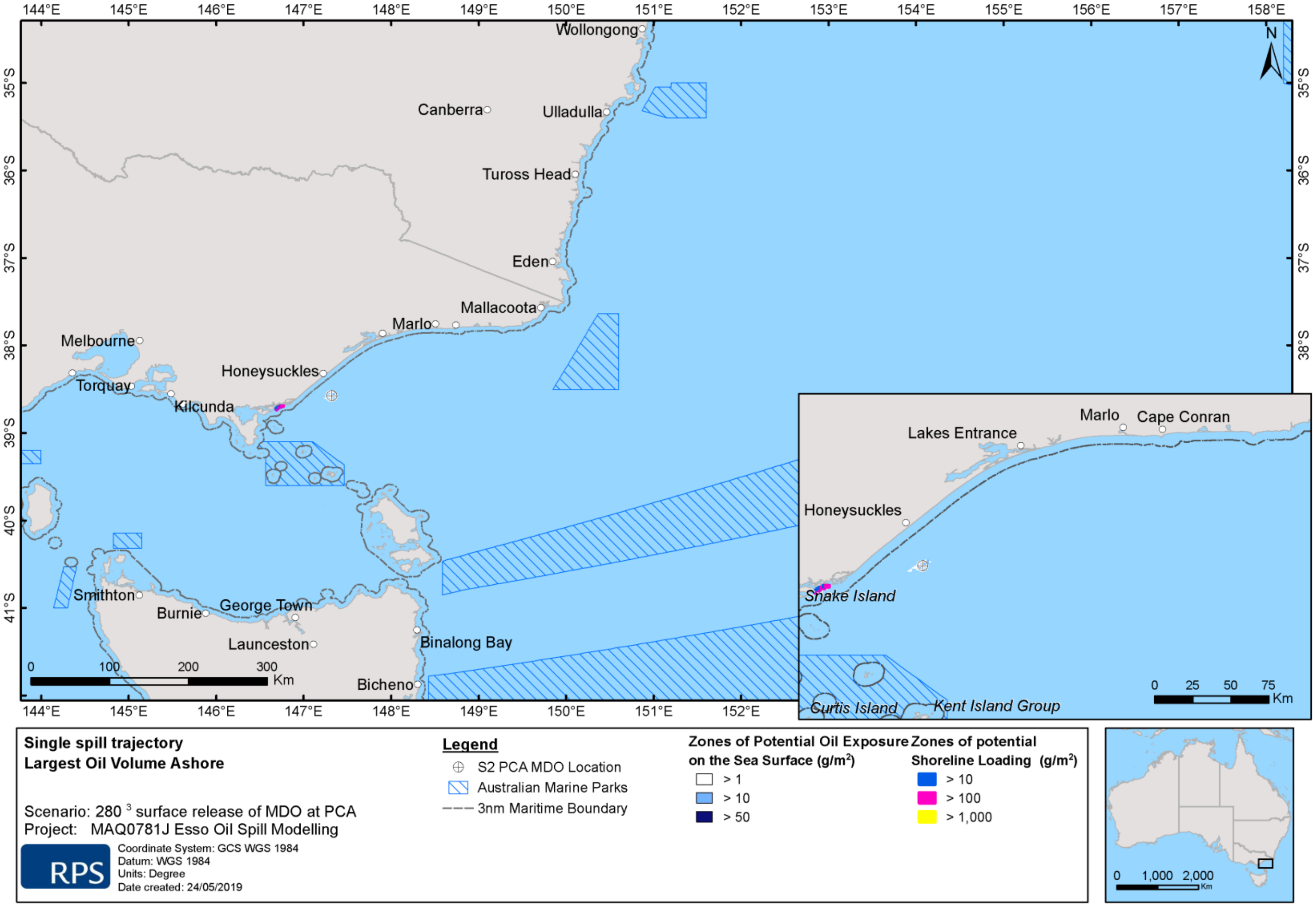


Production Licence No.	VIC/L17 Perch (PCA) platform	
Coordinates	Latitude	38° 34' 15" S
	Longitude	147° 19' 16" E
Oil types and name		Marine Diesel Oil (MDO)
	Density @ 15˚C	829 kg/m^3
	API	37.6
	Dynamic Viscosity	4.0 cP @ 25°C
	Pour Point	-14 ºC
	Wax Content	-
	Oil Property Category	Group II light persistent oil

2. What's the worst that could happen?

Perch	
Worst case oil pollution scenario	Level 2 Vessel collision (280 m^3 of MDO over 6 hours) at PCA location
Dominant Weathering process	Evaporation
Approximate weathering predicted (from deterministic modelling)	Based on deterministic modelling, approximately: • 53 - 40% MDO is predicted to evaporate. • 17 - 22 % MDO is predicted to remain in the water column • 22 - 31% MDO is predicted to have decayed • 8% MDO is predicted to arrive ashore

Exposure –Shoreline and Sea Surface



Zones of potential exposure on the sea surface and shoreline loading for the trajectory with the largest oil volume ashore. Results are based on a 280 m^3 surface release of MDO over 6 hours at the Perch Platform, tracked for 30 days, 12 am 2nd of June 2012.

3. Resources at Risk

Perch		
Minimum time to oil exposure on the sea surface at moderate threshold	< 12 hours	Great White Shark distribution and breeding BIAs Southern Right Whale migration BIA Pygmy Blue Whale distribution and foraging BIAs Seabirds foraging BIAs
	12 – 48 hours	nil
	> 48 hours	nil
Minimum time to shoreline accumulation of oil at moderate threshold	< 12 hours	nil
	12 – 48 hours	Wellington (i.e. coastline of Wellington Shire) Woodside Beach
	> 48 hours	nil

4. Strategic NEBA and selection of response options

Response Option	Benefits	Effectiveness on MDO Spill	Viable Response?	Net Benefit?
Source Control	Limit flow of hydrocarbons to environment.	Only viable option to stop flow of oil to the marine environment.	Yes	✓
Surveillance and Monitoring	Although surveillance is not an active intervention to treat or remove oil pollution, it is critical to effective response both in the initial stages of an incident and during ongoing response operations.	Surveillance and monitoring used to observe the natural break-up and dissipation of a MDO spill without the need for active intervention.	Yes	✓
Dispersant Application	Dispersants act by allowing hydrocarbons to be mixed into the upper layers of the water column, which accelerates the biodegradation process. Removes oil from the water surface, protecting leeward shorelines and providing benefit to sea-surface air breathing fauna.	Dispersant application is not recommended for MDO as it spreads rapidly to a thin layer. Insufficient time to respond while suitable surface thicknesses are present. Dispersant droplets are known to penetrate through the thin oil layer and cause 'herding' of the oil. This creates areas of clear water but is not successful dispersion. Application of dispersant can contribute to water quality degradation through chemical application, without removing surface oil. Considered not to add sufficient benefit.	Not viable	x
Containment & Recovery (Vessel Based)	Booms and skimmers to contain surface oil where there is a potential threat to environmental sensitivities. Relies on calm sea conditions, thicknesses >10µm to collect and adequate deployment timeframes.	MDO spreads rapidly to a thickness of less than 10 µm. Containment is ineffective at these thicknesses.	Not viable	x
Protection of Sensitive Shoreline Resources	Booms and skimmers deployed to protect environmental sensitivities. Environmental conditions (e.g. current, waves) limit application.	MDO spreads rapidly to a thickness of less than 10 µm. Corralling of surface hydrocarbons close to shore is not expected to be effective for MDO and is thus not expected to provide sufficient benefit. However, diverting oil away from inlets or creek / river mouths to protect sensitive sites may be undertaken. There is a very low probability that MDO spilled at the PCA location may contact the shoreline along the coastline of Wellington Shire.	Yes	✓
Shoreline Clean-up	Last response strategy to remove oil from the environment due to potential impact.	There is a very low probability that MDO spilled at the PCA location may contact the shoreline along the coastline of Wellington Shire and Woodside Beach. There are various shoreline techniques that are appropriate for this type of hydrocarbon, a shoreline clean-up may be effective for reducing shoreline loadings where access is possible, to be assessed on a case-by-case basis.	Yes	✓
Oiled Wildlife Response (OWR)	Consists of capture, cleaning and rehabilitation of oiled wildlife. May include hazing or pre-emptive captive management.	Given limited size and rapid spreading of the MDO spill large scale OWR is unlikely to be required. Distance from coastline also	Yes	✓

Response Option	Benefits	Effectiveness on MDO Spill	Viable Response?	Net Benefit?
		reduces likelihood of extensive wildlife oiling, however individuals may become oiled in the vicinity of the spill. OWR may be implemented if required, to be assessed on case-by-case basis.		

5. Response Resources Required

Response Option	Strategy	Resource	Timeframe
Source Control	As per vessel SOPEP	-	-
Surveillance and Monitoring	OSMP O1.1 Weather and Sea State	1 x observer (to conduct 2 hour watch)	<2 hours from time of spill
	OSMP O1.2 Trajectory Estimation	1 x contracted modeller.	< 4 hours of service requested.
	OSMP Module O1.3 and O4.1 Aerial surveillance	1x observer per aircraft. Aircraft to have 100nm range and 3 hour duration.	Initial overflight <4 hours service requested. Trained observer <12 hours of spill occurring.
	OSMP Module O1.4 Tracking buoy	1x buoy available.	Deployed <12 hrs of spill occurring (dependent on weather conditions) (Level 2 & 3 spill).
	OSMP Module O2.1 and O2.3 Water and Oil Sampling	1x vessel. 1x initial sampling kit. 1x contract with laboratory.	Samples obtained <24 hrs of spill occurring. Analysis initiated <24 hours of receipt in laboratory.
Protection of Sensitive Shoreline Resources[*1]	Personnel	1 Foreman 4 Specialised Operators	Required within 24 hours
	OSR Equipment	Nil	
	Vehicles and Vessels	1 x Front End Loader / Dozer	Required within 24 hours
Shoreline Clean-up[*1]	Personnel	1Foreman 8 Labourers 2 Specialised Operators	< 24 hours from request for services
	Vehicles and Vessels	1 x ATV 1 x Truck/Vehicle	
	Manual Equipment	8 x Shovels 8 x Rakes 200 x Plastic Bags 4 x Wheel barrows	< 24 hours from request for services
Oiled Wildlife Response	DELWP will make the decision to stand up resources	To be determined by DELWP	Available <24 hours from request for services

Response Option	Strategy	Resource	Timeframe
	which are based in Victoria		

*1 Calculated resources requirement are for planning purposes only. Actual response strategies and resource needs to be determined in consultation with the State control agency.

Relevant Tactical Response Plan (TRP)	Merriman Creek (Seaspray)

6. Oil Spill Monitoring

PCA		
Sensitivities – Probability of contact with dissolved hydrocarbons at moderate threshold	> 90%	nil
	50 - 90%	nil
	50 – 75%	nil
	25 – 50%	nil
	10 – 25%	nil
	< 10%	nil
Marine Parks – Probability of contact with entrained hydrocarbons at low threshold (0-10m)	> 90%	nil
	75 - 90%	nil
	50 - 75%	nil
	25 - 50%	Cape Howe MNP Point Hicks MNP
	10 – 25%	Beware Reef Marine Sanctuary
	< 10%	Beagle AMP East Gippsland AMP Flinders AMO Batemans MP Ninety Mile Beach MNP Kent Group NP Gippsland Lakes Ramsar wetland

Modelling predicts that an MDO spill may intersect the coastline after 28 hours at locations around:

- Wellington (i.e. coastline of Wellington Shire)
- Woodside Beach

As such, and in addition to the modules that are required to monitor the spill, within 48 hours the following modules may be initiated and resources mobilised to the priority monitoring locations listed above:

- O3 Shoreline assessment
- O4 Fauna observations
- O5 Air quality sampling
- O6 Sediment sampling
- S1 Hydrocarbons in intertidal sediments and water
- S4 Short term impacts to oiled flora and fauna

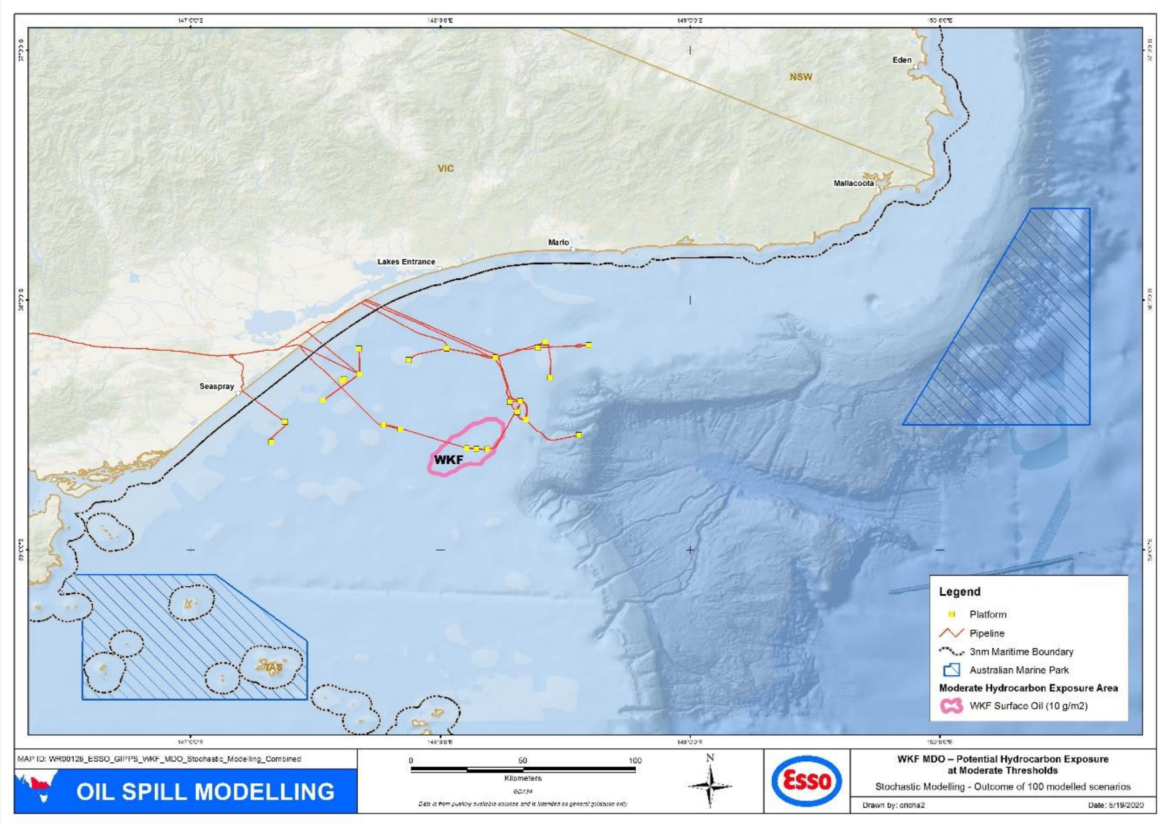
These modules are to be implemented to allow any potential impacts to identified natural values that are present in the area at which intersection of the coastal zone may occur. All identified environmental receptors in the area will be subject to monitoring. Sufficient resources are available to undertake monitoring and these are detailed in the OSMP.

In accordance with the timeframes for module implementation outlined in the OSMP, all of the above modules can be implemented within 48 hours (in most cases, sooner) at the priority monitoring locations. Timing for implementation of the remaining scientific modules will be as detailed in the module.

Information specific to a MDO spill from a vessel collision at the West Kingfish platform during Bass Strait Operations is provided below. For further details, refer to the Bass Strait Operations Environment Plan.

1. Field Location / Oil properties

Location / operational area

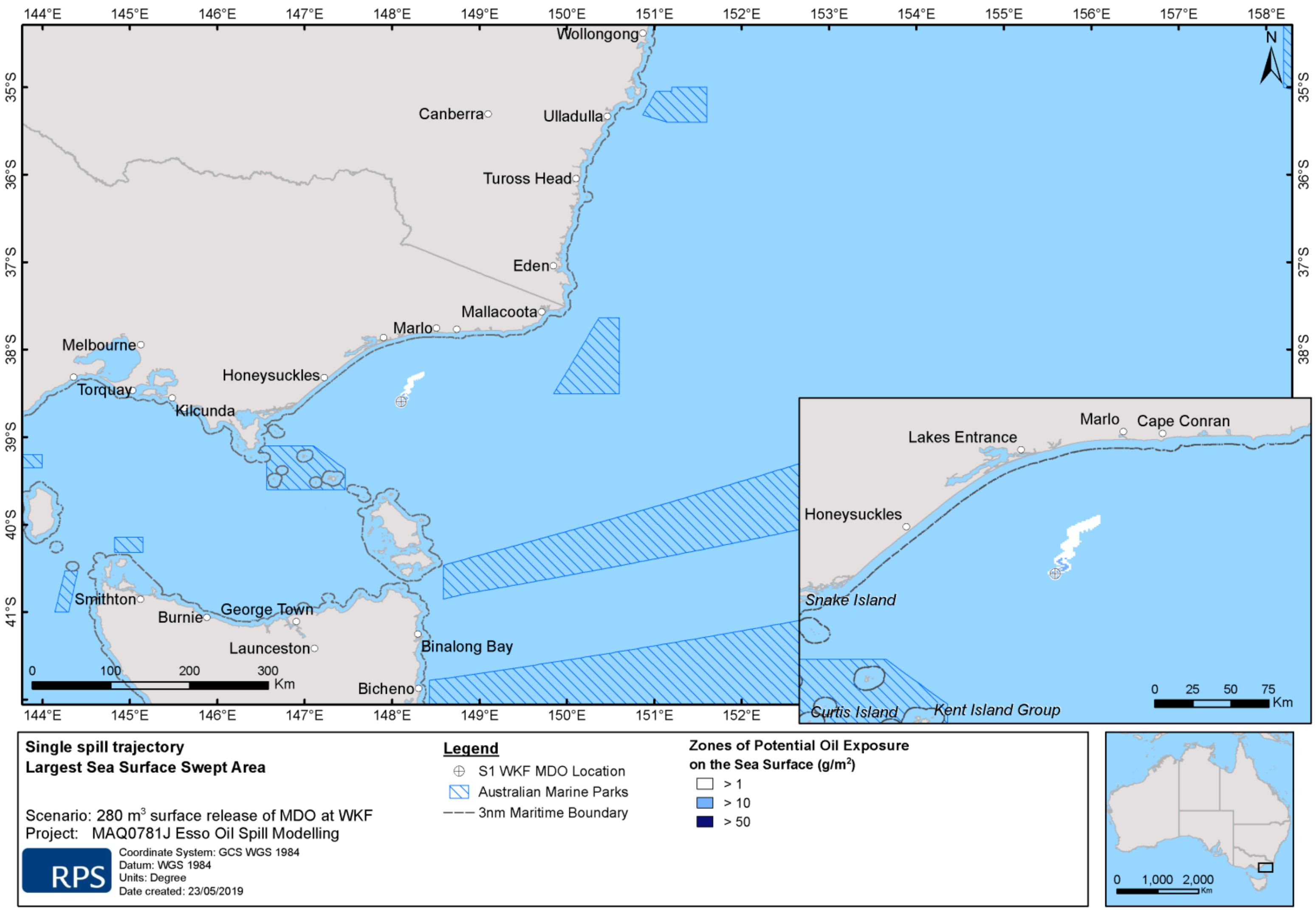


Production Licence No.	VIC/L07 West Kingfish (WKF) platform	
Coordinates	Latitude	38° 35’ 39" S
	Longitude	148° 06’ 15" E
Oil types and name		Marine Diesel Oil (MDO)
	Density @ 15˚C	829 kg/m^3
	API	37.6
	Dynamic Viscosity	4.0 cP @ 25°C
	Pour Point	-14 ºC
	Wax Content	-
	Oil Property Category	Group II light persistent oil

2. What's the worst that could happen?

West Kingfish	
Worst case oil pollution scenario	Level 2 Vessel collision (280 m^3 of MDO over 6 hours) at WKF location
Dominant Weathering process	Evaporation
Approximate weathering predicted (from deterministic modelling)	Based on deterministic modelling, approximately: • 68% MDO is predicted to evaporate. • 15% MDO is predicted to remain in the water column • 17% MDO is predicted to have decayed • Nil shoreline impacts predicted for this scenario

Exposure – Sea Surface



Zones of potential exposure on the sea surface for the trajectory with the largest sea surface swept area at the 10 g/m^2 threshold. Results are based on a 280 m^3 surface release of MDO over 6 hours at West Kingfish, tracked for 30 days, 8 am 22nd of June 2009.

3. Resources at Risk

Perch		
Minimum time to oil exposure on the sea surface at moderate threshold	< 12 hours	Great White Shark distribution BIA Southern Right Whale migration BIA Pygmy Blue Whale distribution and foraging BIAs Seabirds foraging BIAs
	12 – 48 hours	nil
	> 48 hours	nil
Minimum time to shoreline accumulation of oil at moderate threshold	< 12 hours	nil
	12 – 48 hours	nil
	> 48 hours	nil

4. Strategic NEBA and selection of response options

Response Option	Benefits	Effectiveness on MDO Spill	Viable Response?	Net Benefit?
Source Control	Limit flow of hydrocarbons to environment.	Only viable option to stop flow of oil to the marine environment.	Yes	✓
Surveillance and Monitoring	Although surveillance is not an active intervention to treat or remove oil pollution, it is critical to effective response both in the initial stages of an incident and during ongoing response operations.	Surveillance and monitoring used to observe the natural break-up and dissipation of a MDO spill without the need for active intervention.	Yes	✓
Dispersant Application	Dispersants act by allowing hydrocarbons to be mixed into the upper layers of the water column, which accelerates the biodegradation process. Removes oil from the water surface, protecting leeward shorelines and providing benefit to sea-surface air breathing fauna.	Dispersant application is not recommended for MDO as it spreads rapidly to a thin layer. Insufficient time to respond while suitable surface thicknesses are present. Dispersant droplets are known to penetrate through the thin oil layer and cause 'herding' of the oil. This creates areas of clear water but is not successful dispersion. Application of dispersant can contribute to water quality degradation through chemical application, without removing surface oil. Considered not to add sufficient benefit.	Not viable	x
Containment & Recovery (Vessel Based)	Booms and skimmers to contain surface oil where there is a potential threat to environmental sensitivities. Relies on calm sea conditions, thicknesses >10µm to collect and adequate deployment timeframes.	MDO spreads rapidly to a thickness of less than 10 µm. Containment is ineffective at these thicknesses.	Not viable	x
Protection of Sensitive Shoreline Resources	Booms and skimmers deployed to protect environmental sensitivities. Environmental conditions (e.g. current, waves) limit application.	No shoreline contact predicted	Not required	x
Shoreline Clean-up	Last response strategy to remove oil from the environment due to potential impact.	No shoreline contact predicted	Not required	x
Oiled Wildlife Response (OWR)	Consists of capture, cleaning and rehabilitation of oiled wildlife. May include hazing or pre-emptive captive management.	Given limited size and rapid spreading of the MDO spill large scale OWR is unlikely to be required. Distance from coastline also reduces likelihood of extensive wildlife oiling, however individuals may become oiled in the vicinity of the spill. OWR may be implemented if required, to be assessed on case-by-case basis.	Yes	✓

5. Response Resources Required

Response Option	Strategy	Resource	Timeframe
Source Control	As per vessel SOPEP	-	-
Surveillance and Monitoring	OSMP O1.1 Weather and Sea State	1 x observer (to conduct 2 hour watch)	<2 hours from time of spill
	OSMP O1.2 Trajectory Estimation	1 x contracted modeller.	< 4 hours of service requested.
	OSMP Module O1.3 and O4.1 Aerial surveillance	1x observer per aircraft. Aircraft to have 100nm range and 3 hour duration.	Initial overflight <4 hours service requested. Trained observer <12 hours of spill occurring.
	OSMP Module O1.4 Tracking buoy	1x buoy available.	Deployed <12 hrs of spill occurring (dependent on weather conditions) (Level 2 & 3 spill).
	OSMP Module O2.1 and O2.3 Water and Oil Sampling	1x vessel. 1x initial sampling kit. 1x contract with laboratory.	Samples obtained <24 hrs of spill occurring. Analysis initiated <24 hours of receipt in laboratory.
Protection of Sensitive Shoreline Resources	Shoreline protection	**N/A** **No shoreline contact**	
Shoreline Clean-up	Provision of personnel to support CA	**N/A** **No shoreline contact**	
Oiled Wildlife Response	DELWP will make the decision to stand up resources which are based in Victoria	To be determined by DELWP	Available <24 hours from request for services

Relevant Tactical Response Plan (TRP)	N/A

6. Oil Spill Monitoring

West Kingfish		
Sensitives – **Probability of contact with dissolved hydrocarbons at moderate threshold**	> 90%	nil
	50 - 90%	nil
	50 – 75%	nil
	25 – 50%	nil
	10 – 25%	nil
	< 10%	nil
Marine Parks – **Probability of contact with entrained**	> 90%	nil
	75 - 90%	nil
	50 - 75%	nil

West Kingfish		
hydrocarbons at low threshold (0-10m)	25 - 50%	nil
	10 – 25%	Cape Howe MNP Point Hicks MNP
	< 10%	Beagle AMP East Gippsland AMP Flinders AMP Batemans MP Beware Reef Marine Sanctuary Kent Group NP

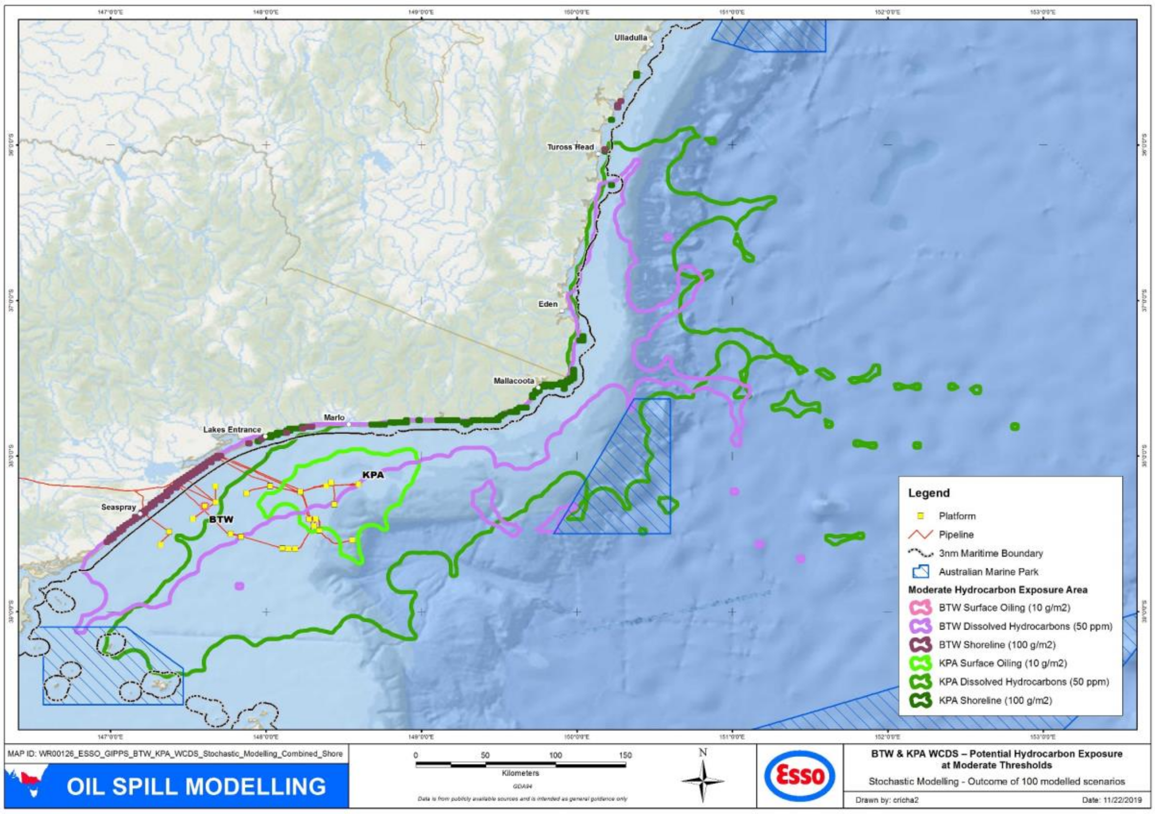
Sufficient resources are available to undertake monitoring and these are detailed in the OSMP.

Modelling does not predict any shoreline contact at the moderate threshold. However in the unlikely event of a spill, should trajectory modelling predict shoreline contact, sufficient resources are available to be initiated within 48 hours (in most cases sooner). Modules in addition to those required to monitor the spill may be initiated and resources mobilised to priority monitoring locations as determined at the time.

Information specific to the West Barracouta (BTW) drilling campaign is provided below. For further details, refer to the JUR Drilling Environment Plan.

1. Field Location / Oil properties

Location / operational area

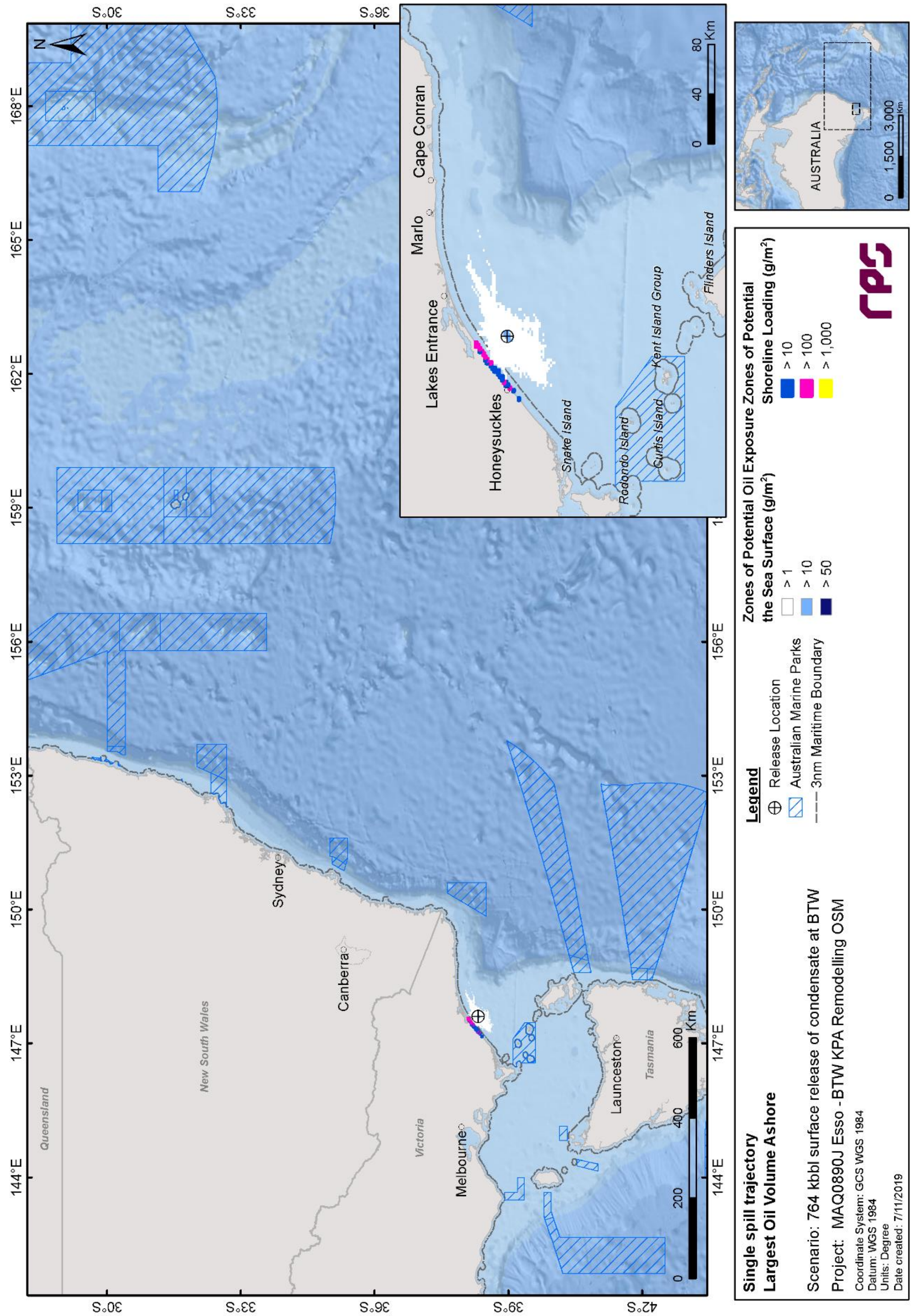


Production Licence No.	West Barracouta VIC/L1	
Coordinates		West Barracouta
	Latitude	38° 19’ 06” S
	Longitude	147° 36’ 53” E
	Depth	45.5 m

Oil types and name		Barracouta Condensate			
	Density @ 15˚C	772.3 kg/m^3			
	API	51.6			
	Dynamic Viscosity	1.291 @ 20ºC			
	Pour Point	-39 ºC			
	Wax Content	1.8%			
	Oil Property Category	Group I non-persistent oils			
	Boiling Point Distribution (°C)	Volatile (<180°C) 43.1 %	Semi-volatile (180-265°C) 30.8 %	Low volatility (265-380°C) 23.8 %	Residual (>380°C) 2.3 %

2. What's the worst that could happen?

West Barracouta	
Worst Case Discharge Scenario	<u>Level 3 Spill</u> A complete loss of well control (no drillpipe in hole) resulting in a release of: 764.0 kbbl condensate until source control is effective (98 days).
Dominant Weathering process	Evaporation
Approximate weathering predicted **(from deterministic modelling)**	• 92% condensate evaporates • 7% decay/ biodegrade • 1% remain within the water column • <0.1% on shoreline



Zones of potential exposure on the sea surface and shoreline loading for the trajectory with the largest oil volume ashore. Results are based on a 764,000 bbl (121,466 m^3) surface release of Barracouta condensate over 98 days at the West Barracouta well, tracked for 118 days, 8 pm 10th of August 2011

Resources at Risk

		West Barracouta
Minimum time to oil exposure on the sea surface at moderate threshold	< 12 hours	Great White Shark distribution and breeding BIAs Southern Right Whale migration BIA Pygmy Blue Whale distribution and foraging BIAs Seabirds foraging BIAs
	12 – 48 hours	nil
	> 48 hours	nil
Minimum time to shoreline accumulation of oil at moderate threshold	< 12 hours	nil
	12 – 48 hours	nil
	> 48 hours	Ninety Mile Beach Lakes Entrance Ocean Grange Seaspray Woodside Beach
	> 1 week	Golden Beach Corringle

Protection priority based on sensitivity and predicted consequence (as per EP Volume 2a), protectable/actionable areas, and minimum time to exposure in this area is:

Lakes Entrance - permantly open river mouth to the Gippsland Lakes being a recognised Ramsar site, marine flora and fauna, marshes, wetlands, estuarine habitat, shorebird/seabird colonies, amenity beaches, surf club, commercial fishing, tourism, dive sites, recreational aquatic activities, waterway amenity access.

The other potentially contacted areas are primarily sandy beaches or river mouths that are not permanently open.

3. Strategic NEBA and selection of response options

Response Option	Benefits	Effectiveness on Condensate Spill	Viable Response?	Net Benefit?
Source Control	Limit flow of hydrocarbons to environment.	Only viable option to stop flow of condensate to the marine environment.	Yes	✓
Surveillance and Monitoring	Although surveillance is not an active intervention to treat or remove oil pollution, it is critical to effective response both in the initial stages of an incident and during ongoing response operations.	Surveillance and monitoring used to observe the natural break-up and dissipation of a condensate spill from the BTW wells without the need for active intervention.	Yes	✓
Dispersant Application	Dispersants act by allowing hydrocarbons to be mixed into the upper layers of the water column, which accelerates the biodegradation process. Removes oil from the water surface, protecting leeward shorelines and providing benefit to sea-surface air breathing fauna.	Condensate from the BTW wells is highly volatile and will be removed from the sea surface by evaporation. Dispersant is ineffective on Group I oils due to the very low viscosity and high volatility. Application of dispersant can contribute to water quality degradation through chemical application, without removing surface oil. Considered not to add sufficient benefit.	Not viable	x
Containment & Recovery (Vessel Based)	Booms and skimmers to contain surface oil where there is a potential threat to environmental sensitivities. Relies on calm sea conditions, thicknesses >10µm to collect and adequate deployment timeframes.	Condensate from the BTW wells is removed rapidly from the surface through evaporation. Suitable thickness for recovery will be present for only a very short period, making containment and recovery option ineffective. In Bass Strait sea conditions likely to be suitable for containment and recovery operations only 50% of the time.	Not viable	x
In-situ Burning	In-situ burning (burning oil in place) can quickly eliminate large quantities of spilled oil.	Condensate from the BTW wells is removed rapidly from the surface through evaporation. Suitable thickness for burning will be present for a very short period, making in-situ burning option ineffective. In Bass Strait sea, conditions likely to be suitable only 50% of the time.	Not viable	x
Protection of Sensitive Shoreline Resources	Booms and skimmers deployed to protect environmental sensitivities. Environmental conditions (e.g. current, waves) limit application.	Condensate released at the BTW location may contact the shoreline along the Ninety Mile Beach (most likely near Ocean Grange, very low likelihood further east at Lakes Entrance or Corringle). Condensate spreads rapidly and corralling of surface hydrocarbons close to shore is not expected to be effective and is thus not expected to provide sufficient benefit. However, diverting oil away from inlets or creek / river mouths to protect sensitive sites may be undertaken.	Yes	✓
Shoreline Clean-up	Last response strategy to remove oil from the environment due to potential impact.	Condensate released at the BTW location may contact the shoreline along the Ninety Mile Beach (most likely near Ocean Grange, very low likelihood further east at Lakes Entrance or Corringle). There are various shoreline techniques that are appropriate for this type of hydrocarbon, a shoreline clean-up may be effective for reducing shoreline loadings where access is possible, to be assessed on a case-by-case basis.	Yes	✓

Response Option	Benefits	Effectiveness on Condensate Spill	Viable Response?	Net Benefit?
Oiled Wildlife Response (OWR)	Consists of capture, cleaning and rehabilitation of oiled wildlife. May include hazing or pre-emptive captive management.	Given rapid removal from surface through evaporation and therefore limited surface exposure, OWR is unlikely to be required. Distance of drilling locations from coastline also reduces likelihood of extensive wildlife oiling, however individuals may become oiled in the vicinity of the spill. OWR may be implemented if required, to be assessed on case-by-case basis.	Yes	✓

4. Response Resources Required

The below resources needs are based on worst case discharge scenario. Actual resource requirements to be determined based on incident specific assessment.

Response Option	Strategy	Resource	Timeframe
Source Control	ROV debris clearing / subsea intervention	1 x ROV and 1 x vessel SFRT (via AMOSC) and 1 x vessel 1 x contract well control specialists (WWC/OSRL)	Estimated 5 days (from call out request to arrival in Victoria) Estimated 7 days (from Perth to BBMT via road transport) 2 days (from Singapore)
	Relief well	1 x MODU (via APPEA mutual aid agreement) 1 x contract engineering support (WWC/OSRL) Well construction material	Estimated 85 days (via HLV from Singapore)
Surveillance and Monitoring	OSMP O1.1 Weather and Sea State	N/A	
	OSMP O1.2 Trajectory Estimation	1 x contracted modeller.	
	OSMP Module O1.3 and O4.1 Aerial surveillance	1x observer per aircraft. Aircraft to have 100nm range and 3 hour duration.	Initial overflight <4 hours service requested. Trained observer <12 hours of spill occurring.
	OSMP Module O1.4 Tracking buoy	1x buoy available.	Deployed <12 hrs of spill occurring (dependent on weather conditions) (Level 2 & 3 spill).
	OSMP O1.5 Satelite Imagery	1 x contract.	
	OSMP Module O2.1 and O2.3 Water and Oil Sampling	1x vessel. 1x initial sampling kit. 1x contract with laboratory.	Samples obtained <24 hrs of spill occurring. Analysis initiated <24 hours of receipt in laboratory.
Protection of Sensitive Shoreline Resources[*1]	Personnel	115 Personnel (Peak)	Required within 48 hours
	OSR Equipment	300m x Shoreboom 650m x Near shore boom 300m x Offshore boom 10 x Fast Tanks Anchor kits + accessories	50% required within 48 hours

	Vehicles and Vessels	1 x Vessel C&R (offshore) 1 x Vessel C&R (near shore) 2 x Workboat 1 x Front End Loader / Dozer	Required within 48 hours
Shoreline Clean-up[*2]	Personnel	12 Foreman 100 Labourers 8 Specialised Operators	50% required within 72 hours
	Vehicles and Vessels	4 x ATV 4 x Truck/Vehicle 1 x Front End Loader / Dozer 2 x Dump Truck	100% required within 72 hours
	OSR Equipment	1 x Pump 84m x Inshore Boom 84m x Sorbent boom/snares 14m x Shoreline flushing pipe	100% required within 72 hours
	Manual Equipment	160 x Shovels 160 x Rakes 160 x Picks 32000 x Plastic Bags 32 x Wheel barrows	50% required within 72 hours
Oiled Wildlife Response	DEWLP will make the decision to stand up resources which are based in Victoria	To be determined by DELWP	Available <24 hours from request for services

[*1] Based on simultaneous implementation of all relevant TRPs for protection of river mouths.

[*2] Based on clean up of shoreline with predicted loading of 100 g/m^2 or greater. Assumed 5% of the shoreline being cleaned up in any 1 day (and a continuous re-oiling of the shoreline). Maximum volume ashore 102m^3 (BTW).

Relevant Tactical Response Plan (TRP)	Lake Tyers Lake Bunga Lakes Entrance Merriman Creek (Seaspray)

5. Oil Spill Monitoring

		West Barracouta
Sensitivities - Probability of contact with dissolved hydrocarbons at moderate threshold (surface 0 – 10m)	> 90%	White Shark distribution / breeding BIA Southern Right Whale migration BIA Pygmy Blue Whale distribution and foraging BIA Seabirds foraging BIAs KEF: Upwelling East of Eden
	75 - 90%	nil
	50 – 75%	Point Hicks MNP White shark foraging BIA Seabirds foraging BIAs
	25 – 50%	Seabirds foraging BIAs
	10 – 25%	Cape Howe MNP Ninety Mile Beach MNP Beware Reef Marine Sanctuary Cape Conran Coastal Park Croajingolong National Park Lakes Entrance Ninety Mile Beach Seabirds foraging BIAs Little penguin foraging BIA
	< 10%	Beagle AMP East Gippsland AMP Grey nurse shark foraging / migration BIA Humpback whale foraging BIA Indo-pacific bottlenose dolphin breeding BIA Little penguin breeding BIA Seabirds foraging BIAs Batemans Marine Sanctuary Mimosa Rocks and Bournda National Parks Gippsland Lakes Ramsar wetland KEF: Big Horseshoe Canyon
Marine Parks – Probability of contact with entrained hydrocarbons at the low threshold	> 90%	Cape Howe MNP Point Hicks MNP Beware Reef MS
	75 - 90%	East Gippsland AMP
	50 - 75%	Ninety Mile Beach MNP Batemans MP Gippsland Lakes Ramsar wetland
	25 - 50%	Beagle AMP Jervis AMP Wilsons Promontory MNP
	10 – 25%	Flinders AMP Nooramunga M&CP Corner Inlet Ramsar wetland
	< 10%	Central Eastern AMP Freycinet AMP

		Lord Howe AMP Bunurong MNP Corner Inler MNP Jervis Bay MP Shallow Inlet M&CP

Modelling predicts that a condensate spill may intersect the coastline after 48 hours at locations around:

- Lakes Entrance
- Seaspray
- Ocean Grange

As such, and in addition to the modules that are required to monitor the spill, within 48 hours the following modules may be initiated and resources mobilised to the **priority monitoring locations** listed above:

- O3 Shoreline assessment
- O4 Fauna observations
- O5 Air quality sampling
- O6 Sediment sampling
- S1 Hydrocarbons in intertidal sediments and water
- S4 Short term impacts to oiled flora and fauna

These modules are to be implemented to allow any potential impacts to identified natural values that are present in the area at which intersection of the coastal zone may occur. All identified environmental receptors in the area will be subject to monitoring. Sufficient resources are available to undertake monitoring and these are detailed in the OSMP.

In accordance with the timeframes for module implementation outlined in the OSMP, all of the above modules can be implemented within 48 hours (in most cases, sooner) at the priority monitoring locations. Timing for implementation of the remaining scientific modules will be as detailed in the module.

The table below estimates the required resources needed to implement the OSMP modules in the field in the event of an example WCDS for BTW. It is estimated that 29 field teams could be required to implement all the modules. Assuming these teams are deployed simultaneously, 90 - 130 specialists and scientists could be required to staff these teams. It can be seen from Sections 2.7.3 and 2.7.5 of the OSMP that the Third Party OSMP Consultant has sufficient resources available to meet this demand. Per Section 2.7.2 of the OSMP, Survey Plans will be developed upon activation of the OSMP which will determine the monitoring requirements for the specific spill.

OSMP - Example response (number of survey units) relevant to BTW WCDS Deterministic OSTM.

	O1: Oil spill surveillance					O2: Water and oil sampling			O3: Shoreline assessment				O4: Fauna observations		O5: Air quality		O6: Sediment sampling	
	O1.1	O1.2	O1.3	O1.4	O1.5	O2.1	O2.2	O2.3	O3.1	O3.2	O3.3	O3.4	O4.1	O4.2	O5.1	O5.2	O6.1	O6.2
Spill Event	Weather and sea state	Trajectory estimation	Aerial or underwater observation	Remote observation	Satellite imagery	Collection of an oil sample	Fluorometry	Water samples	Shoreline segmentation	Shoreline character	Oil on shorelines	Shoreline profile	Fauna observation (at sea)	Fauna observation (onshore)	Personnel and area monitoring	Laboratory analysis	Sediment samples (onshore)	Sediment samples (offshore)
BTW WCDS	E	SC	E	E	SC	E	E / SC lab	E / SC lab	3 FT				3 FT	3 FT	3 FT	SC lab	3 FT	1 FT

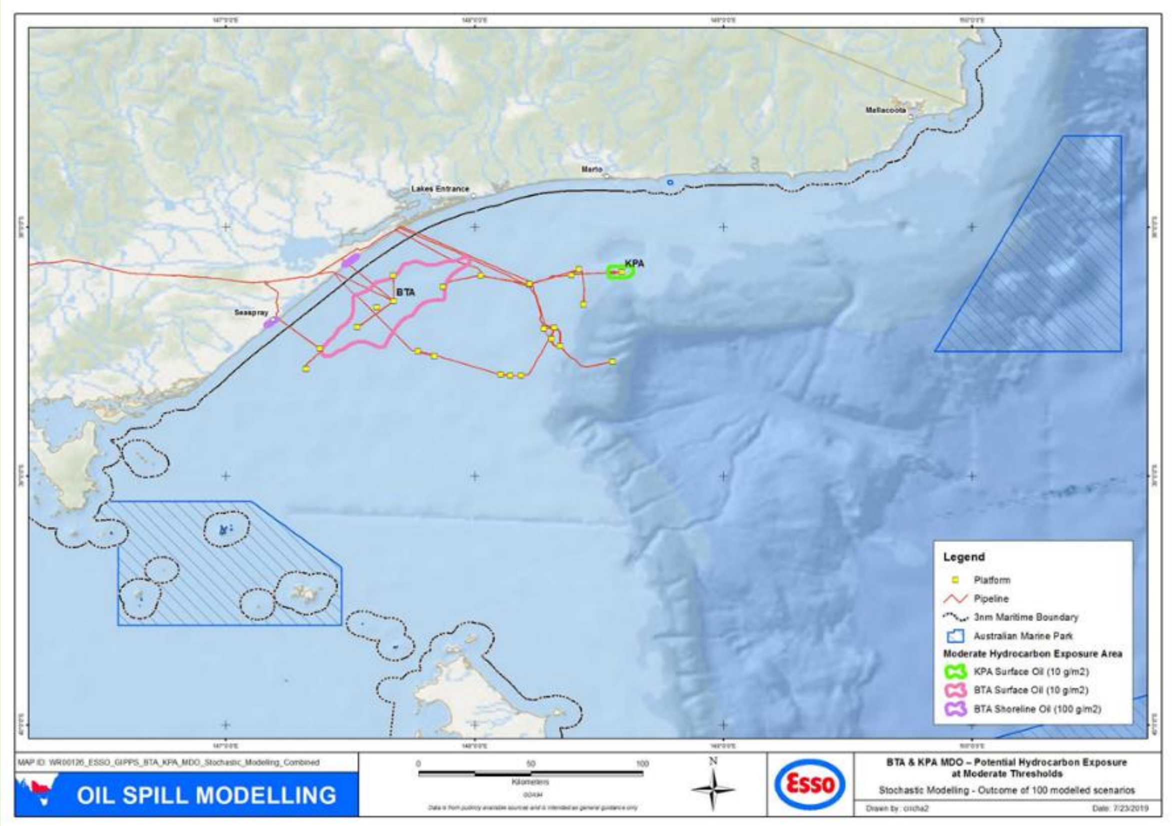
	S1: Hydrocarbons in intertidal sediments and water		S2: Hydrocarbons in offshore sediments and water		S3: Fish and shellfish taint and toxicity for human consumption	S4: Short-term impacts to oiled fauna and flora				S5: Recovery of commercial and recreational fisheries	S6: Recovery of fauna	S7: Recovery of subtidal and intertidal benthic habitat				S8: Recovery of coastal flora		S9: Recovery of Ramsar values
	S1.1	S1.2	S2.1	S2.2	S3	S4.1	S4.2	S4.3	S4.4	S5	S6	S7.1	S7.2	S7.3	S7.4	S8.1	S8.2	S9
Spill Event	Water samples	Sediment samples	Water samples	Sediment samples	Fish/shellfish tissue samples	Fauna surveys (vessel-based)	Fauna surveys (land-based)	Oiled fauna hydrocarbon testing	Flora surveys	Desktop review of fishery stock	Fauna surveys	Habitat mapping	Macroalgae and sponges	Benthic infauna monitoring	Intertidal and subtidal fish monitoring	Habitat mapping	Condition monitoring	Desktop review of wetland values
BTW WCDS	3 FT		3 FT		1 FT	2 FT	2 FT			SC	1 FT	1 FT				1 FT		SC

Key: E = Esso; SC = Specialist consultant (office based or lab); FT = Field Team (# field personnel per team as required by OSMP module – generally 2-3 personnel)

Information specific to a MDO spill from a vessel collision during the Kipper (KPA) and West Barracouta (BTW) drilling campaign is provided below. For further details, refer to the JUR Drilling Environment Plan.

1. Field Location / Oil properties

Location / operational area

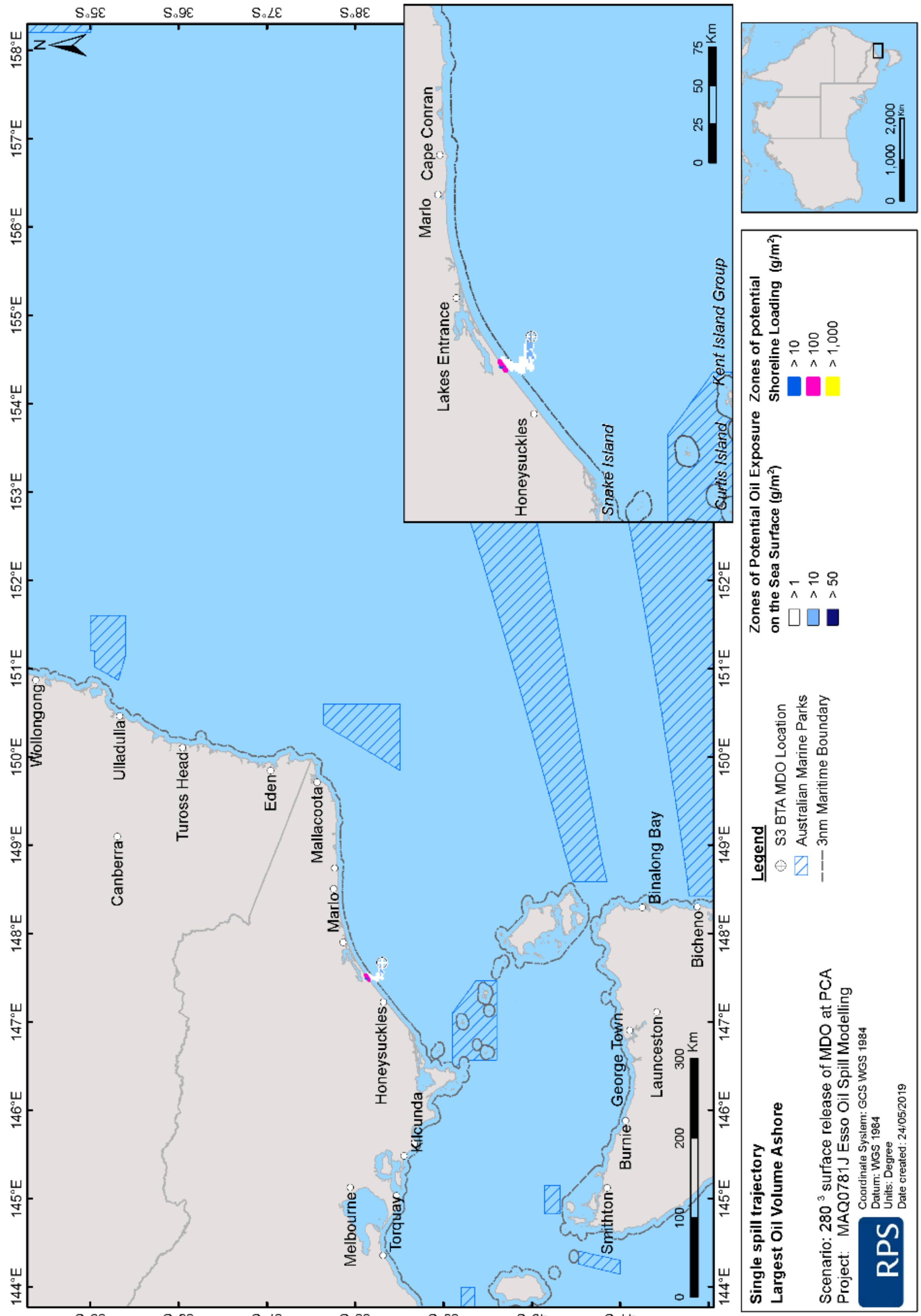


Production Licence No.	West Barracouta VIC/L1 Kipper Subsea Facility VIC/L25		
Coordinates		West Barracouta	Kipper
	Latitude	38° 19’ 06” S	38°10' 53" S
	Longitude	147° 36’ 53” E	148° 35' 35” E
	Depth	45.5 m	95 m
Oil types and name		Marine Diesel Oil (MDO)	
	Density @ 15˚C	829 kg/m^3	
	API	37.6	
	Dynamic Viscosity	4.0 cP @ 25°C	
	Pour Point	-14 ºC	
	Wax Content	-	
	Oil Property Category	Group II light persistent oil	

2. What's the worst that could happen?

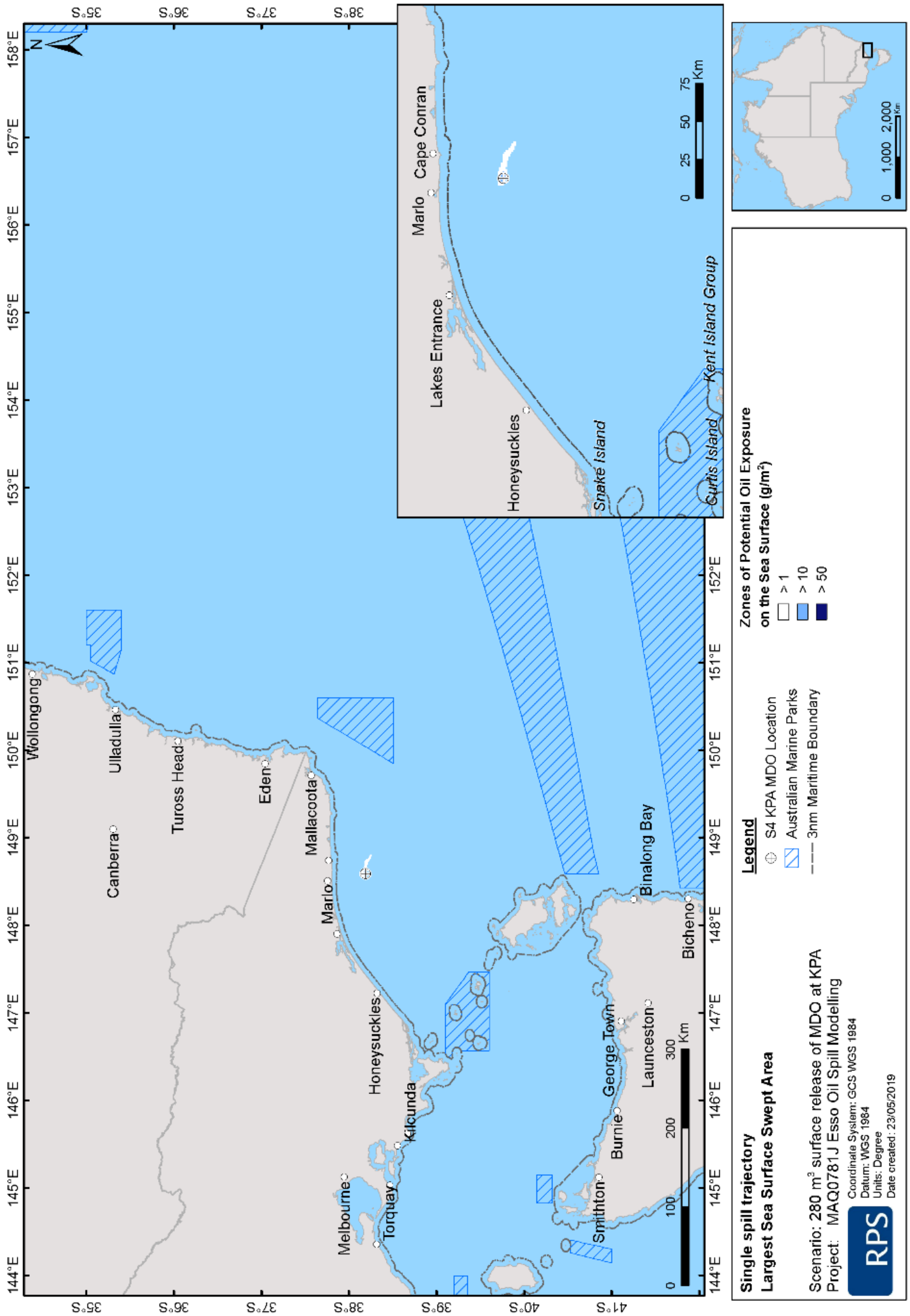
West Barracouta / Kipper	
Worst case oil pollution scenario	Level 2 Vessel collision (280 m^3 of MDO over 6 hours) at either drilling location
Dominant Weathering process	Evaporation
Approximate weathering predicted (from deterministic modelling)	Based on deterministic modelling, approximately: • 70 - 90% MDO is predicted to evaporate. • 5 – 15% MDO is predicted to remain in the water column • Shoreline impacts may occur depending on proximity to shore (8% MDO predicted to arrive ashore if the spill originates at the West Barracouta operational area)

Exposure – Sea Surface BTW



Zones of potential exposure on the sea surface and shoreline loading for the trajectory with the largest oil volume ashore, longest length of shoreline contacted above the 100 g/m^2 threshold and the minimum time before exposure to immediate nearshore waters by visible oil (0.5 g/m^2). Results are based on a 280 m^3 surface release of MDO over 6 hours at the Barracouta Platform, tracked for 30 days, 3 am 22nd of October 2011.

Exposure – Sea Surface KPA



Zones of potential exposure on the sea surface for the trajectory with the largest sea surface swept area at the 10 g/m^2 threshold. Results are based on a 280 m^3 surface release of MDO over 6 hours at the Kipper Facility, tracked for 30 days, 10 am 17th of May 2011.

3. Resources at Risk

		West Barracouta	Kipper
Minimum time to oil exposure on the sea surface at moderate threshold	< 12 hours	Great White Shark distribution and breeding BIAs Southern Right Whale migration BIA Pygmy Blue Whale distribution and foraging BIAs Seabirds foraging BIAs	Great White Shark distribution BIA Southern Right Whale migration BIA Pygmy Blue Whale distribution and foraging BIAs Seabirds foraging BIAs KEF: Upwelling East of Eden
	12 – 48 hours	nil	nil
	> 48 hours	nil	nil
Minimum time to shoreline accumulation of oil at moderate threshold	< 12 hours	nil	nil
	12 – 48 hours	nil	nil
	> 48 hours	Wellington Ocean Grange Seaspray	nil

4. Strategic NEBA and selection of response options

Response Option	Benefits	Effectiveness on MDO Spill	Viable Response?	Net Benefit?
Source Control	Limit flow of hydrocarbons to environment.	Only viable option to stop flow of oil to the marine environment.	Yes	✓
Surveillance and Monitoring	Although surveillance is not an active intervention to treat or remove oil pollution, it is critical to effective response both in the initial stages of an incident and during ongoing response operations.	Surveillance and monitoring used to observe the natural break-up and dissipation of a MDO spill without the need for active intervention.	Yes	✓
Dispersant Application	Dispersants act by allowing hydrocarbons to be mixed into the upper layers of the water column, which accelerates the biodegradation process. Removes oil from the water surface, protecting leeward shorelines and providing benefit to sea-surface air breathing fauna.	Dispersant application is not recommended for MDO as it spreads rapidly to a thin layer. Insufficient time to respond while suitable surface thicknesses are present. Dispersant droplets are known to penetrate through the thin oil layer and cause 'herding' of the oil. This creates areas of clear water but is not successful dispersion. Application of dispersant can contribute to water quality degradation through chemical application, without removing surface oil. Considered not to add sufficient benefit.	Not viable	x
Containment & Recovery (Vessel Based)	Booms and skimmers to contain surface oil where there is a potential threat to environmental sensitivities. Relies on calm sea conditions, thicknesses >10µm to collect and adequate deployment timeframes.	MDO spreads rapidly to a thickness of less than 10 µm. Containment is ineffective at these thicknesses.	Not viable	x
In-situ Burning	In-situ burning (burning oil in place) can quickly eliminate large quantities of spilled oil.	MDO spreads rapidly to a thickness of less than 10 µm. Containment, and therefore also in-situ burning, is ineffective at these thicknesses.	Not viable	x
Protection of Sensitive Shoreline Resources	Booms and skimmers deployed to protect environmental sensitivities. Environmental conditions (e.g. current, waves) limit application.	The KPA location is sufficiently far from shore that coastline impact is not expected. There is a low probability that MDO spilled at the BTW location may contact the shoreline along the Ninety Mile Beach. MDO spreads rapidly to a thickness of less than 10 µm. Corralling of surface hydrocarbons close to shore is not expected to be effective for MDO and is thus not expected to provide sufficient benefit. However, diverting oil away from inlets or creek / river mouths to protect sensitive sites may be undertaken.	Yes	✓
Shoreline Clean-up	Last response strategy to remove oil from the environment due to potential impact.	The KPA location is sufficiently far from shore that coastline impact is not expected. There is a low probability that MDO spilled at the BTW location may contact the shoreline along the Ninety Mile Beach. There are various shoreline techniques that are appropriate for this type of hydrocarbon, a shoreline clean-up may be effective for reducing shoreline loadings where access is possible, to be assessed on a case-by-case basis.	Yes	✓
Oiled Wildlife Response (OWR)	Consists of capture, cleaning and rehabilitation of oiled wildlife. May include hazing or pre-emptive captive management.	Given limited size and rapid spreading of the MDO spill large scale OWR is unlikely to be required. Distance from coastline also reduces likelihood of extensive wildlife oiling, however individuals may become oiled in the vicinity of the spill. OWR may be implemented if required, to be assessed on case-by-case basis.	Yes	✓

5. Response Resources Required

Response Option	Strategy	Resource	Timeframe
Source Control	As per vessel SOPEP	-	-
Surveillance and Monitoring	OSMP O1.1 Weather and Sea State	1 x observer (to conduct 2 hour watch)	<2 hours from time of spill
	OSMP O1.2 Trajectory Estimation	1 x contracted modeller.	< 4 hours of service requested.
	OSMP Module O1.3 and O4.1 Aerial surveillance	1x observer per aircraft. Aircraft to have 100nm range and 3 hour duration.	Initial overflight <4 hours service requested. Trained observer <12 hours of spill occurring.
	OSMP Module O1.4 Tracking buoy	1x buoy available.	Deployed <12 hrs of spill occurring (dependent on weather conditions) (Level 2 & 3 spill).
	OSMP Module O2.1 and O2.3 Water and Oil Sampling	1x vessel. 1x initial sampling kit. 1x contract with laboratory.	Samples obtained <24 hrs of spill occurring. Analysis initiated <24 hours of receipt in laboratory.
Protection of Sensitive Shoreline Resources	Shoreline protection	5x booming systems (based on Lakes Entrance TRP which has the highest resource requirements).	<24 hours from request for services
		Approx. 100 personnel (based on Lakes Entrance TRP which has the highest resource requirements).	Notify State Duty Officer <2 hours of incident. Initiate request to call out core group <3 hours.
Shoreline Clean-up	Provision of personnel to support CA	15m^3 recovery per team per day based on ~~33~~ teams of 15 people. Maximum volume ashore 25 m^3.	< 24 hours from request for services
Oiled Wildlife Response	DELWP will make the decision to stand up resources which are based in Victoria	To be determined by DELWP	Available <24 hours from request for services

Relevant Tactical Response Plan (TRP)	Merriman Creek (Seaspray)

6. Oil Spill Monitoring

		West Barracouta	Kipper
Sensitivities – Probability of contact with dissolved hydrocarbons at moderate threshold	> 90%	nil	nil
	50 - 90%	nil	nil
	50 – 75%	nil	nil
	25 – 50%	nil	nil
	10 – 25%	nil	nil
	< 10%	nil	nil
Marine Parks – Probability of contact with entrained hydrocarbons	> 90%	nil	nil
	75 - 90%	nil	nil
	50 - 75%	Point Hicks Marine National Park	nil
	25 - 50%	Cape Howe Marine Park	nil
	10 – 25%	Beware Reef Marine Sanctuary	Cape Howe Marine National Park Point Hicks Marine National Park
	< 10%	Beagle AMP East Gippsland AMP Batemans Marine Park Ninety Mile Beach Marine National Park Gippsland Lakes Ramsar wetland	Beagle AMP East Gippsland AMP Flinders AMP Freycinet AMP Beware Reef Marine Sanctuary Batemans Marine Park

Modelling predicts that an MDO spill may intersect the coastline after 48 hours at locations around:

- Seaspray,
- Ocean Grange;
- Wellington.

As such, and in addition to the modules that are required to monitor the spill, within 48 hours the following modules may be initiated and resources mobilised to the priority monitoring locations listed above:

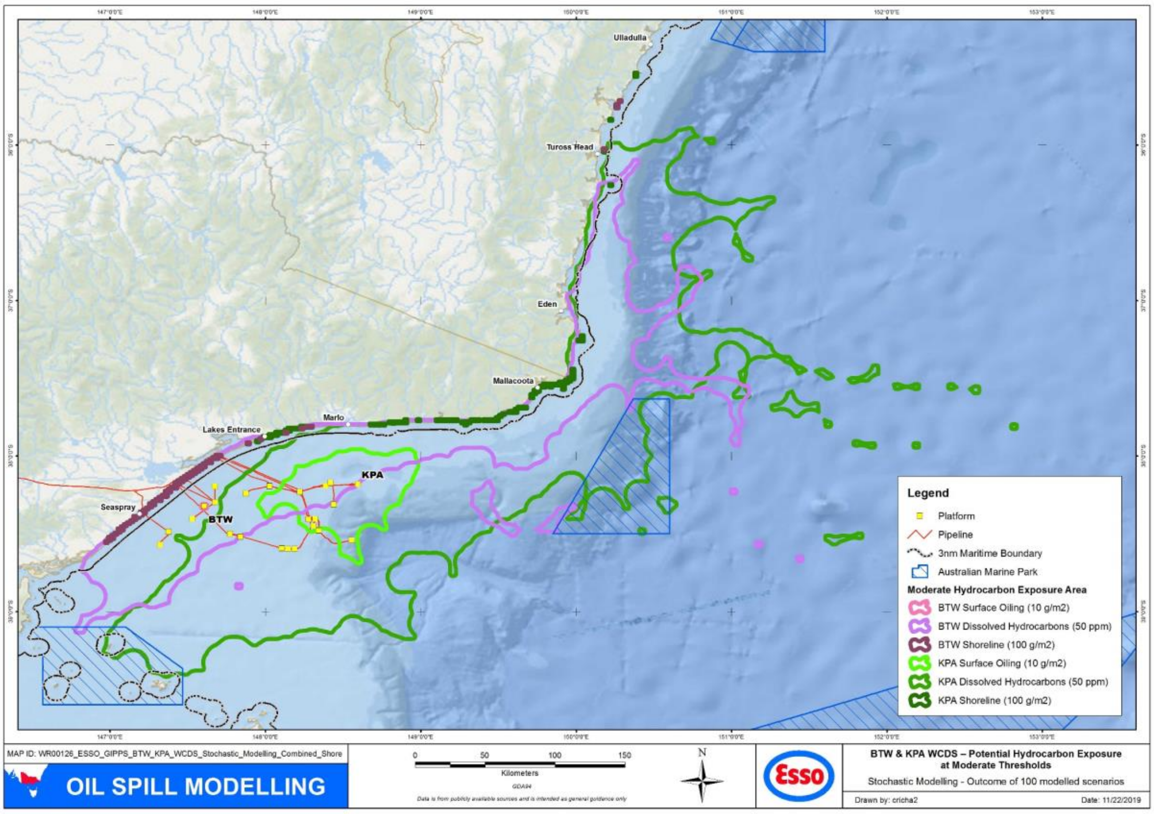
- O3 Shoreline assessment
- O4 Fauna observations
- O5 Air quality sampling
- O6 Sediment sampling
- S1 Hydrocarbons in intertidal sediments and water
- S4 Short term impacts to oiled flora and fauna

These modules are to be implemented to allow any potential impacts to identified natural values that are present in the area at which intersection of the coastal zone may occur. All identified environmental receptors in the area will be subject to monitoring. Sufficient resources are available to undertake monitoring and these are detailed in the OSMP**.** In accordance with the timeframes for module implementation outlined in the OSMP, all of the above modules can be implemented within 48 hours (in most cases, sooner) at the priority monitoring locations. Timing for implementation of the remaining scientific modules will be as detailed in the module.

Information specific to the Kipper (KPA) drilling campaign is provided below. For further details, refer to the JUR Drilling Environment Plan.

1. Field Location / Oil properties

Location / operational area

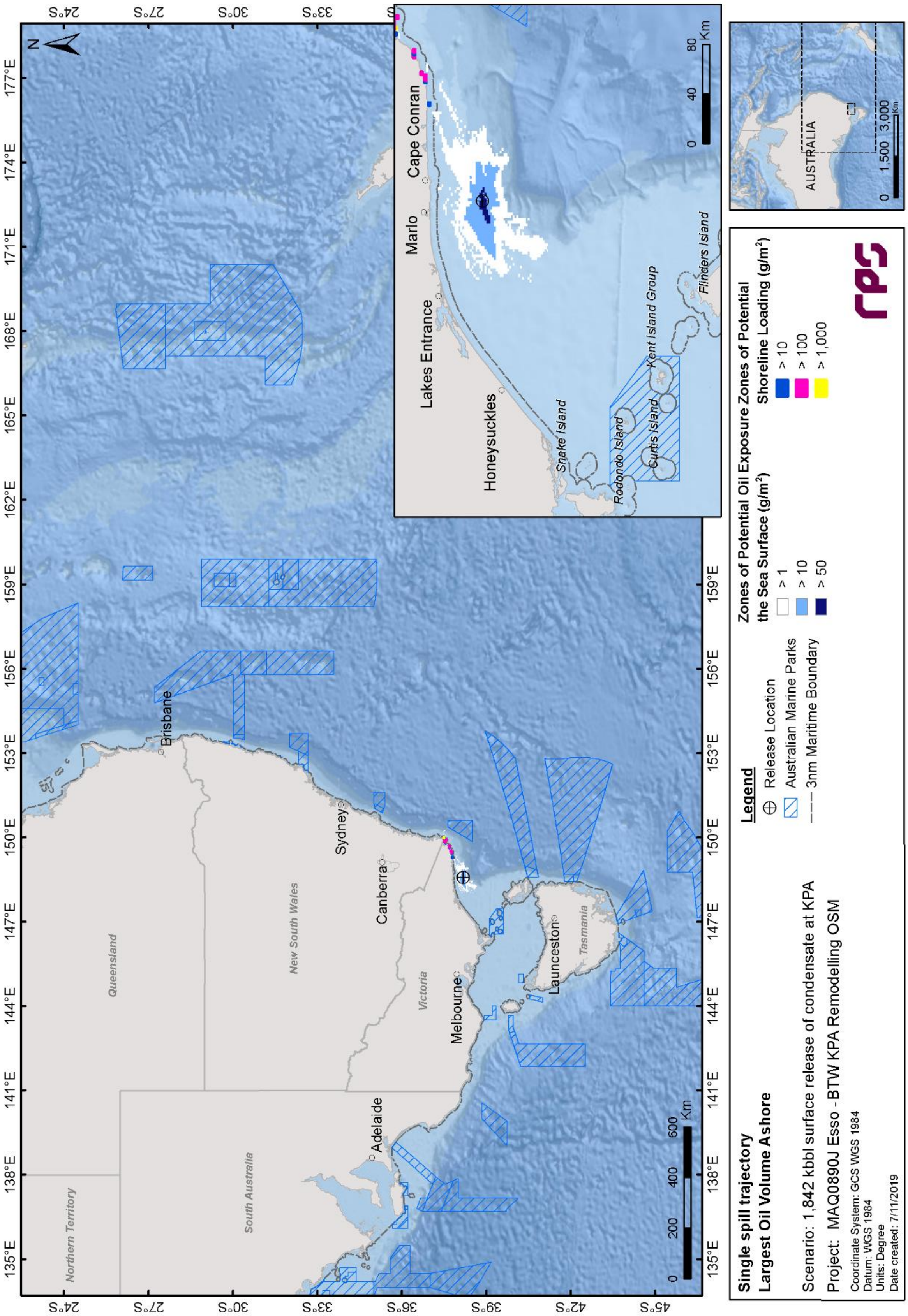


Production Licence No.	Kipper Subsea Facility VIC/L25	
Coordinates		Kipper
	Latitude	38°10' 53" S
	Longitude	148° 35' 35” E
	Depth	95 m

Oil types and name		Kipper Condensate			
	Density @ 15˚C	760.6 kg/m^3			
	API	54.5			
	Dynamic Viscosity	0.91 @ 20ºC			
	Pour Point	-39 ºC			
	Wax Content	2.3%			
	Oil Property Category	Group I non-persistent oils			
	Boiling Point Distribution (°C)	Volatile (<180°C) 55.0 %	Semi-volatile (180-265°C) 34.8 %	Low volatility (265-380°C) 9.6 %	Residual (>380°C) 0.6 %

2. What's the worst that could happen?

	Kipper
Worst Case Discharge Scenario	Level 3 Spill A complete loss of well control (no drillpipe in hole) resulting in a release of: 1842.0 kbbl condensate until source control is effective (98 days).
Dominant Weathering process	Evaporation
Approximate weathering predicted (from deterministic modelling)	• 71% condensate evaporates • 22% decay/ biodegrade • 7% remain within the water column • <0.1% on shoreline



Zones of potential exposure on the sea surface and shoreline loading for the trajectory with the largest oil volume ashore and longest length of shoreline contact. Results are based on a 1,842,400 bbl (292,918 m^3) surface release of Kipper condensate over 98 days at the Kipper Facility, tracked for 118 days, 11 pm 11th of March 2011

3. Resources at Risk

		Kipper
Minimum time to oil exposure on the sea surface at moderate threshold	< 12 hours	nil
	12 – 48 hours	Seabird foraging BIA
	> 48 hours	nil
Minimum time to shoreline accumulation of oil at moderate threshold	< 12 hours	nil
	12 – 48 hours	nil
	> 48 hours	Point Hicks
	> 1 week	Bega Valley Shire coast (including Bournda National Park Mimosa Rocks National Park Croajingolong National Park Gabo Island Cape Howe Lake Tyers Beach Lakes Entrance Cape Conran Coastal Park Montague Island Nature Reserve) City of Shoalhaven coast (including Conjola National Park Booderee National Park Jervis Bay National Park)

Protection priority based on sensitivity and predicted consequence (as per EP Volume 2a), protectable/actionable areas, and minimum time to exposure in this area are:

- **Gabo Island** – Giant Kelp, Little Penguin colony, Seabird rookery, Fur seal colony
- **Mallacoota** – Estuary inlet, nature based tourism, recreational activities

4. Strategic NEBA and selection of response options

Response Option	Benefits	Effectiveness on Condensate Spill	Viable Response?	Net Benefit?
Source Control	Limit flow of hydrocarbons to environment.	Only viable option to stop flow of condensate to the marine environment.	Yes	✓
Surveillance and Monitoring	Although surveillance is not an active intervention to treat or remove oil pollution, it is critical to effective response both in the initial stages of an incident and during ongoing response operations.	Surveillance and monitoring used to observe the natural break-up and dissipation of a condensate spill from the BTW and KPA wells without the need for active intervention.	Yes	✓
Dispersant Application	Dispersants act by allowing hydrocarbons to be mixed into the upper layers of the water column, which accelerates the biodegradation process. Removes oil from the water surface, protecting leeward shorelines and providing benefit to sea-surface air breathing fauna.	Condensate from the BTW and KPA wells is highly volatile and will be removed from the sea surface by evaporation. Dispersant is ineffective on Group I oils due to the very low viscosity and high volatility. Application of dispersant can contribute to water quality degradation through chemical application, without removing surface oil. Considered not to add sufficient benefit.	Not viable	x
Containment & Recovery (Vessel Based)	Booms and skimmers to contain surface oil where there is a potential threat to environmental sensitivities. Relies on calm sea conditions, thicknesses >10µm to collect and adequate deployment timeframes.	Condensate from the BTW and KPA wells is removed rapidly from the surface through evaporation. Suitable thickness for recovery will be present for only a very short period, making containment and recovery option ineffective. In Bass Strait sea conditions likely to be suitable for containment and recovery operations only 50% of the time.	Not viable	x
In-situ Burning	In-situ burning (burning oil in place) can quickly eliminate large quantities of spilled oil.	Condensate from the BTW and KPA wells is removed rapidly from the surface through evaporation. Suitable thickness for burning will be present for a very short period, making in-situ burning option ineffective. In Bass Strait sea, conditions likely to be suitable only 50% of the time.	Not viable	x
Protection of Sensitive Shoreline Resources	Booms and skimmers deployed to protect environmental sensitivities. Environmental conditions (e.g. current, waves) limit application.	Condensate released at the KPA location may contact the shoreline along the East Gippsland coast (most likely at Gabo Island, Cape Howe / Mallacoota) or the Southern NSW coast near Bega. Condensate spreads rapidly and corralling of surface hydrocarbons close to shore is not expected to be effective and is thus not expected to provide sufficient benefit. However, diverting oil away from inlets or creek / river mouths to protect sensitive sites may be undertaken.	Yes	✓
Shoreline Clean-up	Last response strategy to remove oil from the environment due to potential impact.	Condensate released at the KPA location may contact the shoreline along the East Gippsland coast (most likely at Gabo Island, Cape Howe / Mallacoota) or the Southern NSW coast near Bega.	Yes	✓

Response Option	Benefits	Effectiveness on Condensate Spill	Viable Response?	Net Benefit?
		There are various shoreline techniques that are appropriate for this type of hydrocarbon, a shoreline clean-up may be effective for reducing shoreline loadings where access is possible, to be assessed on a case-by-case basis.		
Oiled Wildlife Response (OWR)	Consists of capture, cleaning and rehabilitation of oiled wildlife. May include hazing or pre-emptive captive management.	Given rapid removal from surface through evaporation and therefore limited surface exposure, OWR is unlikely to be required. Distance of drilling locations from coastline also reduces likelihood of extensive wildlife oiling, however individuals may become oiled in the vicinity of the spill. OWR may be implemented if required, to be assessed on case-by-case basis.	**Yes**	✓

5. Response Resources Required

The below resources needs are based on worst case discharge scenario. Actual resource requirements to be determined based on incident specific assessment.

Response Option	Strategy	Resource	Timeframe
Source Control	ROV debris clearing / subsea intervention	1 x ROV and 1 x vessel SFRT (via AMOSC) and 1 x vessel 1 x contract well control specialists (WWC/OSRL)	Estimated 5 days (from call out request to arrival in Victoria) Estimated 7 days (from Perth to BBMT via road transport) 2 days (from Singapore)
	Relief well	1 x MODU (via APPEA mutual aid agreement) 1 x contract engineering support (WWC/OSRL) Well construction material	Estimated 85 days (via HLV from Singapore)
Surveillance and Monitoring	OSMP O1.1 Weather and Sea State	N/A	
	OSMP O1.2 Trajectory Estimation	1 x contracted modeller.	
	OSMP Module O1.3 and O4.1 Aerial surveillance	1x observer per aircraft. Aircraft to have 100nm range and 3 hour duration.	Initial overflight <4 hours service requested. Trained observer <12 hours of spill occurring.
	OSMP Module O1.4 Tracking buoy	1x buoy available.	Deployed <12 hrs of spill occurring (dependent on weather conditions) (Level 2 & 3 spill).
	OSMP O1.5 Satelite Imagery	1 x contract.	
	OSMP Module O2.1 and O2.3 Water and Oil Sampling	1x vessel. 1x initial sampling kit. 1x contract with laboratory.	Samples obtained <24 hrs of spill occurring. Analysis initiated <24 hours of receipt in laboratory.
Protection of Sensitive Shoreline Resources[*1]	Personnel	66 Personnel (Peak)	Required within 7 days
	OSR Equipment	975m x Shoreboom 150m x Near shore boom 1125 x Sandbags Anchor kits + accessories	Required within 7 days

	Vehicles and Vessels	2 x Vessel (shallow draft) 1 x Vessel C&R (near shore) 8 x UTV 3 x Front End Loader / Dozer	Required within 7 days
Shoreline Clean-up*2	Personnel*	14 Foreman 116 Labourers 8 Specialised Operators	50% required within 8 days
	Vehicles and Vessels	5 x ATV 5 x Truck/Vehicle 1 x Front End Loader / Dozer 2 x Dump Truck 1 x Landing craft / barge	100% required within 8 days
	OSR Equipment	1 x Pump 99m x Inshore Boom 99m x Sorbent boom/snares 16m x Shoreline flushing pipe	100% required within 72 hours
	Manual Equipment	188 x Shovels 188 x Rakes 188 x Picks 37000 x Plastic Bags 38 x Wheel barrows	50% required within 72 hours
Oiled Wildlife Response	DEWLP will make the decision to stand up resources which are based in Victoria	To be determined by DELWP	Available <24 hours from request for services

*1 Based on simultaneous implementation of all relevant TRPs for areas indicated in minimum time before shoreline contact deterministic modelling.

*2 Based on clean up of shoreline with predicted loading of 100 g/m^2 or greater. Assumed 5% of the shoreline being cleaned up in any 1 day (and a continuous re-oiling of the shoreline). Maximum volume ashore 186m^3 (KPA).

Relevant Tactical Response Plan (TRP)	<u>Victoria</u> Lakes Entrance Lake Bunga Lake Tyers Sydenham Inlet (Bemm River) Thurra River Mueller River Wingan Inlet Shipwreck Creek Bekta River Davis Creek Mallacoota Gabo Island	<u>NSW</u> Wonboyn River Bittangabee Bay Saltwater Creek Woodburn Creek Fisheries Creek Towamba River Boydtown Creek Nullica River

6. Oil Spill Monitoring

Kipper		
Sensitivities - Probability of contact with dissolved hydrocarbons at moderate threshold (surface 0 – 10m)	> 90%	White Shark distribution BIA Southern Right Whale migration BIA Pygmy Blue Whale distribution and foraging BIA Seabirds foraging BIAs
	75 - 90%	nil
	50 – 75%	Cape Howe MNP Point Hicks MNP Grey nurse shark foraging / migration BIA Humpback whale foraging BIA Little penguin foraging BIA Seabirds foraging BIAs
	25 – 50%	Croajingolong National Park KEF: Big Horseshoe Canyon Indo-Pacific bottlenose dolphin breeding BIA
	10 – 25%	Mimosa Rocks and Bournda National Parks KEF: Canyons on the eastern continental slope White shark breeding BIA Seabirds foraging BIAs
	< 10%	Beagle AMP East Gippsland AMP Batemans MP Beware Reef MS Hogan Island Group and Kent Group NP Montague Island Nature Reserve Cape Conran Coastal Park Seabirds breeding BIA Little penguin breeding BIA
Marine Parks – **Probability of contact with entrained hydrocarbons at the low threshold**	> 90%	East Gippsland AMP Flinders AMP Cape Howe MNP Point Hicks MNP Batemans MP
	75 - 90%	Jervis AMP Beware Reef MS
	50 - 75%	Freycinet AMP Beagle AMP Jervis Bay MP
	25 - 50%	Lord Howe AMP Central Eastern AMP Hunter AMP Ninety Mile Beach MNP Wilsons Promontory MNP Gippsland Lakes Ramsar wetland
	10 – 25%	Bunurong MNP

		Corner Inlet MNP and Ramsar wetland Nooramunga M&CP Shallow Inlet M&CP Logan Lagoon Ramsar wetland Flood Plain Lower Ringarooma River Ramsar wetland East Coast Cape Baron Island Lagoons Ramsar wetland Myall Lakes Ramsar wetland
	< 10%	Elizabeth and Middleton Reefs Ramsar wetland

Modelling predicts that a condensate spill may intersect the coastline after 48 hours at locations around:

- Point Hicks

As such, and in addition to the modules that are required to monitor the spill, within 48 hours the following modules may be initiated and resources mobilised to the **priority monitoring locations** listed above:

- O3 Shoreline assessment
- O4 Fauna observations
- O5 Air quality sampling
- O6 Sediment sampling
- S1 Hydrocarbons in intertidal sediments and water
- S4 Short term impacts to oiled flora and fauna

These modules are to be implemented to allow any potential impacts to identified natural values that are present in the area at which intersection of the coastal zone may occur. All identified environmental receptors in the area will be subject to monitoring. Sufficient resources are available to undertake monitoring and these are detailed in the OSMP**.**

In accordance with the timeframes for module implementation outlined in the OSMP, all of the above modules can be implemented within 48 hours (in most cases, sooner) at the priority monitoring locations. Timing for implementation of the remaining scientific modules will be as detailed in the module.

The table below estimates the required resources needed to implement the OSMP modules in the field in the event of an example WCDS at KPA. It is estimated that 40 field teams could be required to implement all the modules. Assuming these teams are deployed simultaneously, 120 -160 specialists and scientists could be required to staff these teams. It can be seen from Sections 2.7.3 and 2.7.5 of the OSMP that the Third Party OSMP Consultant has sufficient resources available to meet this demand. Per Section 2.7.2 of the OSMP, Survey Plans will be developed upon activation of the OSMP which will determine the monitoring requirements for the specific spill.

OSMP - Example response (number of survey units) relevant to KPA WCDS Deterministic OSTM.

Spill Event	O1: Oil spill surveillance					O2: Water and oil sampling			O3: Shoreline assessment				O4: Fauna observations		O5: Air quality		O6: Sediment sampling	
	O1.1	O1.2	O1.3	O1.4	O1.5	O2.1	O2.2	O2.3	O3.1	O3.2	O3.3	O3.4	O4.1	O4.2	O5.1	O5.2	O6.1	O6.2
	Weather and sea state	Trajectory estimation	Aerial or underwater observation	Remote observation	Satellite imagery	Collection of an oil sample	Fluorometry	Water samples	Shoreline segmentation	Shoreline character	Oil on shorelines	Shoreline profile	Fauna observation (at sea)	Fauna observation (onshore)	Personnel and area monitoring	Laboratory analysis	Sediment samples (onshore)	Sediment samples (offshore)
KPA WCDS	E	SC	E	E	SC	E	E / SC lab	E / SC lab	5 FT				4 FT	4 FT	3 FT	SC lab	3 FT	1 FT

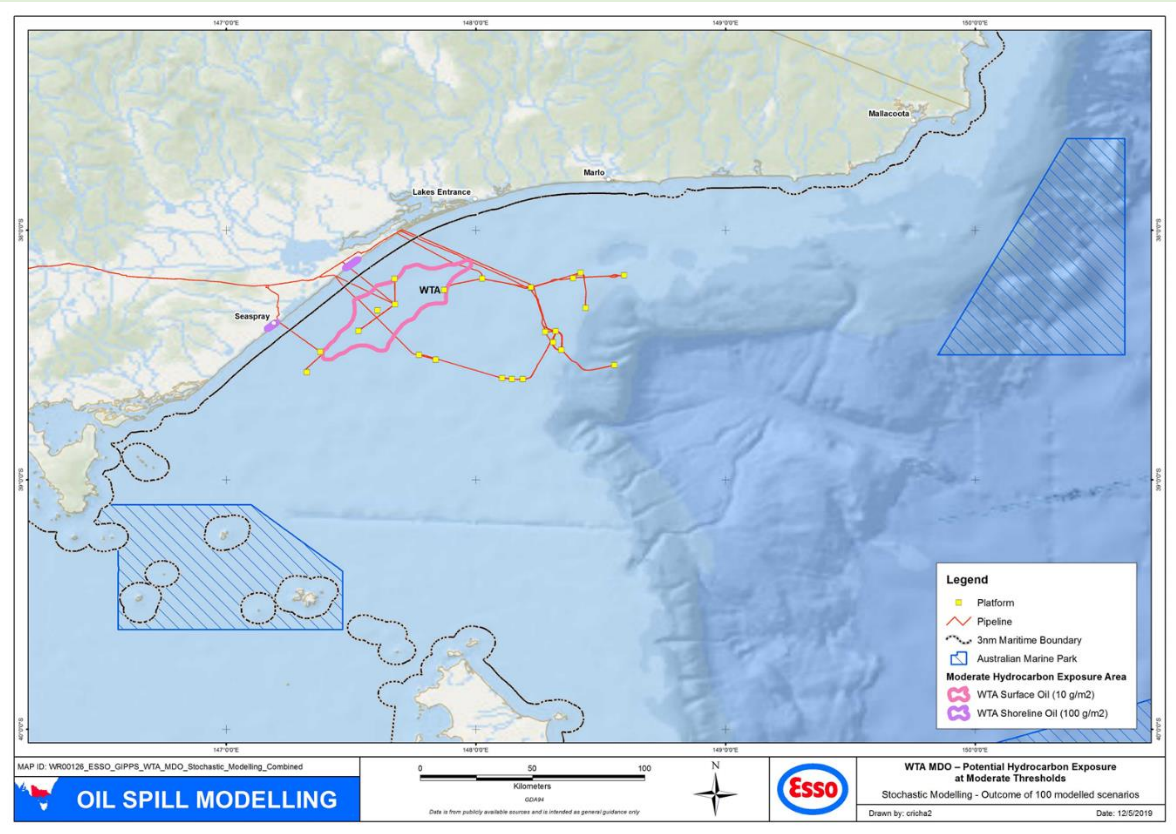
Spill Event	S1: Hydrocarbons in intertidal sediments and water		S2: Hydrocarbons in offshore sediments and water		S3: Fish and shellfish taint and toxicity for human consumption	S4: Short-term impacts to oiled fauna and flora				S5: Recovery of commercial and recreational fisheries	S6: Recovery of fauna	S7: Recovery of subtidal and intertidal benthic habitat				S8: Recovery of coastal flora		S9: Recovery of Ramsar values
	S1.1	S1.2	S2.1	S2.2	S3	S4.1	S4.2	S4.3	S4.4	S5	S6	S7.1	S7.2	S7.3	S7.4	S8.1	S8.2	S9
	Water samples	Sediment samples	Water samples	Sediment samples	Fish/shellfish tissue samples	Fauna surveys (vessel-based)	Fauna surveys (land-based)	Oiled fauna hydrocarbon testing	Flora surveys	Desktop review of fishery stock	Fauna surveys	Habitat mapping	Macroalgae and sponges	Benthic infauna monitoring	Intertidal and subtidal fish monitoring	Habitat mapping	Condition monitoring	Desktop review of wetland values
KPA WCDS	5 FT		3 FT		1 FT	4 FT	4 FT			SC	1 FT	1 FT				1 FT		SC

Key: E = Esso; SC = Specialist consultant (office based or lab); FT = Field Team (# field personnel per team as required by OSMP module – generally 2-3 personnel)

Information specific to a MDO spill from a vessel collision during the Whiting campaign is provided below. MDO spill from Barracouta platform is used for planning purposes. For further details, refer to the JUR Drilling Environment Plan.

