BLACKTIP OFFSHORE DRILLING ENVIRONMENT PLAN

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APPENDICES

Appendix A : EPBC Approval

Appendix B : Environmental Values and Sensitivities

Appendix C : Eni HSE Statement

ACRONYMS AND DEFINITIONS USED IN THIS DOCUMENT

Nomenclature	Definition
°C	degrees Celsius
µ	micro
AHO	Australian Hydrographic Office
ALARP	as low as reasonably practicable
AMOSC	Australia Marine Oil Spill Centre
AMSA	Australian Maritime Safety Authority
APPEA	Australian Petroleum Production and Exploration Association
Bbl	barrel
Bcf	billion cubic feet
BOP	blowout preventer
BTEX	benzene, ethylbenzene, toluene and xylene
BWMS	ballast water management system
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CH_4	methane
CMT	Crisis Management Team
CO_2	carbon dioxide
DAWE	Department of Agriculture, Water and the Environment
DCCEEW	Department of Climate Change, Energy, the Environment and Water (previously DAWE)
DMIRS	Western Australia Department of Mines, Industry Regulation and Safety
DNP	Director of National Parks
DoEE	Department of the Environment and Energy (now Department of Agriculture, Water and the Environment)
DoT	Department of Transport
DPIRD	Western Australia Department of Primary Industry, Resources and Development
EPBC	environmental protection and biodiversity conservation
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
EMBA	Environment that may be affected
Eni	Eni Australia BV
EP	Environment Plan
EPO	environmental performance outcome
EPS	environmental performance standard
ESD	ecological sustainable development
GEP	gas export pipeline
GHG	greenhouse gases
Gsm^3	109 standard cubic metres
H_2S	hydrogen sulphide
HOCNF	harmonised offshore chemical notification format
HQ	hazard quotient

Nomenclature	Definition
hr	hour(s)
HSE	health, safety and environment
HSE IMS	health, safety and environment integrated management system
Hz	hertz
IMO	International Maritime Organisation
IMS	invasive marine species
IMT	Incident Management Team
JBG	Joseph Bonaparte Gulf
kHz	kilohertz
kg	kilogram(s)
km	kilometre(s)
L	litre(s)
m	metre(s)
MARPOL	International Convention for the Prevention of Pollution from Ships
MBES	multibeam echo sounder
mg	milligram(s)
MDO	marine diesel oil
min	minute(s)
mL	millilitre(s)
mm	millimetre(s)
MMscf	million standard cubic feet
MMSI	maritime mobile service identity
MNES	matters of national environmental significance
MoC	management of change
MODU	mobile offshore drilling unit
N_2O	nitrous oxide
NEBA	net environmental benefit analysis
nm	nautical mile(s)
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NORMS	naturally occurring radioactive materials
NPF	Northern Prawn Fishery
NT	Northern Territory
NT DPIR	Northern Territory Department of Primary Industry and Resources
OCNS	Offshore Chemical Notification Scheme
ODS	ozone-depleting substances
OIW	oil in water
OPGGS(E) Regulations	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
OSPAR	oil spill prevention, administration and response
OPEP	Offshore Pollution Emergency Plan
PMST	Protected Matters Search Tool

Nomenclature	Definition
PSZ	petroleum safety zone
PTS	permanent threshold shift
ppb	parts per billion
PW	produced water
ROV	remotely operated vehicle
SEWPaC	Department of Sustainability, Environment, Water, Population and Communities
SEL	sound exposure level
SO_x	sulfur oxides
SPL	sound pressure level
SPM	single point mooring
SSS	side scan sonar
TTS	temporary threshold shift
TSS	total suspended sediment
yr	year(s)
WA	Western Australia
WAFIC	Western Australian Fishing Industry Council
WBMs	water-based muds
WHP	wellhead platform
WOMP	Well Operations Management Plan
YGP	Yelcherr Gas Plant
ZPI	zone of potential impact

1 INTRODUCTION

1.1 Project Overview and Background

Eni Australia BV (Eni) operates the Blacktip facilities, approximately 300 km west-south-west of Darwin, located in Lease Area WA-33-L, within Commonwealth waters in the Joseph Bonaparte Gulf (JBG) (Figure 3-1). The facilities consist of a wellhead platform (WHP), two producing wells, flowlines and a subsea gas export pipeline (WA-15-PL, NT/PL2) bringing whole well stream fluid (as in, gas, condensate and produced water) to the Yelcherr Gas Plant (YGP) near Wadeye in the Northern Territory (NT). Additionally, stabilised condensate is stored on site at the YGP before being exported via a subsea 12-inch condensate export pipeline (NT/PL3) to a single point mooring (SPM), located approximately 7 km offshore in Commonwealth waters, for loading to tankers and subsequent transport to market. The proportion of the condensate export pipeline in Commonwealth waters is less than 1 km.

The Blacktip field comprises 12 stacked reservoirs in four separate geological formations at depths ranging from 1000 to 3100 m true vertical depth subsea. Development was initially focused on production from the Keyling and Treachery Formation reservoirs (at 2000 to 2800 m and 3100 m true vertical depth subsea, respectively). The first phase of subsurface development consists of two wells (P1 and P2). A second phase of development (wells P3 and P4) is planned to assist in meeting the ramping contract.

While the ongoing operations of the Blacktip facilities are within the scope of the Blacktip Operations EP (000036_DV_PR.HSE.0677.0000), this standalone drilling EP covers the P3 and P4 development drilling scopes and possible workover on the P1 development well. The schedule for these activities will be subject to jack-up mobile offshore drilling unit (MODU) availability; however, is anticipated to take place in 2022/23. Once the wells are hooked up and commissioned, the fluids will flow to the Blacktip WHP and to the onshore YGP as per the processes detailed within the Blacktip Operations EP (000036_DV_PR.HSE.0677.000).

This EP has been prepared as part of the requirements under the Environment Regulations, as administered by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

The location of the development drilling and P1 workover activities are shown in Figure 3-1.

1.2 Purpose

This Environment Plan (EP) has been prepared for submission to and acceptance by NOPSEMA in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (OPGGS(E) Regulations).

The purpose of this EP is to identify the potential environmental risks and impacts that may result from the proposed Petroleum Activities Program. Management measures have been identified to reduce the environmental risks and impacts to an acceptable level. Activity-specific performance outcomes, standards and measurement criteria have been developed to reduce impacts and risks to 'as low as reasonably practicable' (ALARP).

The Operational Area for this EP is located within Commonwealth waters, where the Petroleum Activities Program will be undertaken. The extent of the Operational Area is defined in Section 3.3.1. This EP only addresses the potential environmental impacts from planned petroleum activities within the Operational Area and any potential unplanned events that originate from within the Operational Area.

1.3 Environment Plan Summary

An EP summary has been prepared from material provided in this EP (Table 1-1), as required by Regulation 11(4).

Table 1-1: Environment Plan summary

EP Summary material requirement	Relevant section of this EP containing EP Summary material
The location of the activity	Section 3.3
A description of the receiving environment	Section 4
A description of the activity	Section 3
Details of the environmental impacts and risks	Sections 7 and 8
The control measures for the activity	Sections 7 and 8
The arrangements for ongoing monitoring of the titleholder's environmental performance	Section 10
Response arrangements in the Oil Pollution Emergency Plan (OPEP)	Section 12 Blacktip Operations OPEP (000036_DV_PR.HSE.0388.000_Rev14)
Consultation already undertaken and plans for ongoing consultation	Section 5
Details of the titleholder's nominated liaison person for the activity	Section 1.4.1

1.4 Details of Titleholder

Eni Australia BV (Eni) is the Permit Holder for Production Licence WA-33-L. The Blacktip Field and associated offshore infrastructure as well as YGP are 100% owned and operated by Eni. Eni is a subsidiary of Eni S.p.A., one of the world's major integrated energy companies, operating in 85 countries around the world, with headquarters in Rome, Italy.

Eni's Australian head office is in Perth (address below), with a secondary office in Darwin. As well as the Blacktip Operations, Eni has previously operated the Woollybutt Oil Field off the coast of Western Australia (WA) and has ongoing offshore exploration and joint venture production interests.

Eni's contact details are:

Eni Australia BV
226 Adelaide Terrace
Perth WA 6000
Telephone: (08) 9320 1111

Eni's Australian Business Number is 18 092 812 023 and Australian Company Number is 092 812 023. Eni Australia Ltd is an affiliate of Eni Australia BV.

1.4.1 Details of the Liaison Person

The nominated contact person for this EP is:

Joe Covic
Environment Advisor
Eni Australia Ltd
Tel: (08) 9320 1111
Email: info@eniaustralia.com.au

1.4.2 Notifying of Change

Should the titleholder, titleholder's nominated liaison person or contact details for the titleholder or liaison person change, NOPSEMA will be notified in writing of the change and provided with the new details.

2 ENVIRONMENTAL LEGISLATION

This section describes the key Commonwealth legislation, International agreements and industry guidelines that apply to the Petroleum Activities Program.

2.1 Key Commonwealth Legislation

The Petroleum Activities Program will be conducted in Commonwealth waters and is therefore subject to Commonwealth legislation. Key Commonwealth environmental legislation applicable to petroleum operations in Commonwealth waters are detailed in the next subsections.

2.1.1 Offshore Petroleum and Greenhouse Gas Storage Act 2006

The *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGS Act) is the principal legislation managing petroleum activities in Australian Commonwealth waters. The objective of the OPGGS Act is to ensure offshore petroleum operations are performed in a way that is consistent with the principles of ecologically sustainable development.

The OPGGS Act and supporting regulations address all licencing, health, safety environmental and royalty issues for offshore petroleum and gas exploration and production operations in Commonwealth waters.

Specifically, the OPGGS(E) Regulations prescribe the requirements for managing environmental impacts associated with petroleum activities, and require proponents to submit an EP to the Regulatory Authority for approval prior to commencing activities. As part of these documents, the proponent is required to assess the risks associated with the activities and demonstrate the proposed mitigation measures reduce these risks to ALARP and acceptable levels.

All infrastructure brought on to the title under this EP will be decommissioned in accordance with relevant legislative requirements, including those under Section 572 (3) of the OPGGS Act. Eni will ensure through monitoring, and maintenance (detailed in the Blacktip Operations EP) if required, that property can be removed when required, and the ongoing presence of the property is not causing unacceptable environmental impacts or risks. A revision, when required to the Blacktip Operations EP (000036_DV_PR.HSE.0677.000) will include further details on Eni's commitments under Section 572 (3) of the OPGGS Act for the Blacktip field.

Table 2-1 includes the pertinent sections of the OPGGS(E) Regulations and details the sections of the EP which ensure compliance with the requirements.

Table 2-1: Requirements of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations

Reg.	Requirement	Relevant section in the EP
5G	**Demonstration of financial assurance prior condition for acceptance of environment plan**	
5G(1)	This regulation applies if: • an environment plan for a petroleum activity is submitted under Regulation 9, and • there is a titleholder in relation to the activity immediately before the Regulator decides whether or not to accept the plan under Regulation 10, or • a proposed revision of an environment plan for a petroleum activity is submitted under regulation 17, 18, 19.	Section 13 Financial Assurance
11A	**Consultation with relevant authorities, persons and organisations, etc**	
11A(1)	In the course of preparing an environment plan, or a revision of an environment plan, a titleholder must consult each of the following (a *relevant person*): • each Department or agency of the Commonwealth to which the activities to be carried out under the environment plan, or the revision of the environment plan, may be relevant • each Department or agency of a State or the NT to which the activities to be carried out under the environment plan, or the revision of the environment plan, may be relevant • the Department of the responsible State Minister, or the responsible NT Minister • a person or organisation whose functions, interests or activities may be affected by the activities to be carried out under the environment plan, or the revision of the environment plan • any other person or organisation that the titleholder considers relevant.	Section 5 Stakeholder Consultation
11A(2)	For the purpose of the consultation, the titleholder must give each relevant person sufficient information to allow the relevant person to make an informed assessment of the possible consequences of the activity on the functions, interests or activities of the relevant person.	Section 5 Stakeholder Consultation
11A(3)	The titleholder must allow a relevant person a reasonable period for the consultation.	Section 5 Stakeholder Consultation

Reg.	Requirement	Relevant section in the EP
13	**Environmental assessment**	
13(1)	*Description of the activity*	
	The environment plan must contain a comprehensive description of the activity, including: • the location or locations of the activity • general details of the construction and layout of any facility or other structure • an outline of the operational details of the activity (for example, seismic surveys, exploration drilling or production) and proposed timetables • any additional information relevant to consideration of environmental impacts and risks of the activity.	Section 3.3 Location Section 3 Description of Activities
13(2)	*Description of the environment*	
	The environment plan must: • describe the existing environment that may be affected by the activity • include details of the particular relevant values and sensitivities (if any) of that environment.	Section 4 Description of the Environment
	Requirements	
13(4)	The environment plan must: • describe the requirements, including legislative requirements, that apply to the activity and are relevant to the environmental management of the activity • demonstrate how those requirements will be met.	Section 2 Environmental Legislation
13(5)	*Evaluation of environmental impacts and risks*	
	The environment plan must include: • details of the environmental impacts and risks for the activity • an evaluation of all the impacts and risks, appropriate to the nature and scale of each impact or risk • details of the control measures that will be used to reduce the impacts and risks of the activity to as low as reasonably practicable and an acceptable level.	Section 6 Environmental Risk Assessment Methodology
13(6)	To avoid doubt, the evaluation mentioned in paragraph 13(5)(b) must evaluate all the significant impacts and risks arising directly or indirectly from: • all operations of the activity • potential emergency conditions, whether resulting from accident or any other reason.	Section 6 Environmental Risk Assessment Methodology

Reg.	Requirement	Relevant section in the EP
13(7)	*Environmental performance outcomes and standards*	
	The environment plan must: • set environmental performance standards for the control measures identified under paragraph (5)(c) • set out the environmental performance outcomes against which the performance of the titleholder in protecting the environment is to be measured • include measurement criteria that the titleholder will use to determine whether each environmental performance outcome and environmental performance standard is being met.	Section 10 Environment Outcomes, Standards and Measurement Criteria
14	**Implementation strategy for the environment plan**	
14(1)	The environment plan must contain an implementation strategy for the activity in accordance with this regulation.	Section 11 Implementation Strategy
14(2)	The implementation strategy must: • state when the titleholder will report to the Regulator in relation to the titleholder's environmental performance for the activity • provide that the interval between reports will not be more than one year.	
14(3)	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: • the environmental impacts and risks of the activity continue to be identified and reduced to a level that is as low as reasonably practicable • control measures detailed in the environment plan are effective in reducing the environmental impacts and risks of the activity to as low as reasonably practicable and an acceptable level • environmental performance outcomes and standards set out in the environment plan are being met.	Section 11.6 Auditing and Inspection
14(4)	The implementation strategy must establish a clear chain of command, setting out the roles and responsibilities of personnel in relation to the implementation, management and review of the environment plan, including during emergencies or potential emergencies.	Section 11.2 Roles and Responsibilities
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.	Section 11.2 Roles and Responsibilities

Reg.	Requirement	Relevant section in the EP
14(6)	The implementation strategy must provide for sufficient monitoring, recording, audit, management of non-conformance and review of the titleholder's environmental performance and the implementation strategy to ensure that the environmental performance outcomes and standards in the environment plan are being met.	Section 11.8 External Reporting Section 11.9 Internal Reporting Section 11.6 Auditing and Inspection Section 11.7 Non-Conformance, Corrective and Preventative Actions
14(7)	The implementation strategy must provide for sufficient monitoring of, and maintaining a quantitative record of, emissions and discharges (whether occurring during normal operations or otherwise), such that the record can be used to assess whether the environmental performance outcomes and standards in the environment plan are being met.	Section 11.5 Monitoring Section 12 Oil Pollution Emergency Plan
14(8)	The implementation strategy must contain an oil pollution emergency plan and provide for the updating of the plan.	Section 12 Oil Pollution Emergency Plan
14(8AA)	The oil pollution emergency plan must include adequate arrangements for responding to and monitoring oil pollution, including the following: • the control measures necessary for timely response to an emergency that results or may result in oil pollution • 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 • 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 • the arrangements and capability in place for monitoring oil pollution to inform response activities.	Section 12 Oil Pollution Emergency Plan
14(8A)	The implementation strategy must include arrangements for testing the response arrangements in the oil pollution emergency plan that are appropriate to the response arrangements and to the nature and scale of the risk of oil pollution for the activity.	Section 12 Oil Pollution Emergency Plan
14(8B)	The arrangements for testing the response arrangements must include: • statement of the objectives of testing • a proposed schedule of tests • mechanisms to examine the effectiveness of response arrangements against the objectives of testing • mechanisms to address recommendations arising from tests.	Section 12 Oil Pollution Emergency Plan

Reg.	Requirement	Relevant section in the EP
14(8C)	The proposed schedule of tests must provide for: • testing the response arrangements when they are introduced • testing the response arrangements when they are significantly amended • testing the response arrangements not later than 12 months after the most recent test • if a new location for the activity is added to the environment plan after the response arrangements have been tested, and before the next test is conducted – testing the response arrangements in relation to the new location as soon as practicable after it is added to the plan • 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.	Section 12 Oil Pollution Emergency Plan
14(8D)	The implementation strategy must provide for monitoring of impacts to the environment from oil pollution and response activities that: • is appropriate to the nature and scale of the risk of environmental impacts for the activity • is sufficient to inform any remediation activities.	Section 12 Oil Pollution Emergency Plan
14(8E)	The implementation strategy must include information demonstrating that the response arrangements in the oil pollution emergency plan are consistent with the national system for oil pollution preparedness and response.	Section 12 Oil Pollution Emergency Plan
14(9)	The implementation strategy must provide for appropriate consultation with: • relevant authorities of the Commonwealth, a State or Territory • other relevant interested persons or organisations.	Section 5.4 Ongoing Consultation
15	**Details of titleholder and liaison person**	
15(1)	The environment plan must include the following details for the titleholder: • name • business address • telephone number (if any) • fax number (if any) • email address (if any) • if the titleholder is a body corporate that has an Australian Company Number (within the meaning of the Corporations Act 2001) – Australian Company Number.	Section 1.4 Details of Titleholder

Reg.	Requirement	Relevant section in the EP
15(2)	The environment plan must also include the following details for the titleholder's nominated liaison person: • name • business address • telephone number (if any) • fax number (if any) • email address (if any).	Section 1.4.1 Details of Liaison Person
15(3)	The environment plan must include arrangements for notifying the Regulator of a change in the titleholder, a change in the titleholder's nominated liaison person or a change in the contact details for either the titleholder or the liaison person.	Section 11 Implementation Strategy
16	**Other information in the environment plan**	
16	The environment plan must contain: • a statement of the titleholder's corporate environmental policy • a report on all consultations between the titleholder and any relevant person, for Regulation 11A, that contains: – a summary of each response made by a relevant person – an assessment of the merits of any objection or claim about the adverse impact of each activity to which the environment plan relates – a statement of the titleholder's response, or proposed response, if any, to each objection or claim – a copy of the full text of any response by a relevant person. • details of all reportable incidents in relation to the proposed activity.	Appendix C Eni Health, Safety and Environment (HSE) Statement Section 5.3 Environment Plan Consultation
17	**Revision of an environment plan**	
17(1)	A titleholder may, with the Regulator's approval, submit to the Regulator a proposed revision of an environment plan before the commencement of a new activity.	Section 11.12 Management of Change and Reviews of this EP
17 (5)	A titleholder must submit to the Regulator a proposed revision of the environment plan for the activity before the commencement of any significant modification or new stage of the activity that is not provided for in the environment plan that is currently in force.	Section 11.12 Management of Change and Reviews of this EP

Reg.	Requirement	Relevant section in the EP
17(6)	A titleholder must submit a proposed revision of the environment plan for an activity before, or as soon as practicable after: (a) the occurrence of any significant new environmental impact or risk, or significant increase in an existing environmental impact or risk, not provided for in the environment plan in force for the activity, or (b) the occurrence of a series of new environmental impacts or risks, or a series of increases in existing environmental impacts or risks, which, taken together, amount to the occurrence of: (i) a significant new environmental impact or risk, or (ii) a significant increase in an existing environmental impact or risk that is not provided for in the environment plan in force for the activity.	Section 11.12 Management of Change and Reviews of this EP
17(7)	If a change in the titleholder will result in a change in the manner in which the environmental impacts and risks of an activity are managed, the new titleholder must submit a proposed revision of the environment plan for the activity as soon as practicable.	Section 11.12 Management of Change and Reviews of this EP
18	**Revision on request by the Regulator**	
18(1)	A titleholder must submit to the Regulator a proposed revision of the environment plan for an activity if the Regulator requests the titleholder to do so.	Section 11.12 Management of Change and Reviews of this EP

2.1.2 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the primary Commonwealth environmental assessment legislation aimed at protecting and managing flora, fauna, ecological communities, environmentally sensitive and heritage places defined as matters of national environmental significance (MNES).

On 28 February 2014, NOPSEMA became the sole designated assessor of petroleum and greenhouse gas (GHG) activities in Commonwealth waters in accordance with the Minister for the Environment's endorsement of NOPSEMA's environmental authorisation process under Part 10, section 146 of the EPBC Act. All actions which are petroleum and GHG activities undertaken in Commonwealth waters in accordance with the OPGGS(E) Regulations (noting exceptions for activities with extreme sensitivity, such as those in the Great Barrier Reef or Antarctica) have been deemed 'approved classes of actions' and do not require referral, assessment and approval under the EPBC Act. Prior to the streamlining change in 2014, the Blacktip project received approval under the EPBC Act (EPBC 2003/1180) in 2008, and this approval continues to have effect (see Appendix A for approval decision). Table 2-2 presents the conditions of the EPBC approval and details how they have been met within this EP.

The Australian Government Minister for the Environment may make or adopt and implement recovery and management plans for threatened fauna, threatened flora (other than conservation-dependent species), marine parks and threatened ecological communities listed under the EPBC Act. Recovery and management plans relevant to this EP are outlined in Table 4-6 and the consistency of the Petroleum Activities Program against the actions and objectives within them is presented in Section 9.

Table 2-2: Environment Protection and Biodiversity Conservation conditions attached to EPBC 2003/1180 approval

Condition number	Condition	Section
1	The person taking the action must submit, for the Minister's approval, a plan for managing the impacts of construction. The plan must address: a. design and construction of facilities to allow for the complete removal of all structures and components (except flowlines) above the sea floor b. sea floor surveys around the proposed flowline paths and well sites to identify sensitive marine ecosystems such as reefs, sponge beds and sea grasses and historic shipwrecks c. selection of flowline paths and well sites to avoid impacts on sensitive marine ecosystems referred to in 1.b. and historic shipwrecks d. a schedule of works e. managing the impacts on cetaceans, including interaction procedures for aircraft and supply and construction vessels that are consistent with Part 8 of the Environment Protection and Biodiversity Conservation Regulations 2000 f. ballast water management for international construction or tanker vessels arriving in Australia in accordance with Australian Quarantine and Inspection Service Australian Ballast Water Management Requirements. Offshore construction may not commence until the plan is approved. The approved plan must be implemented.	Not relevant. No offshore construction activities will be undertaken under this EP.

Condition number	Condition	Section
2	The person taking the action must submit, for the Minister's approval, a plan for managing the offshore impacts of operation. The plan must address: a. monitoring and disposal of produced water (PW), including: i. analysis of expected PW chemistry ii. baseline biological and physical information at the PW outfall site iii. toxic impacts of PW on marine fauna based on ecotoxicological, bioaccumulation and biodegradation studies iv. industry best practice disposal of PW v. monitoring and reporting of biological and physical indicators vi. contingency measures if adverse impacts occur. b. management of the collection, handling and disposal of naturally occurring radioactive materials (NORMS) that may occur c. use and disposal of hydrotest water additives, based on modelling of the hydrotest water discharge plume d. use and disposal of drilling muds, including monitoring of water quality, in the event low toxicity, water-based drilling fluid additives cannot be used. Operations may not commence until the plan is approved. The approved plan must be implemented.	Section 3.8.4 meets this condition for drilling muds. Disposal of PW is outside the scope of this EP.
3	The person taking the action must submit for the Minister's approval an oil spill contingency plan to mitigate the environmental effects of any hydrocarbon spills. The plan must identify oil-sensitive marine environments and biota, and address spill response and clean-up strategies, the equipment to be used and the capacity to maintain and implement rapid response equipment, the rehabilitation of impacted ecosystems, the training of staff in oil spill response measures and reporting of oil spill incidents to the Minister. The plan must include details of insurance arrangements that have been made in respect of the costs associated with repairing any environmental damage arising from potential oil spills. Offshore construction may not commence until the plan is approved. The approved plan must be implemented.	The Blacktip Operations OPEP (000036_DV_PR.HSE.0388.000_Rev14) is considered to meet this condition.

Condition number	Condition	Section
4	The person taking the action must submit, for the Minister's approval, a plan or plans to address measures for minimising the potential for listed threatened turtles to be impacted during the pipeline construction and for monitoring of the impacts on turtles. The plan or plans must address the impacts of onshore and near shore lighting, the construction, any seabed or onshore blasting required, and the rehabilitation of potential turtle habitat after construction. Onshore construction may not commence until the plan is approved. The approved plan must be implemented.	Outside the scope of this EP.
5	At least 12 months before the expiry of this approval, the person taking the action must submit a decommissioning plan to the Minister for approval, addressing the removal of all the structures and components above the sea floor. Decommissioning may not commence until the plan is approved. The approved plan must be implemented.	Decommissioning is beyond the scope of this EP.
6	On 1 July of each year, the person taking the action must provide a certificate stating they have complied with the conditions of this Approval.	Annual Report to these conditions has been submitted.
7	If the person taking the action wishes to perform any activity otherwise than in accordance with the plans referred to in conditions 1, 2, 3, 4 and 5, they may submit for the Minister's approval a revised version of any such plan. If the Minister approves a revised plan so submitted, the person taking the action must implement that plan instead of the plan as originally approved.	Outside the scope of this EP.
8	If the Minister believes it is necessary or desirable for the better protection of the environment to do so, the Minister may request they make specified revisions to a plan pursuant to conditions 1, 2, 3, 4 and 5 and to submit the revised plan for the Minister's approval. The person taking the action must comply with any such request. If the Minister approves a revised plan pursuant to this condition, the person taking the action must implement that plan instead of the plan as originally approved.	Outside the scope of this EP.
9	The person taking the action must ensure an independent audit of compliance with conditions of approval is conducted and a report submitted to the Minister within 12 months of the commencement of construction and within two years of commencement of operations. The independent auditor must be approved by the Minister and the audit report must address the criteria to the satisfaction of the Minister.	Outside the scope of this EP.

2.1.3 Underwater Cultural Heritage Act 2018

The Act gives clarity to the present and ongoing jurisdictional arrangements for protecting and managing Australia's underwater cultural heritage in line with the 2010 Australian Underwater Cultural Heritage Intergovernmental Agreement.

It is an offence to interfere with any shipwreck covered by the Act.

There are no known shipwrecks located within the Operational Area. Shipwrecks occur outside the Operational Area and are further described in Section 4.6.6.

2.1.4 National Greenhouse and Energy Reporting Act 2007

This Act provides for reporting and disseminating information related to GHG emissions, GHG projects, energy production and energy consumption.

2.1.5 Navigation Act 2012

The Act replaces the century-old *Navigation Act 1912* with a contemporary legislative framework for maritime regulation. The Act reflects changes in the maritime sector and is the primary legislative means for the Australian Government to regulate international ship and seafarer safety, shipping aspects of protecting the marine environment and the actions of seafarers in Australian waters. It also gives effect to the relevant international conventions to which Australia is a signatory, including MARPOL 73/78 (see Section 2.4, Table 2-6).

2.1.6 Protection of the Sea (Prevention of Pollution from Ships) Act 1983

This Act gives effect to the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) (see Section 2.4, Table 2-6). It regulates discharges from ships to protect the sea from pollution and establishes requirements for a shipboard waste management plan.

2.1.7 Biosecurity Act 2015

The *Biosecurity Act 2015* sets mandatory controls for using seawater as ballast in ships and declaring sea vessels that enter and depart Commonwealth waters. The associated Regulations stipulate the management requirements of ballast water and that all information regarding the voyage of the vessel and the ballast water is to be declared correctly to the Director of Biosecurity.

2.1.8 Key Commonwealth Legislation Summary

Table 2-3 summarises the key Commonwealth legislation that is relevant to the environmental aspects of the Petroleum Activities Program.

Table 2-3: Summary of key Commonwealth legislation

Legislation	Requirements
OPGGS Act 2006	Licencing requirements. Section 280: interference with other marine rights. Section 569: operations to be performed in accordance with good oilfield practice. Section 574: written directions can be given to titleholders.
EPBC Act 1999	Relates to significant impacts on MNES. EPBC decision in place (EPBC 2003/1180) (refer Table 2-2).
Environment Protection (Sea Dumping) Act 1981	Aims to minimise pollution threats by prohibiting ocean disposal of waste considered too harmful to be released in the marine environment and regulating permitted waste disposal to ensure environmental impacts are minimised.
Underwater Cultural Heritage Act 2018	Relates to the protection of shipwrecks of heritage value. There are no historical shipwrecks within or in the vicinity of the field (see Section 4.6.6).
National Greenhouse and Energy Reporting Act 2007	GHG reporting requirements.
Navigation Act 2012	Requirements for ships transporting oil and chemicals.
Protection of the Sea (Prevention of Pollution from Ships) Act 1983	Discharge requirements from ships.
Protection of the Sea (Harmful Anti-fouling systems) Act 2006	Requirements for using anti-fouling substances and prohibits using certain types of materials for anti-fouling. Vessels used during the activity will have anti-fouling coatings in place and as such are subject to the Act.
Protection of the Sea (Powers of Intervention) Act 1981	This Act provides a range of powers to Australian Maritime Safety Authority (AMSA) that allow it to take measures and issue directions to prevent or respond to pollution of the sea by oil or other substances. As hydrocarbon spills are identified as credible hazards in relation to the activities in this EP, this Act is applicable.
Protection of the Sea (Civil Liability for Bunker Oil Pollution Damage) Act 2008	Insurance requirements for ships in Australian waters. Activities in this EP will be performed using commercial vessels powered with hydrocarbon fuel and as such are subject to the Act.
Aboriginal and Torres Strait Islander Heritage Protection Act 1984	Enables the Australian Government to respond to requests to protect traditionally important areas and objects that are under threat, if it appears state or territory laws have not provided effective protection. There are no sites of Aboriginal heritage in the vicinity of the Operational Area (see Section 4.6.6).
Australian Heritage Council Act 2003	Relates to protecting heritage: an Act to establish the Australian Heritage Council, and for related purposes.
Australian Maritime Safety Authority Act 1990	Relates to protecting the marine environment and performing maritime and aviation search and rescue services: an Act to establish AMSA.