1. Field Location / Oil properties

Location / operational area

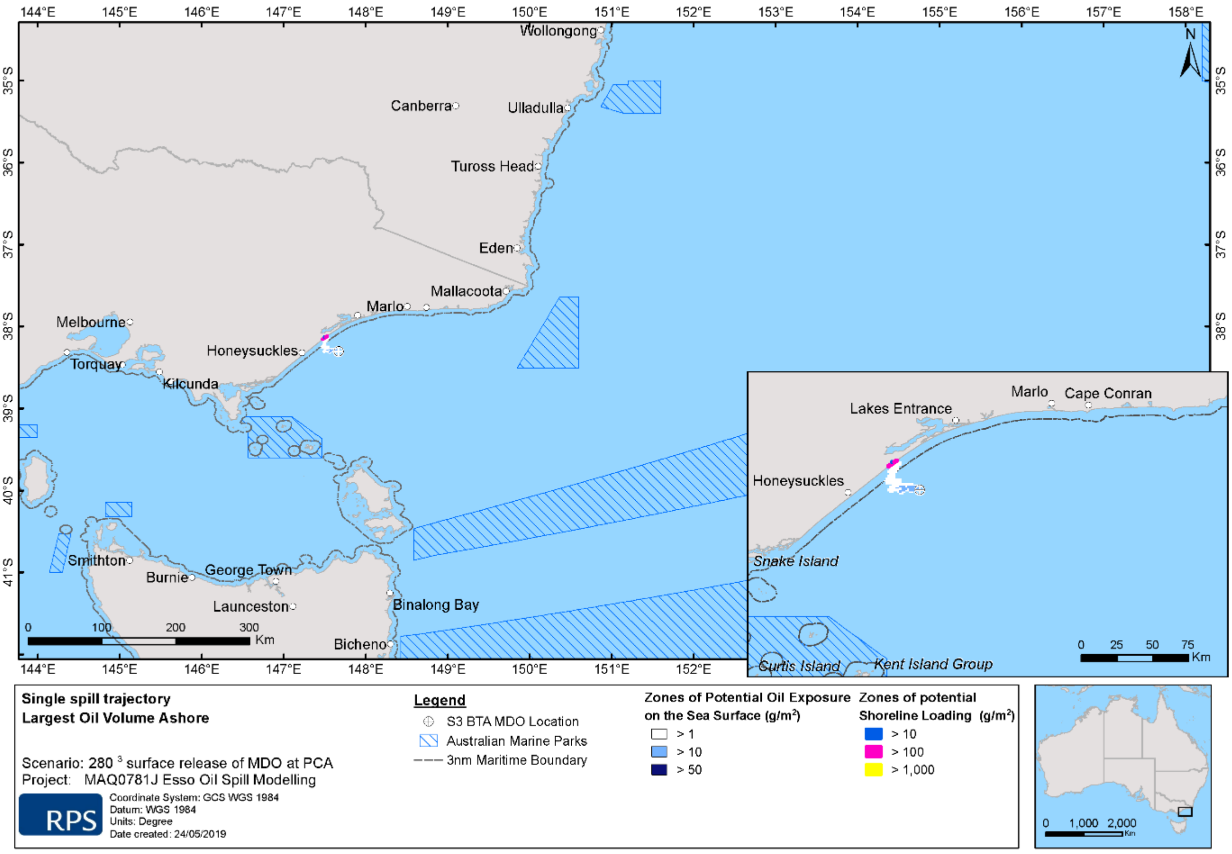


Production Licence No.	Whiting (WTA) VIC/L2	
Coordinates		Whiting
	Latitude	38° 14' 29" S
	Longitude	147° 52' 20" E
	Depth	54 m
Oil types and name		Marine Diesel Oil (MDO)
	Density @ 15˚C	829 kg/m^3
	API	37.6
	Dynamic Viscosity	4.0 cP @ 25°C
	Pour Point	-14 ºC
	Wax Content	-
	Oil Property Category	Group II light persistent oil

2. What's the worst that could happen?

Whiting	
Worst case oil pollution scenario	Level 2 Vessel collision (280 m^3 of MDO over 6 hours) at WTA location
Dominant Weathering process	Evaporation
Approximate weathering predicted (from deterministic modelling)	Based on deterministic modelling, approximately: • 70 - 90% MDO is predicted to evaporate. • 5 – 15% MDO is predicted to remain in the water column • Shoreline impacts may occur depending on proximity to shore (8% MDO predicted to arrive ashore if the spill originates at the WTA operational area (as represented by modelling from Barracouta)

Exposure – Sea Surface WTA



Zones of potential exposure on the sea surface and shoreline loading for the trajectory with the largest oil volume ashore, longest length of shoreline contacted above the 100 g/m^2 threshold and the minimum time before exposure to immediate nearshore waters by visible oil (0.5 g/m^2). Results are based on a 280 m^3 surface release of MDO over 6 hours at the Whiting (as represented by modelling from Barracouta), tracked for 30 days, 3 am 22nd of October 2011.

3. Resources at Risk

Whiting		
Minimum time to oil exposure on the sea surface at moderate threshold	< 12 hours	Great White Shark distribution and breeding BIAs Southern Right Whale migration BIA Pygmy Blue Whale distribution and foraging BIAs Seabirds foraging BIAs
	12 – 48 hours	nil
	> 48 hours	nil
Minimum time to shoreline accumulation of oil at moderate threshold	< 12 hours	nil
	12 – 48 hours	nil
	> 48 hours	Wellington Ocean Grange Seaspray

4. Strategic NEBA and selection of response options

Response Option	Benefits	Effectiveness on MDO Spill	Viable Response?	Net Benefit?
Source Control	Limit flow of hydrocarbons to environment.	Only viable option to stop flow of oil to the marine environment.	Yes	✓
Surveillance and Monitoring	Although surveillance is not an active intervention to treat or remove oil pollution, it is critical to effective response both in the initial stages of an incident and during ongoing response operations.	Surveillance and monitoring used to observe the natural break-up and dissipation of a MDO spill without the need for active intervention.	Yes	✓
Dispersant Application	Dispersants act by allowing hydrocarbons to be mixed into the upper layers of the water column, which accelerates the biodegradation process. Removes oil from the water surface, protecting leeward shorelines and providing benefit to sea-surface air breathing fauna.	Dispersant application is not recommended for MDO as it spreads rapidly to a thin layer. Insufficient time to respond while suitable surface thicknesses are present. Dispersant droplets are known to penetrate through the thin oil layer and cause 'herding' of the oil. This creates areas of clear water but is not successful dispersion. Application of dispersant can contribute to water quality degradation through chemical application, without removing surface oil. Considered not to add sufficient benefit.	**Not viable**	x
Containment & Recovery (Vessel Based)	Booms and skimmers to contain surface oil where there is a potential threat to environmental sensitivities. Relies on calm sea conditions, thicknesses >10µm to collect and adequate deployment timeframes.	MDO spreads rapidly to a thickness of less than 10 µm. Containment is ineffective at these thicknesses.	**Not viable**	x
In-situ Burning	In-situ burning (burning oil in place) can quickly eliminate large quantities of spilled oil.	MDO spreads rapidly to a thickness of less than 10 µm. Containment, and therefore also in-situ burning, is ineffective at these thicknesses.	**Not viable**	x
Protection of Sensitive Shoreline Resources	Booms and skimmers deployed to protect environmental sensitivities. Environmental conditions (e.g. current, waves) limit application.	There is a low probability that MDO spilled at the WTA location may contact the shoreline along the Ninety Mile Beach. MDO spreads rapidly to a thickness of less than 10 µm. Corralling of surface hydrocarbons close to shore is not expected to be effective for MDO and is thus not expected to provide sufficient benefit. However, diverting oil away from inlets or creek / river mouths to protect sensitive sites may be undertaken.	Yes	✓
Shoreline Clean-up	Last response strategy to remove oil from the environment due to potential impact.	There is a low probability that MDO spilled at the WTA location may contact the shoreline along the Ninety Mile Beach. There are various shoreline techniques that are appropriate for this type of hydrocarbon, a shoreline clean-up may be effective for reducing shoreline loadings where access is possible, to be assessed on a case-by-case basis.	Yes	✓

Response Option	Benefits	Effectiveness on MDO Spill	Viable Response?	Net Benefit?
Oiled Wildlife Response (OWR)	Consists of capture, cleaning and rehabilitation of oiled wildlife. May include hazing or pre-emptive captive management.	Given limited size and rapid spreading of the MDO spill large scale OWR is unlikely to be required. Distance from coastline also reduces likelihood of extensive wildlife oiling, however individuals may become oiled in the vicinity of the spill. OWR may be implemented if required, to be assessed on case-by-case basis.	Yes	✓

5. Response Resources Required

Response Option	Strategy	Resource	Timeframe
Source Control	As per vessel SOPEP	-	-
Surveillance and Monitoring	OSMP O1.1 Weather and Sea State	1 x observer (to conduct 2 hour watch)	<2 hours from time of spill
	OSMP O1.2 Trajectory Estimation	1 x contracted modeller.	< 4 hours of service requested.
	OSMP Module O1.3 and O4.1 Aerial surveillance	1x observer per aircraft. Aircraft to have 100nm range and 3 hour duration.	Initial overflight <4 hours service requested. Trained observer <12 hours of spill occurring.
	OSMP Module O1.4 Tracking buoy	1x buoy available.	Deployed <12 hrs of spill occurring (dependent on weather conditions) (Level 2 & 3 spill).
	OSMP Module O2.1 and O2.3 Water and Oil Sampling	1x vessel. 1x initial sampling kit. 1x contract with laboratory.	Samples obtained <24 hrs of spill occurring. Analysis initiated <24 hours of receipt in laboratory.
Protection of Sensitive Shoreline Resources	Shoreline protection	5x booming systems (based on Lakes Entrance TRP which has the highest resource requirements).	<24 hours from request for services
		Approx. 100 personnel (based on Lakes Entrance TRP which has the highest resource requirements).	Notify State Duty Officer <2 hours of incident. Initiate request to call out core group <3 hours.
Shoreline Clean-up	Provision of personnel to support CA	15m^3 recovery per team per day based on teams of 15 people. Maximum volume ashore 25 m^3.	< 24 hours from request for services
Oiled Wildlife Response	DELWP will make the decision to stand up resources which are based in Victoria	To be determined by DELWP	Available <24 hours from request for services

Relevant Tactical Response Plan (TRP)	Merriman Creek (Seaspray)

6. Oil Spill Monitoring

Whiting		
Sensitivities – Probability of contact with dissolved hydrocarbons at moderate threshold	> 90%	nil
	50 - 90%	nil
	50 – 75%	nil
	25 – 50%	nil
	10 – 25%	nil
	< 10%	nil
Marine Parks – Probability of contact with entrained hydrocarbons	> 90%	nil
	75 - 90%	nil
	50 - 75%	Point Hicks Marine National Park
	25 - 50%	Cape Howe Marine Park
	10 – 25%	Beware Reef Marine Sanctuary
	< 10%	Beagle AMP East Gippsland AMP Batemans Marine Park Ninety Mile Beach Marine National Park Gippsland Lakes Ramsar wetland

Modelling predicts that an MDO spill may intersect the coastline after 48 hours at locations around:

- Seaspray.
- Ocean Grange,
- Wellington.

As such, and in addition to the modules that are required to monitor the spill, within 48 hours the following modules may be initiated and resources mobilised to the priority monitoring locations listed above:

- O3 Shoreline assessment
- O4 Fauna observations
- O5 Air quality sampling
- O6 Sediment sampling
- S1 Hydrocarbons in intertidal sediments and water
- S4 Short term impacts to oiled flora and fauna

These modules are to be implemented to allow any potential impacts to identified natural values that are present in the area at which intersection of the coastal zone may occur. All identified environmental receptors in the area will be subject to monitoring. Sufficient resources are available to undertake monitoring and these are detailed in the OSMP.

In accordance with the timeframes for module implementation outlined in the OSMP, all of the above modules can be implemented within 48 hours (in most cases, sooner) at the priority monitoring locations. Timing for implementation of the remaining scientific modules will be as detailed in the module.

Appendix E – Dispersant Testing Results

Table E-1: Dispersant efficacy on different Bass Strait crudes at an application rate of 20:1 (oil:dispersant)

Crude	Seasonal Conditions	Weathering	Dispersant					
			Corexit EC9527		Corexit EC9500A		Slickgone NS	
			10A*	5Q**	10A*	5Q**	10A*	5Q**
Snapper Crude Oil	Summer	Fresh	84.2	73.5	99.7	95.6	99.7	75.8
		Fresh (duplicate)	-	-	-	-	99.8	72.3
		12 hr	1.4	1.7	3.0	1.2	3.4	2.4
		24 hr	1.2	0.7	1.5	0.4	2.1	1.3
		48 hr	0.6	1.3	1.3	1.4	3.2	2.7
	Winter	Fresh	84.2	73.5	99.7	95.6	99.7	75.8
		Fresh (duplicate)	-	-	-	-	99.8	72.3
		12 hr	1.4	1.7	3.0	1.2	3.4	2.4
		24 hr	1.2	0.7	1.5	0.4	2.1	1.3
		48 hr	0.6	1.3	1.3	1.4	3.2	2.7
Flounder Crude Oil	Summer	Fresh	84.6	75.9	99.4	64.6	48.0	27.6
		Fresh (duplicate)	-	-	95.3	59.5	-	-
		12 hr	4.1	4.7	2.9	1.3	1.0	0.5
		24 hr	0.5	0.6	0.3	0.3	0.7	0.1
		48 hr	0.3	0.3	0.2	0.2	0.2	0.3
	Winter	Fresh	84.6	75.9	100.0	65.0	48.0	27.6
		Fresh (duplicate)	-	-	95.3	59.5	-	-
		12 hr	1.4	1.1	7.8	3.6	4.5	2.7
		24 hr	1.4	1.1	4.3	1.8	2.0	1.3
		48 hr	2.6	0.4	0.4	0.2	0.4	0.5
West Kingfish Crude Oil	Summer	Fresh	36.0	8.1	99.9	7.3	99.9	55.8
		Fresh (duplicate)	-	-	78.9	6.0	-	-
		12 hr	0.5	0.1	0.1	0.2	2.5	0.9
		24 hr	0.4	0.1	0.1	0.2	1.8	0.9
		48 hr	0.4	0.1	0.6	0.5	1.7	0.8
	Winter	Fresh	36.0	8.1	72.0	3.7	99.9	55.8
		12 hr	1.6	1.1	8.7	1.7	31.7	14.7

Crude	Seasonal Conditions	Weathering	Dispersant					
			Corexit EC9527		Corexit EC9500A		Slickgone NS	
			10A*	5Q**	10A*	5Q**	10A*	5Q**
		24 hr	0.4	0.4	0.8	0.3	2.4	1.3
		48 hr	0.4	0.1	0.6	0.5	1.7	0.8
Halibut Crude Oil	Summer	Fresh	99.9	51.9	99.7	16.9	95.0	45.9
		Fresh (duplicate)	-	-	-	-	90.9	45.8
		12 hr	0.2	0.2	0.3	0.3	0.9	0.6
		24 hr	0.2	0.2	0.3	0.3	0.9	0.6
		48 hr	0.1	0.1	0.1	0.1	0.3	0.5
	Winter	Fresh	99.9	51.9	99.7	16.9	95.0	45.9
		Fresh (duplicate)	-	-	-	-	90.9	45.8
		12 hr	4.4	2.7	2.4	2.0	4.0	1.2
		24 hr	1.5	0.6	0.6	0.9	0.9	0.5
Moonfish Crude Oil	-	Fresh	3.8	1.7	2.4	1.3	2.6	1.7
		Fresh (duplicate)	0.6	0.5	-	-	2.6	1.7

*Sample collected and analysed after 10 minutes of agitation

**Sample collected and analysed after agitation had stopped for 5 minutes

Appendix B – Bass Strait Oil Spill Monitoring Plan

Esso Australia Resources Pty Ltd
Bass Strait Oil Spill Monitoring Program

Document Number: AUGO-EV-EPL-001

OIMS MANUAL - DOCUMENT CONTROL DETAILS

TITLE:	Bass Strait Oil Spill Monitoring Program
REVISION:	5
REVISION STATUS:	NOPSEMA OMR for Bass Strait EP
DATE OF ISSUE:	9 December 2020
DOCUMENT ADMINISTRATOR:	Environment & Regulatory Advisor
OIMS DOCUMENT CATEGORY:	Special Controls Mandatory
MPI CLASSIFICATION:	None
RETENTION PERIOD:	IND, MIN ACT+10+LC (Indefinite, Retain while current + 10 years, then obtain Law Clearance prior to disposal)
MASTER STORAGE LOCATION:	UDocs (OIMS 10-2 Emergency Prep & Response)

APPROVALS:

Rev 5	Name	Position	Signature	Date
Endorsed By:	Hena Kalam	Offshore Risk, Env. & Regulatory Supervisor	On file	9 December 2020
Document Owner:	Hena Kalam	Offshore Risk, Env. & Regulatory Supervisor	On file	9 December 2020
Approved By	Simon Kemp	Offshore Asset Manager	On file	9 December 2020

Endorsed / approved by Esso Australia Pty Ltd, for and on behalf of Esso Australia Resources Pty Ltd.

REVISION HISTORY

Rev	Revision / Status	Date	Prepared by	Approved By
5	NOPSEMA OMR for Bass Strait Operations EP	9 December 2020	LL	Simon Kemp
4.1	Administrative changes to Sections 3.2.2, 3.2.4 and 2.8	27 August 2020	-	-
4	NOPSEMA RFFWI for Bass Strait Operations EP	10 June 2020	GHD / LL	Simon Kemp
3	NOPSEMA RFFWI (2) for JUR Drilling EP	30 December 2019	CT / HK	Simon Kemp
2	NOPSEMA OMR for JUR Drilling EP	2 December 2019	GHD	Simon Kemp
1	NOPSEMA RFFWI for JUR Drilling EP	23 October 2019	Natasha Carroll	Simon Kemp
0	Issued for acceptance	15 August 2019	Natasha Carroll	Simon Kemp
A	Issued for Review (IFR)	July 2019	Natasha Carroll	

DOCUMENT REVIEW AND UPDATE:

The Document Owner is responsible for maintaining and controlling changes to this document in accordance with the Document Management Manual (AUGO-PO-DMM-001). In the course of using this document, users may identify opportunities to improve its content. They are requested to provide suggestions to the Document Owner.

This document should be reviewed for accuracy and currency on a 5 yearly basis commencing from the original formal issue date. Major revisions to this manual are to comply with the OIMS System Manual/Process Management of Change procedures.

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00	SSHE Group Administrator	Docklands	Email/electronic

Quick Reference: Operational Monitoring Initiation & Termination Criteria

Module	Sub-Module(s)	Initiation Criteria	Position responsible for Initiation	Termination Criteria	Implementation Time [2]
O1: Oil spill surveillance	O1.1 Weather and sea state; O1.2 Trajectory estimation; and O1.3 Aerial or underwater observation;	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred	Planning Section Chief (PSC) (or delegate)	✓ The IMT IC (or delegate) considers that continuation of monitoring under O1[1] will not result in a change to the scale or location of active response options; **or** ✓ Two consecutive aerial or underwater observations show that oil has weathered and dissipated to <0.3 g/m^2; or Bonn appearance 1; or ✓ The IMT IC (or delegate) has advised that agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the response; **or** ✓ The Principal Investigator through the EUL (or delegate) has advised that continuation of monitoring under O1[1] may increase overall environmental impact.	Within 4 hours of initiation criteria being met.
	O1.4 Remote observation;	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ IMT IC (or delegate) confirms the event as a Level 2 or Level 3 hydrocarbon spill.			Within 24 hours of initiation criteria being met.
	O1.5 Satellite imagery;	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ IMT IC (or delegate) confirms the event as a Level 3 hydrocarbon spill;			Within 24 hours of initiation criteria being met.
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of O1 is to commence.			Per above
O2: Water and oil sampling	O2.1 Collection of an oil sample	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred	PSC (or delegate)	✓ The IMT IC (or delegate) has determined that continuation of monitoring under the module is not necessary to meet the objectives of the response; **or** ✓ The IMT IC (or delegate) has advised that agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the response**.**	As soon as practicable following initiation criteria being met
	O2.2 Fluorometry O2.3 Water samples;	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ IMT IC (or delegate) confirms the event as a Level 2 or Level 3 hydrocarbon spill; **or**			Within 24 hours of initiation criteria being met.

Module	Sub-Module(s)	Initiation Criteria	Position responsible for Initiation	Termination Criteria	Implementation Time [2]
		✓ Application of dispersant has been selected as a response option by the IMT IC (or delegate).			
	O2.4 Dispersant Monitoring	✓ Application of dispersant has been selected as a response option by the IMT IC (or delegate).			
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of O2 is to commence.			Per above
O3: Shoreline assessment	O3.1 Shoreline segmentation O3.2 Shoreline character O3.3 Oil on shorelines	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ Results of Module O1 monitoring predict that shorelines could be impacted.	PSC (or delegate)	✓ The IMT IC (or delegate) has determined that continuation of monitoring under the module is not necessary to meet the objectives of the response; **or** ✓ Results of Module O1 and O3.3 monitoring demonstrate that shorelines have not been impacted and will not be impacted; **or** ✓ The IMT IC (or delegate) has advised that agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the response; **or** ✓ The Principal Investigator through the EUL (or delegate) has advised that continuation of monitoring under O3[1] may increase overall environmental impact.	Within 24 hours of initiation criteria being met
	O3.4 Shoreline profile	✓ Modification of the shoreline profile is identified as a recommended strategy (e.g. through mechanical construction of pits, berms, or bulk waste removal)			Within 24 hours of initiation criteria being met
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of O2 is to commence.			Per above
O4: Fauna observations	O4.1 Fauna observation (at sea)	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred	PSC (or delegate)	✓ The IMT IC (or delegate) has determined that continuation of monitoring under the module is not necessary to meet the objectives of the response; **or** ✓ The IMT IC (or delegate) has advised that agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the response; **or**	Within 4 hours of initiation criteria being met
	O4.2 Fauna observations (onshore)	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ IMT IC (or delegate) confirms that data from Modules O1 and/or O3 predicted/confirmed shoreline exposure.			Within 24 hours of initiation criteria being met.

Module	Sub-Module(s)	Initiation Criteria	Position responsible for Initiation	Termination Criteria	Implementation Time [2]
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of O4 is to commence.		✓ The Principal Investigator through the EUL (or delegate) has advised that continuation of monitoring under O4[1] may increase overall environmental impact.	Per above
O5: Air quality	O5.1 Personnel and area monitoring O5.2 Laboratory analysis	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ Confirmation by the Safety Officer (SO) (or delegate) that a health and safety risk to personnel is present	SO (or delegate)	✓ The Safety Officer SO (or delegate) has determined that there is no longer a health and safety risk; **or** ✓ The IMT IC (or delegate) has advised that agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the response.	Within 12 hours of initiation criteria being met.
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of O5 is to commence.			Per above
O6: Sediment sampling	O6.1 Sediment samples (intertidal)	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ IMT IC (or delegate) confirms that data from Modules O1, O2 and/or O3 have predicted/confirmed exposure of intertidal benthic substrate.	PSC (or delegate)	✓ The IMT IC (or delegate) has determined that continuation of monitoring under the module is not necessary to meet the objectives of the response; **or** ✓ The IMT IC (or delegate) has advised that agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the response; **or** ✓ The Principal Investigator through the EUL (or delegate) has advised that continuation of monitoring under O6[1] may increase overall environmental impact.	Within 24 hours of initiation criteria being met
	O6.2 Sediment samples (offshore);	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ IMT IC (or delegate) confirms that data from Modules O1 and/or O2 have predicted/confirmed exposure of offshore benthic substrate.			Within 24 hours of initiation criteria being met
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of O6 is to commence.			Per above

Notes:

1. *Decision to terminate monitoring can be made for each individual sub-module independently.*

2. *A module is considered implemented when Esso have (i) confirmed initiation criteria have been met, (ii) the monitoring providers have been notified, (iii) sampling and analysis plans (where required) have been completed, and (iv) mobilisation has commenced.*

Quick Reference: Scientific Monitoring Initiation & Termination Criteria

Module	Sub-Module	Initiation Criteria	Position responsible for Initiation	Termination Criteria	Position responsible for Termination	Activation Time[1]	Implementation Time
S1: Hydrocarbons in intertidal sediments and water	S1.1 Water samples	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ Principal Investigator through the EUL (or delegate) confirms that data from Modules O1 and/or O2 have predicted/confirmed exposure of intertidal waters	PSC (or delegate)	✓ Ambient hydrocarbon concentrations in intertidal waters have returned to within the expected natural dynamics of baseline state and/or control sites; **or** ✓ Ambient hydrocarbon concentrations in intertidal waters are below relevant ANZECC & ARMCANZ (2000) 99% species protection levels.	Principal Investigator through the EUL, in agreement with the Jurisdictional Authority relevant to the spill	Within 24 hours of initiation criteria being met;	Sampling and analysis plan to be ready within 24 hours of initiation criteria being met; Mobilisation and monitoring to commence within 24 hours of activation.
	S1.2 Sediment samples	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ Principal Investigator through the EUL (or delegate) confirms that data from Modules O1 and/or O2 have predicted/confirmed exposure of intertidal or shoreline sediments		✓ Ambient hydrocarbon concentrations in intertidal sediments have returned to within the expected natural dynamics of baseline state and/or control sites; **or** ✓ Ambient hydrocarbon concentrations in intertidal sediments are below relevant ANZECC & ARMCANZ SQGV (Simpson *et al*. 2013) or NAGD (CoA 2009).			
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial		✓ Agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the monitoring.			

Module	Sub-Module	Initiation Criteria	Position responsible for Initiation	Termination Criteria	Position responsible for Termination	Activation Time[1]	Implementation Time
		implementation of S1 is to commence.					
S2: Hydrocarbons in offshore sediments and water	S2.1 Water samples	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ Principal Investigator through the EUL (or delegate) confirms that data from Modules O1 and/or O2 have predicted/confirmed exposure to offshore waters	PSC (or delegate)	✓ Ambient hydrocarbon concentrations in offshore waters have returned to within the expected natural dynamics of baseline state and/or control sites; **or** ✓ Ambient hydrocarbon concentrations in offshore waters are below relevant ANZECC/ARMCANZ (2000) 99% species protection levels.	Principal Investigator through the EUL, in agreement with the Jurisdictional Authority relevant to the spill	Within 24 hours of initiation criteria being met;	Sampling and analysis plan to be ready within 24 hours of initiation criteria being met; Mobilisation and monitoring to commence within 24 hours of activation.
	S2.2 Sediment samples	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ Principal Investigator through the EUL (or delegate) has determined that data from operational modules O1, O2 or O6 has confirmed exposure to either benthic substrate or waters within bottom 1 m of seabed		✓ Hydrocarbon concentrations in offshore sediments have returned to within the expected natural dynamics of baseline state and/or control sites; **or** ✓ Hydrocarbon concentrations in offshore sediments are below relevant ANZECC/ARMCANZ SQGV (Simpson *et al*. 2013) or NAGD (CoA 2009) trigger levels.			

Module	Sub-Module	Initiation Criteria	Position responsible for Initiation	Termination Criteria	Position responsible for Termination	Activation Time[1]	Implementation Time
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of S2 is to commence.		✓ **Or,** agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the monitoring.			
S3: Fish and shellfish taint and toxicity for human consumption	S3 Fish/shellfish tissue samples	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ Principal Investigator through the EUL (or delegate) has determined that data from operational modules O2/O6 or scientific modules S1/S2 has confirmed either: (a) in-water hydrocarbon concentrations are above guideline levels known to cause tainting (Table 4.4.5 in ANZECC & ARMCANZ 2000); or (b) sediment hydrocarbon concentrations are above SQGV levels (Simpson *et al*. 2013) ✓ Principal Investigator through the EUL (or delegate) has determined that data	PSC (or delegate)	✓ Two sequential sample sets show ambient hydrocarbon concentrations are below guideline levels for tainting in ANZECC & ARMCANZ 2000); **and either** ✓ PAH and non-hydrocarbon constituent levels in fish and shellfish tissue have returned to within the expected natural dynamics of baseline state and/or control sites; **or** ✓ PAH and non-hydrocarbon constituent levels in fish and shellfish tissue are at or below levels specified by Food Standards Australia New Zealand (FSANZ).	Principal Investigator through the EUL, in agreement with the Jurisdictional Authority relevant to the spill	Within 24 hours of initiation criteria being met	Sampling and analysis plan to be ready within 7 days of initiation criteria being met; Mobilisation and monitoring to commence within 7 days of activation.

Module	Sub-Module	Initiation Criteria	Position responsible for Initiation	Termination Criteria	Position responsible for Termination	Activation Time[1]	Implementation Time
		from operational modules O2/O6 or scientific modules S1/S2 has confirmed either: (a) in-water non-hydrocarbon constituent concentrations are above guideline levels known to cause tainting (Table 4.4.5 in ANZECC & ARMCANZ 2000); or (b) sediment hydrocarbon concentrations are above SQGV levels (Simpson *et al*. 2013) **and** ✓ Agreement has been reached with the Jurisdictional Authority relevant to the spill to initiate the monitoring					
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of S3 is to commence.		✓ **Or,** Agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the monitoring.			
S4: Short-term impacts to oiled fauna and flora	S4.1 Fauna surveys (vessel-based)	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and**	PSC (or delegate)	✓ Disturbance parameters (e.g. mortality, percentage oiled fauna/flora) have returned to within the expected natural dynamics	Principal Investigator through the EUL, in agreement with the	Within 24 hours of initiation criteria being met	Sampling and analysis plan to be ready within 24 hours of initiation criteria being met;

Module	Sub-Module	Initiation Criteria	Position responsible for Initiation	Termination Criteria	Position responsible for Termination	Activation Time[1]	Implementation Time
	S4.2 Fauna surveys (land-based) S4.3 Oiled fauna hydrocarbon testing;	✓ Principal Investigator through the EUL (or delegate) has determined that data from operational modules O4 has confirmed the presence of oiled fauna.		of baseline state and/or control sites; **or** ✓ Hydrocarbon concentrations from fauna samples have returned to within the expected natural dynamics of baseline state and/or control sites.	Jurisdictional Authority relevant to the spill		Mobilisation and monitoring to commence within 24 hours of activation.
	S4.4 Flora surveys	✓ Confirmation by the IMT IC (or delegate) that Level 2 or Level 3 hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ Principal Investigator through the EUL (or delegate) has determined that data from operational modules O3 has confirmed the presence of oiled shorelines					
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of S4 is to commence.		✓ Agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the monitoring.			
S5: Recovery of commercial and	S5 Desktop review of fishery stock;	✓ Confirmation by the IMT IC (or delegate) that Level 2 or Level 3 hydrocarbon spill to marine or coastal	PSC (or delegate)	✓ Catch per Unit Effort (CPUE) for fishery stock assessments have returned to within the expected natural dynamics of baseline state and/or control sites; **or**	Principal Investigator through the EUL, in agreement with the	Within 24 hours of initiation criteria being met	Desktop assessment to commence within 24 hours of activation.

Module	Sub-Module	Initiation Criteria	Position responsible for Initiation	Termination Criteria	Position responsible for Termination	Activation Time[1]	Implementation Time
recreational fisheries		waters has occurred; and Principal Investigator through the EUL (or delegate) has confirmed that either: (a) Data from S3 confirms tainting in fish or shellfish tissue; or (b) Advice has been provided to government to restrict, ban or close a fishery; or (c) Declarations of intent by commercial fisheries or government agencies to seek compensation for alleged or possible damage.		✓ The physiological and biochemical parameters in the studied species have returned to baseline levels;	Jurisdictional Authority relevant to the spill		
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of S5 is to commence.		✓ **Or,** agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the monitoring.			

Module	Sub-Module	Initiation Criteria	Position responsible for Initiation	Termination Criteria	Position responsible for Termination	Activation Time[1]	Implementation Time
S6: Recovery of fauna	S6 Fauna surveys	✓ Confirmation by the IMT IC (or delegate) that Level 2 or Level 3 hydrocarbon spill to marine or coastal waters has occurred, **and** ✓ Principal Investigator through the EUL (or delegate) has determined that data from operational module O4 or scientific module S4 has confirmed the exposure of fauna	PSC (or delegate)	✓ Disturbance parameters (e.g. estimated population) have returned to within the expected natural dynamics of baseline state and/or control sites	Principal Investigator through the EUL, in agreement with the Jurisdictional Authority relevant to the spill	Within 24 hours of initiation criteria being met	Sampling and analysis plan to be ready within 7 days of initiation criteria being met; Mobilisation and monitoring to commence within 7 days of activation.
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of S6 is to commence.		✓ **Or,** agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the monitoring.			
S7: Recovery of subtidal and intertidal benthic habitat	S7.1 Habitat mapping; S7.2 Macroalgae and sponges S7.3 Benthic infauna monitoring; S7.4 Intertidal and subtidal fish monitoring	✓ Confirmation by the IMT IC (or delegate) that Level 2 or Level 3 hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ Principal Investigator through the EUL (or delegate) has determined that data from operational module O2/O6 or	PSC (or delegate)	✓ Disturbance parameters (e.g. species composition, percent cover) and health parameters (e.g. leaf condition) have returned to within the expected natural dynamics of baseline state and/or control sites	Principal Investigator through the EUL, in agreement with the Jurisdictional Authority relevant to the spill	Within 24 hours of initiation criteria being met	Sampling and analysis plan to be ready within 7 days of initiation criteria being met; Mobilisation and monitoring to commence within 7 days of activation.

Module	Sub-Module	Initiation Criteria	Position responsible for Initiation	Termination Criteria	Position responsible for Termination	Activation Time[1]	Implementation Time
		scientific module S1/S2/S4 has confirmed the exposure of either benthic substrate or waters within bottom 1 m of seabed					
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of S7 is to commence.		✓ **Or,** agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the monitoring			
S8: Recovery of coastal flora	S8.1 Habitat mapping; S8.2 Condition monitoring	✓ Confirmation by the IMT IC (or delegate) that Level 2 or Level 3 hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ Principal Investigator through the EUL (or delegate) has determined that data from operational module O3 or scientific module S4 has confirmed the exposure of coastal flora	PSC (or delegate)	✓ Disturbance parameters (e.g. abundance, percent cover) and health parameters (e.g. leaf condition) have returned to within the expected natural dynamics of baseline state and/or control sites.	Principal Investigator through the EUL, in agreement with the Jurisdictional Authority relevant to the spill	Within 24 hours of initiation criteria being met	Sampling and analysis plan to be ready within 7 days of initiation criteria being met; Mobilisation and monitoring to commence within 7 days of activation.
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of S8 is to commence.		✓ **Or,** agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the monitoring.			

Module	Sub-Module	Initiation Criteria	Position responsible for Initiation	Termination Criteria	Position responsible for Termination	Activation Time[1]	Implementation Time
S9: Recovery of Ramsar values	S9 Desktop review of wetland values	✓ Confirmation by the IMT IC (or delegate) that Level 2 or Level 3 hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ Principal Investigator through the EUL (or delegate) has determined that (a) data from operational module O3 has confirmed the exposure of a Ramsar wetland; and (b) data from scientific modules S1, S4, S6, S7 or S8 confirm an impact to water/sediment quality, flora or fauna in the wetland.	PSC (or delegate)	✓ Wetland values that are important to the ECD* have returned to within the expected natural dynamics of baseline state and/or control sites. * as described in relevant Ramsar site documents prepared per the National ECD Framework	Principal Investigator through the EUL, in agreement with the Jurisdictional Authority relevant to the spill	Within 24 hours of initiation criteria being met	Desktop assessment to commence within 24 hours of activation.
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of S9 is to commence.		✓ **Or**, agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the monitoring.			

Notes:

1. A module is considered activated when Esso have confirmed initiation criteria have been met and the monitoring providers have been notified to initiate planning and implementation tasks.

Quick Reference: Event Level and Monitoring Modules

Spill Event	O1: Oil spill surveillance					O2: Water and oil sampling				O3: Shoreline assessment				O4: Fauna observations		O5: Air quality		O6: Sediment sampling	
	O1.1	O1.2	O1.3	O1.4	O1.5	O2.1	O2.2	O2.3	O2.4	O3.1	O3.2	O3.3	O3.4	O4.1	O4.2	O5.1	O5.2	O6.1	O6.2
	Weather and sea state	Trajectory estimation	Aerial or underwater observation	Remote observation	Satellite imagery	Collection of an oil sample	Fluorometry	Water samples	Dispersant monitoring	Shoreline segmentation	Shoreline character	Oil on shorelines	Shoreline profile	Fauna observation (at sea)	Fauna observation (onshore)	Personnel and area monitoring	Laboratory analysis	Sediment samples (intertidal)	Sediment samples (offshore)
Level 1	X	X	X	P		P	P	P	P	P	P	P	P	X	P	P	P	P	P
Level 2	X	X	X	P	P	X	P	X	P	P	P	P	P	X	P	P	P	P	P
Level 3	X	X	X	X	X	X	X	X	P	P	P	P	P	X	P	P	P	P	P

Key: X = always required; P = possibly required, dependent on selection of response options, the outcomes of operational modelling such as weather and sea state, observations and trajectory estimation that will provide information on the spill's persistence and potential for contact with shorelines / other receptors.

Spill Event	S1: Hydrocarbons in intertidal sediments and water		S2: Hydrocarbons in offshore sediments and water		S3: Fish and shellfish taint and toxicity for human consumption	S4: Short-term impacts to oiled fauna and flora				S5: Recovery of commercial and recreational fisheries	S6: Recovery of fauna	S7: Recovery of subtidal and intertidal benthic habitat				S8: Recovery of coastal flora		S9: Recovery of Ramsar values
	S1.1	S1.2	S2.1	S2.2	S3	S4.1	S4.2	S4.3	S4.4	S5	S6	S7.1	S7.2	S7.3	S7.4	S8.1	S8.2	S9
	Water samples	Sediment samples	Water samples	Sediment samples	Fish/shellfish tissue samples	Fauna surveys (vessel-based)	Fauna surveys (land-based)	Oiled fauna hydrocarbon testing	Flora surveys	Desktop review of fishery stock	Fauna surveys	Habitat mapping	Macroalgae and sponges	Benthic infauna monitoring	Intertidal and subtidal fish monitoring	Habitat mapping	Condition monitoring	Desktop review of wetland values
Level 1	P	P	P	P		P	P	P	P		P	P	P	P	P	P	P	P
Level 2	P	P	X	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Level 3	P	P	X	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P

Abbreviations

AMOSC	Australian Marine Oil Spill Centre
AMSA	Australian Maritime Safety Authority
ANOVA	Analysis of variance
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agricultural and Resource Management Council of Australia and New Zealand
AUV	Autonomous underwater vehicle
BACI	Before After Control Impact
BoM	Bureau of Meteorology
BTEX	Benzene, toluene, ethylbenzene and xylene
CASA	Civil Aviation Safety Authority
DA	Described Area
DJPR	Department of Jobs, Precincts and Regions
DELWP	Department of Environment, Land, Water and Planning Victoria
DoEE	Department of the Environment and Energy
DOSS	Dioctyl sodium sulfosuccinate
DPI	Department of Primary Industry
DPIPWE	Department of Primary Industries, Parks, Water and Environment
ECD	Ecological Character Description
EMBSI	ExxonMobil Biological Sciences Inc
EP	Environment Plan
ERT	Emergency Response Team
EUL	Environment Unit Lead
EVM	Earned Value Management
SSHE	Safety, Security, Health & Environment
IC	Incident Commander
IMT	Incident Management Team
ITOPF	International Tanker Owners Pollution Federation Limited
IvC	Impact versus Control
JSA	Job Safety Analysis
LCL	Lower control limit
mBACI	Multiple Before After Control Impact
MES	Monitoring, evaluation and surveillance
NAGD	National Assessment Guidelines for Dredging
MNES	Matters of National Environmental Significance

NATA	National Association of Testing Authorities
NOAA	National Oceanic and Atmospheric Administration
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NSW	New South Wales
OIM	Offshore Installation Manager
OIMS	Operations Integrity Management System
OPEP	Oil Pollution Emergency Plan
OPGGS Act	Offshore Petroleum and Greenhouse Gas Storage Act 2006
OSC	Operations Section Chief
OSMP	Oil Spill Monitoring Program
OSRL	Oil Spill Response Limited
OSTM	Oil Spill Trajectory Modelling
PAH	Poly aromatic hydrocarbons
PEA	Potentially Exposed Area
PERMANOVA	Permutational multivariate analysis of variance
PSC	Planning Section Chief
PSD	Particle size distribution
RAMSAR	Convention on Wetlands of International Importance
SCAT	Shoreline Clean-up Assessment Technique
SD	Standard deviation
SMART	Special Monitoring of Applied Response Technologies
SO	Safety Officer
SQG	Sediment Quality Guidelines
TOC	Total organic carbon
TPH	Total petroleum hydrocarbon
TRH	Total recoverable hydrocarbon
UAV	Unmanned aerial vehicle
UCL	Upper control limit
USA	United States of America
USEPA	United States Environment Protection Agency
USFDA	United States Food and Drug Administration
VFA	Victorian Fisheries Authority
VM	Vessel Master

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1. Introduction

1.1 Purpose

This Bass Strait Oil Spill Monitoring Plan (OSMP) is a key component of the environmental management framework (which also includes activity-specific Environment Plans (EP) and the Bass Strait Oil Pollution Emergency Plan (OPEP)) for offshore petroleum activities operated by Esso Australia Resources Pty Ltd (Esso) within the Gippsland region (Figure 1-1).

This OSMP outlines environmental monitoring that may be implemented in the event of a hydrocarbon spill to the marine or coastal environment. Information from operational monitoring provides situational awareness enabling the Incident Management Team (IMT) to make informed decisions regarding response options. Oil Spill monitoring modules are the principle tools for determining the extent, severity and persistence of environmental impacts from a hydrocarbon spill and associated response and/or remediation activities.

Note, this plan focuses on Oil Spill monitoring of a hydrocarbon spill event only. Hydrocarbon spill risks, prevention and response activities are described in the activity-specific EP and OPEP.

This OSMP is supported by a set of internal implementation guides for each of the Oil Spill monitoring modules. It is important to note that the implementation guides are not a prescriptive set of procedures that must strictly be followed, but are intended to provide Esso and their monitoring providers with sufficient information to efficiently finalise a monitoring design of an appropriate nature and scale in the event of a hydrocarbon spill. It is expected that individual monitoring plans and operating procedures would only be finalised once a spill event has occurred. This is essential to ensure the finalised monitoring plan/s are fit for purpose and tailored to the specific location, hydrocarbon type, environmental sensitivities, and the nature and scale of the individual spill.

This OSMP is to be read in conjunction with the activity-specific EP and OPEP when considering the existing environment, environmental impacts, risk management, performance standards, reporting compliance, and the decision processes that will apply in the event of a spill occurring.

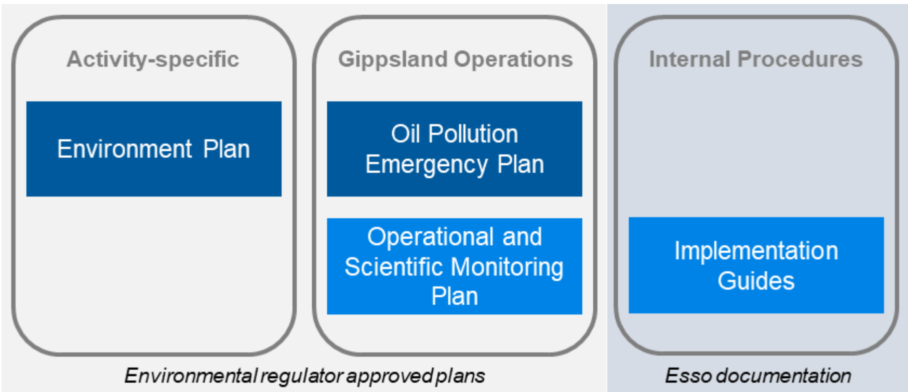

Figure 1-1: Environmental management framework for offshore petroleum activities in the Gippsland region

1.2 Objectives

The objectives of this OSMP are:

- Identify and describe the Oil Spill monitoring that may be implemented in the event of a hydrocarbon spill to the marine or coastal environment;

- Demonstrate an appropriate degree of readiness to implement this monitoring in the event of a hydrocarbon spill to the marine or coastal environment.

1.3 Scope

1.3.1. Activity types

This OSMP is relevant to all Esso petroleum activities within the Gippsland region regulated under the Commonwealth *Offshore Petroleum and Greenhouse Gas Storage Act 2006 (OPGGS) (Environment) Regulations 2009* and the Victorian *OPGGS Regulations 2011*. This includes, but is not limited to:

- Vessel operations;
- Drilling and completions;
- Well workovers and interventions;
- Subsea activities;
- Pipelay activities;
- Operations; and
- Decommissioning.

The OSMP modules provide for the rapid assessment of the extent of spread of oil from a Level 2 or Level 3 spill and effects on the environment both as a result of the spilt hydrocarbons and any oil spill response activities that may be used in the clean-up of the oil or any monitoring activities that may occur in response to the spill. The OSMP modules include provision for the rapid assessment of impacted and potentially affected wildlife including those listed as Matters of National Environmental Significance (MNES) under the EPBC Act (1999).

1.3.2. Hydrocarbon types and states

Esso's petroleum resources within the Gippsland region include both crude oil and natural gas; and petroleum activity related vessels typically use marine diesel oils. This OSMP is relevant to all hydrocarbon types and states (i.e. fresh and weathered); and all distributions throughout the environment (i.e. surface, entrained, dissolved and shoreline). Activity specific hydrocarbon properties are provided in the OPEP Appendix D Quick Reference Information.

1.3.3. Geographical extent

This OSMP is relevant and applicable to all Commonwealth and State marine and coastal areas that are potentially at risk of exposure to hydrocarbons in the event of a spill resulting from petroleum activities. Petroleum titles and selected environmental features within the vicinity of the Gippsland region is shown in Figure 1-2.

The spatial boundaries of an individual monitoring study will depend primarily on the actual or potential exposed area affected by the spill. Spatial boundaries will be sufficient to meet monitoring objectives, usually by determining impacted areas and the level of effects, linking effects to the spill source, and supporting decisions on clean-up strategies. Monitoring may also be undertaken outside the boundaries of a spill where monitoring programs require un-impacted reference sites. The spatial extent of a monitoring study would only be finalised once a spill event has occurred.

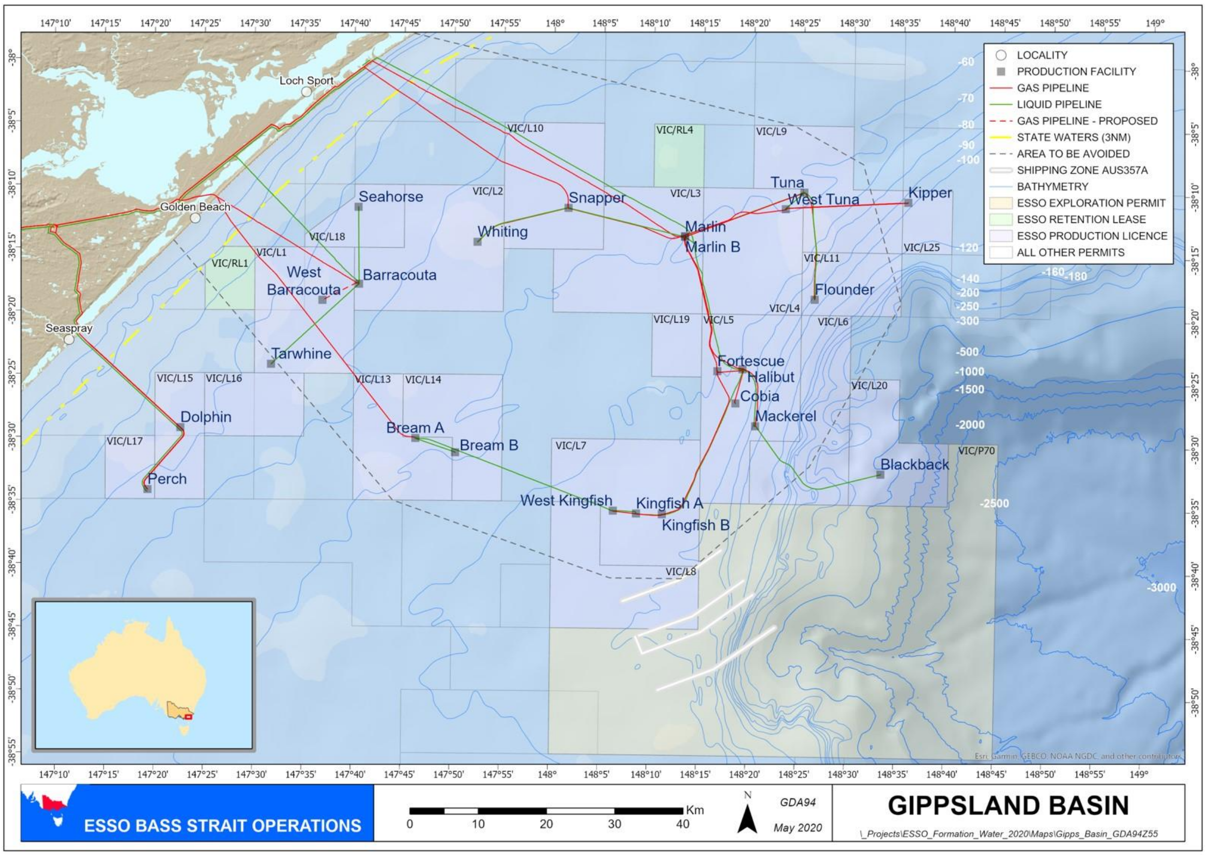

Figure 1-2: Esso assets within the Gippsland region

1.4 Regulatory requirements

Table 1-1 provides guidance on the OSMP requirements of the Commonwealth OPGGS (Environment) Regulations 2009, and Victorian OPGGS Regulations 2011, and reference to the relevant section of this document which addresses that requirement.

This OSMP incorporates regulatory guidance from the following documents:

- Guidance Note – Oil pollution risk management (NOPSEMA 2018)
- Information Paper – Oil Spill monitoring programs (NOPSEMA 2016).

Table 1-1: Relevant Commonwealth and State environmental regulations for OSMPs

Regulation	Relevant section in this OSMP
OPGGS (Environment) Regulations	
Part 2, Division 2.3, Regulation 14 (5) The implementation strategy must include measures to ensure that each employee or contractor working on, or in connection with, the activity is aware of his or her responsibilities in relation to the environment plan, including during emergencies or potential emergencies, and has the appropriate competencies and training.	Sections 2.4 and 2.5
Part 2, Division 2.3, Regulation 14 (8AA) The oil pollution emergency plan must include adequate arrangements for responding to and monitoring oil pollution, including the following: (a) the control measures necessary for timely response to an emergency that results or may result in oil pollution; (b) the arrangements and capability that will be in place, for the duration of the activity, to ensure timely implementation of the control measures, including arrangements for ongoing maintenance of response capability; (c) the arrangements and capability that will be in place for monitoring the effectiveness of the control measures and ensuring that the environmental performance standards for the control measures are met; (d) the arrangements and capability in place for monitoring oil pollution to inform response activities.	Sections 2, 3, and 4
Part 2, Division 2.3, Regulation 14 (8D) The implementation strategy must provide for monitoring of impacts to the environment from oil pollution and response activities that: (a) is appropriate to the nature and scale of the risk of environmental impacts for the activity; and (b) is sufficient to inform any remediation activities.	Sections 2, 3, and 4
Victoria OPGGS Regulations	
Part 2.2, Division 3, Regulation 16 (5) The implementation strategy must include measures to ensure that each employee or contractor working on, or in connection with, the activity is aware of his or her responsibilities in relation to the environment plan, including during emergencies or potential emergencies, and has the appropriate competencies and training	Sections 2.4 and 2.5

1.5 Target audience

In the event of a hydrocarbon spill, Esso is responsible for the implementation and adherence to this OSMP. This OSMP is intended for use by, but not limited to:

- Incident Management Team (IMT) personnel including:
  - Incident Commander (IC);
  - Operations Section Chief (OSC):
  - Planning Section Chief (PSC);
  - Environment Unit Lead (EUL)
  - Safety Officer (SO)
- Platform Emergency Response Team (ERT) personnel including:
  - Offshore Installation Manager (OIM);
  - Vessel Master (VM);
- Esso environment team;
- Monitoring provider personnel including:
  - Principal Investigator;
  - Monitoring/Field teams.

2. OSMP Framework and Implementation

2.1 Types of monitoring

Oil spill monitoring has been divided into two types (Oil Spill) which are undertaken for two distinct, but closely related, purposes (NOPSEMA 2016).

Operational monitoring collects information about the spill and associated response activities to aid planning and decision making for executing spill response or clean-up operations. Operational monitoring may include both initial response phase monitoring (i.e. rapid qualitative and observational data gathering for situational awareness) and advanced response phase monitoring (i.e. quantitative measurement) (Hook *et al*. 2016). Operational monitoring typically finishes when the spill response is terminated.

Six operational monitoring modules have been identified (see Section 3):

- O1: Oil Spill Surveillance;
- O2: Water and Oil Sampling;
- O3: Shoreline Assessment;
- O4: Fauna Observations;
- O5: Air Quality;
- O6: Sediment Sampling.

Scientific monitoring focusses on evaluating environmental impact and recovery from the spill and response activities. Scientific monitoring may be undertaken over an extended period to fully understand impacts.

Nine scientific monitoring modules have been identified (see Section 4):

- S1: Hydrocarbons in Intertidal Sediments and Water;
- S2: Hydrocarbons in Offshore Sediments and Water;
- S3: Fish and Shellfish Taint and Toxicity for Human Consumption;
- S4: Short-Term Impacts to Oiled Fauna and Flora;
- S5: Recovery of Commercial and Recreational Fisheries;
- S6: Recovery of Fauna;
- S7: Recovery of Subtidal and Intertidal Benthic Habitat;
- S8: Recovery of Coastal Flora;
- S9: Recovery of Ramsar Values.

Operational monitoring studies inform offshore and nearshore/shoreline response strategies, and information collected during these studies may trigger scientific monitoring. Oil Spill monitoring studies may occur simultaneously (i.e. scientific monitoring can start before a response operation is completed). Note, some data that may be used within scientific monitoring analyses can also only be collected during the initial phase of the oil spill response (e.g. 'reactive' baseline data) (Hook *et al*. 2016).

2.2 Initiation and termination of monitoring

Initiation and termination criteria have been defined for each individual operational monitoring (Section 3) and scientific monitoring (Section 4) module. The criteria for the initiation and termination of monitoring modules will be assessed on a daily basis during a response operation, and then as-required for any ongoing scientific monitoring modules.

Initiation for operational monitoring modules is typically dependent on presence of a spill, response options being implemented and information from surveillance activities. Termination criteria are typically based on there being no benefit to response planning or a response has ceased, no increase in environmental risk, compliance with relevant environmental guidelines or benchmarks (where available). Termination criteria for operational monitoring also require that any related scientific monitoring initiation criteria have been assessed.

Initiation for scientific monitoring modules is typically dependant on information from operational monitoring results, specifically outcomes of monitoring, evaluation and surveillance (MES) activities, and indications that relevant environmental guidelines or benchmarks have been exceeded (where available). Scientific monitoring may also be needed to determine if ecological impact criteria as defined in the OPEP for Response Level 1 are met or not (and if not an incident should be escalated to a higher level). Termination criteria are based on sufficient evidence to demonstrate no impact from hydrocarbon and/or a return to the expected natural dynamics of the area.

All monitoring modules can also be initiated by the IMT IC (or delegate) irrespective of other criteria being met. This may be an independent Esso decision, or made in conjunction with the relevant Jurisdictional Authority. Depending on the scenario, these studies may be a full or only partial implementation of the relevant operational or scientific module.

The safety of sampling personnel will be assed prior to the collection of any samples and will only occur if safe to do so. Sampling collection will only occur in daylight hours and when wind and sea states allow for the safe collection of samples. It may not be safe for a vessel to get close to a spill if there is positive gas detection. Samples will be undertaken when the presence of spilt oil is detectable.

2.3 Implementation guides

The implementation guides, which sit behind each of the modules outlined in Sections 3 and 4, are not a prescriptive set of procedures that must strictly be followed, but are intended to provide Esso and their monitoring providers with sufficient information to efficiently finalise a monitoring design of an appropriate nature and scale in the event of a hydrocarbon spill. The guides include:

- A description of minimum requirements, adopted standards and/or best practice guidance for monitoring design, sampling techniques and reporting requirements;
- A list of resources (e.g. equipment, personnel) recommended to implement the monitoring;
- Draft standard operating procedures.

It is expected that individual monitoring plans and operating procedures would only be finalised once a spill event has occurred. This is essential to ensure the finalised monitoring plan/s are fit for purpose and tailored to the specific location, hydrocarbon type, environmental sensitivities, and the nature and scale of the individual spill.

Where practicable, the draft standard operating procedures are aligned with existing standards and processes (e.g. Hook *et al*. 2016; NOAA 2006).

2.4 Roles and responsibilities

The key roles (and their associated responsibilities) for the implementation of this OSMP are shown in Table 2-1. Depending on the scale of the event, individual people may perform multiple roles; similarly, multiple people may share the same role.

Table 2-1: Key roles and responsibilities relating to implementation of the OSMP

Role	Responsibilities
IMT IC	• Day to day responsibility for facilitating/coordinating monitoring activities under this OSMP; • Initiation and termination of operational monitoring modules; • Initiation of scientific monitoring modules
PSC	• Initiating Oil Spill monitoring modules when initiation criteria met; • Coordination analysis and distribution of data obtained through operational monitoring, including integration of data into the common operating picture
EUL	• Advising IC on which Oil Spill monitoring modules should be implemented when initiation criteria met; • Activation and liaison with service providers to implement scientific modules • Facilitating/coordinating data and reports from monitoring to the IMT for use in response planning; • Initiation and termination of operational monitoring modules, based on advice from the Principal Investigator; • Initiation and termination of scientific monitoring modules, based on advice from the Principal Investigator • Report review and approval for scientific monitoring modules, prepared by the monitoring team.
OIM / VM	• Initiation of spill surveillance in the initial response phase of a spill; • May undertake day to day responsibilities (e.g. under delegation from the IMT IC).
Principal Investigator	• Responsible for implementation of a particular operational or scientific monitoring module; • Review and/or carry out study's monitoring reporting requirements; • Provides advice with respect to environmental issues as required, including initiation and termination of monitoring modules.
Field Teams	• Implement the operational or scientific monitoring module; • Data QA/QC and reporting; • Compliance with the requirements of this OSMP

2.5 Training and competency

Minimum competencies and experience for key OSMP-specific roles for the operational and scientific modules are detailed in the “Responsibilities, competencies and resources” section of each module in this OSMP. The OSMP Specific team will be scaled up according to the severity of the incident based on external capabilities.

The Esso ERT/IMT have completed oil spill response competency and training in accordance with Table 9-2 in Volume 4 of the EP. In addition to this the Environment Unit Lead is required to have a relevant tertiary degree in engineering, environment science, environmental management or similar. The selection of the Environmental Unit Lead is based on relevant experience as an Environment Advisor, with experience and/or training in the implementation of monitoring programs.

Based on the severity of an oil spill additional resources may be brought in from the ExxonMobil Regional Response Team to support the IMT.

2.6 External Resources

Resources for monitoring (e.g. personnel and equipment) may be outsourced to contractors. Esso currently has a contract in place with a local environmental consultancy to provide this environmental support. In the event that additional resources are required, other consultancy capacity will be utilised (as needed) and may extend to specialist contractors such as research agencies engaged in long-term marine monitoring programs.

Esso will also access specialist capabilities as required (e.g. OSTM via AMOSC).

Esso has identified a pool of NATA accredited laboratories with capabilities for undertaking analyses required as part of Oil Spill monitoring scopes (Table 2-6).

2.7 Third Party OSMP Consultant

2.7.1. Roles and responsibilities

The Third Party OSMP Consultant has an organisation that allows for considerable support to the field, laboratory and office teams involved in the implementation of the OSMP and its modules. Details of the support roles that may be required for the implementation of the OSMP are provided in Table 2-2.

Table 2-2: Summary of support roles (as required)

Role	Responsibilities
Third Party OSMP Consultant Project Director (PD)	Point of contact at a project level for high level contractual and commercial issues Final approver of key deliverables produced by Third Party OSMP Consultant During OSMP implementation high level of liaison with IMT
Third Party OSMP Consultant Project Manager (PM)	Overall project program, progress, budgets, & reporting Management of Third Party OSMP Consultant project team Responsible for Third Party OSMP Consultant Sub-consultancy, subcontractor and Service Provision agreements Client liaison/coordination at IMT level During OSMP implementation: • Command and control of OSMP activities undertaken by Third Party OSMP Consultant • Liaison with IMT • Overarching implementing and monitoring the OSMP activities undertaken by Third Party OSMP Consultant Reports to Third Party OSMP Consultant Project Director
Third Party OSMP Consultant Operations Officer	Overall coordination and management of OSMP modules undertaken by Third Party OSMP Consultant Review and sign off of OSMP deliverables produced from modules undertaken by Third Party OSMP Consultant Ensuring technical compliance and maintaining quality of OSMP deliverables During OSMP implementation for modules implemented by Third Party OSMP Consultant: • Organise initial response mobilisation • Coordinate OSMP operations • Organise mobilisation/escalation/de-escalation/demobilisation activities • Assist Planning and Logistical Officers in development of field activity synergies among operational and scientific monitoring modules Reports to Third Party OSMP Consultant Project Manager
Task Leader (Third Party OSMP Consultant)	Ensuring technical compliance and maintaining quality of allocated operational or scientific monitoring module deliverables from modules implemented by Third Party OSMP Consultant

Role	Responsibilities
	Review of allocated operational or scientific monitoring module deliverables During OSMP implementation assist in coordination and management of allocated operational or scientific monitoring module Reports to Third Party OSMP Consultant Operations Officer
Field Supervisor (Third Party OSMP Consultant)	During OSMP implementation for modules implemented by Third Party OSMP Consultant responsible for SSHE requirements and meeting survey technical objectives during field monitoring Reports to Third Party OSMP Consultant Operations Officer
SSHE Advisor (Third Party OSMP Consultant)	Third Party OSMP Consultant SSHE Advisory role and monitors compliance Review/Approval of SSHE documentation (SSHE Plan, JSA) SSHE Incident Investigations and Reporting Reports to Third Party OSMP Consultant Project Manager Supports SSHE & SP performance reviews Prepare SSHE Alerts and deliver SSHE trainings, briefings
SSHE Focal Point (Third Party OSMP Consultant)	SSHE liaison with Esso SSHE Performance reports Supports project adherence to SSHE Plan Reports to Third Party OSMP Consultant Project Manager
Project Controls Officer (Third Party OSMP Consultant)	PRISM Set Up & Maintenance EVM & Reporting Scheduling Change management, document control, invoicing Reports to Third Party OSMP Consultant Project Manager
Environment & Approvals Officer	Environmental Approvals Licences, Permits, Statutory Approvals Reports to Project Manager
Quality Assurance Officer	Internal QA audits Reports to Project Manager
Third Party OSMP Consultant Logistics Officer	Reports to Project Manager During OSMP implementation: • Organise plant (e.g. aircraft, vessels) • Estimate future service and support requirements • Provision of logistics advice to Operations and Planning Officers
Third Party OSMP Consultant Planning Officer	Reports to Project Manager During OSMP implementation: • Collect, analyse and utilise OSMP information • Risk analysis of technical OSMP service provision (e.g. weather, spill behaviour, projections) • Maintain record of communications and actions including resources requested/allocated/in use.
Third Party OSMP Consultant Safety Officer	Reports to Project Manager During OSMP implementation: • Provide SSHE services in support of the OSMP activities • Review and approve all SSHE documentation in the provision of OSMP services • Risk analysis of SSHE OSMP service provision (e.g. cyclones, interface issues) and that services undertaken in a safe matter
Third Party OSMP Consultant Admin Officer	Reports to Project Manager During OSMP implementation: • Same as role of Project Controls Officer during OSMP implementation

Role	Responsibilities
Principal Investigator	Reports to Project Manager • Responsible for implementation of a particular operational or scientific monitoring module; • Review and/or carry out study's monitoring reporting requirements; • Provides advice with respect to environmental issues as required, including initiation and termination of monitoring modules.
Field Teams	Reports to Principal Investigator • Implement the operational or scientific monitoring module; • Data QA/QC and reporting; • Compliance with the requirements of this OSMP

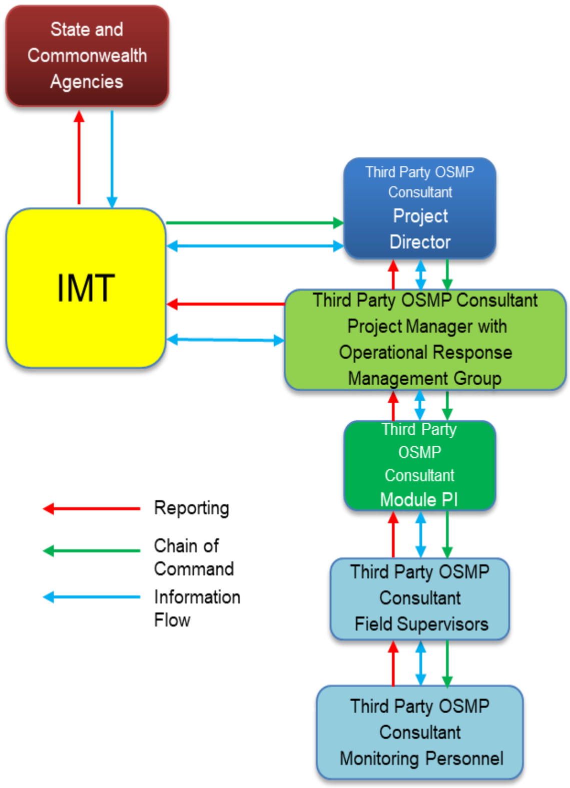

Figure 2-1: OSMP modules implementation organogram between Esso and the Third Party OSMP Consultant

2.7.2. OSMP resourcing

In the activation of the OSMP substantial resources are likely to be required for an extended period of time. Although it is more likely that discontinuous deployment periods are likely this has not been assumed in developing this resourcing strategy (i.e. continuous requirement assumed). The resourcing needs are based on the likely requirements for information.

The operational modules together with S1, S2 and S4 will commence at notification of a spill. Scientific modules have slightly differing needs as their aim is to assess the potential impacts and recovery from a spill. However there may be a need to collect reactive baseline data prior to hydrocarbons contacting the environment and potentially causing impacts to that environment. There are a number of scientific modules that are therefore initiated soon, if not immediately, after notification of a spill in order to collect a reliable reactive baseline as existing baseline data may not be available.

Generally, the following resourcing procedure will be adhered to:

- The Third Party OSMP Consultant Planning Officer and Third Party OSMP Consultant Operations Officer will develop Survey Plan(s) to meet the objectives of OM(s) survey(s) that are provided by the IMT IC. Surveys may entail carrying out acquiring information for multiple OMs with individual ground, vessel and aerial survey teams on the same plant to optimise synergies and efficiencies.
- Field personnel and office-based personnel will be sourced from the organisations that comprise the OSMP team (Table 2-3). The Mobilisation Plan will identify a pool of field staff from which to select for mobilisation to meet initial requirements. Thereafter, during escalation and/or maintenance of the OM modules staff across the pool of field personnel pool will be selected on the basis of availability and capabilities to meet the survey(s) objectives.
- The Task Leaders in consultation with the Third Party OSMP Consultant Logistics Officer will be responsible for organising equipment and laboratory supplies (if needed) for their respective modules. The Operational Response Management Group (ORMG) will support Task Leaders to facilitate the transport of equipment and laboratory supplies
- Office-based personnel will be mobilised on an 'as needed' basis for data analysis and reporting for all OM modules to ensure timely information flow to the IMT for response planning and assessment.

Details for key OSMP resources are summarised in Table 2-3.

Table 2-3: OSMP resources list

Resource/Provider	Personnel/Equipment/Service
Third Party OSMP Consultant	25x field and 20x office personnel in Victoria (marine scientists, wildlife observers) 4 - 10 4WD vehicles available Laboratory for basic WQ analysis and biological analysis Aircraft management Marine monitoring equipment
Subconsultant 1	4 field personnel 3 office personnel Vessel-based wildlife observers Vessel management Water/sediment/plankton sampling and equipment Equipment
Subconsultant 2	4 field personnel 3 office personnel Vessel-based wildlife observers Vessel management Water/sediment/plankton sampling and equipment Equipment
Subconsultant 3	2 field personnel 3 office personnel Vessel-based wildlife observers Vessel management Water/sediment/plankton sampling and equipment Equipment

Resource/Provider	Personnel/Equipment/Service
Vessels	Offshore vessel Inshore vessel Inshore vessel
Air	Fixed wing aircraft

2.7.3. Field staff resources available

The Third Party OSMP Consultant has sufficient resources in terms of personnel to meet the staffing needs of the monitoring program in both the immediate and longer term. The Third Party OSMP Consultant has prepared logistics plans for each worst case discharge scenario that map the number of personnel required for each module at different intervals after the spill event to ensure that resource needs can be fulfilled within the required timeframes.

The Third Party OSMP Consultant has available the resources of its Victorian Environment Team which are highly experienced in the collection of water and sediment quality samples, and also in flora and fauna survey and marine environmental survey. In all the Third Party OSMP Consultant has, in Victoria, 45 people with extensive experience in water quality and sediment sampling and an addition 26 who are flora and fauna specialists. After one day these can be supplemented by additional staff from outside Victoria which will allow access to over 150 staff with water and sediment quality experience and over 100 staff with flora and fauna expertise. Supplementing the local experience there are the resources of three subconsultants (Table 2-3).

In summary the Third Party OSMP Consultant team has the resources available to choose from to deploy:

First Response (immediate):

- 29 water and sediment quality specialists
- 26 flora and fauna specialists
- 16 marine scientists

After 24 hours:

- 150 water and sediment quality specialists
- 100 flora and fauna specialists
- 42 marine scientists

An annual test of the capability of the Third Party OSMP Consultant to provide these resources is conducted. The Third Party OSMP Consultant maintains a register of the available resources, updated quarterly, including:

- Role in OSMP implementation
- Provider (company name)
- Provider contact details
- Contractual arrangement status
- Resource (name(s)) identified
- Minimum qualification and experience requirements
- Whether qualification and experience requirements are met
- Completion of OSMP familiarisation training

2.7.4. Awareness of role in OSMP implementation

The approach to the OSMP implementation summarised in Table 2-4 shows the activities for the Third Party OSMP Consultant that includes phases prior to and after OSMP activation. The outputs of the Readiness Phase includes the awareness of staff and resources through OSMP familiarisation training.

Table 2-4 OSMP implementation phases

Phase	Period	Activity	Purpose	Output
Readiness	Prior to spill	Personnel, contractors and equipment providers prepare for and continue to be prepared for activation of OSMP. Register of OSMP implementation personnel is maintained and updated quarterly	'Readiness' for timely response to implement OSMP.	Register of OSMP implementation personnel Awareness by all participants that they are to be available and ready for OSMP implementation OSMP familiarisation
Mobilising	Notification of a Level 2 or 3 spill	Third Party OSMP Consultant Project Manager and Initial Field Team mobilise onsite) Water and sediment sampling teams report to surveillance vessel(s) for deployment to site. Mobilise monitoring teams based on initiation criteria: Mobilise, personnel equipment and vessels to port Load equipment/ supplies on vessel and depart port	Initiate modules as quickly as possible and within timeframes required by OSMP.	Timely mobilisation of monitoring program.
Monitoring during Spill response	During a spill, before shoreline contact.	Implement relevant OM modules	Inform response planning and manage early stages of spill.	Operational data reported regularly throughout response
		Implement relevant SM modules Collect reactive baseline data. Collate and assess existing baseline data.	Establish baselines and analyse behaviour of spill hydrocarbons	Baseline data reports for each monitoring study.
	During a spill after shore line contact.	Continue to implement modules.	Inform response planning and management	Operational data reported regularly throughout response
Spill Response Termination	At end of spill response	Terminate modules when criteria met	Discontinue modules linked specifically to spill response phase.	Consolidated data on spill response to IMT IC. Consolidated data to inform later Scientific studies.

Monitoring Post-spill response	From termination of spill response until termination criteria met	Update SAPs for long-term monitoring.	Modify frequency /number of long-term monitoring sites. (Not if termination criteria met during spill response phase).	Approval of long-term monitoring SAPs

2.7.5. Staff availability for deployment in initial response

The following table lists staff that are available for deployment to respond to the requirements of the OSMP after the initial confirmation of a Tier 2 or Tier 3 spill. Many staff are capable of performing tasks in a number of modules and as such have been shown in these modules.

TL – Task Leader, FS – Field Staff,

Team Member	Personnel Contract Classification	Yrs Exp	O1- Oil Spill Surveillance	O2- Water and Oil Sampling	O3- - Shoreline Assessment	O4- Fauna Observations	O5- Air Quality	O6 Sediment sampling	S1- Hydrocarbons in intertidal sediments and water	S2- Hydrocarbons in offshore sediments and water	S3- Fish and shellfish taint and toxicity for human consumption	S4- Short term impacts to oiled flora and fauna	S5- Recovery of commercial/recreational fisheries	S6- Recovery of fauna	S7- Recovery of subtidal and intertidal benthic habitat	S8- Recovery of Coastal Flora	S9- Recovery of Ramsar values
[redacted]	[redacted]	30+						TL	TL								
[redacted]	[redacted]	15 +				TL				TL				TL			
[redacted]	[redacted]	20 +			TL										TL		TL
[redacted]	[redacted]	12+					TL										
[redacted]	[redacted]	15 +														TL	
[redacted]	[redacted]	15+		TL													
[redacted]	[redacted]	10+	TL								TL		TL				
[redacted]	[redacted]	20+										TL	TL				
[redacted]	[redacted]	20+										TL					

Team Member	Personnel Contract Classification	Yrs Exp	O1- Oil Spill Surveillance	O2- Water and Oil Sampling	O3- - Shoreline Assessment	O4- Fauna Observations	O5- Air Quality	O6 Sediment sampling	S1- Hydrocarbons in intertidal sediments and water	S2- Hydrocarbons in offshore sediments and water	S3- Fish and shellfish taint and toxicity for human consumption	S4- Short term impacts to oiled flora and fauna	S5- Recovery of commercial/recreational fisheries	S6- Recovery of fauna	S7- Recovery of subtidal and intertidal benthic habitat	S8- Recovery of Coastal Flora	S9- Recovery of Ramsar values
[redacted]	[redacted]	30+							TL			TL					
[redacted]	[redacted]	20+										TL					
[redacted]	[redacted]	25+	TL								TL						
[redacted]	[redacted]	20+										TL				TL	
[redacted]	[redacted]	15+		TL							TL						
[redacted]	[redacted]	10+				TL/FS					TL/FS						
[redacted]	[redacted]	15+	TL	TL							TL						
[redacted]	[redacted]	20+	TL	TL							TL						
[redacted]	[redacted]	10+				TL/FS				TL/FS						TL/FS	
[redacted]	[redacted]	15+				TL/FS				TL/FS						TL/FS	
[redacted]	[redacted]	12+	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS				FS	
[redacted]	[redacted]	10+	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS				FS	
[redacted]	[redacted]	8+	FS	FS	FS	FS		FS	FS	FS	FS	FS				FS	
[redacted]	[redacted]	10+	FS	FS	FS	FS		FS	FS	FS	FS	FS				FS	

Team Member	Personnel Contract Classification	Yrs Exp	O1- Oil Spill Surveillance	O2- Water and Oil Sampling	O3- - Shoreline Assessment	O4- Fauna Observations	O5- Air Quality	O6 Sediment sampling	S1- Hydrocarbons in intertidal sediments and water	S2- Hydrocarbons in offshore sediments and water	S3- Fish and shellfish taint and toxicity for human consumption	S4- Short term impacts to oiled flora and fauna	S5- Recovery of commercial/recreational fisheries	S6- Recovery of fauna	S7- Recovery of subtidal and intertidal benthic habitat	S8- Recovery of Coastal Flora	S9- Recovery of Ramsar values
[redacted]	[redacted]	5+		FS	FS	FS	FS	FS	FS	FS	FS	FS				FS	
[redacted]	[redacted]	5+		FS	FS	FS	FS	FS	FS	FS	FS	FS				FS	
[redacted]	[redacted]	5+	FS	FS				FS	FS			FS					
[redacted]	[redacted]	5+	FS	FS				FS	FS		FS	FS					
[redacted]	[redacted]	5+		FS				FS	FS								
[redacted]	[redacted]	5+		FS				FS	FS								
[redacted]	[redacted]	5+		FS				FS	FS								
[redacted]	[redacted]	10+		FS				FS	FS								
[redacted]	[redacted]	5+	FS	FS				FS	FS								
[redacted]	[redacted]	15+			FS											FS	
[redacted]	[redacted]	15+	FS	FS				FS	FS								
[redacted]	[redacted]	5+	FS	FS				FS	FS								
[redacted]	[redacted]	5+	FS	FS				FS	FS								
[redacted]	[redacted]	15+	FS	FS				FS	FS								
[redacted]	[redacted]	15+			TL			FS	FS		TL						

Team Member	**Personnel Contract Classification**	**Yrs Exp**	**O1-** Oil Spill Surveillance	**O2-** Water and Oil Sampling	**O3-** - Shoreline Assessment	**O4-** Fauna Observations	**O5-** Air Quality	**O6** Sediment sampling	**S1-** Hydrocarbons in intertidal sediments and water	**S2-** Hydrocarbons in offshore sediments and water	**S3-** Fish and shellfish taint and toxicity for human consumption	**S4-** Short term impacts to oiled flora and fauna	**S5-** Recovery of commercial/recreational fisheries	**S6-** Recovery of fauna	**S7-** Recovery of subtidal and intertidal benthic habitat	**S8-** Recovery of Coastal Flora	**S9-** Recovery of Ramsar values
[redacted]	[redacted]	15+	FS	FS	FS	FS	FS	FS	FS	FS	FS						
[redacted]	[redacted]	10+	FS	FS	FS	FS	FS	FS	FS	FS	FS						
[redacted]	[redacted]	15+	FS	FS	FS	FS	FS	FS	FS	FS	FS						
[redacted]	[redacted]	15+	FS	FS	FS	FS	FS	FS	FS	FS	FS						
[redacted]	[redacted]	10+	FS	FS	FS	FS	FS	FS	FS	FS	FS						

2.7.6. Non-personnel resources

A summary of the likely key non-personnel resource requirements for each module is shown below in Table 2-5. Further information on the resources identified in this table is provided below and detailed equipment lists are provided in the supporting implementation guide for each module. Number of resources required will depend on the number of field teams for each module as well as efficiencies where one field team may collect data/samples for multiple modules.

Table 2-5: Non-personnel resource requirements

Equipment	O1	O2	O3	O4	O5	O6	S1	S2	S3	S4	S5	S6	S7	S8	S9
Fixed wing aircraft	✓		✓	✓											
Helicopter	✓		✓	✓											
Vehicles		✓	✓	✓	✓	✓	✓			✓		✓	✓	✓	
Vessels	✓	✓	✓	✓		✓		✓	✓	✓		✓	✓		
UAV	✓			✓						✓					
Sampling equipment		✓	✓			✓	✓	✓	✓	✓					
ROV	✓					✓	✓	✓		✓			✓		
Fluorometer		✓													
NATA accredited lab		✓	✓		✓	✓	✓	✓	✓	✓					
Oil Spill Trajectory Modelling services	✓														
Satellite imagery services	✓														

Aircraft

There may be a requirement for aircraft to support spill surveillance, shoreline assessment and fauna observations. There is access to helicopters through the Esso owned and operated helicopter fleet based out of Longford. An agreement is in place with a third party supplier to provide a fixed wing aircraft.

Vehicles

The Third Party OSMP Consultant has sufficient resources to meet the vehicle needs of the monitoring program in both the immediate and longer term. The Third Party OSMP Consultant has 4WD vehicles at its offices in Melbourne and these can be supplemented with 4WD drive vehicles from each of the subconsultants. The Third Party OSMP Consultant has Australia-wide contracts with rental car providers so that within 24 hours these vehicles can be supplemented with as many 4WD as needed for the duration of the monitoring programs. In addition to these vehicles which are set up for field work Third Party OSMP Consultant also has agreements with its staff to use their own personal vehicles should the need arise.

In summary the Third Party OSMP Consultant has available:

First Response (immediate):

- 4 - 10 4WD vehicles suitable for field work

After 24 hours

- As many 4WD vehicles as would be needed

Vessels

There is requirement for both large and small vessels to allow the monitoring to be completed as per the program.

Four inshore vessels from the Third Party OSMP Consultant which can operate in daylight hours only are immediately available.

The Third Party OSMP Consultant has an in principal agreement that the following vessels capable of operating offshore 24 hours per day can be used.

- *RV Orca II*
  - A trailerable 8 metre aluminium Oceaneer powered by twin 150 hp Yamaha four stroke engines. It is in Class 2C commercial survey, licensed to carry 12 passengers and 2 crew. We have two in-house coxswains with endorsements for operating in Port Phillip Heads. RV Orca II has a dry cabin for electronics and instrumentation as well as a large deck space for diving and instrument deployments.
- *Bass Rover*
  - 17 m long
  - Aluminium offshore twin screw patrol vessel
  - Speed of 22 knots
  - Max fuel consumption 120 litres per hour
  - Deck load carrying capacity of 5 tonnes
- *Silver Star*
  - Alloy aluminium catamaran
  - 20 tonne extendable A frame
  - 8 tonne Hiab crane
  - Max speed of 12 knots
  - Clear deck area of 15 m x 10 m
  - Length of 33.4 m
  - Beam of 11 m
  - Draught of 1.8 m
- *Calypso Star*
  - Twin hull, alloy aluminium catamaran
  - Two upper decks, a bulbous bow, transom stern and transverse and longitudinal framing
  - 3 tonne crane
  - Max speed of 12 knots
  - Clear deck area of 100 m^2
  - Length of 23.8 m
  - Beam of 11 m
  - Draught of 2.2 m
- *Turning Point MSV 11642*

  - Westcoaster 68’, 20’ beam. Powered by two 480HP diesel motors
  - Cruise speed 13 –14 knots, top speed 17 knots
  - 8 m x 5 m flush work deck to accommodate cargo bins plus 132 m of covered deck
  - Cargo to 8 tonnes
  - Water desalinator, sullage tanks and generous below-deck storage
  - Line hauler and 1.9 tonne crane with winch and 70 m spectra-rope available
  - Towing bollards to 5 tonne
  - Large transom doors opening onto dive platform
  - Vessel surveyed for: 2C - 22 passengers to 30 mile off shore and 2B – 12 overnight passengers to 100
- *Seapride MB883*
  - Steber 47’, 16’ beam
  - Powered by two 450HP diesel motors
  - Cruise speed 16 knots, top speed 20 knots
  - Large, stable work deck – 6 m x 3.8 m
  - 6.5 kva gen set
  - 2.2 tonne Hiab seacrane with 14’ reach. 400 kg lift capstan side hauler
  - 400 kg pull drum reel over transom or from vessel’s side
  - Cargo to 3 tonnes
  - Vessel fitted with radar, differential GPS giving accuracy to 2-3 metres
  - Large DGPS plotter incorporating details of Ninety Mile Beach reef system
  - Vessel surveyed for: 2C - 10 passengers to 30 mile off shore and 2B – five overnight passengers to 100 miles offshore intrastate

In addition to the vessels available through the Third Party OSMP Consultant identified above, the Esso support vessel used for ongoing operations may be used for surveillance and monitoring in the event of a spill. Esso also has an agreement in place with a third party supplier for the provision of additional vessels for surveillance and monitoring.

Sampling Equipment

The Third Party OSMP Consultant has its own wet laboratory in Victoria and has available the required sampling equipment for water quality and sediment quality. The Third Party OSMP Consultant also has a suite of ROVs, an automated underwater vehicle (AUV) and drones (with CASA certified operators) for rapid survey of intertidal reefs. The Third Party OSMP Consultant has fully certified divers with all required equipment including a suite of underwater cameras as well as side scan sonar units for mapping undersea habitats. All these resources are available for immediate deployment pending other commitments.

A flow-through fluorometer is not immediately available and this would be sourced by the Third Party OSMP Consultant as soon as possible following notification of the spill.

<u>Initial response sampling kits</u>

Given the short implementation time for sub-module O2.1, Esso has identified the following locations as stocking initial response spill sampling kits:

- Longford Plants Laboratory

- Long Island Point Laboratory
- Esso's contracted supply vessel
- Longford Heliport
- Sale Office (stored for deployment on inspection vessel when being used)
- Pipelines Warehouse - Sale
- Westbury Pumping Station

The initial response kits contain the equipment to obtain and store an oil sample from the water surface or from land.

Personnel should familiarise themselves with the sampling procedure (see Implementation Guide for O2: Water and Oil Sampling); but otherwise no specific training or qualifications are required to use the initial response kits to collect an oil sample.

Laboratory Access

Esso has identified the following NATA accredited laboratories within the region to support the various operational and scientific monitoring modules. Laboratories with the appropriate capabilities to support specific modules have been identified within the relevant modules.

Table 2-6: NATA accredited laboratories

Laboratory	Contact Details
Australian Laboratory Services (Melbourne)	4 Westall Road, Springvale VIC 3171 Ph: 03 8549 9600
Australian Laboratory Services (Traralgon)	Hazelwood Road, Traralgon VIC 3844 Ph: 03 5176 4170
Ecotox Services Australia	27/2 Chaplin Drive, Lane Cove NSW 2066 Ph: 02 9420 9481
Eurofins MGT	25 Kingston Town Close, Oakleigh VIC 3166 Ph: 03 8564 5000
Intertek Geotechnical	41-45 Furnace Road, Welshpool WA 6106 Ph: 08 9458 8877
Leeder Analytical Pty Ltd	33 Steane St, Fairfield, VIC, 3078 Phone: 03 9481 4167
Longford Plants Laboratory	Garretts Road, Longford VIC 3851 Ph: 03 5149 6259
National Measurement Institute	1/153 Bertie Street, Port Melbourne VIC 3207 Ph: 03 9644 4888

Modelling and Imagery Services

Esso (via ExxonMobil) is a member of the AMOSC. AMOSC membership allows access to RPS to provide predictive modelling capabilities in the event of an oil spill. Alternatively, modelling may also be requested from:

- Oil Spill Response Limited (OSRL);
- Exxon Mobil's in-house service (EMBSI).
- Australian Maritime Safety Authority (AMSA), noting that requests for modelling under the National Plan can only be made by Commonwealth or State/Territory spill response control agencies, or by AMOSC

Esso Australia has tracking buoys available, and additional buoys are available for hire from AMOSC. Esso also has agreements in place to allow access to satellite imagery services for remote observation of the spill.

2.8 Communication Management

Stakeholder (including regulators) consultation and external reporting requirements are described in the activity-specific EPs. This includes the requirement to consult with the:

- Department of Transport (DoT) in the event that a hydrocarbon spill is likely to impact Victorian waters;
- Department of Agriculture, Water and Environment (DAWE) in the event that a hydrocarbon spill is likely to impact matters of national environmental significance;
- Parks Australia, Director of National Parks, in the event that a hydrocarbon spill and/or response activity are likely to impact an Australian Marine Park.

If the spill may impact Tasmanian waters then consultation will occur with:

- The Environment Protection Authority Division of the Department of Primary Industries, Parks, Water, and Environment.

If the spill may impact New South Wales waters then consultation will occur with:

- NSW Environment Protection Authority;
- Transport for NSW

2.9 Review and Revision

Regulation 19 of the OPGGS (E) Regulations provides for the revision of this OSMP. Review and update of the OSMP may be initiated through findings from drills/exercises, actual events, internal or external assessments, audits, changes to regulation, or via planned periodic review. As per the EP&R Guide, this document is subject to:

- an annual review
- a mid-cycle (i.e. 2.5 – 3 years) comprehensive update
- 5 yearly revision and resubmission (in accordance with resubmission of Environment Plans)

Any changes made during review and revision must be tracked and documented in order to demonstrate continued compliance with regulatory accepted versions of this document. Changes made to the OSMP should be reviewed against *OPGGS (Environment) Regulations 2009* (Reg 7, Reg 8, Reg 17) to determine if a resubmission is required.

The annual review should be a general review of the OSMP to ensure it remains applicable to current operations. The annual review of the OSMP will include the annual test of the Third Party OSMP Consultants' capability to provide resources to fulfil the requirements of this OSMP (Section 2.7).

Table 2-7 describes the topics that should be considered when completing a mid-cycle update of the OSMP.

Table 2-7: Scope of revision of OSMP

Topic	Useful Links / References
Reference to most recently published NOPSEMA guidance documents	https://www.nopsema.gov.au/environmental-management/environment-resources/
Values and sensitivities within the DA including:	
• KEFs	https://www.environment.gov.au/sprat-public/action/kef/search http://www.environment.gov.au/marine/publications/ south-east-marine-region-profile http://www.environment.gov.au/topics/marine/marine-bioregional-plans/temperate-east

Topic	Useful Links / References
• MNES	https://parksaustralia.gov.au/marine/ parks/south-east/ https://parksaustralia.gov.au/marine/ parks/temperate-east/
• Species Profile and Threats Database	http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl
• BIAs	https://environment.gov.au/marine/ marine-species/bias
• Ramsar Wetlands	http://www.environment.gov.au/cgi-bin/wetlands/alphablist.pl
• Marine protected areas	https://parkweb.vic.gov.au/explore/ find-a-park/marine-protected-areas https://www.parks.tas.gov.au/index.aspx?base=397 https://www.dpi.nsw.gov.au/fishing/marine-protected-areas
Environmental Baseline Information	Refer to Implementation Plans for a summary of existing baseline data available in the Gippsland Region. Refer to linked references to review existing baseline data and establish if updates to existing baseline data is required.
Stakeholder Consultation	Consult with the Stakeholder Engagement Advisor for guidance on any relevant items to be considered.
Lessons Learned	Refer to Exercise reports for lessons learned to be considered. EP&R SharePoint – Offshore Drills and Exercises

3. Operational Monitoring

The following sections outline the individual operational monitoring modules that may be implemented in the event of a hydrocarbon spill to the marine or coastal environment. The tables describe the key aims, initiation and termination criteria, implementation times, and provide a high-level description of monitoring, reporting and resources. The studies are presented separately below; however, in practice they may be undertaken simultaneously.

These overviews are supported by internal implementation guides for each of the operational monitoring modules. The implementation guides have been prepared to provide Esso and their monitoring providers' sufficient information to efficiently finalise a monitoring design of an appropriate nature and scale in the event of a hydrocarbon spill.

Six operational monitoring modules have been identified:

- O1: Oil Spill Surveillance;
- O2: Water and Oil Sampling;
- O3: Shoreline Assessment;
- O4: Fauna Observations;
- O5: Air Quality;
- O6: Sediment Sampling.

3.1 O1: Oil Spill Surveillance

3.1.1. Purpose

The development and implementation of effective responses to oil spills depends critically on the knowledge of the extent and likely fate and behaviour of oil once exposed to ambient weather and sea state conditions. The purpose of this module is to:

- Track the location, extent and thickness of the surface oil slick to gain situational awareness of the incident and validate and inform forecasting and Oil Spill Trajectory Modelling (OSTM);
- Collect and collate relevant weather and sea state conditions to inform OSTM and response actions;
- Predict sensitivities at risk and fate/behaviour of the spill to inform response actions and scientific monitoring;
- Provide location of slick to O2 (water and oil sampling) monitoring team;
- Provide feedback on the extent, location, appearance and thickness of a dispersed slick (applicable only if dispersants used).

3.1.2. Initiation and termination criteria

Initiation Criteria	O1.1 Weather and sea state; O1.2 Trajectory estimation; and O1.3 Aerial or underwater observation;	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred
	O1.4 Remote observation;	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ IMT IC (or delegate) confirms the event as a Level 2 or Level 3 hydrocarbon spill.

	O1.5 Satellite imagery;	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ IMT IC (or delegate) confirms the event as a Level 3 hydrocarbon spill;
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of O1 is to commence.
Termination Criteria	✓ The IMT IC (or delegate) considers that continuation of monitoring under O1[1] will not result in a change to the scale or location of active response options; **or** ✓ Two consecutive aerial or underwater observations show that oil has weathered and dissipated to <0.3 g/m^2; or Bonn appearance code 1; or ✓ The IMT IC (or delegate) has advised that agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the response; **or** ✓ The Principal Investigator through the EUL (or delegate) has advised that continuation of monitoring under O1[1] may increase overall environmental impact.	

Notes:

1. Decision to terminate monitoring can be made for each individual sub-module independently.

3.1.3. Implementation

implementation time[1]	✓ O1.1, O1.2 and O1.3 within 4 hours of initiation criteria being met; ✓ O1.4 and O1.5 within 24 hours of initiation criteria being met.
Implementation Plan	✓ Refer to *Implementation Guide for O1: Oil Spill Surveillance*
Reporting	✓ Results from data collation, visual/remote surveillance, modelling and/or image analysis reported daily to PSC; ✓ Final report prepared within one-week of termination criteria being met; report provided to PSC.

Notes:

1. A module is considered implemented when Esso have (i) confirmed initiation criteria have been met, (ii) the monitoring providers have been notified, (iii) sampling and analysis plans (where required) have been completed, and (iv) mobilisation has commenced.

3.1.4. Monitoring overview

The below table provides an indication of the type of sampling techniques and analysis that may be undertaken during operational module O1. The final sampling design, including methods and analysis, will be determined by Esso in conjunction with their monitoring providers in the event of a spill.

Where practicable, sampling and analysis will be undertaken in line with relevant guidance documents, such as:

- Oil Spill Monitoring Handbook (Hook *et al*. 2016);
- Aerial Observation of Marine Oil Spills (ITOPF 2014);
- SMART Protocols (NOAA 2006).

Sub-module	Sampling technique	Data collection and/or analysis
O1.1 Weather and sea state	• Data records collation; • Visual surveillance	• Data records sourced from Bureau of Meteorology (BoM) or local weather stations; • Sea state observations manually recorded from vessels, offshore platform or shore.
O1.2 Trajectory estimation	• Manual estimation; • OSTM.	• Manual estimation can be completed quickly and with limited data (wind and currents, spill origin and/or present location) • OSTM is generally completed by specialist consultants.
O1.3	• Visual surveillance; • Remote sensing.	• Visual observations of the location, extent, and appearance of the spill.

Sub-module	Sampling technique	Data collection and/or analysis
Aerial or underwater observation		• Estimates of volume based on percentage cover and oil thickness.
O1.4 Remote observation	• Satellite tracking	• Buoys are deployed and position can be tracked via satellite.
O1.5 Satellite imagery	• Satellite imagery analysis	• Remote sensing and image analysis to determine presence of oil slicks.

3.1.5. Responsibilities, competencies, and resources

Emergency response team

The IMT IC and EUL have responsibilities relating to the initiation and termination of this operational monitoring module. These roles may delegate responsibilities as appropriate; e.g. the ERT VM/OIM may be responsible for the initiation if the IMT has not yet been established. Roles, responsibilities and competencies of the ERT and IMT teams are as detailed in the EP.

Monitoring team

The below table lists the minimum personnel requirements from the monitoring provider to implement operational module O1. The numbers of teams and final number of personnel may vary depending on the nature and scale of the spill.

Personnel	Responsibilities	Competencies
Principal Investigator (1 person)	• Finalise the sampling and analysis design for O1 in the event of a spill; • Implement O1; • Review and/or carry out reporting requirements; • Compliance with the requirements of O1 and the OSMP; • Provide advice with respect to environmental issues as required.	• Level 1 - Familiarisation with relevant requirements of the OSMP and OPEP. • Level 2/3 – Relevant experience in coordination of operational monitoring
Field Teams (2 to 3 people)	• Conduct visual observations; • Completing field data sheets; • QA/QC data quality.	• Lead observer to be experienced in surveillance techniques; • All team members to be familiar with the relevant spill observation, estimation and recording techniques.

Resources

The key resources required for implementation of Module O1 include a fixed wing aircraft and/or helicopter for aerial surveillance. UAVs may be utilised to support aerial surveillance. Vessels may also be required for on-water surveillance of the spill and observations of weather and sea state. Use of a ROV may be required for subsea activities such as detection or tracking of the spill. Access to Oil Spill Trajectory Modelling services and satellite imagery services may be required for spill modelling and remote surveillance. Further information on access to these resources is provided in Section 2.7.6.

3.2 O2: Water and Oil Sampling

3.2.1. Purpose

The purpose of this module is to provide quantitative measures of water quality and oil (hydrocarbon) characteristics to:

- Determine the physical and chemical characteristics of the spilled oil to validate trajectory forecasts or models (i.e. provide information regarding the spill source characterisation);
- Obtain samples of spilled oil for retention or additional analysis (e.g. fingerprinting);
- Establish background concentrations of total petroleum hydrocarbon (TPH) and polyaromatic hydrocarbons (PAH), and non-hydrocarbon constituents in sea water;
- Determine concentrations of TPH and PAH within the spill plume to validate and enhance OSTM and support assessment of environmental and social impacts;
- Determine the concentrations of non-hydrocarbon constituents (e.g. heavy metals) within the spill plume;
- Determine the effectiveness of dispersants in reducing concentrations of oil in the water column (applicable only if dispersants used);
- To inform scientific monitoring.

3.2.2. Initiation and termination criteria

Initiation Criteria	O2.1 Collection of an oil sample	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred
	O2.2 Fluorometry O2.3 Water samples;	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ IMT IC (or delegate) confirms the event as a Level 2 or Level 3 hydrocarbon spill; **or** ✓ Application of dispersant has been selected as a response option by the IMT IC (or delegate).
	O2.4 Dispersant Monitoring	✓ Application of dispersant has been selected as a response option by the IMT IC (or delegate).
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of O2 is to commence.
Termination Criteria	✓ The IMT IC (or delegate) has determined that continuation of monitoring under the module is not necessary to meet the objectives of the response **and** ✓ The IMT IC (or delegate) has advised that agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the response; **or** ✓ The Principal Investigator through the EUL (or delegate) has advised that continuation of monitoring under O2[1] may increase overall environmental impact.	

Notes:

1. Decision to terminate monitoring can be made for each individual sub-module independently.

3.2.3. Implementation

Minimum time to implement[1]	✓ O2.1: as soon as practicable following initiation criteria being met; ✓ O2.2, O2.3, O2.4: within 24 hours of initiation criteria being met.
Implementation Plan	✓ Refer to *Implementation Guide for O2: Water and Oil Sampling*
Reporting	✓ Results from in-situ analysis of samples reported daily to PSC; ✓ Results from laboratory analysis of samples reported as available to PSC; ✓ Final report prepared within one-week of termination criteria being met; report provided to PSC.

Notes:

1. A module is considered implemented when Esso have (i) confirmed initiation criteria have been met, (ii) the monitoring providers have been notified, (iii) sampling and analysis plans (where required) have been completed, and (iv) mobilisation has commenced.

3.2.4. Monitoring overview

The below table provides an indication of the type of sampling techniques and analysis that may be undertaken during operational module O2. The final sampling design, including methods and analysis, will be determined by Esso in conjunction with their monitoring providers in the event of a spill.

Where practicable, sampling and analysis will be undertaken in line with relevant guidance documents, such as:

- Oil Spill Monitoring Handbook (Hook *et al*. 2016);
- SMART Protocols (NOAA 2006);
- ASTM D4489 2017 Standard Practices for Sampling of Waterborne Oils.

Sub-module	Sampling technique	Data collection and/or analysis
O2.1 Collection of an oil sample	• Surface oil sample collection[1]	• Physical characteristics (e.g. wax content, dynamic viscosity, density, volatiles); • Chemical characteristics (e.g. PAH)
O2.2 Fluorometry	• Water column profiling	• TPH
O2.3 Water samples	• Surface and sub-surface water sample collection	• Laboratory analysis for hydrocarbons (e.g. TPH, PAH); • Laboratory analysis for non-hydrocarbon parameters (e.g. heavy metals); • Dispersant (e.g. DOSS).
O2.4 Dispersant Monitoring	• Surface and sub-surface water sample collection	• Laboratory analysis for hydrocarbons (e.g. TPH, PAH); • Laboratory analysis for non-hydrocarbon parameters (e.g. heavy metals); • Dispersant (e.g. DOSS).

Notes:

1. The location of Initial response sampling kits has been identified to facilitate the sampling required under O2.1.

3.2.5. Responsibilities, competencies, and resources

Emergency response team

The IMT IC and EUL have responsibilities relating to the initiation and termination of this operational monitoring module. These roles may delegate responsibilities as appropriate; e.g. the ERT VM/OIM may be responsible for initiation if the IMT has not yet been established. Roles, responsibilities and competencies of the ERT and IMT teams are as detailed in the OPEP.

Monitoring team

The below table lists the minimum personnel requirements from the monitoring provider to implement operational module O2. The numbers of teams and final number of personnel may vary depending on the nature and scale of the spill.

Personnel	Responsibilities	Competencies
Principal Investigator (1 person)	• Finalise the sampling and analysis design for O2 in the event of a spill; • Implement O2; • Review and/or carry out reporting requirements; • Compliance with the requirements of O2 and the OSMP; • Provide advice with respect to environmental issues as required.	• Level 1 - Familiarisation with relevant requirements of the OSMP and OPEP. • A least 10 years' experience in the collection and analysis of water quality samples. • Level 2/3 – Relevant experience or training in coordination of operational monitoring
Field Teams (2 to 3 people)	• Conduct sampling, record data and arrange transfer of samples to laboratories • Completing field data sheets • QA/QC data quality	• Familiarisation with oil and water sampling and recording techniques.

Resources

The key resources required for implementation of Module O2 include vessels for on-water sampling and monitoring as well as vehicles for coastal water sampling. A flow-through fluorometer may be required for monitoring oil in water concentrations. Sampling equipment will be required for sampling of the oil slick itself and sampling of water from both inside and outside the spill area. Further information on access to these resources is provided in Section 2.7.6.

Esso has also identified the following NATA accredited laboratories within the region with the capabilities to support the analysis for operational module O2:

NATA accredited laboratory	Details
Australian Laboratory Services (Melbourne)	Main Melbourne Laboratory 4 Westall Road, Springvale VIC 3171 Phone: 03 8549 9600
Australian Laboratory Services (Traralgon)	Hazelwood Road, Traralgon VIC 3844 Phone: 03 5176 4170
National Measurement Institute	1/153 Bertie Street, Port Melbourne VIC 3207 Phone: 03 9644 4888
Leeder Analytical Pty Ltd	33 Steane St, Fairfield, VIC, 3078 Phone: 03 9481 4167

3.3 O3: Shoreline Assessment

3.3.1. Purpose

This module outlines a Shoreline Clean-up Assessment Technique (SCAT) to be used to directly inform shoreline clean-up, provide recommendations to operations, and ensure the clean-up is completed. The purpose of this module is to:

- Determine the physical, biological and dynamic properties of shorelines at risk, in order to:
  - Predict the oil behaviour and distribution;
  - Determine the most appropriate clean-up methods;
  - Identify sensitive or vulnerable areas or resources;
  - Determine whether any pre-impact actions are warranted;
- Determine the characteristics and distribution of oil on the shoreline in order to predict the potential for oil persistence and / or natural removal;
- Determine the effectiveness of shoreline response strategies and provide feedback to the IMT.

3.3.2. Initiation and termination criteria

Initiation Criteria	O3.1 Shoreline segmentation O3.2 Shoreline character O3.3 Oil on shorelines	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred
	O3.4 Shoreline profile	✓ Modification of the shoreline profile is identified as a recommended strategy (e.g. through mechanical construction of pits, berms, or bulk waste removal)
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of O3 is to commence.
Termination Criteria	✓ The IMT IC (or delegate) has determined that continuation of monitoring under the module is not necessary to meet the objectives of the response **and** ✓ Results of Module O1 monitoring demonstrate that shorelines will not be impacted; **or** ✓ The IMT IC (or delegate) has advised that agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the response; **or** ✓ The Principal Investigator through the EUL (or delegate) has advised that continuation of monitoring under O3[1] may increase overall environmental impact.	

Notes:

1. *Decision to terminate monitoring can be made for each individual sub-module independently.*

3.3.3. Implementation

Implementation Time [1]	✓ O3.1, O3.2, O3.3, O3.4: within 24 hours of initiation criteria being met.
Implementation Plan	✓ Refer to *Implementation Guide for O3: Shoreline Assessment*
Reporting	✓ Results from data collation, visual surveillance, in-situ monitoring reported daily to PSC; ✓ Final report prepared within one-week of termination criteria being met; report provided to PSC.

Notes:

1. *A module is considered implemented when Esso have (i) confirmed initiation criteria have been met, (ii) the monitoring providers have been notified, (iii) sampling and analysis plans (where required) have been completed, and (iv) mobilisation has commenced.*

3.3.4. Monitoring overview

The below table provides an indication of the type of sampling techniques and analysis that may be undertaken during operational module O3. The final sampling design, including methods and analysis, will be determined by Esso in conjunction with their monitoring providers in the event of a spill.

Where practicable, sampling and analysis will be undertaken in line with relevant guidance documents, such as:

- Oil Spill Monitoring Handbook (Hook *et al*. 2016);
- SMART Protocols (NOAA 2006);
- Shoreline Assessment Job Aid (NOAA 2007)
- Shoreline Clean up Assessment Technique (SCAT) Oil Spill Response Limited (updated)
- The Open Water Oil Identification Job Aid for Aerial Observation (NOAA 2016)

Sub-module	Sampling technique	Data collection and/or analysis
O3.1 Shoreline character	• Visual surveillance	• Physical and biological characteristics (e.g. shoreline dimensions, habitat type, substrate type, wind/wave energy etc.).
O3.2 Oil on shorelines	• Visual surveillance; • Surface and sub-surface water sample collection	• Visual assessment of oil extent, percent cover, thickness etc.; • In-situ or laboratory analysis for hydrocarbon content (e.g. TPH). • Assessment of endpoints from clean-up, identification of suggested clean-up techniques

3.3.5. Responsibilities, competencies, and resources

Emergency response team

The IMT IC and EUL have responsibilities relating to the initiation and termination of this operational monitoring module. These roles may delegate responsibilities as appropriate. Roles, responsibilities and competencies of the ERT and IMT teams are as detailed in the OPEP.

Monitoring team

The below table lists the minimum personnel requirements from the monitoring provider to implement operational module O3. The numbers of teams and final number of personnel may vary depending on the nature and scale of the spill.

Personnel	Responsibilities	Competencies
Principal Investigator (1 person)	• Finalise the sampling and analysis design for O3 in the event of a spill; • Implement O3; • Review and/or carry out reporting requirements; • Compliance with the requirements of O3 and the OSMP; • Provide advice with respect to environmental issues as required.	• Familiarisation with relevant requirements of the OSMP and OPEP. • A least 10 years' experience in shoreline survey including the analysis of data. • Relevant experience or training in coordination of operational monitoring
Field Teams (2 to 3 people)	• Conduct sampling, record data and arrange transfer of samples to laboratories; • Completing field data sheets; • QA/QC data quality.	• Familiarisation with relevant observation and recording techniques • Zoologist for fauna observations.

Resources

Depending on the size and location of the spill, fixed wing aircraft or helicopters may be required for aerial surveys to help cover a broader area and to quickly assess remote or difficult to access locations. Similarly, vessels may be required for shoreline assessment to conduct vessel-based surveys or allow access to the shoreline. Vehicles will be required to support ground surveys. Sampling equipment is required for taking water and sediment samples to support visual observations of oil on shorelines.

Esso has also identified the following NATA accredited laboratories within the region with the capabilities to support the analysis for operational module O3:

NATA accredited laboratory	Details
Australian Laboratory Services (Melbourne)	Main Melbourne Laboratory 4 Westall Road, Springvale VIC 3171 Phone: 03 8549 9600
Australian Laboratory Services (Traralgon)	Hazelwood Road, Traralgon VIC 3844 Phone: 03 5176 4170
National Measurement Institute	1/153 Bertie Street, Port Melbourne VIC 3207 Phone: 03 9644 4888
Leeder Analytical Pty Ltd	33 Steane St, Fairfield, VIC, 3078 Phone: 03 9481 4167

3.4 O4: Fauna Observations

3.4.1. Purpose

This module is designed to inform responses to spills where there is the potential for exposure to fauna either onshore (e.g. seals or birds on the shoreline) or offshore (e.g. whales or birds either in/on the water). The purpose of this module is to:

- Identify the presence of onshore and offshore fauna, including marine mammals and seabirds, in the response area (i.e. near the oil slick, response vessels or aircraft) in order to implement mitigation strategies, such as reduce vessel speeds, halt operations, move vessels or aircraft from the area, increase flight altitude or consider “hazing” strategies.
- Locate potentially oiled fauna for recovery (i.e. by government agencies (Department of Environment, Land, Water and Planning (DELWP) and Parks Victoria or as directed).

3.4.2. Initiation and termination criteria

Initiation Criteria	O4.1 Fauna observation (at sea)	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred
	O4.2 Fauna observations (onshore)	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ IMT IC (or delegate) confirms that data from Modules O1 and/or O3 predicted/confirmed shoreline exposure.
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of O4 is to commence.
Termination Criteria	✓ The IMT IC (or delegate) has determined that continuation of monitoring under the module is not necessary to meet the objectives of the response **or** ✓ Results of Module O1 monitoring demonstrate that shorelines will not be impacted; **or** ✓ The IMT IC (or delegate) has advised that agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the response; **or** ✓ The Principal Investigator through the EUL (or delegate) has advised that continuation of monitoring under O4[1] may increase overall environmental impact.	

Notes:

1. Decision to terminate monitoring can be made for each individual sub-module independently.

3.4.3. Implementation

Implementation time [1]	✓ O4.1: within 4 hours of initiation criteria being met; ✓ O4.2: within 24 hours of initiation criteria being met.
Implementation Plan	✓ Refer to *Implementation Guide for O4: Fauna Observations*
Reporting	✓ Results from visual surveillance reported daily to PSC; ✓ Final report prepared within one-week of termination criteria being met; report provided to PSC.

Notes:

1. *A module is considered implemented when Esso have (i) confirmed initiation criteria have been met, (ii) the monitoring providers have been notified, (iii) sampling and analysis plans (where required) have been completed, and (iv) mobilisation has commenced.*

3.4.4. Monitoring overview

The below table provides an indication of the type of sampling techniques and analysis that may be undertaken during operational module O4. The final sampling design, including methods and analysis, will be determined by Esso in conjunction with their monitoring providers in the event of a spill.

Where practicable, sampling and analysis will be undertaken in line with relevant guidance documents, such as:

- Oil Spill Monitoring Handbook (Hook *et al*. 2016);
- Australian National Guidelines for Whale and Dolphin (DoEE 2017).

Sub-module	Sampling technique	Data collection and/or analysis
O4.1 Fauna observations (at sea)	• Visual surveillance	• Regular observations of the location, species, activity, evidence of oiling etc.
O4.2 Fauna observations (onshore)	• Visual surveillance	• Regular observations of the location, species, activity, evidence of oiling etc.

3.4.5. Responsibilities, competencies, and resources

Emergency response team

The IMT IC and EUL have responsibilities relating to the initiation and termination of this operational monitoring module. These roles may delegate responsibilities as appropriate; e.g. the ERT VM/OIM may be responsible for the initiation if the IMT has not yet been established. Roles, responsibilities and competencies of the ERT and IMT teams are as detailed in the OPEP.

Monitoring team

The below table lists the minimum personnel requirements from the monitoring provider to implement operational module O4. The numbers of teams and final number of personnel may vary depending on the nature and scale of the spill.

Personnel	Responsibilities	Competencies
Principal Investigator (1 person)	• Finalise the sampling and analysis design for O4 in the event of a spill; • Implement O4; • Review and/or carry out reporting requirements; • Compliance with the requirements of O4 and the OSMP; • Provide advice with respect to environmental issues as required.	• Level 1 - Familiarisation with relevant requirements of the OSMP and OPEP. • At least 10 years' experience in the collection and analysis of fauna data. • Level 2/3 - Doctorate in environmental science

Personnel	Responsibilities	Competencies
Field Teams (1 to 2 people)	• Conduct sampling and record data; • Completing field data sheets; • QA/QC data quality.	• Familiarisation with the fauna identification and recording techniques.

Resources

Fixed wing aircraft and/or helicopters may be required for aerial surveillance of fauna with fixed wing aircraft typically utilised for extensive offshore areas and helicopters used for slow speed near shore surveys. This would likely be an extension of surveillance and observation undertaken as part of Module O1. Vessels may also be used to support at sea fauna observations. Vehicles will be required to support onshore fauna observations. UAVs could be used for rapid data collection about faunal colonies via video or photographs.

3.5 O5: Air Quality

3.5.1. Purpose

In the event of a hydrocarbon spill, people will need to be deployed on site for monitoring and/or response and clean-up operations. Monitoring of air quality is necessary to ensure the protection and safety of human health. The purpose of this module is to:

- Establish a safe perimeter prior to any response operations being conducted where personnel may be exposed to hazards of airborne gases and vapours
- Identify any hazards from airborne gases and vapours;
- Determine the need for respiratory protection for environmental monitoring and clean-up workers; and
- Comply with occupational health regulatory requirements.

3.5.2. Initiation and termination criteria

Initiation Criteria	O5.1 Personnel and area monitoring O5.2 Laboratory analysis	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ Confirmation by the Safety Officer (SO) (or delegate) a health and safety risk to personnel is present
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or ✓ Partial implementation of O5 is to commence.
Termination Criteria	✓ The SO (or delegate) has determined that there is no longer a health and safety risk; **or** ✓ The IMT IC (or delegate) has advised that agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the response.	

Notes:
1. *Decision to terminate monitoring can be made for each individual sub-module independently.*

3.5.3. Implementation

Implementation time [1]	✓ O5.1 and O5.2: within 12 hours of initiation criteria being met.
Implementation Plan	✓ Refer to *Implementation Guide for O5: Air Quality*
Reporting	✓ Results from personnel monitoring reported daily to SO; ✓ Results from laboratory sampling reported as available to SO; ✓ Final report prepared within one-week of termination criteria being met; report provided to SO.

Notes:
1. *A module is considered implemented when Esso have (i) confirmed initiation criteria have been met, (ii) the monitoring providers have been notified, (iii) sampling and analysis plans (where required) have been completed, and (iv) mobilisation has commenced.*

3.5.4. Monitoring overview

The below table provides an indication of the type of sampling techniques and analysis that may be undertaken during operational module O4. The final sampling design, including methods and analysis, will be determined by Esso in conjunction with their monitoring providers in the event of a spill.

Where practicable, sampling and analysis will be undertaken in line with relevant guidance documents, such as:

- Occupational Health Monitoring Plan (Centre for Toxicology and Environmental Health 2011);
- Oil Spill Response Field Manual (ExxonMobil 2008).

Sub-module	Sampling technique	Data collection and/or analysis
O5.1 Personnel and area monitoring	• Direct-read personal or area gas monitoring	• In-situ data collected and compared against known guideline levels.
O5.2 Laboratory analysis	• Laboratory analysis of vapour monitors	• Laboratory analysis for hydrocarbons (e.g. BTEX, TPH).

3.5.5. Responsibilities, competencies, and resources

Emergency response team

The IMT IC and EUL have responsibilities relating to the initiation and termination of this operational monitoring module. These roles may delegate responsibilities as appropriate; e.g. the ERT VM/OIM may be responsible for the initiation if the IMT has not yet been established. Roles, responsibilities and competencies of the ERT and IMT teams are as detailed in the OPEP.

Monitoring team

The below table lists the minimum personnel requirements from the monitoring provider to implement operational module O5. The numbers of teams and final number of personnel may vary depending on the nature and scale of the spill.

Personnel	Responsibilities	Competencies
Principal Investigator (1 person)	• Finalise the sampling and analysis design for O5 in the event of a spill; • Implement O5; • Review and/or carry out reporting requirements; • Compliance with the requirements of O5 and the OSMP; • Provide advice with respect to environmental issues as required.	• Level 1 – Experience in implementation of safety or industrial hygiene programs in the oil & gas industry • A least 10 years' experience in the collection and analysis of air quality measurements and data. • Level 2/3 - Qualifications in Occupational Health & Safety, or Industrial Hygiene from a recognised institution or equivalent tertiary study in technical area; • Familiarisation with relevant requirements of the OSMP and OPEP.
Monitoring personnel	• To conduct air quality monitoring to determine safe exposure levels in operating environment	• Trained in use of personnel air monitoring equipment

Resources

It is expected that vehicles will be required to support onshore air quality monitoring through both personnel and area monitoring. Laboratory analysis of vapour monitors comprises part of this module. Esso has also identified the following NATA accredited laboratories within the region with the capabilities to support the analysis for operational module O5:

NATA accredited laboratory	Details
Australian Laboratory Services (Traralgon)	Hazelwood Road, Traralgon VIC 3844 Phone: 03 5176 4170
Longford Plants Laboratory	Garretts Road, Longford VIC 3851 Phone: 03 5149 6259

3.6 O6: Sediment Sampling

3.6.1. Purpose

The purpose of this module is to provide quantitative measures of sediment quality to:

- Establish background concentrations of TPH and PAH, and non-hydrocarbon constituents in sediment;
- Determine concentrations of TPH, PAH and non-hydrocarbon constituents (e.g. heavy metals) within exposed sediments to inform response strategies;
- Determine the effectiveness of clean-up operations;
- To inform scientific monitoring.

3.6.2. Initiation and termination criteria

Initiation Criteria	O6.1 Sediment samples (intertidal)	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ IMT IC (or delegate) confirms that data from Modules O1, O2 and/or O3 have predicted/confirmed exposure of intertidal benthic substrate.
	O6.2 Sediment samples (offshore);	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ IMT IC (or delegate) confirms that data from Modules O1 and/or O2 have predicted/confirmed exposure of offshore benthic substrate.
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of O6 is to commence.
Termination Criteria	✓ The IMT IC (or delegate) has determined that continuation of monitoring under the module is not necessary to meet the objectives of the response **and** ✓ The IMT IC (or delegate) has advised that agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the response; **or** ✓ The Principal Investigator through the EUL (or delegate) has advised that continuation of monitoring under O6[1] may increase overall environmental impact.	

Notes:

1. *Decision to terminate monitoring can be made for each individual sub-module independently.*

3.6.3. Implementation

Implementation time [1]	✓ O6.1 and O6.2: within 24 hours of initiation criteria being met.
Implementation Plan	✓ Refer to *Implementation Guide for O6: Sediment Sampling*
Reporting	✓ Results from in-situ sampling reported daily to EUL; ✓ Results from laboratory sampling reported as available to EUL; ✓ Final report prepared within one-week of termination criteria being met; report provided to EUL.

Notes:

1. *A module is considered implemented when Esso have (i) confirmed initiation criteria have been met, (ii) the monitoring providers have been notified, (iii) sampling and analysis plans (where required) have been completed, and (iv) mobilisation has commenced.*

3.6.4. Monitoring overview

The below table provides an indication of the type of sampling techniques and analysis that may be undertaken during operational module O6. The final sampling design, including methods and analysis, will be determined by Esso in conjunction with their monitoring providers in the event of a spill.

Where practicable, sampling and analysis will be undertaken in line with relevant guidance documents, such as:

- Oil Spill Monitoring Handbook (Hook *et al.* 2016).

Sub-module	Sampling technique	Data collection and/or analysis
O6.1 Sediment samples (intertidal)	• Surface and sub-surface sediment sample collection	• Laboratory analysis for hydrocarbons (e.g. TPH, TRH, PAH, BTEX); • Laboratory analysis for non-hydrocarbon parameters (e.g. TOC, PSD, heavy metals, nutrients).
O6.2 Sediment samples (offshore)	• Surface sediment sample collection	• Laboratory analysis for hydrocarbons (e.g. TPH, TRH, PAH, BTEX); • Laboratory analysis for non-hydrocarbon parameters (e.g. TOC, PSD, heavy metals, nutrients).

3.6.5. Responsibilities, competencies, and resources

Emergency response team

The IMT IC and EUL have responsibilities relating to the initiation and termination of this operational monitoring module. These roles may delegate responsibilities as appropriate; e.g. the ERT VM/OIM may be responsible for the initiation if the IMT has not yet been established. Roles, responsibilities and competencies of the ERT and IMT teams are as detailed in the OPEP.

Monitoring team

The below table lists the minimum personnel requirements from the monitoring provider to implement operational module O6. The numbers of teams and final number of personnel may vary depending on the nature and scale of the spill.

Personnel	Responsibilities	Competencies
Principal Investigator (1 person)	• Finalise the sampling and analysis design for O6 in the event of a spill; • Implement O6; • Review and/or carry out reporting requirements; • Compliance with the requirements of O6 and the OSMP; • Provide advice with respect to environmental issues as required.	• Level 1 - Familiarisation with relevant requirements of the OSMP and OPEP. • A least 10 years' experience in the collection and analysis of sediment quality samples. • Level 2/3 - Bachelor degree in environmental science or an engineering degree from a recognised institution or equivalent tertiary study in technical area;
Field Teams (2 to 3 people)	• Conduct sampling, record data and arrange transfer of samples to laboratories • Completing field data sheets • QA/QC data quality	• Familiarisation with sediment sampling and recording techniques.

Resources

Sediment sampling will be conducted on both intertidal and offshore sediments with vehicles required to support the intertidal sediment sampling and vessels required to support the offshore sediment sampling. Sediment sampling equipment such as corers and grab samplers will be required to collect sediment samples. Offshore sediment sampling may utilise ROVs. A NATA accredited laboratory will be required to analyse sediment samples. Esso has identified the following NATA accredited laboratories within the region with the capabilities to support the analysis for operational module O6:

NATA accredited laboratory	Details
Australian Laboratory Services (Melbourne)	Main Melbourne Laboratory 4 Westall Road, Springvale VIC 3171 Phone: 03 8549 9600
Australian Laboratory Services (Traralgon)	Hazelwood Road, Traralgon VIC 3844 Phone: 03 5176 4170
National Measurement Institute	1/153 Bertie Street, Port Melbourne VIC 3207 Phone: 03 9644 4888
Leeder Analytical Pty Ltd	33 Steane St, Fairfield, VIC, 3078 Phone: 03 9481 4167

4. Scientific Monitoring

The following sections outline the individual scientific monitoring modules that may be implemented in the event of a hydrocarbon spill to the marine or coastal environment. The sections describe the purpose, initiation and termination criteria, implementation timing, and provide a high-level description of monitoring, reporting and resources required. The modules are presented separately below; however, in practice they may be undertaken simultaneously.

These overviews are supported by internal implementation guides for each of the scientific monitoring modules. The implementation guides have been prepared to provide Esso and their monitoring providers sufficient information to efficiently finalise a monitoring design of an appropriate nature and scale in the event of a hydrocarbon spill.

Scientific monitoring generally has objectives relating to attributing cause-effect interactions of the spill with changes to the surrounding environment. Consequently, such studies are required to account for natural or sampling variation, and study designs must be robust and produce defensible data. Scientific monitoring is typically conducted over a wider study area taking into account the potentially exposed area, extending beyond the spill footprint, and a longer time period, extending beyond the spill response.

Nine scientific monitoring modules have been identified:

- S1: Hydrocarbons in Intertidal Sediments and Water;
- S2: Hydrocarbons in Offshore Sediments and Water;
- S3: Fish and Shellfish Taint and Toxicity for Human Consumption;
- S4: Short-Term Impacts to Oiled Fauna and Flora;
- S5: Recovery of Commercial and Recreational Fisheries;
- S6: Recovery of Fauna;
- S7: Recovery of Subtidal and Intertidal Benthic Habitat;
- S8: Recovery of Coastal Flora;
- S9: Recovery of Ramsar Values.

Guidance on various experimental monitoring approaches for scientific monitoring (e.g. use of baseline data in 'before versus after' analyses, and alternative approaches such as 'control versus impact' and 'gradient approach') is provided in Appendix A. Appendix B describes an approach to utilising baseline data where and when available; and a list of known regional studies and/or data sources. Specific guidance and sampling approaches are described within the implementation guides for each scientific monitoring module.

Guidance documents which provide information such as key locations, receptors and values will be used to inform monitoring design. The management plans for both Commonwealth and State Protected Areas that may be impacted by a spill do not provide guidance as to the levels of acceptable change nor do they state acceptable levels of contaminants including hydrocarbons, however aspects such as key values will be taken into account. Esso will also take into account information from other documents that provide guidance for protected areas such as Corner Inlet and the Gippsland Lakes and in addition will undertake consultation with relevant asset managers of protected areas as well as asset managers responsible for natural assets that are not protected such as commercial and recreational fishery managers. There are also other sources of guidance for the levels of acceptable change such as the Victorian State Environment Protection Policies (Waters) which gives guidance as to levels of change that are considered acceptable for various bodies of water within the state jurisdiction. In addition the conservation advices / recovery plans for Matters of National Environmental Significance (MNES) listed under the EPBC Act also provide guidance on levels of acceptable change and the actions that may be required to ensure protection / recovery of listed species and communities including aspects such as spatial and temporal distribution.

Initiation and/or termination criteria for some of the scientific monitoring modules require the use of 'accepted guidelines and/or benchmark values'. Where available, Australian guidelines (e.g. ANZECC

& ARMCANZ 2000) or regionally relevant data is used. Where these are unavailable or inappropriate for a selected parameter, toxicity screening benchmarks developed by the USEPA in response to the Deepwater Horizon incident (e.g. USEPA 2015), or other international guidelines (e.g. USEPA 2017) may be adopted. Specific guidance on benchmark values are described within the overviews below, and in the implementation guides, for each individual scientific monitoring module.

4.1 S1: Hydrocarbons in Intertidal Sediments and Water

4.1.1. Purpose

The purpose of this module is to provide quantitative measures of intertidal sediment and water quality. Scientific module S1 will assess and monitor concentrations of hydrocarbons and metals in intertidal sediments and water by:

- Establishing the baseline concentrations of hydrocarbons and metals in water and sediment at identified pre-impact (if practicable) or control (i.e. un-impacted) intertidal sites;
- Monitoring concentrations of hydrocarbons, metals and nutrients (if bioremediation techniques used as part of response operations) in intertidal water and sediments at identified control and impact sites.

4.1.2. Initiation and termination criteria

Initiation Criteria	S1.1 Water samples	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ Principal Investigator through the EUL (or delegate) confirms that data from Modules O1 and/or O2 have predicted/confirmed exposure of intertidal waters
	S1.2 Sediment samples	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ Principal Investigator through the EUL (or delegate) confirms that data from Modules O1 and/or O2 have predicted/confirmed exposure of intertidal or shoreline sediments
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of S1 is to commence.
Termination Criteria	S1.1 Water samples	✓ Ambient hydrocarbon concentrations in intertidal waters have returned to within the expected natural dynamics of baseline state and/or control sites; **or** ✓ Ambient hydrocarbon concentrations in intertidal waters are below relevant ANZECC & ARMCANZ (2000) 99% species protection levels; **or** ✓ There has been no demonstrable impact on intertidal water quality from hydrocarbons.
	S1.2 Sediment samples	✓ Ambient hydrocarbon concentrations in intertidal sediments have returned to within the expected natural dynamics of baseline state and/or control sites; **or** ✓ Ambient hydrocarbon concentrations in intertidal sediments are below relevant ANZECC & ARMCANZ SQGV (Simpson *et al*. 2013) or NAGD (CoA 2009) trigger levels
	All sub-modules	✓ **Or** agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the monitoring.

4.1.3. Implementation

Activation Time[1]	✓ S1 to be activated within 24 hours of initiation criteria being met;
Implementation Time	✓ Sampling and analysis plan to be ready within 24 hours of initiation criteria being met; ✓ Mobilisation and monitoring to commence within 24 hours of activation.
Implementation Plan	✓ Refer to *Implementation Guide for S1: Hydrocarbons in intertidal sediments and water*
Reporting	✓ Summary report to be provided to Esso Environment Unit Lead following completion of each field survey event; ✓ Final report (including all data and associated interpretation and analysis) prepared following the termination criteria for the module being met.

Notes:

1. *A module is considered activated when Esso have confirmed initiation criteria have been met and the monitoring providers have been notified to initiate planning and implementation tasks.*

4.1.4. Monitoring overview

The below table provides an indication of the type of sampling techniques and analysis that may be undertaken during scientific module S1. The final sampling design, including methods and analysis, will be determined by Esso in conjunction with their monitoring providers in the event of a spill.

Where practicable, sampling and analysis will be undertaken in line with relevant guidance documents, such as:

- Oil Spill Monitoring Handbook (Hook *et al*. 2016);
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ 2000)
- Revision of the ANZECC/ARMCANZ Sediment Quality Guidelines (Simpson *et al*. 2013);
- National Assessment Guidelines for Dredging (CoA 2009).

Sub-module	Sampling technique	Data collection and/or analysis
S1.1 Water samples	• Surface and sub-surface water sample collection[1]	• Laboratory analysis for hydrocarbons (e.g. TPH, TRH, PAH, BTEX); • Laboratory analysis for non-hydrocarbon parameters (e.g. metals, nutrients).
S1.2 Sediment samples	• Surface and sub-surface sediment sample collection[2]	• Laboratory analysis for hydrocarbons (e.g. TPH, TRH, PAH, BTEX); • Laboratory analysis for non-hydrocarbon parameters (e.g. TOC, PSD, metals, nutrients).

Notes:

1. *Sampling techniques as per operational module O2.3.*
2. *Sampling techniques as per operational module O6.1.*

4.1.5. Responsibilities, competencies, and resources

Emergency response team

The IMT IC and EUL have responsibilities relating to the initiation of this scientific monitoring module. These roles may delegate responsibilities as appropriate. Roles, responsibilities and competencies of the ERT and IMT teams are as detailed in the OPEP.

Esso environmental team

Termination of this scientific monitoring module is the responsibility of Esso Environment Lead.

Monitoring team

The below table lists the minimum personnel requirements from the monitoring provider to implement scientific module S1. The numbers of teams and final number of personnel may vary depending on the nature and scale of the spill.

Personnel	Responsibilities	Competencies
Principal Investigator (1 person)	• Finalise the sampling and analysis design for S1 in the event of a spill; • Implement S1; • Review and/or carry out reporting requirements; • Compliance with the requirements of S1 and the OSMP; • Provide advice with respect to environmental issues as required.	• Doctorate in environmental science, • At least 10 years' experience in the collection of environmental samples from water and sediments; • Familiarisation with relevant requirements of the OSMP and OPEP.
Field Teams (2 to 3 people)	• Conduct sampling, record data and arrange transfer of samples to laboratories; • Completing field data sheets; • QA/QC data quality.	• Bachelor degree in environmental science or an engineering degree from a recognised institution or equivalent tertiary study in technical area; • Experienced in sediment and water quality sampling and recording techniques.

Resources

Vehicles will be required to support sampling of intertidal sediments and water. Sampling equipment for both sediment and water sampling will be required. Some resources for Module S1 can likely be shared with Modules O6 and S2. A NATA accredited laboratory will be required for analysis of the intertidal sediment and water samples. Esso has identified NATA accredited laboratories with the capabilities to support the analysis for scientific module S1, including but not limited to:

NATA accredited laboratory	Details
Australian Laboratory Services (Melbourne)	4 Westall Road, Springvale VIC 3171 Ph: 03 8549 9600
Eurofins MGT	25 Kingston Town Close, Oakleigh VIC 3166 Ph: 03 8564 5000
National Measurement Institute	1/153 Bertie Street, Port Melbourne VIC 3207 Ph: 03 9644 4888
Leeder Analytical Pty Ltd	33 Steane St, Fairfield, VIC, 3078 Phone: 03 9481 4167

4.2 S2: Hydrocarbons in Offshore Sediments and Water

4.2.1. Purpose

The purpose of this module is to provide quantitative measures of offshore sediment and water quality. Scientific module S2 will assess and monitor concentrations of hydrocarbons and metals in offshore sediments and water by:

- Establishing the baseline concentrations of hydrocarbons and metals in water and sediment at identified pre-impact (if practicable) or control (i.e. un-impacted) offshore sites;
- Monitoring concentrations of hydrocarbons, metals and nutrients (if bioremediation techniques used as part of response operations) in offshore sediments and water at identified control and impact sites.

4.2.2. Initiation and termination criteria

Initiation Criteria	S2.1 Water samples	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ Principal Investigator through the EUL (or delegate) confirms that data from Modules O1 and/or O2 have predicted/confirmed exposure to offshore waters
	S2.2 Sediment samples	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ Principal Investigator through the EUL (or delegate) has determined that data from operational modules O1, O2 or O6 has confirmed exposure to either benthic substrate or waters within bottom 1 m of seabed
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of S2 is to commence.
Termination Criteria	S2.1 Water samples	✓ Ambient hydrocarbon concentrations in offshore waters have returned to within the expected natural dynamics of baseline state and/or control sites; **or** ✓ Ambient hydrocarbon concentrations in offshore waters are below relevant ANZECC/ARMCANZ (2000) 99% species protection levels.
	S2.2 Sediment samples	✓ Hydrocarbon concentrations in offshore sediments have returned to within the expected natural dynamics of baseline state and/or control sites; **or** ✓ Hydrocarbon concentrations in offshore sediments are below relevant ANZECC/ARMCANZ SQGV (Simpson *et al*. 2013) or NAGD (CoA 2009) trigger levels.
	All sub-modules	✓ **Or,** agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the monitoring.

4.2.3. Implementation

Activation Time[1]	✓ S2 to be activated within 24 hours of initiation criteria being met
Implementation Time	✓ Sampling and analysis plan to be ready within 24 hours of initiation criteria being met; ✓ Mobilisation and monitoring to commence within 24 hours of activation.
Implementation Plan	✓ Refer to *Implementation Guide for S2: Hydrocarbons in offshore sediments and water*
Reporting	✓ Summary report to be provided to Esso Environment Lead following completion of each field survey event; ✓ Final report (including all data and associated interpretation and analysis) prepared following the termination criteria for the module being met.

Notes:

1. *A module is considered activated when Esso have confirmed initiation criteria have been met and the monitoring providers have been notified to initiate planning and implementation tasks.*

4.2.4. Monitoring overview

The below table provides an indication of the type of sampling techniques and analysis that may be undertaken during scientific module S2. The final sampling design, including methods and analysis, will be determined by Esso in conjunction with their monitoring providers in the event of a spill.

Where practicable, sampling and analysis will be undertaken in line with relevant guidance documents, such as:

- Oil Spill Monitoring Handbook (Hook *et al*. 2016);
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ 2000)
- Revision of the ANZECC/ARMCANZ Sediment Quality Guidelines (Simpson *et al*. 2013);
- National Assessment Guidelines for Dredging (CoA 2009).

Sub-module	Sampling technique	Data collection and/or analysis
S2.1 Water samples	• Surface and sub-surface water sample collection[1]	• Laboratory analysis for hydrocarbons (e.g. TPH, TRH, PAH, BTEX); • Laboratory analysis for non-hydrocarbon parameters (e.g. metals, nutrients)
S2.2 Sediment samples	• Surface sediment sample collection[2]	• Laboratory analysis for hydrocarbons (e.g. TPH, TRH, PAH, BTEX); • Laboratory analysis for non-hydrocarbon parameters (e.g. TOC, PSD, metals, nutrients).

Notes:

1. *Sampling techniques as per operational module O2.3.*
2. *Sampling techniques as per operational module O6.2.*

4.2.5. Responsibilities, competencies, and resources

Emergency response team

The IMT IC and EUL have responsibilities relating to the initiation of this scientific monitoring module. These roles may delegate responsibilities as appropriate. Roles, responsibilities and competencies of the ERT and IMT teams are as detailed in the OPEP.

Esso environmental team

Termination of this scientific monitoring module is the responsibility of Esso Environment Lead.

Monitoring team

The below table lists the minimum personnel requirements from the monitoring provider to implement scientific module S2. The numbers of teams and final number of personnel may vary depending on the nature and scale of the spill.

Personnel	Responsibilities	Competencies
Principal Investigator (1 person)	• Finalise the sampling and analysis design for S2 in the event of a spill • Implement S2 • Review and/or carry out reporting requirements • Compliance with the requirements of S2 and the OSMP • Provide advice with respect to environmental issues as required	• Doctorate in environmental science, • At least 10 years' experience in the collection of environmental samples from water and sediments; • Familiarisation with relevant requirements of the OSMP and OPEP
Field Teams (2 to 3 people)	• Conduct sampling, record data and arrange transfer of samples to laboratories • Completing field data sheets • QA/QC data quality	• Bachelor degree in environmental science or an engineering degree from a recognised institution or equivalent tertiary study in technical area • Experienced in the relevant sampling and/or recording techniques.

Resources

Vessels and ROVs will be required to support sampling of offshore sediments and water. Sampling equipment for both sediment and water sampling will be required. Some resources for Module S2 can likely be shared with Modules O6 and S1. A NATA accredited laboratory will be required for analysis of the offshore sediment and water samples. Esso has identified NATA accredited laboratories with the capabilities to support the analysis for scientific module S2, including but not limited to:

NATA accredited laboratory	Details
Australian Laboratory Services (Melbourne)	4 Westall Road, Springvale VIC 3171 Phone: 03 8549 9600

NATA accredited laboratory	Details
Eurofins MGT	25 Kingston Town Close, Oakleigh VIC 3166 Phone: 03 8564 5000
National Measurement Institute	1/153 Bertie Street, Port Melbourne VIC 3207 Phone: 03 9644 4888
Leeder Analytical Pty Ltd	33 Steane St, Fairfield, VIC, 3078 Phone: 03 9481 4167

4.3 S3: Fish and Shellfish Taint and Toxicity for Human Consumption

4.3.1. Purpose

The purpose of this module is to:

- Provide an understanding of the levels of taint in commercial and recreational fish and/or shellfish species;
- Undertake a chemical analysis of the level of PAH and non-hydrocarbon constituents (e.g. metals) in fish and/or shellfish tissue to assess the level of risk for human consumption;
- Determine if differences exist in concentration of PAH and non-hydrocarbon constituents (e.g. metals) in fish and/or shellfish samples collected from impact and control sites.
- Determine if differences exist in the olfactory status of fish and/or shellfish samples collected from areas exposed to an oil spill (impact) and from control sites;
- Assess possible sources of specific odours via qualitative evaluation;
- Determine the persistence of taint over a specified time period;

4.3.2. Initiation and termination criteria

Initiation Criteria	S3 Fish/shellfish tissue samples	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ Principal Investigator through the EUL (or delegate) has determined that data from operational modules O2/O6 or scientific modules S1/S2 has confirmed either: (a) in-water hydrocarbon concentrations are above guideline levels known to cause tainting (Table 4.4.5 in ANZECC & ARMCANZ 2000); or (b) sediment hydrocarbon concentrations are above SQGV levels (Simpson *et al*. 2013) ✓ Principal Investigator through the EUL (or delegate) has determined that data from operational modules O2/O6 or scientific modules S1/S2 has confirmed either: (a) in-water non-hydrocarbon constituent concentrations are above guideline levels known to cause tainting (Table 4.4.5 in ANZECC & ARMCANZ 2000); or (b) sediment hydrocarbon concentrations are above SQGV levels (Simpson *et al*. 2013) **and** ✓ Agreement has been reached with the Jurisdictional Authority relevant to the spill to initiate the monitoring
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of S3 is to commence.
Termination Criteria	S3 Fish/shellfish tissue samples	✓ Two sequential sample sets show ambient hydrocarbon concentrations are below guideline levels for tainting in ANZECC & ARMCANZ 2000); **and either** ✓ PAH and non-hydrocarbon constituent levels in fish and shellfish tissue have returned to within the expected natural dynamics of baseline state and/or control sites; **or** ✓ PAH and non-hydrocarbon constituent levels in fish and shellfish tissue are at or below levels specified by Food Standards Australia New Zealand (FSANZ).

	All sub-modules	✓ **Or,** agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the monitoring.

4.3.3. Implementation

Activation Time[1]	✓ S3 to be activated within 24 hours of initiation criteria being met
Implementation Time	✓ Sampling and analysis plan to be ready within 7 days of initiation criteria being met; ✓ Mobilisation and monitoring to commence within 7 days of activation.
Implementation Plan	✓ Refer to *Implementation Guide for S3: Fish and shellfish taint and toxicity for human consumption*
Reporting	✓ Summary report to be provided to Esso Environment Lead following completion of each field survey event; ✓ Final report (including all data and associated interpretation and analysis) prepared following the termination criteria for the module being met.

Notes:

1. *A module is considered activated when Esso have confirmed initiation criteria have been met and the monitoring providers have been notified to initiate planning and implementation tasks.*

4.3.4. Monitoring overview

The below table provides an indication of the type of sampling techniques and analysis that may be undertaken during scientific module S3. The final sampling design, including methods and analysis, will be determined by Esso in conjunction with their monitoring providers in the event of a spill.

Where practicable, sampling and analysis will be undertaken in line with relevant guidance documents, such as:

- Oil Spill Monitoring Handbook (Hook *et al*. 2016);
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ 2000)
- Protocol for Interpretation and Use of Sensory Testing and Analytical Chemistry Results for Re-Opening Oil-Impacted Areas Closed to Seafood Harvesting Due to The Deepwater Horizon Oil Spill (USFDA 2010)

Sub-module	Sampling technique	Data collection and/or analysis
S3 Fish/shellfish tissue samples	• Fish and/or shellfish collection; • Biological tissue sampling	• Physical specimen characteristics (e.g. length, sex, visible lesions etc.); • Laboratory analysis of tissue samples for hydrocarbons (e.g. PAH); • Olfactory analysis.

4.3.5. Responsibilities, competencies, and resources

Emergency response team

The IMT IC and EUL have responsibilities relating to the initiation of this scientific monitoring module. These roles may delegate responsibilities as appropriate. Roles, responsibilities and competencies of the ERT and IMT teams are as detailed in the OPEP.

Esso environmental team

Termination of this scientific monitoring module is the responsibility of Esso Environment Lead.

Monitoring team

The below table lists the minimum personnel requirements from the monitoring provider to implement scientific module S3. The numbers of teams and final number of personnel may vary depending on the nature and scale of the spill.

Personnel	Responsibilities	Competencies
Principal Investigator (1 person)	• Finalise the sampling and analysis design for S3 in the event of a spill; • Implement S3;	• Doctorate in environmental science;

Personnel	Responsibilities	Competencies
	• Review and/or carry out reporting requirements; • Compliance with the requirements of S3 and the OSMP; • Provide advice with respect to environmental issues as required.	• At least 10 years' experience in the collection of fish and shellfish for laboratory analysis; • Familiarisation with relevant requirements of the OSMP and OPEP.
Field Teams (2 to 3 people)	• Conduct sampling, record data and arrange transfer of samples to laboratories; • Completing field data sheets; • QA/QC data quality.	• Bachelor degree in environmental science or an engineering degree from a recognised institution or equivalent tertiary study in technical area; • Experienced in the fish/shellfish collection, sampling and recording techniques.
Olfactory Analysis Panel (2 to 3 people)	• Conduct sensory evaluation of fish and/or shellfish samples.	• Bachelor degree in degree environmental science or an engineering degree from a recognised institution or equivalent tertiary study in technical area; • Experienced in olfactory analysis.

Resources

Vessels will be required to support collection of fish and shellfish samples. Equipment required for collection of samples may include baited traps and lure lines. A NATA accredited laboratory will be required for analysis of the fish and shellfish samples. Esso has identified NATA accredited laboratories with the capabilities to support the analysis for scientific module S3, including but not limited to:

NATA accredited laboratory	Details
Australian Laboratory Services (Melbourne)	4 Westall Road, Springvale VIC 3171 Ph: 03 8549 9600
Intertek Geotechnical	41-45 Furnace Road, Welshpool WA 6106 Ph: 08 9458 8877
National Measurement Institute	1/153 Bertie Street, Port Melbourne VIC 3207 Ph: 03 9644 4888
Leeder Analytical Pty Ltd	33 Steane St, Fairfield, VIC, 3078 Phone: 03 9481 4167

4.4 S4: Short-Term Impacts to Oiled Fauna and Flora

4.4.1. Purpose

For the purposes of this module 'fauna' is defined as avifauna (seabirds and shorebirds) and marine megafauna (predominately pinnipeds). 'Flora' is defined as both aquatic flora (e.g. kelp present on subtidal reefs) and coastal flora (e.g. mangroves and saltmarsh).

The purpose of this module is to assess any short-term effects of oiling on marine fauna and flora which may have resulted from an oil spill. Module S5 is designed to conduct:

- Visual inspections of wildlife in the near shore marine environment and assess the number and species of oiled fauna and their health;
- Visual inspections of wildlife on shoreline environments, including at breeding areas and determine the number and species of oiled wildlife, and their general health;
- Surveys of coastal, subtidal and intertidal flora populations to identify the species present and record health condition parameters; and
- Fingerprint analysis of oil samples taken from oiled fauna to provide quantitative measures on the composition, type, estimated age and weathering and degradation of the product.

4.4.2. Initiation and termination criteria

Initiation Criteria	S4.1 Fauna surveys (vessel-based) S4.2 Fauna surveys (land-based) S4.3 Oiled fauna hydrocarbon testing;	✓ Confirmation by the IMT IC (or delegate) that a hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ Principal Investigator through the EUL (or delegate) has determined that data from operational modules O4 has confirmed the presence of oiled fauna.
	S4.4 Flora surveys	✓ Confirmation by the IMT IC (or delegate) that Level 2 or Level 3 hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ Principal Investigator through the EUL (or delegate) has determined that data from operational modules O3 has confirmed the presence of oiled shorelines
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of S4 is to commence.
Termination Criteria	S4.1 Fauna surveys (vessel-based) S4.2 Fauna surveys (land-based) S4.3 Oiled fauna hydrocarbon testing;	✓ Disturbance parameters (e.g. mortality, percentage oiled fauna/flora) have returned to within the expected natural dynamics of baseline state and/or control sites; and ✓ Hydrocarbon concentrations from fauna samples have returned to within the expected natural dynamics of baseline state and/or control sites.
	All sub-modules	✓ Or, agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the monitoring.

4.4.3. Implementation

Activation Time[1]	✓ S4 to be activated within 24 hours of initiation criteria being met
Implementation Time	✓ Sampling and analysis plan to be ready within 24 hours of initiation criteria being met ✓ Mobilisation and monitoring to commence within 24 hours of activation.
Implementation Plan	✓ Refer to *Implementation Guide for S4: Short-term impacts to oiled fauna and flora*
Reporting	✓ Summary report to be provided to Esso Environment Lead following completion of each field survey event; ✓ Final report (including all data and associated interpretation and analysis) prepared following the termination criteria for the module being met.

Notes:

1. *A module is considered activated when Esso have confirmed initiation criteria have been met and the monitoring providers have been notified to initiate planning and implementation tasks.*

4.4.4. Monitoring overview

The below table provides an indication of the type of sampling techniques and analysis that may be undertaken during scientific module S4. The final sampling design, including methods and analysis, will be determined by Esso in conjunction with their monitoring providers in the event of a spill.

Where practicable, sampling and analysis will be undertaken in line with relevant guidance documents, such as:

- Oil Spill Monitoring Handbook (Hook *et al*. 2016).

Sub-module	Sampling technique	Data collection and/or analysis
S4.1 Fauna surveys (vessel-based)	• Visual surveillance	• Quantitative observation records (e.g. presence, abundance, behaviour etc.).

Sub-module	Sampling technique	Data collection and/or analysis
S4.2 Fauna surveys (land-based)	• Visual surveillance	• Quantitative observation records (e.g. presence, abundance, behaviour etc.).
S4.3 Oiled fauna hydrocarbon testing	• Oil sample collection	• Physical characteristics (e.g. wax content, dynamic viscosity, density, volatiles); • Chemical characteristics (e.g. PAH)
S4.4 Flora surveys	• Coastal vegetation surveys • Subtidal and intertidal benthic habitat surveys	• Quantitative observation records (e.g. vegetation type, percent cover, health parameters etc.).

4.4.5. Responsibilities, competencies, and resources

Emergency response team

The IMT IC and EUL have responsibilities relating to the initiation of this scientific monitoring module. These roles may delegate responsibilities as appropriate. Roles, responsibilities and competencies of the ERT and IMT teams are as detailed in the OPEP.

Esso environmental team

Termination of this scientific monitoring module is the responsibility of Esso Environment Lead.

Monitoring team

The below table lists the minimum personnel requirements from the monitoring provider to implement scientific module S4. The numbers of teams and final number of personnel may vary depending on the nature and scale of the spill.

Personnel	Responsibilities	Competencies
Principal Investigator (1 person)	• Finalise the sampling and analysis design for S4 in the event of a spill • Implement S4 • Review and/or carry out reporting requirements • Compliance with the requirements of S4 and the OSMP • Provide advice with respect to environmental issues as required	• Doctorate in environmental science; • At least 10 years' experience infauna survey including the survey of marine fauna; • Familiarisation with relevant requirements of the OSMP and OPEP
Field Teams (2 to 3 people)	• Conduct sampling, record data and arrange transfer of samples to laboratories • Completing field data sheets • QA/QC data quality	• Bachelor degree in environmental science or an engineering degree from a recognised institution or equivalent tertiary study in technical area • Experienced in the relevant sampling and/or recording techniques.

Resources

Vehicles will be required to support land-based fauna surveys and flora surveys. Vessels will be required for implementation of vessel-based fauna surveys and may be supported by the use of UAVs for rapid collection of data via video or photographs of colonies. ROVs may be required for surveys of subtidal flora. Sampling equipment may be used by trained animal handlers to sample oil found on oiled wildlife and will require a NATA accredited laboratory to analyse the oil samples. Esso has identified NATA accredited laboratories with the capabilities to support the analysis for scientific module S4, including but not limited to:

NATA accredited laboratory	Details
Australian Laboratory Services (Melbourne)	4 Westall Road, Springvale VIC 3171 Ph: 03 8549 9600
Intertek Geotechnical	41-45 Furnace Road, Welshpool WA 6106 Ph: 08 9458 8877
Leeder Analytical Pty Ltd	33 Steane St, Fairfield, VIC, 3078 Phone: 03 9481 4167
National Measurement Institute	1/153 Bertie Street, Port Melbourne VIC 3207 Ph: 03 9644 4888

4.5 S5: Recovery of Commercial and Recreational Fisheries

4.5.1. Purpose

This module provides a semi-quantitative longer-term assessment of whether commercial and recreational fisheries have been impacted by a spill and the level of that impact pertaining to fish catch volume and effort rates. Module S5 will assess changes to fishery stocks due to oil exposure by:

- Determining the catch composition of species in each of the main fisheries following exposure to the spill;
- Summarise commercial catch volume and effort data post-oil spill and compare to pre-existing (baseline) information provided by the Victorian Fisheries Authority (VFA), the New South Wales Department of Primary Industries (NSW DPI)), Tasmanian Department of Primary Industries, Parks, Water and Environment (DPIPWE), and/or Australian Fisheries Management Authority (AFMA); and,
- Calculate catch-per-unit effort for fish/shellfish species to determine any change in abundance.

4.5.2. Initiation and termination criteria

Initiation Criteria	S5 Desktop review of fishery stock;	✓ Confirmation by the IMT IC (or delegate) that Level 2 or Level 3 hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ Principal Investigator through the EUL (or delegate) has confirmed that either: (a) data from S3 confirms tainting in fish or shellfish tissue; or (b) in response from government / State IC advice
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of S5 is to commence.
Termination Criteria	S5 Desktop review of fishery stock;	✓ Catch per Unit Effort (CPUE) for fishery stock assessments have returned to within the expected natural dynamics of baseline state and/or control sites.
	All sub-modules	✓ **Or,** agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the monitoring.

4.5.3. Implementation

Activation Time[1]	✓ S5 to be activated within 24 hours of initiation criteria being met
Implementation Time	✓ Desktop assessment to commence within 24 hours of activation.
Implementation Plan	✓ Refer to *Implementation Guide for S5: Long-term impacts to commercial and recreational fisheries*
Reporting	✓ Final report (including all data and associated interpretation and analysis) prepared following the termination criteria for the module being met.

Notes:

1. *A module is considered activated when Esso have confirmed initiation criteria have been met and the monitoring providers have been notified to initiate planning and implementation tasks.*

4.5.4. Monitoring overview

The below table provides an indication of the type of sampling techniques and analysis that may be undertaken during scientific module S5. The final sampling design, including methods and analysis, will be determined by Esso in conjunction with their monitoring providers in the event of a spill.

Sub-module	Sampling technique	Data collection and/or analysis
S5.1 Desktop review of fishery stock	• Desktop review.	• Stakeholder liaison and data collation; • CPUE analyses.

4.5.5. Responsibilities, competencies, and resources

Emergency response team

The IMT IC and EUL have responsibilities relating to the initiation of this scientific monitoring module. These roles may delegate responsibilities as appropriate. Roles, responsibilities and competencies of the ERT and IMT teams are as detailed in the OPEP.

Esso environmental team

Termination of this scientific monitoring module is the responsibility of Esso Environment Lead.

Monitoring team

The below table lists the minimum personnel requirements from the monitoring provider to implement scientific module S5. The numbers of teams and final number of personnel may vary depending on the nature and scale of the spill.

Personnel	Responsibilities	Competencies
Principal Investigator (1 person)	• Implement S5; • Review and/or carry out reporting requirements; • Compliance with the requirements of S5 and the OSMP; • Provide advice with respect to environmental issues as required • QA/QC data quality.	• Doctorate in environmental science; • At least 10 years' experience in the collection and analysis of fishery data; • Familiarisation with relevant requirements of the OSMP and OPEP; • Experienced in fisheries data analysis.

Resources

Module S5 is a desktop review and does not require mobilisation of non-personnel resources.

4.6 S6: Recovery of Fauna

4.6.1. Purpose

The purpose of this module is to provide semi-quantitative measures of changes to population dynamics of indicator fauna to assess long-term environmental effects on these species which may result from a hydrocarbon spill (i.e. assess the extent of damage and measure the degree of recovery, where possible). Module S6 will assess and monitor oil impacts to fauna populations by:

- Monitoring changes in population dynamics (pup counts, breeding success, population changes over time) at identified control and impact sites;
- Assessing the impact of a hydrocarbon spill on indicator fauna by analysing pre and post-impact data on population sizes at control and impact (where existing baseline data is available) sites.

4.6.2. Initiation and termination criteria

Initiation Criteria	S6 Fauna surveys	✓ Confirmation by the IMT IC (or delegate) that Level 2 or Level 3 hydrocarbon spill to marine or coastal waters has occurred, **and** ✓ Principal Investigator through the EUL (or delegate) has determined that data from operational module O4 or scientific module S4 has confirmed the exposure of fauna
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of S6 is to commence.
Termination Criteria	S6 Fauna surveys	✓ Disturbance parameters (e.g. estimated population) have returned to within the expected natural dynamics of baseline state and/or control sites.
	All sub-modules	✓ **Or,** agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the monitoring.

4.6.3. Implementation

Activation Time[1]	✓ S6 to be activated within 24 hours of initiation criteria being met
Implementation Time	✓ Sampling and analysis plan to be ready within 7 days of initiation criteria being met; ✓ Mobilisation and monitoring to commence within 7 days of activation
Implementation Plan	✓ Refer to *Implementation Guide for S6: Long-term impacts to fauna*
Reporting	✓ Summary report to be provided to Esso Environment Lead following completion of each field survey event; ✓ Final report (including all data and associated interpretation and analysis) prepared following the termination criteria for the module being met.

Notes:

1. A module is considered activated when Esso have confirmed initiation criteria have been met and the monitoring providers have been notified to initiate planning and implementation tasks.

4.6.4. Monitoring overview

The below table provides an indication of the type of sampling techniques and analysis that may be undertaken during scientific module S6. The final sampling design, including methods and analysis, will be determined by Esso in conjunction with their monitoring providers in the event of a spill.

Where practicable, sampling and analysis will be undertaken in line with relevant guidance documents, such as:

- Oil Spill Monitoring Handbook (Hook *et al*. 2016).

Or other related scientific studies (e.g. Kirkwood *et al*. 2005; Goldsworth *et al*. 2000).

Sub-module	Sampling technique	Data collection and/or analysis
S6.1 Fauna surveys	• Visual surveillance	• Quantitative observation records (e.g. population, chicks/pups abundance, behaviour etc.).

4.6.5. Responsibilities, competencies, and resources

Emergency response team

The IMT IC and EUL have responsibilities relating to the initiation of this scientific monitoring module. These roles may delegate responsibilities as appropriate. Roles, responsibilities and competencies of the ERT and IMT teams are as detailed in the OPEP.

Esso environmental team

Termination of this scientific monitoring module is the responsibility of Esso Environment Lead.

Monitoring team

The below table lists the minimum personnel requirements from the monitoring provider to implement scientific module S6. The numbers of teams and final number of personnel may vary depending on the nature and scale of the spill.

Personnel	Responsibilities	Competencies
Principal Investigator (1 person)	• Finalise the sampling and analysis design for S6 in the event of a spill • Implement S6 • Review and/or carry out reporting requirements • Compliance with the requirements of S6 and the OSMP • Provide advice with respect to environmental issues as required	• Doctorate in environmental science; • At least 10 years' experience in the survey and analysis of fauna data; • Familiarisation with relevant requirements of the OSMP and OPEP
Field Teams (2 to 3 people)	• Conduct sampling, record data and arrange transfer of samples to laboratories • Completing field data sheets • QA/QC data quality	• Bachelor degree in environmental science or an engineering degree from a recognised institution or equivalent tertiary study in technical area • Experienced in the relevant sampling and/or recording techniques.

Resources

Vessels and vehicles will likely be required to access sites for ongoing monitoring of fauna at sea and on land.

4.7 S7: Recovery of Subtidal and Intertidal Benthic Habitat

4.7.1. Purpose

The purpose of this module is to assess long-term environmental effects on subtidal and intertidal benthic communities which may have resulted from an oil spill or response (i.e. assesses the extent of damage and measure the degree of recovery in benthic communities, where possible). Module S7 will assess and monitor long-term impacts to subtidal and intertidal benthic communities by:

- Undertaking habitat extent analysis to rapidly collect and process real-time data on abiotic and biotic parameters to determine subtidal and intertidal habitat classifications;
- Monitoring seagrass at impact and reference sites to determine extent of change (if any) in biomass and estimated cover due to oil impacts;

- Monitoring macroalgae and sponge at impact and reference sites to determine extent of change (if any) in biomass and estimated cover due to oil impacts;
- Monitoring benthic infauna at impact and reference sites to determine extent of change (if any) to species composition and abundance; and
- Monitoring fish at impact and reference sites to determine extent of change (if any) to species composition and abundance.

4.7.2. Initiation and termination criteria

Initiation Criteria	S7.1 Habitat mapping; S7.2 Macroalgae and sponges S7.3 Benthic infauna monitoring; S7.4 Intertidal and subtidal fish monitoring	✓ Confirmation by the IMT IC (or delegate) that Level 2 or Level 3 hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ Principal Investigator through the EUL (or delegate) has determined that data from operational module O2/O6 or scientific module S1/S2/S4 has confirmed the exposure of either benthic substrate or waters within bottom 1 m of seabed
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of S7 is to commence.
Termination Criteria	S7.1 Habitat mapping; S7.2 Macroalgae and sponges S7.3 Benthic infauna monitoring; S7.4 Intertidal and subtidal fish monitoring	✓ Disturbance parameters (e.g. species composition, percent cover) and health parameters (e.g. leaf condition) have returned to within the expected natural dynamics of baseline state and/or control sites.
	All sub-modules	✓ **Or,** agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the monitoring

4.7.3. Implementation

Activation Time[1]	✓ S7 to be activated within 24 hours of initiation criteria being met
Implementation Time	✓ Sampling and analysis plan to be ready within 7 days of initiation criteria being met; ✓ Mobilisation and monitoring to commence within 7 days of activation.
Implementation Plan	✓ Refer to *Implementation Guide for S7: Long-term impacts to subtidal and intertidal benthic habitat*
Reporting	✓ Summary report to be provided to Esso Environment Lead following completion of each field survey event; ✓ Final report (including all data and associated interpretation and analysis) prepared following the termination criteria for the module being met.

Notes:

1. *A module is considered activated when Esso have confirmed initiation criteria have been met and the monitoring providers have been notified to initiate planning and implementation tasks.*

4.7.4. Monitoring overview

The below table provides an indication of the type of sampling techniques and analysis that may be undertaken during scientific module S7. The final sampling design, including methods and analysis, will be determined by Esso in conjunction with their monitoring providers in the event of a spill.

Where practicable, sampling and analysis will be undertaken in line with relevant guidance documents, such as:

- Oil Spill Monitoring Handbook (Hook *et al*. 2016).

Or other related scientific studies (e.g. Anderson *et al*. 2009; English *et al*. 1997; Brown *et al*. 2004; Cappo *et al*. 2006).

Sub-module	Sampling technique	Data collection and/or analysis
S7.1 Habitat mapping	• Visual and/or remote sensing surveillance (e.g. towed camera, tagging, side-scanning sonar etc.)	• Identification of habitat type and composition; • Mapping of habitat extent.
S7.2 Macroalgae and sponge	• Visual and/or remote sensing surveillance (e.g. towed camera, tagging, side-scanning sonar etc.)	• Population and community parameters (composition, cover, abundance, diversity)
S7.3 Benthic Infauna monitoring	• Infauna sample collection (e.g. sediment grab sampling)	• Population parameters (abundance, composition etc.).
S7.4 Intertidal and subtidal fish or monitoring	• Visual and/or remote sensing surveillance (e.g. divers, BRUVS etc.)	• Population parameters (abundance, composition etc.).

4.7.5. Responsibilities, competencies, and resources

The IMT IC and EUL have responsibilities relating to the initiation of this scientific monitoring module. These roles may delegate responsibilities as appropriate. Roles, responsibilities and competencies of the ERT and IMT teams are as detailed in the OPEP.

Esso environmental team

Termination of this scientific monitoring module is the responsibility of Esso Environment Lead.

Monitoring team

The below table lists the minimum personnel requirements from the monitoring provider to implement scientific module S7. The numbers of teams and final number of personnel may vary depending on the nature and scale of the spill.

Personnel	Responsibilities	Competencies
Principal Investigator (1 person)	• Finalise the sampling and analysis design for S7 in the event of a spill • Implement S7 • Review and/or carry out reporting requirements • Compliance with the requirements of S7 and the OSMP • Provide advice with respect to environmental issues as required	• Doctorate in environmental science; • At least 10 years' experience in the collection and analysis of data relating to marine infauna; • Familiarisation with relevant requirements of the OSMP and OPEP
Field Teams (2 to 3 people)	• Conduct sampling, record data and arrange transfer of samples to laboratories • Completing field data sheets • QA/QC data quality	• Bachelor degree in environmental science or an engineering degree from a recognised institution or equivalent tertiary study in technical area • Experienced in the relevant sampling and/or recording techniques.

Resources

Vehicles and vessels will be required to support monitoring of nearshore and offshore benthic habitats and communities respectively. ROVs may be required for remote surveillance of benthic habitats and communities.

4.8 S8: Recovery of Coastal Flora

4.8.1. Purpose

The purpose of this module is to assess potential long-term environmental effects on the extent, composition and health of coastal flora communities which may have resulted from an oil spill (i.e. assess the extent of damage and measure the degree of recovery in coastal flora populations, where possible). Module S8 assesses and monitors long-term impacts to coastal flora by:

- Establishing the baseline (background) data on coastal flora community composition, structure and health at identified control and impact sites. Post-spill, pre-impact (reactive baseline) sampling will be undertaken if practicable e.g. if timing permits. This data will augment existing baseline information);
- Monitoring coastal flora communities over time at identified control and impact sites by assessing community extent, composition, structure and health; and
- Assessing the impact of a hydrocarbon spill on coastal flora communities by analysing long-term pre- and post-impact data at control and impact sites.

4.8.2. Initiation and termination criteria

Initiation Criteria	S8.1 Habitat mapping; S8.2 Condition monitoring	✓ Confirmation by the IMT IC (or delegate) that Level 2 or Level 3 hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ Principal Investigator through the EUL (or delegate) has determined that data from operational module O3 or scientific module S4 has confirmed the exposure of coastal flora
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of S8 is to commence.
Termination Criteria	S8.1 Habitat mapping; S8.2 Condition monitoring	✓ Disturbance parameters (e.g. abundance, percent cover) and health parameters (e.g. leaf condition) have returned to within the expected natural dynamics of baseline state and/or control sites.
	All sub-modules	✓ **Or,** agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the monitoring.

4.8.3. Implementation

Activation Time[1]	✓ S8 to be activated within 24 hours of initiation criteria being met
Implementation Time	✓ Sampling and analysis plan to be ready within 7 days of initiation criteria being met; ✓ Mobilisation and monitoring to commence within 7 days of activation.
Implementation Plan	✓ Refer to *Implementation Guide for S8: Long-term impacts to coastal fauna*
Reporting	✓ Summary report to be provided to Esso Environment Lead following completion of each field survey event; ✓ Final report (including all data and associated interpretation and analysis) prepared following the termination criteria for the module being met.

Notes:

1. *A module is considered activated when Esso have confirmed initiation criteria have been met and the monitoring providers have been notified to initiate planning and implementation tasks.*

4.8.4. Monitoring overview

The below table provides an indication of the type of sampling techniques and analysis that may be undertaken during scientific module S8. The final sampling design, including methods and analysis, will be determined by Esso in conjunction with their monitoring providers in the event of a spill.

Where practicable, sampling and analysis will be undertaken in line with relevant guidance documents, such as:

- Oil Spill Monitoring Handbook (Hook *et al*. 2016).

Or other related scientific studies (e.g. English *et al*. 1997).

Sub-module	Sampling technique	Data collection and/or analysis
S8.1 Habitat mapping	• Remote sensing surveillance (e.g. multispectral imagery)	• Identification of habitat type and composition; • Mapping of habitat extent.
S8.2 Condition monitoring	• Visual (e.g. quadrats, photographs)	• Population parameters (e.g. abundance, percent cover etc.). • Health parameters (e.g. leaf cover, leaf damage, etc.)

4.8.5. Responsibilities, competencies, and resources

The IMT IC and EUL have responsibilities relating to the initiation of this scientific monitoring module. These roles may delegate responsibilities as appropriate; e.g. the ERT VM/OIM may be responsible for the initiation if the IMT has not yet been established. Roles, responsibilities and competencies of the ERT and IMT teams are as detailed in the OPEP.

Esso environmental team

Termination of this scientific monitoring module is the responsibility of Esso Environment Lead.

Monitoring team

The below table lists the minimum personnel requirements from the monitoring provider to implement scientific module S8. The numbers of teams and final number of personnel may vary depending on the nature and scale of the spill.

Personnel	Responsibilities	Competencies
Principal Investigator (1 person)	• Finalise the sampling and analysis design for S8 in the event of a spill • Implement S8 • Review and/or carry out reporting requirements • Compliance with the requirements of S8 and the OSMP • Provide advice with respect to environmental issues as required	• Doctorate in environmental science; • At least 10 years' experience in the collection and analysis of data on flora including coastal flora; • Familiarisation with relevant requirements of the OSMP and OPEP
Field Teams (2 to 3 people)	• Conduct sampling, record data and arrange transfer of samples to laboratories • Completing field data sheets • QA/QC data quality	• Bachelor degree in environmental science or an engineering degree from a recognised institution or equivalent tertiary study in technical area • Experienced in the relevant sampling and/or recording techniques.

Resources

Vehicles will be required to support the visual surveys involved in monitoring of coastal flora.

4.9 S9: Recovery of Ramsar Values

4.9.1. Purpose

This module is aimed at establishing whether oil entering Ramsar wetland has resulted in an alteration to the ecological character of the system. The purpose of this module is to:

- Assess long-term impacts of an oil spill on the ecological character of Ramsar sites.

4.9.2. Initiation and termination criteria

Initiation Criteria	S9 Desktop review of wetland values	✓ Confirmation by the IMT IC (or delegate) that Level 2 or Level 3 hydrocarbon spill to marine or coastal waters has occurred; **and** ✓ Principal Investigator through the EUL (or delegate) has determined that (a) data from operational module O3 has confirmed the exposure of a Ramsar wetland; and (b) data from scientific modules S1, S4, S6, S7 or S8 confirm an impact to water/sediment quality, flora or fauna in the wetland.
	All sub-modules	✓ The IMT IC (or delegate) has advised that either full or partial implementation of S9 is to commence.
Termination Criteria	S9 Desktop review of wetland values	✓ Wetland values that are important to the ECD* have returned to within the expected natural dynamics of baseline state and/or control sites.
	All sub-modules	✓ **Or**, agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the monitoring.

* as described in relevant Ramsar site documents prepared per the National ECD Framework

4.9.3. Implementation

Activation Time[1]	✓ S9 to be activated[1] within 24 hours of initiation criteria being met
Implementation Time	✓ Desktop assessment to commence within 24 hours of activation.
Implementation Plan	✓ Refer to *Implementation Guide for S9: Long-term impacts to Ramsar values*
Reporting	✓ Final report (including all data and associated interpretation and analysis) prepared following the termination criteria for the module being met.

Notes:

1. *A module is considered activated when Esso have confirmed initiation criteria have been met and the monitoring providers have been notified to initiate planning and implementation tasks.*

4.9.4. Monitoring overview

The below table provides an indication of the type of sampling techniques and analysis that may be undertaken during scientific module S9. The final sampling design, including methods and analysis, will be determined by Esso in conjunction with their monitoring providers in the event of a spill.

Where practicable, desktop reviews will be undertaken in line with relevant guidance documents, such as:

- National Framework and Guidance for Describing the Ecological Character of Australian Ramsar Wetlands (DEWHA 2008).

Sub-module	Sampling technique	Data collection and/or analysis
S9 Desktop review of wetland values	• Desktop review.	• Data collation (including relevant information from scientific modules S1, S4, S6, S7 and S8 where relevant). • Comparison to known ecological character descriptions of Ramsar wetlands.

4.9.5. Responsibilities, competencies, and resources

Emergency response team

The IMT IC and EUL have responsibilities relating to the initiation of this scientific monitoring module. These roles may delegate responsibilities as appropriate; e.g. the ERT VM/OIM may be responsible for the initiation if the IMT has not yet been established. Roles, responsibilities and competencies of the ERT and IMT teams are as detailed in the OPEP.

Esso environmental team

Termination of this scientific monitoring module is the responsibility of Esso Environment Lead.

Monitoring team

The below table lists the minimum personnel requirements from the monitoring provider to implement scientific module S9. The numbers of teams and final number of personnel may vary depending on the nature and scale of the spill.

Personnel	Responsibilities	Competencies
Principal Investigator (1 person)	• Implement S9 • Review and/or carry out reporting requirements • Compliance with the requirements of S9 and the OSMP • Provide advice with respect to environmental issues as required • QA/QC data quality	• Doctorate in environmental science; • At least 10 years' experience in dealing with Ramsar values including the analysis of changes to those values; • Familiarisation with relevant requirements of the OSMP and OPEP • Experienced in wetland ecology.

Resources

Module S9 is a desktop review and will not require mobilisation of non-personnel resources.

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Appendix A: General guidance and approaches for scientific monitoring design

This appendix provides guidance on survey design approaches that are likely to be utilised for the scientific monitoring modules:

- Impact versus Control (IvC);
- Gradient of Impacts;
- Before-After-Control-Impact (BACI);
- Control Chart;
- Lines of Evidence.

The design of monitoring studies should ensure, as far as possible, that the planned monitoring activities are practicable and that the objectives of the study will be met. The design must result in the collection of meaningful data and, where practicable, data that are sufficiently powerful to detect ecologically relevant changes.

The final survey design(s) can depend on a variety of factors, included but not limited to:

- Scale and pattern of potential effects of the spill;
- Availability of baseline data and/or ability to rapidly obtain baseline data;
- Time frame available to gather pre- and post-spill data;
- Availability of operational monitoring data;
- Availability of appropriate control sites;
- Statistical approach proposed for data analysis;
- Range of possible chronic and acute effects on the parameters of concern, based on the characteristics of the spill;
- Monitoring frequency required to ensure short-and long-term impacts are detected;
- Legislative requirements;
- Available resources and equipment to conduct the work in terms of personnel, logistics, and access.

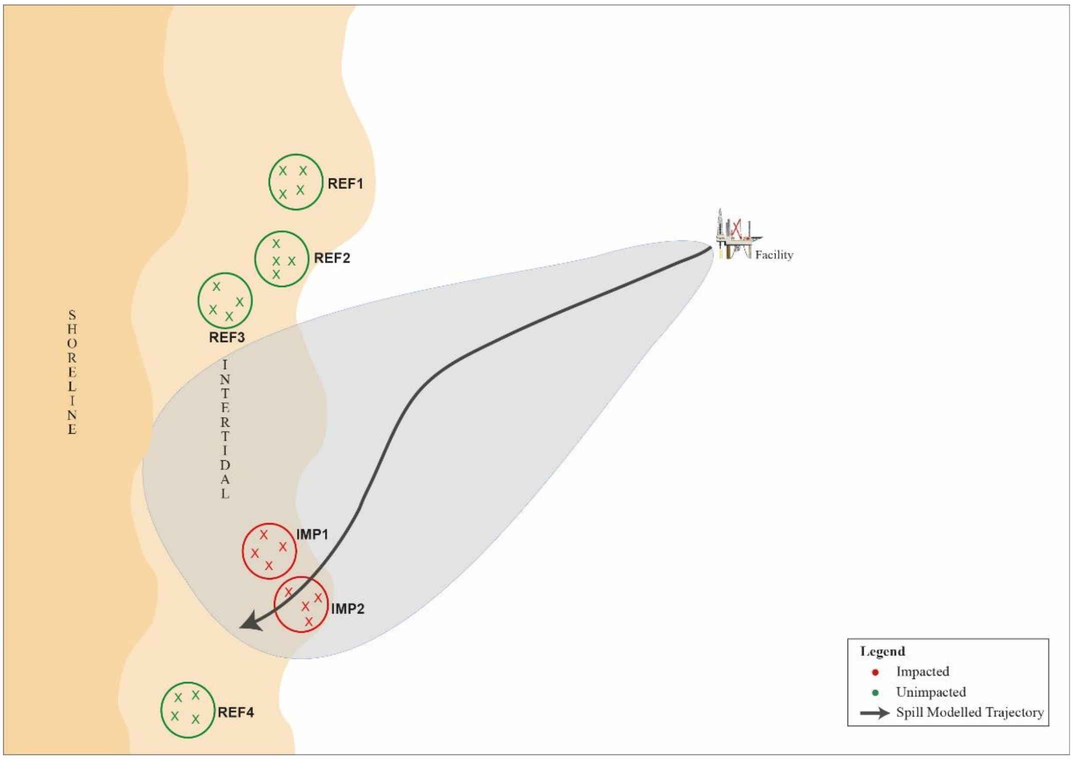
Note: data collection can depend on several constraints (as outlined above) and on access given logistical and safety constraints applicable to a particular spill event. Therefore, the survey designs recommended within the implementation guides for each scientific monitoring module, may not be able to be implemented exactly as intended. For example, there may be inadequate number of control sites because of the size of the spill and therefore data collected from an expected BACI design may need to be analysed as a gradient approach etc.

Before-After-Control-Impact (BACI) approach

Where appropriate baseline data are available, consideration should be given to developing a beyond BACI monitoring program design (Underwood 1991; 1994) or similar extended BACI design (mBACI), which monitors a range of control and impact sites, and can do so over time (Figure A-1). Where robust, appropriate baseline data for exposure sites are not available, pre-exposure sampling of locations that lie within the hydrocarbon spill trajectory should be prioritised to obtain baseline data prior to hydrocarbon exposure.

Exposure sites should be selected first, encompassing a representative selection of locations within the area affected by hydrocarbons. Where practicable, the monitoring program design may consider stratified sampling along environmental gradients (e.g. level of hydrocarbon exposure etc.). Comparable control sites beyond the area affected by hydrocarbons should then be selected, with monitoring conducted at all sites. Clearly obtaining control sites pre-exposure can be challenging and is heavily reliant on predicting the extent of hydrocarbon movement.

The suggested statistical analysis of data collected using the BACI approach includes a univariate or multi-factorial analysis of variance (ANOVA) and equivalent non-parametric tests, all of which will compare between treatment (impact versus reference) and time (before versus after). Components of variation may help partition a sum of squares into different sources and describe the importance of factors within tests.



Notes:

1. *A modification to the beyond BACI design, is known as an MBACI design. MBACI designs incorporate multiple impact locations, whereas beyond BACI designs include only one impact location.*
2. *The above design consists of four reference/control locations and two impact locations, with four nested sites in each. The number of replicates (e.g. quadrats or transects) per site should be set based on resourcing, and /or the results of the power analysis (if applicable).*
3. *The area affected by the spill is indicated by the grey shaded area, or the area of influence.*
4. *Design assumes the area of influence has been affected equally.*

Figure A-1: Example of an MBACI design for shoreline and/or intertidal communities

Impact versus Control (IvC) approach

For some locations and receptors, baseline data may not exist, may not be recent and applicable, or was collected using methods that are unrepeatable in the current study. If there is a lack of baseline information that can feed into a BACI design, an IvC approach can be used to assess impacts. However, due to the unknown status of the parameter before impact, there is a higher likelihood of encountering Type I error (falsely concluding that an impact has occurred) with this approach. For example, if the status of the parameter to be measured was already naturally lower at impact sites than control sites before the impact occurred, but this was not measured, a conclusion may be reached using the IvC approach that an impact has occurred when it may be natural variation. For this reason, sampling designs should always try to collect or use baseline data (i.e. aim for a BACI design), and if an IvC design is used, it is important to ensure that the control sites are comparable to the impact sites in every way possible except for the presence or absence of the studied effect (hydrocarbon). This may include, but not be limited to: site physical aspect, substrate, current regimes, and community composition.

Because of the higher likelihood of Type I error, it is also useful to collect additional data on relevant physical environmental parameters that are likely to be different at impact and control sites and may affect the conclusion of the assessment. Biological information may also be relevant, such as degree of sub-lethal and lethal impacts to populations. These parameters can be examined later for any potential co-variance with the observed changes in the parameter of interest, to understand whether hydrocarbons or natural variation affected the outcome. The physical and biological information can therefore augment and act as additional evidence to help interpret conclusions from any IvC analyses. As with the BACI approach, when using the IvC approach it is important to understand the scale of natural variation that may affect the outcome of the assessment by replicating sites within sampling locations and replicating samples within each site.

The suggested statistical approach for analysing the data collected using the IvC approach is a multi-factorial ANOVA (to account for nested data), including PERMANOVA and non-parametric tests, to test whether the level of variation among treatments (IvC) is greater than the level of variation within treatments. Components of variation may help partition variance into different sources and help infer whether the effect of hydrocarbons or spatial variation was responsible for any detected change in the receptors.

Gradient approach

The gradient approach can be used in some instances where a lack of suitable control sites prohibits using a BACI or IvC approach. Sampling should be established along a gradient of predicted effect (based on input of data from operational monitoring, surveillance or modelling), with sites established at various distances from the source of impact or along a gradient of magnitudes of concentrations of hydrocarbons. The gradient approach can also be used in combination with a BACI or IvC approach to help infer the cause of a detected impact and describe thresholds of impacts at which a response appears to have occurred. The gradient approach also provides a ‘line of evidence’ that the source of potential impact (hydrocarbons) was responsible for the observed effect, rather than natural variation. However, care should be taken to ensure awareness of any natural gradients in the parameter measured and take these into account when interpreting the data.

When designing a study using a gradient approach, relevant Oil Spill monitoring data (e.g. water and sediment quality), and modelling should be considered. Prior knowledge or prediction of the likely gradient of effect will greatly improve the efficiency of the sampling design by minimising the collection of data points that provide no additional information in the analysis (e.g. data points showing similar or no effects that do not help to characterise the gradient of effect), though noting these may aid in statistical power of gradient description so shouldn’t necessarily be discouraged.

Typically, the level of observed impact will decline at distance from the source of a hydrocarbon release, with this decline likely to be exponential (i.e. large changes close to a release that quickly decrease in severity); therefore, sampling effort can be distributed along the gradient of effect in a way that best characterises the changes in the parameter measured.

If possible, multiple (> two) sites could be sampled at each distance along the gradient (if logistics and time permit) to provide an understanding of small-scale variation. Sites should also be sampled at distances where no environmental effect is predicted or observed, if possible, to characterise the full extent of the effect’s gradient.

The suggested statistical analysis for the gradient approach includes correlation analysis between impact (measurements of hydrocarbon/stress; x-axis) and measurement parameter (biological response; y-axis), and associated regression analyses, may include least-squares regression line and hypotheses testing to determine if the trend is significantly different from zero.

Control chart approach

The control chart approach is applicable in the following circumstances:

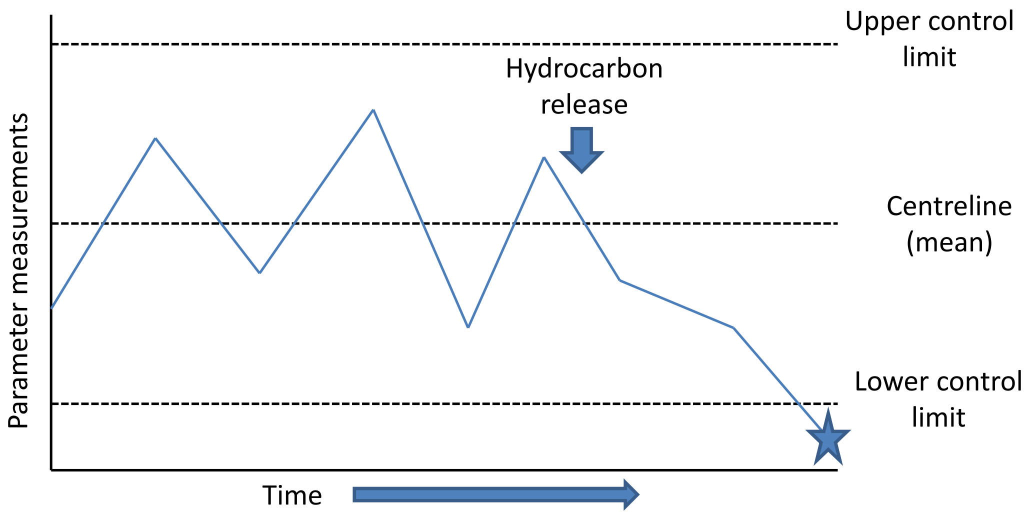
- When long-term (multi-year) datasets exist for the measured parameter;
- When a large amount of natural variation exists in the measured parameter;
- When predicting the expected range of outcomes from an impact.

One of the causal criteria described in the lines of evidence approach is ‘strength of association’ (Hill 1965), exemplified by a ‘larger decline in individuals in areas affected by hydrocarbon than in control areas’. The control chart approach takes this causal criterion a step further and uses rules to establish whether a detected change in a parameter at impact sites is outside what would be expected to occur naturally. This technique requires tracking a parameter over time and determining whether an observed change is within the bounds of what has been observed to occur naturally at that impact site or at control sites.

A control chart has a central line for the mean, an upper control limit (UCL; e.g. typically 3 standard deviations [SD] above the mean), and a lower control limit (LCL; e.g. typically 3SD below the mean), which are typically all determined from historical data (Gotelli and Ellison 2004). The mean line can be constructed using data from i) historical data of an impact site prior to it being affected by hydrocarbons (i.e. what the mean used to be), or ii) control locations, whereby either historical or recent data is used for comparison to other sites (i.e. a control site historical data compared to impact site). The approach is then based on calculating the mean (ongoing) for an impact site to compare against the control chart. Any observations outside the UCL and LCL suggest that increased variation has been observed that are inconsistent with other data and may post a simple way to detect change in a system (Figure A-2).

In addition, if ongoing data collection is possible following a potential impact, the control chart approach can be used to examine the direction of change and whether this is consistent or inconsistent with other data. These data and interpretation may provide a weight of evidence of a directional change in a given parameter.

The control chart approach is only useful if there is an adequate knowledge of natural variability in a given parameter whether from historical sources or similar sites/locations. Control chart approaches can be a powerful tool for detecting impacts for systems that are naturally highly variable.



Note: The star represents a measurement beyond the likely anticipated variation, which needs to be investigated.

Figure A-2: Example Control Chart showing Centreline (mean), Upper Control Limit (3 SD above mean), Lower Control Limit (3 SD below mean), and Measurements

Lines of evidence approach

The lines of evidence approach is applicable in the following circumstances:

- Can be combined with any of the above monitoring designs to provide inferential evidence of an effect;
- Are useful to support evidence of effect if there are limited (or only one) impact locations;
- Are useful to support evidence of effect if the effect radiates outward from source;
- Are useful to infer cause of change if limited or no baseline data exist;
- Are useful to infer cause of change if limited or no control sites exist.

When a sampling design is suboptimal, or if conclusions from more formal tests are inconclusive, a lines of evidence approach can be used to help infer the cause of an observed change (i.e. attribute change to the hydrocarbon release or to other causes, such as natural variation). Within the lines of evidence approach, inference is developed based on carefully structured arguments. A weakness of this method is that the evidence may be largely circumstantial because it is based on correlations (Downes *et al*. 2002), which does not necessarily imply causation. Each causal argument may be weak when considered independently but combined they may provide strong circumstantial evidence and support for a conclusion (Downes *et al*. 2002).

This approach was originally developed in medicine (Hill 1965) but has been used more recently in ecological studies (e.g. Downes *et al*. 2002; McArdle 1996; Suter 1996; Beyers 1998; Fabricius 2004).

Causal criteria have been developed for categorizing arguments from studies on disease on humans (Hill 1965), and these can be applied to ecological arguments (Hill 1965). With lines of evidence, there is a need to seek evidence not only to support the impact prediction, but evidence to rule out plausible alternative predictions, such as that the observed difference was due to natural processes (Downes *et al*. 2002; Beyers 1998).

In the lines of evidence approach, a set of descriptions should be developed for all or some of the causal criteria listed in Table A-1 before the survey is undertaken (see Downes *et al*. 2002 for further criteria and examples). Data would then be collected that allows each line of evidence to be tested or objectively questioned. The final assessment of whether an impact is likely to have occurred should be based on the 'weight of evidence' from examining multiple lines of evidence.

Example generalised lines of evidence descriptions are provided in Table A-2. These should be modified and tailored to individual scientific monitoring module, as required and each parameter investigated.