Legislation	Requirements
Hazardous Waste (Regulation of Exports and Imports) Act 1989	Relating to general vessel operations: this Act relates to controls over importing and exporting hazardous waste material. Permits are required to dispose of waste overseas or to import waste into Australia.
Native Title Act 1993	Recognising by Australian law that some Indigenous people have rights and interests to their land that come from their traditional laws and customs. There are no Native Title claims in the vicinity of the Operational Area (see Section 4.6.6).
Biosecurity Act 2015	The *Biosecurity Act 2015* came into effect on 16 June 2016 and replaced the *Quarantine Act 1908*. Provisions within the Act relating to managing ballast water and biofouling are relevant to the activities. The Commonwealth will work with states and territories to determine when or how these new powers may be used with state and territory legislation to more effectively manage onshore biosecurity risks. The Commonwealth will also identify what thresholds must be met, and how to evaluate these, for the biosecurity emergency declaration powers in Part 1 or Chapter 8 to be triggered. The legislation provides for a single Australia-wide ballast water and sediment management regime for both international and domestic vessels, consistent with the International Convention for the Control and Management of Ships’ Ballast Water and Sediments. The implementation of domestic ballast water regulations has been delayed until the International Convention comes into force.

2.2 Western Australian Legislation

The Operational Area for this EP is described in Section 3.3.1 and is within Commonwealth waters. Vessels supporting the Petroleum Activities Program may pass through WA State waters while transiting to and from a port.

While in WA State waters, the vessels will have to comply with WA legislation, including those listed in Table 2-4.

Table 2-4: Applicable Western Australian legislation

Legislation	Summary
Dangerous Goods Safety Act 2004	Relating to general vessel operations: this Act provides for safely storing, handling and transporting certain dangerous goods, including explosives, gases and flammable or combustible liquids. Licencing may be required, depending on the substances involved and the quantities stored or transported. These laws are administered by the Department of Mines and Petroleum (DMP).
Environmental Protection Act 1986	Relating to non-routine operations (potential oil spills) in areas under State jurisdiction: this Act provides for preventing, controlling and abating pollution and environmental harm and for conserving, preserving, protecting, enhancing and managing the environment.
Marine (Certificates of Competency and Safety Manning) Regulations 1983	Marine Safety is responsible for administering national and internationally agreed competency standards; and for the examination of candidates for commercial Certificates of Competency as master, mate or engineer in WA vessels.
Pollution of Waters by Oil and Noxious Substances Act 1987	Relating to non-routine operations (potential oil spills) in State waters: this Act relates to protecting the sea and certain waters from pollution by oil and other noxious substances discharged from ships and places on land.
Prevention of Collisions at Sea Regulations 1983	Regulations largely comprise the Rules set out in the International Regulations for Preventing Collisions at Sea 1972 (COLREGs) applicable in state and internal waters.
Western Australia Marine Act 1982	Relating to vessel movements: an Act to regulate navigation and shipping.
Western Australian Marine (Sea Dumping) Act 1981	Relating to general vessel operations: an Act to provide for protecting the environment by regulating the dumping into the sea, and the incineration at sea, of wastes and other matter and the dumping into the sea of certain other objects, and for other purposes.
Biodiversity Conservation Act 2016	The *Biodiversity Conservation Act 2016* came into effect on 3 December 2016 and replaced the *Wildlife Conservation Act 1950*. Relating to potential impacts to listed species: this Act provides for conserving and protecting Western Australian wildlife.
Fish Resources Management Regulations 1995	Under Regulation 176 of the Fish Resources Management Regulations 1995, it is an offence to translocate live non-endemic fish to WA without permission. Under section 105 of the *Fish Resources Management Act 1994*, it is an offence to bring noxious fish into WA. Also, under Part 16A of the *Fish Resources Management Act 1994*, the Department has emergency powers to deal with incursions of invasive marine species (IMS), which include directing a person to perform necessary activities to prevent or control the spread of IMS, or to eradicate them in WA waters. If these activities are not undertaken, Eni may perform the activities and recover any costs incurred from the person initially directed to do so.

2.3 Northern Territory Legislation

Vessels supporting the Petroleum Activities Program often leave from Darwin or Wadeye and thus pass through NT waters while transiting to and from the Petroleum Activities Program.

While in NT waters, vessels will have to comply with a variety of NT legislation, including those listed in Table 2-5.

Table 2-5: Applicable Northern Territory legislation

Legislation	Summary
Waste Management and Pollution Control Act 1998	Provides for protecting the environment through encouraging effective waste management and pollution prevention measures, including licencing for certain levels of pollution discharges to air and water. The Act does not apply to wastes that are confined to the site on which they are generated, but requires licencing and registration for wastes that are discharged offsite.
Environment Protection Act 2019	Establishes the framework for assessing potential or anticipated environmental impacts of development. The object of the Act is to ensure matters affecting the environment to a significant extent are fully examined and taken into account in decisions by the NT Government.
Environment Protection (National Pollutant Inventory) Objective 2004	This is an objective under the *Waste Management and Pollution Control Act* that provides for compulsory reporting of air emissions by certain facilities, in accordance with the Commonwealth National Environment Protection (National Pollutant Inventory) Measure.
Dangerous Goods Act 1998	This Act provides for safely storing, handling and transporting certain dangerous goods (such as flammable, combustible liquids) in order to promote public safety and protect property and the environment.

2.4 International Agreements

International agreements and conventions that apply to the Petroleum Activities Program are summarised in Table 2-6.

Table 2-6: Applicable international agreements and conventions

International Agreements and Conventions	Summary
Bilateral migratory bird agreements between the Government of Australia and the Government of Japan, China and Republic of Korea	These agreements recognise international concern for protecting migratory birds and birds in danger of extinction.
Convention for the Control of Transboundary Movements of Hazardous Wastes and Their Disposal 1989 (Basel Convention)	This convention deals with the transboundary movement of hazardous wastes, particularly by sea.

International Agreements and Conventions	Summary
Convention for the Prevention of Pollution from Ships 1973/1978 (MARPOL 73/78)	This convention aims to preserve the marine environment by completely eliminating pollution by oil and other harmful substances and by minimising accidental discharge of such substances. It contains five Annexes, dealing respectively with oil, noxious liquid substances, harmful packaged substances, sewage and garbage. Detailed rules are laid out as to the extent to which (if at all) such substances can be released in different sea areas.
Convention on Biological Diversity 1992	The objectives of the convention are to conserve biological diversity, sustainably use its components and fairly and equitably share the benefits arising out of using genetic resources.
Convention on Oil Pollution Preparedness, Response and Co-operation 1990 (OPRC 90)	This convention establishes national arrangements for responding to oil pollution incidents from ships, offshore oil facilities, sea ports and oil handling. The convention recognises that in the event of a pollution incident, prompt and effective action is essential.
Convention on the Conservation of Migratory Species of Wild Animals 1979 (Bonn Convention)	This convention aims to improve the status of all threatened migratory species by national action and international agreements between range states.
Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (known as the London Protocol)	The London Convention contributes to the international control and prevention of marine pollution by prohibiting the dumping of certain hazardous materials.
International Convention for the Protection of Pollution from Ships (1973) and Protocol (1978) (MARPOL 73/78)	This convention is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes.
International Convention on Civil Liability for Oil Pollution Damage 1969	The Civil Liability Convention ensures adequate compensation is available to persons who suffer oil pollution damage resulting from maritime casualties involving oil-carrying ships by placing liability for such damage on the owner of the ship.
International Convention on OPRC 90	This convention provides a framework to facilitate international cooperation in preparing for and responding to major oil pollution incidents. Australia acceded to this Convention in 1992.
International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties 1969	The convention gives State Parties powers to intervene on ships on the high seas when their coastlines are threatened by an oil spill from that ship.
International Convention for the Control and Management of Ships' Ballast Water and Sediments 2004	The convention aims to prevent the spread of harmful aquatic organisms from one region to another, by establishing standards and procedures for managing and controlling ships' ballast water and sediments.

International Agreements and Conventions	Summary
United Nations Convention on the Law of the Sea 1982	This convention recognises the desirability of establishing a legal order for the seas and oceans which will facilitate international communication, and will promote the: • peaceful uses of the seas and oceans • equitable and efficient utilisation of their resources • conservation of their living resources • study, protection and preservation of the marine environment.
United Nations Framework Convention on Climate Change 1992	The convention is an international environmental treaty with the objective of stabilising GHG concentrations at a level that would prevent dangerous anthropogenic interference with the climate system.
Vienna Convention for the Protection of the Ozone Layer 1985 and the Montreal Protocol on Substances that Deplete the Ozone Layer 1987	The convention is a multilateral environmental agreement that acts as a framework for international efforts to protect the ozone layer. The accompanying Montreal Protocol specifies goals for reducing the uses of chlorofluorocarbons, the main chemical agents causing ozone depletion.
Climate Change Convention 1992	Relating to general vessel operations: the objective of the convention is to stabilise GHG concentrations in the atmosphere at a level that would prevent dangerous interference with the climate system. Australia ratified the convention in December 1992 and it came into force on 21 December 1993.
Minamata Convention on Mercury 2013	The international treaty seeks to protect human health and the environment from anthropogenic (caused by humans) emissions and releases of mercury and mercury compounds. The Convention covers all aspects of the life cycle of mercury, controlling and reducing mercury across a range of products, processes and industries. DCCEEW leads Australia's involvement in the Minamata Convention.

2.5 Industry Guidelines

The Australian petroleum exploration and production industry operates under various industry codes of practice, such as the Australian Petroleum Production and Exploration Association (APPEA) Code of Environmental Practice (2008). These provide guidelines for activities that are not subject to prescriptive regulation and have evolved from the collective knowledge and experience of the oil & gas industry, nationally and internationally. Eni is a member of APPEA and, when undertaking its projects and activities, adheres to the provisions of its Code of Environmental Practice. The APPEA Code of Environmental Practice was a key reference in preparing for the environmental risk assessment and developing performance outcomes in this EP. A summary of applicable industry guidelines is provided in Table 2-7.

Table 2-7: Applicable industry guidelines

Guidelines and Agreements/ Conventions	Summary
APPEA Code of Environmental Practice 2008	October 2008 – Management system and a comprehensive list of environmental guidelines for the petroleum industry. Provides guidelines for activities that are not formally regulated and have evolved from the collective knowledge and experience of the oil & gas industry.
NOPSEMA Guidance note: Environment Plan Content Requirements (N04750-GN1344)	Aims to provide guidelines for use by titleholders in preparing environment plans for submission to NOPSEMA.
NOPSEMA. Information Paper: Reducing Marine Pest Biosecurity Risks through Good Practice Biofouling Management, (N04750-IP1899)	
NOPSEMA Guidance note: Oil pollution risk management – Rev 2 (GN1488)	
NOPSEMA Guidance note: Notification and reporting of environmental incidents (GN0926)	
NOPSEMA Guideline: Consultation with Commonwealth agencies with responsibilities in the marine area (GL1887)	
NOPSEMA. Planning for proactive decommissioning (N-00500-IP2002 A816565)	
Australian Ballast Water Management Requirements (Version 7) – Department of Agriculture, Fisheries and Forestry	July 2017 – This document provides requirements for management measures to reduce the risk of introducing harmful aquatic organisms into Australia's marine environment through ship's ballast water.
National Biofouling Management Guidance for the Petroleum Production and Exploration Industry	April 2009 – This document provides recommendations for managing biofouling hazards by vessels and equipment used in the petroleum industry.
Offshore Petroleum Decommissioning Guideline – Department of Industry, Innovation and Science	January 2018 – Decommissioning guideline confirming the Australian Government's policy expectation that removing property is the 'base case' or default decommissioning requirement. Assists offshore petroleum titleholders to plan and seek the regulatory approvals necessary to undertake a decommissioning project, and to understand the expectations of relevant decision-makers.

Guidelines and Agreements/ Conventions	**Summary**
WA DPIRD Biofouling and Biosecurity Policy	The Department's focus is preventing the transport, introduction and establishment of aquatic pests and diseases within the State through proactively managing (minimising) biofouling on vessels, other moveable structures and immersible equipment before travel into and within the State. The Department policy is that vessels should be 'clean' before leaving for new destinations within WA. This means the risk of aquatic pest and disease transport should be kept to an acceptable (low) level by vessel managers complying with relevant international, national and State obligations, legislation and guidelines prior to travel into and within WA waters.

3 DESCRIPTION OF ACTIVITIES

3.1 Overview

This section has been prepared in accordance with Regulation 13(1) of the OPGGS(E) Regulations. A comprehensive description of the Petroleum Activities Program is included in this section and describes the activities to be undertaken under this EP.

3.2 Scope

The scope of this EP includes:

- a geophysical site survey at the WHP (Section 3.7)
- drilling of two development wells (P3 and P4) in the Blacktip field through existing slots on the Blacktip WHP using a jack-up MODU, cantilevered over the Blacktip WHP (Section 3.8)
- working over of an existing development well (P1) to re-complete and produce hydrocarbon from different reservoir zones (Section 3.9)
- hook-up and commissioning (Section 3.10).

Collectively this scope is referred to as the Petroleum Activities Program.

Once the development wells are hooked up and commissioned, the fluids will flow to the Blacktip WHP and to the onshore YGP as per the processes detailed within the Blacktip Operations EP (000036_DV_PR.HSE.0677.000).

Whilst it is planned that the P4 drilling occurs directly after the drilling of the P3 well, there is the eventuality that the rig does go off location post drilling of P3. Therefore this EP includes both mobilisation and demobilisation of the jack-up MODU. A geophysical survey is common to both the P3 and P4 drilling and is only required to be undertaken once, under the scope of the Blacktip Operations EP (000036_DV_PR.HSE.0677.000) (refer to Section 4.5 of that EP).

Table 3-1 presents an overview of the Petroleum Activities Program.

Table 3-1: Development wells drilling and workover activity overview

Item	Description		
Production area	WA-33-L		
Well site	Blacktip		
Coordinates	13° 53' 41" S 128° 29' 3" E		
Water depth	51 m		
MODU type	Jack-up		
Vessels	Up to three vessels		
Approx. duration[1]	80-120 days	30 to 60 days	25 to 50 days
Well	P3	P4	P1
Activities	• Site survey (if required) • MODU placement • Drilling and cement top hole section using water-based mud (WBM) as the drilling fluid • Install blowout preventer (BOP) • Drill intermediate and production hole sections using WBM as the drilling fluid • Cement production casing/liner • Well completion • Well cleanup (including flaring) • Hookup and commissioning	• Site survey (if required) • MODU placement • Drilling and cement top hole section using water-based mud (WBM) as the drilling fluid • Install blowout preventer (BOP) • Drill intermediate and production hole sections using WBM as the drilling fluid • Cement production casing/liner • Well completion • Well cleanup (including flaring) • Hookup and commissioning	• Retrieve existing completion • Isolate existing production zone • Perforate and re-run completion for upper zone • Well cleanup • Handover to production

Note 1: durations may extend for up to 20 days in the event of adverse weather conditions

3.3 Location

The Blacktip field is located approximately 300 km west-south-west of Darwin, in permit area WA-33-L in the JBG (Figure 3-1).

The coordinates of the WHP are presented in Table 3-2. The proposed development wells and intervention will occur from a MODU cantilevered over the WHP.

Table 3-2: Coordinates of the wellhead platform and the single point mooring

Component	Water Depth	Latitude	Longitude
WHP	51 metres	13° 53' 42" S	128° 29' 3" E

3.3.1 Operational Area

The Operational Area defines the spatial boundary of the Petroleum Activities Program, as described, risk-assessed and managed by this EP, including vessel-related petroleum activities within the Operational Area (Figure 3-1).

The MODU will be positioned adjacent to the Blacktip WHP platform (derrick cantilevered over the well bay), within permit area WA-33-L. As such, all activities will occur within the existing 500 m petroleum safety zone (PSZ) of the Blacktip WHP.

In the event of a well 're-spudded' due to operational difficulties, the MODU would be skidded over to a different slot on the WHP for re-drill.

3.4 Timing

The Petroleum Activities Program timing is subject to rig availability and to obtaining all regulatory and business approvals; however, is anticipated to occur in Q4 2022 - Q1 2023. The timing has not been finalised; therefore, this EP assumes the drilling activities may be undertaken at any time of year over the validity of this EP (2022/23).

Refer to Table 3-1 for individual well timings.

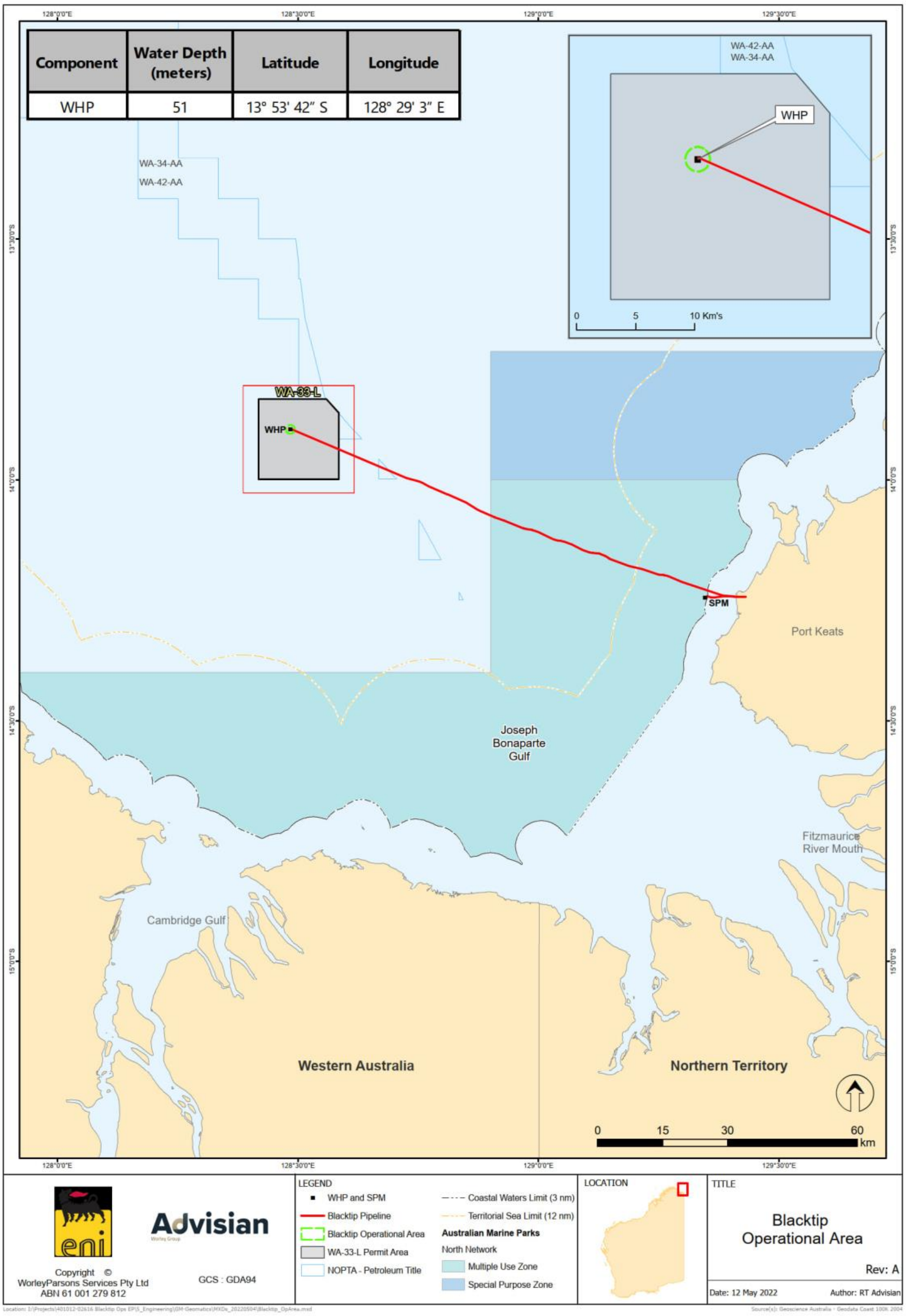


Figure 3-1: Blacktip Operational Area

3.4.1 Start of Activity

This EP comes into force on acceptance by NOPSEMA. At that point in time the P3 drilling activity referred to in the Blacktip Operations EP (000036_DV_PR.HSE.0677.000) is considered no longer valid and the activity P3 drilling activity in this EP supersedes it.

3.4.2 End of Activity

The Petroleum Activities Program ends once the development wells have been completed and hooked up and the workover is complete.

3.5 Mobile Offshore Drilling Unit

Eni shall contract a MODU, selected based on technical capability and in accordance with Eni's prequalification process. The MODU may mobilise from international waters to the JBG, where it will position adjacent to the Blacktip WHP (derrick cantilevered over the well bay) to perform the Petroleum Activities Program.

The mobilisation, positioning (including spud can placement) and demobilisation of the MODU is covered within the scope of the Blacktip Operations EP (000036_DV_PR.HSE.0677.000).

Selection of the MODU will be based on Eni's rig selection criteria, which considers technical and HSE suitability for the drilling. Criteria include:

- The MODU Contractor must be able to meet Eni's and Australian Regulatory environmental and safety standards and requirements, and must operate under a NOPSEMA-accepted Vessel Safety Case.
- The MODU Contractor must meet Eni's prequalification assessment.
- The MODU's cantilever must be capable of reaching all required well slots on Blacktip WHP.
- The MODU must qualify for 50-year seasonal extreme weather survival.
- The MODU must be capable of jacking up over the Blacktip WHP main deck to give suitable clearance to install the BOP stack above the main platform deck.
- The MODU must be capable of drilling the P4 development well down to the required depth.

Specifications of a typical MODU are provided in Table 3-3.

Table 3-3: Specification of a typical mobile offshore drilling unit

Specification	Detail
Rig type	Jack-up barge
Accommodation	100 to 150
Mud and cement storage capacity	270 m^3 / 174 m^3
Fuel	MDO
Fuel oil storage capacity	532 m^3

The MODU, while operating in Australian Commonwealth waters for Eni, will do so in accordance with a NOPSEMA-accepted Vessel Safety Case, including simultaneous operations arrangements with the WHP.

3.6 Support Operations

3.6.1 Vessels

The MODU will typically be supported by up to three vessels. The activities these vessels may conduct are:

- towing the MODU
- standing by close to the MODU during critical operations
- standing by outside the 500 m PSZ from the MODU
- delivering food, potable water, drill water, fuel, dry bulk, drilling fluids, chemicals, equipment and other supplies from shore
- delivering dry bulk, chemicals, equipment and waste to shore.

Transferring of items between the vessels and the MODU will be conducted using the cranes or transfer hoses on-board the MODU. At least one support vessel will remain in the vicinity of the MODU at all times. The vessels will commute back and forth between Darwin and the Operational Area.

All vessels will be commercial vessels with a suitable survey class for the Petroleum Activities Program in the Operational Area.

Typical vessel specifications for the Petroleum Activities Program are provided in Table 3-4.

Table 3-4: Typical vessel specifications

Parameter	Description
Draft (max)	6.8 m (max)
Gross tonnage	3000 Gt
Deck dimensions	350-750m Sq.m
Fuel type	MDO
Total fuel capacity	1000 m^3
Single tank storage volume	100 m^3
Fuel consumption at service speed	26 m^3/24 hours

A vessel with similar specifications to that in Table 3-4 will be used for geophysical survey (Section 3.7).

Vessels used will not anchor during routine operations. In the event of an emergency, they will proceed into a sheltered harbour.

3.6.2 Helicopters

Crew changes for personnel onboard the MODU and supply of some equipment will involve transfer by helicopter. These flights will occur typically five times a week, depending on operational progress and logistical constraints, and will operate out of Darwin or another suitable alternate aviation base such as Truscott or Kununurra.

Helicopter refuelling on the MODU is not anticipated, due to the Operational Area's proximity to the helicopter base.

3.6.3 Remotely Operated Vehicles

Remotely operated vehicles (ROVs) may be used throughout the Petroleum Activities Program for visual inspections and observations.

3.7 Geophysical Survey

In preparation for drilling activities at the WHP, a site survey may be undertaken from a vessel. The survey area will occur within the existing 500 m PSZ of the Blacktip WHP, with an expected duration of 5-7 days.

The purpose of the site survey is to provide an accurate and current measurement of seabed bathymetry and confirm that previous jack-up footprints will be clear of debris or obstructions.

The survey objectives are to:

- accurately measure water depth and map seabed topography across the survey area
- identify potential seabed debris and / or obstructions which could potentially interfere with the positioning of the MODU.

Typically, the site survey will utilise the following equipment to obtain the necessary data to ensure a hazard-free MODU footing location:

- vessel positioning and integrated survey online navigation system and offline processing system
- high precision single beam dual frequency echo sounder (ES) for measuring water depths along the survey track
- high precision, motion corrected multibeam echo sounder (MBES) for swathe bathymetry mapping of water depths along the survey track
- high resolution Side Scan Sonar (SSS) for delineating seabed features
- ultra-short baseline (USBL) acoustic positioning system and marine magnetometer.

3.8 Drilling Methodology

3.8.1 P3 Well

The Blacktip WHP was developed with space for six wells. The P3 well will be drilled through a pre-installed 30" conductor on the WHP. As a contingency, a new 30" conductor pipe will be installed only if required.

The different phases of the P3 development drilling are:

1. Move MODU to Blacktip WHP
2. Jack-up hull and preload
3. Skid cantilever over P3
4. Contingency only; drill 36″ hole and install new 30″ conductor pipe
5. Nipple-up riser, diverter and function test
6. Clean out conductor and run gyro survey
7. Drill 26″ hole and install 20″ casing (see section 4.6.1)
8. Cement 20″ casing
9. Install wellhead, nipple up and test BOPs.
10. Drill 17½" hole and install 13-5/8″ casing
11. Cement 13-5/8″ casing
12. Drill 12-¼″ hole and install 9-5/8″ liner
13. Cement 9-⅝″ liner
14. Drill 8½" hole and install 7″ liner
15. Cement 7″ liner
16. Run wellbore cleanout
17. Run 7″ and 9-5/8″ CBL logs
18. Perforate lower zone (A5-A6) and install lower completion #1
19. Perforate lower zone (A4) and install lower completion #2
20. Perforate middle zone (A3, A3.5) and install middle completion #1
21. Perforate middle zone (A2, A2.5) and install middle completion #2
22. Install upper completion and tubing hanger
23. Nipple down BOP, install Xmas Tree and pressure test
24. Flow well and clean-up
25. Run wireline production logs
26. Install tree cap
27. Secure rig and jack down.

3.8.2 P4 Well

The different phases of the P4 development drilling are:

1. Move MODU to Blacktip WHP
2. Jack up hull and preload
3. Skid cantilever over P4 slot
4. Drill 36-inch hole and install 30-inch conductor

5. Cement 30-inch conductor
6. Cut conductor
7. Install wellhead, nipple up riser, diverter and function test
8. Drill 17½-inch hole and install 13⅜-inch casing
9. Cement 13⅜-inch casing
10. Test BOPs
11. Drill 12¼-inch hole
12. Electric wireline log 12¼-inch section
13. Run and cement 9⅝-inch liner
14. Clean out wellbore
15. Perforate zone #1
16. Install lower completion
17. Perforate zone #2
18. Install middle and upper completion
19. Install Xmas Tree and pressure test
20. Flow well and clean up
21. Install Tree cap, secure rig and jack down.

All standards and requirements will be documented within the Blacktip Development Well Operations Management Plan (WOMP).

3.8.3 Casing

The drilling of the development wells will involve installing several concentric strings of steel casing. The casing string will extend from the platform deck to various depths of the well to provide the hydraulic seal necessary to safely drill and produce the well.

The casing design for the development wells will include:

- Surface conductor cemented to isolate loose and unconsolidated surface formation and prevent contamination to mudline.
- Surface casing cemented to provide blowout protection and to seal off freshwater resources and aquifers and prevent loss of circulation. The setting depth is selected to allow control of a well kick if it occurs in the subsequent hole sections.
- Production liner, which is used to protect weak formations, and the depth is selected as per above. It is set in place across the target reservoir and will be perforated to allow gas production.

At the WHP deck level, the production tubing will connect to the wellhead on which a Xmas Tree will be installed, which will have a system of manual, failsafe and remotely operated valves designed to allow the safe connection and operation of the well and prevent loss of well control. From each wellhead the gas, condensate and produced water flows through a flowline into a manifold before export via the production riser and Blacktip gas export pipeline.

3.8.4 Drilling Fluids and Cuttings

Drilling fluids, commonly referred to as 'muds', consist of a mixture of base fluid, liquid and solid additives and weighting materials. The drilling mud is essential to many aspects of the drilling process, including protecting equipment, stabilising the wellbore and removing drill cuttings. The most important function of the drilling mud is to maintain primary well control. The hydrostatic pressure of the mud is maintained at a level estimated to exceed the formation pore pressure along the open hole and therefore prevents uncontrolled flow or collapse of the wellbore. The drilling mud is designed to assist with removing cuttings and debris from the wellbore, in addition to lubricating and cooling the drill bit.

The mud is mixed, stored and maintained in tanks on the MODU. During drilling, it is pumped down the drill string to the rotary drill bit, then forced up the annulus between the drill string and wellbore or casing. Aside from the conductor hole, which is drilled with mud returns to seabed, the circulation system is closed, which allows the drilling mud to be circulated to the surface facilities, along with the drill cuttings, for processing.

WBMs will be used to drill the development wells. WBMs are regularly used for drilling operations and considered an environmentally acceptable technology. WBMs use fresh or sea water as the continuous phase, with additives including bentonite, potassium chloride, polymers and partially hydrolysed polyacrylamide added to condition the mud. WBMs deliver acceptable performance for drilling non-challenging wells, such as vertical wells with inert rock formations.