Table A-1: Hills (1965) causal criteria and description in the context of ecological impact Assessment

Causal Criterion	Description
Strength of association	A large proportion of individuals are affected in the impact area relative to control areas
Consistency of association	The association was observed by other investigators at other times and places
Specificity of association	The effect is diagnostic of exposure
Temporality	Exposure must precede the effect in time
Biological gradient	The risk of effect is a function of magnitude of exposure
Biological plausibility	A plausible mechanism of action links cause and effect
Experimental evidence	A valid experiment provides strong evidence of causation
Coherence	Similar stressors cause similar effects
Analogy	The causal hypothesis does not conflict with existing knowledge of natural history and biology

Table A-2: Causal criteria and example lines of evidence descriptions that could be used to assess whether a change in a measured parameter was due to the effects of a hydrocarbon release

Causal Criterion	Evidence Supportive of a Hydrocarbon Release Impact	Evidence Unsupportive of a Hydrocarbon Release Impact
Strength of association	Larger decline in individuals in areas affected by hydrocarbon than in control areas	Similar declines in individuals in areas affected by hydrocarbon and control areas
Consistency of association	Consistent finding of declines in a range of biota in areas affected by hydrocarbon	Inconsistent declines in biota in areas affected by hydrocarbon (e.g. declines in one species but not in other similar species)
Specificity of association	Number of individuals affected correlates with hydrocarbon concentrations	No correlation between number of individuals affected and hydrocarbon concentration
Temporality	Decline in individuals immediately preceded by contact with hydrocarbon	Decline in individuals occurred before or long after hydrocarbon contact
Biological gradient	Changes in individuals aligned with exposure to hydrocarbon spills or concentrations	Decline in individuals occurs with increasing distance from a hydrocarbon spill or hydrocarbon concentrations
Biological plausibility	Evidence from literature of sensitivity to detected hydrocarbon concentration for species where declines are observed	Evidence from literature suggests lack of sensitivity to detected hydrocarbon concentration for species where declines are observed

Causal Criterion	Evidence Supportive of a Hydrocarbon Release Impact	Evidence Unsupportive of a Hydrocarbon Release Impact
Experimental evidence	A valid experiment provides strong evidence of causation	Not applicable (N/A)
Coherence	Evidence of a decline in species abundance, habitat, and food source with increasing hydrocarbon exposure	Evidence of a decline in species abundance, but no other evidence of expected declines associated with exposure
Analogy	Apparent declines in hatchling numbers despite no apparent decline in numbers of adults	Apparent declines in hatchling numbers associated with decreased numbers of adults

Appendix B: Baseline data

Rationale and approach

Scientific monitoring provides for the quantitative assessment of the environmental impacts associated with a Level 2 or Level 3 spill. The primary goal of the scientific monitoring program is to document the overall impact (short and long term) of the spill on habitats, species and ecosystems and the subsequent post spill recovery.

In the event of a Level 2 or Level 3 spill, scientific monitoring will be activated and individual modules selected and implemented appropriate to the nature, scale and duration of the spill. Activation of these scientific modules during the spill operational response phase may be required to collect pre-contact baseline data or spill impact data at identified receptors. The appropriate scientific modules will be implemented to assess the extent, severity and persistence of environmental impacts associated with the oil spill event.

Baseline monitoring provides information on the condition of ecological receptors prior to, or spatially independent (e.g. if used in control chart analyses) of, a spill event and is used for comparison with the post-impact scientific monitoring where required. This is particularly important for scientific monitoring where the ability to detect changes between pre-impact and post-impact conditions is necessary.

The design of the scientific monitoring program adopts the following framework:

- Where adequate and appropriate baseline data exists, then scientific modules for species and habitats will commence if and when initiation triggers are reached. In this instance given the adequacy of baseline, the scientific modules will not document the decline of the habitat or species, but will quantify impacts and monitor post-spill recovery;
- Where adequate and appropriate baseline data is not available, the options which will be considered include the following:
    - Collect baseline data prior to hydrocarbon contact and meet the requirements for a Before/After Assessment[1]; or
    - Collect environmental data during the spill event, if practicable, to determine potential impacts[2];
- In all cases, undertake post-spill scientific monitoring to determine the overall impact of the spill and document post-spill recovery.

An assessment of available baseline data for environmental receptors within the DA is contained in each of the scientific modules. Within each of those modules there is a description of the scientific monitoring approach which respect to baseline, obtaining data and determining impacts.

There are Oil Spill monitoring modules that are suited to pre-impact baseline monitoring. In the event of a spill to marine or coastal waters, reactive pre-impact monitoring should, where practicable, be implemented to gather additional data on the current state of the environment. Note: the collection of ongoing baseline data (i.e. under regular operational conditions) is not planned or considered to be practicable.

Understanding priority areas for reactive pre-impact baseline monitoring is important. Stochastic modelling may be used to determine areas likely to be contacted with fresh hydrocarbons above impact thresholds within a specified timeframe. For example, stochastic modelling may indicate a number of shoreline receptors have a high probability of contact with fresh hydrocarbons; these areas would then

[1] Application of the simple BACI sampling design and data analysis programs can be applied to the quantification of oil spill related impacts. See Appendix A

[2] Spill impact and post impact monitoring data will be collected following 'beyond-BACI' principles which is amenable to statistical techniques that can detect significant difference in recorded parameters (i.e. asymmetrical analysis of variance) following procedures described by Underwood (1994).

provide an initial focus for reactive pre-impact monitoring. A summary of activity specific modelling data identifying priority monitoring sites is provided in the OPEP Appendix D Quick Reference Information.

Control sites (i.e. similar to the impact or disturbance location) are sometimes more relevant than reference sites (undisturbed or natural sites) for determining the impact of a hydrocarbon spill as separate from other human or natural stressors (Downes *et al*. 2002). In the event of a spill, existing baseline information should be used to select relevant control sites outside the impact area of a single spill. It is expected that most control sites will be within the predicted environment that may be affected, but outside the impacted area for any given single spill. As all possible permutations or combination of sites cannot be realistically assessed in advance, control sites should be selected post-spill. The number of samples and/or sampling sites for a particular spill should depend on the extent of the spill, and the statistical power necessary to determine whether there is an impact and the ability of the monitoring program to determine recovery and termination criteria.

Baseline monitoring

Baseline information for the environment has been sourced from existing data and is summarised in each scientific monitoring module. In the event of a spill, where insufficient baseline exists information will be augmented with 'reactive' baseline studies at control sites or using pre-impact data at the receptor site where appropriate.

Control sites (i.e. similar to the impact or disturbance location) are often more relevant than reference sites (undisturbed or natural sites) for determining the impact of an oil spill as separate from other human or natural stressors (Downes *et al.* 2002). In the event of a spill existing baseline information will be used to select relevant control sites outside the impact area of a single spill. It is expected that most control sites will be within the DA, but outside the impacted area for any given single spill and will be selected post spill event on the basis of their representativeness to the potentially impacted site and their ability to provide a reliable comparison against which to compare the potentially impacted environmental values that are being measured.

The number of samples and/or sampling locations for a particular spill will depend on the extent of the spill, and the statistical power necessary to determine whether there has been an impact and the ability of the monitoring program to determine recovery and termination criteria.

Existing data

Baseline data characterises the existing environment and its variability both in affected sites and unaffected (control or reference) sites.

The EP contains desk study baseline environmental, social and economic values within the DA at a level deemed suitable for risk assessment and identification of mitigation and contingency planning measures as set out in the EP and OPEP. A summary of known baseline data from the Gippsland region and beyond, including New South Wales is shown in Table B-2.

In the event of a Level 2 or 3 spill relevant specific existing data will be obtained as the starting point to scientific monitoring, by the following process:

- Relevant scientific monitoring studies are catalogued for identified sensitive locations along with the custodian's contact details;
- The monitoring methodology, monitoring sites, and sampling duration and frequency of monitoring studies are provided when appropriate in a tabular format to identify methodological differences, and spatial and temporal gaps in accrued baseline data information;
- In the event of a spill data custodians will be contacted and datasets requested. As a contingency, 'data mining' from publically available information will occur simultaneously for baseline database establishment; and
- Data gaps will be used by the PI to refine the SAP to further optimise the design of the study.

Within each module is a summary of the available baseline information together with implementation strategy to address the assessment of impacts is provided.

The methods used to collect the existing baseline data will be assessed and, where possible, the methods used in the implementation of the monitoring will be consistent with the baseline data methods such that comparisons can be made. The design of the modules has already drawn upon the information contained within the existing baseline studies that were used to inform both the preparation of the EP and the OSMP and its modules, and as such there is already a degree of conformity between the methods proposed in the modules and that used for the collection of the published baseline data.

Monitoring survey type

Establishment of baseline is conducted according to Table B-1.

Table B-1: Baseline data types

Type	Description
Baseline field surveys	Field surveys undertaken in advance of the full implementation of the investigations in the modules where baseline information is required. Since the DA is very large and actual spill trajectory dependent on many variables, it is not possible to devise a study programme in advance of a spill that would provide a useful, representative baseline that would cover all spill scenarios.
Reactive baseline surveys	Monitoring surveys mobilised rapidly after a spill to assess baseline conditions at sensitive locations potentially affected by the spill but before spill contact. Esso recognises that reactive baseline monitoring surveys alone may not be sufficient to serve as a baseline dataset, but can provide an important contribution to augment existing 'baseline' with a 'current pre-exposure' condition.
Baseline studies at control sites	Monitoring at sites chosen from within the DA but where spill trajectory estimation predicts no contact.

Impact surveys

Impact surveys examine the immediate aftermath of a spill on specific receptors.

Recovery surveys

Recovery surveys examine the long term effects on specific receptors following the spill recovery.

Use of operational monitoring data

Findings of operational monitoring will be incorporated into the datasets gathered by scientific monitoring.

Monitoring methods

Survey and analytical methods are specific to the environmental value or receptor to be monitored. Methods selected for each module are set out in the relevant subsection of each module.

Monitoring sites

Reactive baseline monitoring sites may be required where there is insufficient existing baseline data against which to compare data collected following exposure to a hydrocarbon spill.

Selection of reactive baseline survey sites will need to be flexible and will depend on a range of site-specific, scientific criteria depending on the module. However in general sites must be:

- Representative of the area that is potentially impacted by the hydrocarbon spill;
- Coincide in proximity to locations with long-term (or recent) monitoring (notably in Victorian Marine Conservation Areas); and
- Be free from obvious anthropogenic impacts.

Reference sites

Reference sites are those that are representative of undisturbed / natural conditions of similar type, habitat, community etc. to those affected. Although reference sites for most types of affected environment will exist within the DA, control sites may be more representative in many cases.

Control sites

Control sites (i.e. unaffected sites similar to those affected by the spill) are used to determine the impact of an oil spill as separate from other human or natural stressors. In the event of a spill existing baseline information will be used to select relevant control sites outside the impact area of a single spill and must be selected post spill. Control sites will be selected and details of distribution and number of replicates will be decided after detailed appraisal of baseline data such that an understanding of the variability of the data can be obtained.

Monitoring indicators

Indicators are specific species, communities or habitats where changes reflect impacts on the wider environment. Indicators for scientific monitoring were identified and chosen based on the following criteria.

Typical – representative of ecological characteristics of the DA

Monitoring of spill impacts is focussed on species that are known to regularly occur within the DA and for which the DA provides vital habitat. This accords with the ecological principle of 'regularly supports' (United Nations 1971).

Sensitive – are sensitive to the impacts of oil spills

Species and communities can be impacted by both the oil spill and by associated response actions. The mechanisms and cumulative impacts to species and communities have been explored using a stressor model. This does not cover the entire myriad of complexities and pathways associated with oil and response actions in marine, coastal and estuarine environments but provides an overview of the main linkages (Gross 2003).

Determining impacts

Data on impacted sites will be compared with baseline data from reference or control locations to determine impacts. Multiple reference / control locations will be selected to provide a robust assessment of the impacts.

If there is sufficient statistical power in the data collected then post-impact monitoring will be analysed using statistical models such as Analysis of Variance (ANOVA). The data collected during the monitoring may be too variable to establish statistical trends. Such a situation is not uncommon in monitoring programs where limited 'before' data are available.

Generally determination of an impact involves an experimental approach with sampling before and after the purported impact at both potentially impacted and control (non-impacted) sites – the BACI (Before – After – Control – Impact) approach. The BACI approach allows for the detection of impacts that can be identified as statistically separable from the background natural variation that could be causing the observed phenomenon. The soundness of the approach stems from the ability to combine a range of design elements (an assessment of the before situation, replication, use of controls) to ensure the robustness of the assessment.

In many cases, and this situation pertains to an oil spill is one of them, where there is an inability to be able to collect information about the pre-impact situation. This may be as a result of adverse weather conditions not allowing a reactive baseline survey to be conducted safely. Thus a situation can arise there is insufficient information available as to what the before situation was and indeed what the situation was at any control location either before or after the action. There is also potentially no replication. In such cases an evaluation of the available evidence can be undertaken to see whether there is support for a particular hypothesis or not. Downes *et al*. (2002) in their book on monitoring of aquatic environments present a detailed review of this technique, the Weight (Levels) of Evidence approach. The use of multiple lines of evidence consistent with the integrated assessment philosophy of the revised ANZECC/ARMCANZ (2000a) guidelines as discussed in the CSIRO Handbook for

Sediment Quality Assessment (Simpson *et al*., 2005). A weight of evidence approach can be taken when there is no definitive experimental evidence available to support or not support a hypothesis.

Table B-2: Regional environmental studies and available baseline data

Reference	Description	Summary	Relevant Location/s	Relevant scientific module
AFMA	Reported landed annual catch from Commonwealth fisheries	This dataset shows the annual catch for Commonwealth fisheries managed by AFMA. The catch data is provided by fishery, by species and by calendar year.	Commonwealth fisheries	S6
Barton *et al.* (2012)	Marine Natural Values Study Marine Protected Areas of the Flinders and Twofold Shelf bioregions	An inventory of accessible knowledge about the natural (environmental) values of marine parks and sanctuaries located on the flinders and Twofold shelf bioregions. For each park area the following are described: Physical parameters, Marine habitat classes, marine ecological communities, biological processes, species distribution information, Shorebirds, marine mammals, knowledge gaps and existing research.	Wilsons Promontory, Ninety Mile beach, Point Hicks, Cape Howe marine parks and Beware Reef Marine Sanctuary.	S8
Birdata web portal	Access to BirdLife Australia data	Birdata includes data from the Australian Bird Atlas project and also from various dedicated monitoring projects including Shorebirds 2020.	Gippsland Lakes	S10
Birds Australia	Biennial beach nesting birds count reports	Every two years, all suitable ocean beach habitat for Hooded Plovers along the coasts of Victoria, South Australia and NSW, are surveyed across a weekend in mid-November. The aim is to achieve a best estimate of the population and assess the state of the bird's habitat.	Ninety Mile Beach	S5 S7
Blake *et al.* (2000)	Seagrass mapping of Victoria's minor inlets	Remote sensing and aerial photograph analysis of seagrass bed extent in six Victorian inlets.		S8
BMT WBM (2011)	Ecological Character Description	This report provides the Ecological Character Description (ECD) for the Gippsland Lakes Ramsar site, prepared in accordance with the National Framework and Guidance for Describing the Ecological Character of Australia's Ramsar Wetlands 2008.	Gippsland Lakes Ramsar Site	S10
Boon *et al* (2011)	Mangrove and saltmarsh habitat	• Victorian mangrove distribution and extent; • Victorian coastal saltmarsh distribution and extent; • Zonation; • Sedimentation and successional change in communities; • Relation between mangrove and saltmarsh communities and water and salt; • Floristics and structure of coastal vegetation; • Mapping of mangrove and coastal saltmarsh extent and current ecological condition;	Victoria	S9

Reference	Description	Summary	Relevant Location/s	Relevant scientific module
		• Pre-European distributions; and • Assessment of distribution under rising sea levels		
Butler *et al*. (2002)	Assessment of the conservation values of the Bass Strait sponge beds area	Assessment of the conservation / marine biodiversity values of sponge bed areas across the Bass Strait. Locations and extent unable to be identified by the assessment, however gives a comprehensive outline of the biodiversity values in sponge based, including broad-scale mapping.	Twofold shelf	S8
CEE 2003	Marine issues assessment (including benthos) for the Sole Gas Pipeline Extension	Assessment of marine environmental components including (but not limited to) subtidal infauna and epifauna. Field survey included a benthic video survey along the proposed Patricia Baleen pipeline.	Sole/Patricia Baleen	S8
DELWP	Victorian Biodiversity Atlas	The Victorian Biodiversity Atlas (VBA) is the collated information of flora and fauna sightings across Victoria.	Gippsland Lakes	S10
Edmunds *et al.* (2005)	Subtidal reef biota monitoring in marine protected areas in the Twofold Shelf region	Long-term Parks Victoria monitoring and mapping program of macroalgae, invertebrates and fish. Quantitative visual census method based on Edgar and Barrett 1997; Edgar et al. 1997) using transects. 18 sites monitored in total including seven (7) sites originally monitored in 2001. Site depth ranged between 4-10 m.	Twofold Shelf including: Beware Reef Marine Sanctuary, Point Hicks and Cape Howe Marine National Parks	S8
Edmunds et al. (2011)	Victorian Subtidal Reef Monitoring Program: The Reef Biota at Beware Reef Marine Sanctuary,	Inventory of subtidal reef biota at Beware Reef Marine Sanctuary offshore from the Gippsland Coast. Marine habitat classes, marine ecological communities, biological processes, species distribution information, Shorebirds, marine mammals, knowledge gaps and existing research.	Beware Reef Marine Sanctuary	S8
Fisheries Research and Development Corporation	Biological, catch and effort information for Australia's key wild catch fish stocks	fish.gov.au provides reports by jurisdiction or species.	Australia-wide	S6
Fullagar *et al*. (2005)	Historic population data for Little penguin colony at Gabo Island	A reconnaissance of Gabo Island to assess the feasibility of a Little Penguin breeding population survey.	Gabo Island	S5 S7
Henry & Lyle (2003)	2000 National Survey of Recreational and Indigenous Fishing (NRIFS)	The first and most comprehensive snapshot of recreational fishing in Australia.	Australia-wide	S6
Higgins & Davies (eds.) (1996)	Handbook of Australian, New Zealand and Antarctic Birds, Volume 3.	Pre-eminent scientific reference on birds in the region, which includes Australia, New Zealand, Antarctica, and the surrounding ocean and sub-Antarctic islands.	Rigby Island, Gippsland Lakes	S5 S7 S10

Reference	Description	Summary	Relevant Location/s	Relevant scientific module
Institute for Marine and Antarctic Studies (IMAS)	Fisheries and aquaculture reports	Current and past Fishery Assessment Reports conducted on behalf of DPIPWE for the following fisheries; • Scalefish • Rock Lobster • Abalone • Giant Crab • Other fisheries including recreational projects	Tasmanian fisheries	S6
Kirkwood *et al.* (2010)	Continued population recovery by Australian fur seals	Includes Victorian population data for Australian fur seal up to 2008. Pups were recorded at 20 locations: 10 previously known colonies, three newly recognised colonies and seven haul-out sites where pups are occasionally born.	Gabo Island, The Skerries	S5 S7
Littnan & Mitchell (2002)	Australian And New Zealand Fur Seals at The Skerries, Victoria: Recovery of A Breeding Colony	The population size of Australian fur seals Arctocephalus pusillus doriferus and New Zealand fur seals A. forsteri at The Skerries, Victoria was estimated in two consecutive breeding seasons, 1999-2000 and 2000-2001.	The Skerries	S5 S7
Monk *et al.* (2011)	Corner Inlet and Nooramunga Seagrass Mapping Project	Commissioned by Parks Victoria this study creates two updated habitat maps for Corner Inlet and Nooramunga Marine and Coastal Park.		S8
NSW DPI	Fisheries Spatial Portal	NSW revised its fisheries reporting requirements in 2009 so catch and effort data is now more spatially and temporally detailed and as such is likely to be more useful in the assessment of potential impacts from an oil spill.	NSW fisheries	S6
O'Hara *et al.* (2002)	Baseline monitoring of Posidonia seagrass beds in Corner Inlet, Victoria	• Obtain qualitative baseline data on Corner Inlet subtidal seagrass communities; • Obtain data characterising fish, invertebrate and plant communities of Corner Inlet; • Assess status of invertebrate species of conservation concern that occur in Corner Inlet/Nooramunga		S8
Overeem *et al.* (2007)	Contrasting genetic structuring between colonies of the Little Penguin	Includes summary of population data for various Little Penguin, Contrasting genetic structuring between colonies of the world's smallest penguin, Eudyptula minor, colonies.	Gabo Island	S5 S7
Parks Victoria 2006a	Management Plan for Beware Reef Marine Sanctuary	Management Plan developed to help protect and conserve the sanctuary's natural and cultural values, make the sanctuary more widely known and appreciated, and ensure visitors both enjoy and respect its importance for current and future generations. Provides description of species, communities and habitat, however,	Beware Reef	S8

Reference	Description	Summary	Relevant Location/s	Relevant scientific module
		mostly based on Edmunds et al. (2005)		
Parks Victoria 2006b	Management Plan for Point Hicks Marine National Park	Management Plan developed to help protect and conserve the sanctuary's natural and cultural values, make the sanctuary more widely known and appreciated, and ensure visitors both enjoy and respect its importance for current and future generations. Provides description of species, communities and habitat, however, mostly based on Plummer et al. (2003 and Edmunds et al. (2005)	Point Hicks	S8
Plummer *et al*. 2003	Marine Natural Values Study Victorian Marine National Parks and Sanctuaries	The "Marine Natural Values Study – Marine National Parks and Sanctuaries" is an inventory of accessible knowledge about the natural (environmental) values for all 24 of the newly declared Marine National Parks and Sanctuaries in Victoria. For each park area the following are described: Physical parameters, Marine habitat classes, marine ecological communities, biological processes, species distribution information, Shorebirds, marine mammals, knowledge gaps and existing research. Included Ninety Mile Beach Marine National Parka and Point Hicks Marine National Park.	Ninety Mile beach and Point Hicks	S8
Roob and Ball (1997)	Gippsland Lakes seagrass mapping	• Assessment of seagrass changes in the Gippsland Lakes through review of historical aerial photographs; and • Assessment of the spatial distribution of seagrass in the Gippsland Lakes.	Gippsland Lakes	S8 S10
Roob *et al.* (1998)	Corner Inlet and Nooramunga Seagrass Mapping	• Assessment of seagrass changes in Corner Inlet and Nooramunga through a review of historic aerial photographs; and • Assessment of the spatial distribution of seagrass in Corner Inlet and Nooramunga.	Corner Inlet Nooramunga	S8
Shorebirds 2020	Shorebird long-term data count	The Shorebirds 2020 database comprises the most complete shorebird count data available in Australia. The data have been collected by volunteer counters and BirdLife Australia staff for approximately 150 roosting and feeding sites, mainly in coastal Australia. The data goes back as far as 1981 for key areas.	Gippsland Lakes, Ninety Mile Beach	S5 S7
Taylor & Roe (2005)	Study on the Little tern population on Rigby Island, Gippsland Lakes	A study of the feeding ecology of Little terns Sterna albifrons sinensis breeding on Rigby Island, Gippsland Lakes. Includes data from the Victorian Little Tern Task Force on	Rigby Island, Gippsland Lakes	S5 S7 S10

Reference	Description	Summary	Relevant Location/s	Relevant scientific module
		Little tern numbers and breeding success between 1977 and 2002.		
VFA	Commercial Fish Production Information Bulletin	Victorian catch and effort data extends back to 1978/79.	Victorian fisheries	S6
Warry & Hindell (2012)	Fish Assemblages and Seagrass Condition of the Gippsland Lakes	Following a bloom of the blue-green alga in the Gippsland Lakes in 2007 - 2008, there was a widespread decline of seagrass over the same period. The Gippsland Lakes and Catchment Taskforce were concerned at the potential decline in seagrass within the lakes, and undertook an assessment of the condition of seagrass (and associated fish assemblages).	Gippsland Lakes	S8 S10
Warry *et al*. (2013)	Seagrass and Fish of the Gippsland Lakes	A summary presentation for the Gippsland Lakes Ministerial Advisory Committee	Gippsland Lakes	S10
West *et al.* (2015)	Survey of Recreational Fishing in New South Wales and the ACT, 2013/14	A state-wide survey in NSW to measure changes that had occurred since the NRIFS.	NSW	S6
NSW DPI online resources	Online marine environment resources tool	Access to NSW online data with respect to environmental clues for the marine and coastal habitats of NSW	NSW	S5 S6 S7 S8
Creese *et al* (2009)	Mapping of the habitats of NSE Estuaries	Detailed habitats mapping for all NSW estuaries with data collected as part of the state-wide estuary management program	NSW	S7 S8
Birch *et al.* (2018)	Benthic assemblages in southern NSW estuaries	Includes an extensive biological and chemical data set from southern NSW estuaries with descriptions of the relationships between the two.	NSW	S7
Taylor *et al* (2018)	Mangroves and fisheries in southern NSW estuaries	Mangroves and fisheries in southern NSW estuaries	NSW	S5 S8
Davis *et al.* (2016)	Classification scheme for subtidal habitats in NSW estuaries.	Allows for a comparison between the before and after situation with respect to subtidal benthic habitats in NSW estuaries.	NSW	S7
West *et al* (2016)	Estuarine fisheries data for recreational angling	Long term data set with regard to recreational fisheries in southern NSW that can be sued to compare with past spill data.	NSW	S5

Reference	Description	Summary	Relevant Location/s	Relevant scientific module
AFMA (2019)	Commonwealth catch data for Commercial fisheries in Australia https://data.gov.au/dataset/reported-landed-annual-catch-from-commonwealth-fisheries	Long term data set with regard to Commercial fisheries in Australia.	All areas	S5
VFA (2019)	Victorian commercial Fisheries Catch Data https://vfa.vic.gov.au/commercial-fishing/commercial-fish-production	Commercial catch data for the state of Victoria covering all fisheries and broken down by fishery and region.	VIC	S5
NSWDPI (2019)	NSW Commercial catch and effort reporting https://www.dpi.nsw.gov.au/fishing/commercial/catch-effort	Commercial catch data for the state of New South Wales covering all fisheries and broken down by fishery and region	NSW	S5
IMAS (2019)	Tasmanian Commercial Fishery Catch and Effort Data http://www.imas.utas.edu.au	Commercial catch data for the state of Tasmania covering all fisheries and broken down by fishery and region	TAS	S5
SEED (2019)	NSW government shared resource for environmental data https://www.seed.nsw.gov.au/	Detailed mapping of NSW biological and environmental data	NSW	S5 S6 S7 S8
TAFI (2019)	Mapping of Tasmania's marine environments	Detailed mapping and datasets for Tasmania's marine and coastal environments. Includes a fisheries, subtidal vegetation and habitats, intertidal areas and megafauna and shorebirds.	Tas	S5 S6 S7 S8
UTAS (2019)	Mapping of Tasmania's marine environments	Detailed mapping and data on Tasmania's marine environments	Tas	S5 S6 S7 S8
Lucieer *et al* (2007)	Survey of marine habitats by SeaMap Tasmania	Detailed mapping and data on Tasmania's marine environments	Tas	S5 S6 S7 S8
Edyvane (2016)	Mapping of Tasmanian Coastal Waters: Marine Habitat Mapping	Marine Habitat Mapping	Tas	S6 S7 S8

Appendix C: Environmental Values and Sensitivities

Environmental values and sensitivities

The monitoring program responding to a spill is dependent on the types of environmental, social and economic values potentially affected by a spill. Those sensitivities identified by in the Environment Plan (EP) as being present in the Potentially Exposed Area (PEA) are summarised in Table C-1. Linkages between environmental sensitivities, their location, oil spill response options for spill scenarios and OSMP studies are also shown in this table.

Scope of the monitoring program

The OSMP modules provide for the rapid assessment of the extent of spread of hydrocarbons from a Level 2 or Level 3 spill and effects on the environment of the spilt hydrocarbons as well as any spill response activities that may be used in the clean-up of the spill. The modules provide for the rapid assessment of impacted and potentially affected wildlife including those listed as Matters of National Environmental Significance (MNES) und the EPBC Act (1999). These modules were based on the spill impact assessment in the EP and probable exposure pathways and the likelihood of contact with the identified sensitive receptors.

Table C-1: Sensitivities within Level 3 Hydrocarbon Spill PEA with Monitoring Strategies and Potential OSMP Response Measures to be adopted

Environment	Legislative category	Location	Marine Receptors											Coastal Receptors														
			Marine Open Water	Cetaceans/Dugongs	Seals	Turtles	Seabirds (Protected)	Other Birds	Protected Sharks/Fish or Rays	Other Sharks, Fish of Rays	Sub-tidal Invertebrates	Plankton	Commercial and Recreational Fisheries	Inter-tidal Invertebrates	Macrophytes (Kelp/Giant Kelp)	Seal s (Marine) Colonies/Haul-out (Shoreline)	Shoreline and Wetland Birds	Penguin Colonies	Corals	Mangroves	Saltmarsh	Emergent/Sub-tidal Vegetation (Seagrass)	Sheltered Inter-tidal Flats	Rip-Rap	Sand Beaches	Inter-tidal Rocky Platforms	Sub-tidal Reefs	Exposed Rocky Headlands
		Scientific Module (SM)	**01 02**	**04 06**	**04 06**	**04 06**	**04 06**	**04 06**	**07**	**07**	**07**	**02**	**04 05**	**07**	**07**	**04 06**	**04 06**	**04 06**	**04**	**08 09**	**08 09**	**04**	**01**	**01**	**01**	**01**	**04**	**07**
OFFSHORE	COMMONWEALTH Reserves	Australian Whale Sanctuary	X	X	X	X	X	X	X	X	X	X	X														X	
		East Gippsland Australian Marine Park (AMP)	X	X			X	X		X		X																
		Beagle AMP	X	X	X		X	X		X	X	X															X	
		Flinders AMP	X	X			X		X	X	X	X																
		Freycinet AMP	X	X			X			X		X																
		Jervis AMP	X	X						X		X															X	
		Hunter AMP	X	X			X		X	X		X															X	
		Cod Grounds AMP	X	X			X		X	X		X																
		Solitary Islands AMP	X	X			X		X	X		X																
		Central Eastern AMP	X	X			X		X	X		X																
		Lord Howe AMP	X	X		X	X	X	X	X		X							X									
		Zeehan AMP	X	X			X			X		X																
		Apollo AMP	X	X			X			X		X																
		Boags AMP	X				X	X		X		X																
		Franklin AMP	X				X			X		X																
		Huon AMP	X	X	X		X			X		X																
	STATE Reserves	Wilsons Promontory MP & MNP (VIC)[3]	X	X		X	X	X	X	X	X	X				X	X	X				X				X	X	X
		Ninety Mile Beach MNP (VIC)	X	X	X	X	X	X	X	X	X	X					X								X			
		Beware Reef MS (VIC)	X	X			X	X	X	X	X	X			X	X	X									X	X	X
		Point Hicks MNP(VIC)	X	X		X			X	X	X	X			X		X								X	X	X	X
		Cape Howe MNP (VIC)	X	X	X	X	X	X		X		X		X			X								X	X	X	
		Bunurong MNP (VIC)	X							X	X	X		X			X								X		X	X
		Cape Byron MP (NSW)	X	X		X	X	X	X	X	X	X					X		X						X		X	
		Solitary Islands MP (NSW)	X	X		X	X		X	X	X	X					X								X	X	X	
		Batemans MP[4] (NSW)	X	X		X	X	X	X	X	X	X			X		X			X	X	X				X	X	X
		Jervis Bay MP (NSW)		X	X	X	X	X	X	X	X	X		X	X		X			X		X			X		X	
		Port Stephens-Great Lakes MP (NSW)	X	X		X	X		X	X	X	X			X					X	X	X				X	X	

[3] This includes the Anser, Kanowna and Glendinnie Groups of Islands which lie off Wilsons Promontory and the terrestrial National Park Component to the high water mark (i.e. inter-tidal zone). This is common for ALL Victorian National Marine Parks & Sanctuaries

[4] Includes shoreline estuaries and creeks to the limit of tidal influence between Bawley Point and Wallaga Lake.

Environment	Legislative category	Location	Marine Receptors											Coastal Receptors														
			Marine Open Water	Cetaceans/Dugongs	Seals	Turtles	Seabirds (Protected)	Other Birds	Protected Sharks/Fish or Rays	Other Sharks, Fish of Rays	Sub-tidal Invertebrates	Plankton	Commercial and Recreational Fisheries	Inter-tidal Invertebrates	Macrophytes (Kelp/Giant Kelp)	Seal s (Marine) Colonies/Haul-out (Shoreline)	Shoreline and Wetland Birds	Penguin Colonies	Corals	Mangroves	Saltmarsh	Emergent/Sub-tidal Vegetation (Seagrass)	Sheltered Inter-tidal Flats	Rip-Rap	Sand Beaches	Inter-tidal Rocky Platforms	Sub-tidal Reefs	Exposed Rocky Headlands
		Scientific Module (SM)	**01 02**	**04 06**	**04 06**	**04 06**	**04 06**	**04 06**	**07**	**07**	**07**	**02**	**04 05**	**07**	**07**	**04 06**	**04 06**	**04 06**	**04**	**08 09**	**08 09**	**04**	**01**	**01**	**01**	**01**	**04**	**07**
		Lord Howe MP & World Heritage Area (NSW)	X	X	X	X	X	X	X	X	X	X			X				X	X	X	X			X	X	X	X
OFFSHORE	STATE	NSW Aquatic Reserves (Sydney Area)						X	X	X	X	X			X		X					X			X		X	X
OFFSHORE	STATE	Kent Group Marine Reserve (TAS)	X	X	X		X	X		X	X	X				X											X	X
OFFSHORE	STATE	Maria Island Marine Reserve & National Park (TAS)	X												X										X		X	X
SHORELINE	International	Gippsland Lakes (RAMSAR)[5]					X	X						X			X			X	X	X		X	X			
SHORELINE	International	Gippsland Lakes Coastal Park (VIC)[6]		X	X		X	X	X	X	X	X	X	X			X								X			
SHORELINE	International	Corner Inlet MNP, MCP & Nooramunga MCP (RAMSAR)							X	X				X			X			X	X	X	X		X			X
SHORELINE	International	Towra Point Nature Reserve RAMSAR (NSW)															X			X	X	X						
SHORELINE	International	Hunter Estuary Wetlands RAMSAR (NSW)															X			X	X				X			
SHORELINE	International	Elizabeth & Middleton Reef RAMSAR	X	X		X	X			X									X			X						
SHORELINE	International	Moulting Lagoon RAMSAR (TAS)															X				X	X	X					
SHORELINE	International	Lavinia Nature Reserve RAMSAR															X				X							
SHORELINE	International	Flood Plain Lower Ringarooma River RAMSAR															X				X							
SHORELINE	TERRESTRIAL PARKS	Croajingalong Biosphere Reserve and NP[7]					X	X									X	X			X	X	X		X	X		X
SHORELINE	TERRESTRIAL PARKS	Wilsons Promontory Biosphere and NP							X								X	X							X			X
SHORELINE	TERRESTRIAL PARKS	Cape Conran Coastal Park (VIC)[8]					X	X	X					X			X					X			X			X
SHORELINE	TERRESTRIAL PARKS	Gabo Island Harbour SMA & Light Station Reserve (VIC)								X						X	X	X									X	X
SHORELINE	TERRESTRIAL PARKS	Mallacoota SMA (VIC)							X					X			X				X	X	X		X			X
SHORELINE	TERRESTRIAL PARKS	The Skerries SMA														X	X									X		X
SHORELINE	TERRESTRIAL PARKS	Ben Boyd NP/ Nadgee Nature Reserve (NSW)															X			X	X	X			X			X
SHORELINE	TERRESTRIAL PARKS	Bournda NP (NSW)															X				X	X		X	X			X
SHORELINE	TERRESTRIAL PARKS	Mimosa Rocks NP (NSW)															X				X	X			X			X
SHORELINE	TERRESTRIAL PARKS	Montague Island Nature Reserve (NSW)	X				X		X							X		X										X
SHORELINE	TERRESTRIAL PARKS	Eurobodalla NP (NSW)															X			X	X	X			X			X
SHORELINE	TERRESTRIAL PARKS	Murramarang NP (NSW)															X								X			X

[5] This includes Lakes Entrance and Lakes Tyers Estuary System

[6] The northern section of Gippsland Lakes Coastal Park is part of the Gippsland Lakes RAMSAR site. RAMSAR site extends to the adjacent coastline. Adjacent marine sensitivities to the Coastal Park (i.e. white shark BIA, seabird BIA, Southern Right Whale BIA) are also included in this listing.

[7] Park includes the Skerries (excluded from this listing and included in Skerries SMA), Wingan Inlet, Tamboon Inlet, Mallacoota Inlet Special Management Area (excluded from this listing and included in Mallacoota SMA), Bekta River, Cape Howe and Nadgee Wilderness Area

[8] Cape Conran Coastal Park includes Sydenham Inlet and Yeerung River Estuary.

Environment	Legislative category	Location	Marine Receptors											Coastal Receptors														
			Marine Open Water	Cetaceans/Dugongs	Seals	Turtles	Seabirds (Protected)	Other Birds	Protected Sharks/Fish or Rays	Other Sharks, Fish of Rays	Sub-tidal Invertebrates	Plankton	Commercial and Recreational Fisheries	Inter-tidal Invertebrates	Macrophytes (Kelp/Giant Kelp)	Seal s (Marine) Colonies/Haul-out (Shoreline)	Shoreline and Wetland Birds	Penguin Colonies	Corals	Mangroves	Saltmarsh	Emergent/Sub-tidal Vegetation (Seagrass)	Sheltered Inter-tidal Flats	Rip-Rap	Sand Beaches	Inter-tidal Rocky Platforms	Sub-tidal Reefs	Exposed Rocky Headlands
		Scientific Module (SM)	**01 02**	**04 06**	**04 06**	**04 06**	**04 06**	**04 06**	**07**	**07**	**07**	**02**	**04 05**	**07**	**07**	**04 06**	**04 06**	**04 06**	**04**	**08 09**	**08 09**	**04**	**01**	**01**	**01**	**01**	**04**	**07**
SHORELINE	TERRESTRIAL PARKS	Meroo NP (NSW)															X								X			X
		Conjola NP (NSW)															X				X				X			X
		Jervis Bay NP (NSW)															X								X	X		X
		Seven Mile Beach NP (NSW)															X						X		X			X
		Royal NP (NSW)									X						X			X		X			X			X
		Botany Bay/Kamay NP (NSW)									X						X				X							
		Sydney Harbour NP (NSW)																X			X				X	X		X
		Ku-ring-gai Chase NP																X										X
		Bouddi NP (NSW)																		X	X	X			X			X
		Wyrrabalong NP (NSW)								X							X					X			X	X		X
		Worimi NP (NSW)															X								X			X
		Tomaree NP (NSW)															X			X	X	X			X	X		X
		Myall Lakes NP (NSW)					X										X			X	X	X	X		X			
		Booti NP (NSW)																		X	X	X	X		X			X
		Saltwater NP (NSW)					X										X			X	X	X			X			
		Crowdy Bay NP (NSW)															X			X	X				X			X
		Limeburners Creek NP (NSW)															X			X	X				X		X	
		Goolawah NP (NSW)															X								X	X		X
		Hat Head NP (NSW)															X								X			X
		Kent Group National Park & Judgment Rocks NR (TAS)					X									X									X			X
		Strezlecki NP (TAS)					X										X											X
		Mt William NP (TAS)					X										X								X			X
		Narawntapu NP (TAS)															X								X			X
		West Moncoeur Island Nature Reserve and East Moncoeur Island (TAS)					X									X												X
		Curtis Island Nature Reserve and Devils Tower Nature Reserve (TAS)																										
		Hogan Island Group (TAS)																										

Esso Australia Resources Pty Ltd

OPERATIONS ENVIRONMENTAL PERFORMANCE AND IMPLEMENTATION STRATEGY

BASS STRAIT ENVIRONMENT PLAN

Volume 4

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Abbreviations

ACR	Acute to Chronic Ratio
AHS	Australian Hydrographic Service
ALARP	As Low As Reasonably Practicable
AMOSC	Australian Marine Oil Spill Centre
AMSA	Australian Maritime Safety Authority
APPEA	Australian Petroleum Production and Exploration Association
ASAP	As Soon As Possible
ASOG	Activity Specific Operating Guidelines
BWM	Ballast Water Management
CAMO	Critical Activity Mode
CEFAS	Centre for Environment, Fisheries and Aquaculture
CHARM	Chemical Hazard and Risk Management
COMI	Crane Operations, Maintenance and Inspection
DAWR	Department of Agriculture and Water Resources
DELWP	Department of Environment, Land, Water and Planning Victoria
DJPR	Department of Jobs, Precincts and Regions
DoEE	Department of the Environment and Energy
DP	Dynamic Positioning
DTA	Direct Toxicity Assessment, also known as WET testing
EADS	Employee Assessment and Development Summary
EC50	Effect Concentration affecting 50% test animals
EBP	Environmental Business Planning
EMS	Environmental Management System
EP	Environment Plan
EP&R	Emergency Preparedness and Response
EPBC	Environment Protection and Biodiversity Conservation
EPI	Environmental Performance Indicator
EPOs	Environmental Performance Objectives
EPS	Environmental Performance Standards
ERM	Emergency Response Manual
ERP	Emergency Response Plan
ESG	Emergency Support Group
ETS	Environmental Tag System
FIMS	Facility Integrity Management System
FMEA	Failure Mode and Effects Analysis
ft	Feet
HMCS	Harmonised Mandatory Control Scheme

HSE	Health, Safety and Environment
HQ	Hazard Quotient
IACS	International Association of Classification Societies
IC	Integrity Critical
ICS	Incident Command System
IMCA	International Marine Contractors Association
IMS	Invasive Marine Species
IMT	Incident Management Team
IMO	International Maritime Organisation
JRCC	Joint Rescue Coordination Centre
JSA	Job Safety Analysis
JUR	Jack-up Rig
LC50	Lethal Concentration affecting 50% test animals
LEFCOL	Lakes Entrance Fishing Cooperative Limited
LEM	Lifting Equipment Manual
LOWC	Loss of well control
LSC	Logistics Section Chief
m	Metre
MARPOL	International Convention for the Prevention of Pollution from Ships
MC	Management Committee
MDO	Marine Diesel Oil
MOC	Management of Change
MODU	Mobile Offshore Drilling Unit
MoU	Memorandum of Understanding
t	MetricTon
NAF	Non-Aqueous Fluid
NEBA	Net Environmental Benefit Analysis
NGER	National Greenhouse and Energy Reporting
NGO	Non-Governmental Organisation
NOEC	No Effect Concentration
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NOPTA	National Offshore Petroleum Titles Authority
OCNS	Offshore Chemical Notification Scheme
OI	Operational Integrity
OIM	Offshore Installation Manager
OIMS	Operations Integrity Management System
OPEP	Oil Pollution Emergency Plan
OPGGS Act	Offshore Petroleum and Greenhouse Gas Storage Act 2006

OPGGS(E)R	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
OSC	Operations Section Chief
OSMP	Operational and Scientific Monitoring Program
OSR	Oil Spill Response
OSRL	Oil Spill Response Limited
OSRO	Oil Spill Response Organisation
P&A	Plug and Abandonment
PA	Production Annulus
PFW	Produced Formation Water
PLONOR	Pose Little Or No Risk
PNEC	Predicted No-Effect Concentration
POM	Platform Operating Manual
PMeT	Procedures Management Electronic Tool
PMS	Planned Maintenance System
PNG	Papua New Guinea
PSC	Planning Section Chief
PSF	Process Safety Framework
PS&O	Platform Surveillance and Optimisation
PSZ	Petroleum Safety Zone
PTW	Permit To Work
PTWS	Permit To Work System
QA	Quality Assurance
RA	Risk Assessment
RC	Required Competency
ROC	Residual Oil on Cuttings
RRT	Regional Response Team
SAP	WIMS - System Application Product
SCAT	Shoreline Clean-up and Assessment Technique
SCB	Source Control Branch
SD	Standard Deviation
SETFIA	South Eastern Trawl Fishing Industry Association
SFRT	Subsea First Response Toolkit
SIMOPS	Simultaneous Operations
SSD	Species Sensitivity Distribution
SSHE	Safety, Security, Health and Environment
SIV	Seafood Industry Victoria
SMS	Short Message Service
SOPEP	Shipboard Oil Pollution Emergency Plan

TMoA	Toxic Mode of Action, refers to the exertion of similar effects based on concentration addition by certain substances within the same group
TRH	Total Recoverable Hydrocarbons
TU	Toxic Units, refers to the number of times that the predicted exposure concentration is above the corresponding concentration causing toxicity at the median species sensitivity
UK	United Kingdom
US	United States
WA	Western Australia
WET	Whole Effluent Toxicity
WIMS	Well Integrity Management System
WMM	Waste Management Manual
WMS	Work Management System
WOMP	Well Operations Management Plan
WWC	Wild Well Control

1 Environmental Performance

1.1 Environmental Performance Outcomes and Standards

This chapter presents the environmental performance outcomes (EPO), environmental performance standards (EPS) and measurement criteria required to manage the impacts and risks identified in Bass Strait Environment Plan Volumes 2 and 3.

The following definitions are used in this section, as defined in Regulation 4 of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (OPGGS(E)R):

- EPO – 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 (i.e. a statement of the environmental objective);
- EPS – a statement of the performance required of a control measure; and
- Measurement criteria (not defined in the regulations) – defines how environmental performance will be measured such that the measurement can be used to determine whether the EPS and EPO have been met.

1.2 Environment Performance – Operations

1.2.1 Operations

Table 1-1 Environmental Performance - Operations

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
Platform Operations Pipeline Operations Subsea facility operations	Physical Presence	Change to the function, interests or activities of other users	Limit interference with other marine users to the extent necessary for the reasonable exercise of the right conferred by the titles granted. Property is removed as soon as reasonably practicable, taking into account environmental and safety risks, cost efficiency and execution planning. Property is maintained so as not to preclude its removal.	**CM6:** Temporary Storage Assessment	Facilities, pipelines and equipment that have reached the CoP stage of operations (or are deemed 'out of service' during production operations) and where removal is not reasonably practicable prior to a Heavy Lift Vessel campaign will be subject to a Temporary Storage Assessment to ensure that environmental and safety risks continue to be reduced to ALARP and acceptable levels.	Temporary storage assessment which demonstrates environmental and safety risks continue to be reduced to ALARP and acceptable levels.
				CM70: The Subsea Material Register (SMR) will be reviewed by the Marine Group against the scope, location and operational capability of each vessel as they become available.	The Marine Group incorporates the recovery of property/material into the Vessel Synergies Planner to identify opportunities for the removal of subsea property (where possible).	The planned recovery of property/material is documented in the Integrated Marine Schedule Planner for execution. Documentation of recovery is recorded in the SMR.
				CM1: Maintenance activities for facilities already at CoP are implemented in accordance with s572 (2) requirements.	A review of decommissioning critical inspection and maintenance controls will be undertaken and implemented by 1Q, 2022 retrospectively for facilities already in CoP to ensure property is maintained to reduce environmental risks to ALARP and acceptable levels and so as not to preclude its future removal.	Documented Section 572 (2) Maintenance review for all facilities already in CoP.
				CM1a: Post CoP maintenance activities are implemented for facilities as they are assessed prior to reaching CoP stage in accordance with s572 (2) requirements	A Section 572 (2) maintenance review is undertaken to identify decommissioning critical inspection and maintenance activities (post CoP) for all facilities as part of the preparation prior to moving into CoP stage to ensure property is maintained to reduce environmental risks to ALARP and acceptable levels and so as not to preclude its future removal. This process will be in place by 1Q 2021.	Documented Section 572 (2) Maintenance review for all facilities prior to reaching CoP.

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
Platform Operations	Emissions to Air	Change in air quality Injury / mortality to fauna	Limit emissions to air so that impacts to air quality will be localised to the source. Limit injury or harm to fauna from air emissions.	**CM30:** Offshore Technical Monitoring Program	Monthly surveillance of fuel and flare trends identifies abnormalities and response actions taken to address abnormalities.	PS&O Technical Monitoring report documents the identification and significance of abnormalities and any action items required to address abnormalities or potential improvement opportunities.
Platform Operations Subsea facilities operations	Planned Discharge - Operational Fluids	Change in water quality Injury / mortality to fauna	Limit operational fluids discharge to water so that impacts to water will be localised to the source (e.g. pile window, subsea wellhead). Limit injury or harm to fauna from operational discharges to water.	**CM3:** Chemical Discharge Assessment Process	Chemicals planned for discharge are evaluated as acceptable in accordance with the Chemical Discharge Assessment Process.	Chemicals approved for use and discharge list confirms the fluids meet criteria for discharge.
				CM47: Monitoring of chemical use in accordance with Corrosion Control & Chemical Injection program	Chemical Injection, including exceptions or anomalies, is monitored in accordance with the Corrosion Control & Chemical Injection Program.	OFC report shows any exceptions or anomalies to chemical injection, is prepared monthly and is signed-off by the appropriate level of management.
				CM46: Maintenance and testing of Open and Closed Skimmer Piles	Maintenance and inspection of open and closed skimmer pile equipment will occur in accordance with the FIMS equipment strategies and as scheduled in IPES. Pile equipment includes pumps, level indicators and instrumentation. • Maintenance and inspection plans for open and closed skimmer pile equipment which are in exception must be reviewed and endorsed by the Offshore Risk, Environment and Regulatory Supervisor to ensure that potential risk posed by the deferral is mitigated or alternate controls are in place to prevent potential environmental incidents	Monthly exception reports shows any overdue maintenance, inspection, and/or testing tasks with action signed-off by the appropriate level of Operations Management. Offshore Risk, Environment and Regulatory Supervisor endorsement provided for the Environment section of report.
				CM36: Pre Start notifications	Relevant stakeholders are notified of scheduled Pipeline and Subsea IMR activities each quarter and again one week prior to commencement.	Stakeholder consultation records confirm that information regarding Gippsland Basin scheduled Pipeline and Subsea IMR activities was conveyed to relevant stakeholders in required timeframes.

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
				CM68: Environmental Sampling	Sediment and water sampling will be designed and executed in accordance with relevant guidelines and will occur within 2 years from acceptance of this Environment Plan at the following facilities: • CBA • HLA • SNA Sediment and water sampling will occur within 2 years from commissioning of the water handling system at MLB	Sediment and water sampling report
				CM69: Sampling of KPA Gas to monitor mercury concentrations	Bi monthly sampling results demonstrate mercury in KPA gas remains below spec. Should sampling return results above spec, additional sampling is implemented and offshore discharges cease (as required)	Bi-monthly sampling results.
Platform Operations	Produced Formation Water	Change in water quality Change in sediment quality Injury / mortality to fauna Change in habitat Change to the function, interests or activities of other users	At the edge of and beyond the mixing zone, ANZECC 99% species protection water quality and ISQL 'low' sediment quality criteria and/or be within natural variation or background concentrations PFW discharge (within and beyond the mixing zone) will have: - no significant impacts to MNES (per Significant Impact Guidelines [DOE, 2013]) - no direct impact to benthic habitat - no taint of fisheries stock	**CM43:** PFW processed though secondary separation equipment	PFW is processed through secondary separation equipment before being discharged overboard. The online monitor reads <30 mg/L using UV fluorescence for the OIW 24 hour average.	Records demonstrate that the online monitor or substitute manual sampling was reading <30 mg/L 24 hour average OIW levels
				CM67: Surveillance of the treatment system	Monthly surveillance of water handling trends reviews that operation of facilities is within design envelope, identifies abnormalities and response actions taken to address abnormalities as required, as well as potential improvement opportunities.	PS&O Technical Monitoring report documents the identification and significance of abnormalities and any action items required to address abnormalities or potential improvement opportunities
				CM3: Chemical Discharge Assessment Process	Chemicals discharged through the water handling system will be evaluated as acceptable in accordance with the Chemical Discharge Assessment Process (as defined in Section 2.7.2).	Chemicals approved for use and discharge list confirms the fluids meet criteria for discharge.
				CM10a: OIW levels of the discharge stream is continuously monitored and maintained at concentrations below 30 mg/L 24 hour average	Monitoring of the water overboard is per procedure GEN-100-102. This includes: a. Online monitor reads <30 mg/L OIW 24 hour average using UV fluorescence b. The 24 hour average of the on-platform verification checks (InfraCal) using infrared	Records demonstrate that the online monitor or substitute manual sampling was reading <30 mg/L 24 hour average OIW levels

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
			- no seafood is unsafe for human consumption - no interference with commercial fishing operations		spectrophotometry methods also read <30 mg/L c. If an online monitor is not available, then hourly samples using infrared spectrophotometry methods is taken d. Daily oil load is limited to loadings specified in Table F-69 in Volume 2 Appendix F.7, as calculated by either the online oil-in-water monitor or the on-platform verification checks (6-hourly) using infrared spectrophotometry methods e. Discharges of 24 hour average OIW 25-30 mg/L (not inclusive) or daily oil load in the actionable range (specified in Table F-69 in Volume 2 Appendix F.7) are flagged on a daily basis	Records demonstrate that an online monitor was available, or manual sampling was performed Records demonstrate that the platform specific oil load was met Morning report shows a yellow traffic light if platform discharges are within the ranges specified.
				CM10b: Online monitor is calibrated	Calibration is undertaken per procedure GEN-100-102 and lab procedure *GL3 Oil and Grease Analysis*. This includes: a. Acid is added to samples for effective preservation b. A monthly crosscheck sample within the tolerance limits of +/- 6 mg/L compared to the Sigrist and InfraCal must be obtained within a given calendar month for any discharge occurring within that month of >48 hrs total duration c. If monthly lab test is not within expected tolerance limits or is >36 mg/L, a second sample is taken, the Sigrist is serviced and a calibration check performed using a calibration rod d. Turnaround time of the laboratory tests is within 7 days of platform sampling in order to facilitate timely response e. 6 hourly InfraCal results are within +/- 6 mg/L of the Sigrist reading and if not, the Sigrist is cleaned and another InfraCal sample taken and analysed. If the retest difference is still >6 mg/L, the Sigrist is	Records of pH at LFD Lab demonstrate that acid has been added to all samples Records demonstrate cross-check of the online OIW analyser with the onshore laboratory is undertaken each month where a discharge of >48 hours total duration occurred. Records demonstrate that the tolerance limits were met, or another sample was taken and a service and calibration was performed Records demonstrate samples were assessed and notice sent back to the platform within 7 day of platform sampling Records demonstrate that the tolerance limits were met, or the unit was cleaned and reanalysed and passed;

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
					serviced and a calibration check performed using a calibration rod f. The lab conducting the calibration is qualified to conduct the GL3 Oil and Grease analysis procedure	Records show on the third fail test appropriate corrective action was taken. Monthly sample proforma indicates that GL3 Oil and Grease analysis was followed
				CM10c: Online monitor is serviced	The online monitor is serviced routinely as per the frequency defined in IPES equipment strategy.	Records in IPES show the servicing of the online monitor were performed.
				CM38: Sigrist alarm and shutdown function is tested	Sigrist oil in water monitor shutdown function tested in accordance with Critical Function Test Manual and as scheduled in IPES • Sigrist and oil-in-water monitor shutdown function tests to be marked as environmental critical tasks • Tests for Sigrist alarm and function testing which are in exception must be reviewed and endorsed by the Offshore Risk, Environment and Regulatory Supervisor to ensure that: - any risk posed by the deferral is mitigated; or - alternate controls are in place to prevent potential environmental incidents	Monthly exception reports shows any overdue maintenance, inspection, and/or testing tasks with action signed-off by the appropriate level of Operations Management. Offshore Risk, Environment and Regulatory Supervisor endorsement provided for the Environment section of report.
				CM10d: Discharge of water on start-up is controlled	Competent operators manage startup which is controlled according to procedure XXX-100-302 (where XXX is the platform name). Qualification required is Offshore Operations Technician 1 competency.	Records show operators are competent to manage water handling startup and discharge overboard.
				CM11: Apply the PFW monitoring and management framework procedure	The adaptive management regime is implemented to monitor and manage ongoing discharge of PFW. It is described in 2.7.5.1 and consists of: • Annual compositional sampling and analysis • Annual microtox testing • Three yearly WET testing sampling and analysis • Implementation of management measures as required • Additional sampling/modelling as required	Routine monitoring has been conducted as per frequencies defined in this. Monitoring, modelling, adaptive management and/or other assessments demonstrate that the EPS is met.

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
					• For MLB platform, should overboard water discharge be required, six-monthly composition testing for the first two years from the platform PFW stream will also be applied. • For MLB platform, should overboard water discharge be required, WET testing is performed within 6 months of commissioning.	
				CM68: Environmental Sampling	Sediment and water sampling will be designed and executed in accordance with relevant guidelines and will occur within 2 years from acceptance of this Environment Plan at the following facilities: • CBA • HLA • SNA Sediment and water sampling will occur within 2 years from commissioning of the water handling system at MLB.	Sediment and water sampling report
Platform Operations	Accidental Release - Dropped Objects	Change in habitat	Limit impacts to habitat caused by dropped objects to a localised area.	**CM41**: Crane maintenance and inspection programs developed and actioned per FIMS process	Crane maintenance and inspection is carried out within the parameters defined in FIMS to prevent serious SHE risks (Consequence Category 1 or 2), including a process for managing plans that are in exception. Maintenance and inspection plans are developed per Crane Operations, Maintenance and Inspection Manual (COMI) and are scheduled in IPES This includes maintenance and inspection of: • Cranes • Rigging and lifting gear • Testing of equipment Integrity Program compliance is monitored and managed through the IPES Exception Reporting process	IPES – computerised maintenance management system status reviewed and reported monthly. Monthly exception reports shows any overdue maintenance, inspection, and/or testing tasks with action signed-off by the appropriate level of Operations Management as defined by FIMS process. IMPACT database record of incidents shows no crane integrity failure related incidents
				CM42: Crane Operations, Maintenance and Inspection Manual	All lifting operations to be conducted in accordance with the Lifting Procedures. This includes requirements for: • Qualification of crane operators/ doggers/riggers	PTW records for lifting operations

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
				(COMI) - Lifting Procedures	• Checking that equipment is in test • Load weights / safe working loads	
Platform Operations Subsea facilities Operations Pipeline Operations	Accidental Release – LOC (chemicals / hydraulic fluids)	Change in water quality Injury / mortality to fauna	No spills to the environment	**CM66:** PTW system	Operations conducted under PTW (including JSA) • May include operations procedures where they exist for the task	PTW records
				CM44: Bunding	Oil and chemical stores are located within a deck bund, and water-soluble chemicals not approved for discharge are stored in a bund that is isolated from drain/pile.	Operator first day on checks
				CM13: Platform induction process (Greencard)	All personnel are aware of spill clean-up requirements and have access to spill kits.	Greencard demonstrates that spill clean-up requirements and location of spill kits are communicated to all offshore personnel.
				CM3: Chemical Discharge Assessment Process	Firefighting foams planned for discharge are evaluated as PFAS free and acceptable in accordance with the Chemical Discharge Assessment Process.	Chemicals approved for use and discharge list confirms the foams meet criteria for discharge.
				CM12: OPEP	Emergency response activities will be implemented in accordance with the OPEP.	Records confirm that emergency response activities have been implemented in accordance with the OPEP.
Platform Operations	Accidental Release - Waste	Change in habitat Injury / mortality to fauna	Limit impacts to habitat caused by accidental release of waste to a localised area.	**CM13:** Platform induction process (Greencard)	All personnel are aware of waste management requirements and have access to relevant waste receptacles.	Greencard demonstrates that waste management requirements and location of receptacles are communicated to all offshore personnel.
				CM45: Waste Management Manual	Waste is stored and handled in accordance with the Waste Management Manual which includes measures to prevent overboard release of waste: • Prohibition of discharge of waste to the sea • Storage and handling procedures for each type of waste generated including documentation requirements for handling,	IMPACT database records show there have been no incidences of waste managed in a way that is not in accordance with waste management procedures.

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
					storage, and disposal of hazardous materials. • Receptacles on deck or areas exposed to the weather should be secured and have lids that are tight and securely fixed.	
Platform Operations	Accidental Release - Bulk Transfer	Injury / mortality to fauna	No spills to the environment	**CM14:** Procedures for bulk transfer of fluids from supply vessels.	Transfers of fluids from supply vessels to be undertaken in accordance with bulk transfer procedures • Handling of hoses - Liquid Loading Hose Transfer Procedure • Liquid Loading ex supply vessel procedure (diesel, glycol & methanol)	PTW records for liquid bulk transfers.
Pipeline Operations	Accidental Release – LOC (pipeline)	Change in water quality Injury / mortality of fauna	No spills to the environment	**CM27**: Support vessel approach procedure	The 500m approach checklist and DP Checklist are completed prior to the vessel entering the 500m PSZ.	Records of the facility 500 m PSZ and DP operational checklists.
				CM28: ASOG / CAMO procedures	Activity Specific Operating Guidelines (ASOG) / Critical Activity Mode (CAMO) procedures developed to IMCA Standard.	Implementation (AFI) procedures signed by Vessel Master.
				CM29: Support vessel DP system	All support vessels engaged in DP operations have Class recognised DP 2/3 notation.	Records of IACS member DP Notation, Failure Mode and Effects Analysis (FMEA), proving trials and Annual Trials.
					Watchkeepers in charge of watch hold DP certification.	Records of watchkeepers DP certificates.
				CM34: NOPSEMA accepted Safety Case	Development and application of Bass Strait Pipeline Network Safety Case including: • identification of a) potential pathways and b) response measures for major accident events from topsides and subsea • identification of critical controls (both preventative and mitigative) for each MAE • development of performance standards for each critical control	Pipeline Network Safety Case Key Performance Indicators

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
				CM55: Corrosion monitoring and control plans for pipelines developed and actioned per FIMS process	Corrosion monitoring and control plans occur within the parameters defined in FIMS to prevent serious SHE risks (Consequence Category 1 or 2), including a process for managing plans that are in exception. Maintenance and inspection plans are developed for pipelines per the Equipment and Structural Integrity Manual and are scheduled in IPES Corrosion monitoring may be done via • Fluid sampling • Corrosion probes • Inspection (refer inspection below) Corrosion control plans include: • Sand management • Cathodic protection • Corrosion inhibition Integrity Program compliance is monitored and approved through the IPES Exception Reporting process	IPES – computerised maintenance management system status reviewed and reported monthly Monthly exception reports shows any overdue maintenance, inspection, and/or testing tasks with action signed-off by the appropriate level of Operations Management as defined by FIMS process IMPACT database record of incidents shows no pipeline equipment integrity failure incidents.
				CM56: Pipeline inspection and monitoring program developed and actioned per FIMS process	Pipeline inspection and monitoring plans occur within the parameters defined in FIMS to prevent serious SHE risks (Consequence Category 1 or 2), including a process for managing plans that are in exception. Plans are developed in accordance with the Pipeline Management Plan and Pipeline Integrity Manual and are scheduled in IPES. This includes: • Underwater pipeline inspection • Leak detection • In-line metal loss surveys Pipeline equipment includes: • Pipelines • Risers • Pipeline launchers and receivers Integrity Program compliance is monitored and approved through the IPES Exception Reporting process	

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
				CM42: Crane Operations, Maintenance and Inspection Manual (COMI) - Lifting Procedures	All lifting operations to be conducted in accordance with the Lifting Procedures. This includes requirements for: • Qualification of crane operators/ doggers/riggers • Checking that equipment is in test • Load weights / safe working loads	PTW records for lifting operations
				CM40: Flag State lifting requirements	Vessel lifting equipment maintenance standards and procedures undertaken in accordance with vessel Flag state requirements (e.g. Australia: Marine Order 32 - Cargo handling equipment).	Vessel lifting gear register confirms compliance with relevant Flag State requirements. Vessel SMS includes lifting standards and procedures consistent with the relevant Flag State.
				CM58: Navigational Chart	Location of pipelines and facilities is plotted on navigational chart AU357	Navigational chart AUS357 shows locations of pipelines and facilities.
				CM59: Observation during helicopter flights	Helicopters pilots are required to immediately report spills /sheens seen during flights	Incident records describe how spills/sheens were detected.
			Minimise the impact on the environment from a LOC	**CM12**: OPEP	Emergency response activities will be implemented in accordance with the OPEP.	Records confirm that emergency response activities have been implemented in accordance with the OPEP.
				CM35: OSMP	Operational and scientific monitoring will be implemented in accordance with the OSMP.	Records confirm that operational and scientific monitoring have been implemented in accordance with the OSMP.
				CM57: Isolation test plan for pipeline isolation valves developed and actioned per FIMS process	Pipeline isolation mechanisms tested within the parameters defined in FIMS to prevent serious SHE risks (Consequence Category 1 or 2), including a process for managing plans that are in exception. Plans are developed in accordance with Critical	IPES – computerised maintenance management system status reviewed and reported monthly Monthly exception reports shows any overdue

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
					Function Testing Management and are scheduled in IPES Integrity Program compliance is monitored and approved through the IPES Exception Reporting process.	maintenance, inspection, and/or testing tasks with action signed-off by the appropriate level of Operations Management per FIMS process IMPACT database record of incidents shows no pipeline equipment integrity failure incidents.
			Minimise the impact on commercial fisheries from a LOC	**CM51:** Utilisation of idle fishing vessels	Opportunities to utilise idle fishing vessels, if deemed suitable, for oil spill response and monitoring activities will be taken where there is agreement of the vessel owner and where a risk assessment shows that there are no additional risks to vessels and crew.	IMT records reflect communications with fishing industry looking for opportunities to utilise idle fishing vessels
				CM52: Communication with fisheries	Updates on oil spill response and monitoring provided to fishery representative bodies (through SETFIA) to enable accurate information on spill status, impacts and effects of spilled hydrocarbons on seafood safety to be provided to fishing industry members and the public. Daily updates provided in the first week until the modelling is completed and then as needed, until source control has been achieved (and beyond if there is ongoing concern).	IMT records reflect communications with SETFIA.
Platform Operations	Accidental Release - LOC (bulk storage topside)	Change in water quality Injury / mortality to fauna	No spills to the environment	**CM39:** Equipment strategies for pressure equipment developed and actioned per FIMS process	Inspection and condition monitoring occurs within the parameters defined in FIMS to prevent serious SHE risks (Consequence Category 1 or 2), including a process for managing plans that are in exception. Plans are developed in accordance with requirements of Pressure Equipment Inspection Program Manual. Equipment strategies for pressure equipment and are scheduled in IPES. This may include • PSV function checks • Corrosion inspection • Piping (external and internal) • Vessel inspection	IPES – computerised maintenance management system status reviewed and reported monthly Monthly exception reports shows any overdue maintenance, inspection, and/or testing tasks with action signed-off by the appropriate level of Operations Management per FIMS process

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
					Pressure equipment includes: • Tanks (DGI) (atmospheric including jacket leg storage) • Pressure vessels Integrity Program compliance is monitored and approved through the IPES Exception Reporting process	IMPACT database record of incidents shows no pressure equipment integrity failure incidents.
				CM54: Change out of IBC operating procedures	Change out of IBC conducted in accordance with relevant operating procedure • Changing Out Diesel Bulky Packs • Change out of Chemical Bulk containers	PTW records for liquid bulk transfers
				CM12: OPEP	Emergency response activities will be implemented in accordance with the OPEP.	Records confirm that emergency response activities have been implemented in accordance with the OPEP.
Platform Operations	Accidental Release – LOC from drain system	Change in water quality Injury / mortality to fauna Change to the function, interests or activities of other users.	No spills to the environment	**CM46**: Maintenance and testing of Open and Closed Skimmer Piles	Maintenance and inspection of open and closed skimmer pile equipment will occur in accordance with the FIMS equipment strategies and as scheduled in IPES. Pile equipment includes pumps, level indicators and instrumentation. Maintenance and inspection plans for open and closed skimmer pile equipment which are in exception must be reviewed and endorsed by the Offshore Risk, Environment and Regulatory Supervisor to ensure that potential risk posed by the deferral is mitigated or alternate controls are in place to prevent potential environmental incidents	Monthly exception reports shows any overdue maintenance, inspection, and/or testing tasks with action signed-off by the appropriate level of Operations Management. Offshore Risk, Environment and Regulatory Supervisor endorsement provided for the Environment section of report.
				CM49: Equipment strategies for equipment with protective instruments developed and actioned per FIMS process	Testing program for protective instruments occurs per requirements of FIMS Critical Function Testing Management Manual and are scheduled in IPES This includes tests for: • Pump shutdowns • Discharge valve closures • Surface shutdown Testing programs which are in exception must be reviewed and endorsed by the Offshore Risk,	

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
					Environment and Regulatory Supervisor to ensure that potential risk posed by the deferral is mitigated or alternate controls are in place to prevent potential environmental incidents	
				CM50: Closed Drain and Open Drain Piles procedures.	Monitor and respond to Central Control Panel (CCP) indicators for pile operation in accordance with pile procedures to manage operational changes and prevent incidents.	Impact database records incidents associated with piles.
				CM30: Offshore Technical Monitoring Program	Quarterly monitoring of pile trends identifies abnormalities and response actions taken to address abnormalities as required.	PS&O Technical Monitoring report documents the identification and significance of abnormalities and any action items required to address abnormalities.
				CM71: Dosing of piles with emulsion breaker	Where potential for emulsion in piles is identified (either through Offshore Technical Monitoring Program or Testing of Pile systems), application of emulsion breaker is implemented. Effectiveness of emulsion breaker dosing is monitored (per procedure GEN-110-201)	PS&O Technical Monitoring reports or FIMS testing records identify potential presence of emulsions (as required) Platform logs demonstrate effectiveness of emulsion dosing was monitored

1.2.2 Wellwork

Table 1-2 Environmental Performance – Wellwork

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
Wireline / Workover Activities (general)	Emissions to Air	Change in air quality Injury / mortality to fauna	Limit emissions to air so that impacts to air quality will be localised to the source. Limit injury or harm to fauna from air emissions.	**CM4:** Wireline / Workover work scope or plan.	Gas will be flared / vented as per Wireline / Workover work scope or plan.	Workover program shows a plan for flaring / venting is in place, as needed Daily records demonstrate that workover program has been followed.
Wireline / Workover Activities (general) Conductor cutting and pulling Conductor Clean-out Sandwash	Planned Discharge – Operational Fluids	Change in water quality Change in sediment quality Injury / mortality to fauna	Limit operational fluids discharge to water and sediment so that impacts will be localised to the source. Limit injury or harm to fauna from operational discharges to water.	**CM3:** Chemical Discharge Assessment Process	Chemicals planned for discharge are evaluated as acceptable in accordance with the Chemical Discharge Assessment Process.	Chemicals approved for use and discharge list confirms the fluids meet criteria for discharge.
Cementing	Planned Discharge – Cement	Change in water quality Change in sediment quality	Limit impacts to water and sediment caused by discharge of cement to a localised area.	**CM3:** Chemical Discharge Assessment Process	Chemicals planned for discharge are evaluated as acceptable in accordance with the Chemical Discharge Assessment Process.	Chemicals approved for use and discharge list confirms the fluids meet criteria for discharge.
Conductor Clean-out Sandwash	Planned Discharge – Solids	Change in water quality	Limit impacts to water quality from wellwork solids discharges to a localised area.	**CM5:** Collection and onshore disposal of solids.	Solid collection equipment (such as filters, sieves and settling vessels) is used when completing wellwork activities in order to capture solids for onshore disposal, so far as reasonably practicable, as per Wireline / Workover work scope or plan	Workover program shows a plan for the collection of solids as needed. Daily records demonstrate that workover program has been followed.
Wireline / Workover	Accidental Release -	Change in habitat	Limit impacts to habitat caused by	**CM41**: Crane maintenance and	Crane maintenance and inspection is carried out within the parameters defined in FIMS to prevent serious SHE	IPES – computerised maintenance management

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
Activities (general) Conductor cutting and pulling	Dropped Objects		dropped objects to a localised area.	inspection programs developed and actioned per FIMS process	risks (Consequence Category 1 or 2), including a process for managing plans that are in exception. Maintenance and inspection plans are developed per Crane Operations, Maintenance and Inspection Manual (COMI) and are scheduled in IPES This includes maintenance and inspection of: • Cranes • Rigging and lifting gear • Testing of equipment Integrity Program compliance is monitored and approved through the IPES Exception Reporting process	system status reviewed and reported monthly. Monthly exception reports shows any overdue maintenance, inspection, and/or testing tasks with action signed-off by the appropriate level of Operations Management as defined by FIMS process. IMPACT database record of incidents shows no crane integrity failure related incidents
				CM42: Crane Operations, Maintenance and Inspection Manual (COMI) - Lifting Procedures	All lifting operations to be conducted in accordance with the Lifting Procedures Includes requirements for • Qualification of crane operators/ doggers/riggers • Checking that equipment is in test • Load weights / safe working loads	PTW records for lifting operations
Wireline / Workover Activities (general)	Accidental Release - LOC (chemicals / hydraulic fluids)	Change in water quality Injury / mortality to fauna	No spills to the environment	**CM15:** Preventative Maintenance System	Equipment used for wellwork activities is maintained in accordance with the relevant PMS (contractor or Esso dependent on equipment).	Records demonstrate maintenance has been conducted in accordance with the relevant PMS.
Wireline / Workover Activities (general)	Accidental Release - Loss of Well Control	Change in water quality Injury / mortality to fauna	No spills to the environment	**CM32:** NOPSEMA accepted Well Operations Management Plan (WOMP)	The NOPSEMA accepted WOMP demonstrates how the risks to the integrity of the wells will be reduced to as low as reasonably practicable (ALARP). This includes: • Two barriers have been maintained	Records confirm a NOPSEMA-accepted WOMP was in place before operations commenced.

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
Platform Operations Subsea Facility Operations		Change in habitat Change to the function, interests or activities of other users.			• Barrier integrity is tested and verified. • And that suspended wells are left in a safe state.	Records demonstrate that operations take place in accordance with processes described in the WOMP.
				CM33: Wellwork Execution Manual (WEM)	Wellwork procedures are prepared in accordance with the WEM for each wellwork activity and consider: • well design; • fluid selection; and • formation pressures, to ensure that there are two barriers in the well at any time. Procedures are signed off at appropriate level of management	Records demonstrate that a wellwork procedure has been prepared and signed off by the appropriate level of management before wellwork operations have commenced. Records demonstrate that operations take place in accordance with processes described in the procedure.
					The workover program outlines the well control equipment to be used.	Records demonstrate that well control equipment was tested prior to wellwork operations
				CM34: NOPSEMA accepted Safety Case	The NOPSEMA accepted Safety Case demonstrates how the risks to the integrity of the wells will be reduced to as low as reasonably practicable (ALARP). This includes: • Planned maintenance of pressure well control equipment • Testing of well control equipment • Validation of activity specific safety critical equipment	Records confirm a NOPSEMA-accepted safety case was in place before operations commenced. Records demonstrate that operations have taken place in accordance with processes described in the Safety Case.
				CM48: Well Integrity Management System (WIMS)	Periodic pressure monitoring, testing, preventative maintenance and downhole corrosion control is conducted in accordance with the Well Integrity Management System to ensure no loss of containment due to wellbore integrity failure or wellbore equipment failure.	The Wellbore Integrity Testing Exception Report shows any overdue testing and potentially increased wellbore integrity risks, is prepared ~~monthly~~ and is signed-off by the appropriate level of management.

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
			Minimise the impact on the environment from a LOWC	**CM12:** OPEP	Emergency response activities will be implemented in accordance with the OPEP.	Records confirm that emergency response activities have been implemented in accordance with the OPEP.
				CM35: OSMP	Operational and scientific monitoring will be implemented in accordance with the OSMP.	Records confirm that operational and scientific monitoring have been implemented in accordance with the OSMP.
				CM60: Isolation test plan for platform shutdowns and subsurface isolation valves developed and actioned per FIMS process	Subsurface isolation mechanisms tests carried out within the parameters defined in FIMS to prevent serious SHE risks (Consequence Category 1 or 2), including a process for managing plans that are in exception. Isolation test plan developed in accordance with Critical Function Testing Management Manual and are scheduled in IPES Integrity Program compliance is monitored and approved through the IPES Exception Reporting process.	IPES – computerised maintenance management system status reviewed and reported monthly. Monthly exception reports shows any overdue maintenance, inspection, and/or testing tasks with action signed-off by the appropriate level of Operations Management as defined by FIMS process. IMPACT database record of incidents shows no subsurface isolation valve incidents
				CM61: Well Kill Contingency Plan	A Well Kill Contingency Plan has been prepared to ensure emergency response activities can be implemented in the event of a LOWC.	Records demonstrate that a Well Kill Contingency Plan is in place.
				CM62: Drilling Emergency Preparedness and Response (EP&R) Manual	Incident specific Emergency Response Plan (ERP) is prepared prior to relief well being drilled in accordance with the Drilling EP&R Manual, Appendix C2 which includes details of: • Relief well planning	Records demonstrate an incident specific ERP is prepared in the event of an incident which requires drilling a relief well.

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
					• Sourcing available rigs • Required resources • Notification • First Action checklists	Records demonstrate response activities have been implemented as described in the incident specific response plan.
				CM63: Monitoring relief well rig availability.	A register of the status and location of suitable rigs to drill relief wells will be maintained to ensure availability of rigs to meet committed relief well drilling timeframes (98 days as per Volume 2 Section 7.7).	A register of suitable rigs to drill relief wells is maintained and updated on a quarterly basis.
			Minimise the impact on commercial fisheries from a LOWC	**CM51:** Utilisation of idle fishing vessels	Opportunities to utilise idle fishing vessels, if deemed suitable, for oil spill response and monitoring activities will be taken where there is agreement of the vessel owner and where a risk assessment shows that there are no additional risks to vessels and crew.	IMT records reflect communications with fishing industry looking for opportunities to utilise idle fishing vessels
				CM52: Communication with fisheries	Updates on oil spill response and monitoring provided to fishery representative bodies (through SETFIA) to enable accurate information on spill status, impacts and effects of spilled hydrocarbons on seafood safety to be provided to fishing industry members and the public. Daily updates provided in the first week until the modelling is completed and then as needed, until source control has been achieved (and beyond if there is ongoing concern).	Stakeholder consultation records show communication with SETFIA per the performance standard.

1.2.3 Inspection, Maintenance and Repair

Table 1-3 Environmental Performance – Inspection, Maintenance and Repair (IMR)

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
Pipeline and Subsea IMR	Physical Presence - Interference with Other Marine Users	Change to the function, interests or activities of other users	Limit interference with other marine users to the extent necessary for the reasonable exercise of the right conferred by the titles granted.	**CM31:** Temporary storage will occur within an existing PSZ or 200m operational zone around pipelines	Equipment or infrastructure temporary stored on the seabed within PSZ or 200m operational zone around pipelines.	Subsea Material Register showing locations of temporary stored equipment.
				CM36: Pre Start notifications	Pipeline and Subsea IMR activities occurring outside platform designated PSZs will notify AMSA JRCC before operations commence to enable AMSA to distribute an AUSCOAST warning.	Records confirm that information to distribute an AUSCOAST warning was provided to the JRCC before operations commenced.
					Relevant stakeholders are notified of scheduled Pipeline and Subsea IMR activities each quarter and again one week prior to commencement.	Stakeholder consultation records confirm that information regarding Gippsland Basin scheduled Pipeline and Subsea IMR activities was conveyed to relevant stakeholders in required timeframes.
Pipeline and Subsea IMR	Physical Presence – NORM	Change in habitat	Limit impacts to habitat caused by presence of NORM to a localised area.	**CM6:** Temporary Storage Assessment	A Temporary Storage Assessment will be undertaken which will assess technical and environmental considerations associated with management of NORM.	Temporary Storage Assessment
	Physical Presence – Seabed disturbance	Change in habitat	Avoid physical damage to habitats (i.e. benthic features such as epifauna).	**CMP37:** Post campaign ROV inspection	ROVs will inspect the seafloor post pipeline or Subsea IMR campaigns to confirm that no unplanned equipment has been left on the seabed and that it is removed where practicable.	ROV campaign reports note that any identified dropped objects, debris or equipment that was not planned to be left has been removed where practicable

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
Facility IMR Pipeline and Subsea IMR	Planned Discharge - Operational Fluids	Change in water quality Injury / mortality to fauna	Limit operational fluids discharge to water so that impacts to water will be localised to the source. Limit injury or harm to fauna from operational discharges to water.	**CM3:** Chemical Discharge Assessment Process	Chemicals planned for discharge are evaluated as acceptable in accordance with the Chemical Discharge Assessment Process.	Chemicals approved for use and discharge list confirms the fluids meet criteria for discharge.
Facility IMR Pipeline and Subsea IMR	Planned Discharge – Solids	Change in water quality	Limit impacts to water quality caused by discharge of solids to a localised area.	**CM7:** Abrasive blasting SWP 50.101	Abrasive blasting area is contained to capture solids and fines as far as practicable. Captured material is sent to shore for disposal.	PTW records demonstrates solids have been contained as far as practicable.
Facility IMR	Unplanned interaction with fauna	Change in fauna behaviour	No substantial adverse effect to the population of a listed species caused by unplanned interaction with fauna.	**CM16:** SWP 50.139.A1 – Drone Operation Offshore	Drone operators must check for presence of wildlife in the work area to ensure suitable flight route planning and positioning of drone.	PTW records demonstrate that Inspection Drone Operation Checklist has been completed.
				CM17: SWP 50.313 – Sea Deck Access	Access to sea deck is restricted and approval from the supervisor must be sought prior to accessing the area. Access is only allowed in pairs and personnel must communicate with supervisors upon entry to and exit from the area	IMPACT database records show that there has been no unauthorised access to sea deck that resulted in injury or death of wildlife.
				CM13: Platform Induction Process (Greencard)	All personnel are aware of platform restricted areas, including sea deck.	Greencard demonstrates that platform restricted areas have been communicated to all offshore personnel.
				CM53: Onboarding process	All personnel pass through an on boarding process, and placement takes into account a background check.	Records show all personnel have been through the applicable on boarding process.
Facility IMR Pipeline and	Accidental Release – Dropped Objects	Change in habitat	Limit impacts to habitat caused by dropped objects to a localised area.	**CM41**: Crane maintenance and inspection programs developed and actioned per FIMS process	Crane maintenance and inspection is carried out within the parameters defined in FIMS to prevent serious SHE risks (Consequence Category 1 or 2), including a process for managing plans that are in exception. Maintenance and inspection plans are developed per	IPES – computerised maintenance management system status reviewed and reported monthly.

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
Subsea IMR					Crane Operations, Maintenance and Inspection Manual (COMI) and are scheduled in IPES This includes maintenance and inspection of: • Cranes • Rigging and lifting gear • Testing of equipment Integrity Program compliance is monitored and approved through the IPES Exception Reporting process	Monthly exception reports shows any overdue maintenance, inspection, and/or testing tasks with action signed-off by the appropriate level of Operations Management as defined by FIMS process. IMPACT database record of incidents shows no crane integrity failure related incidents
				CM42: Crane Operations, Maintenance and Inspection Manual (COMI) - Lifting Procedures	All lifting operations to be conducted in accordance with the Lifting Procedures. Includes requirements for • Qualification of crane operators/ doggers/riggers • Checking that equipment is in test • Load weights / safe working loads	PTW records for lifting operations
				CM40: Flag State lifting requirements	Vessel lifting standards and procedures undertaken in accordance with the Flag state requirements (e.g. Australia: Marine Order 32 - Cargo handling equipment).	Vessel lifting gear register confirms compliance with relevant Flag State requirements. Vessel SMS contain lifting procedures consistent with the standard required of the Flag State.
Facility IMR Pipeline and Subsea IMR	Accidental Release – LOC (chemicals / hydraulic fluids)	Change in water quality Change in habitat Injury / mortality to fauna	No spills to the environment	**CM64** Equipment Strategies for subsea facilities developed and actioned per FIMS process.	Inspection and condition monitoring is carried out within the parameters defined in FIMS to prevent serious SHE risks (Consequence Category 1 or 2), including a process for managing plans that are in exception. Equipment strategies developed in accordance with requirements of Subsea Equipment Integrity manual and are scheduled in IPES. Subsea facilities includes: ○ Wellhead ○ Tie-in spools	IPES – computerised maintenance management system status reviewed and reported monthly. Monthly exception reports shows any overdue maintenance, inspection, and/or testing tasks with action signed-off by the appropriate

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
					○ Umbilicals, terminations and flying leads ○ Subsea control modules ○ Subsea topside controls ○ Instrumentation ○ Hydraulic and utility chemical system Integrity Program compliance is monitored and approved through the IPES Exception Reporting process	level of Operations Management as defined by FIMS process. IMPACT database record of incidents shows no subsea facility incidents
				CM44: Bunding	Oil and chemical stores are located within a deck bund, and water-soluble chemicals not approved for discharge are stored in a bund that is isolated from drain/pile.	Operator first day on checks
				CM13: Platform induction process (Greencard)	All personnel are aware of spill clean-up requirements and have access to spill kits.	Greencard demonstrates that spill clean-up requirements and location of spill kits are communicated to all offshore personnel.
				CM66: PTW system	Maintenance works conducted under PTW (including JSA) • May include maintenance procedures where they exist for the task	PTW records

1.2.4 Support Operations

Table 1-4 Environmental Performance – Support Operations

<table>
<tr><th>Activity</th><th>Aspect</th><th>Impact</th><th>Environmental Performance Outcome (EPO)</th><th>Control</th><th>Environmental Performance Standard (EPS)</th><th>Measurement Criteria</th></tr>
<tr><td rowspan="4">Vessel Operations
Helicopter Operations</td><td rowspan="4">Underwater Sound Emissions</td><td rowspan="4">Change in ambient noise
Change in fauna behaviour</td><td rowspan="4">Prevent injury, harm or interference to cetaceans from sound emissions during vessel operations</td><td>CM8: Vessel Master</td><td>Vessel Master is aware and implements EPBC interaction management actions consistent with the EPBC Regulations 2000 – Part 8 Division 8.1
• Vessels will not knowingly travel faster than 6 knots within 300m of a whale or 150 m of a dolphin
• Vessels will not knowingly get closer than 100m of a whale or 50m of a dolphin
• If a cetacean approaches the vessel within the above zones, the vessel will avoid rapid changes in engine speed or direction.</td><td>Daily operations reports record when cetaceans were sighted in the caution zone and interaction management actions implemented.</td></tr>
<tr><td rowspan="2">CMP26: Fauna Observations</td><td>Vessel bridge watch officers will undertake noise mitigation training for whales which will include
a. requirements of noise management procedure (CMP33).
b. whale observation and identification and distance measurement and reporting</td><td>Training records confirm that vessel bridge watch officers are trained in the noise management procedure (CMP33).</td></tr>
<tr><td>Crew members on active duty will report observations of megafauna to bridge watch officers as soon as it is safe to do so.</td><td>Daily reports confirm recordings of cetacean sightings</td></tr>
<tr><td>CMP33:
Noise Management</td><td>During the peak Southern Right Whale (SRW) period of May to October inclusive and during daylight hours:
A. vessel bridge watch officers will observe* for whales within a radius of the vessel; and
B. When safe to do so, the activities listed below will not commence unless no</td><td>Daily reports confirm recordings of SRW sightings, and actions taken as a result of sightings are consistent with the noise management procedure</td></tr>
</table>

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
					SRW are observed for a continuous 30 minutes: i. Bringing supply vessel alongside platform during conductor cutting ii. Subsea IMR activities with noise e.g., cutting, grinding **observations can reasonably be made within a range of 0 to 6 km dependent on conditions (DEWHA, 2008)* C. If supply vessel is alongside a platform during conductor cutting, or If Subsea IMR activities with noise are underway, and If a SRW whale is sighted, and Where safe to do so: i. The vessel which is alongside the platform will move to a safe position away from the platform and away from the direction of the SRW or ii. Subsea IMR noise generating activities will be stopped, until the SRW whale moves out of sight or when 30 mins have lapsed since the last sighting. D. During night-time or at times of when visibility is limited to less than 3 km: i. Vessel operations alongside a platform or Subsea IMR activities with noise may proceed provided that there have not been any SRW observations during the preceding 24 hour period.	

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
			Prevent injury or harm to marine mammals from sound emissions during helicopter operations	**CMP4**: Helicopter Pilot	Interaction between helicopters and cetaceans within the operational area will be consistent with EPBC Regulations 2000 – Part 8 Division 8.1: Helicopters will not fly lower than 1650ft when within 500m horizontal distance of a cetacean except when landing or taking off and will not approach a cetacean from head on.	Flight reports note when cetaceans were sighted in the caution zone and interaction management actions implemented.
Vessel Operations ROV Operations	Light Emissions	Change in fauna behaviour	Lighting will be limited to that required for safe navigation and work requirements	**CMP30:** Lighting will be limited	Lighting will be limited to that required for safe navigation and work requirements and light spill to sea will be minimised.	Inspection confirms light spill to sea is minimised, except where required for safe work/navigation.
Vessel Operations	Emissions to Air	Change in air quality Injury / mortality to fauna	Fuel combustion equipment complies with the requirements of MARPOL Annex VI	**CM9:** Class certification	Fuel combustion equipment complies with the requirements of MARPOL Annex VI.	Vessels have class certification verified and issued by IACS member.
Vessel Operations	Planned Discharge - Deck Drainage & Bilge	Change in water quality	Bilge discharges from vessels comply with MARPOL Annex I requirements.	**CM9:** Class certification	Bilge discharges from vessels comply with MARPOL Annex I requirements.	Vessels have class certification verified and issued by IACS member.
			Deck drainage discharges comply with MARPOL Annex V requirements.	**CM9:** Class certification	Deck drainage discharges comply with MARPOL Annex V requirements.	Vessels have class certification verified and issued by IACS member.
Vessel Operations	Planned Discharge - Sewage and Grey water	Change in water quality Injury / mortality to fauna	Sewage discharges comply with MARPOL Annex IV requirements.	**CM9:** Class certification	Sewage discharges comply with MARPOL Annex IV requirements.	Vessels have class certification verified and issued by IACS member.
Vessel Operations	Planned Discharge – Food waste	Change in fauna behaviour	Food waste discharges comply with MARPOL Annex V requirements.	**CM9:** Class certification	Food waste discharges comply with MARPOL Annex V requirements.	Vessels have class certification verified and issued by IACS member.

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
Vessel Operations	Unplanned Interaction with Fauna	Injury / mortality to fauna	No substantial adverse effect to the population of a listed species caused by unplanned interaction with fauna.	**CM8:** Vessel Master	Vessel Master is aware and implements EPBC interaction management actions consistent with the EPBC Regulations 2000 – Part 8 Division 8.1 • Vessels will not knowingly travel faster than 6 knots within 300m of a whale or 150 m of a dolphin • Vessels will not knowingly get closer than 100m of a whale or 50m of a dolphin • If a cetacean approach the vessel within the above zones, the vessel will avoid rapid changes in engine speed or direction.	Daily operations reports record when cetaceans were sighted in the caution zone and interaction management actions implemented
				CMP25: Tunnel thruster guards	Grills are fitted to forward (tunnel) thrusters of the DSV to prevent suction / entrapment.	Inspection or drawings confirm vessel forward (tunnel) thrusters fitted with grills.
Vessel Operations ROV Operations	Accidental Release - Dropped Objects	Change in habitat	Limit impacts to habitat caused by dropped objects to a localised area.	**CM18:** Preventative Maintenance System	Visual inspection of lifting gear is undertaken every quarter by a qualified competent person (e.g. maritime officer) and lifting gear is tested regularly in line with the Vessel PMS.	Records verify that inspections and testing have been conducted to schedule.
				CM19: Cargo Securing Manual	All cargo secured in accordance with approved Cargo Securing Manual to prevent loss to sea.	Pre-departure checklist verifies that cargo is securely sea-fastened.
				CM40: Flag State lifting requirements	Vessel lifting standards and procedures undertaken in accordance with the Flag state requirements (e.g. Australia: Marine Order 32 - Cargo handling equipment).	Vessel lifting gear register confirms compliance with relevant Flag State requirements. Vessel SMS contain lifting procedures consistent with the standard required of the Flag State.
Vessel Operations	Unplanned Introduction of IMS	Change in ecosystem dynamics	No introduction and establishment of IMS Limit interference with other marine users to the extent	**CM23:** Ballast Water Management Plan	Ballast Water Management Plan approved in accordance with IMO Ballast Water Management Convention – Australian Guidelines for Ballast Water Management	Ballast Water Management Plan.

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
		Change in the functions, interests or activities of other users	necessary for the reasonable exercise of the right conferred by the titles granted.		and Development of Ballast Water Management Plans.	
				CM24: Ballast Water Certificate	Ballast Water Management Certificate approved in accordance with the IMO Ballast Water Convention, including implementation of the D-2 standard per the agreed timeline.	Ballast Water Management Certificate.
				CM25: Biosecurity clearance when entering Australian territory	Vessel Master to obtain biosecurity clearance to enter Australian territory through pre-arrival information reported through Maritime Arrivals Reporting System (MARS).	Records confirm biosecurity clearance obtained.
				CM8: Vessel Master	Vessel Master to adhere to Australian Ballast Water Management Requirements and IMO Ballast Water Management Convention.	Ballast water records show location of ballast water uptake and discharge.
				CM26: IMS Risk Assessment Procedure (IMS-RAP).	Biofouling risk assessment conducted in accordance with IMS RAP shows low risk.	Biofouling risk assessment record confirms vessel poses low risk of introducing IMS.
Vessel Operations ROV Operations	Accidental Release – LOC (chemicals / hydraulic fluids)	Change in water quality Injury / mortality to fauna	No spills to the environment	**CM20:** SMPEP	MARPOL Annex I Regulations for the Prevention of Pollution by Oil specifically require that a SMPEP (or equivalent, according to class) is in place.	Vessels have class certification verified and issued by IACS member.
				CM21: ROV pre-post dive checks	A ROV pre and post dive inspection visually check for leaks.	Records of ROV pre and post dive inspection checklist.
				CM22: ROV IMCA Audit	ROV installation inspected against IMCA Guideline.	Audit report - corrective action managed in accordance with IMC A category rating.
Vessel Operations	Accidental Release - Waste	Change in habitat Injury / mortality to fauna	Limit impacts to habitat caused by accidental release of waste to a localised area.	**CM9:** Class certification	Vessel compliant with MARPOL Annex V which includes measures to prevent loss of waste to the ocean such as: • Prohibition of discharge of garbage to the sea (other than as permitted for bilge, sewage and food waste). • Separation of garbage by recommended types	Vessels have class certification verified and issued by IACS member.

Activity	Aspect	Impact	Environmental Performance Outcome (EPO)	Control	Environmental Performance Standard (EPS)	Measurement Criteria
					• Any receptacles on deck areas, poop decks or areas exposed to the weather should be secured on the ship and have lids that are tight and securely fixed • All garbage receptacles should be secured to prevent loss, spillage	
Vessel Operations	Accidental Release - LOC (vessels)	Change in water quality Injury / mortality to fauna Change in habitat Change to the function, interests or activities of other users	No spills to the environment	**CM27:** Support vessel approach procedure	The 500m approach checklist and DP Checklist are completed prior to the vessel entering the 500 m PSZ.	Records of the facility 500 m PSZ and DP operational checklists.
				CM28: ASOG / CAMO procedures	Activity Specific Operating Guidelines (ASOG) / Critical Activity Mode (CAMO) procedures developed to IMCA Standard.	Implementation (AFI) procedures signed by Vessel Master.
				CM29: Support vessel DP system	All support vessels engaged in DP operations have Class recognised DP 2/3 notation.	Records of IACS member DP Notation, Failure Mode and Effects Analysis (FMEA), proving trials and Annual Trials.
					Watchkeepers in charge of watch hold DP certification.	Records of watchkeepers DP certificates.
				CM20: SMPEP	MARPOL Annex I Regulations for the Prevention of Pollution by Oil specifically require that a SMPEP (or equivalent, according to class) is in place.	Vessels have class certification verified and issued by IACS member.
				CM36: Pre Start notifications	Pipeline and Subsea IMR activities occurring outside platform designated PSZs will notify AMSA JRCC before operations commence to enable AMSA to distribute an AUSCOAST warning.	Records confirm that information to distribute an AUSCOAST warning was provided to the JRCC before operations commenced.
					Relevant stakeholders are notified of scheduled Pipeline and Subsea IMR activities each quarter and again one week prior to commencement.	Stakeholder consultation records confirm that information regarding Gippsland basin scheduled Pipeline and Subsea IMR activities was conveyed to relevant stakeholders in required timeframes.

1.3 Environmental Performance – Emergency Response Capability

Table 1-5 Environmental Performance – Emergency Response Capability

Performance Outcome	Control	Performance Standard	Measurement Criteria
Esso Incident Management Team is available to respond as required to coordinate spill response operations in a timely manner to minimise impact to the environment.	Esso Incident Management Team (IMT)	Trained personnel are available to fulfil Incident Commander, Operations Section Chief, Planning Section Chief, Logistics Section Chief, Safety Officer and Environmental Unit Lead roles with 1 hour of IMT activation.	Capability is demonstrated during test / drill and is documented in test/drill report Training records.
		RRT support is available for a Tier III response in: • <12 hours from notification for remote support • <72 hours for in country support	Capability is demonstrated during test / drill and is documented in test/drill report
		Emergency response capability is maintained for the duration of the activities.	IMT call out tests conducted and recorded per test schedule
Source Control equipment is available when required to prevent further uncontrolled release of hydrocarbons into the marine environment.	Agreements in place with ROV specialist	Current global agreements state that a ROV appropriate to the task will be available. Estimated 5 days from call out request to arrive in Victoria.	Current global agreement document.
	Support vessel identification process	Suitable support vessels and their location during the activity will be identified prior to rig activities.	Completed register in the Tier II/III Emergency Response Plan (ERP).
	Agreements with AMOSC for Subsea First Response Toolkit (SFRT)	Current agreements with AMOSC state SFRT will be available to deploy to field <7 days.	Annual review of agreement document.
	MoU with APPEA	Current APPEA MoU states that signatories will make best endeavours to make drilling units available for transfer between operators when requested for emergency response.	MoU document.
	Well Kill Skid	Well Kill Skid is maintained and available for use within 48 hours	Maintenance records
	Pipeline repair	Pipeline repair equipment is available for mobilisation and use within 45 days.	Capability is demonstrated during test / drill and is documented in test/drill report
	Pipeline de-pressuring and watering out	Procedures are in place for pipeline de-pressuring and watering out.	Procedures are in place for pipeline de-pressuring and watering out

Performance Outcome	Control	Performance Standard	Measurement Criteria
Equipment and third party services are available to complete oil spill surveillance and monitoring when required to gather information on the extent, severity & persistence of the oil and potential sensitivities at risk.	Helicopter fleet	A helicopter is available to complete surveillance and monitoring in <4 hours of request, subject to safe flying conditions. (Note: Assumes good visibility, daylight hours and suitable flying conditions).	Capability is demonstrated during test / drill and is documented in test/drill report
	Arrangements with third party for provision of fixed wing aircraft	Third party fixed wing aircraft will be available <24 hours from request of service.	Capability is demonstrated during test / drill and is documented in test/drill report
	Support vessel	Support vessel is available to complete surveillance and monitoring in <24 hours from request of service.	Capability is demonstrated during test / drill and is documented in test/drill report
	Agreement with third party suppliers for provision of additional vessels.	Current agreement states additional vessels will be available when requested.	Agreement document.
	Agreement with AMOSC for trajectory modelling	Trajectory modelling is through AMOSC within <4 hours of service request.	Agreement document
	Tracking buoys	Tracking buoy is available to complete surveillance and monitoring within 12 hours of spill occurring subject to safe conditions.	Functionality is demonstrated during test / drill and is documented in test/drill report
	Contract with satellite imagery provider	Current agreement with satellite imagery provides 24/7 emergency response support.	Agreement document.
	Esso initial response sampling kits	Esso initial response sampling kit with required equipment is available when required. Samples obtained within <24 hours of spill occurring subject to safe conditions.	Functionality is demonstrated during test / drill and is documented in test/drill report
	Agreement with service provider for monitoring and sampling	Monitoring and sampling service provider has capability to implement OSMP.	Annual capability review.
Dispersant and equipment for applying dispersant is available when required to reduce consequences to surface and shoreline values and sensitivities.	Esso owned Dispersant stocks	Sufficient dispersant volume (estimated 12 m^3) is available to mobilise for the first 24 hours of the response.	Annual dispersant testing report.
	Dispersant application equipment	Equipment is maintained in response ready condition.	Annual equipment inspection report.

Performance Outcome	Control	Performance Standard	Measurement Criteria
	Agreement with AMOSC for dispersant capabilities	Response capabilities maintained per service level statement including access to mutual aid and the National Plan (which provides dispersant stockpiles within 24 hours of request).	Annual assurance assessment report.
	Agreement with OSRL for dispersant capabilities	Response capabilities maintained per service level statement including access to OSRL Global Dispersant Stockpile (GDS) within 48 hours.	Annual assurance assessment report.
	Support vessel	Support vessel is available to complete surface dispersant application in <24 hours from request of service.	Capability is demonstrated during test / drill and is documented in test/drill report
	Agreement with third party suppliers for provision of additional vessels.	Current agreement states additional vessels will be available when requested.	Agreement document.
Containment and recovery equipment is available when required to recover spilt oil before shoreline or other sensitivity contact.	Containment & Recovery Vessels	Esso will have access to containment and recovery vessels per Table 6-5 of Volume 3.	Capability is demonstrated during test / drill and is documented in test/drill report
	Agreement in place with AMOSC	Esso will have required contracts, agreements and memberships with AMOSC in place to provide oil spill response equipment and personnel per Table 6-5 of Volume 3 within 72 hours.	Contracts, agreements or memberships that demonstrate access to spill response equipment and personnel
	Annual assurance assessment of AMOSC capabilities	Response capabilities maintained per AMOSC Service Level Statement.	Annual assurance assessment report.
	Personnel trained for containment and recovery activities	Personnel trained in OSR equipment operation per Table 6-5 of Volume 3 within <24 hour of request of service.	Capability is demonstrated during test / drill and is documented in test/drill report
	Agreement with waste management contractor	Current contract in place for onshore waste management in timeframe described in Table 9-6 of Volume 3.	Agreement document.
Equipment and personnel available to support shoreline protection and clean-up when requested to reduce oil impact on shoreline environmental sensitivities.	Agreement with third party OSMP consultant.	Esso will have required contract in place to enable access to personnel and resources required for implementation of OSMP in the timeframe described in Table 7-10 of Volume 3.	Current agreement in place for OSMP consultant Capability testing conducted and recorded.
	Annual review of agreement with third party	Esso will have required contracts in place to enable access to vessels needed for shoreline protection in the timeframe described in Table 7-10 of Volume 3.	Current agreement in place for vessels which meets standard.

Performance Outcome	Control	Performance Standard	Measurement Criteria
	suppliers for provision of vessels.		Capability testing conducted and recorded.
	Esso/AMOSC response equipment	Equipment is maintained in accordance with maintenance strategy. Equipment is available for deployment within 24 hours.	Monthly exception reports shows any overdue maintenance, inspection, and/or testing tasks with actions signed-off by the appropriate level of Operations Management. Capability is demonstrated during test / drill and is documented in test/drill report
	Agreement in place with AMOSC	Esso will have required contracts, agreements and memberships with AMOSC in place to provide oil spill response equipment and personnel in timeframe described in Table 7-10 of Volume 3.	Contracts, agreements or memberships that demonstrate access to spill response equipment and personnel
	Annual assurance assessment of AMOSC capabilities	Response capabilities maintained per AMOSC Service Level Statement.	Annual assurance assessment report.
	Personnel hiring agreements	Current agreements in place with labour hiring companies.	Agreement documents.
	Agreement with waste management contractor	Current contract in place for onshore waste management in timeframe described in Table 9-6 of Volume 3.	Agreement Contract. Capability is demonstrated during test / drill and is documented in test/drill report
	Agreement with contractor for Heavy Plant Equipment	Current agreement in place with contractor for Heavy Plant Equipment. Equipment is available for deployment within 48 hours.	Agreement documents. Capability is demonstrated during test / drill and is documented in test/drill report
Equipment and personnel to support oiled wildlife response are available when requested to monitor, evaluate and reduce environmental impact on fauna	Agreement in place with AMOSC	Esso will have required contracts, agreements and memberships with AMOSC in place to provide oiled wildlife response equipment and personnel per Table 8-6 of Volume 3 for deployment within 24 hours.	Contracts, agreements or memberships that demonstrate access to oiled wildlife response equipment and personnel
	Annual assurance assessment of AMOSC capabilities	Response capabilities maintained per AMOSC Service Level Statement.	Annual assurance assessment report.

Performance Outcome	Control	Performance Standard	Measurement Criteria
	Agreement in place with OSRL	Esso will have required contracts, agreements and memberships with OSRL in place to provide oiled wildlife response equipment per Table 8-6 of Volume 3 for mobilisation to Melbourne within 72 hours.	Contracts, agreements or memberships that demonstrate access to oiled wildlife response equipment and personnel
	ExxonMobil Regional Response Team (RRT)	ExxonMobil RRT OWR Core Team personnel are available for remote support within 12 hours and in country support within 72 hours.	Capability is demonstrated during test / drill and is documented in test/drill report
	Agreement with waste management contractor	Current contract in place for onshore waste management. Equipment is available for deployment within 48 hours.	Contract agreement. Capability is demonstrated during test / drill and is documented in test/drill report
Equipment and personnel to manage waste are available when requested to reduce secondary contamination impacts on shoreline environmental sensitivities	Annual review of agreement with third party suppliers for provision of vessels.	Esso will have required contracts in place to enable access to vessels needed for waste management in the timeframe described in Table 7-10 of Volume 3.	Current agreement in place for vessels which meets standard. Capability testing conducted and recorded.
	Agreement in place with AMOSC	Esso will have required contracts, agreements and memberships with AMOSC in place to provide oil spill response equipment and personnel, and waste management resources in timeframe described in Table 9-8 of Volume 3.	Contracts, agreements or memberships that demonstrate access to spill response equipment and personnel
	Annual assurance assessment of AMOSC capabilities	Response capabilities maintained per AMOSC Service Level Statement.	Annual assurance assessment report.
	Agreement with waste management contractor	Current contract in place for onshore waste management in timeframe described in Section 9.3.1 of Volume 3	Agreement Contract. Capability is demonstrated during test / drill and is documented in test/drill report
	Personnel hiring agreements	Current agreements in place with labour hiring companies.	Agreement documents.
	Agreement with contractor for Heavy Plant Equipment	Current agreement in place with contractor for Heavy Plant Equipment. Equipment is available for deployment within 48 hours.	Agreement documents. Capability is demonstrated during test / drill and is documented in test/drill report

Note: Capability and functionality testing is conducted in accordance with Section 2.5.3 and the schedule outlined in Table 2.7. These tests are also further detailed in the annual EP&R Activity Plan.

2 Operations Integrity Management System (OIMS)

The OPGGS(E)R 14(3) requires that the implementation strategy must contain a description of the environmental management system for the activity, including specific measures to be used to ensure that for the duration of the activity:

a) the environmental impacts and risks of the activity continue to be identified and reduced to a level that is as low as reasonably practicable (ALARP); and

b) control measures detailed in the environment plan are effective in reducing the environmental impacts and risks of the activity to as low as reasonably practicable and an acceptable level; and

c) environmental performance outcomes and standards set out in the environment plan are being met.

The Environmental Management System (EMS) is the method by which environmental impacts and risks are managed to ensure they are reduced to ALARP and an acceptable level for the duration of the activity. The Environmental Management System on Esso facilities is called OIMS (Operations Integrity Management System). Lloyd's Register Quality Assurance Inc. has assessed OIMS and concluded that it is consistent with the intent and meets the requirements of ISO 14001 (Environmental Management Systems).

In practice OIMS comprises of a number of separate systems each designed to meet specific expectations, which are set out within a framework of 11 separate elements. ExxonMobil's OIMS Framework (Figure 2-1) establishes common worldwide expectations for addressing risks inherent in the business. The term Operations Integrity is used by ExxonMobil to address all aspects of its business that can impact personnel and process safety, security, health and environmental (SSHE) performance.

The 11 elements of OIMS interact within a hierarchy as shown in Figure 2-1. The visible leadership and commitment of management required by Element 1 is the driver for the effective implementation of OIMS. Elements 2 to 10 provide the operations of OIMS to control the hazards associated with the operation of all facilities. Element 11 provides evaluation of the effective implementation of Elements 1 to 10 through a process of periodic audits and assessments. Element 11 also drives the feedback loop within OIMS.

Key aspects of OIMS relevant to the implementation of this Environment Plan are described in further detail below. All OIMS Management Systems contribute to the effective management of the environmental impacts and risks identified in this EP.

Figure 2-1 OIMS Framework

2.1 Compliance with Laws, Regulations and Permits (OIMS System 4-2)

OIMS System 4-2: Compliance with Laws, Regulations and Permits, addresses regulatory compliance activities during all phases of operations. Several mechanisms are in place to identify new or amended requirements that may or may not have an impact on the environment:

- Active participation in industry organisations or cooperatives (e.g. APPEA);
- Active participation in local or international trade organisations;
- Subscriptions to specialist consultants, commercial publications and government provided subscriptions (e.g. SAI Global, Environment Essentials, COMLAW);
- Engagement with government agencies and review of government publications of laws and regulations; and
- Participation in government-sanctioned working committees.

If new, amended or existing requirements are identified, an assessment is made as to their applicability and possible impact on Esso operations and the environment. Environmentally relevant changes could include:

- Changes to existing legislation or introduction of new legislation
- Changes to the existing environment including (but not limited to) fisheries, tourism and other commercial and recreational uses, and any changes to protective matter requirements;
- Changes to the requirements of an existing external approval (e.g. changes to conditions of environmental licences);
- New information or changes in information from research, stakeholders, legal and other requirements, and any other sources used to inform the EP; and
- Changes or updates identified from incident investigations, emergency response activities or emergency response exercises.

Changes to legislation are screened by the Esso Regulatory Advisor before being forwarded to an appropriate Subject Matter Contact (SMC) for their determination on applicability. A tracking list of emerging / amending regulation and associated current review status is maintained by the Esso SSHE Group.

Relevant changes to protected matter management are assessed on an periodic basis by the Offshore Environmental Advisor, and incorporated into the risk assessments, control measures, EPOs and EPSs and implementation strategy in the EP where required.

Changes assessed by the Offshore Environmental Advisor are reviewed and assessed in accordance with the process outlined in Section 2.8 (Management of Change (OIMS System 7-1)).

2.2 Occupational Health (OIMS System 5-2)

The purpose of Occupational Health Management is to:

- Identify health hazards (physical, chemical and biological) in the offshore working environment, evaluate risks, control the risks and communicate health hazard information.
- Manage employee health by determining their fitness to work, assessing potentially exposed personnel and provide clinical treatment.
- Identify and communicate information on the health hazards of products.

A risk-based approach is used to ensure occupational health hazards that may exist in the workplace environment are identified and, as far as practicable, eliminated or reduced.

The Medicine and Occupational Health (MOH) Department supports offshore operations and consists of Doctors, Industrial Hygienists and other health professionals.

EAPL's first aid service ensures that emergency first aid and medical advice is provided to offshore facilities in a timely and efficient manner, 24 hours per day, year round. This includes treatment on the Platform and transfer via a medivac flight to an onshore doctor or hospital.

All major changes to first aid medication, equipment, supplies and producers are reviewed by the First Aid Review Group (FARG). This group is a committee comprising key stakeholders including offshore representatives and HSRs.

A confidential Employee Assistance program is in place to provide a range of counselling to employees and their families.

The First Aid Procedures (FAP) Manual (OIMS System 5-2) documents procedures, policies, and processes for the delivery of first aid services offshore. The Manual also details policies regarding inventory control.

Esso Australia manages infectious diseases in line with the ExxonMobil Infectious Disease Outbreak Management (IDOM) Program Manual, with Business Lines also taking guidance from individualised Pandemic Flu Management plans, which are applicable to COVID19, as they are to pandemic influenza.

These documents provide guidance for local management and operations personnel to prevent, quickly identify and interrupt infectious disease outbreaks in locations where personnel live and work together in close quarters, such as offshore installations, ships, and remote camps. The IDOM also identifies external organizations that can support management and operations personnel experiencing infectious disease outbreaks.

The purpose of these are to:

- Provide basic guidance on controls needed to prevent disease outbreaks.
- Recommend surveillance practices to quickly identify potential outbreaks.
- Recommend steps to take to limit or interrupt infectious disease transmission among the workforce when an outbreak is suspect or an outbreak occurs.
- Provide guidance on sharing lessons learned with management and Medical and Occupational Health (MOH).

The hazards and risks associated with infectious diseases are monitored by the local MOH department who recommend the controls and mitigations that are required depending on the level of risk. The local MOH department are supported by the ExxonMobil MOH group that has over 400 personnel worldwide monitoring health risks and providing international support.

2.3 Operations and Maintenance Procedures (OIMS System 6-1)

Esso has a comprehensive library of operations and maintenance procedures (managed by OIMS System 6-1) that cover the full range of activities that are undertaken throughout the Bass Strait operation. Key manuals or procedure types are:

- Platform Operating Procedures detail procedures for operating the platform, including start up procedures, critical function test procedures, process or platform shut down procedures, managing the flare, vent and drain system, and managing the produced water handling system (CM10).
- Offshore Maintenance Procedures cover inspection and maintenance related activities on offshore platforms, pipelines and subsea facilities and include: vessel tanks and exchangers; pumps; compressors; generators and turbines; piping and valves; instrumentation and electrical systems; fire, safety and protective equipment; as well as maintenance and calibration of the produced water online analysers.
- Crane Operation, Maintenance and Inspection (COMI) procedures define the responsibilities for Crane Operators, Maintenance Technicians and the Maintenance Reliability Group (CM42). COMI procedures are available for lifts including diesel, glycol and for methanol bulk transfer from supply vessels (CM14).
- The Lifting Equipment Manual (LEM) includes guidelines for use, storage, maintenance, inspection and purchase of cargo lifting gear (such as winches, jacks, hoists and rigging) used for routine cargo handling.
- Underwater Operations Manual contains marine operations procedures, although some platform based marine operations procedures are also found in the Work Management System.

Procedures are stored and accessed via a globally mandated electronic system known as the Procedures Management Electronic Tool (PMeT). This ensures that the most recent version of a procedure is readily available for use. PMeT is supplemented by physical back-up copies of many of the manuals listed above including procedures and other documents, for situations where the PMeT system is unavailable.

Risk assessment processes are used to identify when procedures are needed to mitigate a risk, and to categorise the procedures as critical procedures, normal procedures or work aids (dependent on the level of risk when completing the work described in the procedure). This assessment process establishes the approval authority, deviation authority, review period and compliance expectations.

2.3.1 Water Handling System (CM10)

Monitoring and management of the water handling process system (refer Volume 2, Figure 5-36 [Routine Monitoring, Water handling system performance]) and the oil in water monitoring system (refer Volume 2, Figure 5-36 Routine Monitoring, OIW monitoring]) consist of operations and maintenance actions, further described here; and surveillance and optimisation actions (described under CM67). Both these management controls act in concert in order to ensure the oil in water is kept at minimum levels during overboard discharge.

Water handling system - *Operations and Maintenance*

Operations procedures outline how to establish control of the process on the platform, start-up the water handling system, and troubleshoot the system. For example:

- *Water handling startup* procedures e.g. XXX-100-302 details how to perform a hot or cold restart (where XXX is platform name, e.g. TNA). In order to ensure that discharge of water on start-up is controlled (CM10d), implementation of the procedure requires:
    - Correct valve line-up/operation, auto controller function and separator levels/flow, ratios across hydrocyclones
    - Implementation of troubleshooting guides as required (i.e. poor water quality at separator or poor water quality post separator).
- *Vortoil operating principles* work aid GEN-100-101 details service troubleshooting to ensure that secondary separation equipment for managing produced water are operating optimally (CM43). This could include troubleshooting of internal blockages, wear or deterioration, general operating principles. I.e. start up, normal operation and shutdown, start up after normal shutdown, shutdown for vessel inspection.
- *Water handling matrix & bypass controls* procedure GEN-100-201 is used in conjunction with GEN-100-102 to ensure OIW levels of the discharge stream are monitored and are below the 30 mg/L 24 hour average (CM10a). Implementation of the procedure requires:
    - backup protective devices must be in operation should a piece of equipment be bypassed or isolated. In particular, if the online OIW monitor is down for maintenance, low flow, spurious, or out of service, then an hourly Spec 21 must be conducted.

Maintenance is performed to keep the system working properly. For example:

- *Vortoil service* procedure e.g. OFS MP XXX 110 (where XXX is platform name, e.g. TNA) details the cleaning and inspection of [platform] Vortoils [hydrocyclones], including removal and replacement of liners, gaskets, o-rings, inspection for wall thickness and cleaning of vessel internals.

Oil in Water monitoring - *Operations and Maintenance*

Instantaneous monitoring of oil in water is available on the platform and a comparison of platform results with the LFD Laboratory takes place on a regular basis to cross-check the platform’s online monitor. For example:

- *System Monitoring, Recording & Reporting work aid* GEN-100-102 is implemented:
    - Primarily to ensure that OIW levels of the discharge stream is continuously monitored and maintained at concentrations below 30 mg/L 24 hour average (CM10a). Implementation of the procedure requires:
        - Sigrist alarms to be set correctly,
        - daily reporting of OIW sampling results,

- Secondly, to ensure the 24 hour average of online monitor is verified via:
    - the requirement that a 'Spec' reading using an infrared Spectrophotometer ("Infracal" unit) be taken every six hours;
- Thirdly, to ensure that the online monitor is calibrated (CM10b). This requires:
    - that a verification sample be sent to the shore laboratory every month for cross-check.
    - *Oil In Water Monitor Cleaning & Lamp Replacement* procedure GEN-100-503 details Sigrist shutdown, start up and general troubleshooting, Sigrist cleaning (including cleaning of the degasser pot and sample conditioning pot as well as lenses and air eductor) and Spectrophotometer lamp replacement
- *Determination of Oil In Formation Water* GEN-100-701 procedure details correct methodology to accurately determine oil in formation water to ensure that the online monitor is calibrated (CM10b). This requires:
    - Execution of the correct sample and extraction method including:
        - Extraction with the use of acid and Horiba via a solvent extraction method;
        - Recycling of contaminated Horiba Solvent S-316 in order to purify it for reuse; and
        - Testing and calibration of the InfraCal spectrophotometer unit.

Maintenance and calibration is performed on the online OIW monitoring unit, and alarms are functional in order to initiate water handling shutdown if required based on the OIW monitor.

- *Oil In Water Monitor Service* procedure OFS MP ALL 512 is implemented to ensure the online monitor accuracy is maintained through servicing (CM10c). Implementation of this procedure requires:
    - checking the accuracy and maintaining the condition of oil in water monitor;
    - cleaning of lenses, use of a calibration rod to system-calibrate the online oil in water monitor, air dryer maintenance, electrical maintenance, UV lamp replacement, testing the oscillating mirror in SIPRO units and troubleshooting common problems.
- *Critical function testing* tests ensures the alarm and shutdown functionality at the online OIW monitor are working. For the system to be considered functional:
    - The water handling system to shutdown after 30 mins where online oil in water monitor readings exceed 50 mg/L and 15 seconds where readings exceed 100 mg/L, and water is either directed to the onshore pipeline or the platform is shut down.

2.4 Facility Integrity (OIMS System 6-2)

The Facility Integrity Management System (FIMS), defines the key processes, standards and tools to be applied to the integrity management of critical equipment. Critical equipment is defined as equipment where failures could pose a serious threat to people (safety and health), the environment, property, security or have a significant business impact. Criticality categories are assigned based on these threats through a formal Consequence Assessment Process. FIMS provides a structured approach to managing facility integrity by developing barriers to *prevent* facility integrity incidents from occurring, *detect* facility integrity threats before an event occurs and to *respond* and *recover* effectively and efficiently by limiting consequence escalation.

Changes in the status of a facility from producing to non-producing does not alter the fundamental approach to the maintenance of equipment within FIMS. A Section 572(2) Maintenance Review mechanism will be developed as part of the initial activities undertaken as a facility begins to approach the CoP stage, while a review of critical inspection and maintenance controls for facilities already in CoP will be undertaken. Until such time as the Section 572 (2) Maintenance Review is undertaken, equipment will continue to be managed in accordance with existing FIMS processes, regardless of operating status. These processes are discussed further in Volume 2, Section 2.4.4.3 of this EP.

FIMS has three key steps in its process, these are:

- Program Design
  - identifying critical equipment through risk assessments
  - developing equipment strategies (for high complexity critical equipment) and maintenance plans (for low complexity critical equipment)

  The criticality categories drive the requirements of the Equipment Strategies which are designed to prevent incidents that pose a threat to people (safety and health), the environment, property, and security or have a significant business impact. The Equipment Strategies and Maintenance Plans are designed to be fit-for-risk and consider regulatory requirements, applicable industry codes, and recommended practices.
- Program Execution
  - developing plans and scheduling into the computerised maintenance management system (IPES)
  - monitoring of schedule
  - executing and assessing the data
  - analysing facility integrity incidents (root-cause failure analysis)
- Program Stewardship and Improvement
  - management reporting and review
  - continuous improvement and program redesign

FIMS has a number of Individual Integrity Programs which document the process applied to manage the ongoing integrity of specific equipment and/or asset covered by that program and all follow the system objectives and process steps described above. Each FIMS program has a Program Owner who oversees and is responsible for, the programmed work on the equipment. Each item of equipment has an overall Program Owner even though several programs may apply to that one item. These programs are:

- Corrosion Control & Chemical Injection;
- Pressure Equipment;
- Pipelines;
- Structures and structural equipment;
- Machinery;
- Subsea Equipment;
- Critical Instrumentation, Controls & Alarms;
- Electrical Systems;
- Cranes & Lifting Gear;
- Emergency Communications;
- Gas & Fire Detection/Safety Equipment;
- Oil Spill Response Equipment; and
- Personnel Protection Equipment

Note: Well integrity is managed under OIMS System 6-3.

Computerised Maintenance Management System

Maintenance and inspection program tasks and requirements are contained within a computerised maintenance management system (IPES). Planners, Supervisors and Technicians use IPES and other tools to generate work requests and work orders, plan and schedule work, order parts & materials, write technical reports and record failure mode and other useful data.

Execution

Maintenance and inspection program tasks are undertaken in accordance with the Maintenance System Manual which describes the requirements and procedures for implementation of all planned maintenance work and for the treatment of new work which has been identified. Reporting of maintenance work is done by the person who completed the work and this includes information such as, as found and as left condition of the equipment, test and inspection results, updating of documentation and also has a process for notification of any additional work or corrective actions identified as a result of the maintenance or inspection task. The results may also be used to determine whether a review of the integrity program (which may result in a change to the condition monitoring or inspection program and schedule) is appropriate.

New work notifications are categorised and recorded through IPES Work Notifications and have a defined process for assessment and implementation. The notification categories include Break-in (Corrective Work that is urgent enough to "break in" to the weekly work schedule) and Emergency work (Corrective Work that needs attention within 24 hours because of significant SSHE or business need, breakdown or shutdown) to address urgency and criticality of the new task.

A Risk Based Work Selection (RBWS) process is used to assess work notifications. Operations, maintenance and technical (where required) personnel (OMT Forum) screen the notifications and use the risk based selection tools (Work Selection Matrix, Work Selection Worksheet and interpretive guidance document) to validate and approve new work notifications including the timeframe in which the task is required to be performed. The Work Selection Worksheet assesses the unmitigated and mitigated safety, health, environmental, economic and business disruption risk (each is assessed separately) based on the proposed task. Any corrective tasks consider the *prevention, detection* and *response/recovery* opportunities used per the initial development of the maintenance or inspection activity (refer above).

Equipment that is found to be inoperable, faulty or out of service is managed in the field through the Work Management System (OIMS System 6-4, refer Section 2.6) and includes controlled processes such as isolation systems (locking and tagging), temporary defeat and shutdown, which must be approved and recorded in the electronic Permit to Work system (ePTW) and reviewed at every change of shift. The Work Permit process is designed to identify and safely manage all work that occurs on facilities including on or around effected equipment.

Details of the process for maintenance of non-producing equipment is included within Volume 2, Section 2.4.4.3 of this EP.

Stewardship and Reporting

Integrity Program compliance is monitored through the IPES Exception Reporting process which monitors if tasks associated with integrity critical equipment ("A" and/or "B" critical equipment) are carried out per the approved work plans. Integrity critical equipment is that which if deferred and/or not performed could pose a serious threat to people (safety and health), property, the environment, and/or significant business impact. Serious threat is defined as those events that could lead to a consequence 1 or 2 risk per the ExxonMobil risk matrix. Potential work plan schedule deviations are subject to risk-based analysis to allow for rescheduling, or developing and implementing corrective action plans through the MOC process. Program tasks are analysed on a monthly basis to identify maintenance, inspection or testing tasks that were due during the month but not completed. Figure 2-3 describes the guidance for integrity threat identification and use of the MOC process. The process flow for critical preventative maintenance in exception which is shown in Figure 2-3 which shows how risk analysis (RBWS) is used to inform the review process.

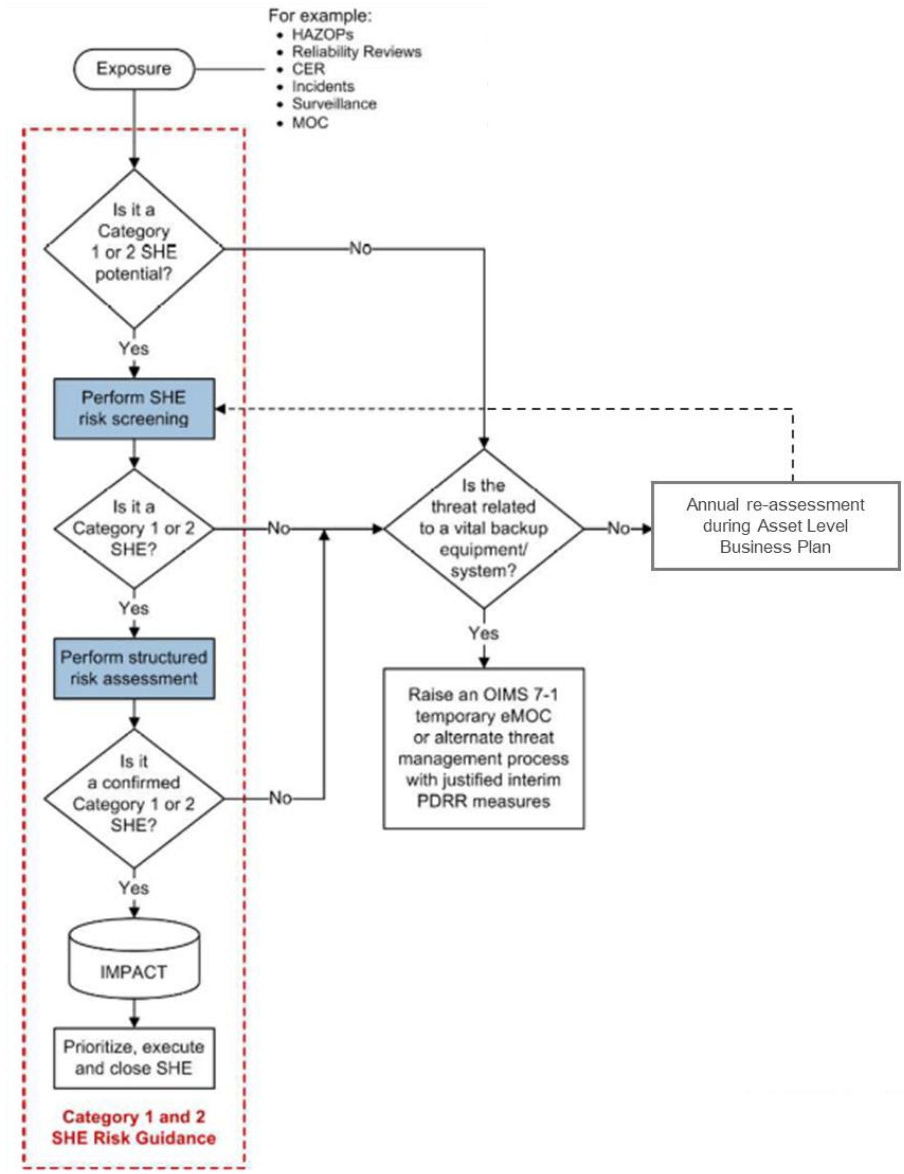


Figure 2-2 Guidance for Integrity Threat Identification: Category 1 and 2 SHE Risks Evaluation

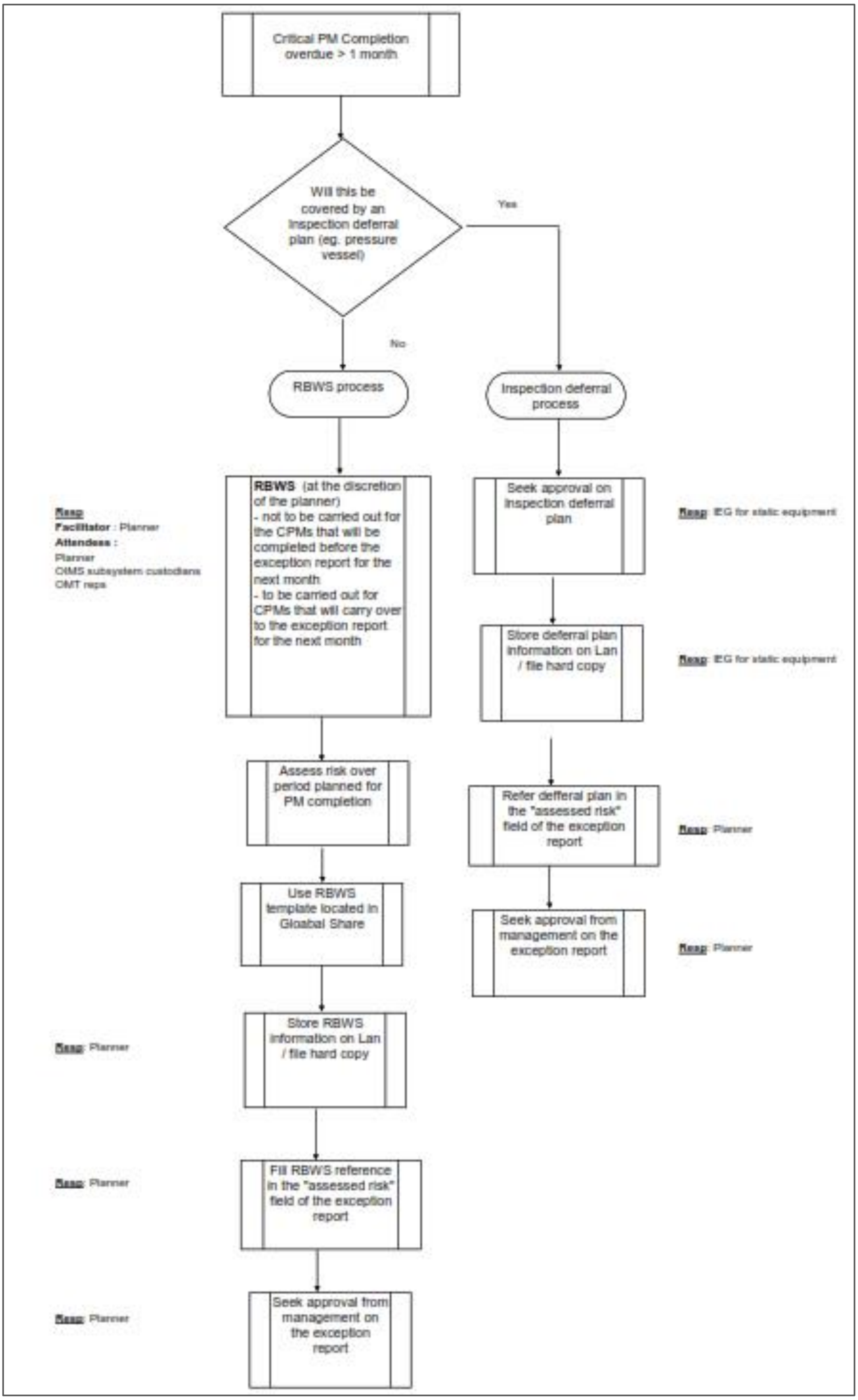


Figure 2-3 Critical PM Exception Process

An exception report is prepared for the Operations Superintendent to review at the end of each month detailing all agreed Key Performance Indicators that measure the effectiveness of the system and includes integrity critical equipment program tasks past their expected due date.

The Operations Superintendent, with appropriate technical and operations staff assistance, evaluates the risk to the operation. At the end of each month critical equipment program tasks that have exceeded their latest acceptable completion date must be reviewed by the Operation Superintendent. The Operations Superintendent, in consultation with technical and operational staff, evaluate the risk to the operation and take one or more of the following actions:

- Request that the task be conducted immediately
- Implement special precautions for continued operations
- Shuts down the critical equipment (or protected equipment) until the tasks are executed
- When regulations address maintenance, inspection, or testing task frequency, arrange for the task to be undertaken or obtain an appropriate extension from the regulatory body, if allowed.

Extension of integrity critical equipment program tasks by more than 30 days past the latest acceptable completion date (referred to as exceptions >30 days) requires a plan to perform the task within a timeframe that meets the asset's safety and reliability objectives, and requires approval by the Operations Superintendent. Exceptions > 90 days requires endorsement by the Operations Superintendent and approval by the Production Manager, allowing use of each individual's judgement to trigger a formal risk assessment to inform their decision if required.

Environment Critical Equipment

The exception report includes a section which reports on environment critical plans which have passed their scheduled completion date. Specific equipment which directly monitor or are designed for planned discharges, has been identified as environment critical and currently includes all oil in water monitors for platforms that discharge produced formation water and the pile systems on producing platforms. All maintenance and inspection programs associated with this equipment appear in the exception report if they are not completed by their scheduled date. The Offshore Risk, Environment and Regulatory Supervisor is required to review the environment section of the exception report and provide endorsement if satisfied that the risk posed by the deferral is mitigated or alternate controls are in place to prevent potential environmental incidents and thereby breaches in environmental commitments associated with discharges from this equipment.

MOC – Equipment Strategies

Revisions or changes to equipment strategies occur through a formal process and are initiated through the Triggered Equipment Strategy Review Request Form. Examples of triggers include:

- change in a process condition or
- change or deviation in performing a mitigation task
- near miss or incident where the level of maintenance is a root cause or a contributing factor
- it is proposed to change the scope or frequency of a PM task
- circumstances change in such a way as to significantly alter the risk of equipment failure

The nature of the critical equipment and the type of change request will determine the level of review and approval necessary before the change can be made. This may include a full workshop risk review. The reviews take into consideration the purpose of the criticality classification (threat to people (safety and health), property, the environment, security or business impact) and also whether the proposed change will impact these or on the regulatory requirements, applicable industry codes, and recommended practices.

Deviations to the Equipment Strategy program must be endorsed by the Program Supervisor and approved by respective Site Operations and Maintenance Superintendents and must still meet the initial objectives and considerations of the strategy with regard to the criticality classification.

MOC – Computerised Maintenance Management System

Change requests can also be triggered through IPES which has an electronic workflow of approval steps to allow changes. These are based on the type of change requested (8 types of change are considered including equipment type, maintenance frequency, parameters etc.). Each type of change must follow the requirements of the IPES Change Request approval matrix which defines the level of endorsement and approved needed from the IPES Lead through to the FIMS Program Supervisor approval with Maintenance Superintendent endorsement. If the change involves a change to an equipment strategy, IPES rejects the request (requiring the requester to use the Triggered Equipment Strategy Review Request Form, as above).

2.5 Well Management System (OIMS System 6-3)

The Well Management System (OIMS System 6-3) provides the structure for wellwork planning and operations as well as ongoing well integrity activities. The Well Integrity Manual provides guidelines to comply with OIMS System 6-3, Well Management, and country specific regulations. The Manual describes policy, management principles, performance standards, assurance processes, procedures and practices that exist to ensure well integrity and to minimise the risk of unplanned or uncontrolled release of wellbore fluids. Monitoring and maintenance of well integrity is completed on a regular basis and includes:

- Annulus pressure monitoring and bleed down test;
- Subsurface safety valve testing;
- Wellhead and tree testing and maintenance;
- Regulatory required tests; and
- Downhole corrosion control.

The Well Integrity Management System (WIMS) (CM 48), which is described in the Well Integrity Manual, is used to ensure that well integrity tasks are scheduled for completion and the results are documented. A risk-based approach is used to determine well monitoring, testing and maintenance requirements and frequencies.

When determining these requirements consideration is given to

- well type and status,
- production method,
- mechanical condition,
- critical equipment installed,
- environmental sensitivity,
- well stream composition,
- wellhead pressure,
- regulatory requirements.

Monitoring and testing acceptance criteria are also established and routine testing or surveillance activities may identify potential issues that require further analysis.

Risk assessment processes are used during Wellwork planning and execution to identify procedures needed to prevent or mitigate risk and to categorise the criticality of the well activity procedure. The Wellwork Execution Manual (CM33) provides a process for assessing the overall risk of Wellwork operations.

Active and shut in wells equipment maintenance, well integrity and annulus integrity are conducted at the following frequency (see also Volume 2, Section 2.4.3.1)

- SSSV testing: 3 – 6 months depending on type of valve
- Annulus pressure monitoring: 6 – 12 months depending on type of well
- Wellhead and tree testing: 6 monthly

Wells that have been suspended, temporarily abandoned or abandoned (until removed from the WOMP as per *OPPGS Regulations (Well Operations) 2015. s5.17)* undergo 6 - 12 monthly pressure and fluid checks on the tubing, PA and SA (depending on the type of well) to ensure that the wells are standing full of inhibited sea water and that the down hole isolations maintain integrity.

Additional requirements for subsea wells (including old exploration wells) includes aerial inspection of subsea wells and ROV visual subsea inspection of the subsea facilities, every 3 or 6 years (depending on the risk characterisation of the well or subsea facility). This is considered to be an appropriate methodology for the following reasons:

- This monitoring / surveillance method allows the wellhead to be inspected for oil seepage, gas bubbles, for signs of extensive corrosion, damage or excessive debris and confirmation of well status (debris cap position). The debris cap protects the wellhead sealing surfaces. This cap is not removed during ROV inspections as this would increase the risk of damage to the wellhead.
- This methodology is consistent with practices adopted by other operators and ExxonMobil worldwide practice with regard to monitoring of exploration wells.
- The methodology and frequency of these inspections is consistent with the accepted Bass Strait WOMP.

Any changes to the frequencies or the testing criteria are subject to MOC approval.

All well integrity testing is done in accordance with the Platform Operating Procedures which outline specific steps to ensure the accuracy of tests while minimising the risk of spills or incidents. Testing results are reported to Wells Engineers for review. If any issues are identified during WIMS testing, appropriate mitigations are considered which may include shutting in the well until appropriate maintenance activities can be completed.

The schedule of well integrity tasks is reviewed each month and an exception report prepared for Operations Management detailing all wells for which any tasks are past due. These exception reports require the appropriate level of management approval, as defined in OIMS System 6-3, Well Management, depending on the nature and duration of the exception.

Overdue tests >3 months require a justification and action plan. Wells with known integrity issues are identified and actions are put in place to manage safety and environmental risks. This could include actions ranging from minor wireline workovers through to abandonment of wells where repair is not reasonably practicable.

2.6 Work Management (OIMS System 6-4)

The OIMS 6-4 Work Management System has two parts: the Work Management System and Safe Work Practices.

The Work Management System (WMS) describes the different types of permits and the process for work planning, authorisation, execution and re-instatement. The WMS provides a framework for identifying hazards, planning work, actively managing the risks associated with the work and confirming that interfaces with the work activity are considered appropriately. This ensures that the activities are undertaken in a structured and controlled manner to reduce the risk of incidents.

The WMS defines controls and restrictions required when simultaneous activities are planned. In particular, simultaneous operations includes helicopter procedures and communication as they relate to platform operations and vessel authorisation to enter the 500m petroleum safety zone.

The WMS also includes the electronic Permit to Work System (ePTW). The Permit to Work System requires proposed work to be planned and reviewed by the team before starting work. It includes the use of tools to identify and mitigate possible safety and environmental risks. Permits must be reviewed and approved by the person in charge before work can commence, and must be closed out once work is complete. Permits are archived electronically for a minimum period of 3 years.

The Safe Work Practices describe additional requirements for a range of specific work activities and hazards. Safe Work Practices can be referenced when preparing permits to ensure site specific risks and requirements are addressed. Examples include guidance for accessing seadeck (CM17), abrasive blasting (CM7) and the use of drones (CM16).

2.7 Environmental Management (OIMS System 6-5)

OIMS System 6-5, Environmental Management, specifically addresses corporate requirements for environmental management, including socioeconomic and community health aspects. This includes the fundamental requirement to develop Environmental Management Plans which identify and assess all environmental aspects, impacts and risks associated with Esso's activities, facilities and ongoing operations. The Environmental Management Plans must also describe how the impacts and risks are addressed and controlled. As such, this EP meets the System 6-5 requirement for an Environment Management Plan for offshore operations and is an integral part of Esso's System 6-5 documents.

In addition, System 6-5 Environmental Management, includes processes and procedures for managing environmental impacts. Processes have been developed for waste management, chemical discharge assessment, invasive marine species risk assessment, produced water adaptive monitoring and management as well as processes for calculating and reporting greenhouse gas emissions based on fuel use and flare volumes.

2.7.1 Waste Management

The Waste Management Manual (WMM) (CM 45) describes the process for labelling, storing, transporting and tracking waste. Waste is clearly labelled with the relevant EPA Victoria waste category and/or Dangerous Goods category. The WMM also details requirements for storage in accordance with EPA Victoria and/or Dangerous Goods bunding guidelines and requirements for transport to onshore including material dispatch advice (MDA).

2.7.2 Chemical Discharge Assessment Process (CM3)

Esso assesses all chemicals that are likely to be discharged during the activities described in this EP. The chemical discharge assessment process is triggered by the (Management of Change) MOC process. The introduction of a new chemical to Esso's facilities requires assessment for environmental and safety suitability in accordance with the Workplace Substances Manual.

In the absence of Australian standards regarding the suitability of chemical additives, the Offshore Chemical Notification Scheme (OCNS) is generally used as a basis for selecting environmentally-acceptable chemicals in the Australian offshore petroleum industry. The OCNS manages chemical use and discharge by the UK and Netherlands offshore petroleum industries. The scheme is regulated in the UK by the Department of Energy and Climate Change using scientific and environmental advice from the UK's Centre for Environment, Fisheries and Aquaculture Science (CEFAS) and Marine Scotland.

The OCNS uses the Harmonised Mandatory Control Scheme (HMCS) developed through the OSPAR Convention 1992. This ranks chemical products according to Hazard Quotient (HQ), calculated using the Chemical Hazard and Risk Management (CHARM) model. The CHARM model requires the biodegradation, bioaccumulation and toxicity data of the product to be provided.

Under the OSPAR Convention, organic-based compounds used in production, completion and workovers, drilling and cementing are subject to the CHARM model. The CHARM model calculates the ratio of the 'Predicted Effect Concentration' against the 'No Effect Concentration' expressed as a HQ, which is then used to rank the product. The HQ is converted to a colour banding to denote its environmental hazard, which is then published on the Definitive Ranked Lists of Approved Products (by the OCNS on its website, https://www.cefas.co.uk/cefas-data-hub/offshore-chemical-notification-scheme/). Gold has the lowest hazard, followed by silver, white, blue, orange and purple (having the highest hazard).

Products not amenable to assessment under the CHARM model (i.e. inorganic substances, synthetic based muds, hydraulic fluids or chemicals used only in pipelines) are assigned an OCNS grouping A – E, with 'A' having the greatest potential environmental hazard and 'E' having the least. Products that only contain substances termed PLONORs (Pose Little or No Risk to the environment) are given the OCNS 'E' grouping. Data used for the assessment includes toxicity, biodegradation and bioaccumulation.

Chemicals that are hazardous to the marine environment are subject to substitution warnings under the HMCS. The UK follows and applies the OSPAR harmonised pre-screening scheme and complies with the REACH recommendation to replace chemical substances identified as candidates for substitution. These substances are flagged with a substitution warning on the product template and CEFAS encourages operators to select products without a substitution warning.

The chemical pre-assessment process is the process referred to that manages a variety of operational discharges, including produced formation water (purple box in Volume 2, Figure 5-36).

The following are criteria for discharge as part of the evaluation:

- Only chemicals ranked under the OCNS rating system (i.e. 'Gold' or 'Silver' [CHARM] and 'E' or 'D' [non-CHARM], or equivalent) with no substitution warning will be approved for discharge without further assessment.
- Where no OCNS ranking is available for a chemical but ecotox data is available, an equivalence check can be completed to establish if it would have a substitution warning. The equivalence check will be completed in accordance with the assessment process outlined by CEFAS for the OCNS scheme. A chemical will be considered to be 'equivalent' if it is assessed to *not* have a substitution warning according to the criteria defined by OCNS (https://www.cefas.co.uk/data-and-publications/ocns/substitution-warning/).
- If a chemical is not on the OCNS list, has a substitution warning (or equivalent) or has limited ecotoxicity data available, then further assessment is required to determine if the chemical is suitable for discharge to the marine environment. This assessment can include:
    - For firefighting foams, that they are PFAS-free
    - Calculation of CHARM ranking in accordance with the CHARM User Guide
    - Details of the technical requirement for this product and review of any possible alternative chemicals
    - Assessment of impacts to the receiving environment from discharge in the relevant scenario
    - Consideration of additional restrictions or controls to the approval e.g. timeframes for use, periodic reassessment.

2.7.3 Vessel Management

Vessels are managed under maritime regulations e.g. MARPOL and Marine orders to minimise environmental impacts and minimise environmental risks associated with operations. A number of vessel controls have been detailed in the EP:

CM18: Preventative Maintenance System (Vessel)

Vessel have software-based system which allows ship owners or operators to carry out maintenance in intervals according to manufacturers and class/Classification society requirements

CM19: Cargo Securing Manual

The Cargo Securing Manual is a regulatory plan which ensures all cargoes other than solid and liquid bulk cargoes shall be loaded, stowed and secured throughout the voyage.

CM20: SMPEP

The SMPEP is available to assist the ship's personnel in dealing with an unexpected discharge of oil or noxious liquids, its primary purpose is to set in motion the necessary actions to stop or minimize the discharge and to mitigate its effects.

CM21: ROV pre-post dive checks:

The pre/post dive checks are conducted each time an ROV is in the water. They include visual checks of hydraulic systems to look for wear and tears to minimise the potential for hydraulic leaks.

CM22: ROV IMCA Audit

The auditing of ROV systems is usually undertaken to either ensure the equipment is fit for purpose or as part of an ongoing internal process.

CM23: Ballast Water Management Plan and **CM24:** Ballast Water Certificate

Ballast Water Management Plans and Certificates are in place in order to reduce the harmful effects on the marine environment that are spread through aquatic micro-organisms transferred from one area to another through ballasting operations of the ship.

CM25: Biosecurity clearance when entering Australian territory

The Department of Agriculture, Water and the Environment conduct an assessment on the vessel prior to entry to Australia to prevent the risks associated with international vessels, which may include rabies, foot and mouth disease, or avian flu. This could be introduced by infected animals or in food purchased overseas or from trading with overseas vessels. International vessels can bring in unwanted pests and disease.

CM27: Support vessel approach procedure

Prior to entering the 500m Platform Safety Zone, vessels complete a checklist to verify safety systems, communications and environmental conditions are in place and or acceptable.

CM28: ASOG / CAMO procedures

Critical Activity Mode (CAMO)) and Activity Specific Operating Guidelines (ASOG) set out the operational, environmental and equipment performance limits and procedures for the location and the specific activity the vessel is undertaking, including SIMOPS.

CM29: Support vessel DP system

Prior to entering the 500m Platform Safety Zone, vessels complete a DP checklist to verify systems are in place and functioning correctly.

A pre-mobilisation inspection is undertaken (Section 6.3.1) of the EP for all vessels to ensure all controls are in place.

Where a control requires ongoing compliance, it is monitored through an ongoing monthly checklist which is completed by the vessel and submitted to the Environmental Adviser with evidence.

Any breaches of vessel controls will be recorded in IMPACT and included in the monthly recordable incident report. Breaches and are reviewed with contractor management during the quarterly management review.

2.7.4 IMS Risk Assessment Process (CM26)

Esso's IMS Risk Assessment Process was developed to complement Australian IMS prevention efforts in the context of Esso's operations offshore in Bass Strait. The assessment is undertaken prior to the mobilisation of all vessels to an Esso Operational Area (as defined under the EP for the activity). The IMS Risk Assessment incorporates key considerations from other established risk assessment processes.

The IMS-RAP is to be applied to all contracted non-trading vessels undertaking petroleum activities in the Gippsland Basin.

Consistent with the 'best practice' approach set out in the IMO Guidelines for the Management of Ships Biofouling (IMO Guidelines) (IMO, 2012) the risk assessment considers many parameters of the vessel or rig including (where relevant):

- Transport method (dry versus wet haulage)
- Presence and age of antifouling coating (AFC)
- Evidence of in-water inspection by divers or inspection in dry dock and cleaning of hull
- Presence and operation of internal seawater treatment systems if applicable
- Duration of stay in overseas or interstate coastal waters
- Location of operations (operational area), timings and durations.

Where the initial indicative assessment (conducted by an IMS Expert and/or via the online Vessel Check tool www.vessel-check.com)) results in 'Low Risk', the risk assessment is provided to the Principal Officer Invasive Marine Species, DJPR. If the Principal Officer is satisfied that no further action is necessary following this consultation the vessel or rig is deemed acceptable for use.

If the risk assessment result is uncertain or high risk, or further action is recommended by the Principal Officer, an IMS Expert is consulted to determine whether additional controls can be implemented to reduce the vessel risk status to 'Low Risk'.

Examples of potential control/mitigation measures to reduce risk that may be proposed are consistent with the NBMG and the IMO Guidelines. The control measures proposed must meet the standard of performance described in IMS-RAP.

Following implementation of these mitigation measures, the IMS Expert is consulted to reassess the level of risk for the activity and determine whether the level of risk for the activity is 'Low Risk' and meets the ALARP and Acceptability criteria (Sections 3.7 and 3.8).

If this process still results in an uncertain or high risk then an alternative vessel or rig must be sought for the activity.

2.7.5 Produced Formation Water Management

2.7.5.1 PFW Adaptive Monitoring and Management Framework (CM11)

Figure 2-4 to Figure 2-7 provide a summary of Esso's Adaptive Monitoring and Management Framework. The framework consists of both routine and non-routine monitoring and/or modelling. Routine monitoring consists of:

- Annual detailed composition sampling
- Annual microtox testing
- Three yearly Whole Effluent Toxicity (WET) testing

In-sea and other types of non-routine monitoring or modelling, are proposed to be triggered if required based on certain trigger factors that may indicate that the ability to maintain the designated mixing zone could have, or may be compromised. Increased frequency routine, or non-routine monitoring/modelling can be triggered by a relevant trigger in the adaptive management process.

Note that composition sampling, microtox testing and/or WET testing or other non-routine monitoring/modelling could be triggered through other changes, such as changes to chemical additives (this section), legislation (Section 2.1, for example changes in ANZECC/ARMCANZ guidance) or changes to process conditions (e.g. via MOC, Section 2.8).

Non-routine monitoring may involve:

- Non-routine WET testing
- Dispersion modelling
- Sediment sampling
- Water sampling
- Biological sampling

A description of each component of the framework, along with associated trigger points, is provided below.

Statistical Analysis of Composition

- Results outside the existing 95% confidence interval for chemical characterization (see data file for confidence interval)
- Increasing trends of potential contaminants of concern over 3 years
- Presence of contaminant of concern not previously detected in that platform's discharge

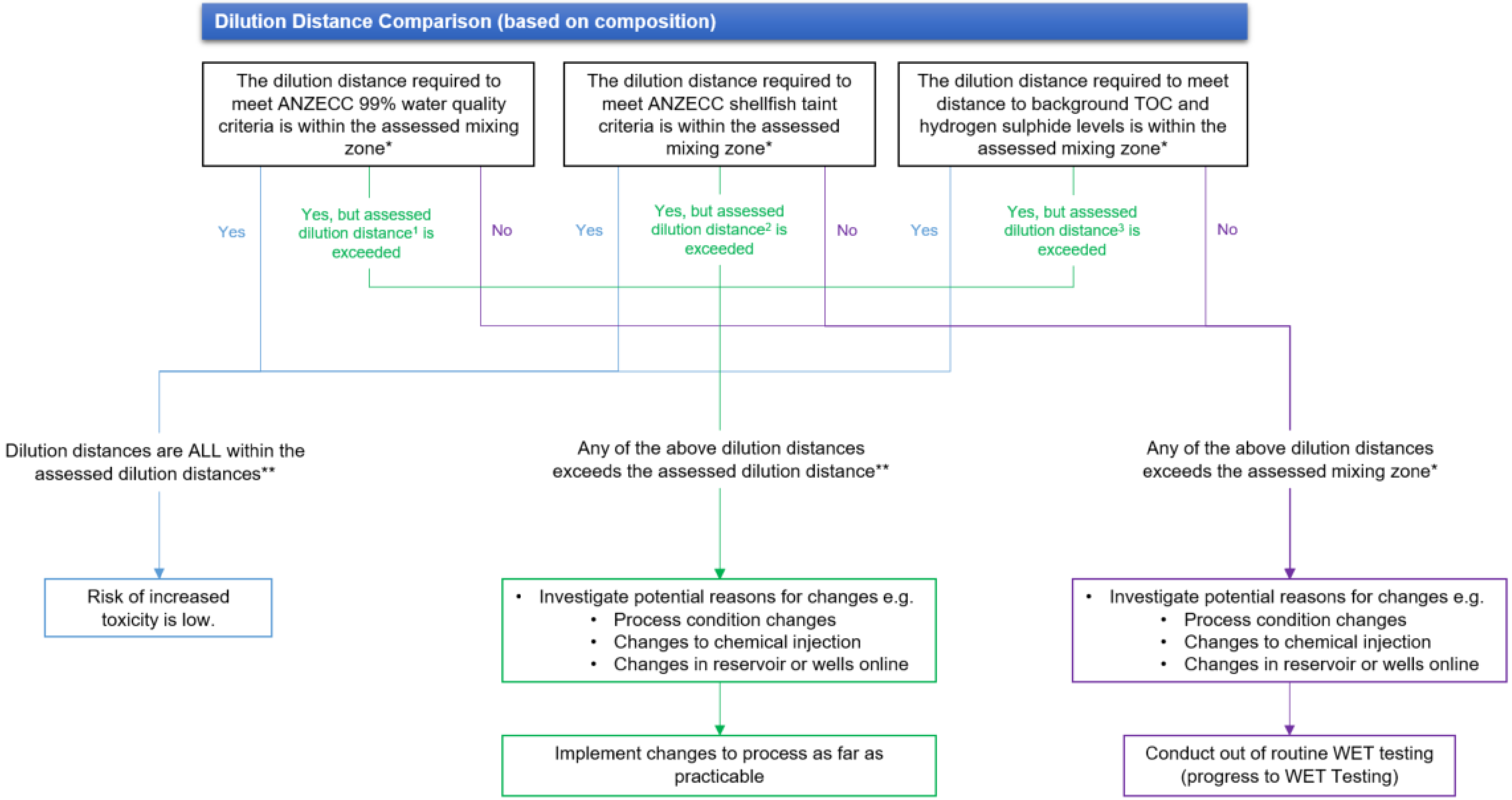
↓

- Investigate potential reasons for changes e.g.
    - Process condition changes
    - Changes to chemical injection
    - Changes in reservoir or wells online

↓

Implement changes to process as far as practicable

Figure 2-4 Line of evidence 1 – Statistical analysis of composition



** "Assessed mixing zone" refers to the "Mixing zone extent (m)" identified in Table 6-5 of Volume 2*
[1] "Assessed dilution distance" refers to the distances identified in Table 6-5 in Volume 2 required to meet ANZECC 99% water quality criteria
[2] "Assessed dilution distance" refers to the distances identified in Table 6-5 in Volume 2 required to meet ANZECC shellfish taint criteria
[3] "Assessed dilution distance" refers to the distances identified in Table 6-5 in Volume 2 required to meet background levels of TOC and hydrogen sulphide
*** "Assessed dilution distance" refers to the distances identified in Table 6-5 in Volume 2 required to meet ANZECC 99% water quality criteria, ANZECC shellfish taint criteria and background levels of TOC and hydrogen sulphide*

Figure 2-5 Line of evidence 2 – Comparison of dilution distances (based on composition)

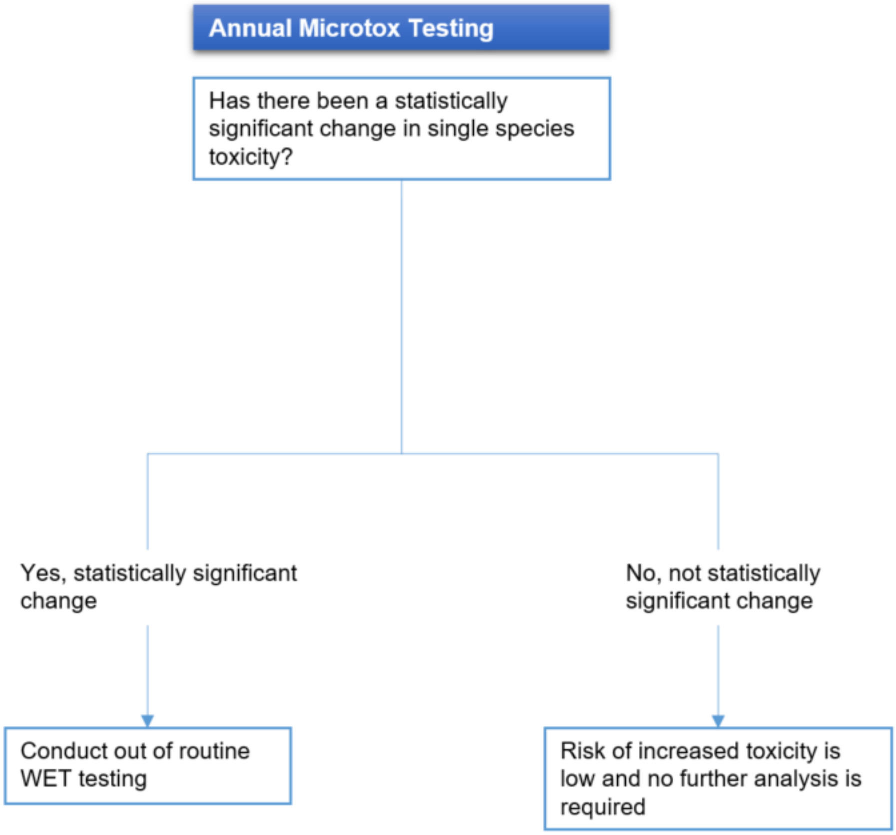
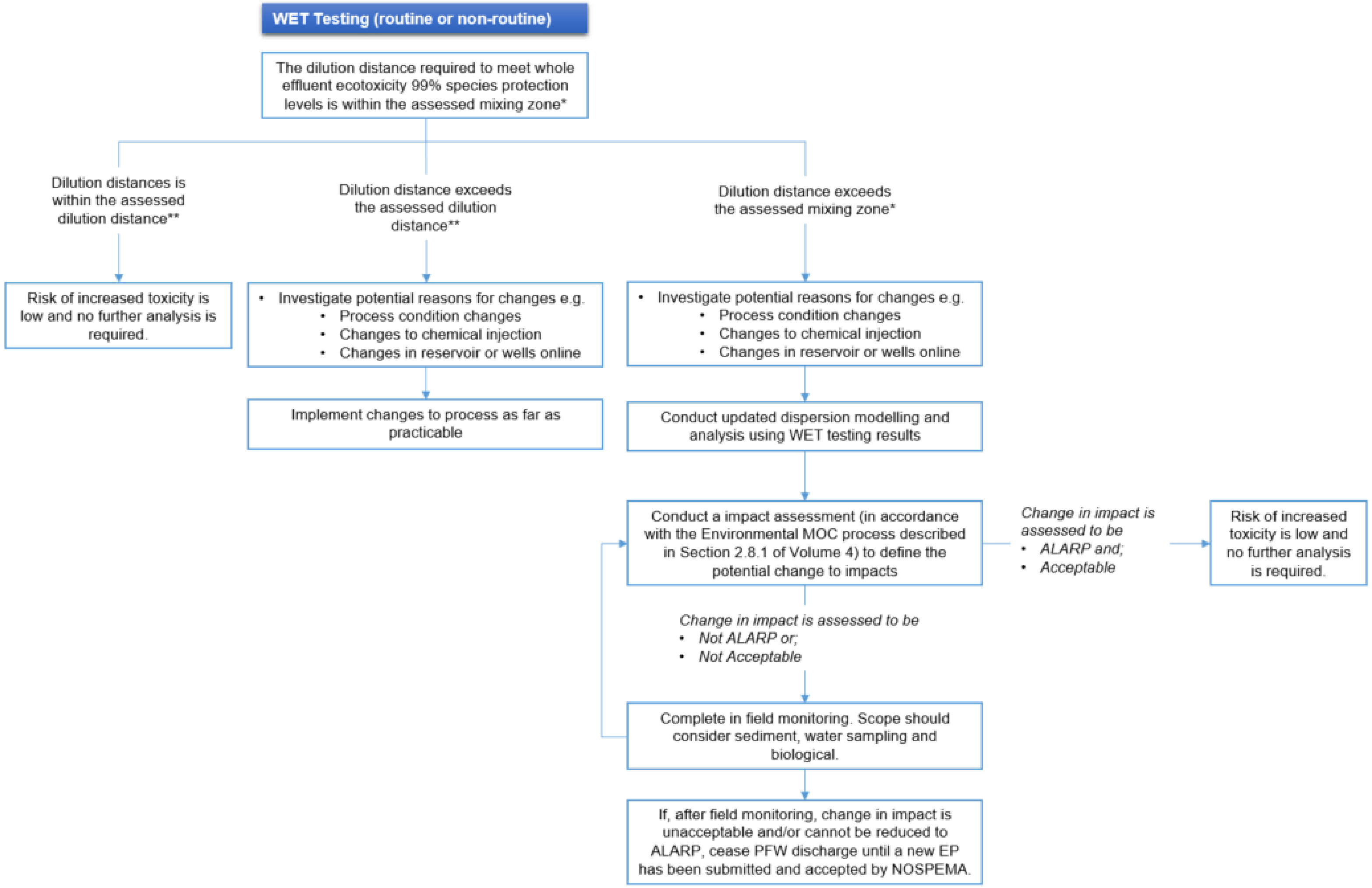


Figure 2-6 Line of evidence 3 – Microtox testing



*"Assessed mixing zone" refers to the "Mixing zone extent (m)" identified in Table 6-5 of Volume 2

** "Assessed dilution distance" refers to the distances identified in Table 6-5 in Volume 2 required to meet whole effluent ecotoxicity 99% species protection criteria

Figure 2-7 Line of evidence 4 – WET testing

2.7.5.2 Detailed compositional samples

Samples are collected in order to understand each individual platform's PFW composition and to identify changes in composition that may require management actions. Annual sampling is targeted to be completed in third quarter each year. A recurring work order directs operators to complete annual sampling before the end of the calendar year for each platform that is discharging produced water to the marine environment. Samples are sent to a third party laboratory for compositional analysis using a comprehensive suite of tests. An Environmental Advisor analyses the composition results for changes and trends, and compares the results to relevant guideline criteria.

Statistical Analysis of Composition

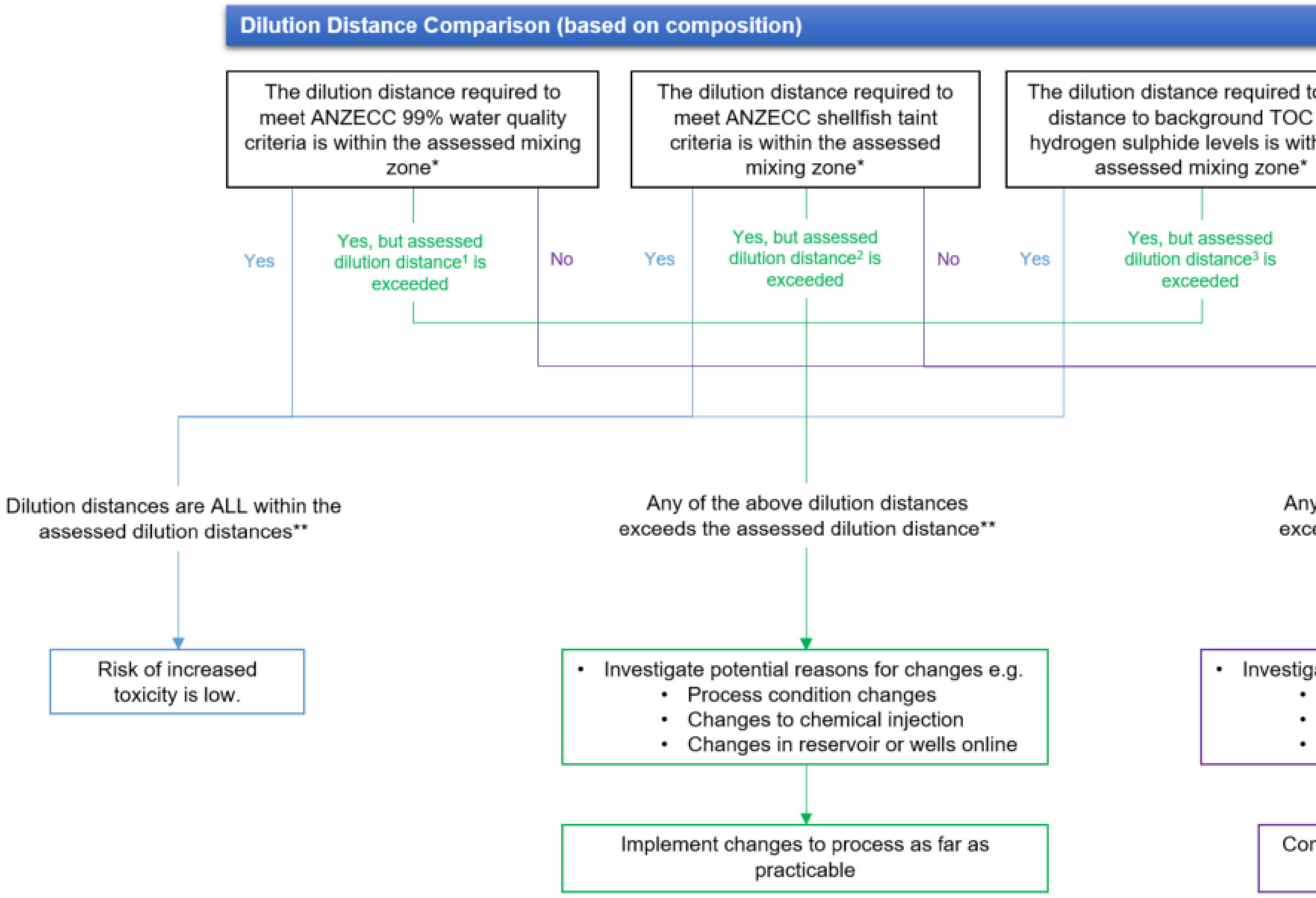
A statistical analysis of the compositional data is conducted to capture any changes that may not be detected through changes to dilution distances or microtox testing. The following will act as triggers for further investigation when analysing the results for changes and trends:

- Results that fall outside of the existing 95% confidence interval (see Volume 2 Appendix F – PFW Data File for confidence intervals)
- Increasing trends of potential contaminant of concern over 3 years
- Presence of a contaminant of concern not previously detected in that platform's discharge

If any of the above triggers are met, investigation will be undertaken to identify possible reasons for the change. The investigation will consider:

- Process condition changes
- Changes to chemical injection
- Changes in reservoir or well mix

Changes to the process will be considered as a means for reducing or preventing further increase in contaminant levels as far as practicable. If changes are not sufficient to prevent an exceedance of the assessed dilution distance or mixing zone in the following round of sampling, this will be managed via the process shown in



** "Assessed mixing zone" refers to the "Mixing zone extent (m)" identified in Table 6-5 of Volume 2*
[1] "Assessed dilution distance" refers to the distances identified in Table 6-5 in Volume 2 required to meet ANZECC 99% water quality criteria
[2] "Assessed dilution distance" refers to the distances identified in Table 6-5 in Volume 2 required to meet ANZECC shellfish taint criteria
[3] "Assessed dilution distance" refers to the distances identified in Table 6-5 in Volume 2 required to meet background levels of TOC and hydrogen sulphide
*** "Assessed dilution distance" refers to the distances identified in Table 6-5 in Volume 2 required to meet ANZECC 99% water quality criteria, ANZECC shellfish taint criteria a*

Figure 2-5 and described in under the "Dilution Distance Comparison" section below.

Dilution Distance Comparison

In parallel to analysis of changes or trends, dilution distances required to meet the following will be calculated from the results:

1. ANZECC 99% species protection water quality criteria
2. ANZECC shellfish taint criteria
3. Background TOC and H_2S levels

If the dilution distances for all of the above three criteria are within the assessed dilution distances for each (provided in Table 6-5 in Volume 2), the risk of increased toxicity is low and no further action is required based on these results. However, further sampling may be required based on the outcomes of microtox testing (see Section 2.7.5.3).

If any of the dilution distances for the above three criteria exceeds the applicable assessed dilution distance but does not exceed the mixing zone for that facility (see "Mixing zone extent" in Volume 2 Table 6-5), potential reasons for the change will be investigated. This will involve investigation into:

- Process condition changes
- Changes to chemical injection
- Changes in reservoir or well mix
- Presence of a contaminant of concern which has not previously been detected at that facility

Changes to the process will be considered as a means for reducing or preventing further increase in contaminant levels as far as practicable.

If any of the dilution distances for the above three criteria exceeds the mixing zone, potential reasons for the change will be investigated and out of routine WET testing will be triggered.

2.7.5.3 Microtox testing

Microtox testing is a single species toxicity test which will be collected at the same time as the annual chemical characterisation and, when applicable, at the same time as WET testing sampling. The single species toxicity test to be undertaken is the Acute Microtox test which measures the decreased light output (luminescence) of the marine bacterium *Viberio fischeri* after exposure to PFW. The toxicity is expressed as the concentration of the PFW sample that causes a 50% reduction in the light output of the bacteria (EC50). These samples will be statistically compared over time to determine if there is a statistically significant change in single species toxicity. It must be noted that there are limitations to these statistical tests until enough sample points have been taken.

If the change in toxicity is not statistically significant, the risk of increased toxicity is low and no further actions are required on the basis of microtox testing.

If the toxicity of the single species toxicity test has shown a statistically significantly increase, then the trigger has been exceeded and non-routine whole effluent toxicity (WET) testing will be undertaken.

2.7.5.4 Whole Effluent Toxicity (WET) testing

Routine WET testing is also performed every three years with the reasoning behind this frequency explained in the Engineering Risk Assessment in Section 6.3.10 of Volume 2. WET testing quantitatively takes into account the bioavailability and interactions of known and unknown substances.

In WET testing, toxicity tests (bioassays) determine the potential toxicity of the sample. Such tests allow for interactions between toxicants and take into account toxicants which cannot readily be measured or are not known to be present in the sample. The toxicity of the sample to temperate marine organisms is determined using chronic bioassays with species that cover a range of trophic levels.

Multiple (8+) tests are used in the WET testing. This number ensures that a range of species and endpoints can be measured with sufficient toxicity data available to establish a species sensitivity distribution (SSD) curve with 50% confidence. From the SSD, the predicted no-effect concentration (PNEC) will be extrapolated; a valuable estimate to compare the toxicity of different samples to a range of biota.

Test species are selected based on their known sensitivity to contaminants, availability of species with standardised test protocols, and, known reproducibility as surrogate test species for assessing contaminants in marine environments. Temperate species are selected in preference to tropical species, where possible, for the toxicity assessment. Toxicity tests with temperate species are carried out at their respective standardised temperatures and fall within the range of 18-20˚C.

Toxicity data generated from these toxicity tests will be utilised to determine a 95% species protection level equivalent per the guidance given in ANZECC (2000).

Species sensitivity distribution (SSD) can also be plotted to derive the concentration that protects (i.e. not harms) 95% and 99% of species with 50% confidence (the PNEC). Species protection values derived from ≥ 8 chronic toxicity values are defined as having a high reliability provided there is an acceptable fit of the data in the SSD. Toxicity data from at least eight toxicity tests is required to ensure that a Burr Type III curve fit is utilised to extrapolate species protection values however eight data points does not necessarily guarantee a good curve fit from which the species protection values are derived. The species protection values (PC95 and PC99) will be derived using the methods described in the Revised Method for Deriving Australian and New Zealand Water Quality Guideline Values for Toxicants (Warne et al., 2014).

The results of both routine and non-routine WET testing will be used to determine the dilution distance required to meet 99% species protection. This distance will be compared to the assessed dilution distance for WET testing and the mixing zone distance for each facility in Table 6-5 in Volume 2.

If the dilution distance determined based on the WET test results is within the assessed dilution distance, the risk of toxicity is low and no further analysis is required.

If the distance is greater than the assessed dilution distance but within the mixing zone in (Volume 2 Table 6-5), investigation into potential reasons for the change will occur. This will involve investigation into:

- Process condition changes
- Changes to chemical injection
- Changes in reservoir or well mix
- Presence of a contaminant of concern which has not previously been detected at that facility

If the dilution distance determined based on the WET test results exceeds the mixing zone defined in Volume 2 Table 6-5, potential reasons for the change will be investigated and updated dispersion modelling will be conducted. Based on the updated dispersion modelling, an impact assessment will be conducted to determine whether the potential change in impact is ALARP and acceptable in accordance with the OPGGS(E) Regulations. This impact assessment will be facilitated by the Environmental MOC process described in Section 2.8.1. If the change in impact is assessed to be ALARP and acceptable, the risk of increased toxicity is considered to be low and no further analysis is required.

If the impact assessment determines that the impact is either not ALARP or not acceptable, in-field monitoring will be triggered. The scope of in-field monitoring will consider sediment sampling, water sampling and biological sampling. Monitoring programs will be designed in consultation with relevant guidance (e.g. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*) to ensure the program will be appropriate for demonstrating that the environmental performance outcomes have been met (per CM68).

Following in-field monitoring, if the change in impact is unacceptable or cannot be reduced to ALARP, PFW discharge from that facility must cease until a new EP has been submitted and accepted by NOPSEMA.

2.7.6 Greenhouse Gas Calculation and Reporting

Esso calculates and reports its greenhouse gas emissions under the National Greenhouse and Energy Reporting (NGER) scheme, established by the National Greenhouse and Energy Act 2007 and administered by the Clean Energy Regulator. Esso's National Greenhouse and Energy Reporting Management Manual describes the process for tracking and collecting data for greenhouse gas emission calculation and energy reporting across Esso's operations. Esso submits a report of the total amount of greenhouse gas emissions (both emissions released as a direct result of facility activities and emissions released from indirect consumption of energy), energy consumption (including fuel gas, natural gas, electricity) and energy production (crude and condensate, LPG, natural gas, ethane) from its operations via the online Emissions and Energy Reporting System on an annual basis.

2.8 Management of Change (OIMS System 7-1)

Esso's management of change process is documented in the Management of Change Manual which sits under OIMS System 7-1 Management of Change (MOC). The objective of OIMS System 7-1 is to manage permanent or temporary changes that arise during operations and ensure that additional impacts and risks are not introduced by changes that could increase the risk of harm to people, assets or the environment.

OIMS System 7-1 is a structured process, involving relevant engineers, technicians, operations and maintenance personnel and SSHE specialists to evaluate the potential positive and negative consequences of the proposed change, and to seek the endorsement of all potentially impacted parties.

The MOC process is implemented electronically and requires a number of assessments which include technical, regulatory, safety and environmental assessments. A mandatory screening checklist is undertaken for all work being assessed under the MOC process to identify the potential for a change to or increase in environmental impacts. A mandatory regulatory checklist is completed to identify if proposed activities will result in a change to the Environment Plan, this process may trigger an Environmental MOC (detailed below). MOCs where potential environmental impacts are also identified, will also need the environmental checklist completed. Environmental and Regulatory checklists are reviewed and approved by an Environmental and Regulatory Advisor.

2.8.1 Environmental MOC Process

Esso have developed and environmental MOC process that will requires any changes to an existing or new activity against OPGGS(E)Rs. This environmental assessment has been developed to align with NOPSEMAs guidance on when a change is likely to trigger the requirement to submit a proposed revision of an EP. This testing criteria is based on NOPSEMA Guideline A515816 – When to submit a proposed revision of an EP.

As soon as a change from existing approved EP has been identified, through MOC process or HAZID risk screening the Offshore Environment Advisor will complete the assessment.

The Environmental and Regulatory Advisor assesses the Environmental MOC in accordance with OPGGS(E)R 17. A revision of the EP will be required under OPGGS(E)R 17 in the event that a proposed change:

- constitutes a new stage or significant modification; or
- introduces a significant new environmental impact or risk; or
- Significantly increases an existing environmental impact or risk.

The environmental MOC also considers the following:

- Regulation 7 – Activity contrary to the Environment Plan Sub-regulation 17(1) – New activity
- Regulation 8 – Significant new or increased environmental impact or risk
- Sub-Regulation 14(3)(a) – Have the impacts and risks been reduced to as low as reasonably practicable
- OPPGS Act (2006), Section 572 – Maintenance and removal or property etc. by titleholder
- Regulation 14(8) – maintenance of oil spill response arrangements

Minor changes (which do not trigger a resubmission under OPGGS(E)R 17) may result in administrative updates to this Environment Plan which are documented in a change register. If outcome of the assessment concludes the activity is not provided for by current EP, a revision or new EP will be submitted for assessment by NOPSEMA.

Assessments are prepared by an Offshore Environmental Advisor with relevant technical support. Dependent on their level of complexity, assessments are signed off by the Offshore Risk, Environment and Regulatory Supervisor.

Records of these assessment are stored on file. Any changes made to Environment Plans as a result of these assessments must be documented in the relevant Environment Plan's change register.

2.8.2 Temporary Storage Assessment

The Management of Change process includes a 'Temporary Storage Assessment' which is completed when there is the requirement to store property on the seabed temporarily as planning for its removal is being undertaken, or a proposed deviation to complete removal is being prepared or assessed. This process is further described in Volume 2, Section 2.4.4.3.

2.9 Contractor Management (OIMS System 8-1)

OIMS System 8-1 Third Party Services, provides a systematic approach for the selection and management of third parties doing work on the company's (Esso's) behalf. Third parties, or third party service providers, referred to here as contractors, can influence Esso's operations and reputation and therefore it is essential that they perform in a manner that is consistent with Esso's policies and business objectives. OIMS System 8-1 defines processes for contractor selection including the establishment of agreements (pre job stage) and all aspects of managing interfaces between Esso and contractors to ensure work meets Esso's expectations and is performed in a safe, secure, and environmentally sound manner (during job execution). This System applies to all contractors whether they are providing a service (including marine operations, wireline and workover operations, crane services and aviation services) or whether they are providing goods such as suppliers of critical equipment (e.g., valves, seals, gaskets, lifting equipment and cranes). Contractors are prioritised based on the environment in which they will operate, their potential SSHE impact, exposure hours/frequency of work and, once job execution has commenced, SSHE performance (categorisation can be adjusted based on SSHE performance). The prioritisation category in which the contractor is placed determines the scale/level/intensity/frequency of interface activities required for that contractor as determined by the Contractor Interface Management program.

The contractor selection and management processes are established to support two different stages of a contract life cycle:

- The first stages include requisitioning for contractor services, pre-qualifying contractors, selecting the contractor, and conducting pre-mobilisation activities associated with subsequent contractor interface management.
- The later stages occur during job execution and involve ongoing interface management to
    - ensure contractor crew understands EAPL's culture and expectations, along with the hazards at the job site;
    - communicate EAPL requirements to take proactive measures to prevent incidents;
    - maintain crew competency; and
    - monitor and steward activities to confirm that the contractor is meeting the Operations Integrity requirements of the agreement.

The pre-qualification process includes review of recent contractor performance results, reviews of contractor SSHE programs, and site visits to the contractor's facilities to validate reported performance results and evaluate a contractor's capability for effective work execution. The Esso SSHE Group participates in the pre-qualification screening and bid evaluation process including contractor site assessments, as required. OIMS System 8-1 specifies that all contractors conducting activities with potential high SSHE impact must submit a SSHE execution plan or a bridging document for the scope of work. High SSHE impacts are activities which if poorly executed could cause significant safety or environmental impacts. These may include aviation, construction, wellwork, subsea activities and vessels.

The Contractor's SSHE execution plan is required to address:

- Communication of SSHE expectations and requirements to Contractor crews and Subcontractors;
- Compliance with relevant regulatory obligations (including Environmental Management Plans, Safety Cases, relevant laws and regulations);
- Reporting of leading and lagging indicators;
- Incident investigation and management processes;
- Other specific requirements as dictated by the scope of the assignment or local site characteristics.

Esso appoints a Contract Owner and a Contract Administrator for each contractor agreement, who together with other Esso personnel, deliver the requirements of the Contractor Interface Management program. The Contract Administrator has responsibilities specific to the contractor activities in this EP. These are listed in Table 4-1.

2.10 Incident Management (OIMS System 9-1)

The purpose of OIMS System 9-1 Incident Management is to provide the requirements for proper management of SSHE incidents including initial response and notifications, investigation and analysis, documentation, communication of lessons learned, corrective actions management and the analysis of trends. In the context of this System, incidents (including near misses) are related to personnel safety, process safety, security, occupational health, equipment reliability (with SSHE consequences), environmental impact and regulatory compliance.

OIMS System 9-1 requires that:

- The incident is reported in the IMPACT database;
- An investigation occurs, if triggered by an evaluation of actual or potential incident severity; and

- The incident is correctly documented, lessons learned are communicated, and corrective actions are followed up and tracked in the IMPACT database.

The triggers and expected deliverables for incident investigations are based on incident severity (actual and potential) and are documented in the Incident Investigation and Sharing Guideline. The triggers for an investigation of an environmental incident are a significant spill to the environment, a community complaint or a regulatory reportable incident (see Table 8-2) (or other incident at the discretion of the Asset Manager).

Corrective actions that address the root cause(s) of the incident are identified and implemented to prevent the recurrence of similar incidents. Corrective actions can be improvements to facilities, programs, processes or procedures that are identified to reduce the impact or risk, and enhance the integrity of operations. Once corrective actions have been identified from incident reports (including audit and inspection reports), the implementation process is systematically managed to completion via IMPACT. This ensures results are achieved and that the improvement is documented and sustained.

Esso utilises the IMPACT incident database as the single, centralised tool for capturing data, tracking, sharing and analysing incidents, assessment findings, lessons learned and follow-up actions.

3 Platform Surveillance and Optimisation

Engineers and technical specialists support the ongoing operation of Esso's Bass Strait activities by providing technical oversight, advice and direction to offshore operators. A variety of engineers and technical specialists are responsible for monitoring and optimising the production process through surveillance of a variety of aspects of the platforms including reservoir performance, production rates, facility efficiency, and flaring rates. In addition, they are responsible for safely and effectively implementing changes and improvements to the facilities.

Operations Technical Monitoring Program (CM30)

The technical monitoring program provides a structure for undertaking process and equipment surveillance. The aims of technical monitoring are to ensure operation within the design envelope. A variety of parameters throughout the process are monitored on a monthly basis.

Technical monitoring continues once platforms suspend oil and gas production, commensurate with the platform services which are still operating.

Pile level trends are monitored on a quarterly basis. The level trends are analysed to identify if there has been any extended period of operation outside the expected operating envelope. Deviations require investigation to establish the cause and develop a corrective plan where required.

Monitoring and management of the water handling process system (red boxes in Volume 2, Figure 5-36) and the oil in water monitoring system (yellow boxes in Volume 2, Figure 5-36) consist partly of operations and maintenance actions (described under CM10); and surveillance and optimisation actions (further described here). Both these management controls act in concert in order to ensure the oil in water is kept at minimum levels during overboard discharge.

Water handling system - *Surveillance and Optimisation*

Checks are performance for the system against key operating limits/bounds and that the control system parameters are stable and functional. Chemical use to aid water and oil separation is monitored according to set targets. Trends are reviewed to make adjustments to enhance the water handling process including to reduce oil-in-water levels.

Engineers/specialists:

- Review the oil in water performance during period.
- Consider whether hydrocyclones have been operating in preferred range.
- Review pressure ratio to ensure it is appropriate.
- Review maintenance history of equipment and suggests improvements as required.
- Where performance issues are identified, review with Platform Operations. Consideration is given to adjusting operating parameters, degassing of the hydrocyclone, more frequent backflushing of the hydrocyclone, and scheduling of clean-up to clear deposits and checking for liner wear.
- Consider separator residence time, DGF gas feed rate per design (where applicable) and chemical injection rates

OIW monitoring - Surveillance and Optimisation

Trends are reviewed to make adjustments to the OIW monitor to enhance monitoring effectiveness.

Engineers/specialists:

- Consider reliability of online OIW monitor – shore laboratory trends and long term OIW trends
- Review performance against OIW discharge limits to ensure discharges remain below limits and to allow for identification of opportunities for improvement

4 Roles and Responsibilities

As required by OPGGS(E)R 14(4), this section sets out the roles and responsibilities of personnel in relation to the implementation, management and review of this EP.

4.1 OIMS Management Committee

The OIMS Management Committee (OIMS MC) has overall accountability for the implementation, execution and continuous improvement of OIMS within Esso.

Key responsibilities of the OIMS MC include:

- Demonstrate commitment to OIMS through active and visible participation in OIMS implementation, execution and improvement;
- Ensure that Annual System Reviews are conducted;
- Review key Operations Integrity performance indicators that show the status and effectiveness of OIMS implementation and execution; and
- Periodically review Operations Integrity incidents for learning and continuous improvements to OIMS.

4.2 Environment Plan Key Roles and Responsibilities

Key roles and responsibilities for Esso and Contractor personnel relating to implementing, managing and reviewing this EP are described in Table 4-1.

The organisation structure for the activities described in this EP is illustrated in Figure 4-1.