Other additives may be required in small amounts to assist in controlling bacteria and corrosion; and to produce specific fluid characteristics. Likely additives include biocides, weighting agents, alkaline chemicals, inorganic salts, defoamers, corrosion control agents, scale inhibitors, drilling lubricants, lost circulation materials and pipe release agents. Pipe dope, a lubricant used when connecting threads on pipe strings, becomes mixed with the mud as it is forced along the pipe string. Any excess dope is lost down hole during drilling and ultimately lost to sea with the drill cuttings and muds.

Processing equipment enables the mud to be recycled by recovering as much mud as is practical and removing a large proportion of the drill cuttings with vibrating screens (shale shakers). Excess WBMs will be flushed with seawater and discharged to the ocean through a direct overboard drain. The whole drilling muds will be routinely discharged to the ocean at the end of drilling, or when mud property requirements change. The result will be a thin layer of cuttings and muds widely distributed over the seabed, as well as a plume of turbid water created by the finer particles which remain suspended in the water column for some time before they sink to the seabed.

The approximate volume of muds and cuttings discharge for the development wells is summarised in Table 3-5 and Table 3-6.

All drilling fluids will be environmentally assessed in accordance with the process described in Section 3.12.

Table 3-5: Estimate of the drill cuttings and drilling muds discharged for the P3 well

Bore diameter (inches)	Depth (m)	Well interval	Cuttings	Mud			Approx. discharge duration (days)
			Volume discharged (m^3)	Type	Volume seawater and muds (m^3)	Drilling muds solids only (m^3)	
30	-	Conductor (already installed)	-	-	-	-	-
26	185-950	Surface Hole	262	WBM	654	10%	6
17.5	950-2341	Intermediate Hole	216	WBM	546	10%	7
12.25	2341-2987	Intermediate Hole	49	WBM	246	10%	8
8.5	2987-3479	Production Hole	18	WBM	102	10%	9
		Total	**545**		**1548**		

Table 3-6: Estimate of the drill cuttings and drilling muds discharged for the P4 well

Bore diameter (inches)	Depth (m)	Well interval	Cuttings	Mud			Approx. discharge duration (days)
			Volume discharged (m^3)	Type	Volume seawater and muds (m^3)	Drilling muds solids only (m^3)	
36	0 to 175	Conductor	55	WBM	140	10%	3
17.5	175 to 900	Surface hole	115	WBM	290	10%	5
12.25	900 to 2500	Intermediate hole	125	WBM	625	10%	8
		Total	**295**		**1055**		

3.8.5 Cement

Cementing fluids will generally consist of Portland cement with additives (such as inorganic salts, lignins, bentonite, resin and surfactants). Cementing fluids are not routinely discharged to the marine environment; however, volumes of approximately 5 m³ per well could be released when surplus fluids require disposal after cementing operations at the surface. Water-based cement spacers can be used as part of the cementing process within the well casing to assist with cleaning the casing sections before cement flowthrough.

Cement will be used to form permanent barriers and fix casings in place before drilling the next sections in the well. Cement in the annular space between casing and formation will form a seal to ensure the circulation system remains closed. Cement may also be used to seal a lost circulation zone, plug the well from which a side-track may be drilled, and when abandoning the well. The majority of cement pumped remains downhole, but minor volumes (approximately 5 m³ per well) may be discharged at surface (when flushing lines or tanks). Tracer dyes may be used during cementing operations for detection purposes.

While transferring bulk drilling fluid materials and cement, minor solids will be vented to air to prevent tank overpressure.

Unused excess dry bulk cement which is stored in the MODU silo and surplus to requirements of the well will be, where possible, provided to the next Operator at the end of the drilling (as it remains on the MODU). If this is not a feasible option, the excess cement will be discharged to the marine environment as a slurry below the sea surface. The volume of cement required for the operation is reasonably well understood and can be predicted fairly accurately; however, it is standard industry practice for additional cement to be made up as contingency. The maximum volume of excess cement slurry which could be discharged below the sea surface is 20 m³.

All cementing chemicals will be environmentally assessed in accordance with the process described in Section 3.12.

3.8.6 Blowout Preventer Testing

The BOP will be routinely checked by completing pressure and function testing in line with Safety Case and WOMP commitments. As the BOP is at the surface, no fluids are released to the marine environment.

3.8.7 Completions

Following successful drilling and casing of the reservoir, well completion will be undertaken to connect the reservoir to production facilities. After running and cementing the liner, the drilling mud in the tubing and casing annulus is displaced by completion brine (typically potassium chloride solution). This provides a solid-free medium for the completion string that will generate minimal chemical interaction when in contact with reservoir formation fluids and maintain a positive overbalance to reservoir pressure. After running the completion, the tubing is displaced with approximately 90 m³ of diesel to provide an under-balanced condition in the tubing to assist in flowing hydrocarbons to the surface after perforation. Diesel, being a hydrocarbon product, generates minimal formation damage should it come into contact with the reservoir. The diesel will be burnt as part of the well clean-up operation after completion. If the downhole formation pressures are too low to enable well kick-off with a diesel cushion, the contingency lifting method will be nitrogen through either injection via a conduit (coil hose) or bullheading.

3.8.8 Well Clean-Up

The well clean-up process will occur after drilling and completions activities on the development wells. The purpose is to clean up drilling and completion fluids, measure the production potential and identify any potential reservoir damage.

Well clean-up will occur via the MODU and test package, which will result in a flare emission from the MODU flare tip. Flaring will occur for a period of up to 96 hours per development well. The same volume of diesel pumped downhole (used as a cushion) will be flared (approximately 90 m³ per well).

All well clean-up chemicals will be environmentally assessed in accordance with the process described in Section 3.12.

3.8.9 Well Control

Eni ensures control of wells through control measures incorporated into the well design, drilling procedures, mud selection, personnel training and equipment maintenance and testing. Well control requirements will be detailed within the NOPSEMA-approved WOMP and the MODU Safety Case and campaign specific Safety Case Addendum.

3.9 Intervention Methodology

The Blacktip P1 well may undergo workover to re-complete and produce from a different reservoir zone (upper zone). The workover sequence is listed below:

1. Skid cantilever to P1 slot.
2. Rig up and connect cement unit to P1.
3. Bullhead to kill well.
4. Suspend the well with a deep set mechanical barrier.
5. Set a temporary shallow second mechanical barrier.
6. Remove Xmas Tree, install BOP.

7. Remove the temporary shallow barrier
8. Cut and release 9⅝inch production packer
9. Retrieve 7inch completion
10. Run Cement Bond Log for upper zone.
11. Proceed with remedial annular cement job if insufficient annular isolation.
12. Clean up wellbore.
13. Re-complete well for upper zone (including perforations).
14. Remove BOP, install Xmas Tree.
15. Flow well and clean up.

Brines and seawater will be used throughout the P1 intervention operations. Details of completion fluids (brine), cement plugs, completion running and BOP testing activities are covered in Sections 3.8.5 to 3.8.8.

3.9.1 Well Fluids and Gases

Well fluids produced from the lower zone are planned to be pushed back to the reservoir, hence minimising surface handling requirements. However, residual gas or fluid might be circulated back to the surface. In that case, the hydrocarbon will be vented via the MODU well test package.

3.10 Hook-Up and Commissioning

Hook-up and commissioning will occur after drilling of the development wells and will occur on the WHP. After well clean-up (Section 3.8.8), the well will be temporarily shut-in until hook-up occurs. The high-level sequence for hook-up and commissioning is as follows:

1. Prepare the piping for the well:
   a. Prepare required connections to the nominated well and other wells.
   b. Install the required choke and other items.
   c. Hook up the control instruments.
   d. Commission and test.
2. Flow the well through the production manifold:
   a. Monitor well parameters (pressures, temperatures).

3.11 Mobile Offshore Drilling Unit Operations

Operational discharge streams from the MODU and vessels include:

- deck drainage and stormwater
- putrescible waste and sewage and grey water
- oily water
- cooling water

- desalination plant effluent (brine) and backwash water discharge
- ballast water.

3.11.1 Deck Drainage

During the activity, the MODU and vessels are likely to receive rainfall on deck. Deck cleaning and wash-down may also occur as part of standard operations. Deck water will be discharged to sea and may contain detergents and contaminants in trace quantities, such as wash chemicals.

3.11.2 Putrescible Waste and Sewage

The volume of sewage and food waste is directly proportional to the number of persons on-board the MODU and vessels. Approximately 30 to 40 L of sewage and grey water will be generated per person per day. Putrescible waste will consist of approximately 1 L of food waste per person per day.

3.11.3 Oily Water

Bilge water is an almost unavoidable product in marine operations. Bilge water that is generated in proximity to equipment (such as in the engine room) may contain residual hydrocarbons. Bunded spaces around machinery may also contain oily water. Oily water will be directed to a bilge water tank, and either treated and released to the marine environment, or transferred onshore for disposal.

3.11.4 Cooling Water

Seawater is used as a heat exchange medium for cooling machinery engines. Seawater is drawn from the ocean and flows counter-current through closed-circuit heat exchangers, transferring heat from the vessel engines and machinery to the seawater. The seawater is then discharged to the ocean (as in, it is a once-through system). Cooling water temperatures vary depending upon the vessel's engine's workload and activity. Heated water may also be discharged from the MODU during well testing activities. Cooling water may be dosed with inhibitors to protect against cavitation erosion and corrosion, mineral scale deposits and electrolysis.

3.11.5 Desalination Plant Effluent (Brine) and Backwash Water Discharge

Effluents from the water supply systems on-board the MODU and vessels will be discharged to the marine environment at a salinity higher than seawater. The volume of the discharge depends on the requirement for fresh (or potable) water and will vary between the vessels and the number of persons on board.

The effluent may contain scale inhibitors that control inorganic scale formation, such as the formation of calcium carbonate and magnesium hydroxide, in water-making plants. Other water treatment chemicals such as chlorine may also be added to the potable water. Other water-making plant cleaning chemicals may be used and discharged to sea after completing the cleaning process.

3.11.6 Ballast Water

The vessels contain ballast seawater for stability reasons and may need to exchange ballast seawater on location. This will be done in accordance with the Australian Ballast Water Management Requirements 2017.

3.11.7 Solid and Liquid Waste

Non-hazardous solid wastes including paper, plastics and packaging, and hazardous solid wastes such as batteries, fluorescent tubes, medical wastes and aerosol cans, will be generated during the Petroleum Activities Program. Liquid waste such as, but not limited to, used engine oil, hydraulic fluids, solvents and paints, may also be produced during the drilling activity. All of these wastes are disposed of onshore.

3.12 Chemical Assessment Process (Production, Cementing, Drill Fluids and Completion Chemicals)

All operational chemicals used in Blacktip activities are considered within the scope of this chemical assessment and selection process. These include production, drilling, cementing, completion and rig chemicals (pipe dopes, threadlock chemicals and such). Chemicals required for maintenance activities (such as paints, lubricants and greases), portable water treatment chemicals, emergency response chemicals and those chemicals used for domestic purposes are considered out of scope. The scope follows the same principles as applied in the United Kingdom under the Offshore Chemical Regulations 2002 (as Amended 2011).

3.12.1 Assessment Process

3.12.1.1 Centre for Environment, Fisheries and Aquaculture Science Offshore Chemical Notification Scheme Registered Chemicals

All chemicals which are registered on the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) Offshore Chemical Notification Scheme (OCNS) list with assigned Hazard Quotient (HQ) Bands of Gold or Silver, or OCNS Groups E or D and have no substitution warnings or product warnings, are determined to not require further assessment, as they do not present a significant impact on the environment in standard discharge scenarios. These chemicals are considered approved for use or discharge for the Blacktip activities.

CEFAS OCNS registered chemicals which have a substitution warning, product warning or have HQ Bands of White, Blue, Orange, Purple or OCNS Groups of A, B or C require assessment by the Eni Environment Team to understand the environment risk of their use and discharge into the marine environment. The Eni HSE Team may either reject or approve once an ALARP assessment is documented and signed off, showing the environmental risk from the use and discharge is acceptable.

3.12.1.2 Non-Centre for Environment, Fisheries and Aquaculture Science Offshore Chemical Notification Scheme Registered Chemicals

All chemicals proposed for use that are not on the CEFAS OCNS register require assessment by the Eni HSE Team to understand the environment impacts of their use and discharge to the marine environment.

3.12.1.3 As Low As Reasonably Practicable Chemical Assessment and Justification for Use or Discharge

CEFAS OCNS-registered chemicals which have a substitution warning, a product warning or have HQ Bands of white, blue, orange, purple or OCNS Groups of A, B or C and any chemical which is not registered under the CEFAS OCNS require further assessment by Eni HSE Team in accordance with the principles of ALARP. This assessment includes:

- assessment of the chemicals application and discharge
- assessment of the ecotoxicity, biodegradation and bioaccumulation potential of the chemical in the marine environment and any other applicable environmental information available (see below)
- investigation of potential alternatives for the chemical, with preference for options that are on the OCNS-Ranked List of Notified Chemicals with OCNS HQ of Gold, Silver, or are Group E or D with no substitution or product warning and chemicals with low ecotoxicity risk (Section 3.12.2), are readily biodegradable (Section 3.12.3) and do not bioaccumulate (Section 3.12.4)
- if no more environmentally suitable alternatives are available, further risk reduction measures (such as controls related to use and discharge) considered for the specific context and implemented where relevant to ensure the risk is ALARP and acceptable
- justification of the selected chemical in respect to others available
- further risk reduction measures; as in, specific controls on its use or future recommendations
- concurrence and sign-off by the relevant Environment Team Lead that the environmental risk associated with the chemical use and discharge is ALARP and acceptable.

The above is included and documented in the Eni HSE Standard: Hazardous Materials Management (ENI-HSE-ST-009).

3.12.2 Ecotoxicity Assessment

Table 3-7 and Table 3-8 can act as guidance in assessing a chemical’s toxicity. Table 3-7 is used by CEFAS to group chemicals based on ecotoxicity results, ‘A’ representing highest toxicity and risk to the environment and ‘E’ lowest. Table 3-8 shows classifications and categories of toxicity against ecotoxicity results.

Table 3-7: Initial Centre for Environment, Fisheries and Aquaculture Science Offshore Chemical Notification Scheme grouping

Initial grouping	A	B	C	D	E
Result for aquatic-toxicity data (ppm)	<1	>1 to 10	>10 to 100	>100 to 1000	>1000
Result for sediment-toxicity data (ppm)	<10	>10 to 100	>100 to 1000	>1000 to 10,000	>10,000

Note: Aquatic Toxicity refers to the Skeletonema costatum EC50, Acartia tonsa LC50 and Scophthalmus maximus (juvenile turbot) LC50 toxicity tests. Source: DMP 2013, Environmental Risk Assessment of Chemicals Used in WA Petroleum Activities Guideline.

Table 3-8: Aquatic species toxicity grouping

Category	Species	LC50 and EC50 criteria
Very toxic	Fish	LC50 (96 hrs) of <1 mg/l
	Crustacea	EC50 (48 hrs) of <1 mg/l
	Algae and other aquatic species	ErC50 (72 or 96 hrs) of 1 mg/l
Toxic	Fish	LC50 (96 hrs) of >1 mg/l to >10 mg/l
	Crustacea	EC50 (48 hrs) of >1 mg/l to <10 mg/l
	Algae and other aquatic species	ErC50 (72 or 96 hrs) of 1 mg/l to <10 mg/l
Harmful	Fish	LC50 (96 hrs) of <10 mg/l to <100 mg/l
	Crustacea	EC50 (48 hrs) of <10 mg/l to <100 mg/l
	Algae and other aquatic species	ErC50 (72 or 96 hrs) of <10 mg/l to <100 mg/l

Source: DMP 2013, Environmental Risk Assessment of Chemicals Used in WA Petroleum Activities Guideline

If a product has no specific ecotoxicity data available, the following options should be considered:

- Ecotoxicity data for analogous products can be referred to where the chemical ingredients and composition are largely identical (for example, Portland cement is produced by different manufacturers, with some having minor variations in content; ecotoxicity from a variation product may be used with careful consideration).
- Ecotoxicity data may be referenced for each separate chemical ingredient (if known) within the product.

3.12.3 Biodegradation Assessment

The biodegradation of chemicals is assessed using the CEFAS biodegradation criteria, which aligns with the categorisation outlined in the DMP Chemical Assessment Guide: *Environmental Risk Assessment of Chemicals used in WA Petroleum Activities Guideline.*

CEFAS categories biodegradation into the following groups:

- Readily biodegradable: results of greater than 60% biodegradation in 28 days to an oil spill prevention, administration and response (OSPAR) harmonised offshore chemical notification format (HOCNF)-accepted ready biodegradation protocol.
- Inherently biodegradable: results greater than 20% and less than 60% to an OSPAR HOCNF-accepted ready biodegradation protocol or result of greater than 20% by OSPAR-accepted inherent biodegradation study.

- Not biodegradable: results from OSPAR HOCNF accepted biodegradation protocol or inherent biodegradation protocol are less than 20%, or half-life values derived from aquatic simulation test indicate persistence.

Chemicals with greater than 60% biodegradation in 28 days to an OSPAR HOCNF-accepted ready biodegradation protocol are considered acceptable in terms of biodegradation.

3.12.4 Bioaccumulation Assessment

The bioaccumulation of chemicals is assessed using the CEFAS bioaccumulation criteria, which aligns with the categorisation outlined in the DMP Chemical Assessment Guide*: Environmental Risk Assessment of Chemicals used in WA Petroleum Activities Guideline* (2013)*.*

The following guidance is used by CEFAS:

- Non-bioaccumulative: LogPow <3, or BCF ≤100 and molecular weight is ≥700.
- Bioaccumulative: LogPow ≥3 or BC>100 and molecular weight is <700.

4 DESCRIPTION OF THE ENVIRONMENT

The purpose of this section is to address the requirements of Regulations 13(2) and 13(3) of the Environment Regulations through describing the existing environment, including values and sensitivities that may be affected by both planned activities and unplanned events.

The description of the environment applies to two spatial areas:

1. the Operational Area (as defined in Section 3.3.1)
2. the environment that may be affected (EMBA) (as defined in Section 4.1)

A third area is referenced in this EP, the Zone of Potential Impact (ZPI) (as defined in Section 8.5 and shown in Figure 4-1), which is smaller than the EMBA. The ZPI is used inform the environmental impact assessment (as detailed in Section 8.6) and may be representative of an area of biological impact from hydrocarbons.

While this section summarises the values and sensitivities within the Operational Area and EMBA. A full description of the environmental values and sensitivities relevant to the Operational Area and EMBA is provided in Appendix B.

Searches for protected species listed under the EPBC Act were undertaken for the Operational Area, ZPI and EMBA (refer Appendix B attachments), using the DCCEEW Protected Matters Search Tool (PMST) for the purpose of identifying matters of national environmental significance listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This section is informed by this search.

4.1 Determination of the EMBA

Stochastic hydrocarbon dispersion and fate modelling has been performed on the worst-case credible hydrocarbon releases from the Petroleum Activities Program. The EMBA (Figure 4-1) encompasses the outermost boundary of the worst-case spatial extent of the credible hydrocarbon release scenarios, based on the hydrocarbon low exposure values presented in Table 4-1, which have been justified in Section 8.5.

Table 4-1: Credible hydrocarbon release scenarios and exposure thresholds applied to create the EMBA

Spill scenario	Threshold applied to create the EMBA	Modelling
100 m³ surface loss of marine gas oil (MDO) from vessel collision at the WHP	Weathering of surface hydrocarbon to zero and that the surface spill will travel at 100% of the speed and direction of ambient currents, and 3% of speed and direction of local wind	ADIOS II
4943 m³ surface loss of Blacktip condensate as a result of a well blowout during drilling of the development wells	Surface Hydrocarbon (1 g/m²) Entrained hydrocarbon (10 ppb) Dissolved aromatic hydrocarbon (6 ppb) Shoreline (10 g/m²)	APASA

The EMBA establishes a planning area for scientific monitoring, based on the potential for exceeding water quality triggers or socioeconomic effects. For further details on the extent of the EMBA, informed by the APASA modelling, refer Section 8.5.2.

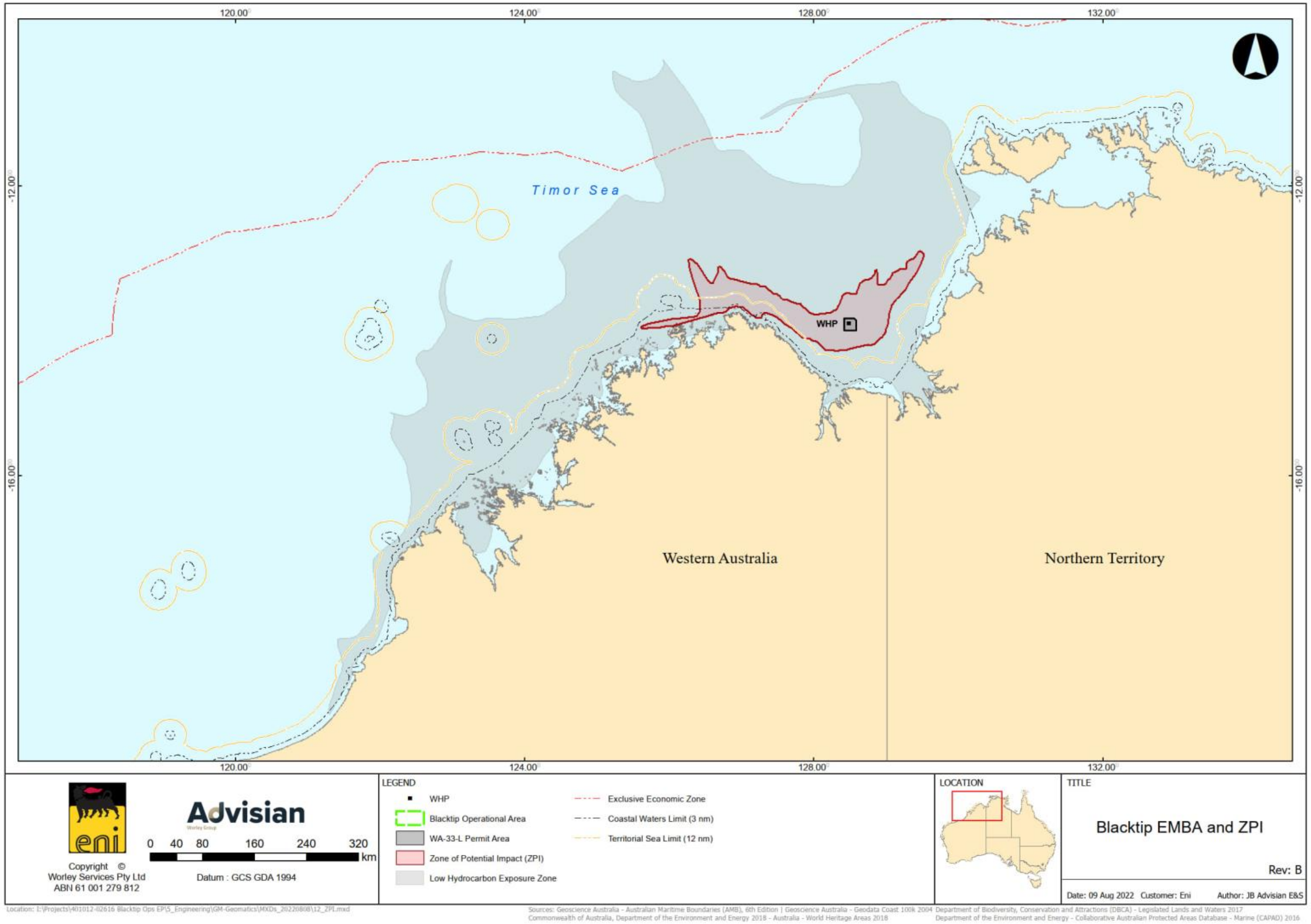


Figure 4-1: The EMBA and ZPI for the Petroleum Activities Program

4.2 Particular Relevant Values and Sensitivities of the Environment

Table 4-2 and Table 4-3 summarise the MNES (EPBC Act) identified as potentially occurring within the Operational Area and EMBA, respectively, as determined by the PMST results (Appendix B).

Additional information about identified MNES is provided throughout this section and in Appendix B.

Table 4-2: Summary of matters of national environmental significance within the Operational Area

MNES	Number	Relevant Section
World Heritage Properties	0	Section 4.5.4
National Heritage Places	0	Section 4.5.3
Wetlands of International Importance (Ramsar)	0	N/A
Commonwealth Marine Areas	0	N/A
Listed Threatened Ecological Communities	0	N/A
Listed Threatened Species [1]	12	Section 4.4
Listed Migratory Species [1] [2]	19	Section 4.4

Note 1: Terrestrial species (such as terrestrial mammals, reptiles and bird species) that appear in the PMST results of the EMBA and do not have habitats along shorelines are not relevant to the Petroleum Activities Program impacts and risks and have, therefore, not been included in these numbers.

Note 2: The EPBC Act categorise migratory and threatened species independently; therefore, migratory species can also be threatened.

Table 4-3: Summary of matters of national environmental significance within the EMBA

MNES	Number	Relevant Section
World Heritage Properties	0	Section 4.5.4
National Heritage Places	1	Section 4.5.3
Wetlands of International Importance (Ramsar)	1	Section 4.5.5
Commonwealth Marine Areas	1	Section 4.5.1
Listed Threatened Ecological Communities	0	N/A
Listed Threatened Species [1]	32	Section 4.4
Listed Migratory Species [1] [2]	81	Section 4.4

Note 1: Terrestrial species (such as terrestrial mammals, reptiles and bird species) that appear in the PMST results of the EMBA and do not have habitats along shorelines are not relevant to the Petroleum Activities Program impacts and risks and have, therefore, not been included in these numbers.

Note 2: The EPBC Act categorise migratory and threatened species independently, therefore migratory species can also be threatened.

4.3 Regional Setting

The Blacktip WHP is within the JBG, which lies over the Sahul Shelf in the Timor Sea from west of Bathurst Island to the eastern boundary of the North-west Marine Region (Figure 4-2). The JBG is characterised by complex geomorphology, including:

- coastal, shelf and basin features in the JBG

- dissected banks, shoals, valleys and terraces on the Van Diemen Rise
- deeper areas on the shelf slope to the north of the Van Diemen Rise.

The JBG is an area of soft substrate expanses with localised rocky outcrops, gravel deposits and raised features (URS, 2009). Some areas contain high densities of pockmarks and sand waves, and calcarenite subcrops occur in the far northwest in an 11 km wide palaeo-channel (URS, 2009). Benthic communities are exposed to strong tidal currents, high turbidity and substantial sediment mobility, with disturbance decreasing offshore.

The Bonaparte Basin, which dominates the western portion of the JBG system, was formed between 15,000 to 13,000 years ago after rapid sea level rise inundated most of the Sahul Shelf, creating fully open marine conditions within the area known as the Bonaparte Depression. During the late quaternary, the environment of the Bonaparte Depression varied with fluctuating sea levels and climatic conditions, from an estuarine embayment to a shallow, freshwater lake. Extensive palaeo-river channels, some up to 150 km long, 5 km wide and 240 m deep, connect the present-day basin to the old shoreline at the edge of the shelf (Heyward, 1997).

The JBG has been included in several continent-scale habitat classifications. The most recent being the Commonwealth bioregionalisation (IMCRA 4.0) which places most of the JBG into a single provincial bioregion the Northwest Shelf Transition. IMCRA further classifies Australia's marine regions into smaller meso-scale bioregions, five of which overlap the JBG.

Transitional bioregions are regions that overlap between core centres of demersal fish endemicity (Przeslawski *et al.,* 2012). The Northwest Shelf Transition bioregion connects the Commonwealth planning areas of the North-west Marine Region Planning Area and the North Marine Planning Area. The Commonwealth planning regions and IMCRA classifications for the JBG region are summarised in Table 4-4.