Table 4-1 Key Roles and Responsibilities

Role	Responsibility
Operations	
All site personnel	• Follow procedures and safe work practices • Comply with requirements and expectations of the Permit to Work system, including completing JSAs • Store equipment, chemicals and oils in designated areas to prevent spills to the environment • Dispose of waste in appropriate containers • Notify relevant person in charge of all environmental incidents immediately • Record and report environmental hazards
Offshore Installation Managers (OIM) / Designated person in charge	• Encourage active employee and contractor involvement in hazard identification and risk assessment processes including Job Safety Analysis and Step Back 5x5 • Ensure platform inductions (Greencards) are completed as required • Ensure waste is managed on platforms and that it is stored and sent to shore as per relevant Waste Management Plan • Review and approve Permits to Work • Review and approve daily operations performance data (e.g. water discharge, fuel and flare volumes) • Ensure periodic environmental compliance reviews are completed • Develop, track and close out corrective actions from inspections, audits or environmental monitoring in a timely manner • Ensure production operations are conducted in accordance with this EP and approval conditions • Report environmental incidents • Complete verbal notifications of Reportable incidents to NOPSEMA

Role	Responsibility
Platform Services Operator	• Deliver Platform Induction Card "Green Card" • Ensure waste is transported with correct labelling • Oversee general platform housekeeping • Correspondence with helicopters and vessels from platform

Offshore Producing Field Superintendent / Offshore Decommissioning Superintendent	• Assist Environment and Regulatory advisors to
	  ○ engage with OIMs on environmental matters
	  ○ communicate environmental expectations and guidance materials
	  ○ communicate environmental learnings
	• Ensure all personnel (including third party service contractors) on platforms complete an HSE induction
	• Ensure any environmental incidents or breaches of objectives, standards or criteria outlined in this EP are reported immediately
	• Ensure personnel are competent to perform the work they have been assigned.
	• Ensure production operations are conducted as per this EP and approval conditions
	• Stewardship and sustainability of OIMS on platforms
	• Encourage active employee and contractor involvement in hazard identification and risk assessment processes including Job Safety Analysis and Step Back 5x5
	• Manage change requests for the activity and submit MOC to notify the Offshore Environmental Adviser of any scope changes in a timely manner

Offshore Producing Asset Manager / Offshore Decommissioning Asset Manager	• Ensure sufficient competent staff to operate the platform and pipelines under normal and emergency conditions • Ensure production operations are conducted as per this EP and approval conditions • Liaise with regulatory authorities as required • Manage change requests for the activity and submit MOC to notify the Offshore Environmental Adviser of any scope changes in a timely manner • Monitor and steward close out of corrective actions identified during environmental monitoring or audits • Provide notification of potential new activity/modification of existing activity/change in stage of activity for new or increased risk to the Offshore Environmental Advisor • Review this EP as necessary and manage change requests • Verify relevant Environmental Approvals for petroleum activities exist prior to commencing an activity
Decommissioning Supervisor	• Steward development of Decommissioning activities • Manage change requests for the activity and submit MOC to the Offshore Environmental Adviser for assessment of implications for this EP • Provide notification of potential new activity/modification of existing activity/change in stage of activity for new or increased risk to the Offshore Environmental Advisor
Marine Field Superintendent	• Responsible for sourcing and contracting vessels • Liaise with *Contractor Representative – Vessel Services* • Ensure Vessel Management Team completes an Environmental Familiarisation
Wellwork	
Well Operations Supervisor	• Manages work activities in accordance with Operations, Maintenance, Wellwork and Work Management procedures

Role	Responsibility
	• Steward wellwork and contractor management requirements on Workover/Wireline Rig and Marine Operations while servicing Esso operations • Manage change requests for the activity and submit MOC to the Offshore Environmental Adviser for assessment of implications for this EP • Submit notification of potential new activity/modification of existing activity/change in stage of activity for new or increased risk to the Offshore Environmental Advisor • Verify relevant Environmental Approvals have been obtained prior to commencing activity • Ensure any environmental incidents or breaches of objectives, standards or criteria outlined in this EP are reported
Well Operations Superintendent	• Monitor and steward close out of corrective actions identified during environmental monitoring or audits • Manage change requests for the activity and submit MOC to the Offshore Environmental Adviser for assessment of implications for this EP • Submit notification of potential new activity/modification of existing activity/change in stage of activity for new or increased risk to the Offshore Environmental Advisor • Verify relevant Environmental Approvals have been obtained prior to commencing activity
Maintenance, Reliability and Integrity	
Emergency Preparedness & Response (EP&R) Advisor	• Ensure emergency drills are conducted as per the OPEP schedule • Maintain Production OPEP and ERM • Verify, maintain and monitor changes in oil spill capabilities (EPOs and EPSs)
IMT Duty Manager	• Establish and take control of the Incident Management Team (IMT) and establish an appropriate command structure for the incident. Implement Emergency Response Activities as required and as outlined in the OPEP
Maintenance Reliability and Integrity (MR&I) Manager	• Ensure maintenance and testing activities are carried out in accordance with OIMS 6-4 requirements • Ensure that a SSHE Execution plan is in place as required • Review current operations and maintenance issues with the Production Manager and the Operations Superintendent • Monitor and steward close out of corrective actions identified during environmental monitoring or audits • Manage change requests for the activity and submit MOC to the Offshore Environmental Adviser for assessment of implications for this EP • Provide notification of potential new activity/modification of existing activity/change in stage of activity for new or increased risk to the Offshore Environmental Advisor • Ensure subsea installation activities are conducted as per this EP and approval conditions • Track and report compliance with performance outcomes and performance standards as per the requirements of this EP • Verify relevant Environmental Approvals for all petroleum activities exist prior to commencing activity • Submit MOC to notify the Offshore Environmental Adviser of any scope changes in a timely manner
Production Chemist	• Ensure all chemicals proposed to be discharged are communicated to the Offshore Environment Advisor, assessed and approved prior to discharge • Ensure all production chemicals are used in approved concentrations

Role	Responsibility
	• Provide relevant documentation and assist Offshore Environmental Advisor in assessment of chemicals proposed to be discharged
Production Surveillance and Optimisation	
Production Surveillance & Optimization (PS&O) Engineers / CoP Engineers	• Close out corrective actions identified during environmental monitoring or audits. • Ensure all chemicals proposed to be discharged are communicated to, assessed and approved prior to discharge • Ensure any environmental incidents or breaches of objectives, standards or criteria outlined in this EP are reported immediately • Ensure production operations are conducted as per this EP and approval conditions • Surveillance and optimisation of production systems listed in this EP • Manage change requests for the activity and submit MOC to notify the Offshore Environmental Adviser of any scope changes in a timely manner. • Provide notification of potential new activity/modification of existing activity/change in stage of activity for new or increased risk to the Offshore Environmental Advisor • Verify relevant Environmental Approvals for petroleum activities exist prior to commencing activity
Third Party Services	
Contractor Representative – Vessel Services	• Develop and maintain a SSHE Execution Plan which details Esso EP obligations and HSE requirements • Track and report compliance with performance outcomes and performance standards as per the requirements of this EP • Verify that contractors meet environmental-related contractual obligations • Ensure personnel are competent to perform the work they have been assigned • Ensure the vessel management system and procedures are implemented • Maintain Vessel ERP • Ensure all chemicals proposed to be discharged are communicated to, assessed and approved prior to discharge • Ensure periodic environmental compliance reviews are completed. Corrective actions from inspections must be developed, tracked and closed out in a timely manner • Monitor and steward close out of corrective actions identified during environmental monitoring or audits • Ensure any environmental incidents or breaches of objectives, standards or criteria outlined in this EP are reported immediately • Ensure emergency drills are conducted as per the Shipboard Marine Pollution Emergency Plan (SMPEP) schedule. • Manage change requests for the activity and submit MOC to notify the Offshore Environmental Adviser of any scope changes in a timely manner • Provide notification of potential new activity/modification of existing activity/change in stage of activity for new or increased risk to the Offshore Environmental Advisor • Verify relevant Environmental Approvals for the activities exist prior to commencing activity
Contractor Representative – (for all contractors except for contractor providing vessel services)	• Develop and maintain a SSHE Execution Plan (if required) which details Esso EP obligations and HSE requirements • Track and report compliance with performance outcomes and performance standards as per the requirements of this EP

Role	Responsibility
	• Ensure periodic environmental compliance reviews are completed. Corrective actions from inspections must be developed, tracked and closed out in a timely manner • Verify that contractors meet environmental-related contractual obligations • Ensure personnel are competent to perform the work they have been assigned. • Ensure all chemicals proposed to be discharged are communicated to, assessed and approved prior to discharge • Close out corrective actions identified during environmental monitoring or audits • Ensure any environmental incidents or breaches of objectives, standards or criteria outlined in this EP are reported immediately • Ensure emergency drills are conducted as per the SMPEP schedule • Provide notification of potential new activity/modification of existing activity/change in stage of activity for new or increased risk to the Offshore Environmental Advisor • Verify relevant Environmental Approvals for all petroleum activities exist prior to commencing activity
Contract Administrator (Esso)	• Confirm that activities are conducted in accordance with this EP, as detailed in the approved Contactor SSHE Execution Plan (or equivalent) • Ensure contracted personnel are competent to perform the work they have been assigned • Track and report compliance with performance outcomes and performance standards in accordance with requirements in this EP • Ensure that a SSHE Execution plan is in place where required • Verify that contractors meet environmental-related contractual obligations
Safety, Security, Health and Environment (SSHE)	
Offshore Environmental Advisor(s)	• Provide day-to-day environmental support and advice • Assist with reviewing, investigating and reporting environmental incidents. • Confirm environmental incident reporting meets regulatory requirements • Compile and review environmental compliance documentation • Communicate Environmental Plan obligations to relevant personnel (including contractors) • Prepare environmental component of relevant Induction Packages • Provide material and advice to relevant personnel and contractors to assist them to understand their environment responsibilities • Confirm that activities are conducted in accordance with this EP, as detailed in the approved Contactor SSHE Execution Plan (or equivalent) • Track and report compliance with performance outcomes and performance standards as per the requirements of this EP • Ensure environmental monitoring and inspections/audits are conducted as per the requirements of the EP • Monitor and steward close out of corrective actions identified during environmental monitoring or audits • Assess change requests against the scope of the Environment Plan to ensure it meets regulatory requirements using Environmental Management of Change process (See Section 2.8) • Conduct assessment of chemicals proposed to be discharged • Assist in preparing external regulatory reports, in line with environmental approval requirements and ExxonMobil external regulatory reporting obligations • Liaise with regulatory authorities as required

Role	Responsibility
	• Verify relevant Environmental Approvals for all petroleum activities exist prior to commencing an activity
Offshore OIMS Coordinator	• Confirm environmental incident reporting meets ExxonMobil internal event recording, investigation and learning requirements
Stakeholder Engagement Advisor	• Perform ongoing liaison and notification as outlined in the EP • Prepare and implement the Stakeholder Consultation Plan Report on stakeholder consultation
Offshore Risk, Environment and Regulatory Supervisor	• Ensure any environmental incidents or breaches of objectives, standards or criteria outlined in this EP are reported immediately • Ensure ongoing engagement with government agencies and other relevant external stakeholders • Liaise with regulatory authorities as required • Monitor and steward close out of corrective actions identified during environmental monitoring or audits • Review environmental performance at Asset Leadership Team meetings. • Verify relevant Environmental Approvals for petroleum activities exist prior to commencing activity
Management	
SSHE Manager	• Hold personnel accountable for ensuring operations are conducted as per the relevant standards and commitments in this EP • Review environmental performance at Business Unit Leadership meetings.
Production Manager	• Ensure any environmental incidents or breaches of objectives, standards or criteria outlined in this EP are reported immediately • Ensure an effective organisational structure is in place, with defined roles and responsibilities to ensure the implementation of OIMS for offshore facilities and associated pipeline operations • Hold personnel accountable for ensuring operations are conducted as per the relevant standards and commitments in this EP • Verify relevant Environmental Approvals for petroleum activities exist prior to commencing activity
Projects Manager	• Ensure any environmental incidents or breaches of objectives, standards or criteria outlined in this EP are reported immediately. • Provide notification of potential new activity/modification of existing activity/change in stage of activity for new or increased risk to the Offshore Environmental Advisor • Verify relevant Environmental Approvals for petroleum activities exist prior to commencing activity

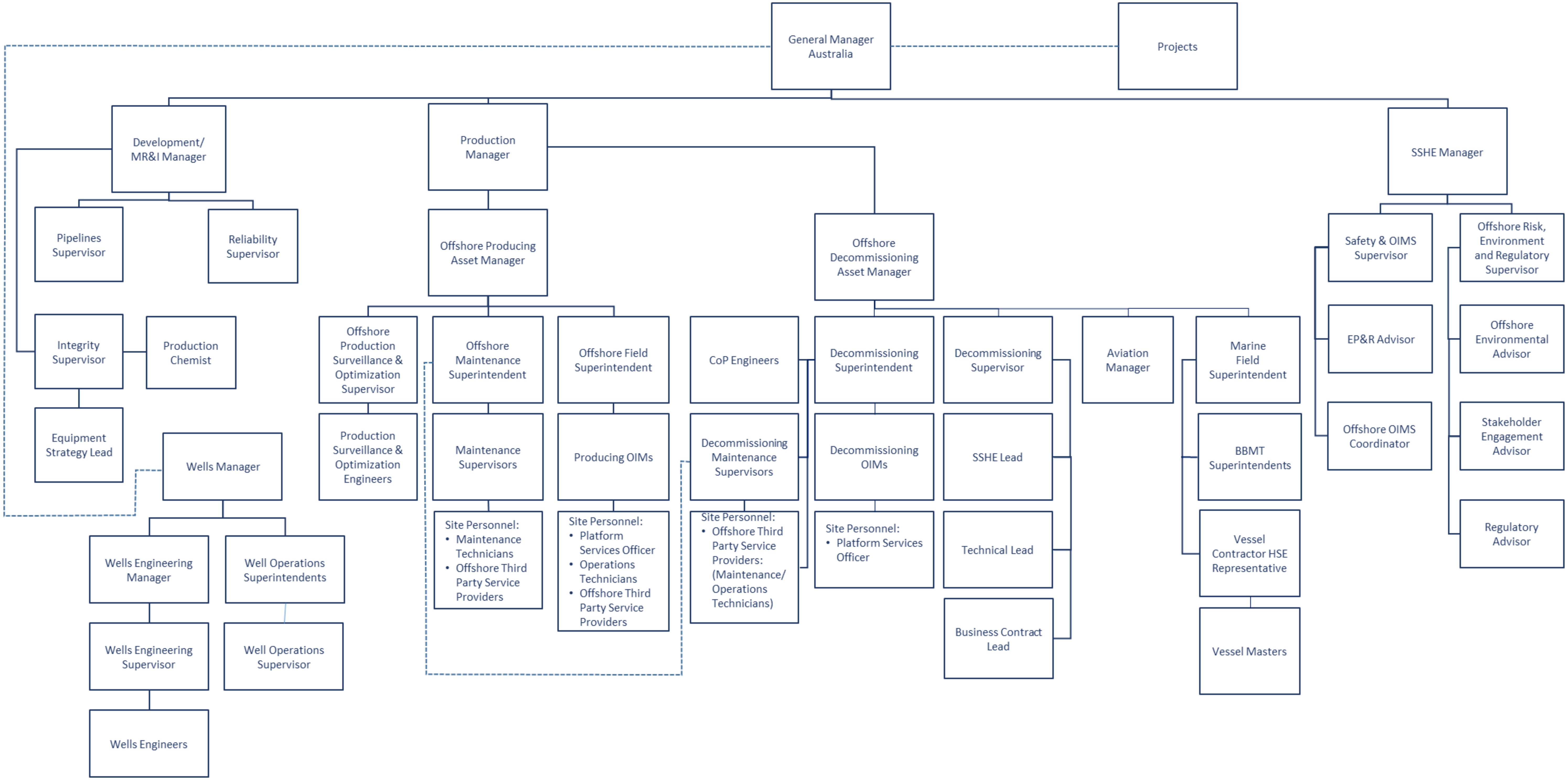


Chart current at time of writing. Subject to change

Figure 4-1 Organisational Chart

5 Training and Awareness

OPGGS(E)R 14(5) requires that the implementation strategy must include measures to ensure that each employee and contractor working on, or in connection with, the activity is aware of their roles and responsibilities in relation to the EP.

All personnel are required to be competent to perform their assigned positions. The Training and Procedures group are responsible for identifying training needs, keeping records of training undertaken, and identifying minimum training requirements of personnel. Personnel Competency is managed through OIMS System 5-1.

As part of the contracting process, Esso Procurement ensures all contractors have the appropriate qualifications, job skills and training. Additional training and familiarisation may be delivered by the Training and Procedures group or environmental and regulatory adviser.

5.1 Environmental Training

5.1.1 Environment Plan Awareness

All personnel with roles and responsibilities (as defined in Table 4-1) will complete general environmental awareness training which outlines Environment Plan importance, structure, implementation and roles and responsibilities. This training will define reportable environmental incidents and highlight the associated reporting requirements. Personnel receiving the training will be made aware of all environmental performance outcomes and standards relating to their area of work and that a breach of any outcome or standard constitutes a recordable environmental incident. This training will also cover reporting of recordable incidents.

Guidance documents exist for identifying and reporting environmental reportable incidents, identifying environmental recordable incidents and incidents involving wildlife. These documents will be reviewed, updated as required and distributed to the relevant personnel on an annual basis or if triggered earlier (e.g. following an update to this EP).

5.1.2 Offshore Induction

The Offshore Induction is compulsory for anyone accessing Esso's offshore facilities. The Offshore Induction describes basic requirements including identifying and reporting incidents to the OIM, work permits and waste management practices. Records of inductions are maintained by the Training and Procedures group.

5.1.3 Platform Induction Card "Green Card"

The Platform Induction or 'Green Card' (CM 13) is provided to all personnel that have not visited a platform before, or have not been to the platform in more than a year. The induction includes platform-specific information about environmental awareness, including reporting oil/chemical spills or potential spills and locating emergency spill kits. A record is kept of all completed inductions on the platform for a minimum of one year.

5.1.4 Vessel Management Environmental Familiarisation

Vessel Management personnel receive Esso environmental familiarisation. The familiarisation material includes specific Environmental Plan vessel requirements and definitions of an environmental incident. The familiarisation material will ensure Vessel Management personnel are aware of all environmental performance outcomes and standards relating to their work and that a breach of any outcome or standard constitutes a recordable environmental incident. This familiarisation material will also cover the requirements of the vessel contractor in relation to reporting of recordable incidents. The environmental familiarisation material will be delivered on newly contracted vessels and to new crew members when they board the vessel for the first time. The familiarisation material will be reviewed, updated as required and distributed to the relevant personnel on an annual basis or if triggered earlier (e.g. following an update to this EP).

5.2 Competency and Training

5.2.1 Esso Personnel

OIMS System 5-1 Personnel Selection, Placement and Competency Verification addresses the selection, placement, training and ongoing verification of competency of employees and contractors to meet specific job requirements

Position descriptions for Key Positions, which could have a significant impact on OI (personnel and process safety, security, health or environment), document required OI related competencies and/or experience. This provides the basis for ensuring personnel selection and placement decisions meet specific job requirements. Personnel performing tasks with environmental aspects and impacts / risks will have the knowledge and skills necessary to perform their work in a manner consistent with the environmental policy and the requirements of OIMS System 6-5 Environmental Management.

The placement of personnel is subject to verification of completion of any needed training and/or experience, and demonstration of the required competencies for the performance of the job. The extent of initial, ongoing and refresher training provided is based on established requirements for OI related training and an individual's competency and/or experience gaps. These training requirements are documented in a training plan. The requirements may be met through training and/or developmental activities (i.e. training assignments).

Learning management systems are used for competency tracking, e-learning, training, scheduling and tracking of re-qualification requirements. Training progress is reviewed periodically by an individual's Supervisor. Any new training requirements are completed per the training plan.

In addition to the process of assuring that a person is competent in the knowledge and skills necessary to perform in a position, an assessment of the individual's performance and behaviours in that position is conducted annually. The performance assessment process includes OI aspects and behaviours such as compliance with OIMS systems and associated procedures.

5.2.2 Third Party Service Providers

Third party services contractor requirements are addressed in OIMS System 8-1 Third Party Services. Job specific requirements are defined and communicated to contractors during the contracting process and all contractor personnel are screened, trained and suitably qualified.

Each contractor is required to maintain training files for their personnel. Esso verifies these records as part of the initial contracting process and at least annually for OIMS Critical contractors.

Table 5-1 Overview of Offshore Personnel Environment Plan Induction and Training

Component	Esso Office Based Personnel (inc. engineers, contractors)	Esso Facilities		Vessels
		Esso Offshore Personnel (field staff)	Third Party Service Providers (Contractors)	Vessel Personnel
Environmental Plan / environmental incident definition	Environment Plan Awareness	Environment Plan Awareness	Environment Plan Awareness	Vessel management environmental familiarisation
Work Management Systems (Risk Assessments, JSA, Stepback 5x5) to manage environmental risks	Offshore Induction (where relevant)	Work Management Systems Fundamentals Training Offshore Induction Stepback 5x5 and Job Safety Analysis competency (non-Visitors)	Work Management Systems Fundamentals Training (where relevant) Offshore Induction Stepback 5x5 and Job Safety Analysis competency (non-Visitors)	Contractor Management System SSHE Execution Plan
Identification and reporting of environmental hazards and incidents	Platform Induction Card "Green Card" (where relevant)	Platform Induction Card "Green Card"	Platform Induction Card "Green Card" SSHE Execution Plan	SSHE Execution Plan Vessel management environmental familiarisation
Overview of oil spill response procedures	Green Card (where relevant) Included in Esso Offshore Induction Specific training for those with a response position in an emergency	Green Card Included in Esso Offshore Induction Specific training for those with a response position in an emergency	Green Card Included in Esso Offshore Induction Specific training for those with a response position in an emergency	SSHE Execution Plan Contractor Vessel Induction Vessel management environmental familiarisation
MOC	Via use of Procedures & MOC electronic Tool (P/MeT) which includes MOC training	Via use of Procedures & MOC electronic Tool (P/MeT) which includes MOC training	MOC for work completed by Third Party Service Providers on Esso Facilities is managed by Esso Personnel.	Via implementation of contractor MOC system. Vessel management environmental familiarisation

6 Monitoring of Environmental Performance

In accordance with OPGGS(E)R 14(6) the implementation strategy must include monitoring, recording, audit, management of non-conformance and review of environmental performance and the implementation strategy to ensure that the environmental performance outcomes and standards in the environment plan are being met.

6.1 Monthly Review of the Environmental Plan

Esso conducts a monthly review of activities against the EPOs and the EPSs in the EP to ensure they are continually being met. The process involves reviewing a number of reports including the FIMS equipment exception list, vessel monthly compliance checklists, incident records from IMPACT, produced formation water monthly report, Required Competency exception reports and Wellbore Risk Management Test Exceptions reports. The review also includes tracking of open and overdue action items.

The purpose of this review is to monitor and confirm that all EPOs and EPSs are being met and that the effectiveness of the controls is acceptable. This review ensures the correct level of environmental performance is continuously being achieved and prompts action where EPOs or EPSs may not be met.

This review is recorded and if there any breaches of EPOs or EPS, these are detailed and provided to NOPSEMA through the monthly recordable incident report. This monthly review allows for comparison of compliance against EPOs and EPSs with previous months and provides a foundation for the identification of trends in environmental compliance. Trends identified may form focus areas for the audits against this EP described below.

The review is distributed to the Offshore Asset Managers each month.

6.2 Audits, Assessments and Inspections

Environmental performance assurance for the activity will be undertaken to ensure that:

- Controls are implemented in accordance with EPSs to achieve the EPOs;
- Non-compliances and opportunities for improvement are identified; and
- Environmental monitoring and reporting requirements are met.

6.3 Offshore Audit and Inspections

Esso undertakes audits against this EP periodically which may consist of both desktop audits and offshore site audits. Audits are conducted in accordance with the Esso Internal Audit Protocol. This protocol describes the EAPL risk-based approach to environmental plan (or monitoring plan, license conditions) audits and assessments. The risk-based approach considers the environmental impacts and risks associated with the activities, previous environmental performance of the activity (informed by NOPSEMA inspections, incident history and other environmental performance factors), trends in environmental recordable/reportable incident notifications and the nature and scale of the activity.

The primary objective of each audit is to verify activities are undertaken in accordance with EPOs and EPSs in this EP and that the controls are in place and effective in reducing the environmental impacts and risks of the activity to ALARP and acceptable levels. However, the audit may also consider the following secondary objectives:

- Verify that environmental risks are identified, assessed and managed adequately;
- Training and competency verification and communication of roles and responsibilities;
- Evaluate the effectiveness of environmental management systems; and
- Recommendations for improvement opportunities for environmental performance.

Across the lifetime of the EP, the implementation strategy as well as all impacts and risks identified in Volume 2 will be audited. Learnings from audits will be applied to all applicable facilities. Table 6-1 and Table 6-2 are used as the coversheet for all internal audits to ensure the scope of the audit is clearly linked to impacts, risks and elements of the implementation strategy in the EP. The environmental management system described in this plan is common to all EAPL facilities in Bass Strait. Therefore audits of the environmental management system are applicable to all facilities. Verification (field or desktop) will be conducted on a minimum of three facilities per audit and these facilities will be selected to give a varied representation of Esso's Bass Strait facilities (e.g. CoP, wellwork/wireline, older facility, newer facility). As a minimum, an annual offshore audit will be completed against this EP and each facility covered by this EP will be subject to verification once over the lifetime of the EP.

The Offshore Environmental Advisor(s) is responsible for planning and coordinating audits. The Offshore Environmental Advisor(s) may perform the role of auditor for particular components of the audit where they are independent from the work being conducted. To maintain the independence of the auditor, another auditor will be selected to audit work which the Offshore Environmental Advisor(s) has been directly involved in such as environment plan awareness training, monitoring of environmental performance and reporting.

Periodic environmental inspections will be completed. These inspections may focus on aspects of activities assessed to be of a higher consequence level or risk category, or key focus areas, or specific EPOs.

Opportunities for improvement or non-compliances observed are documented and communicated to the OIM at the time of the audit, who in turn is responsible for communicating this information to all relevant platform personnel. Findings and actions are provided in an audit report and documented in the IMPACT database to facilitate the tracking of the actions until closed out.

Table 6-1 Audit Coversheet – Implementation Strategy

Implementation Strategy	
☐	4-2 Compliance with Law, Regulations and Permits
☐	6-1 Operations and Maintenance Procedures
☐	6-2 Facility Integrity Management System
☐	6-3 Well Management System
☐	6-4 Work Management
☐	6-5 Environmental Management
☐	7-1 Management of Change
☐	8-1 Contractor Management
☐	9-1 Incident Management
☐	Platform Surveillance and Optimisation
☐	Roles and Responsibilities
☐	Training and Awareness
☐	Monitoring of Environmental Performance
☐	Monitoring of Emissions and Discharges
☐	Reporting
☐	Emergency Response
☐	Stakeholder Engagement

Table 6-2 Audit Coversheet – Impacts and Risks

	Operations			Wellwork	Inspection, Maintenance and Repair (IMR)		Support Operations		
	Platform Operations	Subsea facilities operation	Pipeline Operations	Wireline / Workover Activities	Facility IMR	Pipeline and Subsea IMR	Vessel Operations	ROV Operations	Helicopter Operations
Physical Presence	☐		☐			☐	☐		☐
Seabed Disturbance				☐		☐		☐	
Underwater Sound Emissions	☐						☐		☐
Light Emissions	☐						☐	☐	
Emissions to Air	☐			☐	☐	☐	☐		
Planned Discharge - Brine	☐						☐		
Planned Discharge - Cooling Water							☐		
Planned Discharge - Deck Drainage & Bilge							☐		
Planned Discharge - Sewage and Greywater	☐						☐		
Planned Discharge - Food waste	☐						☐		
Planned Discharge - Operational Fluids	☐	☐		☐	☐	☐			
Planned Release – Gas (subsea)						☐			
Planned Discharge - Cement				☐					
Planned Discharge – Solids				☐	☐	☐			
Physical Presence - NORM						☐			
Produced Water Discharge	☐								
Unplanned Interaction with Fauna					☐		☐		
Unplanned Introduction of IMS							☐		
Accidental Release - Dropped Objects	☐			☐	☐	☐	☐	☐	
Accidental Release - Cement				☐		☐			
Accidental Release - LOC (chemicals / hydraulic fluids)	☐	☐	☐	☐	☐	☐	☐	☐	
Accidental Release - Waste	☐						☐		
Accidental Release - Bulk Transfer	☐								
Accidental Release - LOC (pipelines)			☐						
Accidental Release - LOC (bulk storage)	☐								
Accidental Release - LOC (vessels)							☐		
Accidental Release - Hydrocarbon from the piles	☐								
Accidental Release - Loss of Well Integrity / Loss of Well Control	☐	☐		☐					

6.3.1 Vessel Inspections

In addition to the third party services contractor OIMS evaluation (see Section 2.8), a pre-mobilisation inspection is undertaken for all vessels to communicate specific EP requirements and to ensure that procedures and equipment for managing routine discharges and emissions are in place to enable compliance with this EP.

Vessels will conduct their own HSE inspections, which will be provided to Esso for ongoing compliance monitoring. These will be discussed in the quarterly review and any findings/actions discussed.

Table 6-3 Summary of Audits, Inspections and Assessments

Audit/Inspection/Assessment	Frequency	Responsibility
EP Compliance Audit / Inspection	Once for contracts <1 year Annually for contracts >1 year	Environment & Regulatory Advisor
EP Compliance ongoing monitoring	Monthly report	Vessel Master /HSE
OIMS Assessment	Annually for contracts >1 year	Contract Manager

6.3.2 Marine Assurance

The ExxonMobil Marine Quality Assurance Best Practice (MQABP) is developed by the ExxonMobil Logistics Upstream Centre of Excellence and administered locally by each affiliate. The MQABP is based on a recognised marine quality process and standards framework developed and administered by the Oil Companies International Marine Forum.

The MQABP determines the level of assessment required, based on the term of hire, or repeated terms of hire. The Best Practice assesses both the vessel, and vessel operator, against a recognised industry standard:

- Offshore Vessel Safety Management System Assessment (OVMSA); and
- Offshore Vessel Inspection Questionnaire (OVIQ).

The OVIQ is customised by the selection of appropriate variants designed to examine the specific capabilities of the subject vessel in the specific tasks that will be undertaken by the vessel. An OCIMF accredited inspector completes the OVIQ and provides the observations in the form of the OVIQ report which is uploaded to the OCIMF database. The ExxonMobil Global Marine Quality Assurance group provides feedback on the OVIQ completed, or where less than 12 months old, provides a review of the existing OVIQ. OVIQ observations are ranked in priority by the Global Marine group, and the affiliate is responsible for ensuring the closeout of observations.

Esso's marine/logistics group is responsible for engaging with the vessel owner to develop a closeout target for high priority items, and the effective closeout of observations is reviewed quarterly by the Global Upstream Logistics Centre of Excellence. The assessment of OVMSA is determined by the length of engagement of each specific vessel operator, and is defined within the MQABP. Where OVMSA's are to be verified, they are verified at the site responsible for the day to day management of the vessel. ExxonMobil's Global Upstream Logistics Centre of Excellence assigns OCIMF accredited inspectors to complete on site OVMSA verifications.

Other inspections which are complimentary to the OVIQ, such as Condition and Suitability Surveys, and assessments against International Marine Contractor (IMCA) guidelines may also be conducted.

Where an OVIQ inspection and/or OVMSA Verification Review is not available and all reasonable efforts based on time and resource availability to complete an OVID inspection and/or OVMSA Verification Review are exhausted (i.e. short term vessel hire), the affiliate may approve the use of an alternate means of inspection.

6.3.3 Annual OIMS Assessment

OIMS Assessments (OIMS System 11-1) are carried out annually to determine if Esso is meeting the ExxonMobil OIMS Expectations and Guidelines.

OIMS System 11-1 describes the following OIMS assessments:

- External Assessment - An ExxonMobil team, composed of persons external to Esso operations, conduct an assessment of all of the Systems every 4 years. The External Assessment provides an independent evaluation of compliance with OIMS Expectations.
- OIMS Internal Assessment - This assessment is conducted in a similar manner to that of the external assessment. It is undertaken annually by a local team, except in the years in which an external assessment is conducted.

The findings and recommendations of assessments are documented in the IMPACT database to facilitate the tracking of all OIMS actions until closed out. Annual OIMS assessments do not look specifically at compliance with EPOs and EPSs in the EP and instead evaluate compliance at the system level. This allows for continual and systematic identification of deficiencies and improvements in the environmental management system.

6.3.4 Ongoing Stewardship

6.3.4.1 Business Unit Leadership

Business Unit Leadership meetings (attendees include the Production Manager, the SSHE Manager and the Production Projects Manager, among others) cover issues relating to management of the upstream business and involve a review of key performance indicators. These meetings do not review compliance against all EPOs and EPSs but do involve periodic reviews of environmental KPIs.

6.3.4.2 OIMS Management Committee

OIMS Management Committee Review meetings (attendees include the Production Manager, the SSHE Manager, the Maintenance, Reliability & Integrity Manager, Asset Managers, OIMS Supervisor and OIMS Coordinator) are held quarterly to review the OIMS system. These reviews may include regulatory submissions, enforcement notices and current regulator focus areas driving activity.

OIMS Management Committee meetings also involve an annual review of OIMS System 6-5 Environmental Management. The annual OIMS System 6-5 review does not focus specifically on performance against EPOs and EPSs in this EP. The annual review looks at system KPIs including trends in environmental spills and corporate environmental compliance incidents. The review may include a discussion on opportunities for continuous improvement including areas for environmental performance improvement from the previous year.

6.3.4.3 Asset Managers Environment Meeting

These meetings are held quarterly between the Offshore Environmental Advisors, Offshore Asset Managers and the Offshore Field Superintendents. These meetings are aimed at giving an overview of offshore environmental monitoring and management and to compare the environmental performance from the current quarter to previous quarters. Agenda items may include a discussion of current and upcoming work fronts in the environmental space and discussions on trends in environmental compliance and performance. Trends by facility or type of non-compliance may be identified and discussed in these meetings. Asset Managers also receive a Monthly Environmental Compliance Monitoring Report which includes:

- Recordable Environmental Incident Report for the month
- Monthly EP compliance check against performance standards and outcomes
- Monthly PFW performance summary

6.3.4.4 Red Box

The Red Box Team (which includes OIMs and Offshore Field Superintendents) reviews platform performance fortnightly for each platform covering production, cost, engineering safety and environment. Each meeting reviews overdue action items including those from NOPSEMA Environmental Inspections and those arising from internal environmental audits. Red Box meetings also include a summary of environmental non-compliances against EPOs and EPSs in the EP which is generated from the IMPACT database.

6.3.4.5 Incident Reviews

Offshore Incident Reviews are held at the start of each week with a team which includes Offshore Asset Managers, Field Superintendents, the Offshore Safety Coordinator and the Offshore OIMS Coordinator. The meeting involves a review of all incidents and near misses that were entered into IMPACT the previous week, including environmental incidents and near misses against this EP. This review verifies that the environmental team has been engaged for any environmental incidents. The review also involves a check for any internal or external triggers that have been met to report or investigate the incident further.

6.3.4.6 Toolbox

Toolbox meetings are conducted at the start of each shift to plan for activities being undertaken during the shift. This allows for relevant permits and Job Safety Analyses to be completed and to make sure that personnel undertaking the tasks understand all associated safety and environmental risks. Toolbox meetings involve a review of IMPACT entries from the previous day, including environmental incidents against this EP.

6.3.4.7 Vessel

Daily vessel reports are prepared by project vessels and issued to Esso. The report provides updates on project activities and HSE performance. Vessel HSE meetings are also used to transfer information, discuss environmental incidents and hazards and provide updates on environmental performance.

6.3.4.8 Third Party Services Contractor Performance

In accordance with the Third Party Services Management Manual, third parties' performance monitoring plans are established prior to a contractor mobilising to a work site location.

The Esso Contract Administrator is engaged in the contract life cycle management and the SSHE Group assists in the assessment and monitoring of contractor performance, as required. Providers of OIMS-critical services such as aviation, vessels, construction, subsea activities and wellwork are subject to a Quarterly Performance Review and Annual Performance Assessment.

Performance reporting consists of documented reports and verbal communications appropriate to the impacts and risks involved with the services provided. Written reports can include:

- Non-conformance reports;
- SSHE performance statistics, including environmental incidents/ EP breaches;
- Assessments of the adequacy of actions taken to address performance gaps / incidents;
- Deficiencies with SSHE requirements and recommended corrective actions; and
- Review of contractor HSE inspections and findings.

Report findings and recommendations are reviewed with contractor management and follow-up actions implemented to address deficiencies.

7 Monitoring of Emissions and Discharges

In accordance with OPGGS (E) Reg 14 (7) the implementation strategy must provide for sufficient monitoring of, and maintain quantitative records of, emissions and discharges (whether occurring during normal operations or otherwise), such that the record can be used to assess whether the environmental performance outcomes and standards in the environment plan are being met. Measurement and recording of emissions and discharges are completed under OIMS System 6-5 Environmental Management. Table 7-1 summarises the monitoring requirements for routine operations in this EP.

Table 7-1 Summary of monitoring of emissions and discharges

Activity / Aspect	Platform Operations Subsea facilities operation Pipeline Operations Facility IMR Pipeline and Subsea IMR	Wellwork	Vessel Operations ROV Operations
Planned Discharges			
Emissions to air	Platform fuel and flare volumes recorded and reported (including wellwork emissions) - *daily*. Monthly tech monitoring to identify anomalies – *monthly*		Recorded by vessel contractor. Anomalies or abnormalities provided - *by exception, quarterly*
Planned Discharge - Brine	Number of persons on board (monthly average)	Monitored and recorded in Wellview - *daily*	Recorded by vessel contractor. Anomalies or abnormalities provided - *by exception, quarterly*
Planned Discharge - Cooling Water			Recorded by vessel contractor. Anomalies or abnormalities provided - *by exception, quarterly*
Planned Discharge - Deck Drainage & Bilge			Recorded by vessel contractor. Anomalies or abnormalities provided - *by exception, quarterly*
Planned Discharge - Sewage and Greywater	Number of persons on board (monthly average)		Recorded by vessel contractor. Anomalies or abnormalities provided - *by exception, quarterly*
Planned Discharge - Food waste	Number of persons on board (monthly average)		Recorded by vessel contractor. Anomalies or abnormalities provided - *by exception, quarterly*
Planned Discharge - Operational Fluids	Monitored in accordance with Corrosion Control & Chemical Injection program – *ongoing* Oil Field Chemicals Exception Report - *monthly*	Monitored and recorded in Wellview - *daily*	

Aspect / Activity	Platform Operations Subsea facilities operation Pipeline Operations Facility IMR Pipeline and Subsea IMR	Wellwork	Vessel Operations ROV Operations
Planned Release – Gas (subsea)	Intermittent discharge. Volume and frequency monitored by PS&O Engineers - *as required*.		
Planned Discharge - Cement		Monitored and recorded in Wellview - *daily*	
Planned Discharge – Solids	During facility IMR solids are collected. Residual solids may be discharged via the drain system. Sediment sampling and water program to be completed (per CM68).	Monitored and recorded in Wellview - *daily*	
Produced Water Discharge	Monitored and reported as per Section 2.3 and Section 2.7.		
Accidental / Unplanned Discharges			
Accidental Release - Cement	Spill volumes estimated/calculated. Documented via incident records – *as required*	Spill volumes estimated/calculated. Monitored and recorded in Wellview. Documented via incident records – *as required.*	
Accidental Release - LOC (chemicals / hydraulic fluids)	Spill volumes estimated/calculated. Documented via incident records – *as required*	Spill volumes estimated/calculated. Monitored and recorded in Wellview. Documented via incident records – *as required.*	Spill volumes estimated/calculated. Recorded by vessel contractor. Documented via incident records – *as required* Incident records provided by vessel contractor- *monthly*.
Accidental Release - Bulk Transfer	Spill volumes estimated/calculated. Documented via incident records – *as required*		
Accidental Release - LOC (pipelines)	Spill volumes estimated/calculated. Documented via incident records – *as required*		
Accidental Release - LOC (bulk storage)	Spill volumes estimated/calculated. Documented via incident records – *as required*		

Aspect \ Activity	Platform Operations Subsea facilities operation Pipeline Operations Facility IMR Pipeline and Subsea IMR	Wellwork	Vessel Operations ROV Operations
Accidental Release - LOC (vessels)			Spill volumes estimated/calculated. Recorded by vessel contractor. Documented via incident records – *as required* Incident records provided by vessel contractor- *monthly*.
Accidental Release - Hydrocarbon from the piles	Spill volumes estimated/calculated. Documented via incident records – *as required*		
Accidental Release - Loss of Well Integrity / Loss of Well Control	Spill volumes estimated/calculated. Documented via incident records – *as required*	Spill volumes estimated/calculated. Monitored and recorded in Wellview. Documented via incident records – *as required.*	

8 Reporting

8.1.1 Annual Environmental Performance Reporting

The OPGGS (E) R 14(2) states that the implementation strategy must:

a) state when the titleholder will report to the Regulator in relation to the titleholder's environmental performance for the activity; and
b) Provide that the interval between reports will not be more than 1 year.

Note: Regulation 26C requires a titleholder to report on environmental performance in accordance with the timetable set out in the environment plan.

Table 8-1 NOPSEMA annual environmental performance reporting timetable

Requirement	Timing	Contact
Submit an annual EP environmental performance report to NOPSEMA.	The annual report for the calendar year (January – December) will be submitted to NOPSEMA by the end of February of the following year.	NOPSEMA – submissions@nopsema.gov.au

8.1.2 Incident Notification and Reporting

The OPGGS(E)R define "*recordable incidents*" and "*reportable incidents*", and also describe reporting requirements for each type of incident. The reporting requirements under the OPGGS(E)R are managed under OIMS System 4-2 Compliance with Laws Regulations and Permits.

Incidents are managed internally in accordance with OIMS System 9-1 Incident Management to ensure valuable information and lessons learned are available to improve operations and prevent the recurrence of similar incidents.

The requirements for reporting environmental incidents to external agencies are listed in Table 8-2.

Table 8-2 External incident notification and reporting requirements

Requirement	Timing	Contact
Recordable Incidents		
Recordable incident, for an activity, means a breach of an EPO or EPS, in the environment plan that applies to the activity that is not a reportable incident. As a minimum, the written monthly recordable incident 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 titleholder knows or is able, by reasonable search or enquiry, to find out; • Any action taken to avoid or mitigate any adverse environmental impacts of the recordable incidents; and • The action that has been taken, or is proposed to be taken, to prevent a similar incident occurring in the future.	As soon as possible but before the 15th day of the following calendar month.	NOPSEMA – submissions@nopsema.gov.au

Requirement	Timing	Contact
• Monthly reports will utilise the NOPSEMA Incident Monthly Summary Report template.		
Reportable Incidents		
Reportable incidents are those that have caused, or have the potential to cause, moderate to significant environmental damage. Esso has interpreted this to mean: • Unplanned release of hydrocarbon liquid or chemicals exceeding 80 L into the marine environment caused by, or suspected to have been caused by, petroleum activities (as defined as a Significant Spill in the ExxonMobil EPI Reporting Guidelines); and • Injury or death of a listed threatened / migratory / marine species caused by, or suspected to have been caused by, petroleum activities. The notification must contain: • All material facts and circumstances concerning the reportable incident that the titleholder knows or is able, by reasonable search or enquiry, to find out; • Any action taken to avoid or mitigate the adverse environmental impact of the reportable incident; and • The corrective action that has been taken or is proposed to be taken to stop, control or remedy the reportable incident.	• **Verbally ASAP but within 2 hours of incident,** or, if the reportable incident was not detected by the Titleholder at the time of the first occurrence – the time the titleholder becomes aware of the reportable incident, then • **Written notification as soon as practicable** (copy to NOPTA and DJPR) • **Written report as soon as practicable but within 3 days** including specifying if a further written report will be provided (then copy to NOPTA and DJPR within 7 days) • **If formal investigation is triggered, a further written report within 30 days**	NOPSEMA - 1300 674 472 submissions@nopsema.gov.au DJPR - marine.pollution@ecodev.vic.gov.au (0409 858 715) NOPTA – reporting@nopta.gov.au
Other Reporting Requirements		
Mandatory vessel MARPOL pollution notification reporting, Vessel Master to provide AMSA with the following information: • name of ship/s involved; • time, type and location of incident; • quantity and type of harmful substance; • assistance and salvage measures; and • any other relevant information. A POLREP form should be submitted by Vessel Master • Harmful substances report (POLREP) form 197 (Marine	Notification Immediately POLREP (pollution report). <24 hours	AMSA – Notification 1800 641 792 (Maritime) 1800 815 257 (Aviation) or +612 6230 6811 (Maritime) +612 6230 6899 (Aviation) AMSA POLREP Report rccaus@amsa.gov.au

Requirement	Timing	Contact
Order 91—Marine Pollution—Oil); • Harmful substances report (POLREP) form 196 (Marine Order 93—Marine Pollution Prevention—Noxious Liquid Substances); and • Marine Order 94 (Marine pollution prevention—packaged harmful substances) 2014 (Schedule 1—Marine pollutants report form).		
Suspected or known IMS introduction	Immediately	Report a pest (as per marinepests.gov.au website): DELWP – 136 186
Oiled wildlife	Immediately	DJPR – 1300 134 444
Wildlife emergency	Immediately	DELWP – 136 186 DELWP Whale & 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.
Notification of activities affecting listed species or ecological communities in or on a Commonwealth area (specifically unintentional injury or death of a cetacean or listed threatened / migratory / marine species caused by, or suspected to have been caused by petroleum activity)	Within 7 days	DoEE – 1800 803 772 EPBC.Permits@environment.gov.au
Cetacean vessel strike	Within 3 days	DoEE – https://data.marinemammals.gov.au/report/shipstrike

9 Emergency Response

The process to prepare emergency preparedness and response plans, including procedures to prevent and mitigate potential environmental impacts associated with accidents and emergency situations, is addressed through OIMS System 10-2 Emergency Preparedness and Response.

The purpose of OIMS 10-2 is to ensure that Esso establishes effective response to emergencies and business disruptions that threaten: the safety, security and health of the public, contractors and employees; the environment; asset integrity; and critical business operations. This System addresses all sites for which Esso has responsibility and includes emergencies, disruptions to critical business operations, and security threats that could occur throughout the business line's sphere of influence (e.g. processing, drilling, transportation, and office).

The System objectives are as follows:

- Emergency response plan(s) and business continuity plan(s) are documented, resourced with qualified personnel, accessible, current, and clearly communicated; and
- Required training, exercises, simulations, and/or drills are conducted to determine the adequacy of the emergency response and business continuity plans.

9.1 Emergency Response Documentation

The Emergency Response Manual (ERM) consists of concise information that may be required immediately in the event of an incident. Information contained in the ERM includes emergency response organisational structures, emergency response procedures relevant to specific emergency events, personnel role and responsibility checklists, emergency response call-out procedures and contact directories.

Copies of the ERM are held on each platform and other Esso onshore sites.

9.2 Oil Pollution Emergency Plan

In accordance with OPGGS(E)R 14(8) and 14(8A), the implementation strategy must contain an OPEP and provide for updating the plan, and include arrangements for testing the response arrangements in the OPEP.

Esso has in place the Bass Strait OPEP (see Appendix A of Volume 3) for all its offshore assets and operations in Bass Strait. The OPEP describes how Level 1, 2 and 3 spills will be managed and defines the lead organisations, responders, and notification requirements.

9.2.1 Oil Spill Monitoring Program

In accordance with OPGGS(E)R 14(8D), the implementation strategy must provide for monitoring of impacts to the environment from oil pollution and response activities. This is provided for in Esso's Bass Strait Oil Spill Monitoring Program (OSMP). The OSMP guides monitoring of extent, severity and persistence of environmental impacts from a hydrocarbon spill and associated response activities.

The OSMP is subject to annual reviews as well as a mid-cycle comprehensive update. A register of OSMP implementation resources is updated quarterly. Testing of the OSMP comprises of an annual desktop capability review as well as 2 yearly detailed testing of the ability to implement the OSMP.

The Bass Strait OSMP exists as Appendix B to Volume 3 and applies to all of Esso's offshore assets and operations in Bass Strait. The OSMP is supported by a set of internal implementation guides for each monitoring module which are designed to provide Esso and its monitoring providers with information to finalise a monitoring design appropriate to the nature and scale of the spill.

9.3 Testing of Oil Spill Response Arrangements

In accordance with OPGGS(E)R 14(8C) and requirements of OIMS System 10-2 Emergency Preparedness and Response, the response arrangements within the OPEP will be tested:

- When they are introduced;
- Prior to the commencement of the activity;
- When they are significantly amended;
- Not later than 12 months after the most recent test;
- If a new location for the activity is added to the EP after the response arrangements have been tested, and before the next test is conducted—testing the response arrangements in relation to the new location as soon as practicable after it is added to the plan; and
- If a facility becomes operational after the response arrangements have been tested and before the next test is conducted—testing the response arrangements in relation to the facility when it becomes operational.
- In accordance with the schedule outlined in Table 9-1, and as further detailed in the annual EP&R Activity Plan.

The EP&R Activity Plan includes some additional guidance on how to organise a test, test types, duration and recommended participants, to assist in meeting preparedness and response performance standards outlined in Table 1-5 and the OPEP.

Testing may be externally or internally facilitated. Tests will be documented and any corrective actions/recommendations arising from the tests will be managed in accordance with the Emergency Preparedness & Response Programs Guide. Emergency response training records will be maintained in accordance with OIMS System 10-2: Emergency Preparedness and Response.

Where changes are required to the OPEP, resulting from testing / exercise outcomes, altered contractual arrangements, corrective actions, routine information updates (e.g. contact detail change), or other items; the OIMS System 10-2 Administrator is responsible for ensuring changes are assessed against OPGGS(E)R 17 revision criteria and where necessary, the EP and / or OPEP is submitted to NOPSEMA as a formal revision, in accordance with the Management of Change (MOC) process (OIMS System 7-1 Management of Change). For changes which do not trigger a formal revision, internal revisions to the OPEP will also be in accordance with the MOC process with any change justified.

Table 9-1 Testing of oil spill response arrangements

Test	Objective	Parties Involved	Schedule
Emergency Response contact lists	To ensure that current emergency response contact details are available.	Esso and Third party service providers	6 Monthly
Incident Management Team (IMT) availability	To test the availability of personnel to staff the Esso Incident Management Team	Esso IMT	Quarterly
NEBA	To test the NEBA decision making process	Esso IMT – Environmental Unit	6 Monthly
Dispersant	To test efficacy of Esso owned dispersant stockpile	Esso AMOSC	Annual
Dispersant	To test arrangements to implement dispersant application	Esso IMT AMOSC	Annual
Shoreline response	To test ability to undertake SCAT and execute Shoreline Tactical Response Plans and/or Shoreline Treatment Recommendations	Esso IMT AMOSC	Annual
Waste management	To test ability to implement waste management plans	Esso Waste Contractor	2 yearly
Oil Spill Monitoring Plan (OSMP)	To test availability of qualified personnel to implement OSMP	Esso / OSMP service provider	Annual

Test	Objective	Parties Involved	Schedule
OSMP	To test ability to implement OSMP	Esso OSMP service provider	2 yearly
Regional Response Team (RRT)	To test the integration of the ExxonMobil RRT to support a Level II IMT	Esso ExxonMobil RRT	3 yearly
Oil Spill Response (OSR) Equipment	To test availability of third party OSR equipment.	Esso AMOSC OSRL	Quarterly
OSR Equipment	To test readiness of Esso owned OSR equipment.	Esso	Annual
OSR Equipment	To maintain familiarity with use of OSR equipment through field equipment deployment.	Field response teams	Annual
OSR Equipment	To test field deployment of an offshore containment and recovery with a third party	Esso 3rd party	Every 3 years
Level II/III response arrangements	To test Level II/III response arrangements included within OPEPs including activation of external service providers and OSROs To test interface and communication/reporting arrangements with regulatory authorities and controlling agencies	Esso IMT & ESG State govt. agencies ExxonMobil RRT AMOSC	Every 5 years
Oiled Wildlife Response	To test availability of OWR resources to assist a State led oiled wildlife response	Esso AMOSC OSRL DELWP	Every 3 years
OSRO preparedness	To assess preparedness of AMOSC	Esso AMOSC APPEA	Annual
OSRO preparedness	To assess preparedness of OSRL	Esso / ExxonMobil	Annual

9.4 Oil Spill Response Competency and Training

In accordance with OPGGS(E)R 14(5), the implementation strategy must ensure personnel have the appropriate competencies and training to undertake their roles and responsibilities in emergency situations.

Esso implements incident management based on the Incident Command System (ICS). The ICS is a system designed to provide a consistent organisation to respond to emergency situations. Positions within the ICS are fixed and have specific functions, ensuring that all responders know what to do and where they report in the organisation structure. The ICS is based on the US National Incident Management System 2006 ICS Structure, with slight modifications for industry. ICS is the primary emergency response framework for an oil spill response from all offshore activities. Typical incident management roles and training requirements are outlined in Table 9-2.

IMT members are selected by their supervisors based on skills and experience. Nominations are reviewed by the OIMS 10-2 system owner (to ensure training and competency requirements have been met or appropriate management measures have been put in place) and approved by the asset manager, An Emergency Preparedness and Response required competency road map is assigned to the new incumbent. A training plan is put in place and the OIMS System 5-1 mitigation approval process applies.

IMT key members have 6 months to complete the required training once listed on the IMT. In the event of an incident, additional resources will be used to fill IMT key roles. These additional IMT members will be required to meet the relevant training and competency requirements.

The selection of the Environmental Unit Lead is based on relevant experience as an Environment Advisor, with experience and/or training in the implementation of scientific monitoring. Minimum requirements include involvement in drills and spill exercises, management of marine monitoring programmes, such as produced formation water monitoring, and monitoring of parameters relating to offshore operations. In addition, the minimum requirement includes a relevant tertiary degree in engineering, environmental science, environmental management or similar.

Table 9-2 Oil spill response competency and training

Section	Role	Training and competency
Command	Incident Commander	• Incident Management Training (PMAOMIR418). • IMO III - Command & Control Training (for Level II/III incidents)
	Safety Officer	• Incident Management Training (PMAOMIR320). • Experience in implementing safety management systems
	Liaison Officer	• Incident Management Training (PMAOMIR320).
Planning Section	Planning Section Chief (PSC)	• Incident Management Training (PMAOMIR320). • IMO II - Oil Spill Response Management Training (for Level II/III incidents) • Familiarity with PSC role
	Environment Unit Lead*	• Incident Management Training (PMAOMIR320). • IMO II - Oil Spill Management • Familiarity with OSMP
	All other roles	• ICS 200
Operations Section	Operations Section Chief (OSC)	• Incident Management Training (PMAOMIR320). • IMO II - Oil Spill Response Management Training (for Level II/III incidents) • Familiarity with OSC role
	Maritime Unit	• ICS 200 • Experience in marine operations
	Aviation Unit	• ICS 200 • Experience in aviation operations
	Aerial Observer	• Aerial Surveillance Course
	Source Control Branch Director / Deputy Director (for loss of well control incidents)	• ICS 300
	Source Control Branch – team member	• ICS 100/200

Section	Role	Training and competency
Logistics Section	Logistics Section Chief (LSC)	• Incident Management Training (PMAOMIR320). • IMO II - Oil Spill Response Management Training (for Level II/III incidents) • Familiarity with LSC role
	All other roles	• ICS 200
Finance & Admin Section	Finance & Admin Section Chief	• ICS 200
	All other roles	• ICS 200

**When the IMT is activated, the Environmental Unit Lead becomes responsible for managing implementation of the OSMP modules, as directed by the Planning Section Chief.*

9.4.1 Incident Management Training

The training program has been designed to meet the PMA08 Chemical, Hydrocarbons and Refining training standard. Personnel with an oil spill response role undertake Incident Management Training including ICS and oil spill response specific training, as defined by their role and in accordance with the Emergency Response Training Plan.

ICS 100 & 200 Training

ICS 100 & 200 Training consists of computer based training IMT which addresses fundamental principles of the ICS including key roles and functions.

ICS 300

ICS 300 training is instructor led training that expands upon the information covered in the ICS 200 course. ICS 300 training may be obtained through completion of the ExxonMobil University of Spill Management course where the training provider is accredited to provide the certification.

IMO II/II Oil Spill Response Training

To supplement Incident Management Training, identified IMT members must also complete IMO II/III - Oil Spill Response Management or Command and Control Training. Oil Spill Response Training may be completed through participation in a training program, completion of training delivered by AMOSC (or another training provider). Key aspects that must be addressed in this training include:

1. Understand different oil spill response objectives and strategies;
2. Understand the different environmental, sociological and economic considerations of oil spill response;
3. Learn and undertake an oil spill incident action planning process;
4. Understand how to effectively monitor and evaluate oil spill strategies; and
5. Understand jurisdictional control arrangements.

9.4.2 Oil Spill Response Equipment Operation

Selected operations and maintenance personnel at Esso's onshore facilities are familiarized with oil spill equipment operation, deployment and shoreline clean up techniques through dedicated training sessions and/or through participation in exercises. Training and exercises may be supported by AMOSC, Oil Response Company of Australia (ORCA) or another training provider. Selected personnel may also be nominated to attend IMO I - Oil Spill Response Operations.

9.4.3 Additional Specialist Training

Additional specialist training may be made available to specific personnel required to undertake a role in oil spill response. This training has been summarised in Table 9-3 and discussed further below.

Table 9-3 Specialist training

Typical Attendees	Course
Members of the AMOSC Core Group	IMO I - Oil Spill Response Operations AMOSC Core Group Workshop
Select IMT members	IMO II - Oil Spill Response Management or IMO III - Command and Control Oiled Wildlife Response
Aerial observers	Aerial Surveillance Course
Regional Response Team (RRT) members and select IMT members	ExxonMobil University of Spill Management (or equivalent) RRT Training Workshop
Emergency Support Group (ESG) members and select IMT members	ESG Training

AMOSC Core Group

Selected ExxonMobil personnel have been identified as members of the AMOSC Core Group and may be called upon to respond under the AMOSplan and National Plan arrangements. These personnel receive training through AMOSC in accordance with the AMOSC Core Group agreement. They also participate in bi-annual training, exercise or response activities in order to maintain their competency.

ExxonMobil University of Spill Management

ExxonMobil has developed an oil spill response training program which presents the fundamentals of oil spill response and provides a broad overview of response activities with a focus on the practicality and limits when responding to an oil spill. This course is aimed at personnel who fulfil a role within the IMT. The course combines theory, desktop exercises and field deployment of response equipment. The course is jointly run by ExxonMobil personnel along with specialist contractors and the local oil spill response organisation. The course is generally run over four days.

The course content covers:

- Oil spill response concepts;
- Decision processes;
- Corporate policies and preferences;
- Fate, behaviour, tracking and surveillance;
- Response options: Mechanical, In-situ burning, Dispersants, Monitor & Surveillance;
- Response components;
- Practical realities;
- Common misconceptions;
- Hands-on equipment deployment; and

On completion of the course, participants are certified in ICS 100-200.

Regional Response Team

Esso, along with other ExxonMobil business units, contribute personnel to ExxonMobil's RRT. All RRT members in Europe, Africa, Middle East, Asia Pacific RRT complete University of Spill Management training (or equivalent) as base training. RRT Members in the Americas RRT complete a minimum of ICS 300. Selected RRT members also participate in additional role specific training. The RRT conducts annual RRT Training Workshops which are typically combined with a response exercise.

The ExxonMobil Regional Response Team includes personnel (currently 10) with experience and/or training in oiled wildlife response. These personnel are able to provide above field support to an oiled wildlife response through development of response plans and coordination of specialist resources.

Emergency Support Group

Members of the ESG provide strategic support in event of an oil spill or other emergency event. ExxonMobil's ESG course is used to train ESG members in the ESG process as well as provide an overview of ExxonMobil's emergency response structure. This is an internally run course which combines theory and a number of simulation exercises. The course is typically run over 2.5 days. Course objectives are to:

- Increase awareness of the ExxonMobil emergency response system and the underpinning principles;
- Assist in achieving a consistent approach to the ESG response process across the Corporation
- Familiarise participants with roles and responsibilities within the ESG and the interface with other responders and stakeholders;
- Provide an opportunity for participants to practice roles;
- Improve ESG leadership and communication skills;
- Build confidence of participants in responding as a team and individually; and
- Enhance ExxonMobil's commitment to a consistent approach to emergency response.

Personnel new to the ESG may initially complete ESG Overview training (2 hours) and/or ESG CBT which provides an overview of ESG processes and roles and responsibilities.

Aerial Surveillance Course

Aerial Observers complete an Aerial Surveillance Course, which is provided by AMOSC and OSRL. The course is typically run over two days and includes theory and practical activities including:

- Basic hydrocarbon theory and its relevance to aerial surveillance;
- Basic understanding of how to work in an aviation crew environment;
- How to effectively plan and coordinate an aerial surveillance flight;
- How to carry out the plotting and recording of oil spill information; and
- How to present oil spill information back through the IMT in a clear and coherent manner.

9.4.4 Source Control Branch

ExxonMobil have a source control branch who specialise in source control in relation to a well blowout scenario. Personnel involved in Source Control Branch (SCB) management (i.e. Branch Director / Deputy Branch Director) will have the minimum competencies and training or meet requirements recognition of prior learning and experience.

10 Stakeholder Engagement and Community Consultation

OIMS System 10-1 Community Awareness and Public Affairs is in place to establish and maintain community confidence and trust in Esso activities through consultative and collaborative interactions and relationships that establish Esso as a responsible corporate citizen and good neighbour. This System addresses all forms of communication and interaction with employees, contractors, government and law enforcement officials, non-governmental organisations (NGOs), the media and local communities where Esso's offices and operations could have an impact on the communities.

The System objectives are:

- Recognise and respond to community concerns and impacts so as to establish and maintain public trust and confidence in the Operations Integrity of Esso operations and facilities;
- Anticipate community concerns and develop response plans, as appropriate; and
- Stakeholder consultation contributes to Esso's understanding of the impacts and risks of the activity and is undertaken with a genuine desire to further understand the environments in which we operate.

Esso maintains a database of relevant stakeholders potentially affected by offshore production and drilling operations and records of consultation for each stakeholder (Appendix A).

10.1 Activity-based Consultation with Relevant Stakeholders

To consult with relevant stakeholders and assist with preparing EPs, Esso provides Campaign Information Sheets to all relevant stakeholders. These information sheets include a description of the activity to be undertaken, impacts and risks and control measures to be implemented, as appropriate to the stakeholders' functions, activities or interests.

Relevant stakeholders are invited to correspond with Esso if they have concerns or require clarification. Follow up verbal discussions with relevant stakeholders occur if and when requested. All phone discussions are followed up with an email summarising the discussion and included in the SSHE consultation database.

10.2 Discussions with Relevant Stakeholders in the Immediate Vicinity of Esso's Activities

Esso has regular meetings with SETFIA and Cooper Energy (approximately every quarter) to discuss proposed and current Bass Strait offshore activities in detail and to communicate associated impacts and risks that may affect relevant stakeholders. SETFIA then assists in identifying fisheries stakeholders who may be affected by an activity and consults with these stakeholders on Esso's behalf. All consultation between SETFIA and identified stakeholders is documented and provided to Esso, and any identified issues or concerns are followed up by Esso with a phone call and/or emails.

Esso also includes Offshore Fact Sheets and Campaign Information Sheets (including impacts and risks) in the SETFIA quarterly newsletter as necessary.

During times of major project activity, regular meetings with interested relevant stakeholders are considered. Esso had a monthly phone hook-up with SETFIA and Lakes Entrance Fishermen's Cooperative Society Limited (LEFCOL) throughout 2018 and 2019 to discuss Esso's activities. Details of these meetings are recorded in the SSHE consultation database.

In February 2020 Esso held a consultation session in Lakes Entrance for the Eastern Fishing Fleet in conjunction with SETFIA. The session was held to discuss current and proposed offshore activities, including impacts and risks, and offer the opportunity for stakeholders to raise any questions or concerns about any of Esso's activities. Stakeholders were also asked how the consultation process could be improved.

Following on from the session, Esso's environmental representatives spent time at the Lakes Entrance wharf with the stakeholders to gain a deeper insight into how the fishing activities are undertaken, including the use of plotter systems and trawling equipment.

Esso have offered to hold more of these consultation sessions as requested by the fisheries stakeholders.

A six-monthly meeting occurs with the fishing industry to negotiate compensation claims (Compensation Tribunal). A fisheries subject matter expert also attends the meeting together with fisheries claimants. The last tribunal meetings occurred in August 2019 and February 2020 and an overview of Esso's current projects was outlined.

Throughout 2020, Esso has also been consulting with relevant stakeholder on other activities (jack up activities and P&A campaigns).

10.3 Consultation with State Departments and Agencies

The following consultation / review process was agreed with the following state departments and agencies - Victorian Department of Transport (DoT), Tasmanian Department of Primary Industries, Parks, Water and Environment (DEPIPWE) - Environment Protection Authority (EPA) and NSW Transport for NSW:

- 30 days to review a new OPEP
- 14 days to review OPEP changes, by exception only
- 14 days to review Quick Reference Guides or similar smaller documents

The DoT will be the main contact for Victorian government department and agency stakeholders. Esso will consult with DoT who will then distribute relevant consultation to the following stakeholders:

- Victorian Fisheries Authority
- Department of Environment, Land, Water and Planning
- Department of Jobs Precincts and Regions (DJTR) – Earth Resources Regulation
- Environment Protection Authority
- Transport Safety Victoria - Maritime Safety
- Parks Victoria

10.4 Periodic Updates

To assist relevant stakeholders in their general understanding of the industry and Esso's overall operations, Esso provides an annual fact sheet or email to relevant stakeholders. This communication contains updates about Esso's offshore operations, including information such as environmental performance data.

Esso also works with Seafood Industry Victoria (SIV) to include a copy of Offshore Fact Sheets and Campaign Information Sheets in the SIV quarterly newsletter, PROFISH when practical.

10.5 Ongoing Community Engagement

Esso is committed to supporting and engaging with the communities in which we operate and consider community relationships an essential element of our business. The process for receiving, documenting and responding to relevant environmental, socioeconomic, and community health information requests from external interested parties is addressed through OIMS System 10-1 Community Awareness and Public Affairs.

10.5.1 Public Forums

Esso currently conducts public engagement sessions approximately every one to two years to engage with the broader community. The purpose of these sessions is to enable face-to-face discussions with relevant stakeholders and also to enable other persons and organisations to learn about Esso's activities.

The last two public engagement sessions were conducted on 17 November 2017 and 5 December 2018 and included information on Esso's offshore projects and ongoing operational activity. Invitations were sent to all Lakes Entrance local stakeholders, including fishers and both sessions were advertised in the local newspaper. The next public engagement session is planned for 2H 2021.

10.5.2 Esso Webpage

Esso's webpage is an information portal providing the community with access to fact sheets and EP summaries and provides an opportunity for stakeholders to make enquiries about our offshore activities and projects. Information on current major project activity can be accessed at https://www.exxonmobil.com.au/Energy-and-environment/Energy-resources/Upstream-operations/Bass-Strait

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Appendix A – Relevant Stakeholders

Stakeholder Consultation

The OPGGS(E)R establish that titleholders (and those with access authority) 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.

To address this, Esso has undertaken consultation during the preparation of this EP to identify stakeholders; share sufficient information; and allow reasonable time for consideration of this information (and feedback to Esso).

Categories of relevant persons

As described in the OPSGG(E)R, there are five categories of relevant persons with whom Esso will consult:

- Each department or agency of the Commonwealth to which the activities to be carried out under the EP may be relevant.
    - This is taken to mean a Commonwealth Government department or agency that has responsibility for managing or protecting the marine environment from pollution. This may include those with responsibilities for environmental and fisheries management, oil pollution management and response, defence and communications, maritime / navigational safety, marine parks and native title.
- Each department or agency of a State or the Northern Territory to which the activities to be carried out under the EP may be relevant.
    - This is taken to mean a State or the Northern Territory Government department or agency that has responsibility for managing or protecting the marine environment from pollution. This may include those with responsibilities for environmental and fisheries management, oil pollution management and response, defence and communications, maritime / navigational safety, marine parks and native title.
- The department of the responsible State Minister or the responsible Northern Territory Minister.
    - This is taken to mean the department that has responsibilities for offshore petroleum or energy resources in the adjacent State or Northern Territory.
- Persons or organisations whose functions, interests or activities may be affected by the activities to be carried out under the EP.
    - This is taken to mean a person or organisation that may be affected by the petroleum activity.
- Any other persons or organisation that it considers relevant.
    - Any other identified stakeholders based on existing environmental knowledge, past experience, internet research, initial campaign emails, existing networks and forums, or social media.

Definition of relevant persons' functions, interests and activities

Relevant persons' functions, interests and activities have been defined in Table 1 below.

Table A0-1 Definitions of relevant persons' functions, interests and activities

Function	Person or organisation's power, duty, authority or responsibilities
Activity	Thing or things that a person or group does or has done
Interest	Person or organisation's rights, advantages, duties and liabilities; or a group or organisation having a common concern

Definition of sufficient information

Providing 'sufficient information' includes:

- Sharing information that is targeted to relevant persons' needs;
- Detailing the proposed activity and any impacts and risks that may be relevant to them;

- Putting forward information on how an impact or risk may affect that relevant person; and
- Describing the control measures proposed to manage the potential impacts to that relevant person.

Reasonable consultation period

The time required for consultation varies depending on the individual circumstances of the relevant person, the proposed activity, the extent of impact and risks on that relevant person and the level of information that has been provided.

Esso understands that some relevant persons may require longer timeframes than others, such as those that do not have resources dedicated specifically to liaise with the petroleum industry.

A reasonable consultation period will allow:

- A relevant person to assess information and provide a response detailing any 'objections or claims'
- Esso to consider responses in developing the EP; and
- Esso to reply back to the relevant person addressing any 'objections or claims' in the EP.

Addressing objections / claims

Esso will clearly identify and address each *specific* objection or claim raised by relevant persons and if applicable:

- Demonstrate that the risk or impact in question has been reduced to ALARP and will be of an acceptable level;
- Provide a statement that addresses each element of the objection or claim made by a relevant person and where control measures are implemented to resolve objections and claims, will clearly communicate this to the relevant person; and
- Provide copies of all written responses provided by a relevant person to NOPSEMA.

In the event that Esso and a relevant person are unable to reach agreement on an activity, or there is a broad objection (e.g. to resource exploitation) or differing views (e.g. on the significance of an environmental impact or risk) the consultation report will demonstrate that:

- Reasonable attempts have been made;
- Reasonably available options have been explored for resolving or mitigating the degree to which a person may be affected, particularly through control measures;
- The relevant person has been informed about how their objections or claims have been addressed; and
- The relevant person has been made aware of how their objections or claims are going to be represented to NOPSEMA.

Stakeholder Categorisation

Table A0-2 Category 1 Stakeholders – Commonwealth department or agency

Commonwealth Department or Agency	Relevance
Department of Agriculture, Water and Environment - fisheries, biosecurity and marine pests	Responsible for the implementation of Australia's marine pest and biosecurity management requirements when bringing in diving or installation vessels, MODUs and support vessels.
Department of Agriculture, Water and Environment Parks Australia- Director of National Parks	Responsible for managing Commonwealth reserves and conservation zones. Esso reports death / injury of EPBC listed species and notifies oil pollution if it impacts, or potentially impacts, Australian Marine Parks.
Department of Defence Australian Hydrographic Office (AHO)	Responsible for publication of nautical charts and other information for safety of ships navigating in Australian waters (including Notices to mariners)
Department of Foreign Affairs and Trade	Relevant where proposed activity, or oil spill/other environmental risk, could result in impacts in international jurisdictions or on foreign individuals/governments

Commonwealth Department or Agency	Relevance
Australian Maritime Safety Authority	Commonwealth government agency responsible for maritime safety, protection of the marine environment including marine pollution and maritime aviation search and rescue.
Australian Fisheries Management Authority	Responsible for management of Commonwealth commercial fisheries from 3NM to 200NM. Esso titles and areas of operations overlap with a number of these fisheries.
National Offshore Petroleum Titles Administrator (NOPTA)	Advises on and administers the OPGGS Act, provides regulation and management of offshore petroleum resources in Commonwealth waters.

Table A0-3 Category 2 Stakeholders – State or Northern Territory department or agency

State	State or Northern Territory Department or Agency	Relevance
VIC	Victorian Fisheries Authority	An independent statutory authority established to effectively manage Victoria's fisheries resources. Bay and inlet fishery license holders overlap with Esso's operational areas and further fisheries could potentially be affected by an unplanned event.
VIC	Department of Environment, Land, Water and Planning	Relevant for unplanned events as a response agency for responding to wildlife impacted by marine pollution.
VIC	Department of Transport (DOT) (formerly DJPR and DEDJTR)	Relevant for unplanned events as a control agency in Victorian state waters.
VIC	Department of Jobs Precincts and Regions (DJTR) – Biosecurity and agricultural services	Relevant for planned events. Responsible for marine biosecurity.
VIC	Environment Protection Authority	Relevant for unplanned events as they have jurisdiction over environmental matters in Victoria, including environmental protection and may advise on pollution and waste management in a response scenario.
VIC	Transport Safety Victoria - Maritime Safety	Relevant for unplanned events. A branch of Transport Safety Victoria, working closely with vessel operators and waterway and port managers to provide expert knowledge, education, support and direction
VIC	Parks Victoria	Relevant for unplanned events. They manage significant stretches of land along the Gippsland coastline and some maritime infrastructure in the Gippsland area (e.g. some piers, jetties, berths)
NSW	Transport for NSW	Relevant for unplanned events. The control agency for marine pollution incidents impacting NSW state waters. NSW waters could potentially be affected by an extended duration unplanned event.
NSW	Department of Primary Industries	Relevant for unplanned events. Is responsible for the administration and development for agriculture, fisheries, aquaculture, forestry, and biosecurity in NSW.
TAS	Department of Primary Industries, Parks, Water and Environment – Environment Protection Authority (EPA)	Relevant for unplanned events as the control agency for marine pollution in Tasmanian state waters.
TAS	Parks and Wildlife Service	Relevant for unplanned events. The managing authority of Tasmania's nature reserve system which could potentially be affected by an unplanned event.

Table A0-4 Category 3 Stakeholders – Department of the responsible State Minister

Department of the responsible State Minister	Relevance
Department of Jobs Precincts and Regions - Earth Resources Regulation (VIC)	Victoria's regulator of exploration, mining, quarrying, petroleum, recreational prospecting and other earth resources activities. Assesses and authorises earth resource projects and enforces laws to ensure those projects are conducted such that the community and environment are safeguarded.

Category 4 (and 5) Stakeholders - Persons or organisations with functions, interests or activities that could be potentially affected by the activities (sub-divided into planned activities and unplanned events) to be carried out under the EP.

During the planning of each activity Esso reviews the current list of stakeholders maintained in the SSHE database and uses a checklist to assess which stakeholders are relevant based on the definitions in Table 1.

Table A0-5 Category 4 & 5 Stakeholders – Other relevant persons or organisations

Stakeholder ID	Relevant stakeholders (planned activities)	Relevance
17	Lakes Entrance Fishermen's Co-operative Limited	The largest (fleet and throughput) fishing co-operative in Australia.
33	Seafood Industry Victoria	The peak body representing professional fishing, seafood processors and exporters in Victoria.
37	South East Trawl Fishing Industry Association	Represents the interests of Commonwealth-licensed trawl fishermen in the South East Trawl Fishery.
15	Gippsland Ports	Potentially affected function or activity
18	Lakes Entrance Scallop Fishing Industry Association	Potentially affected function or activity
24	Seven Group Holdings (formerly Nexus)	Potentially affected function or activity
26	Beach Energy	Potentially affected function or activity
34	Cooper Energy (Formerly Santos)	Potentially affected during activity
40	Sustainable Shark Fishing Association	Potentially affected during activity
52	Victorian Scallop Industry Association	Potentially affected during activity
58	Emperor Energy (formerly Oil Basins)	Potentially affected function or activity
70	Victorian Bays and Inlets Fisheries Association	Potentially affected during activity
73	Victorian Rock Lobster Association	Potentially affected during activity
76	Commonwealth Fisheries Association	Potentially affected during activity
77	Southern Shark Industry Alliance	Potentially affected during activity
79	Eastern Victorian Sea Urchin Divers Association	Potentially affected during activity
81	Australian Oceanographic Services	Potentially affected during activity
83	Corner Inlet Fisheries Habitat Association	Potentially affected during activity
87	Bass Oil	Potentially affected during activity
100	CarbonNet	Potentially affected during activity

Stakeholder ID	Relevant stakeholders (planned activities)	Relevance
121	Australian Southern Bluefin Tuna Industry Association	Potentially affected during activity
123	Panama II Octopus fishing vessel	Potentially affected during activity
128	Fishermans Tribunal	Potentially affected during activity
10	East Gippsland Catchment Management Authority	Potentially relevant in an unplanned event
11	East Gippsland Shire Council	Potentially relevant in an unplanned event
20	Wellington Shire Council	Potentially relevant in an unplanned event
29	Phillip Island Nature Park	Potentially relevant in an unplanned event
30	Port Franklin Fisherman's Association	Potentially relevant in an unplanned event
38	South Gippsland Shire Council	Potentially relevant in an unplanned event
41	Tasmanian Seafood Industry Council	Potentially relevant in an unplanned event
51	VR Fish - Victorian Recreational Fishing Peak Body	Potentially relevant in an unplanned event
66	Apollo Bay Fishermen's Co-op	Potentially relevant in an unplanned event
71	Victorian Fishery Association in Research Management (VFARM)	Potentially relevant in an unplanned event
82	East Gippsland Estuarine Fishermen's Association	Potentially relevant in an unplanned event
112	Victorian Regional Channels Authority	Potentially relevant in an unplanned event

Appendix B – Stakeholder Consultation Reports

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response

Category: 1 - Commonwealth Department or Agency

ID: 4 Organisation: Australian Fisheries Management Authority

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
09-Oct-17	136	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
13-Oct-17	137	From Stakeholder	Email	Request to update contact details	No objections, claims or issues raised	EAPL stakeholder database updated.
26-Oct-17	138	From Stakeholder	Email	Invitation to December 2017 Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	Stakeholder requested invitation be resent
09-Nov-17	140	To Stakeholder	Phone	Stakeholder requested invitation to Community Session be resent.	No objections, claims or issues raised	EAPL resent invitation.
21-Dec-17	1178	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
16-Jul-18	1995	To Stakeholder	Phone	Called to check if contact details are current	No objections, claims or issues raised	N/A
06-Aug-18	2013	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
20-Nov-18	2143	To Stakeholder	Email	Invitation to December 2018 Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	Stakeholder requested invitation be resent
06-May-19	2956	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3077	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3188	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3247	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3385	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	Acknowledgement of receipt
11-Mar-20	3338	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3425	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	Acknowledgement of receipt
09-Apr-20	3315	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 125 Organisation: Australian Hydrographic Office

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
08-Nov-17	1825	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
21-Dec-17	1823	From Stakeholder	Email	Stakeholder acknowledged receiving fact sheet #2	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
07-Jun-18	1810	From Stakeholder	Email	Stakeholder acknowledged receiving fact sheet #2	No objections, claims or issues raised	N/A
06-Aug-18	2090	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
06-Aug-18	2091	From Stakeholder	Email	Stakeholder acknowledged receiving fact sheet #4	No objections, claims or issues raised	N/A
22-Aug-18	2112	From Stakeholder	Email	Stakeholder advised there were technical issues with the email gateway	No objections, claims or issues raised	N/A
06-May-19	2993	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	Acknowledgement of receipt
09-May-19	3045	To Stakeholder	Email	Email sent advising stakeholder that Esso Australia are planning to conduct some offshore work in Bass Strait within the Barracouta platform's petroleum safety zone in early June.	No objections, claims or issues raised	N/A
24-Jul-19	3078	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	RESPONSE 24/07/19: Please accept this email as acknowledgement that your email has been received by the AHO. The data you have supplied will now be registered, assessed, prioritised and validated in preparation for updating our Navigational Charting products. These adhere to International and Australian Charting Specifications and standards. These standards may result in some data generalisation or filtering due to the scale of existing charts, proximity to other features, and the level of risk a reported feature presents to mariners.	N/A
11-Dec-19	3194	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	Please accept this email as acknowledgement that your email has been received by the AHO. The data you supplied will now be registered, assessed, prioritised and validated in preparation for updating our Navigational Charting products. These adhere to International and Australian Charting Specifications and standards. These standards may result in some data generalisation or filtering due to the scale of existing charts, proximity to other features, and the level of risk a reported feature presents to mariners.
13-Dec-19	3254	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	Please accept this email as acknowledgement that your email has been received by the AHO. The data you supplied will now be registered, assessed, prioritised and validated in preparation for updating our Navigational Charting products. These adhere to International and Australian Charting Specifications and standards. These standards may result in some data generalisation or filtering due to the scale of existing charts, proximity to other features, and the level of risk a reported feature presents to mariners.
07-Mar-20	3379	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	Acknowledgement of receipt
12-Mar-20	3431	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	Acknowledgement of receipt
09-Apr-20	3321	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	Stakeholder querying Jack Up Rig movements

ID: 2 Organisation: Australian Maritime Safety Authority

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
09-Oct-17	106	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
12-Oct-17	1154	To Stakeholder	Email	EAPL stakeholder consultation being underway and looking for formal input	No objections, claims or issues raised	Stakeholder confirmed they received revised coordinates
15-Nov-17	1157	From Stakeholder	Email	Stakeholder confirmed they received revised coordinates	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
21-Dec-17	1180	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	Email from stakeholder requesting shapefiles for the seabed survey and operational areas. EAPL emailed shapefiles to the stakeholder.
06-Aug-18	2011	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
05-Dec-18	2636	From Stakeholder	Email	Discussion on Corexit EC9527 holdings	No objections, claims or issues raised	Confirming that Esso Australia is holding the following dispersant stockpile, all of which was purchased before 2010.
06-May-19	2955	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	Acknowledge of receipt
24-Jul-19	3058	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
24-Jul-19	3079	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	24/07/19 RESPONSE: Thank you for contacting the Australian Maritime Safety Authority. The Master should notify AMSA's Joint Rescue Coordination Centre (JRCC) by e-mail to rccaus@amsa.gov.au (Phone: 1800 641 792 or +61 2 6230 6811) for promulgation of radio-navigation warnings at least 24-48 hours before operations commence. AMSA's JRCC will require the vessel details (including name, callsign and Maritime Mobile Service Identity (MMSI)), satellite communications details (including INMARSAT-C and satellite telephone numbers), area of operation, requested clearance from other vessels and any other information that may contribute to safety at sea. JRCC will also need to be advised when operations start and end. Contact the Australian Hydrographic Office at datacentre@hydro.gov.au no less than four working weeks before operations, with details relevant to the operations. The AHO will promulgate the appropriate Notice to Mariners (NTM), which will ensure other vessels are informed of your activities. To obtain a vessel traffic plot showing Automatic Identification System (AIS) traffic data for your area of interest, please visit AMSA's spatial data gateway and Spatial@AMSA portal to download digital data sets and maps. A form for requesting customised information and data is also available via the portal (fees and charges may apply).	Email from stakeholder advising they received our update. No objections, claims or issues raised
11-Dec-19	3177	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3215	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	jack up rig notify AMSA's Joint Rescue Coordination Centre.
07-Mar-20	3413	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	Acknowledgement of receipt

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
11-Mar-20	3366	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	Stakeholder advising receipt of campaign sheet
12-Mar-20	3440	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	Acknowledgement of receipt
09-Apr-20	3287	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	Stakeholder acknowledged receipt of update

ID: 99 Organisation: Department of Agriculture, Water and the Environment

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
09-Nov-17	295	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
21-Dec-17	1197	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
22-Aug-18	2113	To Stakeholder	Phone	Phone call to discuss international vessels	No objections, claims or issues raised	N/A
06-May-19	2996	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
11-Dec-19	3191	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3257	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3388	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3341	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3422	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3312	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 127 Organisation: Department of Agriculture, Water and the Environment - fisheries, biosecurity and marine pests

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
06-May-19	3046	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	Stakeholder provided information on biofouling management and biosecurity requirements
11-Dec-19	3174	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3229	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	Thank you for providing the Department the opportunity to comment on the programme. The Marine Biosecurity Unit has reviewed this document and is comfortable with the management practices specified to manage ballast water and biofouling.

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
07-Mar-20	3374	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3327	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3436	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3326	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 105 Organisation: Department of Foreign Affairs & Trade

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
08-Nov-17	301	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
21-Dec-17	1205	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
07-Jun-18	1639	From Stakeholder	Email	Email received to update contact details	No objections, claims or issues raised	Consultation database updated to reflect new contact
06-Aug-18	2076	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
06-Aug-18	2096	From Stakeholder	Email	Out of office reply	No objections, claims or issues raised	N/A
06-May-19	2994	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3086	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3193	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3255	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3405	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3358	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3448	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
09-Apr-20	3295	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 85 Organisation: National Offshore Petroleum Titles Administrator

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
21-Dec-17	1231	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	Email received to update contact details
06-Aug-18	2067	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
06-May-19	2989	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	Acknowledgement of receipt
24-Jul-19	3067	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	Acknowledgement that your email has been received by NOPTA
11-Dec-19	3198	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3250	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3383	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	Thank you for emailing the National Offshore Petroleum Titles Administrator (NOPTA) Titles Team. Please accept this email as acknowledgement that your email has been received by NOPTA
11-Mar-20	3336	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3427	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3317	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	Acknowledgement of receipt

ID: 129 Organisation: Parks Australia

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
06-May-19	3049	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	the planned activities do not overlap any Australian Marine Parks, therefore there are no authorisation requirements from the DNP.

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
24-Jul-19	3107	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No issues, objections or claims	Thank you for providing the Director of National Parks (DNP) with an update on Geotechnical Investigation at Proposed West Barracouta Well Site (VIC/L1) as approved under the accepted Gippsland Basin Geophysical and Geotechnical Investigations Environment Plan (EP), as well the additional works associated with Sweetlips and Wirrah. Based on the information provided in this email and previous correspondence, we note that the planned activities are a minimum of approximately 80 km from the closest Australian Marine Park. Therefore there are no authorisation requirements from the DNP. As mentioned in our previous comments sent 13 June 2019, I can confirm that we do not require further notification of progress made in relation to this activity unless details regarding the activity change and result in an overlap with, or may impact, a marine park or for emergency responses (please see our previous correspondence for details on emergency response notifications). Please don't hesitate to contact marineparks@environment.gov.au if you have any further questions.
11-Dec-19	3173	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3230	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3398	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	Stakeholder advised that the planned activities for both West Barracouta and Seahorse/Tarwhine do not overlap any Australian Marine Parks
11-Mar-20	3332	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	Stakeholder advised that the planned activities for both West Barracouta and Seahorse/Tarwhine do not overlap any Australian Marine Parks
12-Mar-20	3455	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	Acknowldgement of receipt
09-Apr-20	3302	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	Stakeholder acknowledged receipt of the update
27-May-20	3503	To Stakeholder	Email	Follow up email after phone call with stakeholder to discuss Area Response Plan and Species Response Plans that have been developed.	No objections, claims or issues raised	N/A
03-Jun-20	3504	To Stakeholder	Email	Email regarding Tactical Response Plans for areas of the Gippsland coast.	No objections, claims or issues raised	N/A
09-Jun-20	3508	To Stakeholder	Email	Gabo Island Area Response Plan and Species Response Plans emailed to stakeholder.	No objections, claims or issues raised	N/A

Category: 2 - State Department or Agency

ID: 46 Organisation: Department of Environment, Land, Water and Planning (Victorian State Control Agency for wildlife impacted by marine pollution)

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
10-Oct-17	234	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
26-Oct-17	235	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
09-Nov-17	236	To Stakeholder	Phone	Follow up phone call regarding invitation to community session	No objections, claims or issues raised	N/A
21-Dec-17	1201	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
06-Aug-18	2045	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
29-Oct-18	2132	To Stakeholder	Phone	Discussion on Marine Pollution sub-plan	No objections, claims or issues raised	N/A
02-Nov-18	2141	From Stakeholder	Email	Discussion on "advice to oil exploration companies" document	No objections, claims or issues raised	N/A
02-Nov-18	2634	From Stakeholder	Email	Discussion on "advice to oil exploration companies" document	No objections, claims or issues raised	N/A
20-Nov-18	2169	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
02-Dec-18	2633	From Stakeholder	Email	Information to petroleum companies on wildlife.	No objections, claims or issues raised	N/A
25-Mar-19	2938	To Stakeholder	Email	Working draft for testing titleholder's Oiled Wildlife Response arrangements	No objections, claims or issues raised	Email regarding titleholder's Oiled Wildlife Response arrangements in Gippsland
01-May-19	3047	To Stakeholder	Email	Planning for titleholder's test of oiled wildlife response arrangement.	No objections, claims or issues raised	Discussion about how resources will be requested
06-May-19	2976	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
09-May-19	3048	To Stakeholder	Email	Discussion on exercise scope and injects	No objections, claims or issues raised	Unable to provide an evaluator for this exercise.
18-Jul-19	3125	To Stakeholder	Email	Confirmed details for upcoming meeting to review the outcomes of titleholders Oiled Wildlife Response test	No objections, claims or issues raised	N/A
23-Jul-19	3126	To Stakeholder	Minutes	Meeting held to discuss: - Review of titleholder Oiled wildlife Response Test - Evaluation report - Review of Oiled Wildlife Response Arrangements ALARP Assessment - Draft Oil Pollution Emergency Plan - State Marine Pollution exercise	No objections, claims or issues raised	N/A
24-Jul-19	3074	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
24-Jul-19	3127	To Stakeholder	Email	Titleholder provided stakeholder with: - Bass Strait Operational & Scientific Monitoring Plan - Personal Protective Equipment	No objections, claims or issues raised	N/A
09-Dec-19	3163	To Stakeholder	Email	Stakeholder provided with Esso Australia Bass Strait Oil Pollution Emergency Plan and Quick Reference Guides for review and comment.	No objections, claims or issues raised	N/A
11-Dec-19	3179	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3236	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
07-Mar-20	3399	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3352	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3454	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3301	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A
12-May-20	3492	To Stakeholder	Email	EAPL requesting meeting with stakeholder to review oiled wildlife response guidance documents	No objections, claims or issues raised	Stakeholder proposed meeting dates/times
18-May-20	3478	To Stakeholder	Email	Provided stakeholder with Oiled Wildlife Response document for review	No objections, claims or issues raised	N/A
20-May-20	3474	To Stakeholder	Email	EAPL meeting with DELWP to discuss Area Response Plan and Species Response Plans	No objections, claims or issues raised	N/A
20-May-20	3475	To Stakeholder	Phone	Meeting to discuss Oiled Wildlife Response	No objections, claims or issues raised	N/A

ID: 45 Organisation: Department of Jobs Precincts and Regions - Earth Resources Regulation (VIC)

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
26-Oct-17	232	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
21-Dec-17	1198	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
06-Aug-18	2044	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
06-Aug-18	2095	From Stakeholder	Email	Out of office reply	No objections, claims or issues raised	N/A
20-Nov-18	2166	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
06-May-19	2973	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
27-Aug-19	3130	To Stakeholder	Email	Please find attached a draft of the Esso Australia Bass Strait Oil Pollution Emergency Plan for review and comment by the Victorian Department of Transport and other State agencies.	No objections, claims or issues raised	N/A
11-Dec-19	3169	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3232	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3407	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
11-Mar-20	3360	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3446	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3293	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 126 Organisation: Department of Jobs, Precincts and Regions - Agriculture & Biosecurity services

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
20-Nov-18	2165	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	No objections, claims or issues raised
24-Jul-19	3082	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
10-Dec-19	3273	To Stakeholder	Email	EAPL emailed stakeholder to enquire if the WA vessel check is being reworked and may evolve into a more Australia wide tool for assessing IMS issues	No objections, claims or issues raised	Stakeholder confirmed that the Vessel Check system has been reworked. It is already live and can be accessed at www.vessel-check.com. The portal does not rely on any specific questions (unlike the previous WA questionnaire process) – it effectively seeks what vessel biofouling management is being undertaken for a vessel and assesses whether the outlined management is sufficient to mitigate the transfer of invasive marine species (IMS) to as low as reasonably practicable (ALARP) (it is NOT assessing whether a vessel has an IMS on it).
11-Dec-19	3199	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3237	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3395	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3348	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3428	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3305	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 43 Organisation: Department of Jobs, Precincts and Regions - Marine Pollution

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
10-Oct-17	225	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
26-Oct-17	226	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
09-Nov-17	227	To Stakeholder	Phone	Follow up phone call regarding invitation to community session	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
21-Dec-17	1200	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	I will be on leave. I will respond to your message when I return.
25-Jul-18	2002	From Stakeholder	Email	Meeting invitation received	No objections, claims or issues raised	No objections, claims or issues raised
06-Aug-18	2042	To Stakeholder	EmailE	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
06-Aug-18	2100	From Stakeholder	Email	Out of office reply	No objections, claims or issues raised	N/A
23-Aug-18	2117	To Stakeholder	Minutes	Discussion – focusing on Offshore Operations	No objections, claims or issues raised	N/A
20-Nov-18	2167	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
05-Dec-18	2282	To Stakeholder	Community Session	Titleholder held community session in Lakes Entrance discussing current and planned activities in Bass Strait.	No objections, claims or issues raised	N/A
29-Mar-19	2939	To Stakeholder	Phone	Discussing exercises and testing	Follow Up: Send contact details to stakeholder for invitations to Regional Reference Group and State exercise.	Phonecall with stakeholder discussing EAPL emergency reponse exercises and testing
06-May-19	2971	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
14-May-19	3134	To Stakeholder	Minutes	Meeting to discuss: - Status and scope of Bass Strait OPEP - Consultation with other State agencies - SCAT expectation - Notifications and expectations - Cost recovery arrangements - Transfer of control arrangements - Naming conventions for Vic Govt IMT, including for OWR IMT - TRP handover	No objections, claims or issues raised	N/A
18-Jun-19	3122	To Stakeholder	Email	Request for a meeting to discuss incident data and the Oil Pollution Emergency Plan	No objections, claims or issues raised	Meeting scheduled and clarification provided on the role of DJPR during a marine pollution incident.
21-Jun-19	3123	To Stakeholder	Email	Provided stakeholder with a draft copy of the Oil Pollution Emergency Plan for Seahorse, Tarwhine and Barracouta for review and comment	No objections, claims or issues raised	Stakeholder received the document and agreed to review it.
24-Jun-19	3124	To Stakeholder	Minutes	Meeting to discuss the - Oil Pollution Emergency Plans - Shoreline response - Access to Air Attach Supervision from State resources - State owned OSR equipment list - Cross jurisdictional arrangements - Outcomes from OWR capability testing	No objections, claims or issues raised	Stakeholder provided a link to state equipment stockpile
24-Jul-19	3084	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A

ID: 63 Organisation: Department of Primary Industries, Parks, Water and Environment (Tasmania) (Tasmanian State Control Agency)

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
21-Dec-17	1207	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
06-Aug-18	2054	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
06-May-19	2981	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
24-Jul-19	3087	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
09-Dec-19	3150	To Stakeholder	Email	Stakeholder provided with Esso Australia Bass Strait Oil Pollution Emergency Plan and Quick Reference Guides for review and comment.	No objections, claims or issues raised	N/A
11-Dec-19	3206	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3242	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
19-Dec-19	3158	To Stakeholder	Email	Stakeholder provided with Quick Reference Guides containing the specific information and potential risks related to worst case discharge scenario from the West Barracouta (BTW), Kipper (KPA) and Whiting (WTA) activities under the Jack Up Rig campaign and requested stakeholder feedback on the Quick Reference Guides.	Stakeholder raised some queries relating to the Condensate QRG and low resolution of maps provided	Stakeholder has reviewed the OPEP and QRGs and provided feedback: - maps require higher resolution - question regarding oiled wildlife response and what the percentage contact is considered for a response to be likely.
20-Feb-20	3278	To Stakeholder	Email	EAPL repsonse to stakeholder re review and feedback on OPEP and quick reference guides. Regarding clarity of maps, we are including higher resolution images in future quick reference guides. Your question regarding the thresholds for wildlife response is a one that we need to give more consideration to, particularly in regards to open water foraging areas where ability to conduct oiled wildlife response activities is difficult. Esso will conduct some additional OWR preparedness activities and we will consider this in the scope of that work. From a practical response perspective, fauna observations are included as part of our operational and scientific monitoring program and would be used to inform the IMT of potential impacts to wildlife. The Esso IMT would engage with relevant State response agencies regarding OWR activities.	No objections, claims or issues raised	N/A
07-Mar-20	3390	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3343	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3420	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3310	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A
25-May-20	3479	To Stakeholder	Email	EAPL proposing a process defining adequate timing for reviewing documents	No objections, claims or issues raised	N/A
27-May-20	3480	To Stakeholder	Email	EAPL requesting stakeholder to review Quick Reference Guides Part 1	No objections, claims or issues raised	N/A
27-May-20	3481	To Stakeholder	Email	EAPL requesting stakeholder to review Quick Reference Guides Part 2	No objections, claims or issues raised	N/A
27-May-20	3482	To Stakeholder	Email	EAPL requesting stakeholder to review Quick Reference Guides Part 3	No objections, claims or issues raised	N/A
01-Jun-20	3500	To Stakeholder	Email	Updated Quick Reference Guides with changes to Shoreline clean up resources for Seahorse, Cobia, Halibut and Tuna	Request for further discussion on expectations of the state.	N/A
04-Jun-20	3499	To Stakeholder	Phone	EAPL called stakeholder to follow up on the Quick Reference Guides. Stakeholder advised they are satisified with the QRGs and requested a higher quality map and further discussion on expectations of the state.	Stakeholder requested further discussion on expectations of the state during a response. EAPL will call on 9 June 2020 to discuss.	EAPL advised stakeholder how to enlarge maps for higher quality.
09-Jun-20	3509	To Stakeholder	Email	EAPL contacted stakeholder to discuss OPEP and IMT arrangements.	No objections, claims or issues raised	N/A

ID: 131 **Organisation:** **Department of Transport (Victorian State Control Agency for marine pollution)**

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
04-Jul-18	2276	From Stakeholder	Email	Out of office reply	No objections, claims or issues raised	Email received to update contact details
08-Aug-19	3128	From Stakeholder	Email	Stakeholder advising change of contact details	No objections, claims or issues raised	N/A
26-Aug-19	3129	To Stakeholder	Email	Email discussing titleholders Oil Pollution Emergency Plans and confirming scheduled meeting	No objections, claims or issues raised	N/A
09-Sep-19	3132	To Stakeholder	Email	Resent draft of the Esso Australia Bass Strait Oil Pollution Emergency Plan for review and comment by the Victorian Department of Transport and other State agencies.	No objections, claims or issues raised	Acknowlegement of receipt
09-Sep-19	3133	To Stakeholder	Email	Provided stakeholder with titleholders Bass Strait Oil Spill Monitoring Program	No objections, claims or issues raised	Stakeholder requested minor changes to OPEP
09-Dec-19	3145	To Stakeholder	Email	Stakeholder provided with Esso Australia Bass Strait Oil Pollution Emergency Plan and Quick Reference Guides for West Barracouta, Kipper and Whiting for review and comment.	No objections, claims or issues raised	N/A
11-Dec-19	3172	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3231	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
19-Dec-19	3152	To Stakeholder	Email	Stakeholder provided with additional information regarding oil spill response risks and capabilities related to West Barracouta and Kipper programs which are scheduled to commence in January 2020. Stakeholder provided with updated Quick Reference Information sheets for these facilities for both MDO and condensate including revised worst case scenario modelling.	No objections, claims or issues raised	Stakeholder responded that the OPEP and Quick Reference Guides look ok.
19-Dec-19	3164	To Stakeholder	Email	Stakeholder provided with Quick Reference Guides containing the specific information and potential risks related to worst case discharge scenario from the West Barracouta (BTW), Kipper (KPA) and Whiting (WTA) activities under the Jack Up Rig campaign and requested stakeholder feedback on the Quick Reference Guides.	No objections, claims or issues raised	Stakeholder responded no further comment. If marine mammals and sharks are impacted in the ocean, there is little that can be done from a response point of view.
07-Mar-20	3378	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3331	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3432	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3322	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A
16-Apr-20	3461	To Stakeholder	Email	EAPL shared a disease management protocol developed for use in an oil spill response scenario in the current COVID-19 environment.	No objections, claims or issues raised	N/A
16-Apr-20	3462	To Stakeholder	Email	EAPL confirming confirming consultation process and document review periods	No objections, claims or issues raised	N/A
21-Apr-20	3494	From Stakeholder	Email	COVID-19 emergency response information	No objections, claims or issues raised	N/A
12-May-20	3493	To Stakeholder	Email	EAPL requesting meeting with stakeholder to review oiled wildlife response guidance documents	No objections, claims or issues raised	Stakeholder proposed meeting dates/times
18-May-20	3477	To Stakeholder	Email	Provided stakeholder with Oiled Wildlife Response document for review	No objections, claims or issues raised	N/A
20-May-20	3473	To Stakeholder	Email	EAPL meeting with DoT to discuss Area Response Plan and Species Response Plans	No objections, claims or issues raised	N/A
20-May-20	3476	To Stakeholder	Phone	Meeting to discuss Oiled Wildlife Response	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
25-May-20	3469	To Stakeholder	Phone	EAPL following up email regarding consultation process	No objections, claims or issues raised	N/A
25-May-20	3470	To Stakeholder	Email	EAPL following up email regarding consultation process	No objections, claims or issues raised	Stakeholder agreed to proposed consultation process
27-May-20	3487	To Stakeholder	Email	EAPL requesting stakeholder to review Quick Reference Guides Part 1	No objections, claims or issues raised	N/A
27-May-20	3488	To Stakeholder	Email	EAPL requesting stakeholder to review Quick Reference Guides Part 2	No objections, claims or issues raised	N/A
27-May-20	3489	To Stakeholder	Email	EAPL requesting stakeholder to review Quick Reference Guides Part 3	No objections, claims or issues raised	N/A
01-Jun-20	3497	To Stakeholder	Email	Updated Quick Reference Guides with changes to Shoreline clean up resources for Seahorse, Cobia, Halibut and Tuna	No objections, claims or issues raised	N/A
04-Jun-20	3498	To Stakeholder	Phone	EAPL called stakeholder to follow up on the Quick Reference Guides. Stakeholder advised they hadn't reviewed them as yet.	No objections, claims or issues raised	N/A
09-Jun-20	3506	To Stakeholder	Email	EAPL following up stakeholder review of Quick Reference Guides	No objections, claims or issues raised	Stakeholder advised no feedback so far.

ID: 13 Organisation: Environment Protection Authority Victoria

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
09-Oct-17	161	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
26-Oct-17	162	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
08-Nov-17	163	From Stakeholder	Email	Invitation declined	No objections, claims or issues raised	N/A
21-Dec-17	1211	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
06-Aug-18	2019	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
20-Nov-18	2147	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
06-May-19	2957	To Stakeholder	Email	JUR Campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3089	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3187	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3216	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3412	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3365	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3441	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
09-Apr-20	3288	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 64 Organisation: Parks and Wildlife Service (Tasmania)

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
21-Dec-17	1243	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
06-Aug-18	2055	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
06-May-19	2982	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3065	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	Email received from stakeholder advising they received the email and are currently out of the office.
11-Dec-19	3205	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3243	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3389	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	
11-Mar-20	3342	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3421	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3311	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	Out of office reply

ID: 27 Organisation: Parks Victoria

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
09-Oct-17	187	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	Email from stakeholder received to update contact details.
26-Oct-17	188	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
09-Nov-17	189	To Stakeholder	Phone	Follow up phone call regarding invitation to community session	No objections, claims or issues raised	N/A
21-Dec-17	1172	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
06-Aug-18	2029	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
23-Aug-18	2118	From Stakeholder	Minutes	Discussion on Offshore Operations	No objections, claims or issues raised	N/A
20-Nov-18	2155	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
06-May-19	2964	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3064	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3180	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3223	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3415	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3368	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3458	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3285	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	Out of office receipt

ID: 62 Organisation: Transport for NSW (formerly RAMS) (NSW state control agency for marine pollution)

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
10-Oct-17	259	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
18-Oct-17	260	From Stakeholder	Email	Email from stakeholder received to update contact details.	No objections, claims or issues raised	N/A
21-Dec-17	1244	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
07-Jun-18	1730	From Stakeholder	Email	Out of office reply	No objections, claims or issues raised	N/A
08-Jun-18	1733	From Stakeholder	Email	Fact Sheet received	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
06-Aug-18	2053	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
13-Aug-18	2461	To Stakeholder	Email	Offer to discuss offshore operations via phone call	No objections, claims or issues raised	N/A
06-May-19	2980	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3073	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
27-Aug-19	3131	To Stakeholder	Email	Please find attached a draft of the Esso Australia Bass Strait Oil Pollution Emergency Plan for review and comment by the NSW Roads and Maritime Services and other NSW State agencies that you may wish to share witH.	No objections, claims or issues raised	N/A
09-Dec-19	3144	To Stakeholder	Email	Stakeholder provided with Esso Australia Bass Strait Oil Pollution Emergency Plan and Quick Reference Guides for review and comment.	No objections, claims or issues raised	N/A
11-Dec-19	3207	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3241	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
19-Dec-19	3153	To Stakeholder	Email	Stakeholder provided with Quick Reference Guides containing the specific information and potential risks related to worst case discharge scenario from the West Barracouta (BTW), Kipper (KPA) and Whiting (WTA) activities under the Jack Up Rig campaign and requested stakeholder feedback on the Quick Reference Guides.	No objections, claims or issues raised	N/A
23-Dec-19	3165	To Stakeholder	Email	Stakeholder provided with additional information regarding oil spill response risks and capabilities related to West Barracouta and Kipper programs which are scheduled to commence in January 2020. Stakeholder provided with updated Quick Reference Information sheets for these facilities for both MDO and condensate including revised worst case scenario modelling.	No objections, claims or issues raised	N/A
20-Feb-20	3283	To Stakeholder	Email	EAPL following up if stakeholder has any feedback on the OPEP or QRGs.	1. Names of state control agencies for both NSW and Victoria have been updated in the latest revision of the OPEP (version 5) COMPLETE 2. Discussed that NSW would send a Liaison Officer into IMT for a Level 2/3 incident early within a response to understand and plan for potential impacts to NSW State waters - COMPLETE 3. Nadgie Lake and Nadgie River are of highest protection priority to NSW due to unique ecosystems in these areas. Esso to add these locations to QRG and/or EP. IN PROGRESS - No tactical response plans have been developed for these locations. Refer to NSW South Coast Marine Oil & Chemical Spill Contingency Plan (Jan 2017) for details on arrangements for this area. - Nadgie Lake is intermittently open to the sea. No vehicle access. All resources would need to be brought in by vessel or helicopter. - Nadgie River is accessible by vehicle. 4. Cross border marine pollution exercise to be conducted later in 2020. Esso to be kept in the loop with planning	Stakeholder advised of name change, advising of action in the event of a tier 2/3 incident and of a couple of extreme sensitive areas in Victoria

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
07-Mar-20	3391	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3344	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3419	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3309	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A
25-May-20	3483	To Stakeholder	Email	EAPL proposing a process defining adequate timing for reviewing documents	No objections, claims or issues raised	N/A
27-May-20	3484	To Stakeholder	Email	EAPL requesting stakeholder to review Quick Reference Guides Part 1	No objections, claims or issues raised	N/A
27-May-20	3485	To Stakeholder	Email	EAPL requesting stakeholder to review Quick Reference Guides Part 2	No objections, claims or issues raised	N/A
27-May-20	3486	To Stakeholder	Email	EAPL requesting stakeholder to review Quick Reference Guides Part 3	No objections, claims or issues raised	N/A
01-Jun-20	3502	To Stakeholder	Email	Updated Quick Reference Guides with changes to Shoreline clean up resources for Seahorse, Cobia, Halibut and Tuna	No objections, claims or issues raised	N/A
04-Jun-20	3501	To Stakeholder	Phone	EAPL called stakeholder to follow up review of the Quick Reference Guides.	No objections, claims or issues raised	Stakeholder advised they will be reviewing EAPL Quick Reference Guides.
08-Jun-20	3510	From Stakeholder	Email	Stakeholder provided feedback on Quick Reference Guides, namely additional areas to be referenced for TRPs.	No objections, claims or issues raised	EAPL will include 'significant wilderness area' as suggested by stakeholder. EAPL explained that suggested additional estuaries won't be includedas the current list includes all locations that we have an existing Tactical Response Plan (TRP), rather than it being a list of all estuaries. If the State has developed any tactical response plans that should be referenced, EAPL can add reference to those in the plans.

ID: 42 Organisation: Transport Safety Victoria – Maritime Safety

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
08-Nov-17	3516	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
21-Dec-17	1257	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
06-Aug-18	2041	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
06-Aug-18	2093	From Stakeholder	Email	Out of office reply	No objections, claims or issues raised	N/A
06-May-19	2970	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3093	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3514	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
07-Mar-20	3515	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3512	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3511	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3519	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 101 Organisation: Victorian Fisheries Authority

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
08-Nov-17	297	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
21-Dec-17	1199	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	Email from stakeholder received to update contact details.
21-Dec-17	1260	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
06-Aug-18	2072	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
06-May-19	2991	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3096	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3196	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3252	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3381	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	Out of office receipt
11-Mar-20	3334	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3429	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
09-Apr-20	3319	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	Out of office receipt

Category: 4 & 5 - Other Relevant Persons or Organisations

ID: 1 Organisation: Australian Marine Oil Spill Centre

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
09-Oct-17	141	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
10-Oct-17	142	From Stakeholder	Email	Stakeholder enquiry about details of field / asset sales	No objections, claims or issues raised	EAPL consulted with stakeholder regarding which activities may interface with them and will consult with them on drilling activities and provide them with an opportunity for input.
10-Oct-17	262	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
10-Oct-17	1151	To Stakeholder	Email	EAPL consulted with stakeholder regarding which activities may interface with them and will consult with them on drilling activities and provide them with an opportunity for input	No objections, claims or issues raised	N/A
26-Oct-17	143	To Stakeholder	Email	Invitation to December 2017 Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
09-Nov-17	144	To Stakeholder	Phone	Follow up phone call regarding invitation to community session. No answer - left a message.	No objections, claims or issues raised	N/A
21-Dec-17	1181	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
06-Aug-18	2010	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
06-Aug-18	2099	From Stakeholder	Email	Out of office reply received	No objections, claims or issues raised	N/A
30-Oct-18	2133	From Stakeholder	Email	Stakeholder interested participating in response exercise	No objections, claims or issues raised	N/A
31-Oct-18	2136	From Stakeholder	Email	Update on planned response exercise	No objections, claims or issues raised	N/A
20-Nov-18	2142	From Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
14-May-19	3135	To Stakeholder	Minutes	Meeting to discuss: - Status and scope of Bass Strait OPEP - Consultation with other State agencies - SCAT expectation - Notifications and expectations - Cost recovery arrangements - Transfer of control arrangements - Naming conventions for Vic Govt IMT, including for OWR IMT - TRP handover	No objections, claims or issues raised	N/A
09-Dec-19	3149	To Stakeholder	Email	Stakeholder provided with Esso Australia Bass Strait Oil Pollution Emergency Plan and Quick Reference Guides for review and comment.	No objections, claims or issues raised	N/A
19-Dec-19	3157	To Stakeholder	Email	Stakeholder provided with Quick Reference Guides containing the specific information and potential risks related to worst case discharge scenario from the West Barracouta (BTW), Kipper (KPA) and Whiting (WTA) activities under the Jack Up Rig campaign and requested stakeholder feedback on the Quick Reference Guides.	No objections, claims or issues raised	Stakeholder confirmed receipt of email. They will review the documentation provided and return feedback in early January.
30-Mar-20	3460	From Stakeholder	Email	AMOSC provided Gabo Island Area Response Plan (with referenced Little Penguin Species Response Plan and Short Tailed Shearwater Species Response Plan)	No objections, claims or issues raised	EAPL requested Gabo Island plans be communicated to Stakeholder Consultation Advisor

ID: 81 Organisation: Australian Oceanographic Services

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
21-Dec-17	1170	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	Email received to update contact details
06-Aug-18	2063	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
06-May-19	2986	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3080	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3190	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3226	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3402	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3355	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3451	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3298	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 121 Organisation: Australian Southern Bluefin Tuna Industry Association

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
21-Dec-17	1183	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	Stakeholder received fact sheet and would like to remain on the mailing list.
14-Jun-18	1735	From Stakeholder	Email	Stakeholder received fact sheet and would like to remain on the mailing list.	No objections, claims or issues raised	N/A
06-Aug-18	2084	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
06-May-19	2992	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
11-Dec-19	3195	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3253	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
07-Mar-20	3380	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3333	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3430	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3320	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 87 Organisation: Bass Oil

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
10-Oct-17	285	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
26-Oct-17	286	From Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	Email bounced
09-Nov-17	287	To Stakeholder	Phone	Follow up phone call regarding invitation to community session	No objections, claims or issues raised	N/A
21-Dec-17	1185	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
06-Aug-18	2068	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
20-Nov-18	2184	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
06-May-19	2990	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3097	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3197	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3251	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3382	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3335	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
12-Mar-20	3417	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3318	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 26 Organisation: Beach Energy (formerly Lattice Energy - formerly Origin Energy)

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
09-Oct-17	184	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	Email from stakeholder received to update contact details. EAPL stakeholder database updated.
18-Oct-17	185	From Stakeholder	Email	Email from stakeholder received to update contact details. EAPL stakeholder database updated.	No objections, claims or issues raised	N/A
25-Oct-17	186	From Stakeholder	Email	Email from stakeholder received to update contact details. EAPL stakeholder database updated.	No objections, claims or issues raised	N/A
21-Dec-17	1220	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
10-Jan-18	1295	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
06-Aug-18	2028	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
20-Nov-18	2154	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
06-May-19	2963	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3081	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3181	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3222	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3406	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3359	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3459	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
09-Apr-20	3294	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A
ID: 100		**Organisation:**	**CarbonNet**			
06-Oct-17	1142	To Stakeholder	In Person	EAPL provided an overview of activities at meeting	No objections, claims or issues raised	N/A
21-Dec-17	1189	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
ID: 133		**Organisation:**	**Cardno**			
09-Dec-19	3147	To Stakeholder	Email	Stakeholder provided with Esso Australia Bass Strait Oil Pollution Emergency Plan and Quick Reference Guides for review and comment.	Issue: Stakeholder requested high resolution copies of the maps used in the Quick Reference Guides	Email sent to stakeholder advising that high resolution maps were being sources and would be provided.
19-Dec-19	3155	To Stakeholder	Email	Stakeholder provided with Quick Reference Guides containing the specific information and potential risks related to worst case discharge scenario from the West Barracouta (BTW), Kipper (KPA) and Whiting (WTA) activities under the Jack Up Rig campaign and requested stakeholder feedback on the Quick Reference Guides.	No objections, claims or issues raised	N/A
03-Jan-20	3260	To Stakeholder	Email	High Resolution maps provided to stakeholder	No objections, claims or issues raised	Email response advising stakeholder is on leave
06-Jan-20	3271	From Stakeholder	Email	proposal to undertake the review of the OPEP and QRGs	No objections, claims or issues raised	raising a purchase order to advise proceedings.
17-Jan-20	3268	From Stakeholder	Email	Cardno have reviewed and provided feedback on the OPEP and QRGs.	No objections, claims or issues raised	N/A
04-Feb-20	3276	From Stakeholder	Email	Stakeholder confirming that EAPL do not require any additional information or clarifications in relation to their review of the OPEP and QRG.	No objections, claims or issues raised	No additional information / clarifications needed from Cardno at this time. We appreciate you reaching out to check. I understand that Esso Enviro Team are meeting with Cardno in a couple of weeks. If any additional support is needed we can discuss then.
ID: 76		**Organisation:**	**Commonwealth Fisheries Association**			
10-Oct-17	273	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
21-Dec-17	1194	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
06-Aug-18	2060	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
ID: 34		**Organisation:**	**Cooper Energy (Formerly Santos)**			
09-Oct-17	206	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	Email from stakeholder received to update contact details. EAPL stakeholder database updated.
09-Oct-17	599	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
26-Oct-17	208	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
09-Nov-17	209	From Stakeholder	Email	Stakeholder accept invitation to community session	No objections, claims or issues raised	N/A
17-Nov-17	316	From Stakeholder	Community Session	Attended community session	No objections, claims or issues raised	N/A
21-Dec-17	1196	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
06-Aug-18	2035	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
06-Aug-18	2097	From Stakeholder	Email	Email from stakeholder received to update contact details.	No objections, claims or issues raised	EAPL stakeholder database updated.
20-Nov-18	2160	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
06-May-19	2966	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3085	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3178	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3225	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3403	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3356	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3450	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3297	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	Out of office reply

ID: 83 Organisation: Corner Inlet Fisheries Habitat Association

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
10-Oct-17	282	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
26-Oct-17	283	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
09-Nov-17	284	To Stakeholder	Phone	Follow up phone call regarding invitation to community session	No objections, claims or issues raised	N/A
21-Dec-17	1195	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
06-Aug-18	2065	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
20-Nov-18	2183	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
06-May-19	2988	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
11-Dec-19	3211	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3258	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3414	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3367	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3439	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3286	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 11 Organisation: East Gipplsand Shire Council

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
19-Oct-17	159	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
06-Nov-17	160				No objections, claims or issues raised	N/A
21-Dec-17	1209	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	Automated interim response confirms that your enquiry has been received
07-Jun-18	1727	From Stakeholder	Email	automated interim response confirms that your enquiry has been received	No objections, claims or issues raised	N/A
06-Aug-18	2018	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	Automated interim response confirms that your enquiry has been received
06-Aug-18	2094	From Stakeholder	Email	automated interim response confirms that your enquiry has been received	No objections, claims or issues raised	N/A
05-Dec-18	2281	To Stakeholder	Community Session	Titleholder held community session in Lakes Entrance discussing current and planned activities in Bass Strait.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
ID: 82		**Organisation:**		**East Gippsland Estuarine Fishermen's Association**		
10-Oct-17	279	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
26-Oct-17	280	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
09-Nov-17	281	To Stakeholder	Phone	left message on mobile regarding community session	No objections, claims or issues raised	N/A
21-Dec-17	1208	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
06-Aug-18	2064	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
20-Nov-18	2182	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
06-May-19	2987	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3088	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3200	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3248	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3384	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3337	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3437	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3316	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A
ID: 79		**Organisation:**		**Eastern Victorian Sea Urchin Divers Association**		
10-Oct-17	274	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
26-Oct-17	277	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
09-Nov-17	278	To Stakeholder	Phone	Follow up phone call regarding invitation to community session	No objections, claims or issues raised	N/A
21-Dec-17	1213	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
09-Apr-18	1594	From Stakeholder	Email	Email received from stakeholder enquiring whether EAPL has topography maps available	No objections, claims or issues raised	No mapping east of Marlow available

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
01-May-18	1602	To Stakeholder	Email	No mapping east of Marlow available	No objections, claims or issues raised	N/A
06-Aug-18	2062	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
20-Nov-18	2181	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
06-May-19	2985	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3090	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3202	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3246	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3396	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3349	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3457	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3304	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 58 Organisation: Emperor Energy (formerly Oil Basins Ltd)

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
09-Oct-17	255	To Stakeholder	Phone	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
26-Oct-17	254	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
21-Dec-17	1232	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
06-Aug-18	2051	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
20-Nov-18	2176	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
06-May-19	2979	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3066	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3208	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3240	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3392	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3345	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3418	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3308	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 128 Organisation: Fishermans Tribunal

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
06-Feb-18	2458	From Stakeholder	Minutes	Minutes from Esso Fishermens Claims Tribunal	No objections, claims or issues raised	N/A
06-Aug-18	2459	From Stakeholder	Minutes	Minutes from Esso Fishermens Claims Tribunal	No objections, claims or issues raised	N/A
18-Feb-19	2951	From Stakeholder	Minutes	Minutes from Esso Fishermens Claims Tribunal	No objections, claims or issues raised	N/A
12-Aug-19	3466	To Stakeholder	In Person	Fishermen's Tribunal Meeting at LEFCOL in Lakes Entrance	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
01-Feb-20	3277	To Stakeholder	Email	Upcoming EAPL offshore activities provided to the fishermans tribunal: Listed below are our proposed upcoming Offshore activities for 2020, keeping mind that timing for all activities are subject to change and we don't have approved Eps for all activities as yet. I've also attached the campaign sheet we sent out regarding the Jack Up Rig activities at West Barracouta and Kipper. Drilling at Sculpin-1 has finished and the Ocean Monarch and supporting vessels departed on 29 January. January Mackerel P&A West Barracouta Drilling (Noble Tom Prosser) April Whiting P&A June Kingfish B P&A July Seahorse / Tarwhine P&A August Fortescue P&A Kipper drilling December Mulloway / Whiptail P&A	No objections, claims or issues raised	N/A
03-Feb-20	3467	To Stakeholder	In Person	Fishermen's Tribunal Meeting at LEFCOL in Lakes Entrance	No objections, claims or issues raised	N/A
07-Feb-20	3279	From Stakeholder	Email	feedback from the SME representative for the fishing industry that was voiced at the most recent fishing tribunal meeting. They would like to be consulted regarding any upcoming structure decommissioning, jacket & pipeline removal proposals for our Bass Strait facilities, so that they have a chance to put forward their preferences from a fishing industry point of view. They have been in touch with their industry counterparts in other parts of the world where oil & gas facility decommissioning has taken place and have some learnings that they feel should be considered.	No objections, claims or issues raised	N/A
12-Feb-20	3281	To Stakeholder	Email	Calendar invite sent to stakeholders for a meeting in Lakes Entrance as an opportunity to discuss: -Impacts and risks that are included in the Environment Plans -Decommissioning -EAPL bushfire relief and assistance -Online stakeholder portal -Upcoming activities in Bass Strait	No objections, claims or issues raised	N/A

ID: 132 Organisation: GHD

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
09-Dec-19	3146	To Stakeholder	Email	Stakeholder provided with Esso Australia Bass Strait Oil Pollution Emergency Plan and Quick Reference Guides for review and comment.	No objections, claims or issues raised	N/A
19-Dec-19	3154	To Stakeholder	Email	Stakeholder provided with Quick Reference Guides containing the specific information and potential risks related to worst case discharge scenario from the West Barracouta (BTW), Kipper (KPA) and Whiting (WTA) activities under the Jack Up Rig campaign and requested stakeholder feedback on the Quick Reference Guides.	No objections, claims or issues raised	N/A

ID: 15 Organisation: Gippsland Ports

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
09-Oct-17	164	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
26-Oct-17	165	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
08-Nov-17	166	From Stakeholder		Responses to community session	No objections, claims or issues raised	N/A
16-Nov-17	167	From Stakeholder		Stakeholder contact changed.	No objections, claims or issues raised	N/A
17-Nov-17	313			Stakeholder attended Lakes Entrance Community Session	No objections, claims or issues raised	N/A
21-Dec-17	1217	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
06-Aug-18	2021	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
20-Nov-18	2148	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
05-Dec-18	2283	To Stakeholder	Community Session	Titleholder held community session in Lakes Entrance discussing current and planned activities in Bass Strait.	No objections, claims or issues raised	N/A
14-Jan-19	2828	From Stakeholder	Email	Email received from stakeholder requesting consultation on EAPL offshore activities that may impact on vessel activity within waterways managed by Gippsland Ports.	No objections, claims or issues raised	EAPL phoned stakeholder to discuss Esso's near term vessel related activities in Gippsland Ports.
24-Jul-19	3091	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A

ID: 17 Organisation: Lakes Entrance Fishermans' Co-op

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
09-Oct-17	168	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
09-Nov-17	170	From Stakeholder	Email	Communit invitation response	No objections, claims or issues raised	N/A
17-Nov-17	317	From Stakeholder	Community Session	N/A	No objections, claims or issues raised	N/A
21-Dec-17	1221	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
14-Feb-18	1478	From Stakeholder	Email	Meeting acceptance	No objections, claims or issues raised	N/A
15-Feb-18	1571	To Stakeholder	In Person	Meeting to discuss degree of consultation and update on offshore activities	ISSUE: Amount and degree of consluation - too much MERIT: Yes and acknowledged however the regulatory regime requires it and Esso need to be able to demonstrate that they have consulted. Esso consultation will continue to be scheduled and managed to try and co-ordinate and minimise the amount. No further action required - closed.	During a meeting the stakeholder raised the item of the amount and degree of consultation between key fishing representatives and EAPL. EAPL will coordinate consultation to try and minimise the amount and degree, whilst still meeting community needs and regulatory requirements. Monthly phone call with key stakeholders to discuss EAPL offshore activities.
06-Aug-18	2022	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
20-Nov-18	2149	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
05-Dec-18	2279	To Stakeholder	Community Session	Titleholder held community session in Lakes Entrance discussing current and planned activities in Bass Strait.	No objections, claims or issues raised	N/A
06-May-19	2959	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
06-May-19	2999	To Stakeholder	Phone	Phone call to to discuss consultation and providing updates on current projects and EP submissions.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
21-May-19	3043	To Stakeholder	Minutes	Meeting with stakeholder to discuss: - increased workload from the Oil and Gas industry to SETFIA - West Barracouta and Kipper projects (including the Geotechnical & Geophysical campaign), potential plugging and abandonment at Blackback, Seahorse, Tarwhine, Whiting, Perch and Dolphin and drilling at Sculpin, East Pilchard, Wirrah & Sweetlips. - Work at Seahorse, Tarwhine, Perch and Dolphin would also be within PSZs and that decommissioning options and potential removal of their PSZs was being considered. - The Geotechnical & Geophysical EP has been revised to cover potential advance work at these locations to confirm the sea bed is suitable for a jack-up rig. - Drilling at Wirrah, Sweetlips, and East Pilchard would require temporary PSZs - Drilling at Sculpin is expected to start Q3/Q4 this year this is very deep water (2400m) and there is no known commercial fishing effort at this depth.	No objections, claims or issues raised	N/A
24-Jul-19	3056	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3185	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3218	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3410	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3363	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3443	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3290	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 18 Organisation: Lakes Entrance Scallop Fishing Industry Association

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
19-Oct-17	171	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	Email from stakeholder received to update contact details. EAPL stakeholder database updated.
26-Oct-17	172	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
09-Nov-17	173	To Stakeholder	Phone	Follow up phone call regarding invitation to community session	No objections, claims or issues raised	N/A
21-Dec-17	1222	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
06-Aug-18	2023	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
20-Nov-18	2150	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
06-May-19	2960	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3092	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3184	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3219	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3409	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3362	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3444	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3291	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 25 Organisation: Oil Spill Response Limited

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
19-Oct-17	181	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
26-Oct-17	182	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
09-Nov-17	183	From Stakeholder		Response to community session	No objections, claims or issues raised	N/A
21-Dec-17	1233	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
06-Aug-18	2027	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
20-Nov-18	2153	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
08-May-19	3117	To Stakeholder	Minutes	Meeting with OSRL to discuss oil spill response	No objections, claims or issues raised	N/A
09-Dec-19	3148	To Stakeholder	Email	Stakeholder provided with Esso Australia Bass Strait Oil Pollution Emergency Plan and Quick Reference Guides for review and comment.	No objections, claims or issues raised	N/A
19-Dec-19	3156	To Stakeholder	Email	Stakeholder provided with Quick Reference Guides containing the specific information and potential risks related to worst case discharge scenario from the West Barracouta (BTW), Kipper (KPA) and Whiting (WTA) activities under the Jack Up Rig campaign and requested stakeholder feedback on the Quick Reference Guides.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
ID: 123		**Organisation:**	**Panama II Octopus fishing vessel**			
06-Aug-18	2086	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
20-Nov-18	2186	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
06-May-19	2995	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3063	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3192	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3256	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3386	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3339	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3424	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3314	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A
ID: 33		**Organisation:**	**Seafood Industry Victoria**			
09-Oct-17	202	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
10-Oct-17	203	From Stakeholder		Email received from stakeholder requesting a meeting to discuss offshore activities and consultation options	No objections, claims or issues raised	EAPL to arrange meeting with stakeholder
26-Oct-17	204	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
08-Nov-17	205	From Stakeholder		Invitation ACCEPTED	No objections, claims or issues raised	N/A
16-Nov-17	1046	To Stakeholder		Phonecall and face-to-face meeting to discuss the opportunity to do a fish abundance study and arrange additional meetings with EAPL. EAPL advised stakeholder that fish information from ABARES is sufficient at present and that we will arrange more meetings in the future.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
17-Nov-17	315	From Stakeholder		Face-to-face discussion with stakeholder regarding: 1: Seismic campaigns 1: EAPL is currently not planning any seismic campaigns 2: Nature and amount of consultation that groups are asked to participate in 2: EAPL are trying to reduce the amount of consultation by combining projects into a single fact sheet 3: The inclusion of EAPL fact sheets in the Seafood Industry Victoria newsletter 3: EAPL will include fact sheets in the Seafood Industry Victoria newsletter	No objections, claims or issues raised	N/A
21-Dec-17	1251	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	Email received from stakeholder with a proposal to include EAPL fact sheets in Seafood Industry Victoria quarterly newsletter. EAPL will include fact sheets in Seafood Industry Victoria quarterly newsletter.
16-Apr-18	3138	To Stakeholder	-	Fact sheet #3 outlining Esso Australia's upcoming activities in Bass Strait was included in the SIV Newsletter PROFISH (Volume 7 April 2018)	No objections, claims or issues raised	N/A
06-Aug-18	2034	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
20-Nov-18	2159	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
16-Jan-19	2839	To Stakeholder	Email	Email regarding the inclusion of EAPL fact sheet in SIV quarterly newsletter	No objections, claims or issues raised	N/A
06-May-19	2965	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
21-May-19	3042	To Stakeholder	In Person	Meeting with stakeholder to discuss: - increased workload from the Oil and Gas industry to SETFIA - West Barracouta and Kipper projects (including the Geotechnical & Geophysical campaign), potential plugging and abandonment at Blackback, Seahorse, Tarwhine, Whiting, Perch and Dolphin and drilling at Sculpin, East Pilchard, Wirrah & Sweetlips. - Work at Seahorse, Tarwhine, Perch and Dolphin would also be within PSZs and that decommissioning options and potential removal of their PSZs was being considered. - The Geotechnical & Geophysical EP has been revised to cover potential advance work at these locations to confirm the sea bed is suitable for a jack-up rig. - Drilling at Wirrah, Sweetlips, and East Pilchard would require temporary PSZs - Drilling at Sculpin is expected to start Q3/Q4 this year this is very deep water (2400m) and there is no known commercial fishing effort at this depth.	No objections, claims or issues raised	N/A
24-Jul-19	3057	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3168	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3235	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3375	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
11-Mar-20	3328	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3435	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3325	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 24 Organisation: Seven Group Holdings (formerly Nexus)

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
09-Oct-17	495	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
20-Oct-17	179	From Stakeholder	Email	Thanks for the consultation, we have no concerns regarding your proposed activitieS	No objections, claims or issues raised	N/A
26-Oct-17	180	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
21-Dec-17	1249	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
06-Aug-18	2026	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
14-Aug-18	2104	From Stakeholder	Email	Email from stakeholder requesting current EAPL contact details	No objections, claims or issues raised	EAPL provided contact details to stakeholder
27-Aug-18	2105	To Stakeholder	Email	EAPL provided contact details to stakeholder	No objections, claims or issues raised	N/A
20-Nov-18	2152	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
06-May-19	2962	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3069	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3182	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3221	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3397	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3350	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3456	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
09-Apr-20	3303	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 37 Organisation: South East Trawl Fishing Industry Association

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
09-Oct-17	213	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
26-Oct-17	214	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
09-Nov-17	217	To Stakeholder	Phone	Follow up phone call regarding invitation to community session	No objections, claims or issues raised	N/A
21-Dec-17	1248	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
15-Feb-18	1572	To Stakeholder	In Person	Meeting to discuss offshore activities in Bass Strait and any impacts on the fishing community	1: MERIT: Yes Useful means of consultation and titleholder is now using the SMS services to advise stakeholders of EAPL offshore activities CLOSED 2. MERIT: Currently No there is no immediate need for a fishing survey - if this changes stakeholder will be considered to conduct it. CLOSED	1: Stakeholder can provide SMS service to advise fishermen of EAPL offshore activities 2: Stakeholder can provide fishing studies
08-May-18	1614	From Stakeholder	SMS	Stakeholder requesting quarterly meeting to be rescheduled	No objections, claims or issues raised	N/A
06-Aug-18	2036	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	Stakeholder confirmed an SMS to fishermen was not required
20-Nov-18	2161	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
29-Apr-19	2998	To Stakeholder	Email	Invitation to set up a meeting with stakeholder to discuss consultation processes and provide an update on current Bass Strait activities	No objections, claims or issues raised	N/A
06-May-19	2967	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
06-May-19	3039	From Stakeholder	Email	-Stakeholder suggesting a consultant be used for Bass Strait Oil and Gas consultation.	MERIT: YES EAPL will research viability of this arrangement.	EAPL will research viability of this arrangement.
08-May-19	3116	To Stakeholder	Email	Titleholder requested information from stakeholder on consultation model including how the model works, how much the titleholder pays and methodologies.	MERIT: YES EAPL will research viability of this arrangement.	Stakeholder provided a proposal for engaging a consultant for Bass Strait Oil and Gas consultation.
13-May-19	3040	To Stakeholder	Email	Meeting notice sent to Stakeholder to discuss Bass Strait activities and consultation options.	ISSUE: Stakeholder has limited resources	Stakeholder declined meeting due to limited resources.
24-Jul-19	3068	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3167	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3224	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
16-Dec-19	3160	To Stakeholder	Email	Esso requested key stakeholder to identify relevant stakeholders who fish in the area of the Whiting P&A and discuss with them the key potential impacts relating to the Whiting jack up rig campaign to assist them making an informed assessment on possible impacts to their interests, functions or activities.	Issue: Stakeholder has concerns regarding various discharges, release of materials/waste and whether the site will be fish-overable.	Stakeholder responded with concerns regarding various discharges, release of materials/waste and whether the site will be fish-overable. Stakeholder requested further information regarding the Whiting plug and abandon campaign.
20-Dec-19	3213	From Stakeholder	Email	Esso explained the aim of the P&A campaigns is to permanently plug and abandon the wells. This process provides multiple barriers to prevent the release of any hydrocarbons from these wells in the future. The remaining infrastructure, such as platforms may be removed as part of a separate, future campaign and will be the subject of further consultation. Until that occurs, access to the area around platforms will remain unchanged in accordance with NOPSEMA policy.	No objections, claims or issues raised	Stakeholder sent email advising they now understand the P&A activity.
07-Jan-20	3261	To Stakeholder	Email	Request to call stakeholder to: • Discuss online portal for stakeholders • Visit a commercial fishing boat and view the plotters, etc • Discuss the impacts and risks that are included in our EPs • General update on EAPL activities in Bass Strait	No objections, claims or issues raised	N/A
12-Feb-20	3280	To Stakeholder	Email	Calendar invite sent to stakeholders for a meeting in Lakes Entrance as an opportunity to discuss: - Impacts and risks that are included in the Environment Plans - Decommissioning - EAPL bushfire relief and assistance - Online stakeholder portal -Upcoming activities in Bass Strait	No objections, claims or issues raised	N/A
24-Feb-20	3282	To Stakeholder	SMS	SMS sent to Eastern Fishing Fleet: Esso will be in Lakes Entrance on Thurs at 10am at SEAMEC to speak with fishers about their plans, decommissioning of assets and the roll-over of their approvals in eastern Bass Strait. If anyone is interested please let me know.	No objections, claims or issues raised	N/A
27-Feb-20	3463	To Stakeholder	Community Session	Meeting held at SEAMAC (Lakes Entrance) for Eastern Fishing Fleet as an opportunity to discuss: - Impacts and risks that are included in the Environment Plans - Decommissioning - EAPL bushfire relief and assistance - proposed Online stakeholder portal Approximately 15 commercial fishermen attended the session along with fishing rep SETFIA Following on from the information session, EAPL reps went on board several fishing vessels to better understand the plotter systems and how the Eastern Fishing Fleet operate and how to improve the consulation process.	Stakeholder enquiring about fishing activities around West Barracouta	
07-Mar-20	3404	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3357	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
12-Mar-20	3371	From Stakeholder	Email	Stakeholder enquiring about fishing activities around West Barracouta	Queries have been answered	Email sent to stakeholder responding to the following questions: QUESTIONS: 1. Regarding the hot tap tie in on Barracouta: is that inside the PSZ? 2. Regarding the flow line skid: does this run up and down the pipe or is it fixed? Is this fish-over-able? 3. Are there any other flowline skids? 4. Where are concrete mats going to be positioned? RESPONSE: The hot tap tie in and the flowline skid, located in close proximity are planned to be within the Barracouta PSZ. The flowline skid is the termination assembly to the flexible pipeline and is fixed in position. It is a steel structure about 8m long, 3m wide and 3m high and is not designed to be over-fishable, given its location within the Platform PSZ. The other end of the pipeline is contained within another structure called the Pipeline End Manifold (PLEM) located within the BTW PSZ. There are no other skids along the pipeline. The concrete mattresses will be placed over the electrical and hydraulic flying leads, between the umbilical termination assembly and the two wells, within the BTW PSZ. Mattresses will also be placed on the jumpers connecting the wells to the PLEM and on the end of the pipeline before the PLEM again all within the BTW PSZ. At the platform end additional concrete mattresses may be used at the hot tap location, on the pipeline before the flowline skid, on the jumper between the skid and the hot tap and at the end of the umbilical near the platform, all these are planned to be in the platform PSZ. The flexible pipeline consists of 6 sections, the ends of each pipeline section are bolted together with a shroud installed to minimise snag points. Whilst there are no anode sleds there are low profile bracelet style anodes at each end next to the shroud, the design of these bracelet anodes shouldn't pose a significant snag risk. The ends of each flexible section will also be restrained by a number of low profile concrete mattresses.
12-Mar-20	3426	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
12-Mar-20	3438	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3296	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A
28-Apr-20	3464	To Stakeholder	Phone	EAPL called Fishing Representative to discuss the postponment of all JUR activities offshore and see if Stakeholders / Eastern Fishing Fleet had an queries or concerns. Fishing Represetative confirmed there are currently no concerns or queries from the fishing stakeholders.	No objections, claims or issues raised	N/A
25-May-20	3471	To Stakeholder	Phone	EAPL called stakeholder to review minutes from stakeholder consultation session in February 2020.	No objections, claims or issues raised	N/A
25-May-20	3472	To Stakeholder	Email	EAPL emailed stakeholder to review minutes from stakeholder consultation session in February 2020.	No objections, claims or issues raised	Stakeholder made minor amendments to minutes

ID: 38 Organisation: South Gippsland Shire Council

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
09-Oct-17	210	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
26-Oct-17	211	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
08-Nov-17	212	From Stakeholder		Response to community session invitation	No objections, claims or issues raised	N/A
21-Dec-17	1250	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
06-Aug-18	2037	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
20-Nov-18	2162	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
06-May-19	2968	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3070	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3176	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3227	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3401	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3354	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3452	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3299	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 77 Organisation: Southern Shark Industry Alliance

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
08-Nov-17	275	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	No objections, claims or issues raised
21-Dec-17	1253	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	ISSUE: stakeholder requesting more information on the EAPL stakeholder consultation process.	Email received from stakeholder requesting more information on the EAPL stakeholder consultation process.
05-Jul-18	1997	From Stakeholder	Email	Email received from stakeholder requesting more information on the EAPL stakeholder consultation process.	ISSUE: EAPL to contact stakeholder to discuss EAPL stakeholder consultation process MERIT: Email sent from titleholder to stakeholder with contact details to discuss stakeholder consultation process.	Email sent to stakeholder with EAPL contact details to discuss the consultation process further.

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
06-Aug-18	2061	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
15-Jan-19	2734	To Stakeholder	Email	Email sent to stakeholder with EAPL contact details to discuss the consultation process further.	ISSUE: change of government to address fishing industry concerns. MERIT: Phone call made to Stakeholder to discuss concerns	Email received from stakeholder regarding a change of government to address fishing industry concerns.
16-Jan-19	2831	To Stakeholder	Phone	EAPL called Stakeholder to discuss concerns	CLOSED	Email received from stakeholder regarding a change of government to address fishing industry concerns.
06-May-19	2984	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3059	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3203	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3245	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3387	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3340	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3423	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3313	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 40 Organisation: Sustainable Shark Fishing Association

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
10-Oct-17	221	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
26-Oct-17	222	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
09-Nov-17	223	To Stakeholder	Phone	Follow up phone call regarding invitation to community session	No objections, claims or issues raised	N/A
21-Dec-17	1252	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
06-Aug-18	2039	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
20-Nov-18	2164	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
06-May-19	2969	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3072	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3175	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3228	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3400	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3353	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3453	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3300	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 41 Organisation: Tasmanian Seafood Industry Council

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
19-Oct-17	224	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
21-Dec-17	1256	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
06-Aug-18	2040	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A

ID: 70 Organisation: Victorian Bays and Inlets Fisheries Association

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
19-Oct-17	263	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
26-Oct-17	264	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
09-Nov-17	265	To Stakeholder	Phone	Follow up phone call regarding invitation to community session	No objections, claims or issues raised	N/A
21-Dec-17	1259	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
06-Aug-18	2057	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
20-Nov-18	2178	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
06-May-19	2983	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3095	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3204	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3244	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3377	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3330	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3433	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3323	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 51 Organisation: Victorian Recreational Fishing (VRFish)

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
10-Oct-17	240	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
26-Oct-17	241	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
09-Nov-17	242		Phone	Follow up phone call regarding invitation to community session	No objections, claims or issues raised	N/A
15-Nov-17	243	From Stakeholder	Phone	Response to community session invitation	No objections, claims or issues raised	N/A
21-Dec-17	1268	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
06-Aug-18	2047	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
20-Nov-18	2172	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
06-May-19	2975	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
11-Dec-19	3201	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3259	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3376	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3329	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3434	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3324	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 73 Organisation: Victorian Rock Lobster Association

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
10-Oct-17	269	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
26-Oct-17	270	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
09-Nov-17	271	To Stakeholder	Phone	Follow up phone call regarding invitation to community session	No objections, claims or issues raised	N/A
21-Dec-17	1269	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
20-Nov-18	2180	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A

ID: 52 Organisation: Victorian Scallop Industry Association

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
10-Oct-17	244	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
26-Oct-17	245	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
09-Nov-17	246	To Stakeholder	Phone	Follow up phone call regarding invitation to community session	No objections, claims or issues raised.	N/A
21-Dec-17	1270	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
06-Aug-18	2048	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	Email received from stakeholder regarding the level of detail provided on maps in the EAPL Fact Sheet.	Emailed stakeholder high resolution copies of the maps used in the fact sheet
08-Aug-18	2103	To Stakeholder	Email	Higher resolution copies of the maps provided to stakeholder	No objections, claims or issues raised	N/A
20-Nov-18	2171	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
06-May-19	2977	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3083	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3210	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3238	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3394	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	N/A
11-Mar-20	3347	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3449	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3306	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 20 Organisation: Wellington Shire Council

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
09-Oct-17	174	To Stakeholder	Email	Fact sheet #1 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
26-Oct-17	175	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
09-Nov-17	176	To Stakeholder	Phone	Follow up phone call regarding invitation to community session	No objections, claims or issues raised	N/A
21-Dec-17	1274	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
06-Aug-18	2024	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
20-Nov-18	2151	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
06-May-19	2961	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	N/A
24-Jul-19	3061	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	N/A
11-Dec-19	3183	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3220	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3408	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	Out of office reply
11-Mar-20	3361	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3445	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	N/A
09-Apr-20	3292	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	N/A

ID: 134 Organisation: Wild Well Control

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
09-Dec-19	3151	To Stakeholder	Email	Stakeholder provided with Esso Australia Bass Strait Oil Pollution Emergency Plan and Quick Reference Guides for review and comment.	No objections, claims or issues raised	Stakeholder will review the documents and provide feedback.
19-Dec-19	3159	To Stakeholder	Email	Stakeholder provided with Quick Reference Guides containing the specific information and potential risks related to worst case discharge scenario from the West Barracouta (BTW), Kipper (KPA) and Whiting (WTA) activities under the Jack Up Rig campaign and requested stakeholder feedback on the Quick Reference Guides.	No objections, claims or issues raised	N/A

ID: 55 Organisation: Wildlife Victoria

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
25-Oct-17	248	To Stakeholder	Email	Fact sheet outlining Esso Australia's upcoming activities in Bass Strait.	Identify contact and update	Email from stakeholder received to update contact details. EAPL stakeholder database updated.
08-Nov-17	249	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
21-Dec-17	1277	To Stakeholder	Email	Fact sheet #2 outlining Esso Australia's upcoming activities in Bass Strait.	No objections, claims or issues raised	N/A
07-Jun-18	1728	From Stakeholder	Email	Confirmation fact sheet was received	No objections, claims or issues raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
06-Aug-18	2049	To Stakeholder	Email	Fact sheet #4 outlining Esso Australia's upcoming activities in Bass Strait including: - Baldfish and Hairtail drilling program - Blackback wells - West Barracouta drilling - Seabed surveys - Cobia pipeline project - Mackerel wells - Kipper and Pilchard drilling - Environments Plans - Produced Water Formation	No objections, claims or issues raised	N/A
06-Aug-18	2092	From Stakeholder	Email	Confirmation fact sheet was received	No objections, claims or issues raised	N/A
20-Nov-18	2174	To Stakeholder	Email	Invitation to Community Session in Lakes Entrance to discuss offshore activities in Bass Strait	No objections, claims or issues raised	N/A
06-May-19	2978	To Stakeholder	Email	JUR campaign sheet #1 detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline	No objections, claims or issues raised	Acknowledgement of receipt
24-Jul-19	3062	To Stakeholder	Email	Advising of geotechnical investigation at the proposed West Barracouta well site to confirm the suitability of locations for the use of a jack-up rig to drill new wells at West Barracouta, Kipper, Sweetlips and Wirrah and to workover the existing wells at Tarwhine and Seahorse with a view to plugging and abandoning them.	No objections, claims or issues raised	Email from stakeholder advising they have received our email. No objections, claims or issues raised
11-Dec-19	3209	To Stakeholder	Email	2020 JUR Campaign Sheet #2: campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
13-Dec-19	3239	To Stakeholder	Email	2020 JUR Campaign Sheet #2: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Whiting Plug and Abandonment programme including activity description, location, timing, impacts and risks.	No objections, claims or issues raised	N/A
07-Mar-20	3393	To Stakeholder	Email	2020 JUR Campaign Sheet #3: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the West Barracouta Installation programme including activity description, location and timing.	No objections, claims or issues raised	Acknowledgement of receipt
11-Mar-20	3346	To Stakeholder	Email	2020 JUR Campaign Sheet #4: updated campaign information sheet detailing a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign. This campaign sheet contains details of the Seahorse/Tarwhine P&A programme including activity description, location and timing.	No objections, claims or issues raised	N/A
12-Mar-20	3447	To Stakeholder	Email	Further to the West Barracouta installation campaign sheet #3 we sent last week, below is a link to view a 2 minute video outlining how this complex project will come together.	No objections, claims or issues raised	Acknowledgement of receipt
09-Apr-20	3307	To Stakeholder	Email	The following activities will be postponed after the completion of drilling at West Barracouta by approximately 13 April 2020: • Whiting plug and abandonment • Seahorse / Tarwhine plug and abandonment • Kipper drilling • Mulloway / Whiptail plug and abandonment	No objections, claims or issues raised	Acknowledgement of receipt

ExxonMobil

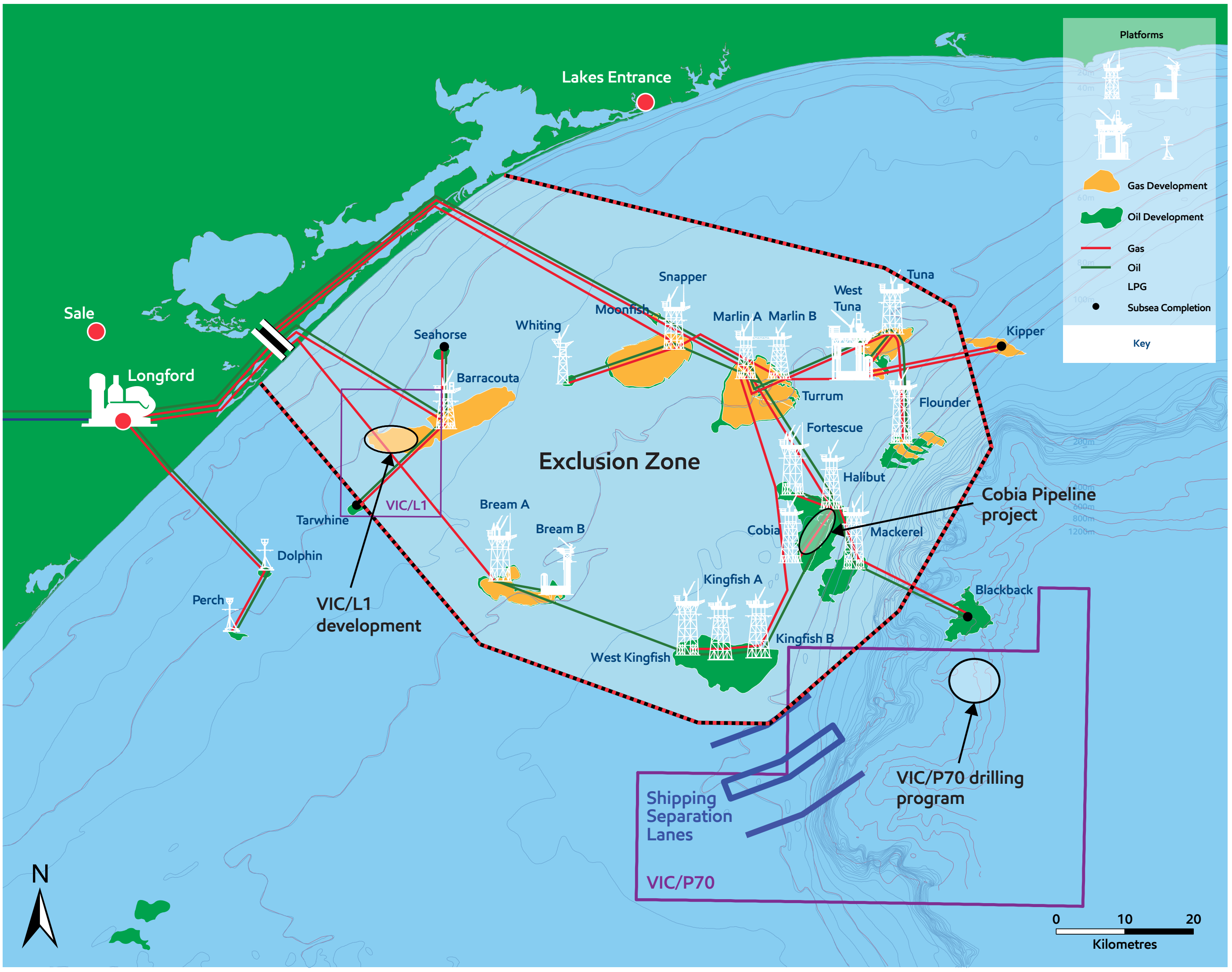
Esso offshore projects

Introduction

Esso Australia, a subsidiary of ExxonMobil Australia, is planning on undertaking a program of work across some of its offshore assets, including those owned jointly by the Gippsland Basin Joint Venture, in 2018 and 2019. This program forms part of Esso's ongoing investment in exploring domestic gas development opportunities to ensure that we can continue to meet Australia's energy needs.

This fact sheet provides high level details about the projects, regulatory requirements and consultation which will be occurring to facilitate information sharing and stakeholder engagement.

Project locations



Well coordinates

Baldfish Latitude 38° 36′ south, Longitude 148° 35′ east

Hairtail Latitude 38° 36′ south, Longitude 148° 31′ east

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VIC/P70 drilling program

Esso Australia is planning to undertake an exploration drilling program in the VIC/P70 block, approximately 90km off the East Gippsland Victorian coast. The program will involve drilling two exploration wells, known as Baldfish and Hairtail, with the activity planned to commence in mid 2018. The drilling program is expected to last approximately 60 days.

The exploration wells will determine the extent of any gas reserves contained within the field and support any subsequent development. If successful, this development has the potential to bring online much needed new gas supplies from Bass Strait fields, which have been producing for more than 40 years.

Offshore Environment Regulations

Esso is preparing an Environment Plan and associated Oil Pollution Emergency Plan to identify, assess and manage environmental risks for the exploration drilling program. These plans will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), the offshore environment regulator, for review and acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* and *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009*.

In developing the Environment Plans, Esso will conduct an environmental risk assessment to evaluate environmental risks associated with the activities being planned, and will incorporate prevention and mitigation measures that reduce these risks to As Low as Reasonably Practicable (ALARP).

Key impacts and environmental risks

As part of development of the VIC/P70 Environment Plan, the key impacts and environmental risks of the project will be identified and controls implemented to reduce the risks to ALARP. These include:

Temporary displacement of shipping/fishing

The Baldfish and Hairtail wells are located outside the "*Bass Strait Area to be Avoided*" as defined on marine chart AUS357. Esso will seek to have a temporary petroleum safety zone created around the drill rig will for the duration of the drilling program, to ensure drilling activities can be completed safely and other marine users are protected. Esso will be working with stakeholders, including the Australian Marine Safety Authority, to manage the impact and communicate with marine users.

Drilling fluids and drill cuttings

As part of the drilling program, water-based mud (WBM) will be used to remove the cuttings from the wells to be drilled, cool the drill bits and maintain pressure control of the wells. WBM is mostly water and natural clays, with a small amount of low toxicity additives. The drill cuttings will be separated from the WBM and discharged overboard, while the WBM will be recycled and reused. Drill cuttings will settle in the local vicinity of the wells on the sea floor, which is predominantly sandy with limited bottom-dwelling marine fauna.

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Other discharges and waste

Controls such as hose inspections and creation of bunded areas will be in place to prevent and mitigate the uncontrolled release of fluids to the marine environment. Any waste generated will be managed in accordance with correct segregation, handling and be returned for onshore disposal. Small amounts of residual fluid from cleaning the mud and cement equipment will be discharged overboard.

Hydrocarbon release

The VIC/P70 drilling program will be undertaken in a well understood geological area where the target reservoir is gas. This, in conjunction with preventative measures, including the application of appropriate well control barriers, procedures and equipment, means that a well blowout or loss of well control are very unlikely. In the unlikely event of a release, the impact is expected to be localized with no significant shore line impact. Third party oil spill modelling is being conducted with a range of scenarios being investigated which will form the basis of Oil Pollution Emergency Plans. The plans will outline the roles, responsibilities and response strategies to mitigate the impact of a potential spill from drilling activities.

Other projects

VIC/L1 development

Esso Australia is examining options to develop a gas field in block VIC/L1 known as West Barracouta, approximately 6km south west of the existing Barracouta platform. The project is likely to involve the drilling of a number of subsea wells which will be tied back to our existing Barracouta infrastructure in Bass Strait. This project will be undertaken within Esso's current "Bass Strait Area to be Avoided".

To support the project's development, Esso will be conducting environmental and seabed surveys commencing in early 2018 (duration approximately 20 days) to assess the location of potential well sites and flow line routes. As the project develops, additional consultation with stakeholders will be conducted.

Cobia Pipeline project

The Cobia Pipeline project will undertake maintenance and repair works on the Cobia pipeline, which runs from the Cobia platform to the Halibut platform in Bass Strait. This project will be undertaken within the existing Bass Strait "Area to be Avoided" and a temporary petroleum safety zone will be implemented to provide protection during the project.

The offshore work for this project is planned to be carried out by a dynamically positioned vessel in late 2018 and will take approximately two weeks.

The key impacts and environmental risks of the VIC/L1 development and Cobia pipeline project will be developed and shared with stakeholders as regulatory documentation is progressed.

Consultation

We are committed to engaging with the communities where we operate and helping our stakeholders to understand our business. Esso will be consulting with stakeholders potentially affected by these projects through a number of different channels.

This fact sheet provides information to allow stakeholders to make an informed assessment of the possible consequences of the proposed activities to their functions, interests or activities. We will address questions and consider feedback from stakeholders relating to these projects throughout this consultation process.

If you have any specific questions or feedback about any of these projects please contact Esso at consultation@exxonmobil.com.

A face to face session is being planned for 17 November 2017. To register your interest in attending, please RSVP to consultation@exxonmobil.com

About Esso

Esso Australia is a subsidiary of ExxonMobil Australia, the country's largest integrated oil and gas company. Esso's Longford Plants has processed more than four billion barrels of oil and eight trillion cubic feet of gas since production began in 1969.

We place the highest priority on operating flawlessly in all aspects of our business. All these offshore projects will be managed in accordance with all regulatory requirements, as well as Esso's Operational Integrity Management System to reduce risks to ALARP. Environment Plans detailing each program of work and how the risks of the program will be managed by Esso will be submitted to NOPSEMA for acceptance.

Esso is continuously striving to improve all aspects of our safety performance including for our people, our processes, security, health, and environmental performance.

For more information about our operations please visit www.exxonmobil.com.au

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Fact Sheet #2 - December 2017

ExxonMobil

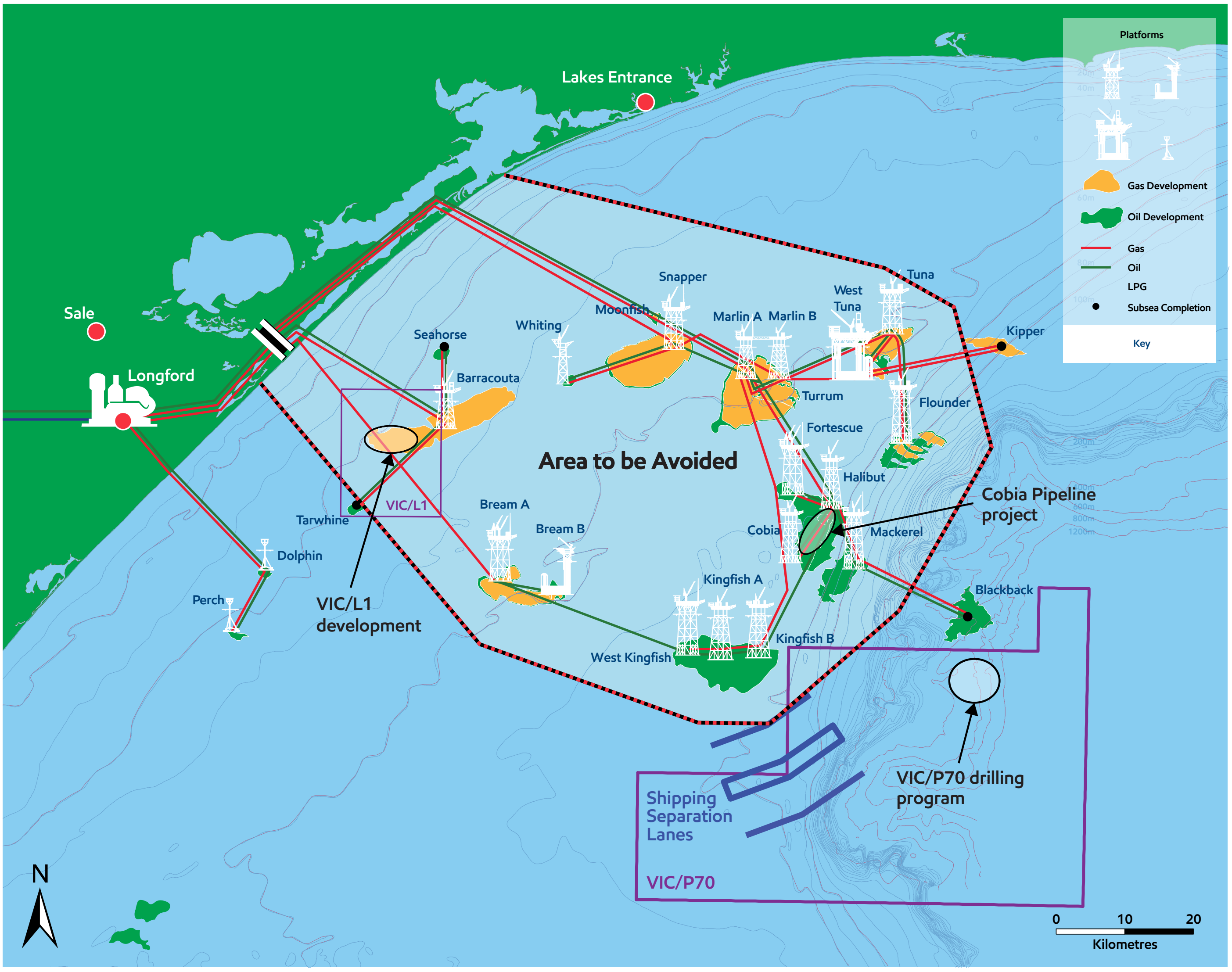
Esso offshore projects

Introduction

Esso Australia, a subsidiary of ExxonMobil Australia, is planning on undertaking a program of work across some of its offshore assets, including those owned jointly by the Gippsland Basin Joint Venture, in 2018 and 2019. This program forms part of Esso's ongoing investment in exploring domestic gas development opportunities to ensure that we can continue to meet Australia's energy needs.

This fact sheet provides high level details about the projects, regulatory requirements and consultation which will be occurring to facilitate information sharing and stakeholder engagement.

Project locations



Well coordinates

Baldfish Latitude 38° 36′ south, Longitude 148° 35′ east

Hairtail Latitude 38° 36′ south, Longitude 148° 31′ east

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VIC/P70 drilling program

Esso Australia is planning to undertake an exploration drilling program in the VIC/P70 block, approximately 90km off the East Gippsland Victorian coast. The program will involve drilling two exploration wells, known as Baldfish and Hairtail, with the activity planned to commence in mid 2018. The drilling program is expected to last approximately 60 days.

The exploration wells will determine the extent of any gas reserves contained within the field and support any subsequent development. If successful, this development has the potential to bring online much needed new gas supplies from Bass Strait fields, which have been producing for more than 40 years.

Offshore Environment Regulations

Esso is preparing an Environment Plan and associated Oil Pollution Emergency Plan to identify, assess and manage environmental risks for the exploration drilling program. These plans will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), the offshore environment regulator, for review and acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* and *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009*.

In developing the Environment Plans, Esso will conduct an environmental risk assessment to evaluate environmental risks associated with the activities being planned, and will incorporate prevention and mitigation measures that reduce these risks to As Low as Reasonably Practicable (ALARP).

Key impacts and environmental risks

As part of development of the VIC/P70 Environment Plan, the key impacts and environmental risks of the project will be identified and controls implemented to reduce the risks to ALARP. These include:

Temporary displacement of shipping/fishing

The Baldfish and Hairtail wells are located outside the "*Bass Strait Area to be Avoided*" as defined on marine chart AUS357. Esso will seek to have a temporary petroleum safety zone created around the drill rig will for the duration of the drilling program, to ensure drilling activities can be completed safely and other marine users are protected. Esso will be working with stakeholders, including the Australian Marine Safety Authority, to manage the impact and communicate with marine users.

Drilling fluids and drill cuttings

As part of the drilling program, water-based mud (WBM) will be used to remove the cuttings from the wells to be drilled, cool the drill bits and maintain pressure control of the wells. WBM is mostly water and natural clays, with a small amount of low toxicity additives. The drill cuttings will be separated from the WBM and discharged overboard, while the WBM will be recycled and reused. Drill cuttings will settle in the local vicinity of the wells on the sea floor, which is predominantly sandy with limited bottom-dwelling marine fauna.

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Other discharges and waste

Controls such as hose inspections and creation of bunded areas will be in place to prevent and mitigate the uncontrolled release of fluids to the marine environment. Any waste generated will be managed in accordance with correct segregation, handling and be returned for onshore disposal. Small amounts of residual fluid from cleaning the mud and cement equipment will be discharged overboard.

Hydrocarbon release

The VIC/P70 drilling program will be undertaken in a well understood geological area where the target reservoir is gas. This, in conjunction with preventative measures, including the application of appropriate well control barriers, procedures and equipment, means that a well blowout or loss of well control are very unlikely. In the unlikely event of a release, the impact is expected to be localized with no significant shore line impact. Third party oil spill modelling is being conducted with a range of scenarios being investigated which will form the basis of Oil Pollution Emergency Plans. The plans will outline the roles, responsibilities and response strategies to mitigate the impact of a potential spill from drilling activities.

Other projects

VIC/L1 development

Esso Australia is examining options to develop a gas field in block VIC/L1 known as West Barracouta, approximately 6km south west of the existing Barracouta platform. The project is likely to involve the drilling of a number of subsea wells which will be tied back to our existing Barracouta infrastructure in Bass Strait. This project will be undertaken within Esso's current "Bass Strait Area to be Avoided".

To support the project's development, Esso will be conducting environmental and seabed surveys commencing in early 2018 (duration approximately 20 days) to assess the location of potential well sites and flow line routes. As the project develops, additional consultation with stakeholders will be conducted.

Cobia Pipeline project

The Cobia Pipeline project will undertake maintenance and repair works on the Cobia pipeline, which runs from the Cobia platform to the Halibut platform in Bass Strait. This project will be undertaken within the existing Bass Strait "Area to be Avoided" and a temporary petroleum safety zone will be implemented to provide protection during the project.

The offshore work for this project is planned to be carried out by a dynamically positioned vessel in late 2018 and will take approximately two weeks.

The key impacts and environmental risks of the VIC/L1 development and Cobia pipeline project will be developed and shared with stakeholders as regulatory documentation is progressed.

Seabed surveys

In addition to the environmental and seabed surveys to be conducted for the VIC/L1 development, in order to support a number of future developments, Esso will be conducting seabed surveys commencing in early 2018 (duration approximately 60 days over a 6 month period) to help inform potential drilling activities at Kipper and VIC/L9, as well as potential plug and abandonment activities at a number of existing licence areas as shown in the figure below.

The proposed surveys will involve collection of geophysical data (i.e. measurements of seabed characteristics, imaging and profiling), collection of water and sediment samples, and collection of subsea floor materials.

A range of measures will be implemented to reduce potential environmental impacts to acceptable levels:

- Survey vessels will not anchor or refuel during the activity
- Measures will be taken to protect marine fauna from noise and to prevent vessel collisions
- All discharges (e.g. sewage, grey water) will meet legal requirements
- Appropriate spill response plans will be established
- Survey vessels will be assessed and managed to prevent the introduction of invasive marine species

Consultation

We are committed to engaging with the communities where we operate and helping our stakeholders to understand our business. Esso has been consulting with stakeholders potentially affected by these projects through a number of different channels.

This fact sheet provides information to allow stakeholders to make an informed assessment of the possible consequences of the proposed activities to their functions, interests or activities. We will address questions and consider feedback from stakeholders relating to these projects throughout this consultation process. If you have any specific questions or feedback about any of these projects please contact Esso at consultation@exxonmobil.com or call 03 9261 0260.

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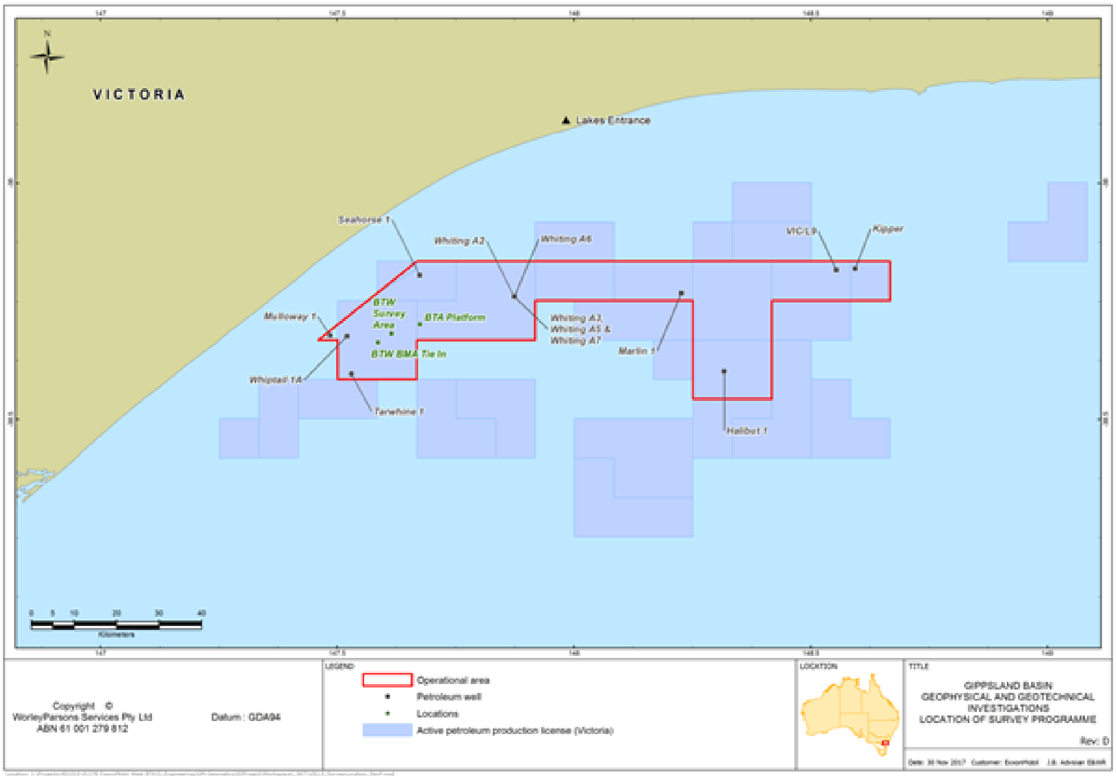

Map of proposed seabed surveys

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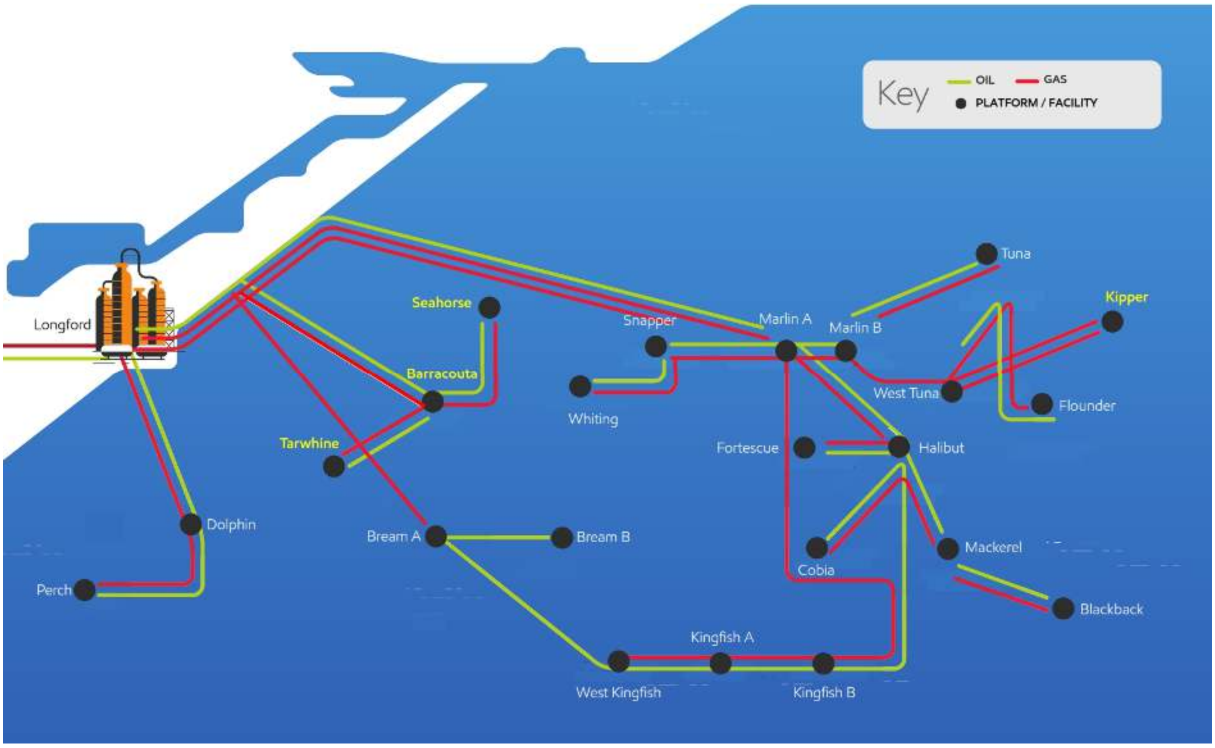
Esso Bass Strait 2020 Jack Up Rig Campaign



Esso Australia is planning to undertake a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign and includes:

- Well Plug and Abandonment (P&A)
  - Two subsea wells, Seahorse -1 and Tarwhine – 1
  - 5 wells at the Whiting platform
- Drilling
  - Two subsea gas production wells in the West Barracouta field.
  - Two subsea gas production wells in the Kipper field.

There will be no seismic activity as part of this campaign.

All well abandonment and drilling activities will be undertaken by the jack-up drilling rig “Tom Prosser”. The Tom Prosser was built in 2014 and operates to the latest international safety and environmental standards. The drilling rig will be supported by up to three support vessels.

Noble Tom Prosser Jack-Up Drilling Rig (Image courtesy of Noble Corporation)

The Tom Prosser does not have any propulsion capability and will be towed into position, then the legs lowered onto the seabed and the rig elevated above the sea surface.

Activity Description

Well Abandonment

The Seahorse-1, Tarwhine-1 and Whiting wells no longer produce a viable quantity of oil and gas, so permanent barriers will be installed to enable the wells to be safely abandoned in accordance with regulatory standards. Well ‘abandonment’ is a safe and long-standing practice.

For all wells, a Blowout Preventer (BOP) will be used to prevent the release of hydrocarbons during the plugging of the wells. Tubing and associated instruments and control valves will be removed, and permanent cement plugs / barriers installed to provide multiple physical barriers to prevent the release of any hydrocarbons that remain in the reservoir.

The Seahorse-1 and Tarwhine-1 wellheads will be cut at a depth of ~ 3 m beneath the seabed and removed. The remaining infrastructure, such as the Whiting platform jacket and topsides, well conductors, disconnected pipelines and umbilical control lines, will be removed as part of a separate campaign and will be the subject of further consultation.

Production Drilling

The drilling process uses a rotating bit attached to the end of a string of drill pipe to bore through the earth to reach the gas reservoirs. As the bit turns, it grinds off small pieces of rock, or drill cuttings, thus deepening the well.

In upper sections seawater-based fluids will be pumped down the drill string to remove the cuttings from the well, cool the drill bit, and maintain pressure control of the well. In lower sections, to assist well stability, low toxicity non-aqueous fluids (NAF) will be used. The NAF and cuttings are recirculated to the drilling rig where the fluids will be removed from the cuttings before being re-used. Once removed, drill cuttings will be discharged overboard where they will settle on the seabed near the rig.

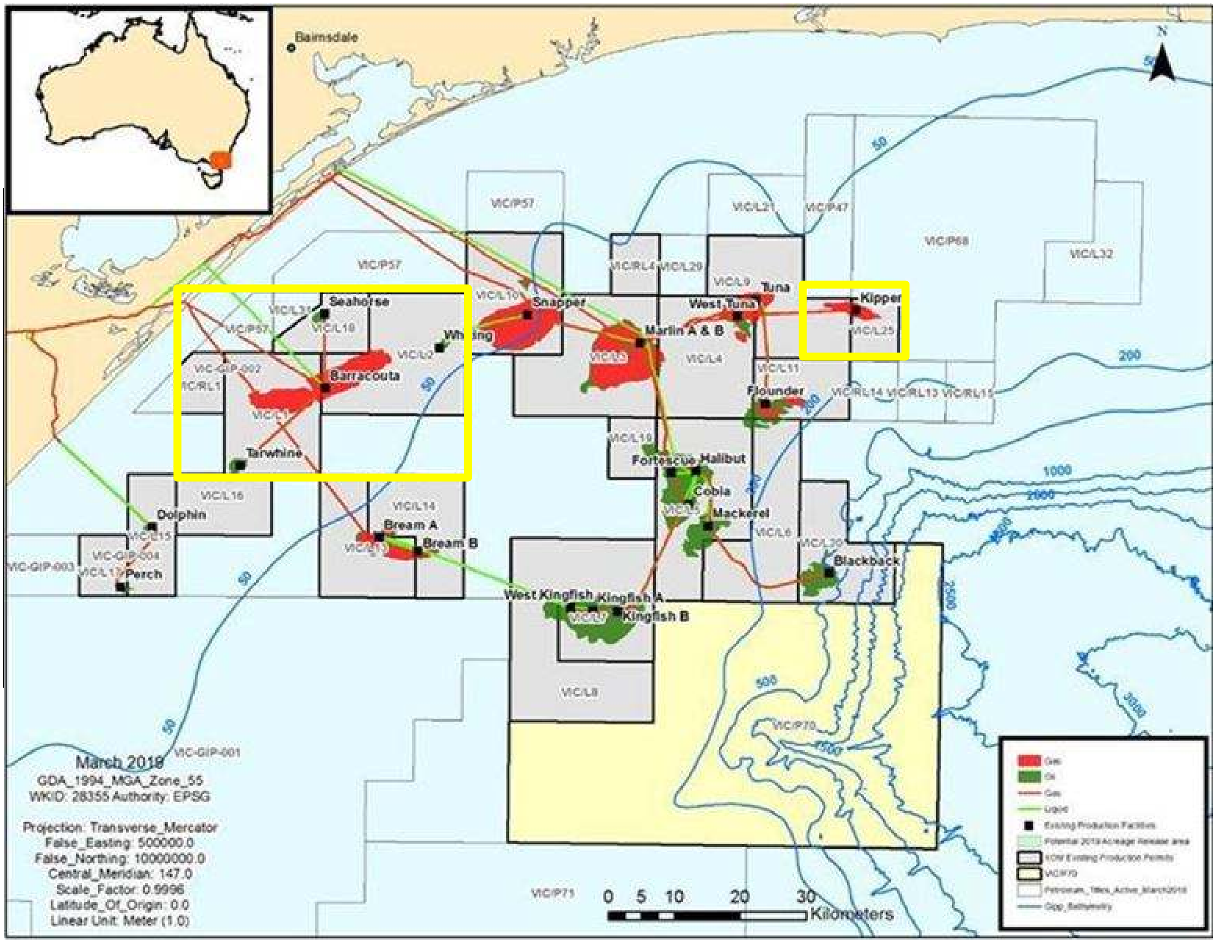
Once drilling has finished, steel casing will be installed in the wellbore and cemented in place. Then production tubing will be installed containing various instruments and flow control valves.

At Kipper the rig will also install the pipework and control valves attached to the top of the well on the seafloor called 'trees'. However, the West Barracouta wells will be suspended until the trees, which will sit ~ 5m above the seafloor, are installed in a separate campaign.

Activity Location

The Seahorse and Tarwhine wells and the proposed West Barracouta wells are located ~ 15km off the Gippsland coastline, south of Lakes Entrance in water depths of ~45m. The Whiting platform is located ~34km offshore in water depths of ~54m. The Kipper Subsea Facility is located ~45km east of Lakes Entrance in a water depth of ~95m.

The wells are not located within any established or proposed Commonwealth or State Marine Protected Areas, Critical Habitats or Threatened Ecological Communities, and are outside of established shipping fairways. It is recognised that the activities will overlap with existing fisheries.



Esso Bass Strait 2020 Jack Up Rig Campaign Activity Locations

Activity Timing

The following shows two indicative campaign timetables only. The earliest date of commencement of the campaign is January 2020 with all activity scheduled to be completed no later than December 2021.

Activities will be conducted 24 hours per day, seven days per week. It is expected to take ~30 days to plug and abandon each well and ~50 days to drill and complete each of the West Barracouta and Kipper wells.

The timing and order of activity may vary and is contingent on regulatory approvals, joint venture approvals, and weather and rig/vessel schedules.

Jack Up Rig Campaign ‘Early’ Activity Timeline

Jack Up Rig Campaign ‘Late’ Activity Timeline

Impacts and Risks

Provided in the table below are the key potential impacts relating to the Jack Up Rig Campaign to assist stakeholders in making an informed assessment on possible impacts to their activities, functions or interests in the area.

Potential Impacts	Potential Consequence	Impact/Risk Reduction & Mitigation Measures
Drill Rig and Vessel-based impacts		
Drill rig leg placement	Temporary and localised seabed disturbance	Seabed survey completed to identify obstructions. Rig move procedures in place. Small area affected by leg placement, rapidly filled after removal. Area is sandy bottom with no sensitive seabed features.
Planned discharges to the marine environment - Sewage and food waste - Treated bilge and deck wash - Cooling water and brine	Temporary and localised reduction in water quality Temporary change to predator / prey dynamics	Routine discharges and vessel waste treatment systems will meet MARPOL requirements and are routinely maintained. Food-scraps will be macerated prior to discharge. Discharged bilge water will have less than 15 ppm oil in water content. Any chemicals planned for discharge undergo an environmental assessment to confirm suitability for discharge prior to use.
Sound emissions	Temporary displacement of sound sensitive fauna around active vessels	Support vessels and helicopters will comply with EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans.
Light emissions	Attraction of light sensitive species Change in fauna behaviour	Lighting will be kept to minimum while still meeting navigational and workplace safety requirements.
Air emissions	Temporary and localised reduction in air quality	Air emissions from marine engines will meet MARPOL requirements and are routinely maintained. Low sulphur content fuel will be used.
Unplanned interaction with marine fauna (vessel strike)	Injury or death of marine fauna	Support vessels will comply with EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans. Any injury/mortality of EPBC-listed fauna will be reported to the Department of the Environment and Energy
Unplanned introduction of invasive marine species (IMS)	Displacement of native species and habitat domination	Jack Up Rig and all support vessels will have a Ballast Water Management Plan and Certificate. Jack Up Rig and all support vessels will comply with Australian Ballast Water Management requirements.

		A Biofouling Risk Assessment will be completed to confirm a low risk of IMS introduction. Submersible equipment will be cleaned prior to commencement of activity.
Accidental release of materials and waste	Temporary and localised: - Increase in turbidity - Burial of benthic habitat in immediate seabed area - Potential toxicity impacts	Waste handling, storage and disposal will meet MARPOL requirements. Lifting equipment is certified and routinely maintained. Bulk transfer equipment is certified and routinely maintained. Dropped objects will be recovered where safe and practicable.
Accidental release of fuel (vessel collision)	Tainting of commercial fisheries species (e.g. shellfish). Injury and death of species such as fish, marine reptiles, seabirds, cetaceans. Pathological effects on fish larvae and plankton.	All operational locations are within gazetted exclusion zones. Commencement of activity and exclusion zone will be communicated to other marine users via Notice to Mariners and via AMSA. Vessel will hold Dynamic Positioning (DP) System II Notation and watchkeeper-in-charge will hold DP Certification. Vessels will only travel at slow speeds within 500m of Jack Up Rig. Vessels will comply with their approved Shipboard Oil Pollution Emergency Plan (SOPEP) including maintaining spill kits, emergency response procedures and conducting spill response exercises Esso has a comprehensive Oil Pollution Emergency Plan (OPEP) which will be used in the event of a spill.
Drilling and Abandonment Activity Impacts		
Discharge of cement	Localised and temporary: - Reduction in water quality - Smothering of benthic habitat	Low toxicity cement additives have been selected for use. Cement hose flushing and slurry releases will be rapidly diluted and dispersed by the dynamic marine environment.
Drilling fluid and cuttings discharges	Localised and temporary: - Increase in turbidity - Burial of benthic habitat in immediate seabed area - Potential toxicity impacts	Seawater-based fluids will be used where practicable. Low toxicity non-aqueous fluids (NAF) and additives will be used when required. Solids control equipment will be used to remove NAF on cuttings to minimal residues prior to discharge overboard Dynamic seabed and marine environment will rapidly disperse discharged cuttings and drilling fluids.
Well fluid discharges	Increased salinity Potential toxicity effects	Low toxicity chemical additives have been selected for use in abandonment and completion fluids.

		Chemicals used in well fluids undergo environmental assessment to confirm suitability for discharge prior to use. Dynamic seabed and marine environment will rapidly disperse discharged well fluids.
–Disconnection / cutting discharges	Localised and temporary: - Reduction in water quality - Smothering of benthic habitats	Chemicals planned for discharge undergo environmental assessment to confirm suitability prior to use. Discharge will rapidly disperse in dynamic seabed and marine environment.
Naturally Occurring Radioactive Materials (NORM)	Temporary exposure of marine fauna to radioactive materials	Open ends of disconnected pipelines plugged to prevent fauna entry and leave NORM in a contained system.
Loss of well control	Tainting of commercial fisheries species (e.g. shellfish). Injury and death of species such as fish, marine reptiles, seabirds, cetaceans. Pathological effects on fish larvae and plankton. Pollution of shoreline habitats such as sandy beaches and rocky shores	West Barracouta and Kipper are gas wells. A loss of well control event may release condensate, which is generally not persistent in the environment, but not oil. Seahorse and Tarwhine are depleted light crude wells that mainly produce water. An accepted Environment Plan (EP), OPEP and Emergency Response Plan (ERP) will be in place and implemented in the event of a loss of well control. An accepted Safety Case and Well Operations Management Plan will be in place.

Petroleum Safety Zones

The Seahorse and Tarwhine subsea wells, the Whiting platform and the Kipper Subsea Facility are located within existing 500m Petroleum Safety Zones (PSZ) and a new PSZ will be gazetted around the West Barracouta subsea drill location. The exact location of the drill rig while at each location will be communicated to other marine vessels via a Notice to Mariners issued by the Australian Hydrographic Service (AHS) and AUSCOAST warnings issued by the Australian Maritime Safety Authority (AMSA).

The existing PSZ around the Seahorse and Tarwhine wells will be removed once all well abandonment activities have been carried out and removal of seabed infrastructure is complete.