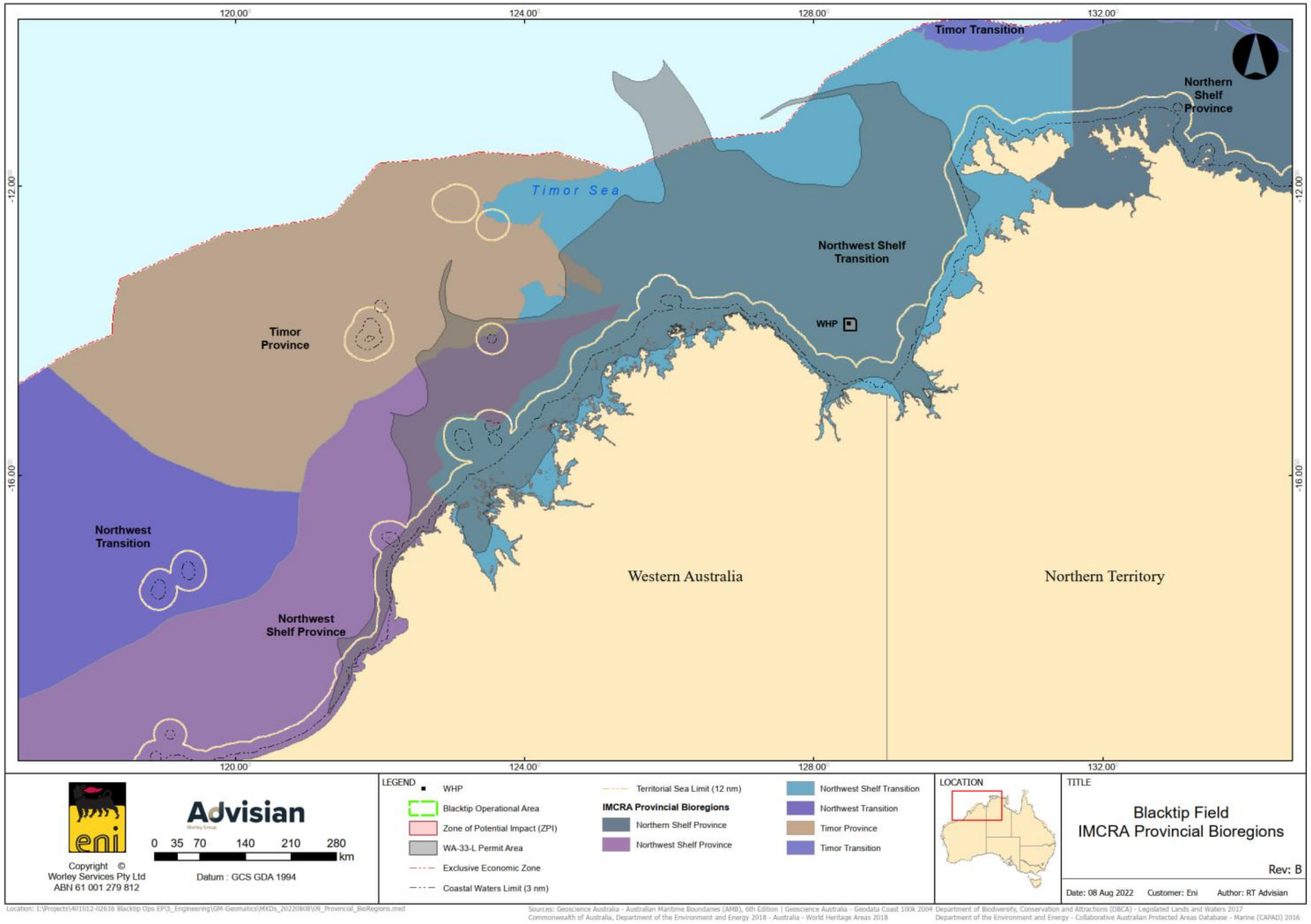


Figure 4-2: Provincial bioregions within the Operational Area and EMBA

Table 4-4: Summary of regional classification systems under IMCRA 4.0 and the Commonwealth marine areas for the permit area

<table>
<tr><th colspan="3">Classification System</th><th>Blacktip Area</th></tr>
<tr><td colspan="3">Commonwealth marine areas</td><td>North-west Marine Region
Also borders the North Marine Region</td></tr>
<tr><td rowspan="4">IMCRA 4.0 Provincial Bioregions</td><td rowspan="3">Benthic regionalisation</td><td>Provincial bioregion</td><td>Northwest IMCRA Transition</td></tr>
<tr><td>Meso-scale region</td><td>Bonaparte Gulf
Cambridge – Bonaparte
Anson Beagle</td></tr>
<tr><td>Geomorphic units</td><td>Shelf</td></tr>
<tr><td>Pelagic regionalisation (IMCRA, 1998)</td><td>Province</td><td>Northern Pelagic Province</td></tr>
</table>

4.4 Threatened and Migratory Species and Ecological Communities

A search of the EPBC PMST was undertaken using areas that covered the full extent of the Operational Area and EMBA, respectively, to identify MNES under the EPBC Act. Full PMST Reports are for the Operational Area and EMBA are included in Appendix B attachments. The PMST results identified 12 marine fauna species listed as `threatened' species and 19 marine fauna species listed as `migratory' within the Operational Area. In the EMBA there were 32 'threatened' and 81 'migratory' species identified, (Table 4-5). All of the species listed as 'threatened' under the EPBC Act are also 'Protected' under State legislation under the *Wildlife Conservation Act 1950*. A full description of the identified threatened and migratory species is included in Appendix B.

Terrestrial species (such as terrestrial mammals, reptiles and bird species) that appear in the PMST of the EMBA and do not have habitats along shorelines are not relevant to the Petroleum Activities Program impacts and have been excluded from Table 4-5.

Table 4-6 outlines the recovery plans and conservation advices relevant to those species identified by the PMST as potentially occurring within or using habitat in the Operational Area and EMBA, and summarises the key threats to those species, as described in relevant recovery plans and conservation advices. Section 9 includes an assessment of the Petroleum Activities Program against the actions and objectives within the recovery plans and threat abatement plans.

Species with designated biologically important areas (BIAs) and Habitat Critical to their Survival (Habitat Critical) overlapping the EMBA and Operational Area have been identified in Section 4.4.1 and Section 4.4.2, respectively.

Table 4-5: Commonwealth listed threatened and migratory species

Scientific name	Common name	EPBC status	Presence in Operational Area	Presence in EMBA
Birds				
Acrocephalus orientalis	Oriental reed-warbler	Migratory	N/A	Species or species habitat known to occur within area
Actitis hypoleucos	Common sandpiper	Migratory	Species or species habitat may occur within area	Species or species habitat known to occur within area
Anous stolidus	Common noddy	Migratory	Species or species habitat may occur within area	Species or species habitat likely to occur within area
Anous tenuirostris melanops	Australian Lesser Noddy	Vulnerable	N/A	Breeding known to occur within area
Apus pacificus	Fork-tailed Swift	Migratory	N/A	Species or species habitat likely to occur within area
Calidris acuminata	Sharp-tailed sandpiper	Migratory	Species or species habitat may occur within area	Roosting known to occur within area
Calidris alba	Sanderling	Migratory	N/A	Roosting known to occur within area
Calidris canutus	Red knot	Migratory/ Endangered	Species or species habitat may occur within area	Species or species habitat known to occur within area
Calidris ferruginea	Curlew sandpiper	Migratory/ Critically Endangered	Species or species habitat may occur within area	Species or species habitat known to occur within area
Calidris melanotos	Pectoral sandpiper	Migratory	Species or species habitat may occur within area	Species or species habitat known to occur within area
Calidris ruficollis	Red-necked Stint	Migratory	N/A	Roosting known to occur within area
Calidris tenuirostris	Great Knot	Migratory/ Critically Endangered	N/A	Roosting known to occur within area
Calonectris leucomelas	Streaked shearwater	Migratory	Species or species habitat likely to occur within area	Species or species habitat known to occur within area

Scientific name	Common name	EPBC status	Presence in Operational Area	Presence in EMBA
Cecropis daurica	Red-rumped swallow	Migratory	N/A	Species or species habitat may occur within area
Charadrius leschenaultii	Greater sand plover	Migratory/ Vulnerable	N/A	Species or species habitat known to occur within area
Charadrius mongolus	Lesser Sand Plover	Migratory/ Endangered	N/A	Roosting known to occur within area
Charadrius veredus	Oriental plover	Migratory	N/A	Roosting known to occur within area
Cuculus optatus	Oriental cuckoo	Migratory	N/A	Species or species habitat known to occur within area
Erythrotriorchis radiatus	Red goshawk	Vulnerable	N/A	Species or species habitat known to occur within area
Fregata ariel	Lesser frigatebird	Migratory	Species or species habitat likely to occur within area	Breeding known to occur within area
Fregata minor	Great frigatebird	Migratory	Species or species habitat may occur within area	Species or species habitat likely to occur within area
Gallinago megala	Swinhoe's Snipe	Migratory	N/A	Roosting likely to occur within area
Gallinago stenura	Pin-tailed Snipe	Migratory	N/A	Roosting likely to occur within area
Glareola maldivarum	Oriental pratincole	Migratory	N/A	Roosting known to occur within area
Hirundo rustica	Barn swallow	Migratory	N/A	Species or species habitat known to occur within area
Hydroprogne caspia	Caspian Tern	Migratory	N/A	Breeding known to occur within area
Limicola falcinellus	Broad-billed Sandpiper	Migratory	N/A	Roosting known to occur within area
Limnodromus semipalmatus	Asian Dowitcher	Migratory	N/A	Species or species habitat known to occur within area
Limosa lapponica	Bar-tailed godwit	Migratory	N/A	Species or species habitat known to occur within area
Limosa lapponica baueri	Nunivak Bar-tailed Godwit	Vulnerable	N/A	Species or species habitat may occur within area

Scientific name	Common name	EPBC status	Presence in Operational Area	Presence in EMBA
Limosa lapponica menzbieri	Northern Siberian bar-tailed godwit	Critically Endangered	N/A	Species or species habitat known to occur within area
Limosa limosa	Black-tailed Godwit	Migratory	N/A	Roosting known to occur within area
Motacilla cinerea	Grey wagtail	Migratory	N/A	Species or species habitat known to occur within area
Motacilla flava	Yellow wagtail	Migratory	N/A	Species or species habitat known to occur within area
Numenius madagascariensis	Eastern curlew	Migratory/ Critically Endangered	Species or species habitat may occur within area	Species or species habitat known to occur within area
Numenius minutus	Little Curlew	Migratory	N/A	Roosting known to occur within area
Numenius phaeopus	Whimbrel	Migratory	N/A	Roosting known to occur within area
Onychoprion anaethetus	Bridled tern	Migratory	N/A	Breeding known to occur within area
Pandion haliaetus	Osprey	Migratory	N/A	Breeding known to occur within area
Papasula abbotti	Abbott's Booby	Endangered	N/A	Species or species habitat may occur within area
Phaethon lepturus	White-tailed tropicbird	Migratory	Species or species habitat may occur within area	Species or species habitat known to occur within area
Philomachus pugnax	Ruff (Reeve)	Migratory	N/A	Roosting known to occur within area
Pluvialis fulva	Pacific Golden Plover	Migratory	N/A	Roosting known to occur within area
Pluvialis squatarola	Grey Plover	Migratory	N/A	Roosting known to occur within area
Rhipidura rufifrons	Rufous Fantail	Migratory	N/A	Species or species habitat likely to occur within area
Rostratula australis	Australian Painted Snipe	Endangered	N/A	Species or species habitat likely to occur within area
Sterna dougallii	Roseate tern	Migratory	N/A	Breeding known to occur within area
Sternula albifrons	Little tern	Migratory	N/A	Breeding known to occur within area

Scientific name	Common name	EPBC status	Presence in Operational Area	Presence in EMBA
Sula dactylatra	Masked Booby	Migratory	N/A	Breeding known to occur within area
Sula leucogaster	Brown Booby	Migratory	N/A	Breeding known to occur within area
Sula sula	Red-footed Booby	Migratory	N/A	Breeding known to occur within area
Thalasseus bergii	Greater Crested Tern	Migratory	N/A	Breeding known to occur within area
Tringa brevipes	Grey-tailed Tattler	Migratory	N/A	Roosting known to occur within area
Tringa nebularia	Common Greenshank	Migratory	N/A	Species or species habitat known to occur within area
Tringa stagnatilis	Marsh Sandpiper	Migratory	N/A	Roosting known to occur within area
Tringa totanus	Common Redshank	Migratory	N/A	Roosting known to occur within area
Xenus cinereus	Terek Sandpiper	Migratory	N/A	Roosting known to occur within area
Fish, Sharks and Rays				
Anoxypristis cuspidata	Narrow sawfish	Migratory	Species or species habitat likely to occur within area	Species or species habitat likely to occur within area
Carcharhinus longimanus	Oceanic whitetip shark	Migratory	Species or species habitat may occur within area	Species or species habitat may occur within area
Carcharodon carcharias	Great white shark	Migratory/ Vulnerable	Species or species habitat may occur within area	Species or species habitat may occur within area
Glyphis garricki	Northern river shark	Migratory/ Endangered	Species or species habitat may occur within area	Breeding known to occur within area
Glyphis glyphis	Speartooth Shark	Critically Endangered		Species or species habitat may occur within area
Isurus oxyrinchus	Shortfin mako	Migratory	Species or species habitat likely to occur within area	Species or species habitat likely to occur within area

Scientific name	Common name	EPBC status	Presence in Operational Area	Presence in EMBA
Isurus paucus	Longfin mako	Migratory	Species or species habitat likely to occur within area	Species or species habitat likely to occur within area
Mobula alfredi	Reef manta ray	Migratory	Species or species habitat likely to occur within area	Species or species habitat known to occur within area
Mobula birostris	Giant manta ray	Migratory	Species or species habitat likely to occur within area	Species or species habitat likely to occur within area
Pristis clavata	Dwarf sawfish	Migratory/ Vulnerable	Species or species habitat known to occur within area	Breeding known to occur within area
Pristis pristis	Freshwater sawfish	Migratory/ Vulnerable	Species or species habitat may occur within area	Species or species habitat known to occur within area
Pristis zijsron	Green sawfish	Migratory/ Vulnerable	Species or species habitat known to occur within area	Breeding known to occur within area
Rhincodon typus	Whale shark	Migratory/ Vulnerable	Species or species habitat may occur within area	Foraging, feeding or related behaviour known to occur within area
Sphyrna lewini	Scalloped hammerhead	Conservation Dependent	Species or species habitat likely to occur within area	Species or species habitat known to occur within area
Thunnus maccoyii	Southern bluefin tuna	Conservation Dependent	N/A	Breeding known to occur within area
Marine Mammals				
Balaenoptera borealis	Sei whale	Migratory/ Vulnerable	Species or species habitat may occur within area	Species or species habitat likely to occur within area
Balaenoptera edeni	Bryde's whale	Migratory	Species or species habitat may occur within area	Species or species habitat likely to occur within area
Balaenoptera musculus	Blue whale	Migratory/ Endangered	Species or species habitat may occur within area	Migration route known to occur within area

Scientific name	Common name	EPBC status	Presence in Operational Area	Presence in EMBA
Balaenoptera physalus	Fin whale	Migratory/ Vulnerable	Species or species habitat may occur within area	Species or species habitat likely to occur within area
Dugong dugon	Dugong	Migratory	Species or species habitat may occur within area	Migration route known to occur within area
Megaptera novaeangliae	Humpback whale	Migratory	Species or species habitat likely to occur within area	Breeding known to occur within area
Orcaella heinsohni	Australian snubfin dolphin	Migratory	N/A	Species or species habitat known to occur within area
Orcinus orca	Killer whale	Migratory	Species or species habitat may occur within area	Species or species habitat may occur within area
Physeter macrocephalus	Sperm Whale	Migratory	N/A	Species or species habitat may occur within area
Sousa sahulensis	Australian humpback dolphin	Migratory	N/A	Breeding known to occur within area
Tursiops aduncus (Arafura/Timor Sea populations)	Spotted bottlenose dolphin	Migratory	Species or species habitat likely to occur within area	Species or species habitat known to occur within area
Marine Reptiles				
Aipysurus apraefrontalis	Short-nosed sea snake	Critically Endangered	N/A	Species or habitat likely to occur
Aipysurus foliosquama	Leaf-scaled sea snake	Critically Endangered	N/A	Species or species habitat may occur within area
Caretta caretta	Loggerhead turtle	Migratory/ Endangered	Species or species habitat likely to occur within area	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas	Green turtle	Vulnerable/ Migratory	Species or species habitat known to occur within area	Breeding known to occur within area
Crocodylus porosus	Saltwater crocodile	Migratory	Species or habitat likely to occur	Species or habitat likely to occur

Scientific name	Common name	EPBC status	Presence in Operational Area	Presence in EMBA
Dermochelys coriacea	Leatherback turtle	Migratory/ Endangered	Species or species habitat likely to occur within area	Breeding likely to occur within area
Eretmochelys imbricata	Hawksbill turtle	Migratory/ Vulnerable	Species or species habitat likely to occur within area	Foraging, feeding or related behaviour known to occur within area
Lepidochelys olivacea	Olive Ridley turtle	Migratory/ Endangered	Species or species habitat known to occur within area	Foraging, feeding or related behaviour known to occur within area
Natator depressus	Flatback turtle	Migratory/ Vulnerable	Congregation or aggregation known to occur within area	Breeding known to occur within area

Table 4-6: Conservation advice for *Environment Protection and Biodiversity Conservation Act* listed species identified in the Protected Matters Search Tool

Species	Recovery plan/conservation advice	Key threats identified in the recovery plan and conservation advice	Summary of relevant management and conservation actions	Relevant EP section
All Vertebrate Fauna				
All vertebrate fauna	Threat abatement plan for the impacts of marine debris on vertebrate marine life (Commonwealth of Australia, 2018)	Marine debris	No explicit management actions for non-fisheries-related industries (note that management actions in the plan relate largely to managing fishing waste (such as 'ghost' gear), and State and Commonwealth management through regulation)	Section 8.1
Marine Mammals				
Sei whale	Conservation advice *Balaenoptera borealis* sei whale (2015)	Noise interference	Assess and manage acoustic disturbance	Section 7.3
		Vessel disturbance	Assess and manage physical disturbance and development activities	Section 8.2
Blue whale	Conservation management plan for the blue whale: A recovery plan under the EPBC Act 1999 2015–2025 (Commonwealth of Australia, 2015a)	Noise interference	Assess and address anthropogenic noise	Section 7.3
		Vessel disturbance	Minimise vessel collisions	Section 8.2
Fin whale	Approved conservation advice for *Balaenoptera physalus* (fin whale) (2015)	Noise interference	Assess and address anthropogenic noise	Section 7.3
		Vessel disturbance	Minimise vessel collisions	Section 8.2

Species	Recovery plan/conservation advice	Key threats identified in the recovery plan and conservation advice	Summary of relevant management and conservation actions	Relevant EP section
Humpback whale	Approved conservation advice for *Megaptera novaeangliae* (humpback whale) (2015)	Noise interference	For actions involving acoustic impacts (example pile driving, explosives) on humpback whale calving, resting, feeding area or confined migratory pathways, site-specific acoustic modelling should be undertaken (including cumulative noise impacts)	Section 7.3
		Vessel disturbance	Ensure the risk of vessel strike on humpback whales is considered when assessing actions that increase vessel traffic in areas where humpback whales occur and, if required, implement appropriate mitigation measures to reduce the risk of vessel strike	Section 8.2
Reptiles				
All marine turtle species (loggerhead, green, leatherback, hawksbill, flatback, Olive Ridley)	Recovery plan for marine turtles in Australia (Commonwealth of Australia, 2017)	Chemical and terrestrial discharge (oil pollution)	Ensure spill risk strategies and response programs include management for turtles and their habitats	Section 8.6
		Light pollution	Minimise light pollution	Section 7.5
		Vessel disturbance	No relevant management actions identified; vessel strikes identified as a threat	Section 8.2
		Noise interference	No relevant management actions identified; vessel strikes identified as a threat	Section 7.3
Leatherback turtle	Approved conservation advice on *Dermochelys coriacea* (2008)	Vessel disturbance	No relevant management actions identified; vessel strikes identified as a threat	Section 8.2
Short-nosed sea snake	Approved conservation advice for *Aipysurus apraefrontalis* (2011)	Habitat degradation/ modification	No explicit relevant management actions; habitat loss, disturbance and modification identified as a threat	Sections 8.6 and 8.7

Species	Recovery plan/conservation advice	Key threats identified in the recovery plan and conservation advice	Summary of relevant management and conservation actions	Relevant EP section
Sharks and Rays				
Sawfish (green, dwarf, freshwater)	Sawfish and river shark multispecies recovery plan (Commonwealth of Australia, 2015b)	Habitat degradation/ modification	No explicit relevant management actions; habitat loss, disturbance and modification identified as a threat	Sections 8.6 and 8.7
Green sawfish	Approved conservation advice for green sawfish (2008)	Habitat degradation/ modification	No relevant management actions identified; habitat loss, disturbance and modification identified as a threat	Sections 8.6 and 8.7
Dwarf sawfish	Approved conservation advice for *Pristis clavata* (dwarf sawfish) (2009)	Habitat degradation/ modification	No relevant management actions identified; habitat loss, disturbance and modification identified as a threat	Sections 8.6 and 8.7
Freshwater sawfish	Approved conservation advice for *Pristis pristis* (largetooth sawfish) (2014)	Habitat degradation/ modification	No relevant management actions identified; habitat loss, disturbance and modification identified as a threat	Sections 8.6 and 8.7
Northern river shark	Approved conservation advice for *Glyphis garricki* (northern river shark) (2014) Sawfish and River Sharks Multispecies Recovery Plan (CoA, 2015a)	Habitat degradation/ modification	No relevant management actions identified; habitat loss, disturbance and modification identified as a threat	Sections 8.6 and 8.7
Great White Shark	Recovery Plan for the White Shark (Carcharodon carcharias) (DSEWPaC, 2013)	Ecosystem effects	None applicable	Sections 8.6 and 8.7
Speartooth Shark	Approved Conservation Advice for Glyphis glyphis (speartooth shark) (DoE, 2014) Sawfish and River Sharks Multispecies Recovery Plan (CoA, 2015a)	Habitat degradation/ modification	No relevant management actions identified; habitat loss, disturbance and modification identified as a threat	Sections 8.6 and 8.7

Species	Recovery plan/conservation advice	Key threats identified in the recovery plan and conservation advice	Summary of relevant management and conservation actions	Relevant EP section
Whale shark	Approved conservation advice for *Rhincodon typus* (whale shark) (2015)	Vessel disturbance	None applicable	Section 8.2
Birds				
Migratory shorebird species	Wildlife conservation plan for migratory shorebirds (2015)	Habitat degradation/ modification	Ensure all areas important to migratory shorebirds in Australia continue to be considered in development assessment process	Sections 8.6 and 8.7
Abbott's booby	Conservation advice *Papasula abbotti* Abbott's booby (2015)	Habitat degradation/ modification	None applicable	Sections 8.6 and 8.7
Curlew sandpiper	Conservation advice *Calidris ferruginea* curlew sandpiper (2015)	Acute pollution	Ensure all areas important to migratory shorebirds in Australia continue to be considered in development assessment process	Sections 8.6 and 8.7
Red knot	Approved conservation advice for *Calidris canutus* (red knot) (2016)	Pollution/contamination	No relevant management actions identified; pollution identified as a threat	Sections 8.6 and 8.7
Eastern curlew	Approved Conservation Advice for *Numenius madagascariensis* (2015)	Acute pollution	Ensure all areas important to migratory shorebirds in Australia continue to be considered in development assessment process	Sections 8.6 and 8.7
Bar-tailed godwit (baueri)	Conservation advice *Limosa lapponica baueri* bar-tailed godwit (2016)	Pollution/contamination	No relevant management actions identified; pollution identified as a threat	Sections 8.6 and 8.7
Northern Siberian bar-tailed godwit	Conservation advice *Limosa lapponica menzbieri* bar-tailed godwit (northern Siberian) (2016)	Pollution/contamination	No relevant management actions identified; pollution identified as a threat	Sections 8.6 and 8.7
Australian painted snipe	Approved conservation advice for *Rostratula australis* (2013)	Pollution/contamination	No relevant management actions identified; pollution identified as a threat	Sections 8.6 and 8.7

Species	Recovery plan/conservation advice	Key threats identified in the recovery plan and conservation advice	Summary of relevant management and conservation actions	Relevant EP section
Gouldian Finch	National Recovery Plan for the Gouldian Finch (Erythrura gouldiae).(DEWR, 2006)	Pollution/contamination	No relevant management actions identified; pollution identified as a threat	Sections 8.6 and 8.7
Great Knot	Conservation Advice Calidris tenuirostriss Great knot. (TTSC, 2016)	Pollution/contamination	No relevant management actions identified; pollution identified as a threat	Sections 8.6 and 8.7
Lesser sand plover	Conservation Advice Charadrius mongolus Lesser sand plover (TSSC, 2016)	Pollution/contamination	No relevant management actions identified; pollution identified as a threat	Sections 8.6 and 8.7

4.4.1 Biologically Important Areas

BIAs are those locations where aggregations of members of a species are known to undertake biologically important behaviours, such as breeding, resting, foraging or migration (DoEE, 2017). BIAs have been identified using expert scientific knowledge about species' abundance, distribution and behaviours. BIAs identified within the Operational Area and EMBA are identified in Table 4-7.

Table 4-7: Biologically important areas within the Operational Area and EMBA

Species	BIA type	Overlaps Operational Area	Overlaps EMBA	Distance from Operational Area (km)	Figure
Marine Reptiles					
Green turtle	Foraging	Yes	Yes	Overlaps	Figure 4-3
	Nesting	No	Yes	300 km west	
	Internesting buffer	No	Yes	285 km west	
Flatback turtle	Internesting buffer	No	Yes	8 km south	
	Internesting	No	Yes	160 km north-west	
	Foraging	No	Yes	95 km north	
Loggerhead turtle	Foraging	No	Yes	100 km north	
Olive Ridley turtle	Foraging	Yes	Yes	Overlaps	Figure 4-4
Marine Mammals					
Australian snubfin dolphin	Breeding	No	Yes	100 km west	Figure 4-5
	Calving	No	Yes	85 km south	
	Foraging (high-density prey)	No	Yes	100 km west	
	Resting	No	Yes	130 km west	
Indo-Pacific humpback dolphin	Foraging (including high-density prey)	No	Yes	430 km south west-west	Figure 4-6
	Foraging	No	Yes	270 km west	
	Significant habitat	No	Yes	130 km west	
	Breeding	No	Yes	385 km south-west	
Indo-Pacific/Spotted	Calving	No	Yes	430 km south-west	Figure 4-7

Species	BIA type	Overlaps Operational Area	Overlaps EMBA	Distance from Operational Area (km)	Figure
Bottlenose Dolphin	Foraging	No	Yes	560 km south-west	-
Dugong	Foraging	No	Yes	640 km south-west	-
Humpback Whale	Nursing	No	Yes	370 km south west-west	Figure 4-8
	Migration (north and south)	No	Yes	750 km south-west	
Pygmy Blue Whale	Migration	No	Yes	430 km north west-west	
	Distribution	No	Yes	680 km south-west	
Seabirds and Shorebirds					
Lesser crested tern	Breeding	No	Yes	55 km south west-west	Figure 4-9
Lesser frigate bird	Breeding	No	Yes	180 km west	
Roseate tern	Breeding	No	Yes	180 km west	
Brown Booby	Breeding	No	Yes	400 km south west-west	
Greater Frigatebird	Breeding	No	Yes	490 km south west-west	
Little Tern	Breeding	No	Yes	270 km west	
	Resting	No	Yes	560 km south-west	
Red-footed Booby	Breeding	No	Yes	500 km south west-west	
Wedge-tailed Shearwater	Breeding	No	Yes	600 km north west-west	
White-tailed Tropicbird	Breeding	No	Yes	600 km north west-west	
Fish, Sharks, and Rays					
Dwarf Sawfish	Foraging	No	Yes	470 km south-west	-
	Nursing	No	Yes	600 km south-west	-
	Juvenile	No	Yes	650 km south-west	-
Freshwater Sawfish	Foraging	No	Yes	614 km south-west	-
Green Sawfish	Foraging	No	Yes	470 km south-west	-

Species	BIA type	Overlaps Operational Area	Overlaps EMBA	Distance from Operational Area (km)	Figure
	Pupping	No	Yes	650 km south-west	-
	Nursing	No	Yes	900 km south-west	-
Whale Shark	Foraging	No	Yes	280 km west	Figure 4-8

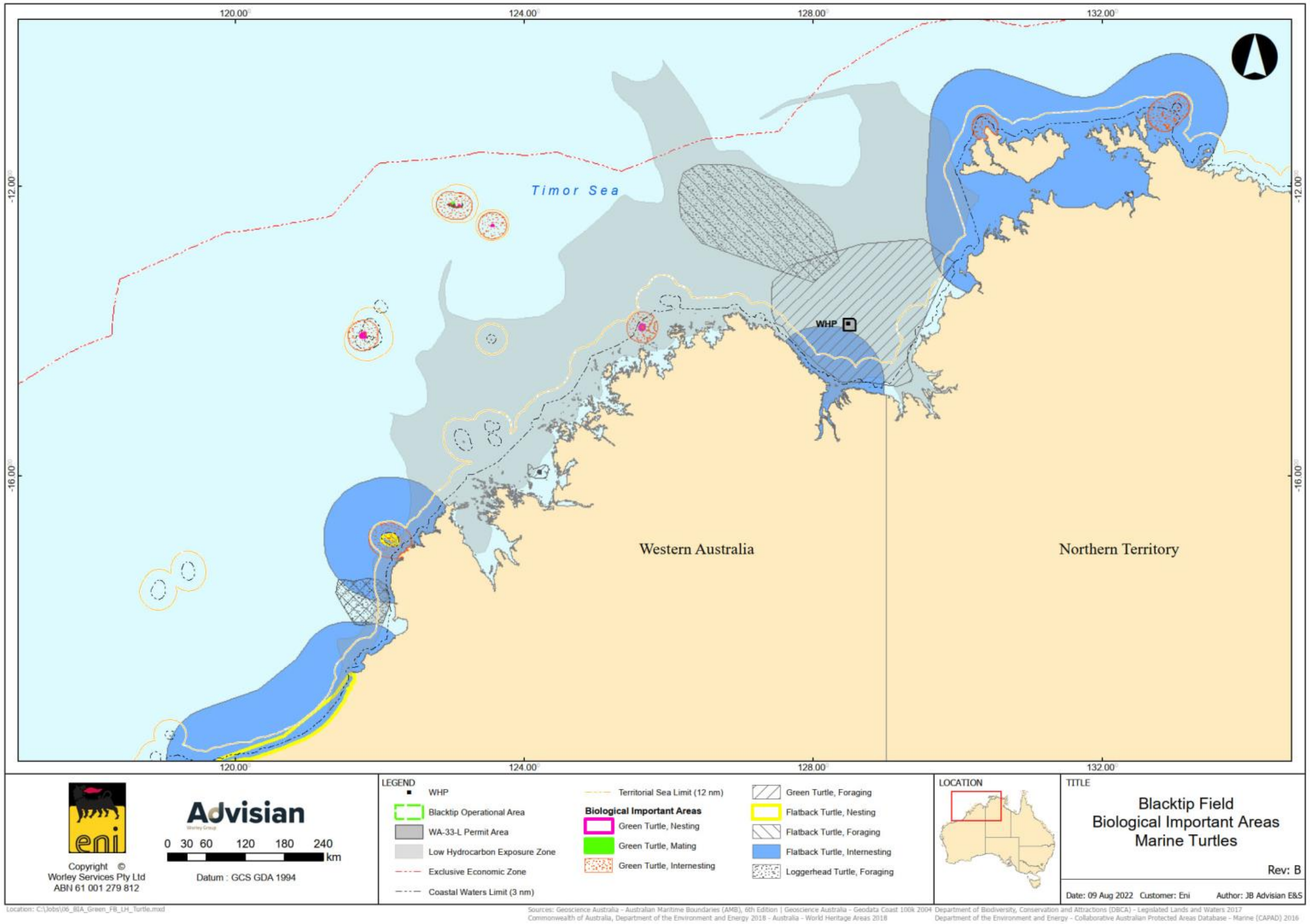


Figure 4-3: Biologically important areas for the Green, Flatback and Loggerhead turtle within the EMBA

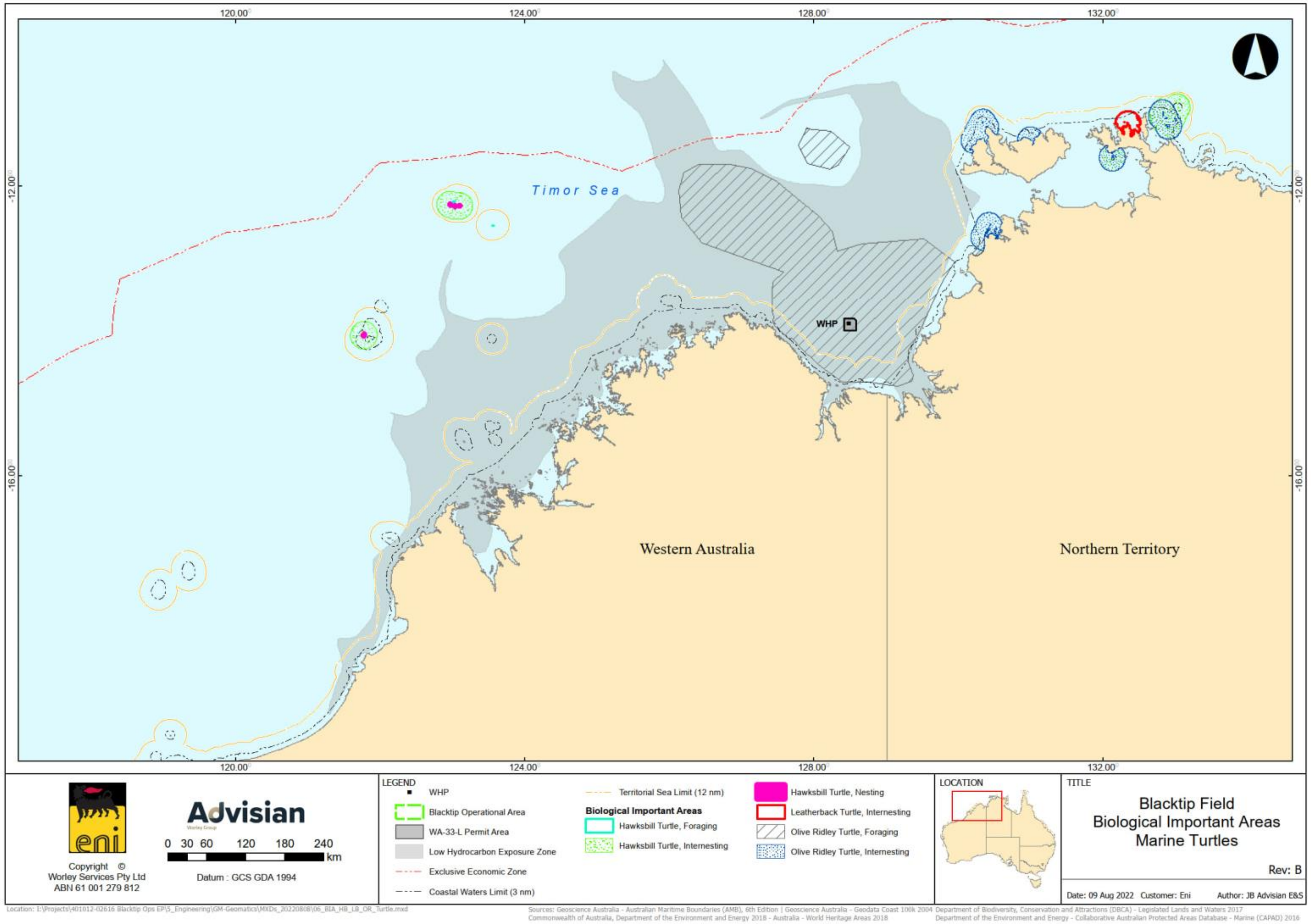


Figure 4-4: Biologically important areas for the Olive Ridley turtle within the EMBA

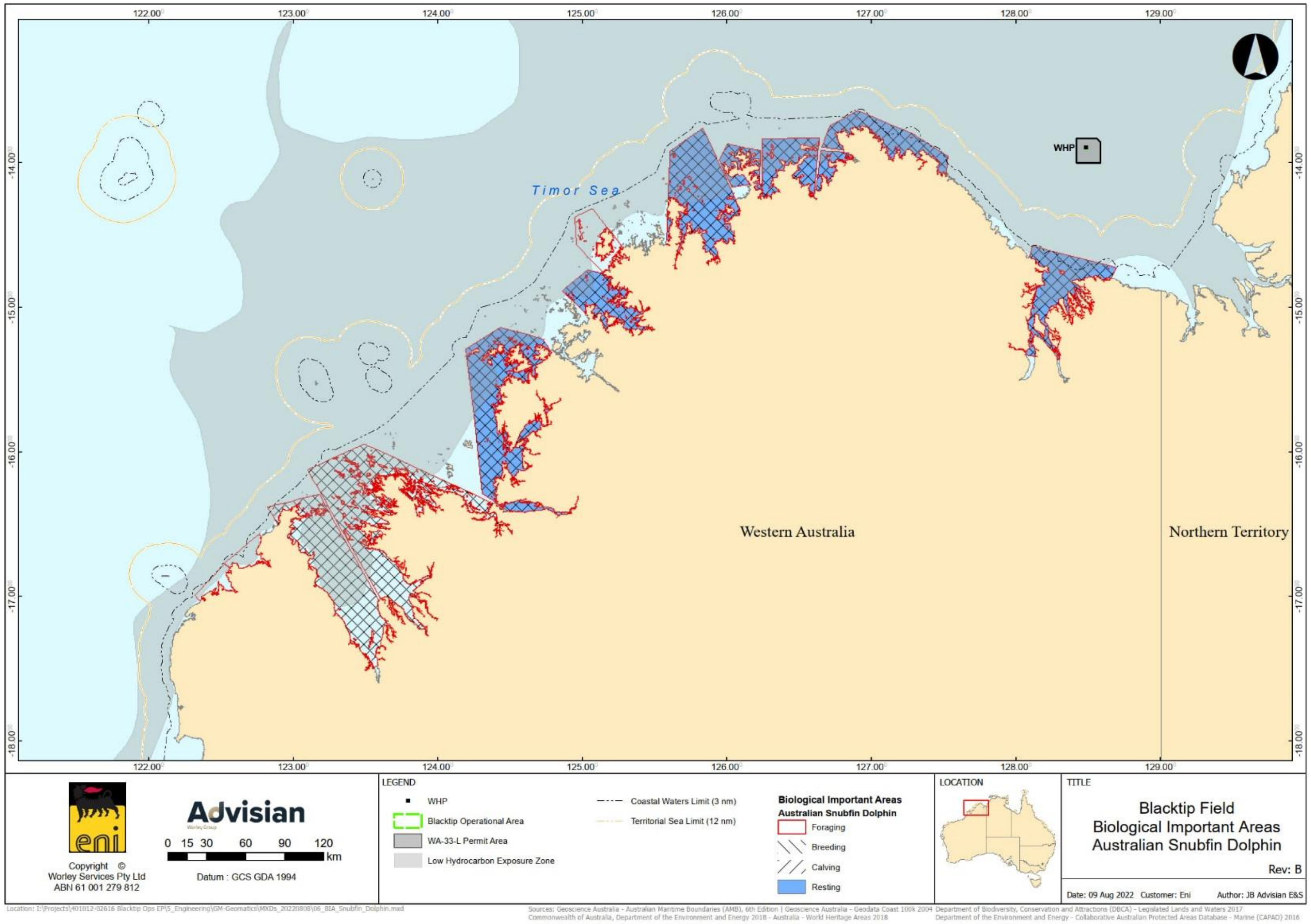


Figure 4-5: Biologically important areas for the Australian snubfin dolphin within the EMBA

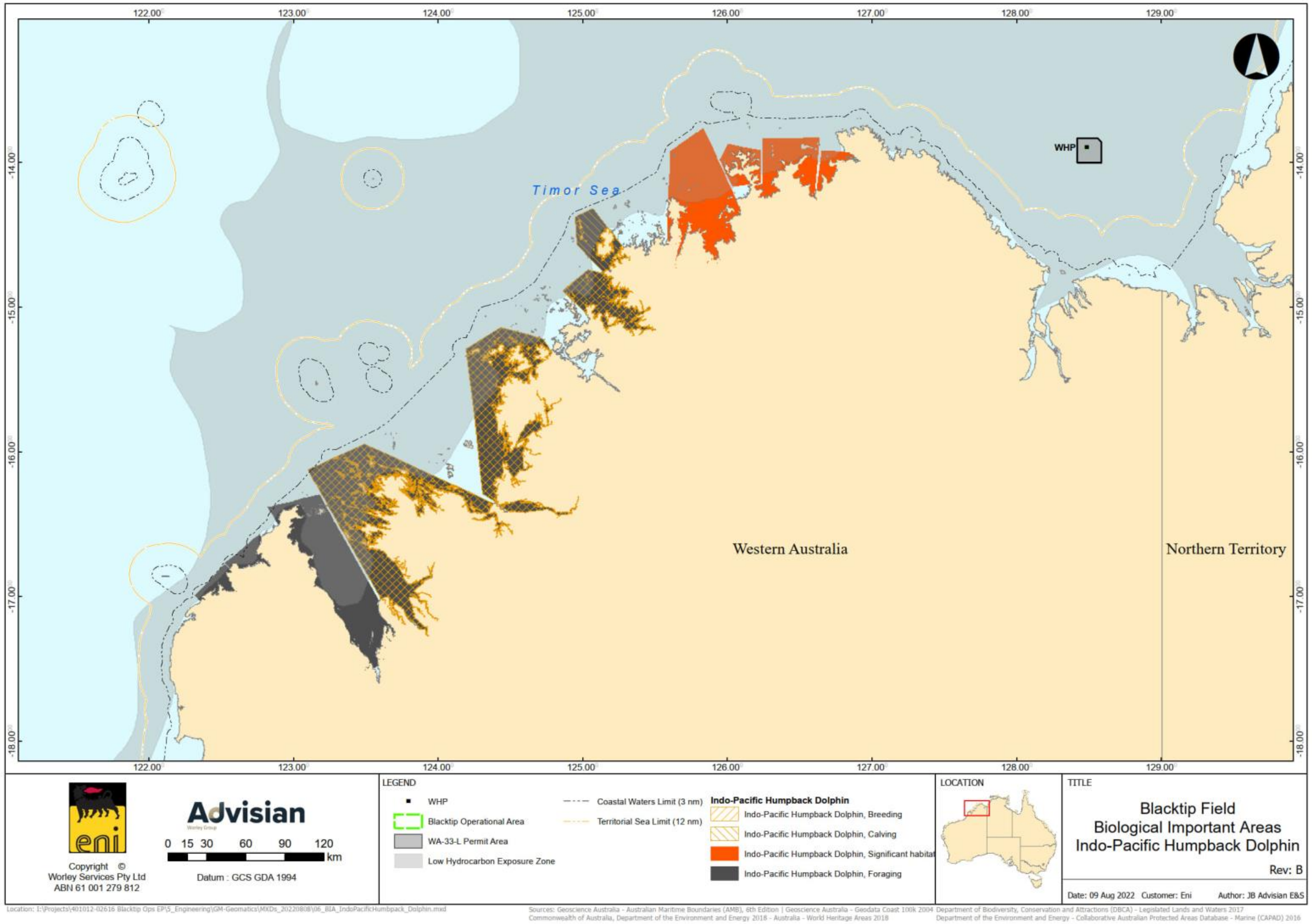


Figure 4-6: Biologically important areas for the Indo-Pacific humpback dolphin within the EMBA

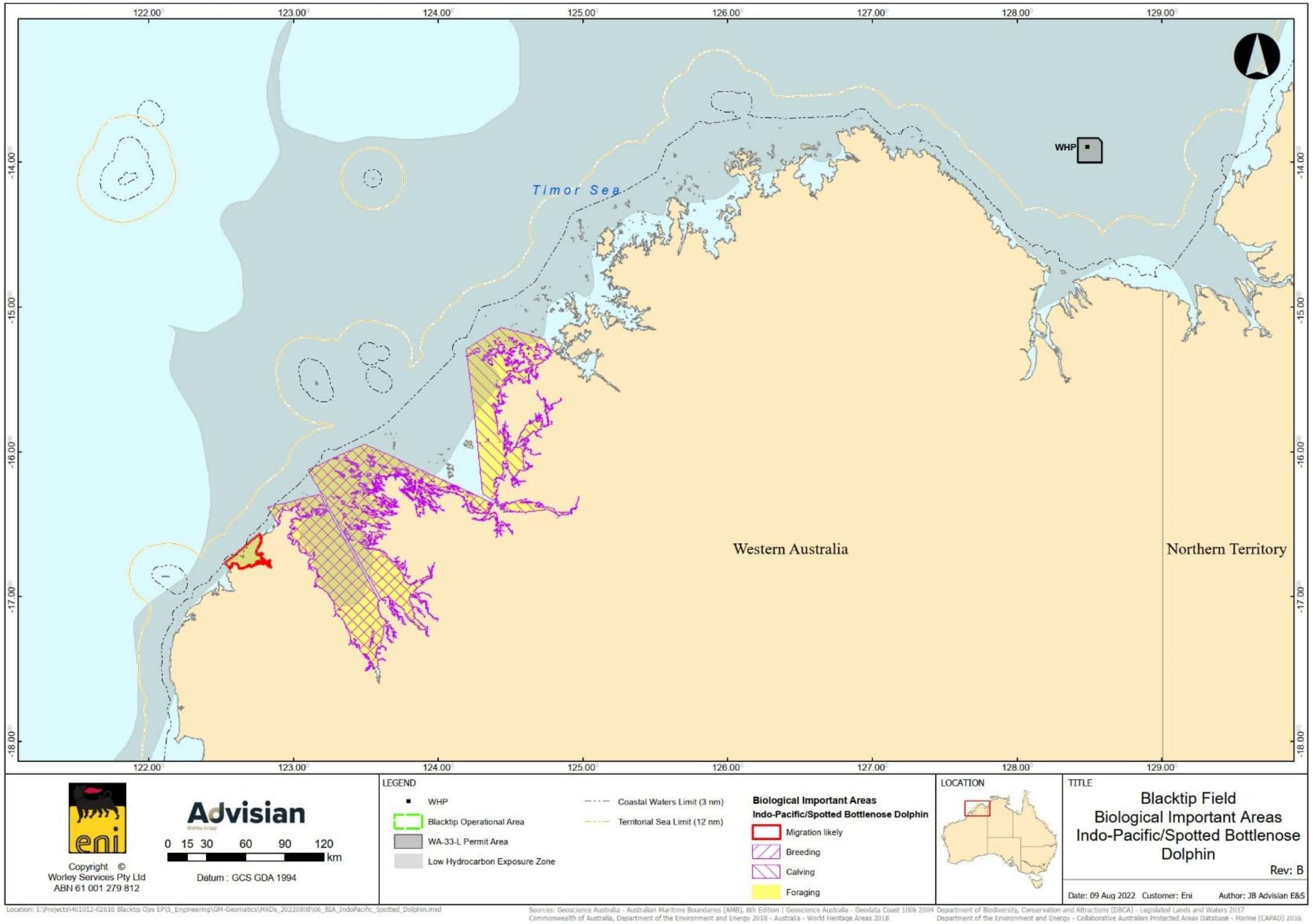


Figure 4-7: Biologically important areas for the Indo-Pacific/Spotted Bottlenose Dolphin

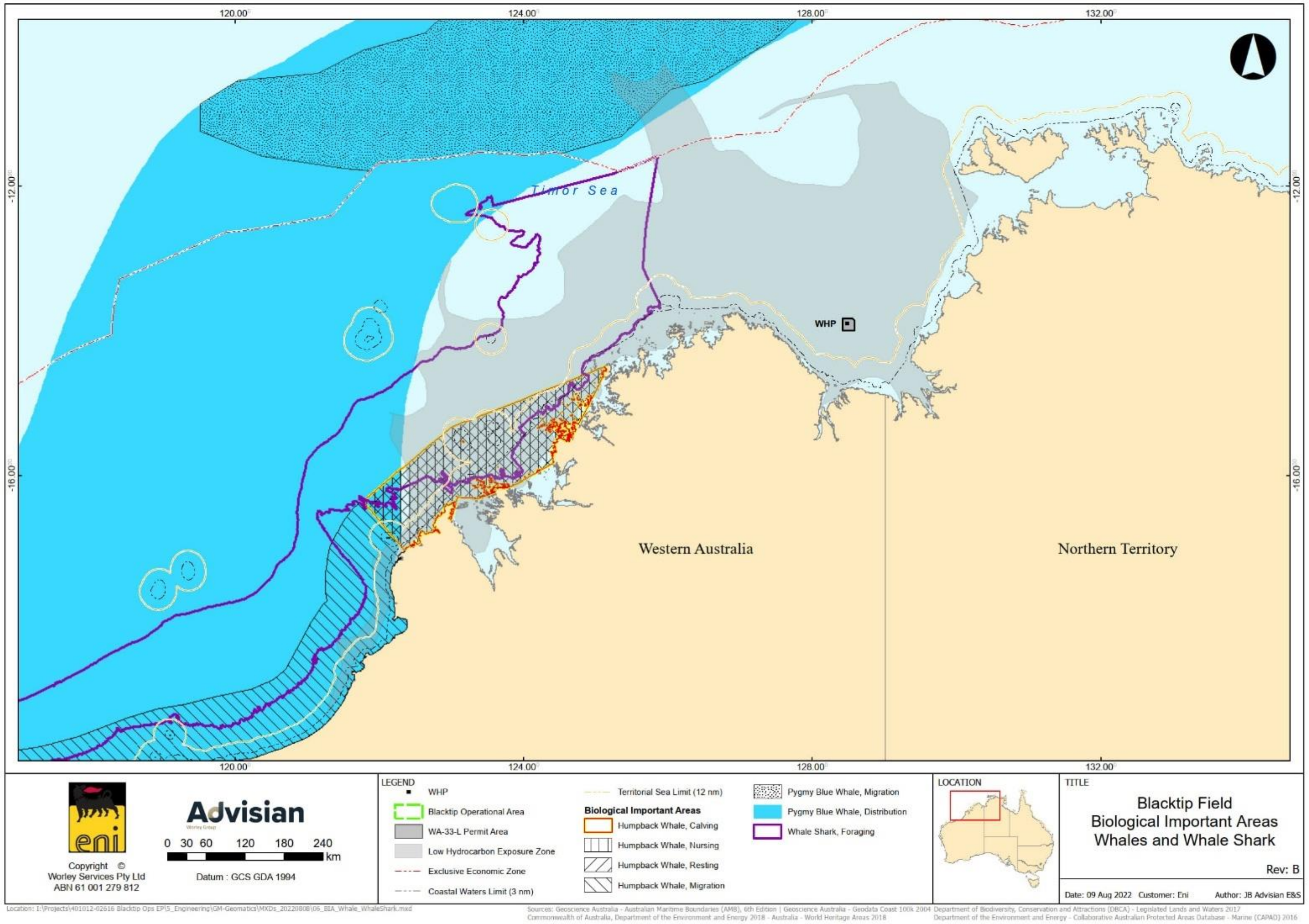


Figure 4-8: Biologically important areas for whales and whale shark within the EMBA

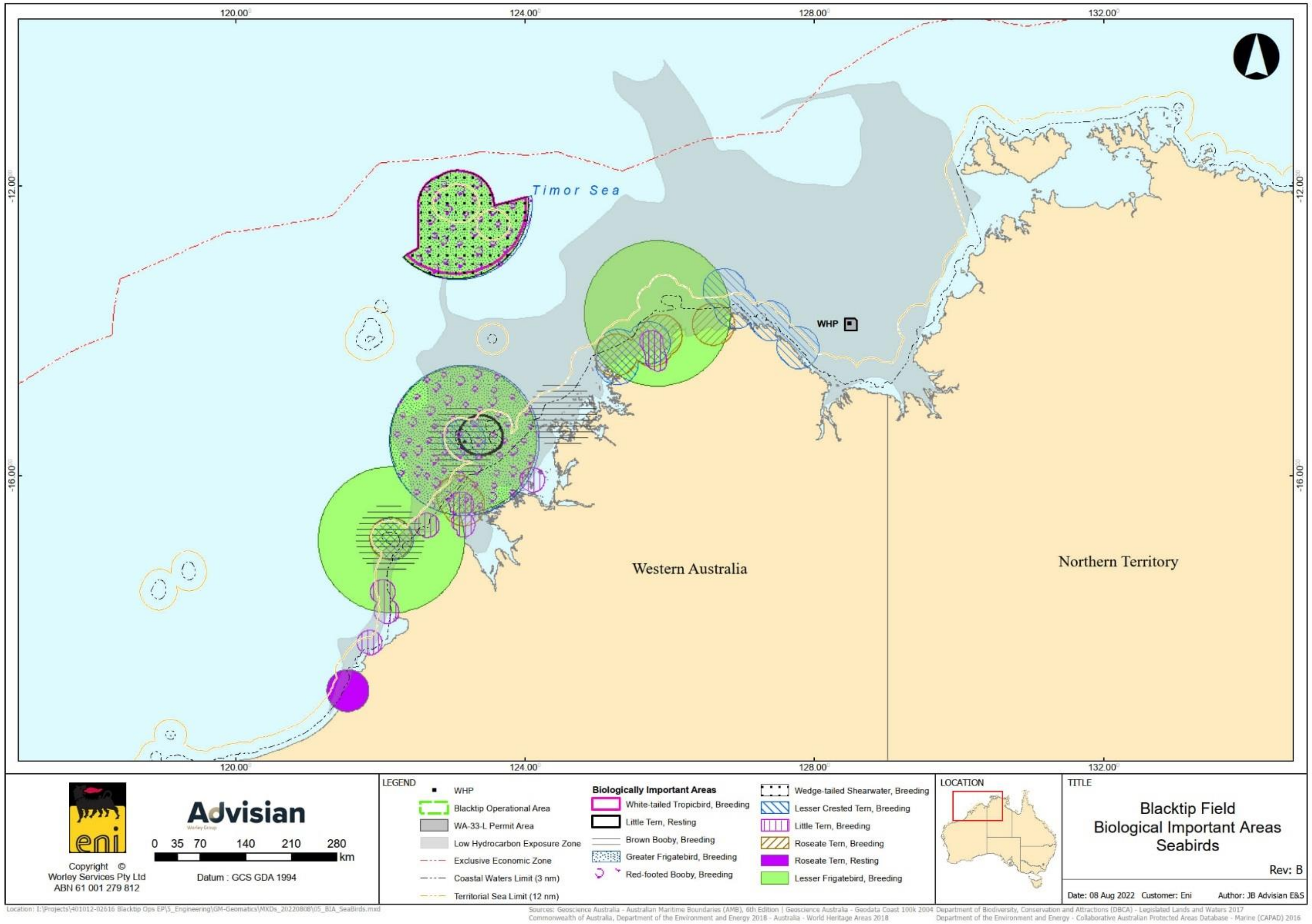


Figure 4-9: Biologically important areas for seabird species within the EMBA

4.4.2 Habitat Critical to the Survival of Marine Turtles

No habitat critical to the survival of marine turtles is present in the Operational Area; those identified in the EMBA are listed in Table 4-8 and shown in Figure 4-10.

Table 4-8: Habitat critical to the survival of marine turtles within the EMBA

Species	Habitat Type	Overlaps Operational Area	Overlaps EMBA	Distance from Operational Area (km)
Marine Reptiles				
Green turtle	Nesting	No	Yes	220 km west
Flatback turtle	Nesting	No	Yes	30 km south
Olive Ridley	Nesting	No	Yes	445 km south west-west

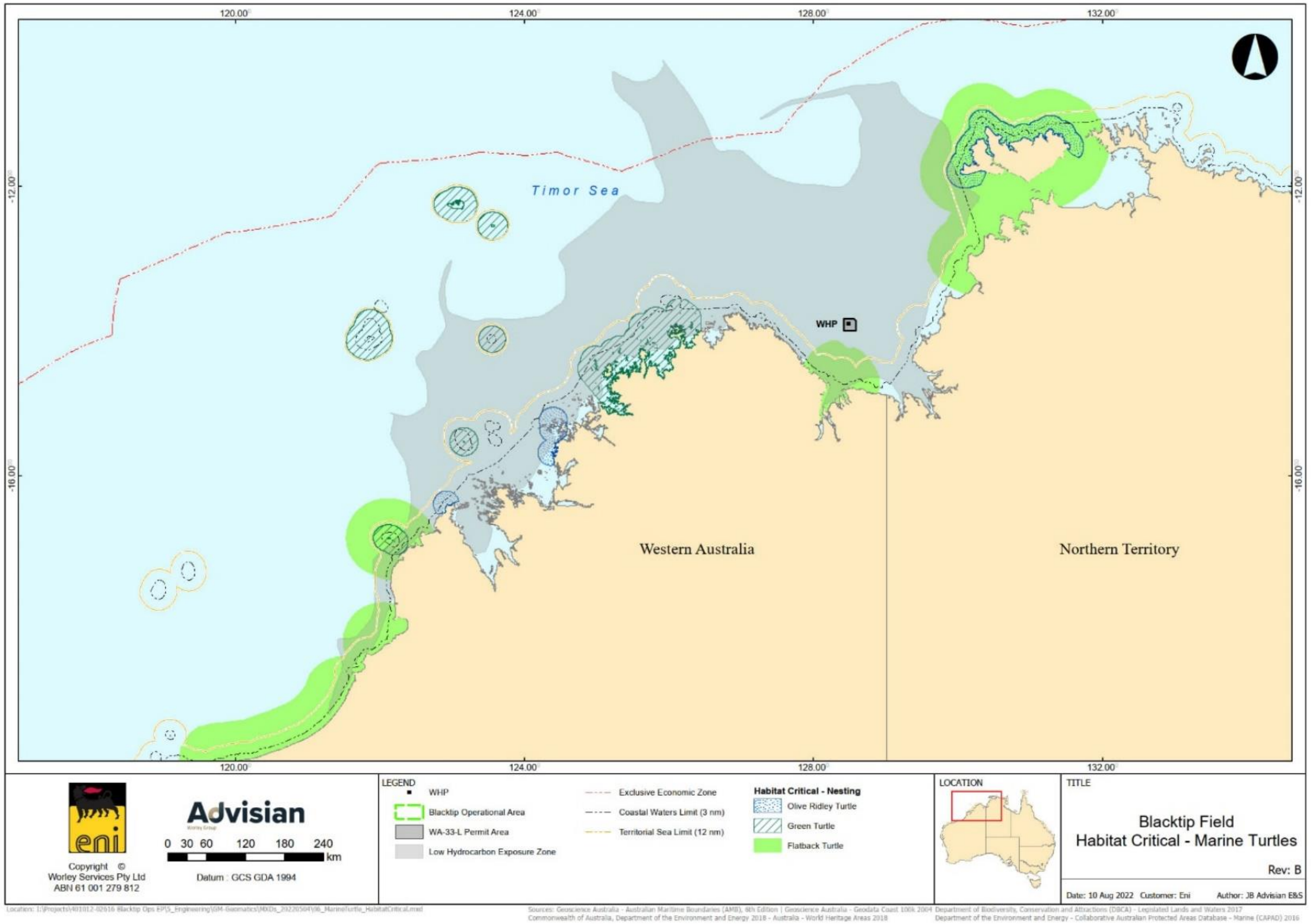


Figure 4-10: Critical habitat for the Olive Ridley, Green and Flatback Turtle within the EMBA

4.5 Protected and Significant Areas

There are a number of key sensitive areas that overlap the Operational Area and EMBA. These are summarised in Table 4-9 and further described in the next subsections and in Appendix B.

Table 4-9: Key sensitive areas within the Operational Area and EMBA

Key sensitive area	IUCN category	Overlaps Operational Area	Overlaps EMBA	Distance from Operational Area (km)
Australian Marine Parks (AMPs)				
Joseph Bonaparte Gulf Marine Park	VI	No	Yes	50 km east
Kimberley Marine Park	II IV and VI	No	Yes	220 km west
Oceanic Shoals Marine Park	IV and VI	No	Yes	140 km north
Roebuck Marine Pack	VI	No	Yes	815 km south-west
Eighty Mile Beach Marine Park	VI	No	Yes	910 km south-west
State Marine Protected Areas				
North Kimberley Marine Park	VI	No	Yes	90 km south
North Lalang-garam Marine Park	Not applicable	No	Yes	430 km south west
Lalang-garam/Camden Sound	Not applicable	No	Yes	430 km south west
Horizontal Falls Marine Park	Not applicable	No	Yes	530 km south west
Eighty Mile Beach Marine Park	Not applicable	No	Yes	965 km south west
Bardi Jawi Gaarra, Mayala and Maiyalam Marine Parks	Not applicable	No	Yes	500 km south west
Key Ecological Features				
Carbonate bank and terrace system of the Sahul Shelf	Not applicable	No	Yes	22 km west
Carbonate bank and terrace system of the Van Diemen Rise	Not applicable	No	Yes	215 km north
Pinnacles of the Bonaparte Basin	Not applicable	No	Yes	100 km north west-west
Ancient coastline at 125m depth contour	Not applicable	No	Yes	400 km north west-west
Demersal Fish Communities	Not applicable	No	Yes	530 km west

4.5.1 State and Australian Marine Parks

There are no Australian or State Marine Parks located in the Operational Area. The closest marine parks to the Operational Area are the JBG Marine Park and North Kimberley Marine Park (Table 4-9).

Australian and State Marine Parks within the Operational Area and EMBA are presented in Figure 4-11 and Figure 4-12. A detailed description of the Australian and State Marine Parks within the EMBA are provided in Appendix B.