Interaction with Commercial Fishing

The well sites are located within existing designated Commonwealth and State fisheries that may be used by commercial fishers. The 500 m PSZ will be communicated to Lakes Entrance Fisherman's Co-op (LEFCOL), South East Trawl Fishing Industry Association (SETFIA) and Seafood Industry Victoria (SIV) as it is a legal requirement that the area should be avoided during drilling.

Environment Plans

Under the Offshore Petroleum and Greenhouse Gas Storage Act 2006, before any petroleum related activities in Commonwealth waters can commence, an Environment Plan (EP) must be accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

In the course of preparing an EP, Esso Australia must consult with relevant authorities, persons and organisations whose functions, interests or activities may be affected by the proposed activities (i.e. a relevant person) and provide the opportunity for any issues or concerns to be raised.

Three separate Environment Plans (EPs) are proposed to be developed for these different activities, however, to improve efficiencies for stakeholders, a single consultation process is being undertaken.

The EP is a comprehensive document that describes the existing environment, including stakeholders, and how Esso Australia will undertake the activities to avoid, minimise or manage potential environmental impacts to the "As Low As Reasonable Practicable" standard (ALARP) and meet Esso Australia's acceptability criteria.

Oil Pollution Emergency Plan (OPEP)

Under Commonwealth environment legislation, Esso Australia must demonstrate and document oil spill response arrangements. The OPEP forms part of an EP submission and demonstrates our capability to respond in the unlikely event of an oil spill.

Esso Australia is a member of the Australian Marine Oil Spill Centre (AMOSC), a co-operative national oil spill response organisation, which provides access to additional oil spill response resources if required.

Esso Australia's OPEP interfaces with national, state and industry response plans prepared and implemented by the Australian Government via AMSA (NATPLAN), the Victorian Government (Maritime Emergencies (non-search and rescue) Plan), the Tasmanian Government (TASPLAN), the NSW Government (NSW Marine Oil and Chemical Spill Contingency Plan) and the Australian Oil industry's Australian Marine Oil Spill Plan (AMOSPLAN) administered by AMOSC.

The OPEP defines spill response options which may be applied to a spill event. The selected spill response option(s) would depend upon the size and type of spill; environmental sensitivities within the spill path; prevailing weather conditions; access restrictions and available resources. In all instances, a Net Environmental Benefits Assessment (NEBA) is undertaken, in consultation with relevant government agencies, to consider the advantages and disadvantages of the available spill response options.

Consultation

Esso Australia is committed to engaging with the communities where we operate and helping our stakeholders to understand our business.

Esso has been consulting with stakeholders potentially affected by this campaign through a number of different channels.

While some community consultations have occurred, Esso welcomes the opportunity for more face-to-face meetings and will continue to keep interested stakeholders informed of the proposed activities throughout the planning phase and into operational phase.

We will address questions and consider feedback from stakeholders throughout this campaign.

If you have any specific questions or feedback about any of these activities please contact Esso at consultation@exxonmobil.com or call 03 9261 0260.

Fact Sheet #3 - April 2018 (included in PROFISH)

ExxonMobil

Esso offshore projects

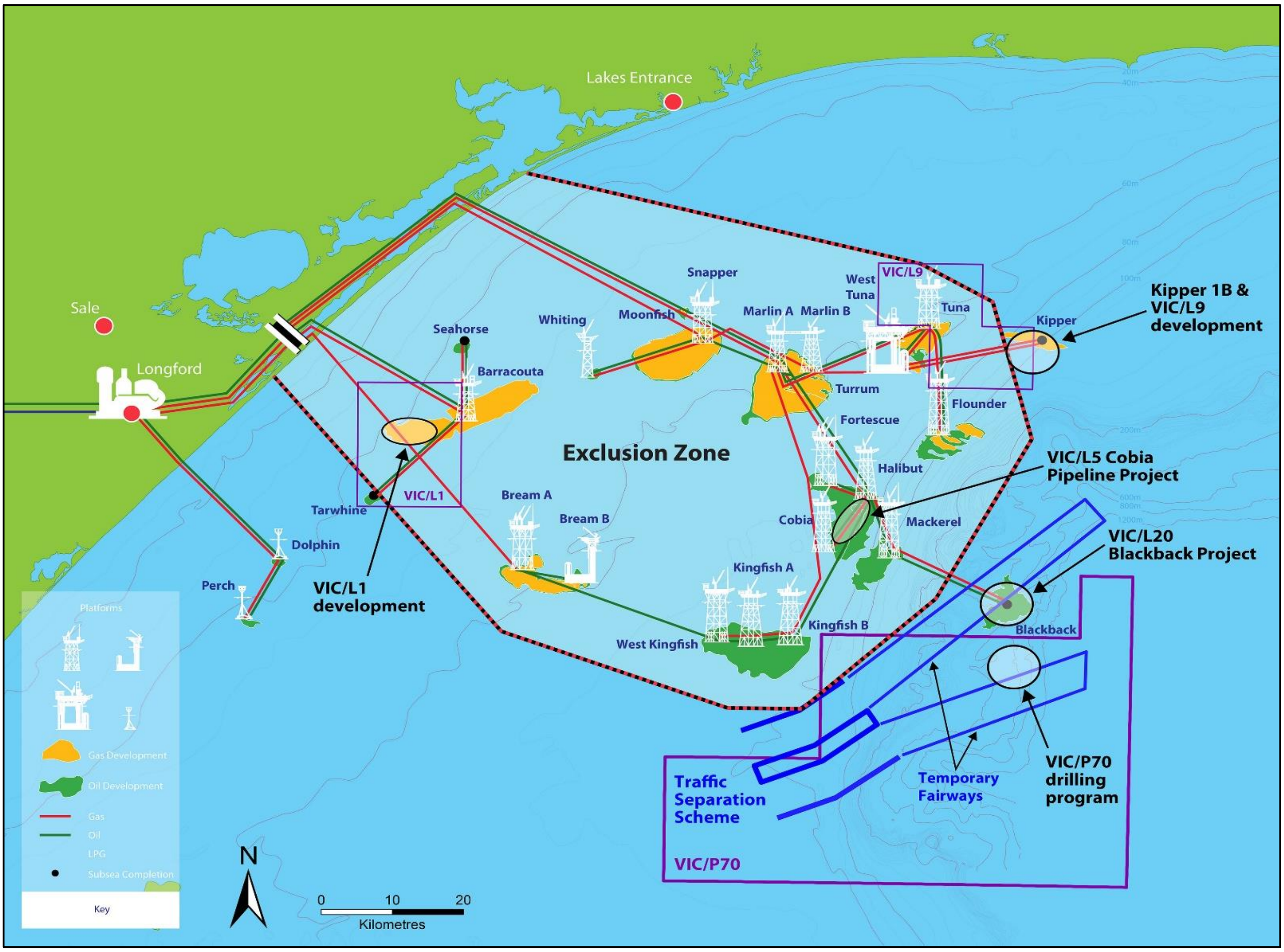
INTRODUCTION

Esso Australia, a subsidiary of ExxonMobil Australia, is planning on undertaking a program of work across some of its offshore assets, including those owned jointly by the Gippsland Basin and Kipper Unit Joint Ventures, in 2018 and 2019.

This program forms part of Esso's ongoing investment in exploring domestic gas development opportunities to ensure that we can continue to meet Australia's energy needs.

This fact sheet provides high level details about the projects, regulatory requirements and consultation which will be occurring to facilitate information sharing and stakeholder engagement.

Project Locations



PROJECTS

VIC/P70 drilling program

Esso Australia is planning to undertake an exploration drilling program in the VIC/P70 block, approximately 90km off the East Gippsland Victorian coast. The program will involve drilling two exploration wells, known as Baldfish and Hairtail. The drilling program is expected to last approximately 60 days starting mid-2018.

The exploration wells will determine the extent of any gas reserves contained within the field and has the potential to lead to development of much needed new gas supplies from The Gippsland Basin, which has been producing for more than 40 years.

The Baldfish and Hairtail wells are located outside the "Bass Strait Area to be Avoided" as defined on marine chart AUS357.

Esso will seek to have a temporary petroleum safety zone created around the drill rig for the duration of the drilling program, to ensure drilling activities can be completed safely and other marine users are protected. (VIC/P70 well coordinates: Baldfish Latitude 38° 36′ south, Longitude 148° 35′ east / Hairtail Latitude 38° 36′ south, Longitude 148° 31′ east)

Esso will be working with stakeholders, including the Australian Marine Safety Authority, to manage the impact and communicate with marine users.

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Seabed surveys

Esso Australia is examining options to develop a gas field in block VIC/L1 known as West Barracouta, approximately 6km south west of the existing Barracouta platform. The project is likely to involve the drilling of a number of subsea wells which will be tied back to our existing Barracouta infrastructure in Bass Strait. This project will be undertaken within Esso's current "Bass Strait Area to be Avoided".

To support the project's development, Esso will be conducting environmental and seabed surveys commencing in early 2018 (duration approximately 20 days) to assess the location of potential well sites and flow line routes.

In addition to the environmental and seabed surveys to be conducted for the VIC/L1 development, in order to support a number of future developments, Esso will be conducting seabed surveys commencing in early 2018 (duration approximately 60 days over a 6 month period) to help inform potential drilling activities at Kipper and VIC/L9, as well other activities at a number of existing licence areas.

The proposed surveys will involve collection of geophysical data (i.e. measurements of seabed characteristics, imaging and profiling), collection of water and sediment samples, and collection of subsea floor materials. The Environment Plan for the seabed survey work was accepted in February 2018.

VIC/L5 Cobia Pipeline project

The Cobia Pipeline project will undertake maintenance and repair works on the Cobia pipeline, which runs from the Cobia platform to the Halibut platform in Bass Strait. This project will be undertaken within the existing Bass Strait "Area to be Avoided" and a temporary petroleum safety zone will be implemented to provide protection during the project.

The offshore work for this project is planned to be carried out by a dynamically positioned vessel in late 2018 and will take approximately two weeks.

VIC/L20 Blackback

Esso Australia is examining options to secure wells no longer in operation. (Well coordinates: Latitude 38° 32′ south, Longitude 148° 33′ east)

VIC/L25 and VIC/L9 Kipper 1B and Pilchard

Esso Australia and its Joint Venture partners are planning to drill a number of additional wells at Kipper. These will be tied into the existing infrastructure within the existing Kipper petroleum safety zone. The current schedule is for these to be drilled in 2019.

In addition to the Kipper infield drilling a similar gas field, Pilchard, is being assessed and may be drilled and developed in the same drilling campaign.
Pilchard may be drilled from Kipper or may require a new subsea location nearby. (Well coordinates: Latitude 38° 11′ south, Longitude 148° 36′ east)

OFFSHORE ENVIRONMENT REGULATIONS

Esso is preparing Environment Plans and associated Oil Pollution Emergency Plans to identify, assess and manage environmental risks for these projects. These plans will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), the offshore environment regulator, for review and acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* and *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009*.

In developing the Environment Plans, Esso will conduct an environmental risk assessment to evaluate environmental risks associated with the activities being planned, and will incorporate prevention and mitigation measures that reduce these risks to As Low as Reasonably Practicable (ALARP).

CONSULTATION

We are committed to engaging with the communities where we operate and helping our stakeholders to understand our business. Esso has been consulting with stakeholders potentially affected by these projects through a number of different channels.

As these projects develop, additional consultation with stakeholders will be conducted, including key impacts and environmental risks.

This fact sheet provides information to allow stakeholders to make an informed assessment of the possible consequences of the proposed activities to their functions, interests or activities. We will address questions and consider feedback from stakeholders relating to these projects throughout this consultation process. If you have any specific questions or feedback about any of these projects please contact Esso at consultation@exxonmobil.com or call 03 92610260

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Fact Sheet #4 - August 2018

ExxonMobil

Esso offshore projects

Introduction

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This program forms part of Esso's ongoing investment in exploring for domestic gas development opportunities to ensure that we can continue to meet Australia's energy needs.

This fact sheet provides high level details about the projects, regulatory requirements and consultation that is occurring to facilitate information sharing and stakeholder engagement.

Projects

VIC/P70 drilling program

Esso is undertaking an exploration drilling program in the VIC/P70 block, approximately 90km off the East Gippsland Victorian coast. The program will involve drilling two exploration wells, known as Baldfish and Hairtail.

All regulatory requirements are in place with the Environmental Plan accepted by NOPSEMA on 4 July 2018 (a summary is available on the NOPSEMA website and on the ExxonMobil Australia website www.exxonmobil.com.au).

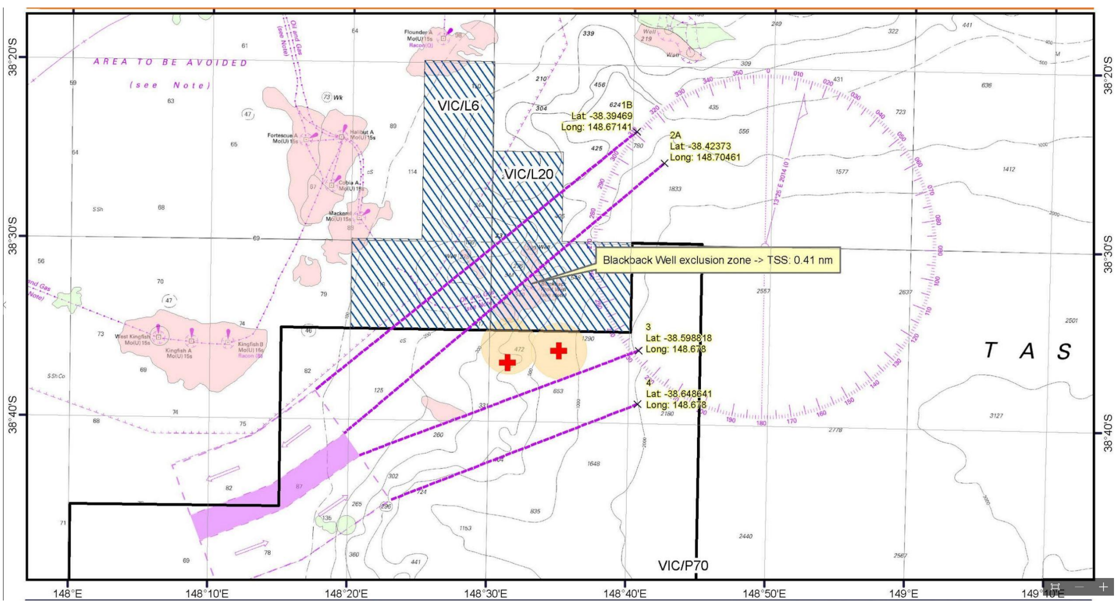
The drilling program is expected to start in the second half of 2018 and continue for approximately 60 days, using the Ocean Monarch mobile offshore drilling unit (MODU).

The exploration wells will determine the extent of any gas reserves contained within the field and the potential for development of much needed new gas supplies from the Gippsland Basin, which has been producing for more than 45 years.

The Baldfish and Hairtail wells are located outside the Bass Strait "Area to be Avoided" as defined on marine chart AUS357 and temporary fairways have been established to protect the rig and other marine users (see figure below).

Temporary petroleum safety zones will also be in place for the duration of the drilling program, to further provide protection. (VIC/P70 well coordinates: Baldfish Latitude 38° 36′ south, Longitude 148° 35′ east / Hairtail Latitude 38° 36′ south, Longitude 148° 31′ east).

Esso is working with stakeholders, including the Australian Marine Safety Authority, to manage the impact and communicate with marine users.



Temporary fairways

VIC/L20 Blackback

Esso is undertaking a project to work on the Blackback wells also using the Ocean Monarch MODU. The program is expected to start in the second half of 2018 and continue for approximately 60 days. (Well coordinates: Latitude 38° 32′ south, Longitude 148° 33′ east).

Ocean Monarch MODU

VIC/L1 development

Esso is examining options to develop a gas field in block VIC/L1 known as West Barracouta, approximately 6km south west of the existing Barracouta platform. The project is likely to involve the drilling of two subsea wells within one petroleum safety zone, which will be tied back to our existing Barracouta infrastructure in Bass Strait.

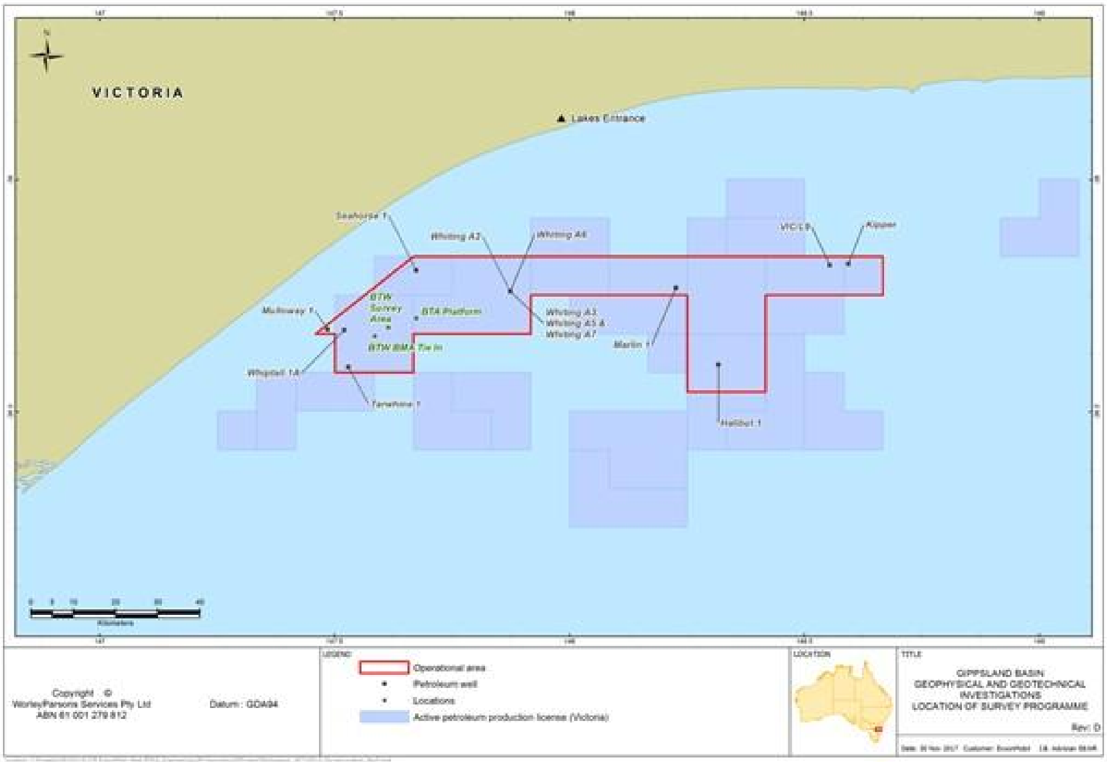
A subsea flowline approximately 6km in length connected via a subsea hot tap into the existing gas export pipeline and controls umbilical approximately 6.5 km in length to the Barracouta platform is planned to be installed. This project will be undertaken within Esso's current Bass Strait "Area to be Avoided".

To support the project's development, Esso has conducted environmental and seabed surveys and geotechnical surveys are planned to be completed the first half of 2019 (previously planned for 2018), subject to regulatory approval. The results of these surveys will be used to assess the location of the well sites and flowline and umbilical routes.

Seabed surveys

In addition to the seabed surveys to be conducted for the VIC/L1 development, Esso will be conducting seabed surveys to help inform potential drilling activities in VIC/L9, as well as potential plug and abandonment activities at a number of existing licence areas as shown in the figure below.

The proposed surveys will involve collection of geophysical data (i.e. measurements of seabed characteristics, imaging and profiling), collection of water and sediment samples, and collection of subsea floor materials. Geotechnical data will also be collected.



Map of proposed seabed surveys

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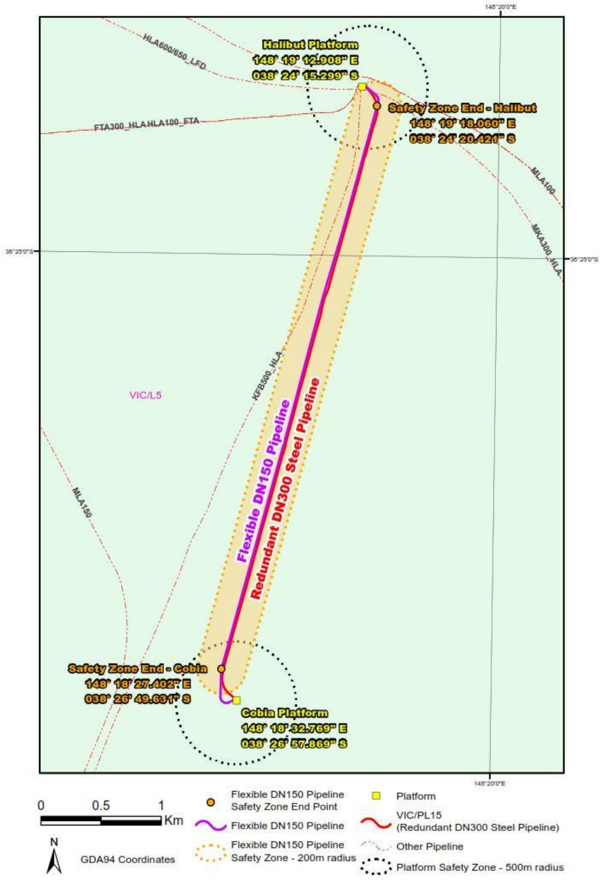
A range of measures will be implemented to reduce potential environmental impacts to acceptable levels:

- Survey vessels will not anchor or refuel during the activity
- Measures will be taken to protect marine fauna from noise and to prevent vessel collisions
- All discharges (e.g. sewage, grey water) will meet legal and environmental requirements
- Appropriate spill response plans will be established
- Survey vessels will be assessed and managed to prevent the introduction of invasive marine species

VIC/L05 Cobia Pipeline project

The Cobia Pipeline project will undertake maintenance and repair works on the Cobia pipeline, which runs from the Cobia platform to the Halibut platform in Bass Strait.

This project will be undertaken within the existing Bass Strait "Area to be Avoided" and a temporary petroleum safety zone will be implemented to provide protection during the project.



Temporary petroleum safety zone for Cobia Project

The offshore work for this project is planned to be carried out by the Seven Eagle, a dive support vessel, in December 2018 and will take approximately two weeks.

Dive support vessel 'Seven Eagle'

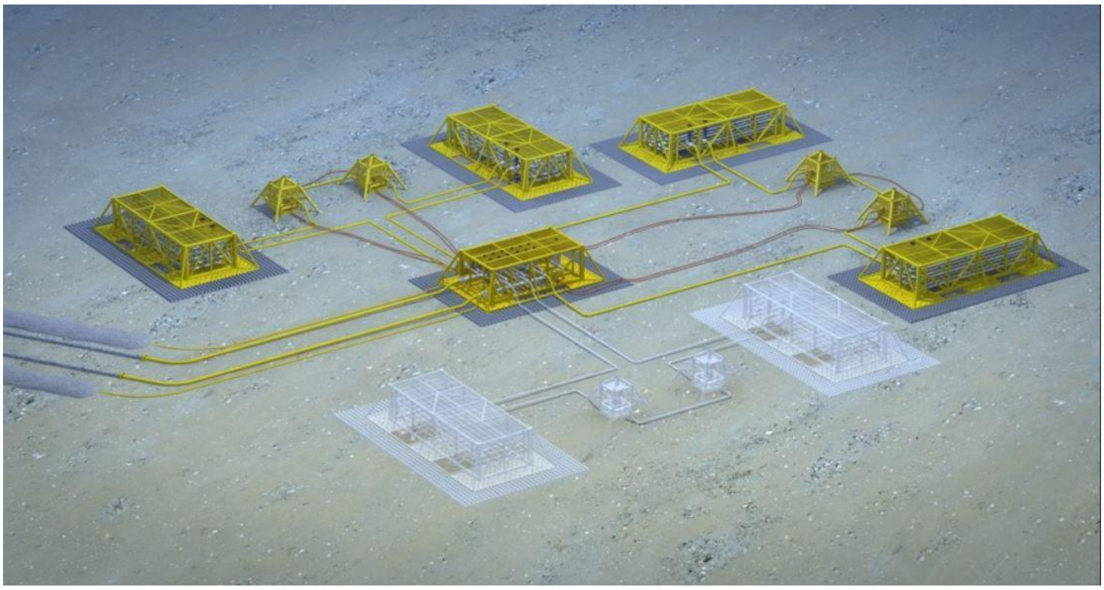
VIC/L05 Mackerel and other platform based activities

Esso is also considering work on the Mackerel wells with the program expected to begin in November 2018 and continue for approximately 10 months (Platform coordinates: Latitude 38° 27′ south, 148° 18′ east), with various platform based activities scheduled throughout 2019 to 2022.

VIC/L25 and VIC/L9 Kipper 1B and Pilchard

Esso and its Kipper Unit Joint Venture partners are planning to drill a number of additional wells at Kipper (Well coordinates: Latitude 38° 11′ south, Longitude 148° 36′ east). These wells were part of the original Kipper plan and are referred to as Stage 1B.

The wells will be tied into the existing subsea infrastructure within the current Kipper petroleum safety zone as shown in the following artist's impression. The current schedule is for the Kipper 1B wells to be drilled in 2020.



Artist's impression of Kipper Subsea Facilities

In addition to the Kipper infield drilling, a similar gas field, Pilchard, is being assessed by Esso and its Gippsland Basin Joint Venturers and may be drilled and developed in a future drilling campaign.

Offshore environment regulations

Esso is preparing Environment Plans and associated Oil Pollution Emergency Plans to identify, assess and manage environmental risks for these projects.

These plans will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), the offshore environment regulator, for review and acceptance in accordance with the Offshore Petroleum and Greenhouse Gas Storage Act 2006 and Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009.

In addition, Esso will be conducting a five-yearly review of existing Environment Plans for platforms operating in Bass Strait commencing mid-2019, in accordance with the Offshore Petroleum and Greenhouse Gas Storage Act 2006 and Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009.

In developing the Environment Plans, Esso will conduct an environmental risk assessment to evaluate environmental risks associated with the activities being planned, and will incorporate prevention and mitigation measures that reduce these risks to As Low as Reasonably Practicable (ALARP).

Produced Formation Water (PFW)

As part of the accepted offshore Environment Plans, Esso committed to undertaking in-situ monitoring of the discharge of Produced Formation Water (PFW) to assess its potential impact on the Bass Strait environment, including impacts to seawater and marine sediments.

This in-situ sampling was conducted during the period 28 to 29 June 2018 in the vicinity of the Tuna platform (Latitude 38° 10′ south, Longitude 148° 25′ east).

The sampling involved adding fluorescent (FWT) red dye solution to the PFW stream as a tracer (prior to discharge) for two hours on 28 June and three hours on 29 June.

The dye allowed visual detection of the plume for accurate sampling. Dilution was also determined by towing a fluorometer in transects, a short distance behind the sampling vessel at both near field and far field locations.

This type of monitoring is commonly undertaken to provide dispersion and dilution parameters from discharge points such as sewage outfalls.

Produced Formation Water tracer dye study

Consultation

We are committed to engaging with the communities where we operate and helping our stakeholders to understand our business. Esso has been consulting with stakeholders potentially affected by these projects through a number of different channels.

As these projects develop, additional consultation with stakeholders will be conducted, including key impacts and environmental risks.

This fact sheet provides information to allow stakeholders to make an informed assessment of the possible consequences of the proposed activities to their functions, interests or activities. We will address questions and consider feedback from stakeholders relating to these projects throughout this consultation process.

If you have any specific questions or feedback about any of these projects please contact Esso at consultation@exxonmobil.com or call 03 9261 0260.

About Esso

Esso Australia is a subsidiary of ExxonMobil Australia, the country's largest integrated oil and gas company. Esso's Longford Plants has processed more than four billion barrels of oil and eight trillion cubic feet of gas since production began in 1969.

We place the highest priority on operating flawlessly in all aspects of our business. All of these offshore projects will be managed in accordance with all regulatory requirements, as well as Esso's Operational Integrity Management System to reduce risks to ALARP.

Environment Plans detailing each program of work and how the risks of the program will be managed by Esso will be submitted to NOPSEMA for acceptance.

Esso is continuously striving to improve all aspects of our safety performance including for our people, our processes, security, health, and environmental performance.
For more information about our operations please visit www.exxonmobil.com.au.

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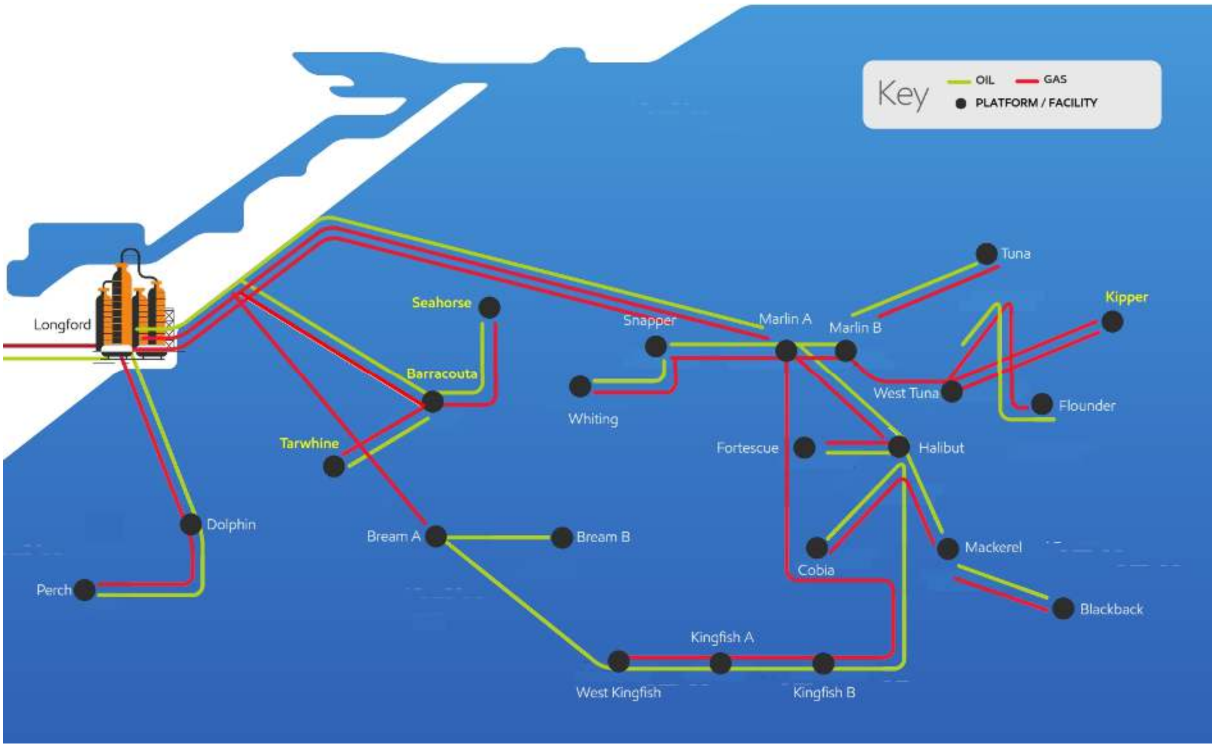
Esso Bass Strait 2020 Jack Up Rig Campaign – Update 1 (December 2019):

Whiting P&A programme



Esso Australia is planning to undertake a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign as advised in 2Q19. This programme includes:

- Drilling
    - Two subsea gas production wells in the West Barracouta field.
    - Two subsea gas production wells in the Kipper field.
- Well Plug and Abandonment (P&A)
    - Two subsea wells, Seahorse -1 and Tarwhine – 1
    - 5 wells at the Whiting platform (WTA)

There will be no seismic activity as part of this campaign.

Planning is well underway for the drilling activities to begin at Barracouta in January 2020 using the jack-up drilling rig "Tom Prosser", which is known as a jack-up offshore drilling rig (JUR). The Tom Prosser was built in 2014 and operates to the latest international safety and environmental standards. The drilling rig will be supported by up to three support vessels.

Noble Tom Prosser Jack-Up Drilling Rig (Image courtesy of Noble Corporation)

The Tom Prosser does not have any propulsion capability and will be towed into position, then the legs lowered onto the seabed and the rig elevated above the sea surface.

Following the BTW drilling activities the Tom Prosser will move to the Whiting platform to begin the plug and abandonment programme of the five Whiting wells.

This information sheet provides additional information on the Whiting Plug and Abandonment (WTA P&A) programme.

Activity Description

Well Abandonment

The Whiting platform has been shut in since 1997 after the five wells were temporarily suspended. Whiting wells no longer produce a viable quantity of oil and gas, so permanent barriers will be installed to enable the wells to be safely abandoned in accordance with regulatory standards. Well 'abandonment' is a safe and long-standing practice.

Once onsite, the JUR will be jacked-up and cantilevered over the wellheads on the Whiting platform. For all wells, a Blowout Preventer (BOP) will be used to prevent the release of hydrocarbons during the plugging of the wells. Tubing and associated instruments and control valves will be removed, and permanent cement plugs / barriers installed to provide multiple physical barriers to prevent the release of any hydrocarbons that remain in the reservoir.

The well casing and conductors will be cut at a depth of ~ 3 m below the mudline and removed. The remaining infrastructure, such as the Whiting platform jacket and topsides and disconnected pipelines will be removed as part of a separate campaign and will be the subject of further consultation.

Activity Location

The Whiting platform is located ~ 34km off the Gippsland coastline, south of Lakes Entrance in water depths of ~54m.

All activities will occur in existing Commonwealth offshore petroleum licences.

The Whiting platform is not located within any established or proposed Commonwealth or State Marine Protected Areas, Critical Habitats or Threatened Ecological Communities, and is outside of established shipping fairways. It is recognised that the activities will overlap with existing fisheries.

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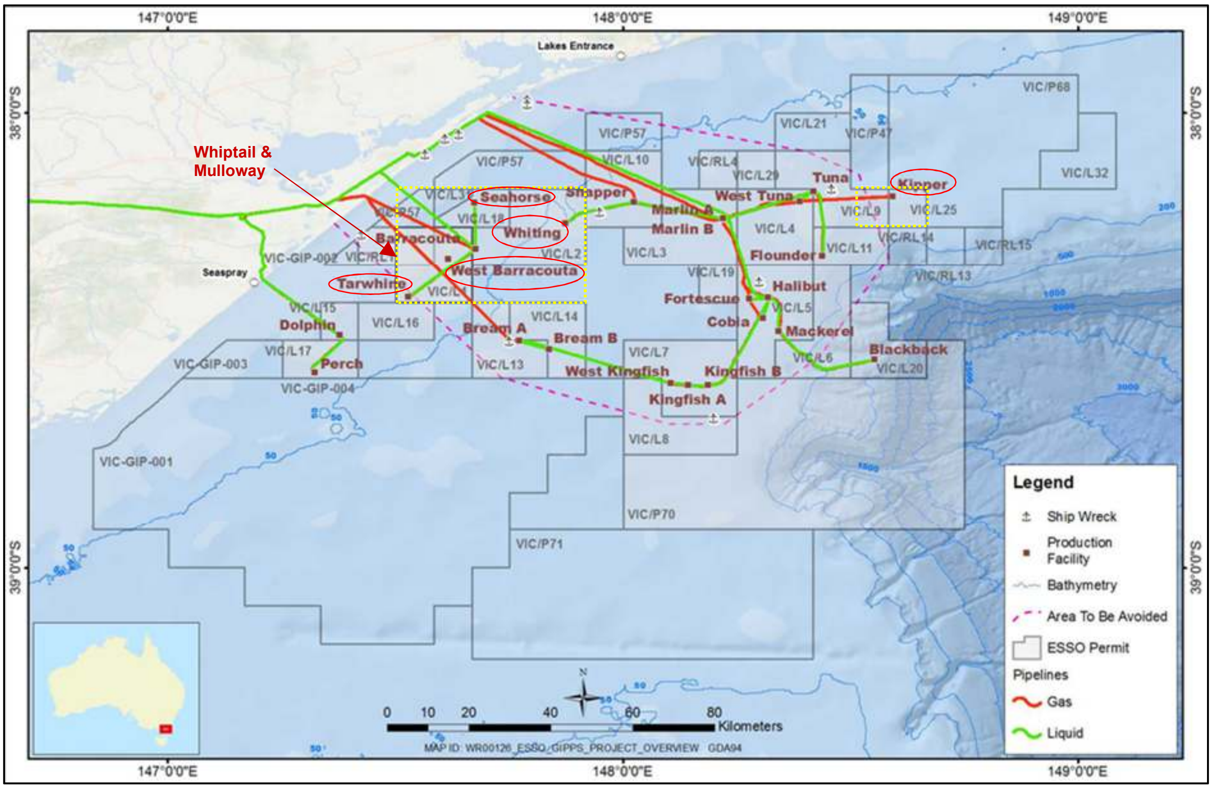
Well Locations	Licence Area	Latitude/Longitude	Activity Type	Water depth (m)
Kipper Subsea Facility (KPA-A1, KPA-A3)	VIC/L25	38°10' 53" S 148° 35' 35" E	Drilling	95
West Barracouta Drill Centres (BTW-W1, BTW-W2)	VIC/L1	38° 19' 06" S 147° 36' 53" E	Drilling	46
Tarwhine (TWA-1)	VIC/L1	38° 24' 12" S 147° 31' 46" E	P&A	42
Seahorse (SHA-1)	VIC/L18	38° 11' 42" S 147° 40' 27" E	P&A	42
Whiting platform (WTA) (5 wells)	VIC/L2	38° 14' 29" S 147° 72' 20" E	P&A	54



Esso Bass Strait 2020 Jack Up Rig Campaign Activity Locations as circled

Activity Timing

The following shows an indicative campaign timetable only.

Activities will be conducted 24 hours per day, seven days per week. It is expected to take ~20 days to plug and abandon each well.

The timing of the activity may vary and is contingent on regulatory approvals, joint venture approvals, and weather and rig/vessel schedules.

January 2020	West Barracouta Drilling Commences
April 2020	Whiting Plug & Abandonment Commences
July 2020	Seahorse / Tarwhine Plug & Abandonment Commences
September 2020	Kipper Drilling Commences
December 2020	Mulloway / Whiptail Plug & Abandonment Commences (to be confirmed)

Indicative Jack Up Rig Campaign Activity Timeline

Impacts and Risks

Provided in the table below are the key potential impacts relating to the Whiting Jack Up Rig Campaign to assist stakeholders in making an informed assessment on possible impacts to their activities, functions or interests in the area.

Potential Impacts	Potential Consequence	Impact/Risk Reduction & Mitigation Measures
Drill Rig and Vessel-based impacts		
Drill rig leg placement	Temporary and localised seabed disturbance	Seabed survey completed to identify obstructions. Rig move procedures in place. Small area affected by leg placement, rapidly filled after removal. Area is sandy bottom with no sensitive seabed features.
Planned discharges to the marine environment - Sewage and food waste - Treated bilge and deck wash	Temporary and localised reduction in water quality Temporary change to predator / prey dynamics	Routine discharges and vessel waste treatment systems will meet MARPOL requirements and are routinely maintained. Food-scraps will be macerated prior to discharge. Discharged bilge water will have less than 15 ppm oil in water content. Any chemicals planned for discharge undergo an environmental assessment to confirm suitability for discharge prior to use.
Sound emissions	Temporary displacement of sound sensitive fauna around active vessels	Support vessels and helicopters will comply with EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans.
Unplanned interaction with marine fauna (vessel strike)	Injury or death of marine fauna	Support vessels will comply with EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans. Any injury/mortality of EPBC-listed fauna will be reported to the Department of the Environment and Energy.
Unplanned introduction of invasive marine species (IMS)	Displacement of native species and habitat domination	Jack Up Rig and all support vessels will have a Ballast Water Management Plan and Certificate. Jack Up Rig and all support vessels will comply with Australian Ballast Water Management requirements. A Biofouling Risk Assessment will be completed to confirm a low risk of IMS introduction. Submersible equipment will be cleaned prior to commencement of activity. Spud cans on JUR legs will be jetted prior to moving location.
Accidental release of materials and waste	Temporary and localised:	Waste handling, storage and disposal will meet MARPOL requirements.

Potential Impacts	Potential Consequence	Impact/Risk Reduction & Mitigation Measures
	- Increase in turbidity - Burial of benthic habitat in immediate seabed area - Potential toxicity impacts	Lifting equipment is certified and routinely maintained. Bulk transfer equipment is certified and routinely maintained. Dropped objects will be recovered where safe and practicable.
Accidental release of fuel (vessel collision)	Tainting of commercial fisheries species (e.g. shellfish). Injury and death of species such as fish, marine reptiles, seabirds, cetaceans. Pathological effects on fish larvae and plankton.	All operational locations are within gazetted exclusion zones. Commencement of activity and exclusion zone will be communicated to other marine users via Notice to Mariners and via AMSA. Vessel will hold Dynamic Positioning (DP) System II Notation and watchkeeper-in-charge will hold DP Certification. Vessels will only travel at slow speeds within 500m of Jack Up Rig. Vessels will comply with their approved Shipboard Oil Pollution Emergency Plan (SOPEP) including maintaining spill kits, emergency response procedures and conducting spill response exercises Esso has a comprehensive Oil Pollution Emergency Plan (OPEP) which will be used in the event of a spill.
Abandonment Activity Impacts		
Discharge of cement	Localised and temporary: - Reduction in water quality - Smothering of benthic habitat	Low toxicity cement additives have been selected for use. Cement hose flushing and slurry releases will be rapidly diluted and dispersed by the dynamic marine environment. Cement powder is also lost to the air as part of the transfer process.
Well fluid discharges	Increased salinity Potential toxicity effects	Low toxicity chemical additives have been selected for use in abandonment and completion fluids. Chemicals used in well fluids undergo environmental assessment to confirm suitability for discharge prior to use. Dynamic seabed and marine environment will rapidly disperse discharged well fluids.
Removal of Conductors	Localised and temporary: - Reduction in water quality - Change to local benthic habitat - Smothering of benthic fauna	Turbidity produced is akin to that that caused by natural currents and will be short term with no lasting impact. Impact is limited to the small, direct area under the platform. Once conductors are removed the benthic environment will be available for recolonisation. No long term on species diversity or abundance.

Potential Impacts	Potential Consequence	Impact/Risk Reduction & Mitigation Measures
Potential Loss of well control	Tainting of commercial fisheries species (e.g. shellfish). Injury and death of species such as fish, marine reptiles, seabirds, cetaceans. Pathological effects on fish larvae and plankton. No pollution of shoreline habitats.	Whiting has one gas well and four condensate wells. A loss of well control event may release condensate, which is generally not persistent in the environment. No surface oil shoreline impact is predicted. An accepted Environment Plan (EP), OPEP and Emergency Response Plan (ERP) will be in place and implemented in the event of a loss of well control. An accepted Safety Case and Well Operations Management Plan will be in place.

Whiting produces a non-persistent light condensate. Spill assessment demonstrates that in the unlikely event of a loss of well control during P&A activities, no shoreline impact is predicted, with ecological impacts from surface oil (10 g/m^2) restricted to an area immediately around the release location (<1km).

Petroleum Safety Zones

The Whiting platform is located within existing 500m Petroleum Safety Zones (PSZ) which in turn is situated within the Gippsland Basin "Area To Be Avoided" (ATBA), as designated by the Australian Maritime Safety Authority (AMSA). The exact location of the drill rig while at location will be communicated to other marine vessels via a Notice to Mariners issued by the Australian Hydrographic Service (AHS) and AUSCOAST warnings issued by AMSA.

Interaction with Commercial Fishing

The Whiting Platform is located within existing designated Commonwealth and State fisheries that may be used by commercial fishers. The 500 m PSZ will be communicated to Lakes Entrance Fisherman's Co-op (LEFCOL), South East Trawl Fishing Industry Association (SETFIA) and Seafood Industry Victoria (SIV) as it is a legal requirement that the area should be avoided during the P&A Activities.

Environment Plans

Under the Offshore Petroleum and Greenhouse Gas Storage Act 2006, before any petroleum related activities in Commonwealth waters can commence, an Environment Plan (EP) must be accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

In the course of preparing an EP, Esso Australia must consult with relevant authorities, persons and organisations whose functions, interests or activities may be affected by the proposed activities (i.e. a relevant person) and provide the opportunity for any issues or concerns to be raised.

Separate Environment Plans (EPs) are being developed for these different activities, however, to improve efficiencies for stakeholders, a single consultation process is being undertaken.

The EP is a comprehensive document that describes the existing environment, including stakeholders, and how Esso Australia will undertake the activities to avoid, minimise or manage potential environmental impacts to the "As Low As Reasonable Practicable" standard (ALARP) and meet Esso Australia's acceptability criteria.

Oil Pollution Emergency Plan (OPEP)

Under Commonwealth environment legislation, Esso Australia must demonstrate and document oil spill response arrangements. The OPEP forms part of an EP submission and demonstrates our capability to respond in the unlikely event of an oil spill.

Esso Australia is a member of the Australian Marine Oil Spill Centre (AMOSC), a co-operative national oil spill response organisation, which provides access to additional oil spill response resources if required.

Esso Australia's OPEP interfaces with national, state and industry response plans prepared and implemented by the Australian Government via AMSA (NATPLAN), the Victorian Government

(Maritime Emergencies (non-search and rescue) Plan), the Tasmanian Government (TASPLAN), the NSW Government (NSW Marine Oil and Chemical Spill Contingency Plan) and the Australian Oil industry's Australian Marine Oil Spill Plan (AMOSPLAN) administered by AMOSC.

The OPEP defines spill response options which may be applied to a spill event. The selected spill response option(s) would depend upon the size and type of spill; environmental sensitivities within the spill path; prevailing weather conditions; access restrictions and available resources. In all instances, a Net Environmental Benefits Assessment (NEBA) is undertaken, in consultation with relevant government agencies, to consider the advantages and disadvantages of the available spill response options.

Consultation

Esso Australia is committed to engaging with the communities where we operate and helping our stakeholders to understand our business.

Esso has been consulting with stakeholders potentially affected by this campaign through a number of different channels.

While some community consultations have occurred, Esso welcomes the opportunity for more face-to-face meetings and will continue to keep interested stakeholders informed of the proposed activities throughout the planning phase and into operational phase.

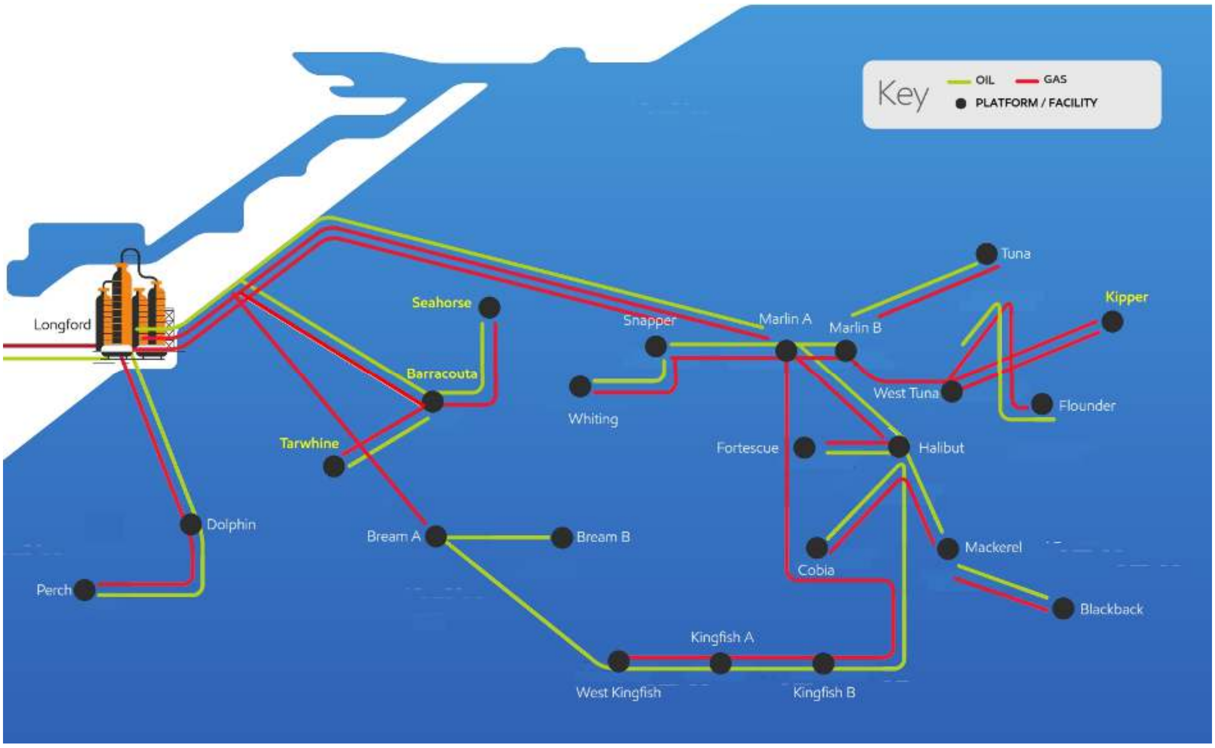
We will address questions and consider feedback from stakeholders throughout this campaign.

If you have any specific questions or feedback about any of these activities please contact Esso at consultation@exxonmobil.com or call 03 9261 0260.

Esso Bass Strait 2020 Jack Up Rig Campaign – Update 2

March 2020

Seahorse / Tarwhine P&A programme



Esso Australia is planning to undertake a number of offshore activities within the Gippsland Basin off the Victorian coastline collectively called the 2020 Jack Up Rig Campaign as advised in 2Q19. This programme includes:

- Drilling
  - Two subsea gas production wells in the West Barracouta field (BTW)
  - Two subsea gas production wells in the Kipper field
- Well Plug and Abandonment (P&A)
  - Subsea wells, Seahorse -1 and Tarwhine – 1 (SHA/TWA)
  - Whiting platform
  - Mulloway / Whiptail
  - Perch / Dolphin

There will be no seismic activity as part of this campaign.

Drilling activities began at Barracouta (BTA) in January 2020 using the jack-up drilling rig "Tom Prosser", which is known as a jack-up offshore drilling rig (JUR). The Tom Prosser was built in 2014 and operates to the latest international safety and environmental standards. The drilling rig will be supported by up to three support vessels.

Noble Tom Prosser Jack-Up Drilling Rig (Image courtesy of Noble Corporation)

The Tom Prosser does not have any propulsion capability and will be towed into position, then the legs lowered onto the seabed and the rig elevated above the sea surface.

Following the BTW drilling activities the Tom Prosser will move to the Whiting platform and then to Seahorse / Tarwhine to begin the plug and abandonment programme of the wells.

This information sheet provides additional information on the Seahorse/Tarwhine Plug and Abandonment (SHA/TWA P&A) programme.

Activity Description

Well Abandonment

The SHA subsea well was plugged with solids in 2014 and the wellbore was circulated to replace its contents with inhibited water.

The TWA chemical and hydraulic cores of the umbilical were also flushed with inhibited seawater prior to severing it at the BTA platform end in 2018.

Once the JUR is positioned over the wellhead, the tree cap will be removed and barrier testing will be completed.

For all wells, a Blowout Preventer (BOP) will be used to prevent the release of hydrocarbons during the plugging of the wells. Tubing and associated instruments and control valves will be removed, and permanent cement plugs / barriers installed to provide multiple physical barriers to prevent the release of any hydrocarbons that remain in the reservoir.

The well casing and conductors will be cut at a depth of ~ 3 m below the mudline and removed and the severed wellhead will be retrieved.

Activity Location

The Seahorse and Tarwhine wells are located 15 and 23 km off the Gippsland coastline respectively, south of Lakes Entrance in a water depth of ~43m.

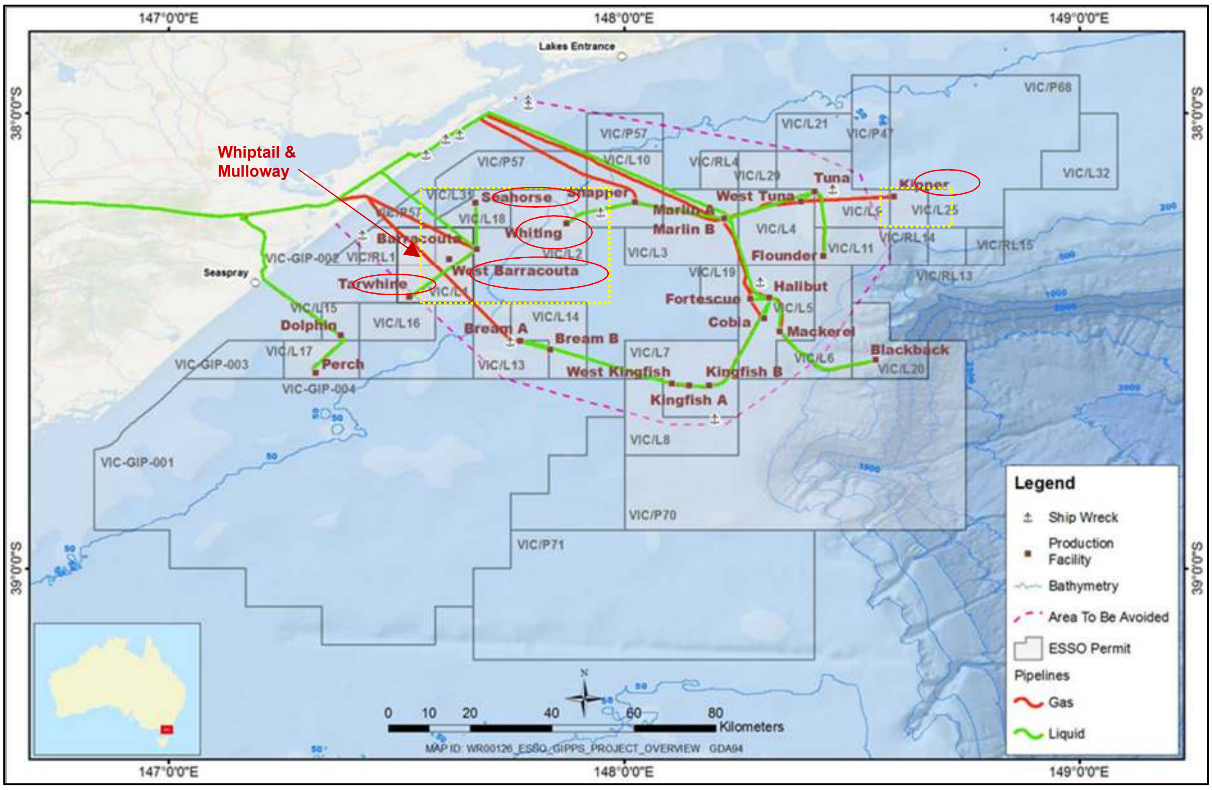
The BTA platform lies in-between the two subsea wells, ~11km from SHA and ~17km from TWA.

SHA activities will occur within the Bass Strait Area To Be Avoided (ATBA) for commercial shipping while TWA lies immediately outside the ATBA. Neither the existing subsea facilities nor the existing routes of the flexible flowline and control umbilical from BTA to SHA/TWA are located within any established or proposed Commonwealth or State Marine Protected Areas, Critical Habitats or Threatened Ecological Communities. It is recognised that the activities will overlap with existing fisheries.

Impacts and Risks

Impacts and risks from the JUR activities have been outlined in the campaign sheet sent out in 2Q19.

Well Locations	Licence Area	Latitude/Longitude	Activity Type	Water depth (m)
Kipper Subsea Facility (KPA-A1, KPA-A3)	VIC/L25	38°10' 53" S 148° 35' 35" E	Drilling	95
West Barracouta Drill Centres (BTW-W1, BTW-W2)	VIC/L1	38° 19' 06" S 147° 36' 53" E	Drilling	46
Tarwhine (TWA-1)	VIC/L1	38° 24' 12" S 147° 31' 46" E	P&A	42
Seahorse (SHA-1)	VIC/L18	38° 11' 42" S 147° 40' 27" E	P&A	42
Whiting platform (WTA) (5 wells)	VIC/L2	38° 14' 29" S 147° 72' 20" E	P&A	54



Esso Bass Strait 2020 Jack Up Rig Campaign Activity Locations as circled

Activity Timing

The following shows an indicative campaign timetable only.

Activities will be conducted 24 hours per day, seven days per week. It is expected to take ~30 days to plug and abandon each well.

The timing of the activity may vary and is contingent on regulatory approvals, joint venture approvals, and weather and rig/vessel schedules.

Indicative Jack Up Rig Campaign Activity Timeline

Petroleum Safety Zones

Seahorse / Tarwhine is located within existing 500m Petroleum Safety Zones (PSZ). The exact location of the drill rig while at location will be communicated to other marine vessels via a Notice to Mariners issued by the Australian Hydrographic Service (AHS) and AUSCOAST warnings issued by AMSA.

Interaction with Commercial Fishing

Seahorse / Tarwhine is located within existing designated Commonwealth and State fisheries that may be used by commercial fishers. The 500m PSZ will be communicated to South East Trawl Fishing Industry Association (SETFIA) as it is a legal requirement that the area should be avoided during the P&A Activities.

Environment Plans

Under the Offshore Petroleum and Greenhouse Gas Storage Act 2006, before any petroleum related activities in Commonwealth waters can commence, an Environment Plan (EP) must be accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

In the course of preparing an EP, Esso Australia must consult with relevant authorities, persons and organisations whose functions, interests or activities may be affected by the proposed activities (i.e. a relevant person) and provide the opportunity for any issues or concerns to be raised.

Separate Environment Plans (EPs) are being developed for these different activities, however, to improve efficiencies for stakeholders, a single consultation process is being undertaken.

The EP is a comprehensive document that describes the existing environment, including stakeholders, and how Esso Australia will undertake the activities to avoid, minimise or manage potential environmental impacts to the "As Low As Reasonable Practicable" standard (ALARP) and meet Esso Australia's acceptability criteria.

Consultation

Esso Australia is committed to engaging with the communities where we operate and helping our stakeholders to understand our business.

Esso has been consulting with stakeholders potentially affected by this campaign through a number of different channels.

While some community consultations have occurred, Esso welcomes the opportunity for more face-to-face meetings and will continue to keep interested stakeholders informed of the proposed activities throughout the planning phase and into operational phase.

We will address questions and consider feedback from stakeholders throughout this campaign.

If you have any specific questions or feedback about any of these activities please contact Esso at consultation@exxonmobil.com or call 03 9261 0788.

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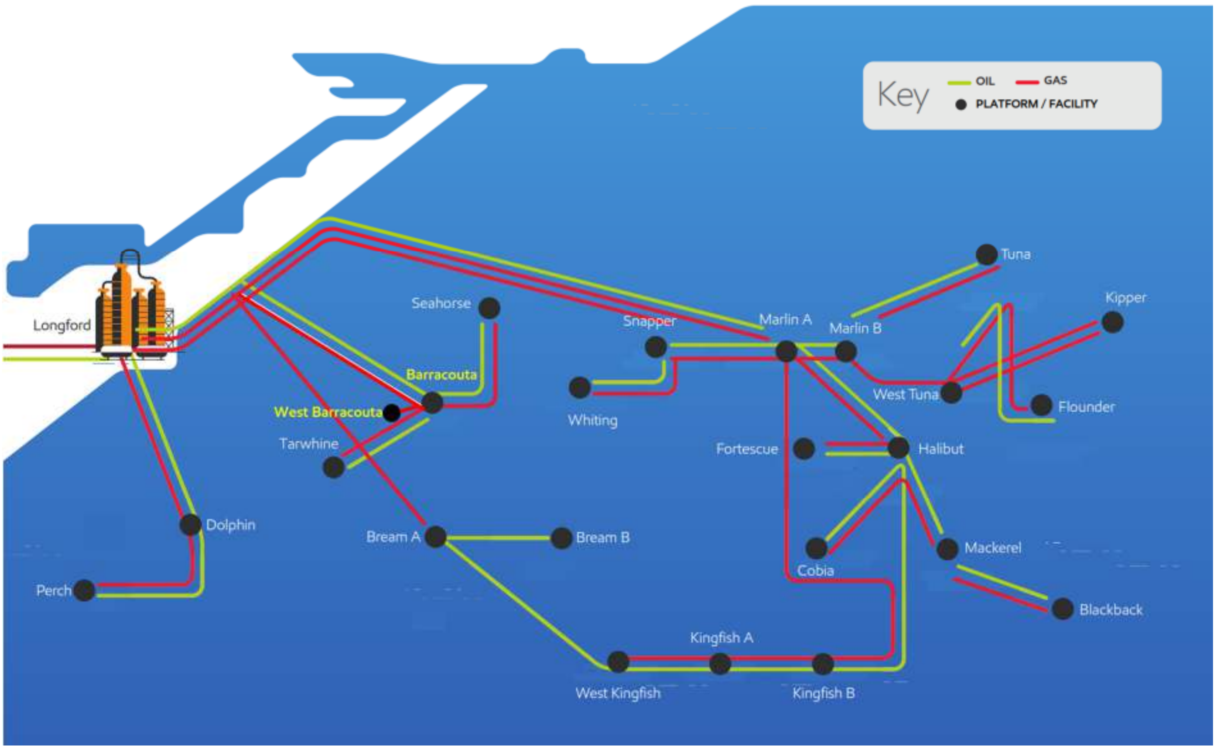
West Barracouta Installation Campaign



Summary

In January 2020 Esso Australia Pty Ltd (Esso) commenced drilling of two subsea gas production wells in the West Barracouta field. The drilling activity is the subject of a separate Environment Plan and was subject to previous consultation.

At the completion of drilling, the two wells will be suspended. The subsequent West Barracouta installation campaign will be covered by a new Environment Plan and the work includes:

- Installation of two subsea trees on the West Barracouta wells.
- Laying a ~ 6km 12" flexible pipeline between the wells and the existing BTA450 pipeline to shore.
- Tie-in to the BTA450 pipeline via a Hot Tap.
- Laying and trenching a control umbilical from the wells to the Barracouta platform.
- Installation of associated subsea equipment including the Pipeline End Manifold (PLEM) and pipeline skid, Umbilical Termination Assembly (UTA) and jumpers and flying leads.
- Pre commissioning.

There will be no seismic activity as part of this campaign.

The activities will be undertaken by a Dive Support Vessel (DSV) the "Seven Eagle". The Seven Eagle operates to international safety and environmental standards. Diving operations from the Seven Eagle will be supported by a Hyperbaric Rescue Vessel stationed outside the West Barracouta Petroleum Safety Zone (PSZ).

The activities will be undertaken in multiple stages and it is expected that the DSV will travel between the onshore supply base and the West Barracouta field between each stage.

The operation of the West Barracouta wells and the pipeline are covered by the Esso Bass Strait Environment Plan.

Subsea 7 Seven Eagle Dive Support Vessel (Image courtesy of Subsea 7)

Activity Location

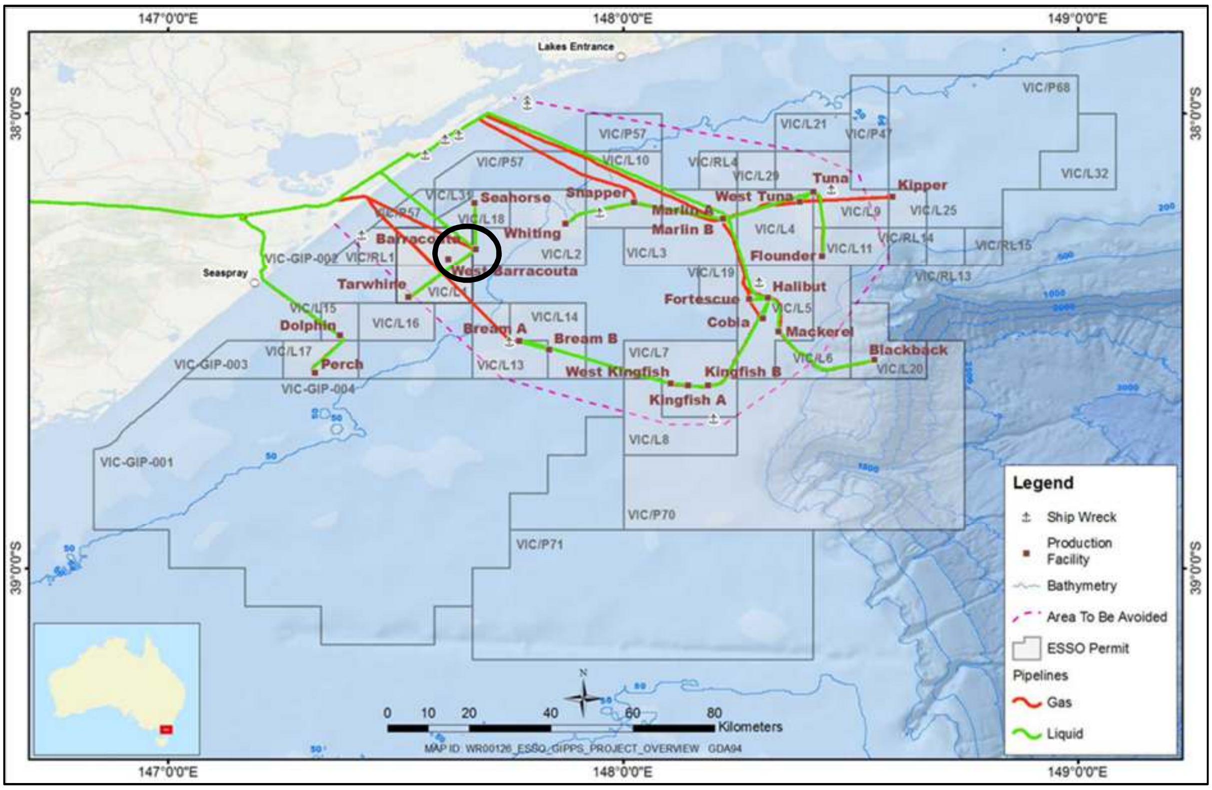
The West Barracouta wells are located ~ 15km off the Gippsland coastline, south of Lakes Entrance in a water depth of ~45m.

The DSV will be operating in the Barracouta platform PSZ when performing the hot tap operations and installing the umbilical to the platform. Activities around the West Barracouta Well Centre are located 6km distant from the platform and within the West Barracouta PSZ.

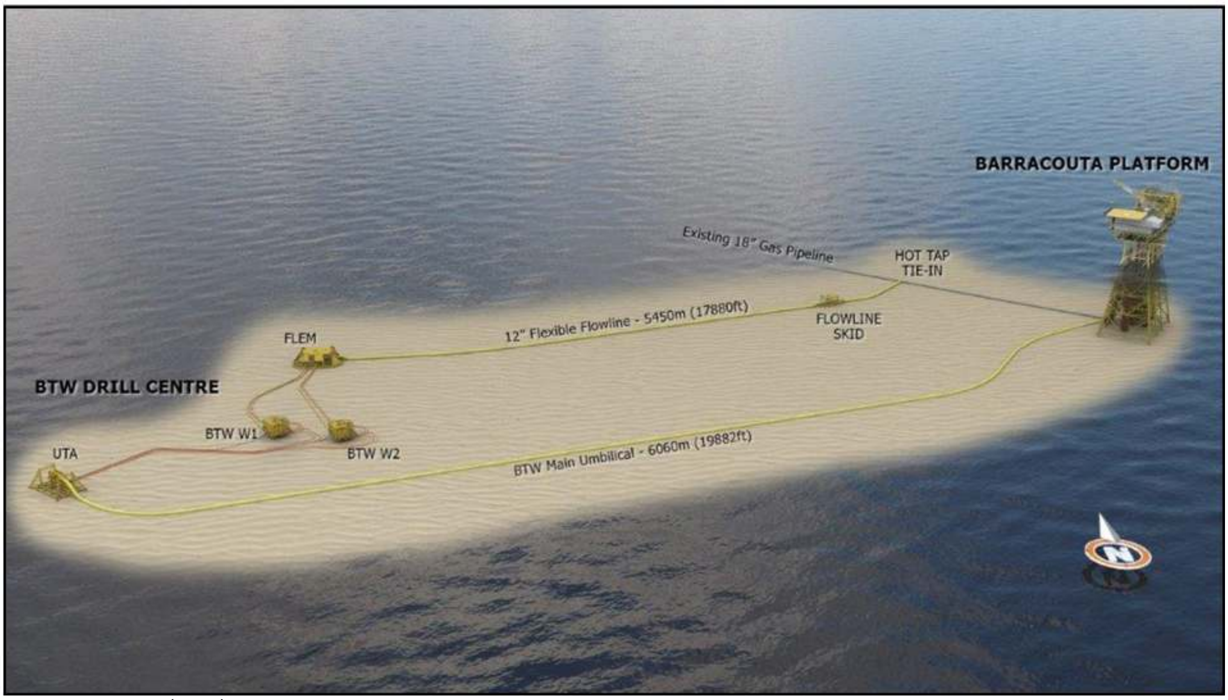
All activities will occur within the Bass Strait Area To Be Avoided for commercial shipping.

Neither the proposed West Barracouta subsea facilities nor the proposed routes of the flexible flowline and control umbilical are located within any established or proposed Commonwealth or State Marine Protected Areas, Critical Habitats or Threatened Ecological Communities. It is recognised that the activities will overlap with existing fisheries.

Locations	Licence Area	Latitude/ Longitude	Activity Type	Water depth (m)
Barracouta Platform	VIC/L2	38° 17.883′ S 147° 40.467′ E	Umbilical tie-in and Hot Tap	~45
West Barracouta Well Centre (BTW-W1, BTW-W2)	VIC/L1	38° 19.100′ S 147° 36.467′ E	Subsea trees, PLEM, UTA installation	~45



West Barracouta Installation Campaign Location



West Barracouta (BTW) Field Development Schematic

Activity Description

Tree installation

The DSV will install the subsea trees (pipework and control valves) that are approximately 5m x 5m x 4m and weigh over 50 tonnes. Once in position the trees and wells will be function tested using a Remotely Operated Vehicle (ROV) to confirm function and integrity.

Pipeline / umbilical installation

The flexible pipeline will be installed by the Seven Eagle, filled with Mono-ethylene Glycol (MEG) and water. The lay will be initiated from the PLEM and then laid along the seafloor towards the BTA450 hot tap tie-in location.

Connections between pipeline sections will be made on the back deck of the Seven Eagle. Stabilising concrete mattresses will be installed over the pipeline adjacent to the tie-in location, mid-line connections and at any crossings to ensure stability.

The Seven Eagle will install the umbilical through a J Tube onto the Barracouta platform. The umbilical will then be laid towards the Barracouta Well Centre near the pipeline. The umbilical will be trenched using either a water-jetting or mechanical trencher vehicle to mitigate the risk of impact and snagging from fishing vessels.

Hot tap tie-in

A hot tap tie-in enables a new connection to be safely made to an existing / operating piping. This means that a pipe, such as the BTA450 which transports gas to Longford Plants for distribution to consumers, can remain in service whilst modifications are being made to it. The hot tap installation will involve divers, a hot tap machine and support from an ROV.

Pre-commissioning

Once all new infrastructure is tied in it will be leak tested using dyed MEG to confirm the integrity of the pipeline and trees.

Activity Timing

The earliest date of commencement of the campaign is October 2020.

Activities will be conducted 24 hours per day, seven days per week. It is expected to take approximately 6 weeks to complete the activities, subject to weather conditions.

Impacts and Risks

Provided in the tables attached, are the key potential impacts / risks relating to the Installation Campaign. These are provided to assist stakeholders in making an informed assessment on possible impacts to their activities, functions or interests in the area.

Environment Plans

Under the Offshore Petroleum and Greenhouse Gas Storage Act 2006, before any petroleum related activities in Commonwealth waters can commence, an Environment Plan must be accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

In the course of preparing an Environment Plan, Esso must consult with relevant authorities, persons and organisations whose functions, interests or activities may be affected by the proposed activities (i.e. a relevant person) and provide the opportunity for any issues or concerns to be raised.

This consultation is specifically for the West Barracouta Installation Environment Plan.

The Environment Plan is a comprehensive document that describes the existing environment, including stakeholders, and how Esso will undertake the activities to avoid, minimise or manage potential environmental impacts to the "As Low As Reasonable Practicable" standard (ALARP) and meet Esso's acceptability criteria.

Oil Pollution Emergency Plan (OPEP)

Under Commonwealth environment legislation, Esso must demonstrate and document oil spill response arrangements. The OPEP forms part of an Environment Plan submission and demonstrates our capability to respond in the unlikely event of an oil spill.

Esso is a member of the Australian Marine Oil Spill Centre (AMOSC), a co-operative national oil spill response organisation, which provides access to additional oil spill response resources if required.

Esso's OPEP interfaces with national, state and industry response plans prepared and implemented by the Australian Government via AMSA (NATPLAN), the Victorian Government (Maritime Emergencies (non-search and rescue) Plan), the Tasmanian Government (TASPLAN), the NSW Government (NSW Marine Oil and Chemical Spill Contingency Plan) and the Australian Oil industry's Australian Marine Oil Spill Plan (AMOSPLAN) administered by AMOSC.

The OPEP defines spill response options which may be applied to a spill event. The selected spill response option(s) would depend upon the size and type of spill; environmental sensitivities within the spill path; prevailing weather conditions; access restrictions and available resources. In all instances, a Net Environmental Benefits Assessment (NEBA) is undertaken, in consultation with relevant government agencies, to consider the advantages and disadvantages of the available spill response options.

Consultation

Esso is committed to engaging with the communities where we operate and helping our stakeholders to understand our business.

Esso has been consulting with stakeholders potentially affected by this campaign through a number of different channels.

While some community consultations have occurred, Esso welcomes the opportunity for more face-to-face meetings and will continue to keep interested stakeholders informed of the proposed activities throughout the planning phase and into operational phase.

We will address questions and consider feedback from stakeholders throughout this campaign.

If you have any specific questions or feedback about any of these activities please contact Esso at consultation@exxonmobil.com or call 03 9261 0260. If you require any of this consultation to be kept confidential or if you would like to be removed from our consultation list please advise us.

Aspect of Activities	Potential Consequence	Impact/Risk Reduction & Mitigation Measures
Physical interaction with other marine users	Disruption to other marine users such as commercial fishing and shipping	Activity occurs within Bass Strait Area To Be Avoided. Existing PSZs shown on navigation charts. Communicate commencement of installation activities to relevant stakeholders via Notice to Mariners and via AMSA JRCC Installation activity outside of PSZs of relatively short duration. Umbilical is trenched. Pipeline tie-in and West Barracouta subsea facilities located within PSZs.
Vessel planned discharges to the marine environment - Sewage and food waste - Treated bilge and deck wash	Temporary and localised reduction in water quality Temporary change to predator / prey dynamics	Routine discharges and vessel waste treatment systems will meet MARPOL requirements. Food-scraps will be macerated prior to discharge. Discharged bilge water will have less than 15 ppm oil in water content. Any chemicals planned for discharge undergo an environmental assessment to confirm suitability for discharge prior to use.
Vessel sound emissions	Localised sound emissions Temporary disturbance / displacement of sound sensitive fauna around active vessels	Vessels will maintain 'caution' and 'no approach' zones consistent with EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans.
Vessel air emissions	Temporary and localised reduction in air quality	Air emissions from marine engines will meet MARPOL requirements. Low sulphur content fuel will be used.
Seabed disturbance	Localised and temporary increase in turbidity near the seabed. Localised disturbance / damage to benthic habitat and communities.	Seabed survey along flowline and umbilical routes completed to identify obstacles including benthic features. Procedures in place for activities with the potential to disturb the seabed such as pipeline / umbilical laydown, excavation for Hot Tap, umbilical trenching, concrete mattress installation. Area affected by trenching expected to be rapidly filled after laying of umbilical. Area affected by installation activities expected to be rapidly recolonised. No vessel anchoring except in an emergency. Area is a mobile sandy bottom with no sensitive seabed features.

Aspect of Activities	Potential Consequence	Impact/Risk Reduction & Mitigation Measures
Planned subsea discharges from preparatory cleaning and function / leak testing	Localised and temporary reduction in water quality	Chemicals planned for discharge undergo environmental assessment to confirm suitability prior to use. Discharge will rapidly disperse in dynamic seabed and marine environment.
Unplanned vessel interaction with marine fauna (vessel strike)	Injury or death of marine fauna	Installation vessel will travel at low speed during installation activities. Vessels will maintain 'caution' and 'no approach' zones consistent with EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans.
Unplanned introduction of invasive marine species (IMS) from vessel ballast water / biofouling	Displacement of native species and habitat domination	Vessels will have a Ballast Water Management Plan and Certificate, and a Ballast Water Record System. Vessel clearance will be obtained to enter Australian territory through DAWR pre-arrival reporting system (MARS). Vessels will comply with Australian Ballast Water Management requirements. A Biofouling Risk Assessment will be completed to confirm a low risk of IMS introduction. Immersible, retrievable equipment will be cleaned prior to commencement of activity.
Accidental release of materials and waste	Temporary and localised reduction in water quality. Injury / death of marine fauna. Localised disturbance / damage to benthic habitat and communities.	Waste handling, storage and disposal will meet MARPOL requirements. Chemicals and oils will be stored with spill protection in place. Overboarding procedures will be developed and implemented including ROV surveillance. Lifting equipment is certified and routinely maintained and inspected. Bulk transfer equipment is certified and routinely maintained and inspected. Vessel cargo securing manual is adhered to. Vessels will comply with approved SOPEP, including maintaining spill kits, emergency response procedures and conducting spill response exercises.

Aspect of Activities	Potential Consequence	Impact/Risk Reduction & Mitigation Measures
Accidental release of fuel (vessel collision)	Reduction in water quality Injury / death of marine fauna Pollution of shorelines such as sandy beaches Disruption to other marine users such as commercial fisheries	Commencement of activity will be communicated to other marine users via Notice to Mariners and via AMSA JRCC. DSV will hold Dynamic Positioning (DP) System II Notation and watchkeeper-in-charge will hold DP Certification. DSV will only travel at slow speeds during installation activities. Activity occurs within Bass Strait Area To Be Avoided. Main installation work will take place within the existing PSZs shown on navigation charts. Installation activity outside of PSZs of relatively short duration. Platform approach procedures will be adhered to. Activity specific vessel operating procedures will be developed and implemented. Vessels will comply with their approved Shipboard Marine Pollution Emergency Plan (SMPEP) including maintaining spill kits, emergency response procedures and conducting oil spill response exercises Esso has a comprehensive and approved Oil Pollution Emergency Plan (OPEP) which will be used in the event of a spill. No offshore bunkering will take place.
Accidental release of gas from pipeline	Temporary and localised change in water and air quality	NOPSEMA accepted Dive Support Vessel Safety Case and Pipeline Safety Case Installation / Hot Tap procedures will be developed and implemented including ROV surveillance. Lifting equipment is certified and routinely maintained and inspected. Pipeline emergency shutdown / isolation facilities

Category: 1 - Commonwealth Department or Agency

ID: 129 Organisation: Parks Australia

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
18-Mar-21	3752	To Stakeholder	Email	EAPL sent email to stakeholder advising of an oil spill field exercise in Corner Inlet on 23 March 2021.	No objections, claims or issues raised	N/A

Category: 2 - Victorian State Department or Agency

ID: 126 Organisation: Department of Jobs, Precincts and Regions - Agriculture & Biosecurity services

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
16-Dec-20	3719	From Stakeholder	Email	Email from stakeholder advising EAPL they will review IMS reports for vessels being used on the West Barracouta project.	No objections, claims or issues raised	EAPL provided stakeholder with IMS inspection report for the Seven Eagle for review.
13-Jan-21	3720	From Stakeholder	Email	Stakeholder advised that based on the recent dry-docking, application of antifouling and quick departure from Singapore following the clean they are comfortable that the Seven Eagle does not present an unacceptable biosecurity risk to Victoria.	No objections, claims or issues raised	EAPL advised project team of IMS report findings.

ID: 131 Organisation: Department of Transport (Victorian State Control Agency - formerly DJPR / DEDJTR)

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
11-Feb-21	3740	To Stakeholder	Phone	EAPL called stakeholder to advise of planned BBMT and C&R exercise.	No objections, claims or issues raised	Stakeholder asked about possibility of NRT participation.

Category: 4 & 5 - Other Relevant Persons or Organisations

ID: 83 Organisation: Corner Inlet Fisheries Habitat Association

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
18-Mar-21	3751	To Stakeholder	Email	EAPL sent email to stakeholder advising of an oil spill field exercise in Corner Inlet on 23 March 2021.	No objections, claims or issues raised	N/A

ID: 15 Organisation: Gippsland Ports

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
16-Mar-21	3753	To Stakeholder	Email	EAPL requesting stakeholder to issue a "Notice to Mariners" ahead of an Oil Spill Response exercise on 23 March 2021.	No objections, claims or issues raised	N/A

ID: 123 Organisation: Panama II Octopus fishing vessel

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
12-Jan-21	3715	To Stakeholder	SMS	Providing stakeholder with updated information relating West Barracouta work location and timing	No objections, claims or issues raised	N/A
13-Jan-21	3716	To Stakeholder	Phone	Follow up phone call with stakeholder to check that message from previous day had been received. No answer, voicemail left.	No objections, claims or issues raised	N/A
13-Jan-21	3717	From Stakeholder	Phone	Stakeholder returned call and confirmed that he had received my text message with information relating to West Barracouta and that he would not be in the area. We briefly discussed that the timing was currently planned for 24/25 January but that this could change if government regulations regarding COVID restrictions changed and obviously if sea conditions did not permit. Stakeholder said he was well aware of the likelihood of changes. He also advised that he would send me a list of where his current strings were laid so that the vessels were aware. I agreed to pass this on to our vessels team. We also discussed how close Stakeholder lays his lines to our pipelines - he advised that sometimes he lays over the top of them but usually not closer than 0.2 of a mile. I advised that we had some ROV work planned for February starting 1st for about three weeks. The actual locations and timing yet to be confirmed and that once I had that I would let him know. He said given it was an ROV it was unlikely to impact him as it does go on the seabed. I did advise him though that on this ocassion we were likely be taking samples from the seabed so could impact. Once I have more information I will share it with him. He thanked me for the advice.	No objections, claims or issues raised in relation to the Barracouta work. ACTION: Provide stakeholder with information regarding ROV survey work to test if any impacts	N/A
21-Jan-21	3724	To Stakeholder	SMS	EAPL sent stakeholder SMS advising the following: Seven Eagle (call sign ELUB4) will commence work around the West Barracouta wells on Jan 24. Work involves pipeline installation, associated construction & diving activities in & between the West Barracouta PSZ & the Barracouta Platform PSZ. A box around this work is: SW 38° 19' 52"S 147° 36'42"E NW 38° 18'50"S 147° 36'02"E NE 38° 16' 59"S 147° 40'36"E SE 38° 18'01"S 147° 41'17"E	No objections, claims or issues raised	Stakeholder advised EAPL of locations of surface buoys.
29-Jan-21	3725	To Stakeholder	SMS	7 Eagle vessel advising has arrived in the area and confirming that stakeholder's pot locations are plotted on vessel's maps.	No objections, claims or issues raised	N/A
05-Feb-21	3726	To Stakeholder	SMS	Advice to stakeholder that 7 Eagle vessel is moving off site in next 24 hours but will be back in about a week. Vessel will advise when moving. Requested update from stakeholder on pot locations so that we can pass on to the vessel.	No objections, claims or issues raised	Stakeholder advised he has moved 3 lines but they are in same area so shouldn't be a problem
05-Feb-21	3727	To Stakeholder	SMS	SMS to Stakeholder from Vessel advising vessel was departing West Barrouta well site within next 24 hours to return to Melbourne and would be back approximately 11 Feb.	No objections, claims or issues raised	N/A
10-Feb-21	3728	To Stakeholder	SMS	Advice to stakeholder that Seven Eagle vessel will be heading back to West Barracouta wells next day; requested coordinates of gear locations so that the vessel can load to its navigation system.	No objections, claims or issues raised	Stakeholder provided coordinates of gear location and advised if more information needed to let him know
10-Feb-21	3729	From Stakeholder	SMS	Text message received from stakeholder advising he won't be moving any gear into the area until work completed	No objections, claims or issues raised	Acknowledged text message received
15-Feb-21	3730	From Stakeholder	SMS	Stakeholder seeking update on status of work at West Barracouta	ISSUE: work status query MERIT: provided update to which stakeholder responded no issues	Advised Stakeholder that work is expected to be complete around March 7th with divers expected in the water approximately February 27th Stakeholder responded No worries thanks for that
02-Mar-21	3736	To Stakeholder	SMS	Text message to stakeholder advising the Seven Eagle is currently in Melbourne and expecting to return to the Barracouta site on Thursday. This trip will involve divers for 2-3 weeks and you will see an additional vessel, the Dryden, for dive support.	No objections, claims or issues raised.	Stakeholder acknowledged message
16-Mar-21	3741	To Stakeholder	SMS	Text message to Stakeholder - 'Good afternoon the Seven Eagle has completed its work and is departing the Barracouta and West Barracouta area today'	ISSUE: will there be any other works or is it okay to deploy lines in the area MERIT: All work going forward will be within the PSZ's including another vessel	Stakeholder acknowledged advice and asked if okay to deploy lines. Upon our response, stakeholder advised no issues
16-Mar-21	3742	To Stakeholder	SMS	Text message to stakeholder advising that we will be installing a noise monitoring device outside the PSZs	No issues or concerns	No issues
17-Mar-21	3743	To Stakeholder	Email	Email to stakeholder confirming noise monitoring devices will be installed - provided timing and locations and a brief description of the activity.	No issues, concerns raised	N/A

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
ID: 37		**Organisation:**	**South East Trawl Fishing Industry Association**			
17-Dec-20	3712	To Stakeholder	Email	EAPL confirming West Barracouta installation SMS scheduled for 1/1/21	No objections, claims or issues raised	
02-Jan-21	3713	To Stakeholder	SMS	Dear Eastern Fleet, Esso will work around the West Barracouta wells from the Seven Eagle (call sign ELUB4) between 15 Jan & 20 Feb 2021. Work involves pipeline installation, construction & divin in & between the West Barracouta PSZ & the Barracouta platform PSZ. A box around this work is: SW 38° 19′ 52″S 147° 36′42 NW 38° 18′50″S 147° 36′02 NE 38° 16′ 59″S 147° 40′36 SE 38° 18′01″S 147° 41′17	No objections, claims or issues raised	
05-Jan-21	3714	To Stakeholder	Email	EAPL requested contact to be added to SMS distribution list.	No objections, claims or issues raised	Stakeholder confirmed contact has been added to distribution list.
21-Jan-21	3721	To Stakeholder	Email	EAPL requested SMS be sent to fisheries stakeholders: Seven Eagle (call sign ELUB4) will commence work around the West Barracouta wells on Jan 24. Work involves pipeline installation, associated construction & diving activities in & between the West Barracouta PSZ & the Barracouta Platform PSZ. A box around this work is: SW 38° 19′ 52″S 147° 36′42″E NW 38° 18′50″S 147° 36′02″E NE 38° 16′ 59″S 147° 40′36″E SE 38° 18′01″S 147° 41′17″E	No objections, claims or issues raised	Stakeholder asked what is requested?
22-Jan-21	3722	To Stakeholder	Phone	EAPL rang stakeholder and discussed the West Barracouta SMS and advised of upcoming ROV pipeline work.	No objections, claims or issues raised	N/A
22-Jan-21	3723	From Stakeholder	SMS	Dear Eastern Oil/Gas Fleet, Seven Eagle (call sign ELUB4) will commence work around the West Barracouta wells on Jan 24. Work involves pipeline installation, associated construction & diving activities in & between the West Barracouta PSZ & the Barracouta Platform PSZ. A box around this work is: SW 38° 19′ 52″S 147° 36′42″E NW 38° 18′50″S 147° 36′02″E NE 38° 16′ 59″S 147° 40′36″E SE 38° 18′01″S 147° 41′17″E Please make contact if you are fishing in that area.	No objections, claims or issues raised	N/A
25-Jan-21	3731	To Stakeholder	SMS	EAPL requested stakeholder to send SMS to fisheries: The Seven Eagle (call sign ELUB4) has been delayed & will now commence work around the West Barracouta wells on Jan 28. Work involves pipeline installation, associated construction & diving activities in & between the West Barracouta PSZ & the Barracouta Platform PSZ.	No objections, claims or issues raised	SMS sent to fisheries.
05-Feb-21	3732	To Stakeholder	SMS	EAPL requested stakeholder to send SMS to fisheries: The 7 Eagle will be departing the West Barracouta wells site in the next 24 hours to return to Melbourne. We expect the vessel to be back at the West Barracouta PSZ approx. 11 February. Vessel will advise when returning.	No objections, claims or issues raised	SMS sent to fisheries.
08-Feb-21	3733	From Stakeholder	Email	Stakeholder advising EAPL of increase of cost of SMS service.	No objections, claims or issues raised	Acceptance of increased rate.
10-Feb-21	3734	To Stakeholder	SMS	EAPL requested stakeholder to send SMS to fisheries: EAPL advises that the Seven Eagle is expected back at the West Barracouta well sites from 12 Jan for up to 2 weeks. Work continues involving the pipeline installation in & between the West Barracouta PSZ & the Barracouta Platform PSZ.	No objections, claims or issues raised	SMS sent to fisheries.
26-Feb-21	3735	To Stakeholder	Phone	General catchup with Stakeholder to discuss up and coming activities for EAPL. We discussed: 1. West Barracouta installation works - noting that slightly behind schedule but we expected the Seven Eagle to return to shore early next week, essentially to just pick up the divers and then back out again Thursday /Friday of same week. We will communicate when this is happening and ask Stakeholder to send out an SMS to his distribution list to let everyone know as an added safety precaution. 2. West Barracouta pipeline is located at the 400m mark with in the PSZ - will ask Stakeholder to advise his stakeholders so that they are aware that it is wihtin the PSZ and as a reminder to folks to stay out of it. 3. Noise Monitoring - we will be conducting some noise monitoring activities involving putting some equipment in the water; essentially all will be within the PSZs but some will be outside. Once we know detials (expected next week) we will reach out to him to see if we can identify anyone in particular it may impact and also will ask him to notify stakeholders to ensure awareness 4. Oil Spill Deployment Response exercise - we will be conducting an exercise on 23rd March at Corner Inlet; we do not expect it will immpact anyone, but would like to advise people so that they know it is just an exercise and not to be concerned 5. Discussed potential face to face meeting in Lakes Entrance on neither 15th March or 25th March.	No objections, claims or issues raised	N/A
28-Feb-21	3737	To Stakeholder	Email	Email requesting text advice to fleet be sent "The 7 Eagle will be departing the West Barracouta wells site in the next 24 hours to return to Melbourne. We expect the vessel to be back at the West Barracouta PSZ approx. 4/5 March. Vessel will advise when returning."	No objections or issues raised	Text message to fleet sent

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
02-Mar-21	3738	To Stakeholder	Email	Email requesting text advice to the fleet be sent "EAPL advises that the Seven Eagle is expected back at the West Barracouta wells site on Thursday 04 March. Work continues involving the pipeline installation in and between the West Barracouta PSZ & the Barracouta Platform PSZ. This trip will involve divers for 2-3 weeks and you will see an additional vessel, the Dryden, for dive support."	No objections or issues raised	Text message sent to fleet
16-Mar-21	3744	To Stakeholder	SMS	SMS sent to Eastern Fishing Fleet "Esso would like to advise that the Seven Eagle has completed its work and is currently demobilising from its current location at West Barracouta."	No objections, claims or issues raised	N/A
18-Mar-21	3745	To Stakeholder	Phone	EAPL called stakeholder to discuss the planned noise monitoring at Barracouta and Flounder.	No objections, claims or issues raised	N/A
18-Mar-21	3746	To Stakeholder	Email	EAPL sent stakeholder noise monitoring information including locations and photos	No objections, claims or issues raised	Stakeholder asked EAPL for additional info to send to Eastern Fishing Fleet
18-Mar-21	3747		SMS	EAPL requested stakeholder send SMS to Eastern Fishing Fleet: Esso will be conducting an oil spill field exercise in Corner Inlet on 23 March – it's expected to take 4-5 hours. An inflatable boom will be deployed from the DOF – Skandi Feisten and towed into formation by the MV Investigator. This exercise is only testing equipment deployment and its operations and there is no plan to spill oil into the water.	No objections, claims or issues raised	N/A
22-Mar-21	3748	To Stakeholder	SMS	EAPL requested stakeholder send out SMS to Eastern Fishing Fleet: Dear Eastern Fishers, Esso plan to place 4 noise monitors to measure noise levels from platform and vessel operations on the seafloor around Barracoutta platform at the following locations (link to table Facebook, also show image). One device is located outside the PSZ (38° 19.57643' S 147° 42.66622' E) and is not fisher-overable. The monitors will be deployed approx 26 Mar to 9 April (subject to change) and updates will follow.	No objections, claims or issues raised	N/A

ID: 38 Organisation: South Gippsland Shire Council

Date	ID	To / From	Method	Consultation	Assessment of Merit	Response
18-Mar-21	3749	To Stakeholder	Email	EAPL sent email to stakeholder advising of an oil spill field exercise in Corner Inlet on 23 March 2021.	No objections, claims or issues raised	N/A
19-Mar-21	3750	From Stakeholder	Phone	Stakeholder left a voice message for EAPL requesting a call back to discuss the OSR exercise.	No objections, claims or issues raised	EAPL returned stakeholders call and after a discussion about the exercise, there was no further questions or follow up.