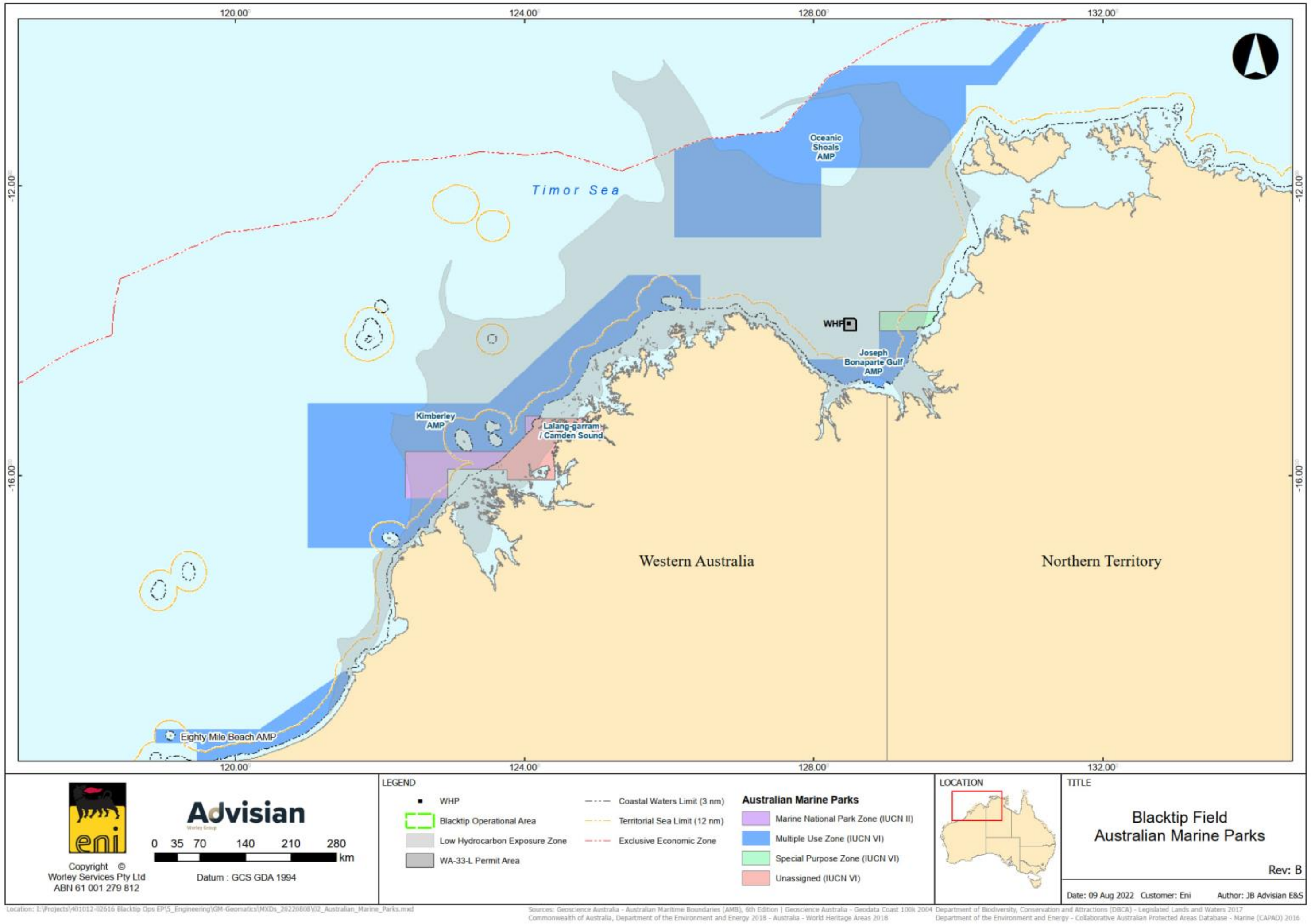


Figure 4-11: Australian Marine Parks within the Operational Area and EMBA

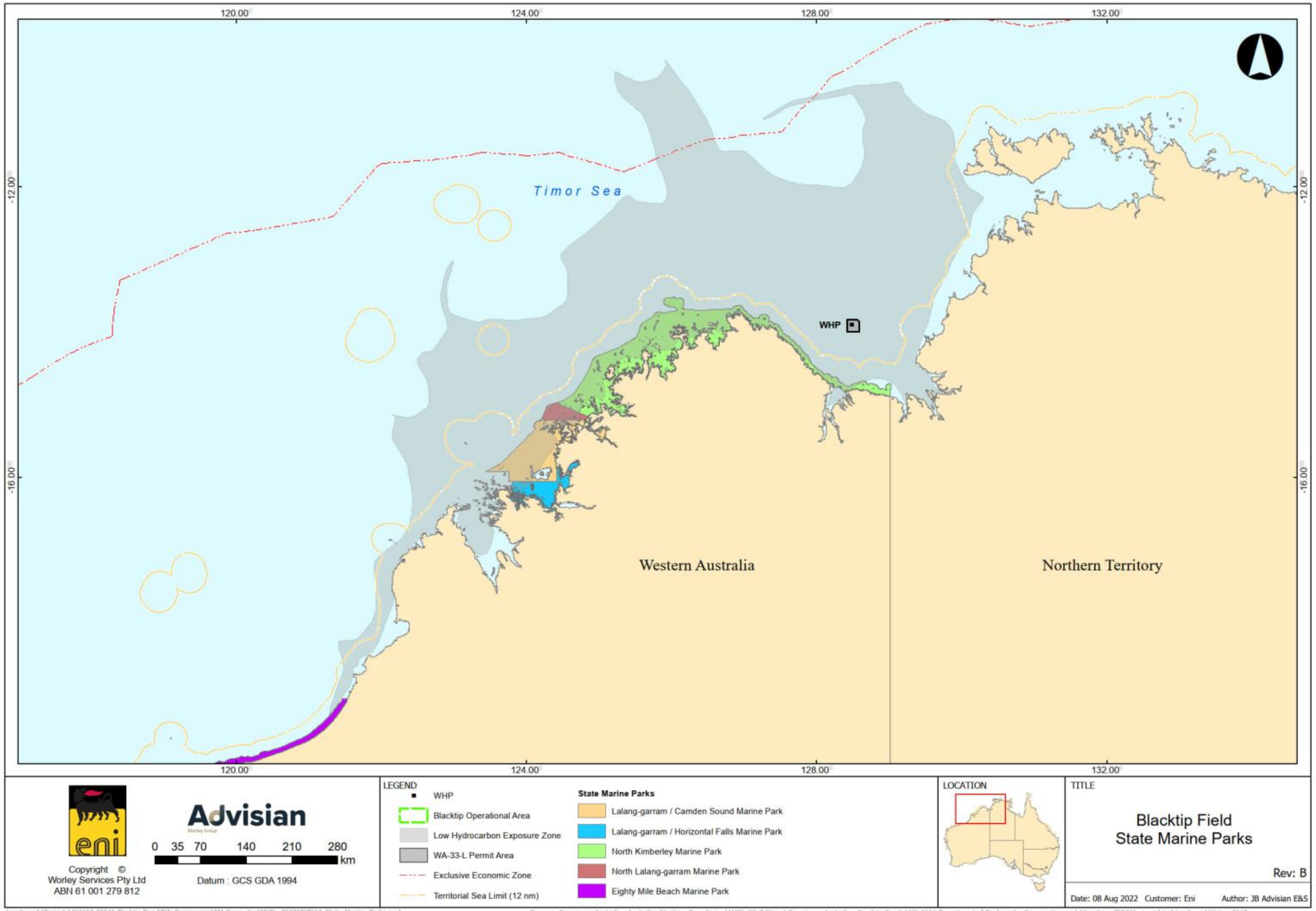


Figure 4-12: State Marine Parks within the Operational Area and EMBA

4.5.2 Key Ecological Features

A PMST (Appendix B attachment) shows the Operational Area did not identify any key ecological feature (KEF).

The following KEFs were identified within the EMBA:

- Carbonate bank and terrace system of the Sahul Shelf
- Pinnacles of the Bonaparte Basin
- Carbonate bank and terrace system of the Van Diemen Rise
- Ancient coastline at 125m depth contour
- Demersal Fish Communities

Further information on KEFS is provided in Table 4-9 and shown in Figure 4-13. A detailed description of the KEFs is provided in Appendix B.

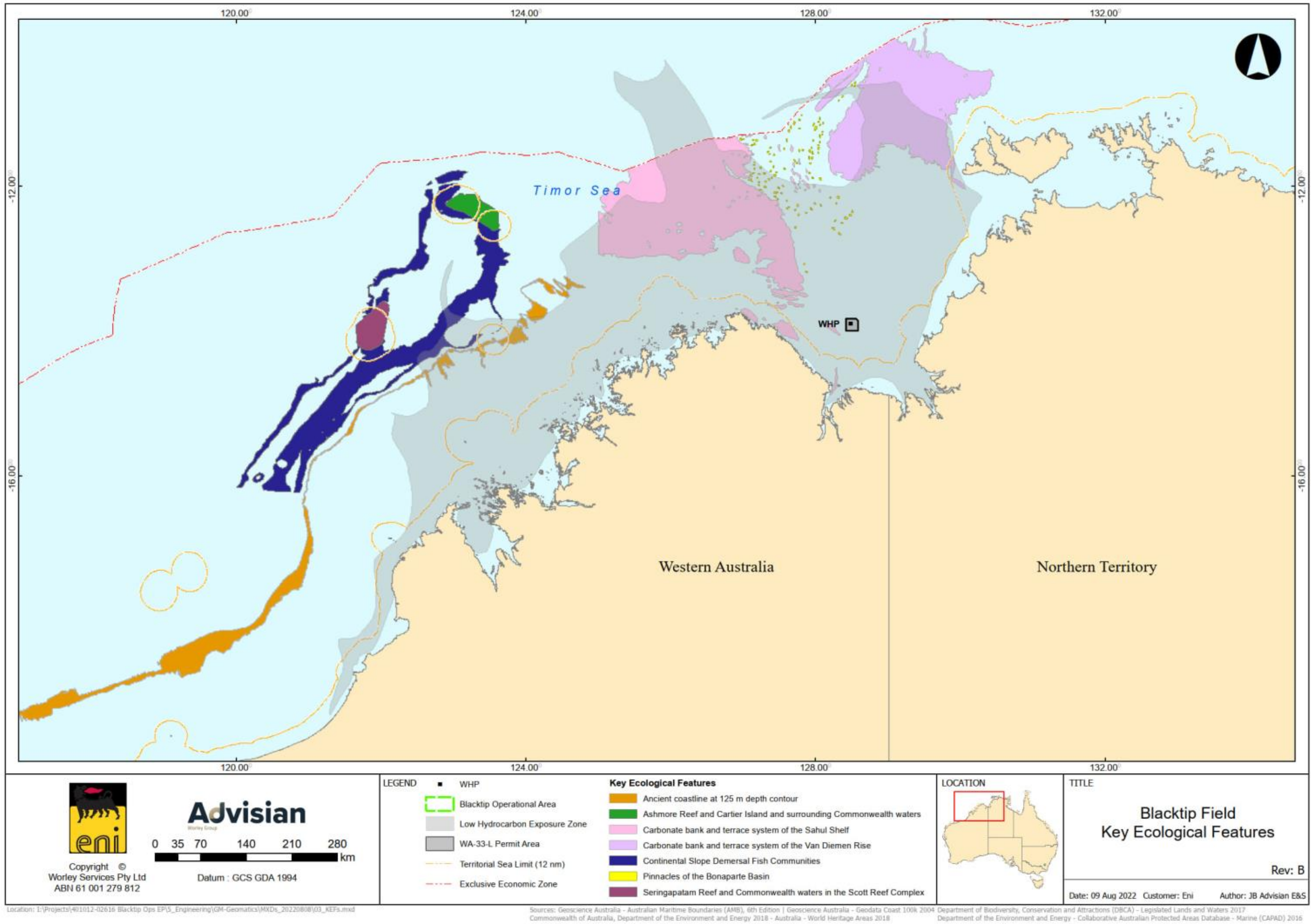


Figure 4-13: Key ecological features within the Operational Area and EMBA

4.5.3 National Heritage Places

The West Kimberley National Heritage Place is located 80 km south-west of the Operational Area. The West Kimberley is listed as a National Heritage Place as it includes natural landscape features, ancient geology, biological richness, Aboriginal and European heritage, historical pastoral values, and Aboriginal and European pearling values. The Kimberley intertidal shoreline, which is part of the Heritage Place, is described further in Appendix B.

4.5.4 World Heritage Properties

World Heritage Properties represent the best examples of the world's cultural and natural heritage. There are no World Heritage Properties within the Operational Area or EMBA.

4.5.5 Ramsar Wetlands

Whilst the EMBA PMST search returned three Ramsar wetlands (Eighty-mile beach, Ord river floodplain, Roebuck bay), these have been determined outside the EMBA.

4.6 Cultural and Socio-Economic Environment

4.6.1 Commercial Fisheries

Table 4-10 identifies the Commonwealth and State commercial fisheries overlapping the Operational Area and EMBA, and provides an assessment of the potential interaction based on the nature of the fishery and historic DPIRD catch data. Information on fisheries within Table 4-10 has been summarised from the Status reports of the fisheries and aquatic resources of Western Australia 2020/21 (Newman et al, 2021) and Fishery status reports 2021 (Patterson et al, 2021).

The jack-up MODU is positioned adjacent to the Blacktip WHP (refer Section 3.5). As such, all drilling and workover activities will occur within the existing 500 m PSZ, limiting any potential for interaction with commercial fisheries who will avoid the area.

Whilst is recognised that the DPIRD catch data referenced in Table 4-10 does not provide preclude the possibility for future catch, it is highly unlikely the catch effort will significantly increase in the vicinity of the Operational Area over the life of this EP.

Table 4-10: Commonwealth and State fisheries within the Operational Area

Fishery	Licenced to fish in Operational Area	Potential for interaction	Description
Commonwealth Managed Fisheries			
Western Tuna and Billfish Fishery	✓	×	**Description:** In 2020 there were three active fishing vessels. Fishing effort has concentrated off south-west Western Australia, with occasional activity off South Australia (Patterson *et al.*, 2021). While the Operational Area overlaps with the fishery management area, there is no potential for interaction.
Western Skipjack Tuna Fishery	✓	×	**Description:** Historically, effort in the Western Skipjack Tuna Fishery has been low and was 885 t in 2007–08. There has been no fishing in the since 2008–09 (Patterson *et al.*, 2021). While the Operational Area overlaps with the fishery management area, there is no potential for interaction.
Southern Bluefin Tuna Fishery	✓	×	**Description:** Fishing effort for the Southern Bluefin Tuna Fishery occurs in the Great Australian Bight and north-east of Eden in New South Wales (Patterson *et al.*, 2021). While the Operational Area overlaps with the fishery management area, there is no potential for interaction.
Northern Prawn Fishery	✓	×	**Description:** The Northern Prawn Fishery is located off Australia's northern coast, from Cape York in Queensland to Cape Londonderry in Western Australia. Season 1 lasts from April to mid-June and mainly consists of banana prawn catches. Season 2 goes from August to the end of November and mainly focuses on tiger prawns caught (AFMA, 2022). While the Operational Area overlaps with the fishery management area, there is no potential for interaction.

Fishery	Licenced to fish in Operational Area	Potential for interaction	Description
State Managed Fisheries			
Mackerel Managed Fishery	✓	×	**Description:** The Mackerel Managed Fishery targets Spanish mackerel (*Scomberomorus commerson*) using near-surface trawling gear from small vessels in coastal areas around reefs, shoals and headlands. Jig fishing is also used to capture grey mackerel (*S. semifasciatus*), with other species from the genera Scomberomorus. The commercial fishery extends from Cape Leeuwin to the NT border. There are three managed fishing areas: Kimberley (Area 1), Pilbara (Area 2), and Gascoyne and West Coast (Area 3). The Operational Area is located within Area 3. Most of the catch is taken from waters off the Kimberley coasts, reflecting the tropical distribution of mackerel species. Most fishing activity occurs around the coastal reefs of the Dampier Archipelago and Port Hedland area, with the seasonal appearance of mackerel in shallower coastal waters most likely associated with feeding and gonad development before spawning. Spanish mackerel spawn between August and November when inhabiting coastal reef areas of the Exmouth/Gascoyne region, with females exhibiting serial spawning behaviour (spawning every one to three days) over the spawning period. Outside the main fishing season (December to April), it is unclear where the mackerel populations inhabit. However, there is anecdotal evidence to suggest populations move into deeper offshore waters. Records show no vessels were active in the 10 nm block that covers the Operational Area between 2018 and 2021.

Fishery	Licenced to fish in Operational Area	Potential for interaction	Description
Pilbara Demersal Scalefish Fishery – Line	✓	×	**Description:** The Pilbara Demersal Scalefish Fishery – Line encompasses all of the 'Pilbara waters', extending from a line commencing at the intersection of 21°56'S latitude and the boundary of the Australian Fishing Zone and north to longitude 120°E (Newman *et al.*, 2014). The fishery targets tropical demersal scalefish and is the smallest scale fishery within the Pilbara Demersal Scale Fishery in terms of monetary value, attaining a commercial catch of 40 t. There are no stated depth limits and the western extent of the fishery is the boundary of the Australian Fishing Zone. The fishery is managed under the Prohibition on Fishing by Line from Fishing Boats (Pilbara Waters) Order 2006, with the exemption of nine fishing vessels for any nominated five-month block period within the year. Fishing in Area 3 has also been a closed to line fishing since 1998. Records show no vessels were active in the 10 nm block that covers the Operational Area between 2018 and 2021.
Pilbara Demersal Scalefish Fishery – Trap	✓	×	**Description:** The Pilbara Demersal Scalefish Fishery – Trap covers the area from Exmouth northwards and eastwards to the 120° line of longitude, and offshore as far as the 200 m isobath. Like the trawl fishery, the trap fishery is also managed by using input controls in the form of individual transferable effort allocations, monitored with a satellite-based vessel monitoring system. Waters inside of the 50 m isobath are permanently closed to trap fishing and Area 3 has also been closed to trapping since 1998. Traps are limited in number, with the greatest effort in waters deeper than 50 m. This fishery targets high-value species, such as red emperor and goldband snapper. Records show no vessels were active in the 10 nm block that covers the Operational Area between 2018 and 2021.
Pilbara Demersal Scalefish Fishery – Trawl	×	×	**Description:** The Pilbara Demersal Scalefish Fishery – Trawl is divided into two zones and waters inside of the 50 m isobath are permanently closed to fish trawling. The Operational Area is located within Zone 1, which has been closed to fish trawling since 1998. Only if this fishery was to reopen would there be any potential for interaction. The fishery operates with standard stern trawling gear (single net with extension sweeps).

Fishery	Licenced to fish in Operational Area	Potential for interaction	Description
Marine Aquarium Managed Fishery	✓	×	**Description:** The Marine Aquarium Managed Fishery operates within Western Australian waters, between the NT and South Australia borders. The Operational Area is located within the managed fishery. The fishery is primarily dive-based, with fishers using handheld nets to capture the desired target species, and is restricted to safe diving depths (typically less than 30 m). The fishery is typically more active in waters south of Broome with higher levels of effort around the Capes region, Perth, Geraldton, Exmouth, Dampier and Broome. The landed catch was predominantly ornamental fish but included hermit crabs, seahorses, invertebrates, corals and live rock. Records show no vessels were active in the 10 nm block that covers the Operational Area between 2018 and 2021.
Pilbara Crab Managed Fishery	✓	×	**Description:** The Pilbara Crab Managed Fishery primarily targets blue swimmer crabs using hourglass traps, primarily within inshore waters around Nichol Bay and the Exmouth Gulf. The blue swimmer crab is most abundant in sandy benthic habitats with water depths of less than 20 m. Catch rates for the fishery in 2019 saw a significant increase (88%) from 2018. This catch rate was well above the preliminary harvest strategy threshold, indicating there should be adequate egg production under typical environmental conditions. Records show no vessels were active in the 10 nm block that covers the Operational Area between 2018 and 2021.

Fishery	Licenced to fish in Operational Area	Potential for interaction	Description
Specimen Shell Managed Fishery	✓	×	**Description:** The Specimen Shell Managed Fishery can be conducted anywhere within WA waters and targets the collection of specimen shells for display, collection, cataloguing and sale. The fishery encompasses the entire WA coastline but effort is concentrated in areas adjacent to the largest population centres, such as Broome, Exmouth, Shark Bay, Geraldton, Perth, Mandurah, the Capes area and Albany. Collection is predominantly by hand when diving or wading in shallow, coastal waters, though a deeper water collection aspect to the fishery has been initiated with the employment of remotely operated vehicles (ROVs) operating at depths up to 300 m. Multiple areas are closed to the fishery, including various marine parks and aquatic reserves such as Reef Observation Areas and Fish Habitat Protection Areas. Records show no vessels were active in the 10 nm block that covers the Operational Area between 2018 and 2021. **Licences/vessels:** Thirty-one licences in 2019/20 (each licence allows a maximum of four divers in the water at any one time), 17 used for fishing in 2019.
South-west Coast Salmon Fishery	✓	×	**Description:** The South West Coast Salmon Managed Fishery is one of ten commercial fisheries that make up the West Coast Nearshore and Estuarine Finfish Resource. The main commercial methods are haul, beach seine and gill netting. In 2019, the fishery was a major contributor to the total commercial catch for the West Coast Nearshore and Estuarine Finfish Resource, with two fish species (Western Australian salmon and sea mullet) making up most of the catch. Records show no vessels were active in the 10 nm block that covers the Operational Area between 2018 and 2021. **Licences/vessels:** N/A.

Fishery	Licenced to fish in Operational Area	Potential for interaction	Description
Onslow Prawn Managed Fishery	✓	×	**Description:** The Onslow Prawn Managed Fishery encompasses a portion of the continental shelf off the Pilbara. The fishery targets a range of penaeids, including king prawns (*Penaeus latisulcatus*), brown tiger prawns (*Penaeus esculentus*) and blue endeavour prawns (*Metapenaeus endeavouri*), which typically inhabit soft sediments less than 45 m water depth. Fishing is performed using trawl gear over unconsolidated sediments (sand and mud). Total prawn catches in 2019 were less than 50 tonnes, below the target catch range (Kangas *et al.*, 2020). Records show no vessels were active in the 10 nm block that covers the Operational Area between 2018 and 2021. **Licences/vessels:** One vessel fished in the fishery during 2019
West Australian Abalone Fishery	✓	×	**Description:** The Western Australian Abalone Fishery includes all coastal waters from the WA and South Australia border to the WA and NT border. The fishery is concentrated on the south coast (greenlip and brownlip abalone) and the west coast (Roe's abalone). Abalone are harvested by divers, limiting the fishery to shallow waters (typically less than 30 m). No commercial fishing for abalone north of Moore River (Zone 8 of the managed fishery) has occurred since 2011–12. A restocking project has been successful in a trial scale but has yet to be implemented on a commercial scale to determine if restocking would recover the entire stock in the longer term; interactions with participants in the fishery will not occur during the Petroleum Activities Program. Records show no vessels were active in the 10 nm block that covers the Operational Area between 2018 and 2021. **Licences/vessels:** Twenty-one vessels were active in the Western Australian Abalone Fishery

Fishery	Licenced to fish in Operational Area	Potential for interaction	Description
West Coast Deep Sea Crustacean	✓	×	**Description:** The West Coast Deep Sea Crustacean fishery is a 'pot' fishery that operates in a long-line formation in the shelf edge waters (more than 150 m) of the West Coast and Gascoyne bioregions. The fishery targets three crab species; crystal (snow) (*Chaceon albus*), champagne (*Hypothalassia acerba*) and giant (king) (*Pseudocarcinus gigas*). Crystal crab makes up the vast majority (99% in 2019) of annual total landings. Records show no vessels were active in the 10 nm block that covers the Operational Area between 2018 and 2021. **Licences/vessels:** Four vessels operated in the fishery in 2019

4.6.2 Tourism and Recreational Fishing

Charter fishing and tourism operate out of Darwin and the Kimberley (more than 150 km from the Operational Area) and generally target areas of high scenic value or offshore coral reef areas. As these attributes are generally sparse in the offshore area of the JBG, the level of charter fishing and tourism is expected to be very low.

Expedition cruise boats operate between Broome and Wyndham and Darwin in the dry months (April to October). The boats remain in proximity to the coastline and are not likely to be present within the Operational Area for any significant periods.

Any recreational and charter fishing from vessels is largely undertaken using lines. Given the distance from boating facilities and slipways and lack of natural attractions in the Operational Area, very little recreational or charter fishing is expected to occur. As such, impacts to recreational and charter fishing are expected to be negligible and of no lasting effect.

4.6.3 Commercial Shipping

Under the Commonwealth *Navigation Act 2012*, all vessels operating in Australian waters are required to report their location daily to the Rescue Coordination Centre (RCC) in Canberra. This Australian Ship Reporting System is an integral part of the Australian Maritime Search and Rescue system and is operated by AMSA through the RCC.

AMSA was consulted about the Petroleum Activities Program and its coordinate searches have indicated there is no major commercial shipping in the vicinity of the Operational Area.

There are no recognised shipping routes in or near the Operational Area, with the nearest shipping fairway designated by AMSA located more than 80 km away (Figure 4-14). Traffic is limited to infrequent visits by Northern Prawn Fishery (NPF) and other fisheries, whose boats are typically 13 to 25 m long. Supply vessels for the Petroleum Activities Program will travel to and from Darwin to the site.

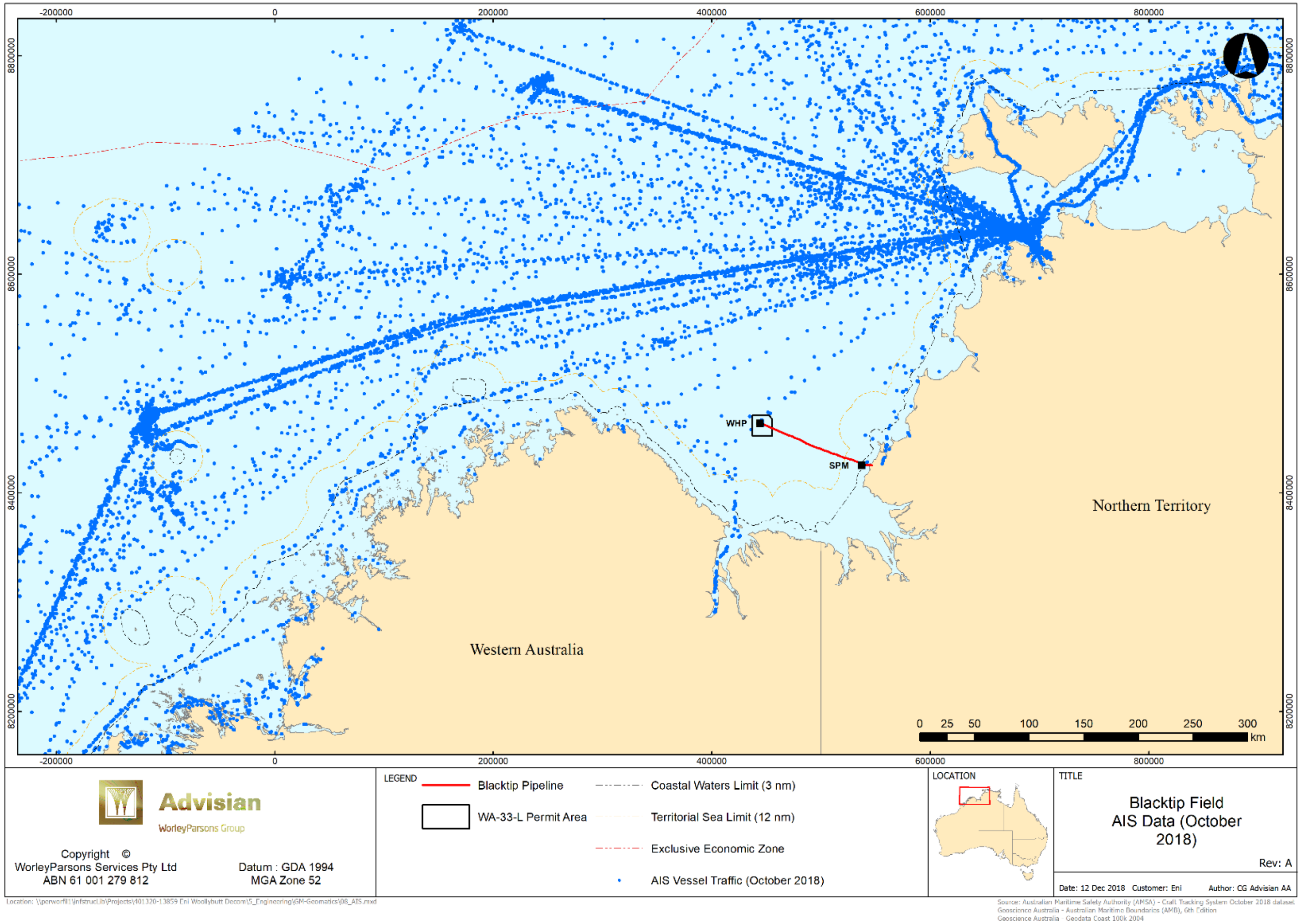


Figure 4-14: Commercial shipping within the region

4.6.4 Defence Activities

There are two defence training areas in the North Marine Region. WA-33-L is located within the North Australia Exercise Area (NAXA) and restricted airspace R264G. A Royal Australian Air Force base, located at Darwin, lies approximately 300 km to the north-east of the Operational Area.

4.6.5 Oil and Gas Infrastructure

There is no other oil and gas infrastructure in the vicinity of the Operational Area. Figure 4-15 shows oil and gas infrastructure within the EMBA.

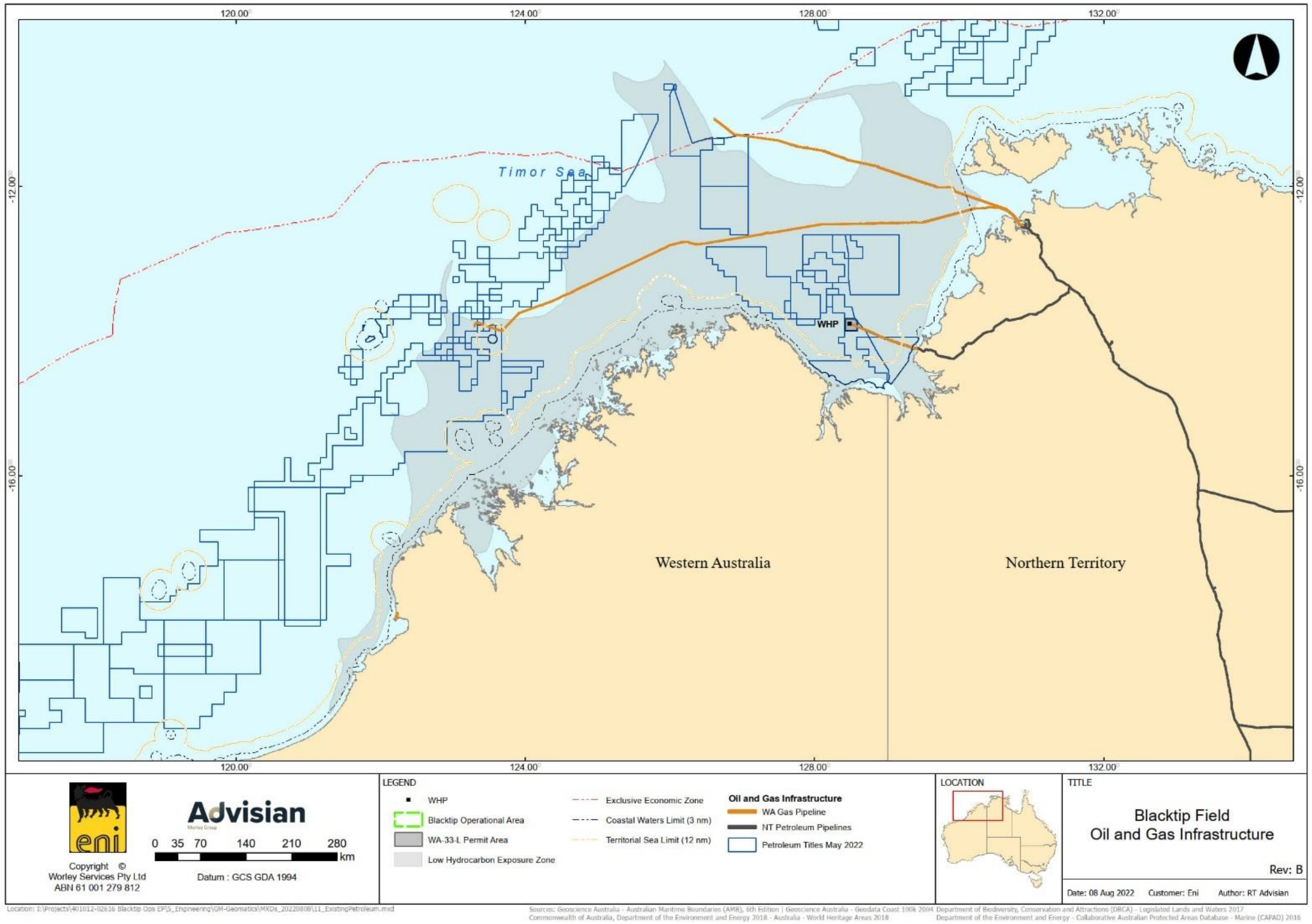


Figure 4-15: Oil and Gas Infrastructure within the EMBA

4.6.6 Cultural Heritage and Shipwrecks

There are no known cultural heritage sites of significance or shipwreck sites within the Operational Area. Detailed geotechnical and geophysical surveys conducted for the Blacktip facilities, which included the use of a magnometer, have not detected any shipwrecks at the Operational Area (Woodside, 2004a).

There are a number of Aboriginal heritage sites along the northern Kimberly coastline. The sites within the EMBA that are less than 300 km from the Operational Area are listed in Table 4-11.

Table 4-11: Registered Aboriginal sites and other heritage places within the EMBA that are less than 300 km from the Operational Area

Site/place name	Type	Distance from Operational Area (km)
Registered Aboriginal Sites		
Duli Cave	Ceremonial, mythological, rock shelter, camp	300 km west
Didji Point	Human-made structure, mythological, named place	300 km west
Didji Wells	Mythological, water source	300 km west
Cassini Stone Line	Human-made structure, mythological	300 km west
Cassini Stone Circles	Human-made structure, mythological	300 km west
Ngalumal Gudangari	Ceremonial, mythological, camp	300 km west
Wadai/Red Island	Mythological, camp	225 km west
Other Heritage Places		
Cassini Island	Camp, hunting place, named place, plant resource	300 km west
Duli Cove Caves	Artefacts and scatter, arch deposit, other	300 km west
Duli Bay	Named place	300 km west
Karena Bay	Named place	300 km west
Belele	Named place	300 km west
Cassini Island	Human-made structure	300 km west
Daibi, Malapuru, Parry Harbour	Camp	300 km west
Guraringai	Camp	265 km west
Djala Bianggangai	Hunting place	265 km west

There are a number of shipwreck sites along the northern Kimberly coastline. The sites within the EMBA that are less than 300 km from the Operational Area are listed in Table 4-11

Table 4-12: Shipwrecks within the EMBA that are less than 300 km from the Operational Area

Shipwreck name	Distance from Operational Area (km)
SEDCO Helen	120 km north
RAAF B-24 Liberator A-72 80 (aircraft)	225 km west

5 STAKEHOLDER CONSULTATION

5.1 Summary

In accordance with Regulation 16 of the OPGGS(E) Regulations, the EP must contain:

b) a report on all consultations between the titleholder and any relevant person, for Regulation 11A, that contains:

   i) a summary of each response made by a relevant person, and

   ii) an assessment of the merits of any objection or claim about the adverse impact of each activity to which the environment plan relates, and

   iii) a statement of the titleholder's response, or proposed response, if any, to each objection or claim.

The Blacktip facilities have been operational since 2009 and Eni is familiar with local community stakeholders and other users of the marine environment in the region.

A consultation letter specific to this drilling EP was developed that gave an overview of the planned activities and associated risk, then distributed to identified stakeholders (refer to Table 5-1) via email and post in May 2022. Stakeholders have also been continually informed of Blacktip activities and operations over the life of the asset, including those activities covered by the Blacktip Operations EP (000036_DV_PR.HSE.0677.000).

No significant stakeholder issues were raised in consultation for the Petroleum Activities Program.

Eni considers that consultation with regulators and key stakeholders has been adequate for the assessment of this EP (refer Table 5-2). Notwithstanding, Eni has identified the need for additional stakeholder consultation to ensure the effective implementation of identified control measures, as detailed in Section 5.4.

All correspondence with external stakeholders is recorded and Eni will remain available to stakeholders before, after and during the Petroleum Activities Program.

5.2 Stakeholder Consultation Strategy

Eni understands retaining a broad licence to operate depends on maintaining a positive relationship with a comprehensive set of stakeholders in the community, government, non-government and other business sectors.

Eni began the stakeholder identification process with a review of the stakeholder database for the Blacktip facilities and a review of stakeholders consulted for other recent activities in the area.

More specifically, stakeholders were identified through:

- regular review of all legislation applicable to the Petroleum Activities Program

- discussions with relevant stakeholders to identify other potentially impacted persons
- records from previous consultation activities in the area, including Blacktip activities.

Eni maintains a close working relationship with the traditional owners in the Wadeye Community through the Thamarrurr Development Corporation and Thamarrurr Rangers. The Thamarrurr Rangers support various ongoing environmental monitoring activities and are kept informed of activities in the local area.

Currently identified relevant stakeholders for this activity are listed in Table 5-1.

Table 5-1: Identified stakeholders

Group	Stakeholder
Shipping safety, security and communications	• Australian Hydrographic Office (AHO) • Australian Maritime Safety Authority (AMSA) • Department of Defence (Defence) • Australian Marine Oil Spill Centre (AMOSC) • WA Department of Transport (DoT)
Commonwealth government departments	• Australian Fisheries Management Authority (AFMA) • Department of Agriculture and Water Resources – Fisheries • Director of National Parks (DNP) • Department of Agriculture, Water and the Environment (DAWE), now DCCEEW • National Offshore Petroleum Safety and Environmental Management Authority
State government departments	• NT Department of Primary Industry and Resources – Fisheries • NT Environment Protection Authority (NTEPA) • Department of Environment and Natural Resources (DENR) • WA Department of Primary Industries and Regional Development – Fisheries Division (WA DPIRD-Fisheries) • WA Department of Biodiversity, Conservation and Attractions (WA DBCA) • WA Department of Mines, Industry Regulation and Safety (WA DMIRS)
Fishing bodies	• Commonwealth Fisheries Association (CFA) • Western Australian Fishing Industry Council (WAFIC) • Northern Territory Guided Fishing Industry Association (NTGFIA)
Commercial fisheries (identified based on DPIRD Fish Cube data and in consultation with WAFIC)	• Austral Fisheries • Northern Prawn Fishery • Mackerel Managed Fishery • Northern Wildcatch Seafood Australia • North Coast Demersal Scalefish Managed Fishery
Other	• Thamarrurr Development Corporation • Recfish • Northern Land Council (NLC)

5.3 Environment Plan Consultation

The Blacktip consultation letter contains details such as an activity summary, location map, coordinates, water depth, distance to key regional features, exclusion zone details and estimated timing and duration. This consultation letter outlined potential risks and impacts together with a summary of proposed management measures.

In relation to Regulation 11(f) of the OPGGS(E) Regulations, Eni believes there has been an appropriate level of consultation with relative stakeholders. Ongoing stakeholder consultation, as required for effectively implementing the accepted EP, will be managed in accordance with Section 5.4.

Consultation material is summarised in Table 5-2. Full transcripts between Eni and stakeholders are provided in a confidential submission to NOPSEMA.

Table 5-2: Consultation summary for activity

Stakeholder	Relevance or reasoning for engagement	Consultation summary	Consultation assessment
Shipping safety, security and communications			
AHO	AHO is responsible for maintaining and disseminating nautical charts and distributing Notices to Mariners.	AHO was provided the Blacktip Drilling EP consultation information sheet via email on 9th May 2022. On the 11th May AHO responded with acknowledgement and no further comments on the proposal. An activity update consultation sheet was provided on 26 August 2022, which advised that the EP now includes the drilling of two development wells.	AHO does not object to the Blacktip Drilling EP and has made no claim. AHO is notified four weeks before commencing drilling. Refer Section 11.8.1. Eni considers the level of consultation to be adequate.
AMSA	AMSA is the statutory authority established under *Australian Maritime Safety Act 1990*. Its principal functions are promoting maritime safety and protecting the marine environment, preventing and combating ship-sourced pollution in the marine environment, providing infrastructure to support safety of navigation in Australian waters, and providing national search and rescue services to the maritime and aviation sectors.	AMSA was provided the Blacktip Drilling EP consultation information sheet via email on 9th May 2022. On the 17th May, AMSA responded with acknowledgement of the proposal and included maritime safety information. An activity update consultation sheet was provided on 26 August 2022, which advised that the EP now includes the drilling of two development wells.	AMSA does not object to the Blacktip Drilling EP and has made no claim. The AMSA RCC (as part of the marine safety division) is notified of drilling operations four weeks before mobilisation. Refer Section 11.8.1. Eni considers the level of consultation to be adequate.

Defence	The Commonwealth Defence as an Australian Government Agency are identified as a relevant person under the OPGGS(E) Regulations 2009.	Defence was provided the Blacktip Drilling EP consultation information sheet via email on 9th May 2022. On 10th June 2022 Defence replied to Eni advising that: – WA-33-L is located within the North Australia Exercise Area (NAXA) and restricted airspace R264G – Defence requests that Eni vacate the area during the approximate period of 12 – 25 September 2022, with an allowance of a few days for flexibility – Eni is advised that unexploded ordnance (UXO) may be present on and in the sea floor within the NAXA. Eni must, therefore, inform itself as to the risks associated with conducting activities in the area (for example, the detonation of UXO). Additionally, Eni was advised that: a. all activities in the area are conducted at its own risk; and b. the Commonwealth of Australia, represented by the Department of Defence, takes no responsibility for: i. reporting the location and type of UXO that may be in the areas; ii. identifying or removing any UXO from these areas; and iii. any loss or damage suffered or incurred by Eni or any third party arising out of, or directly related to, UXO in the area. Defence requested that in order to ensure Eni activities do not conflict with Defence training, Defence requires a minimum of five weeks notification prior to the actual commencement of activities. Notification will need to be provided to Offshore.Petroleum@defence.gov.au. On 30th June 2022 Eni replied to Defence informing:	Defence will be contacted at least five weeks prior to the actual commencement of activities. Refer Section 11.8.1. Any activities undertaken within Restricted Airspace need to comply with the relevant Notice to Airmen (NOTAM) restrictions.

Stakeholder	Relevance or reasoning for engagement	Consultation summary	Consultation assessment
		– The WHP is located in WA-33-L, which is a permanently unmanned platform and has been in operation since 2009. – The infill drilling activity is planned to occur from the WHP, however it should also be noted that the WHP is in production and may also require urgent maintenance, meaning WHP visitation to perform activities, regardless of the date. – Eni queried if Defence has the location of the WHP and GEP Eni also requested further information on why Defence believe Eni activities are incompatible with Defence operations during the period. On 30th June 2022 Defence replied stating that Minister for Defence has the authority, under the Defence Regulation 2016, to gazette any area of sea or airspace as a Defence Practice Area (DPA) for carrying out Defence operations or practices. The North Australia Exercise Area (NAXA) has been gazetted as a DPA. Defence reserves the right to order the evacuation of any gazetted DPA at short notice and unauthorised access to the area will be prohibited as per Section 59 of the Defence Regulation 2016. An activity update consultation sheet was provided on 26 August 2022, which advised that the EP now includes the drilling of two development wells.	

Stakeholder	Relevance or reasoning for engagement	Consultation summary	Consultation assessment
WA DoT	DoT is responsible for marine safety, marine environment protection and coastal facilities. Administer WestPlan – Marine Oil Pollution.	DoT was provided the Blacktip Drilling EP consultation information sheet via email on 9th May 2022 and responded via email on 16th May, asking Eni for the OPEP if State waters will be impacted. Eni is utilising the accepted Blacktip Operations OPEP (000036_DV_PR.HSE.0388.000_Rev14). An activity update consultation sheet was provided on 26 August 2022, which advised that the EP now includes the drilling of two development wells.	Eni commits to ongoing consultation with DoT regarding its role as State marine pollution coordinator, as per DoT's Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements (Sep 2018). Eni considers the level of consultation to be adequate. Eni is utilising the accepted Blacktip Operations OPEP (000036_DV_PR.HSE.0388.000_Rev14).
Commonwealth government departments			
AFMA	AFMA is the Australian Government agency responsible for the efficient management and sustainable use of Commonwealth fish resources.	AFMA was provided the Blacktip Drilling EP consultation information sheet via email on 9th May 2022. On the 13th May AFMA responded with acknowledgement and no specific comment on the proposal. AFMA provided contact details of the northern prawn fishery and Commonwealth Fisheries Association (CFA). Eni have consulted with the both the northern prawn fishery and CFA. An activity update consultation sheet was provided on 26 August 2022, which advised that the EP now includes the drilling of two development wells.	Eni considers the level of consultation to be adequate.

Stakeholder	Relevance or reasoning for engagement	Consultation summary	Consultation assessment
DNP (Marine Parks)	DNP is the statutory authority responsible for administering, managing and controlling Australian Marine Parks.	DNP was provided the Blacktip Drilling EP consultation information sheet via email on 9th May 2022. DNP responded on 23rd June. Noting that the activity does not overlap marine parks and confirming they 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 new impact to a marine park. DNP also provided notification details should incidences which occur within a marine park or are likely to impact a marine park. An activity update consultation sheet was provided on 26 August, which advised that the EP now includes the drilling of two development wells.	The impacts to AMPs have been assessed throughout Sections 7 and 8 of the EP. Eni considers the level of consultation to be adequate. Notification requirements have been included in Section 11.8.
State government departments			
NT Department of Primary Industry and Resources (DPIR)– Fisheries	DPIR has a key role to play in the emerging agenda for developing northern Australia. Its three areas of focus are growing new industries including diversification of existing production enterprises, protecting industries and market access, and providing the specialist services needed for these operations.	DPIR was provided the Blacktip Drilling EP consultation information sheet via email on 9th May 2022. An activity update consultation sheet was provided on 26 August 2022, which advised that the EP now includes the drilling of two development wells. No reply has been received by submission of this EP.	Fishing effort in the Operational Area has been discussed in Section 4.5.5 of the EP. Eni considers the level of consultation to be adequate.

Stakeholder	Relevance or reasoning for engagement	Consultation summary	Consultation assessment
NTEPA	NTEPA is an independent authority established under the NT *Environment Protection Authority Act*. NTEPA provides advice about the environmental impacts of development proposals and advice and regulatory services to encourage effective waste management, pollution control and sustainable practices.	NTEPA was provided the Blacktip Drilling EP consultation information sheet via email on 9th May 2022. An activity update consultation sheet was provided on 26 August 2022, which advised that the EP now includes the drilling of two development wells. No reply has been received by submission of this EP.	Eni considers the level of consultation to be adequate.
WA DPIRD – Fisheries	DPIRD is responsible for conserving, developing and managing WA aquatic resources, commercial and recreational fishing licencing, and protecting the aquatic environment and fish ecosystems.	DPIRD was provided the Blacktip Drilling EP consultation information sheet via email on 9th May 2022. An activity update consultation sheet was provided on 26 August 2022, which advised that the EP now includes the drilling of two development wells. No reply has been received by submission of this EP.	Fishing effort in the Operational Area has been discussed in Section 4.5.5 of the EP. IMS risk and controls are included in Section 8.3. Eni considers the level of consultation to be adequate.
WA DBCA	DBCA is responsible for promoting biodiversity and conservation, through sustainably managing WA's species, ecosystems, lands and the attractions in its care. DBCA comprises Botanic Gardens and Parks Authority, Zoological Parks Authority and the former Department of Parks and Wildlife (DPAW).	DBCA was provided the Blacktip Drilling EP consultation information sheet via email on 9th May 2022. On the 1st June 2022 DBCA responded with acknowledgement and no specific comment on the proposal. An activity update consultation sheet was provided on 26 August 2022, which advised that the EP now includes the drilling of two development wells.	DBCA does not object to the Blacktip Drilling EP and has made no claim. Eni considers the level of consultation to be adequate.

Stakeholder	Relevance or reasoning for engagement	Consultation summary	Consultation assessment
WA DMIRS	DMIRS is responsible for ensuring the State's resources sector is developed and managed responsibly and sustainably for the benefit of all Western Australians. Prior to NOPSEMA, it was the Designated Authority for adjacent Commonwealth waters. As recommended by DMIRS, pre-start and cessation notifications of activities being undertaken in Commonwealth waters adjacent to the WA coastline must be provided.	DMIRS was provided the Blacktip Drilling EP consultation information sheet via email on 9th May 2022. An activity update consultation sheet was provided on 26 August 2022, which advised that the EP now includes the drilling of two development wells. No reply has been received by submission of this EP.	Eni considers the level of consultation to be adequate.
Fishing industry			
CFA	CFA was engaged as a representative body for Commonwealth fisheries. As no Commonwealth fishing activity for the tuna industry has been identified in recent years, the level of interest from CFA is expected to be low.	CFA was provided the Blacktip Drilling EP consultation information sheet via email on 9th May 2022. A follow-up email was sent on 6th June 2022. An activity update consultation sheet was provided on 26 August 2022, which advised that the EP now includes the drilling of two development wells. Further detail on the timing of activities was also provided to Defence. No reply has been received by submission of this EP.	Eni considers the level of consultation to be adequate.

Stakeholder	Relevance or reasoning for engagement	Consultation summary	Consultation assessment
WAFIC	WAFIC is the peak industry body representing the interests of the commercial fishing, pearling and aquaculture sector. WAFIC is a relevant stakeholder for this Petroleum Activities Program.	WAFIC was provided the Blacktip Drilling EP consultation information sheet via email on 9th May 2022. On May 31 WAFIC responded with a request for a summary outline of what the cuttings management processes will be to reduce impacts and confirmation over any risk of a spill event and scientific monitoring. Eni replied to WAFIC on 14th June 2022 and advised that cuttings modelling has been completed and provided an overview of the results (presented in Section 7.9.2.2). Eni also provided details of the control measures for cuttings management Eni advised WAFIC that there is an OPEP in place for the drilling and an Operational and Scientific Monitoring Plan and outlined the studies included. Eni included details that they are responsible for the full extent of any costs expenses, liability and damages that occur including any civil liability damages (e.g. in the event of a spill) that might be pursued through civil action in a court of law, or under the 'polluter pays' statutory duty under OPGGS Act. An activity update consultation sheet was provided on 26 August 2022, which advised that the EP now includes the drilling of two development wells. Eni provided further detail on the discharge of cuttings.	Impacts to fisheries have been discussed in: • Section 7.1 (interaction with other marine users) • Section 7.3 (noise) • Section 7.8 (drilling muds and fluids discharge) • Section 7.9 (cuttings discharge) • Sections 8.6 (spills). Cuttings management controls are included in Section 7.9.4 Eni is utilising the accepted Blacktip Operations OPEP (000036_DV_PR.HSE.0388.000_Rev14) and Scientific Monitoring Plan (000036_DV_PR.HSE.0860.000) which includes studies to determine impact to fish and fisheries from a spill. Eni considers the level of consultation to be adequate.
NTGFIA	NTGFIA is the industry body for guided fishing and recreational fishers.	NTGFIA was provided the Blacktip Drilling EP consultation information sheet via email on 9th May 2022. A follow-up email was sent on 28th June 2022. No reply has been received by submission of this EP.	Eni considers the level of consultation to be adequate.

Stakeholder	Relevance or reasoning for engagement	Consultation summary	Consultation assessment
Commercial Fisheries			
NPF	Fishing group.	NPF was provided the Blacktip Drilling EP consultation information sheet via email on 9th May 2022. A follow-up email was sent on 6th June 2022, which included an attachment of the emails between NPF and Eni in 2019 during the planning of the P3 development well with the aim to facilitate any feedback on the development wells under this EP. A follow-up phone call was made on 28th June 2022 and message left regarding the proposed drilling and information contained in the information sheet. A further phone call was made on 29th June, without response. A further phone call was made on 30th June, without response. A further follow-up email was sent on 30th June 2022, which included an attachment of the emails between NPF and Eni in 2019. Also included that correspondence has been made with WAFIC regarding the activity. An activity update consultation sheet was provided 26 August 2022, which advised that the EP now includes the drilling of two development wells. Eni followed up with a phone call, without response. Contact details for the NPF (email and phone numbers) were taken from the NPF website (http://npfindustry.com.au/), which are the same that were provided by AFMA during consultation.	Section 7.1 (interaction with other users) includes an assessment of impact to fisheries. including the NPF. Section 7.8 (drilling muds and fluid discharges) includes an assessment of the drilling muds and fluids discharge on prawn stocks. Eni considers the level of consultation to be adequate.

Stakeholder	Relevance or reasoning for engagement	Consultation summary	Consultation assessment
Other			
Thamarrurr Development Corporation/ Rangers	Subsistence fishing. Based out of Wadeye.	Thamarrurr Development Corporation was provided the Blacktip Drilling EP consultation information sheet via email on 9th May 2022. An activity update consultation sheet was provided on 26 August 2022, which advised that the EP now includes the drilling of two development wells. No reply has been received by submission of this EP. Eni has regular ongoing engagement with the Thamarrurr Rangers regarding other activities related to the onshore YGP.	Eni considers the level of consultation to be adequate.
Recfishwest	Industry Non-Government Organisation – Peak recreational fishing body and advocate for fisheries.	Recfishwest was provided the Blacktip Drilling EP consultation information sheet via email on 6th June 2022. An activity update consultation sheet was provided on 26 August 2022, which advised that the EP now includes the drilling of two development wells. No reply has been received by submission of this EP.	Section 7.1 (interaction with other users) includes an assessment of impact to fisheries. including the NPF. Section 7.8 (drilling muds and fluid discharges) includes an assessment of the drilling muds and fluids discharge on prawn stocks. Eni considers the level of consultation to be adequate.
NLC	Administers the Aboriginal Land Rights (NT) Act and Native Title Act and controls access to Aboriginal Land through permits to enter.	NLC was provided the Blacktip Drilling EP consultation information sheet via email on 28th June 2022. An activity update consultation sheet was provided on 26 August 2022, which advised that the EP now includes the drilling of two development wells. No reply has been received by submission of this EP.	Eni considers the level of consultation to be adequate.

5.4 Ongoing Consultation

Stakeholder consultation for the Petroleum Activities Program will be ongoing. Eni will work with stakeholders to address any future concerns if they arise throughout the duration of this EP. Should any new stakeholders be identified, they will be added to the stakeholder database and included in all future correspondence as required, including specific activity notifications.

Eni will continue to accept feedback from all stakeholders during the assessment of this EP and throughout the duration of the accepted EP.

Additional consultation with relevant stakeholders will occur in the event there is a significant change to the proposed activities.

6 ENVIRONMENTAL RISK ASSESSMENT METHODOLOGY

6.1 Risk Assessment

In accordance with Regulation 13(5) of the OPGGS(E) Regulations, the EP must contain:

(a) details of the environmental impacts and risks for the activity, and

(b) an evaluation of all the impacts and risks, appropriate to the nature and scale of each impact or risk, and

(c) details of the control measures that will be used to reduce the impacts and risks of the activity to as low as reasonably practicable and an acceptable level.

The Eni philosophy to manage environmental risks is to eliminate or mitigate the risk during the planning phase. Managing risks through design is contingent upon identifying, at an early stage in the project, the sources and pathways by which environmental impacts can occur and the sensitivities of the receiving environment in which the project is situated.

The expected or potential risks associated with the Petroleum Activities Program were assessed using the Eni procedure *Risk Management and Hazard Identification* (ENI-HSE-PR-001). This procedure is consistent with the Australian Standard for Risk Management: *AS/NZS ISO 31000:2018 Risk management – Principles and guidelines* and provides a systematic process for:

1. identifying each project activity and its associated environmental aspects
2. identifying the environmental values within and adjacent to the area
3. defining the potential environmental effects (impacts) of aspects identified in Step 1 above on the values identified in Step 2 above
4. identifying the potential environmental consequences and severity of the impact (Table 6-2)
5. identifying the likelihood of occurrence of the consequence, according to a six-level scale (Table 6-1)
6. evaluating overall environmental risk levels using the Eni environmental risk matrix (Figure 6-1)
7. identifying mitigation measures, assigning management actions and further recommended risk reduction measures according to risk levels (Table 6-3) in order to reduce the risk to ALARP.

Table 6-1: Likelihood scale

ID	Likelihood	Description
0	Non-credible	Theoretically possible but not known or reasonably expected to have occurred in the exploration and production industry
(A)	Rare	Reported for exploration and production industry (Freq 10-6 to 10-4/years)
(B)	Unlikely	Has occurred at least once in company (Freq 10-4 to 10-3/years)
(C)	Credible	Has occurred several times in company (Freq 10-3 to 10-1/years)
(D)	Probable	Happens several times per year in company (Freq 10-1 to 1/years)
(E)	Almost certain/ will occur	Several times per year at one location (Freq >1/year)

Table 6-2: Environmental consequence descriptors

Descriptor	Description
(1) Slight	Aspect not subject to compliance with legal and regulatory prescriptions in force or with prescriptions voluntarily subscribed by the Organisation. No breach. Temporary impact on a non-sensible area. Impacted area less than 0.1 square mile (0.26 km^2). Onshore spill less than 0.1 m^3. Minimum and short-term impact in the interested community. No problem with stakeholders. Slight damage and no interruption of activities or business.
(2) Minor	Limits occasionally exceeded. An impact on localised areas. An impact on a reduced number of non-compromised species. Impacted area less than 1.0 square mile (2.6 km^2). Onshore spill less than 10 m^3. A reduced damage to the company's image in the area that has to be repairable. Problems with local stakeholders. Minor damage resulting in: • a brief interruption of activities or business • repair cost area less than $200,000, or • loss of production less than one day.
(3) Local	Possible temporary suspension of activities or administrative sanctions. An impact on protected natural areas. Damage for some species. Impacted area less than ten square miles (26 km^2). Onshore spill less than 100 m^3. A potential significant damage to the Company's reputation in the region (local impact). Problems with regional stakeholders. Local damage resulting in: • the unit requiring repair or replacement to resume the activity • repair cost less than $2,500,000, or • loss of production less than one week.

Descriptor	Description
(4) Major	Impact on permits to perform the works. An impact on areas interested in science. Damage to the biodiversity. Impacted area less than 100 square miles (260 km²). Onshore spill less than 1000 m³. A serious and permanent damage to the Subsidiary's capacity to maintain its business position in the area with some wider implications for the subsidiary/problems with national stakeholders. Significant damage resulting in: • long-term or significant modifications to resume the activity • repair cost less than $25,000,000, or • loss of production less than three months.
(5) Extensive	Impact on permits or acquisitions (future). An impact on special areas of conservation/reduction of biodiversity. Impacted area greater than 100 square miles (260 km²). Onshore spill less than 1000 m³. Potential loss of future business possibilities in the area or region or an enduring significant damage to Eni's image in the international field. Problems with international stakeholders. Extensive damage resulting in: • total loss of operations or business • revamping required to resume the activity • repair cost more than $25,000,000, or • loss of production more than three months.

Consequence					Likelihood or Annual Frequency					
					0	A	B	C	D	E
Severity	**Company Reputation**	**People (Health & Safety)**	**Environment**	**Assets / Project**	**0** - Non credible / Could happen in E&P industry (Freq <10-6 /y)	**A** - Rare / Reported for E&P industry (Freq 10-6 to 10-4 /y)	**B** - Unlikely / Has occurred at least once in Company (Freq 10-4 to 10-3 /y)	**C** - Credible / Has occurred several times in Company (Freq 10-3 to 10-1 /y)	**D** - Probable / Happens several times per year in Company (Freq 10-1 to 1 /y)	**E** - Frequent / Several times per year at one location (Freq >1 /y)
1	**1**-Slight impact	**1**-Slight health effect / injury	**1**-Slight effect	**1**-Slight damage	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**
2	**2**-Minor impact	**2**-Minor health effect / injury	**2**-Minor effect	**2**-Minor damage	**Low**	**Low**	**Low**	**Medium**	**Medium**	**Medium**
3	**3**-Local impact	**3**-Major health effect / injury	**3**-Local effect	**3**-Local damage	**Low**	**Low**	**Medium**	**Medium - High**	**High**	**High**
4	**4**-National impact	**4**-PTD or single fatality	**4**-Major effect	**4**-Major damage	**Low**	**Medium**	**Medium - High**	**High**	**High**	**High**
5	**5**-International impact	**5**-Multiple fatalities	**5**-Extensive effect	**5**-Extensive damage	**Medium**	**Medium - High**	**High**	**High**	**High**	**High**

Figure 6-1: Eni environmental risk matrix

Table 6-3: Risk management actions

Risk Rating	Management Actions Required
Low (L)	*Continuous improvement:* The level of risk is broadly acceptable and generic control measures are required, aimed at avoiding deterioration. * Non-credible hazards require no further risk assessment.
Medium (M) Medium – High (orange)	The level of risk can be tolerable only once a structured review of the risk reduction measures has been performed (where necessary, the relevant guidance from the local authorities should be adopted for application of ALARP).
High (H)	*Intolerable risk:* The level of risk is not acceptable and risk control measures are required to lower the risk to another level of significance.

The environmental risk assessment process includes an analysis of inherent and residual risk levels. Inherent risk levels assume limited controls are in place. Residual risk levels are based on the application of further recommended risk reduction measures above and beyond those minimum standards, which drive the risk level down to ALARP.

6.2 Risk Reduction

Impacts or risks identified as requiring additional controls (the application of mitigation and management measures beyond what is standard practice for offshore petroleum activities) are subject to further review to identify the controls that are required to be provided or modified in order to reduce the residual risk.

Risk assessment is an iterative process of:

- identifying a risk
- assessing a risk
- deciding whether residual risk is tolerable
- if not tolerable, generating a new risk or mitigation measures
- assessing the effectiveness of the mitigation measures.

The acceptability of a risk, after controls and mitigation measures have been applied, is determined in accordance with ratings and associated management actions outlined in Table 6-3.

6.3 As Low As Reasonably Practicable and Acceptance Criteria

6.3.1 As Low As Reasonably Practicable Criteria

The ALARP principle recognises no industrial activity is entirely risk free. ALARP is defined as a level of impact and risk that is not unacceptable and cannot be reduced further without the expenditure of costs that are disproportionate to the benefit gained. Cost may be in terms of financial, health, safety and schedule implications.

Regulation 10A(b) of the OPGGS(E) Regulations require a demonstration that environmental impacts will be reduced to ALARP. For risks to be considered as reduced to ALARP, one of the following criteria must apply:

- There are no reasonable practicable alternatives to the activity.
- The cost (in other words, sacrifice) for implementing further measure is disproportionate to the reduction in risk.

When deciding whether risks are managed to ALARP, Eni considered the:

- risk level
- existing layers of protection, including both preventive and mitigative controls
- feasibility of additional controls or alternative arrangements
- practicality of additional controls or alternative arrangements
- cost of additional controls or alternative arrangements
- effectiveness of additional controls or alternative arrangements
- impact on risks from additional controls or alternative arrangements.

6.3.2 Acceptance Criteria

Regulation 10A(c) of the OPGGS(E) Regulations requires a demonstration that environmental impacts are of an acceptable level.

Eni considered a range of factors when evaluating the acceptability of environmental impacts associated with its activities. This evaluation is outlined in Table 6-4.

Table 6-4: Eni acceptability factors

Demonstration of Acceptability	
Compliance with legal requirements, laws and standards	Considers the legal aspect, particularly compliance with applicable legislative prescriptions and regulations in force which imply specific procedures to be performed by the Titleholder to control the environmental aspect.
Policy compliance	The risk or impact must be compliant with the objectives of Eni policies.
Social acceptability	Considers the 'social' aspects that can alter stakeholder perception of the Titleholder's commitment regarding the safeguard and protection of the environment and that can cause serious harm to the Titleholder's public image.
Area sensitivity/biodiversity	The proposed risk or impact controls, environmental performance outcomes (EPOs) and environmental performance standards (EPSs) must be consistent with the nature of the receiving environment.
Environmentally sustainable development principles	The overall activity is consistent with principles of ecological sustainable development ESD[1].
ALARP	There is a consensus among the risk assessment team that risks or impacts are ALARP.

Note 1: The principles of ESD (as defined in Section 3A of the Commonwealth EPBC Act, including:

- *Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations (the 'integration principle').*
- *If there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation (the 'precautionary principle').*
- *The principle of intergenerational equity – that the present generation should ensure the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations (the 'intergenerational principle').*
- *The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making (the 'biodiversity principle').*

6.3.3 Risk Identification Workshop

An environmental risk identification and assessment workshop (ENVID) for the Petroleum Activities Program was undertaken in May 2022 and reviewed in August 2022. The workshop was attended by a representative cross-section of the Blacktip drilling project workforce, including Eni engineers and HSE personnel.

All the credible risks from the Petroleum Activities Program were assessed and EPOs, EPSs and Measurement Criteria (MC) to reduce the risks to ALARP and acceptable were developed. Performance outcomes, standards and measurement criteria are outlined in Section 10.

7 ENVIRONMENTAL RISK ASSESSMENT – PLANNED OPERATIONS

7.1 Interaction with Other Marine Users (Risk Identification P1)

7.1.1 Summary of Environmental Risk Assessment

Hazard	Interference with other Marine Users		
	Frequency	Severity	Risk
Inherent Risk	B	1	L
Residual Risk	A	1	L

7.1.2 Description of Hazard

The Petroleum Activities Program will occur within the WHP 500 m PSZ. The MODU will be on location continuously for the period of the Petroleum Activities Program, with support from three vessels (refer Section 3.6.1). The presence of the 500 m PSZ, which extends around the MODU and the WHP, potentially impacts on other marine users, such as shipping and fisheries, through displacing them from the area.

7.1.3 Potential Environmental Impact

7.1.3.1 Shipping

To reduce the likelihood of interactions between commercial vessels and offshore facilities, AMSA has introduced shipping fairways within which commercial vessels are advised to navigate. The fairways are not mandatory, but AMSA strongly recommends commercial vessels remain within the fairways when transiting the region. As discussed in Section 4.6.3, the nearest shipping fairway is 100 km from the Operational Area and therefore the presence of the vessels and MODU is unlikely to cause any disturbance or displacement of shipping traffic.

7.1.3.2 Fishing

A number of NT, WA and Commonwealth fisheries overlap the Operational Area; however, given the Petroleum Activities Program will occur within the WHP 500 m PSZ, no interaction is anticipated (Section 4.6.1).

The NPF operates from the low water mark of the Australian north coast to the outer edge of the Australian Fishing Zone (AFMA, 2022). It is the largest fishery in the North Marine Region. The fishery has a short season, with the banana prawn season lasting a maximum of ten weeks and the tiger prawn season taking less than four months. Species are targeted by otter trawl over soft substrates, such as those within the Operational Area. While the NPF operates in the vicinity of the Operational Area, it does not utilise it for catch.

The presence of the MODU and the 500 m PSZ extending around the WHP can potentially limit the fishing areas for the respective commercial fisheries that overlap. However, given the continued presence of the Blacktip infrastructure over the last ten years, which has operated with no issues around interaction with other users, and the vastness of the fishery zones compared to the 500 m PSZ, the displacement from fishing grounds is considered temporary and of slight consequence. Commercial fishing groups have been consulted regarding the Petroleum Activities Program and no issues have been raised.

7.1.3.3 Traditional and Subsistence Fisheries

Subsistence fishing continues to form an important part of Aboriginal culture and as a source of food. Wadeye (located 70 km from the Operational Area) is the main community in the Thamarrurr Region and is populated by landowners who own land from Cape Scott in the north to the Fitzmaurice River in the south. Subsistence fishing occurs throughout this region using traditional methods, as it does across the NT. The most important species reflect those typically important across the territory and include mullet for bait, barramundi and catfish. Species of mussels and mudcrabs are also highly significant. Given fishing is generally limited to shorelines, creeks and nearshore reefs, the Petroleum Activities Program is not anticipated to cause any interference. Meetings were held with Thamarrurr Rangers (about Blacktip operations in general rather than this EP development) which confirmed most of the fishing occurs nearshore and there is little to no offshore subsistence fishing in the region. Therefore, impacts to traditional fisheries are not anticipated.

7.1.3.4 Defence

As advised by Defence (Table 5-2), WA-33-L is located within the North Australia Exercise Area (NAXA) and restricted airspace R264G. Defence have advised that during Eni activities within the period of 12 – 25 September 2022 (with a few days allowance), may become mutually incompatible with Defence operations.

In order to ensure Eni activities do not conflict with Defence training in the future, Eni will notify Defence a minimum of five weeks prior to the actual commencement of activities. Notification will need to be provided to Offshore.Petroleum@defence.gov.au.

7.1.4 Environmental Performance Outcomes and Control Measures

EPOs relating to this risk include:

- information provided to regulatory authorities and marine users directly affected by planned activities (EPO-01)
- activity is managed in accordance with navigational and safety requirements (EPO-02)
- no unplanned interactions with other users (EPO-03).

Control measures (CMs) relating to this risk include:

- navigation equipment and procedures (lighting as required for safe work conditions and navigational purposes) (CM-01)

- maritime / stakeholder notices (CM-02)
- Petroleum Safety Zone (CM-03).

EPSs and MC relating to the above are presented in Section 10.

7.1.5 As Low As Reasonably Practicable Demonstration

Demonstration of ALARP			
Type	**Control/ management**	**Evaluation**	**Adoption?**
Eliminate	Eliminating the use of vessels in the Operational Area	Vessel use is required to support the MODU operations and cannot be eliminated.	×
	Reducing or eliminating the 500 m PSZ around the WHP and MODU	PSZ is mandated by the OPGGS Act and cannot be reduced or eliminated.	×
	Timing drilling to avoid NPF fishing season	The drilling will occur at the WHP which has a 500 m gazetted PSZ; commercial fishing activities are not permitted within the PSZ. Given the WHP has been operational since 2009, displacement impact from the drilling activity to the NPF commercial fishing is considered to be no greater than the displacement which already occurs due to the presence of the WHP. Timing drilling to avoid NPF fishing season therefore provides no benefit.	×
Substitute	N/A	N/A.	N/A
Engineering	Navigation lighting and aids in accordance with AMSA Marine Order Part 30: Prevention of collisions, and with Marine Order Part 21: Safety of navigation and emergency procedures	Ensures the MODU and vessels are seen by other marine users. Reduces risk of environmental impact from vessel collisions due to ensuring safety requirements are fulfilled. Negligible costs of operating navigational equipment. A requirement under Marine Orders, which requires vessels to have navigational equipment to avoid collisions.	✓ (CM-01)
Isolation	N/A	N/A.	N/A
Administrative	AHO and AMSA RCC (as part of marine safety division) notifications	Minor administrative costs in notifying AHO and RCC. Ensures other users are aware of the activities, reducing likelihood of interactions.	✓ (CM-02)

Demonstration of ALARP			
Type	**Control/ management**	**Evaluation**	**Adoption?**
	Establishment and enforcement of a 500 PSZ around the MODU	No additional costs. Other marine users may be temporarily excluded from areas. A 500 m PSZ is already present around the WHP (drilling is from the WHP).	✓ (CM-03)
	Defence notifications	In order to ensure Eni activities do not conflict with Defence training in the future, Eni will notify Defence a minimum of five weeks prior to the actual commencement of activities. Notification will need to be provided to Offshore.Petroleum@defence.gov.au Defence will also be made aware of any high velocity exhaust gas plumes and/or burn-offs that could impact safety of flights. Minor administrative costs in notifying Defence. Ensures Defence are aware of the activities, reducing likelihood of interactions.	✓ (CM-02)

7.1.6 Acceptability Demonstration

Demonstration of Acceptability	
Compliance with Legal Requirements, Laws and Standards	Vessels and MODU compliant (where applicable) with standard maritime safety and navigation procedures, including AMSA Marine Order Part 30 (Prevention of collisions) 2009 and Marine Order Part 21 (Safety of navigation and emergency procedures) 2016. The Petroleum Activities Program complies with the EPBC approval conditions (EPBC 2003/1180).
Policy Compliance	Eni HSE Statement objectives will be met.
Social Acceptability	A process of consultation has been performed with other potential users of the area, confirming there are no concerns with the Petroleum Activities Program. A process is available for ongoing consultation as required. NPF raised concern about the installation (including timing) of the third well (P3) during consultation in 2020 (under the Blacktip Operations EP) in particular and the disruption to, or displacement of, NPF commercial fishing activities. The development well drilling will occur at the WHP which has a 500 m gazetted PSZ; commercial fishing activities are not permitted within the PSZ. Given the WHP has been operational since 2009, displacement impact from this Petroleum Activities Program to the NPF commercial fishing is considered to be no greater than the displacement which already occurs due to the presence of the WHP. Maritime regulations will be followed (issuing of a Notice to Mariners and such).
Area Sensitivity/ Biodiversity	The Operational Area is not located in or near heavily fished waters or shipping fairways.

ESD Principles	The impact assessment presented throughout this EP demonstrates compliance with the principles of ESD.
ALARP	The residual risk has been demonstrated to be ALARP.

Given the duration of the Petroleum Activities Program (refer Section 3.4) and low volume of shipping traffic and fishing in the Operational Area, potential impacts associated with interaction and displacement of other marine users are slight. The residual risk is considered low, which is acceptable in accordance with Eni's acceptability criteria (Table 6-4). Therefore, potential impacts associated with interactions with other marine users are considered acceptable and ALARP.

7.2 Atmospheric Emissions (Risk Identification P2)

7.2.1 Summary of Environmental Risk Assessment

Hazard	Atmospheric Emissions – power generation and flaring		
	Likelihood	**Severity**	**Risk**
Inherent Risk	E	1	L
Residual Risk	E	1	L

7.2.2 Description of Hazard

Atmospheric emissions will released by the MODU and vessels as a result of combustion for power generation (Section 7.2.2.1) and transport during the period of the Petroleum Activities Program. Emissions will also be released from the flare tip during clean-up via the well test package on the MODU (Section 7.2.2.2). Whilst greenhouse gas (GHG) emissions will be released during the Petroleum Activities Program from both power generation and flaring, these emissions are a fraction (<0.01%) of the overall annual Australian GHG emissions.

MODU and vessels may also use ozone-depleting substances (ODS) in closed-system rechargeable refrigeration systems.

7.2.2.1 Power Generation

Continuous power generation is the main source of engine exhaust emissions on the MODU and vessels. Other engine exhausts result from the use of cranes and helicopters. The MODU and vessel generators are typically run on MDO. A vessel on dynamic positioning typically uses approximately 16 t of MDO per day.

Products of hydrocarbon combustion emitted to the atmosphere include emissions of GHG, such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), along with non-GHG such as sulphur oxides (SO_X) and nitrogen oxides (NO_X). There may also be emissions of particulate matter, and hydrocarbons, including benzene, ethyl benzene, toluene and xylene (BTEX).

7.2.2.2 Flaring and Venting

Clean-up via the MODU well test package will result in a flare emission from the MODU flare tip. Flaring will occur for a period of up to 96 hours per development well. The same volume of diesel pumped downhole will be flared (approximately 90 m^3 per development well). Emissions and combustion products include CO_2, NOx, SO_2, methane, particulates and VOCs. Incomplete combustion under certain scenarios may also generate dark smoke.

7.2.2.3 Potential Environmental Impact

Hydrocarbon combustion may result in a temporary, localised reduction of air quality in the environment immediately surrounding the discharge point.

Non-GHG emissions, such as NO_X and SO_X, and GHG emissions can lead to a reduction in local air quality, which could impact humans and seabirds in the immediate vicinity and add to the national GHG loadings.

Local impacts typically associated with the emissions are mitigated by the dispersive nature of the offshore environment. Any potential local elevated concentrations of emissions will be short lived and unlikely to be detectable except in the near vicinity of the release. Combustion of fuels and incineration (including flaring) at the field will not impact on air quality in coastal communities.

Air emissions will be similar to other vessels operating in the region for both petroleum and non-petroleum activities.

Air emissions are not expected to significantly affect air quality or contribute significantly to GHG contributions to the atmosphere.

7.2.3 Environmental Performance Outcomes and Control Measures

EPOs relating to this risk include:

- atmospheric emissions in compliance with Marine Order 97 requirements to restrict emissions to those necessary to perform the activity (EPO-04)
- Maximise efficiency of combustion during flaring (EPO-05).

CMs relating to this risk include:

- air pollution prevention certification (CM-04)
- fuel type used (CM-05)
- administrative control measures for flaring (CM-06).

EPSs and MC relating to the above are presented in Section 10.

7.2.4 As Low As Reasonably Practicable Demonstration

Demonstration of ALARP			
Type	**Control/ management**	**Evaluation**	**Adoption?**
Eliminate	Eliminating the use of vessels in the Operational Area	Vessels are required to perform equipment removal activities and vessel use cannot be eliminated.	×
	No incineration of waste on vessels	Eliminates the potential for emissions due to waste incineration to impact air quality. However, increases health risk from storage of wastes. Increase in risk due to transfers (increased fuel usage, potential increase in collision risk, disposal on land).	×
	Eliminate flaring during clean-up	Eliminating flaring would limit the atmospheric emissions volume. Flaring is a common and necessary part of drilling activities. It is required for well clean-up and cannot be eliminated.	×
Substitute	Use green energy sources on the MODU and vessels	Alternatives such as renewable energy generators (wind and sun) are not viable options as they are weather-dependent and do not supply continuous base load power. The vessels and MODU will use MDO, which is low in sulphur dioxide (rather than heavy fuel oil).	×
	Replace all ODS on MODU and vessels	Replacing all ODS systems would be costly and take time. It should be noted ODS is rarely found on vessels.	×
	Use low sulphur fuel on the support vessels and MODU, in accordance with Marine Order 97	Reduces emissions through use of low-sulphur fuel in accordance with Marine Order 97. Minimal cost as vessels required to comply with Marine Orders.	✓ (CM-05)
Engineering	N/A	N/A.	N/A
Isolation	N/A	N/A.	N/A
Administrative	Compliance with administrative control measures for flaring	Administrative control can reduce atmospheric emissions with minimal cost involved.	✓ (CM-06)
	Vessel Air Pollution Prevention Certificate and compliance with the requirements of MARPOL 73/78 Annex VI and Marine Order 97	Reduces probability of potential impacts to air quality due to ODS emissions, high NOx, SOx and incineration emissions. Benefits of ensuring vessel is compliant outweigh the minimal administrative costs and it is a legislated requirement.	✓ (CM-04)

7.2.5 Acceptability Demonstration

Demonstration of Acceptability	
Compliance with Legal Requirements, Laws and Standards	Emissions will comply with relevant maritime and air quality requirements. Vessels will comply with the requirements of MARPOL 73/78 Annex VI and Marine Order 97. The Petroleum Activities Program complies with the EPBC approval conditions (EPBC 2003/1180).
Policy Compliance	Eni HSE Statement objectives will be met.
Social Acceptability	Stakeholder consultation has been undertaken. No stakeholder concerns have been raised with regards to atmospheric emissions.
Area Sensitivity/ Biodiversity	Offshore location means winds will disperse and dilute emissions rapidly. No human settlements nearby.
ESD Principles	The impact assessment presented throughout this EP demonstrates compliance with the principles of ESD.
ALARP	The residual risk has been demonstrated to be ALARP.

Given the duration of the Petroleum Activities Program (see Section 3.4) and receptors in the Operational Area, the potential consequence associated with atmospheric emissions is slight. The residual risk is considered low, which is acceptable in accordance with Eni's acceptability criteria (Table 6-4). Therefore, potential impacts associated with atmospheric emissions are acceptable and ALARP.

7.3 Routine Helicopter, Vessel and Mobile Offshore Drilling Unit Noise (Risk Identification P3)

7.3.1 Summary of Environmental Risk

Hazard	Noise caused by Helicopters, Vessels, MODU noise		
	Likelihood	Severity	Risk
Inherent Risk	A	1	L
Residual Risk	A	1	L

7.3.2 Description of Hazard

During the Petroleum Activities Program, noise emissions will be generated through the operation of support vessels, helicopters and MODU operation and drilling. A maximum of three vessels will be active in the Operational Area at any one time, supporting the Petroleum Activities Program. Noise from these sources can be broadly defined as non-impulsive.

7.3.2.1 Helicopters

Crew changes will be required during the Petroleum Activities Program and will be undertaken using helicopters.

The main acoustic source associated with helicopters is the impulse noise from the main rotor, which consists of blade-vortex interaction noise in decent or level flight at low and medium velocities, and high-speed impulsive noise related to trans-sonic effects on the advancing blade. The rotating blades of helicopters produce tones with fundamental frequencies proportional to the rate and number of blades. Noise levels for typical helicopters used in offshore operations (Eurocopter Super Puma AS332) at 150 m separation distance have been measured at up to a maximum of 90.6 dB (BMT Asia Pacific, 2005). Unconstrained point source noise in the atmosphere (such as helicopter noise) spreads spherically (Truax, 1978), with noise received at the sea surface decreasing with increasing distance from the aircraft (Nowacek *et al*., 2007). Noise levels reported for a Bell 212 helicopter during fly-over was reported at 162 dB re 1 µPa and for Sikorsky-61 is 108 dB re 1 µPa at 305 m (Simmonds *et al*., 2004).

Table 7-1 presents the source levels and frequencies from helicopter operations.

Table 7-1: Sound source levels and frequencies from helicopter operations

Source of aspect	Operating frequency (kHz)	Source Level (@1 m)		Sound category	Reference
		SPL (L_p)	PK (L_{pk})		
Helicopter operations	0.5	162	-	Continuous	Simmonds *et al.*, 2004

7.3.2.2 Vessels

For vessels, the noisiest anticipated activity is when the vessel uses dynamic positioning to maintain a position and heading by using its own propellers and thrusters. Support vessels and many research vessels in the 50 to 100 m size class typically have broadband source levels in the 165 to 180 dB re 1 µPa sound pressure level (SPL) range (Gotz *et al*., 2009). In comparison, underwater sound levels generated by large ships can produce levels exceeding 190 dB re 1 µPa SPL (Gotz *et al*., 2009).

McCauley (1998) measured underwater broadband noise equivalent to approximately 182 dB re 1 µPa SPL @ 1 m with a frequency range of 20 Hz to 10 kHz from a support vessel using dynamic positioning in the Timor Sea; it is expected similar noise levels will be generated by the vessels used for Petroleum Activities Program. The thruster noise dropped below 120 dB re 1 µPa (thresholds that could result in behavioural response for cetaceans for continuous noise sources, refer Table 7-3) within 3 to 4 km and was audible above ambient noise up to 20 km away (McCauley, 1998).

Table 7-2 presents a summary of the expected source levels and frequencies from vessels relevant to the Petroleum Activities Program.

Table 7-2: Sound source levels and frequencies from vessels relevant to the subsea equipment recovery activities

Source of aspect	Operating frequency	Source Level (@1 m)		Sound category
		SPL (L_p)	PK (L_{pk})	
Support vessel	0.2 to 1 kHz [1]	182 to 186 [1]	-	Continuous – non-impulsive

[1] *McCauley (1998)*

7.3.2.3 Mobile Offshore Drilling Unit and Drilling

MODUs working but not drilling have been measured to produce noise between 0.005 and 1.2 kHz frequencies with a source level of 59 dB re 1 µPa @ 1 m (WDCS, 2004), noting the key source of sound originates from generators and equipment above the water level on the MODU.

Jack-up MODUs do not require the use of thrusters to maintain position. Non-impulsive sound produced subsurface by the jack-up MODU drilling activity can be categorised as:

- Rig working but not drilling. During this period, the primary sources are from mechanical plant, discharged fluids, pumping systems and miscellaneous banging of gear on the rig. Typically, this is low-level, low-intensity continuous sound.
- Rig actively drilling. Typically, this is at 16 to 200 kHz frequencies with a source level range of 167 to 171 dB re 1 µPa @ 1 m for drilling using a jack-up MODU (MMO, 2015).

7.3.3 Potential Environmental Impact

For non-impulsive noise, only weighted sound exposure level metrics are provided in the literature (Table 7-3). Estimating sound exposure level provides a metric that integrates cumulative exposures. For permanent threshold shift (PTS) and temporary threshold shift (TTS) to non-impulsive noise, 24 hours has been provided as a suitable timeframe to estimate sound exposure level (Southall *et al*., 2007). Since TTS and PTS thresholds are not provided in SPL, it is not possible to directly compare these thresholds with the predicted SPL @ 1 m for the vessels and MODU, as described in Section 7.3.2.

It is recognised that noise at source from the vessels exceed TTS and PTS thresholds at source and noise from the MODU exceeds TTS at source (high-frequency cetaceans only). However, since cetaceans are transient in the Operational Area, which lacks aggregating habitat such as foraging, resting or calving areas, individuals are expected to pass through the Operational Area, potentially showing localised avoidance via behavioural responses (see below). In doing so, individuals are not expected to remain within the vicinity of the noise source for the duration (as in, 24 hours) required to exceed PTS or TTS thresholds.

Table 7-3: Permanent threshold shift, temporary threshold shift and behavioural thresholds for non-impulsive sources

Hearing group	PTS onset thresholds (received level)	TTS onset thresholds (received level)	Behavioural response
	Non-impulsive	***Non-impulsive***	
Low-frequency cetaceans	L_E, LF, 24h: 199 dB	L_E, LF, 24h: 179 dB	L_p 120 dB
Mid-frequency cetaceans	L_E, MF, 24h: 198 dB	L_E, MF, 24h: 178 dB	L_p 120 dB
High-frequency cetaceans	L_E, HF, 24h: 173 dB	L_E, HF, 24h: 153 dB	L_p 120 dB

Source: NMFS (2014, 2018); Southall et al. (2019).

Vessel and MODU noise levels may exceed behavioural response levels in cetaceans (refer to Table 7-3) out to the distances presented in Table 7-4. Within this area, cetaceans may exhibit localised avoidance and attraction behaviour.

Table 7-4: Sound levels and frequencies from vessels relevant to the Petroleum Activities Program and distances to behavioural thresholds for cetaceans

Source of aspect	Operating frequency	Source Level (@1 m)		Sound category	Distance to behavioural response threshold for cetaceans for continuous noise sources
		SPL (L_p)	PK (L_{pk})		
Vessels	0.2 to 1 kHz [1]	182 to 186 [1]	-	Continuous	4 km [1]
MODU	16 to 200 kHz	167 to 171 dB [2]	-	Continuous	4 km [2]

[1] McCauley (1998)

[2] Based on SPL being within lower than that of the vessel

Underwater noise generated through vessel positioning and movement (continuous (non-impulsive) noise) does not have the intensity and characteristics likely to cause physiological damage in marine fauna (Nedwell & Edwards, 2004; Hatch & Southall, 2009).

Marine mammals that may occur within the Operational Area are detailed in Table 4-7 and include low-frequency (such as baleen whales), medium-frequency (ondocetes such as orca and sperm whale) and high-frequency (such as dolphins) cetaceans. However, no cetacean BIAs overlap the Operational Area (refer Table 4-7).

Six species of species of turtle may pass through the Operational Area (Section 4.4), and the Operational Area overlaps with the BIA for the Olive Ridley turtle and green turtle (foraging) (refer Table 4-7). However, turtle species are not likely to be resident or occur in the area in significant numbers. Water depths in the Operational Area suggest the area is unlikely to comprise important habitat for the turtles during any life history phase of the species.

Thresholds for non-impulsive noise emissions have not been identified for marine turtles. However, playback study of diamondback terrapins (*Malaclemys terrapin terrapin*) using boat noise, some animals were observed to increase or decrease swimming speed while others did not alter their behaviour at all (Lester *et al*., 2013). (Popper *et al*., 2014) identified mortality or permanent injury as being low risk to marine turtles, and TTS is moderate close to the source only.

Based on the limited data regarding noise levels that illicit a behavioural response in turtles, the lower level of 166 dB re 1 µPa level drawn from NSF (2011) is typically applied as the threshold level at which behavioural disturbance could occur, such as diving and avoidance. Behavioural impacts are expected to be temporary, within close proximity to the vessels.

Impacts from non-impulsive noise are not considered significant due to the following:

- Given cetaceans' mobility and ability to avoid the sound source, PTS and TTS criteria (Table 7-3), which are based on a 24-hour exposure, are not anticipated to be exceeded.
- Behavioural responses in cetaceans may occur out to a distance of 4 km (McCauley, 1998) for vessels and MODU.
- The presence of vessels and MODU will occur within a localised area of the Operational Area, where the activities will be centred. Cumulative impact from the use of multiple vessels is not considered to present significant impacts to marine fauna, given their mobility and ability to avoid the sound source; impacts will relate to behavioural disturbance and avoidance only. The Operational Area is not within an area of high shipping density (Section 4.6.3); therefore, should avoidance behaviour occur, it is anticipated the marine fauna would be able to move to an area below the behavioural threshold.
- Marine turtles are at low risk of mortality or permanent injury due to continuous noise sources such as vessels or subsea infrastructure, even near the source (Popper *et al*., 2014).

- Marine mammals and turtles are transitory and, given the low frequency and limited duration of the Petroleum Activities Program (Section 3.4), behavioural impacts are expected to be temporary and at the individual level only.
- Reactions of marine mammals to circling aircraft (fixed wing or helicopter) are sometimes conspicuous if the aircraft is below an altitude of 300 m, uncommon at 460 m and generally undetectable at 600 m (NMFS, 2001). Impacts to marine mammals will be behavioural (diving and avoidance) and short-term only, with no lasting effect.

7.3.4 Environmental Performance Outcomes and Control Measures

EPOs relating to this risk include:

- no injury or mortality to EPBC Act listed fauna during operational activities (EPO-06).

CMs relating to this risk include:

- regulations and measures for interacting with marine fauna (CM-07).

EPSs and MC relating to the above are presented in Section 10.

7.3.5 As Low As Reasonably Practicable Demonstration

Demonstration of ALARP			
Type	**Control/ management**	**Evaluation**	**Adoption?**
Eliminate	Eliminating the helicopters, vessels and MODU use	The noise associated with the use of helicopters, vessels and MODU cannot be eliminated. Elimination of helicopters, vessels and MODU would mean the activities cannot be completed.	×
Substitute	Substitute vessels	The vessels will be contracted to meet the specifications of the scheduled work and cannot be substituted. They are required to support the MODU operations.	N/A
Engineering	N/A	N/A.	N/A
Isolation	N/A	N/A.	N/A
Administrative	Compliance with administrative controls (such as EPBC Regulations 8 (Part 8)	Minor cost in complying, with benefit in reducing impact to marine fauna from noise impacts.	✓ (CM-07)
	Scheduling activity outside of sensitive period for marine fauna	The timing of the Petroleum Activities Program will be subject to vessel and MODU availability and weather conditions. Given the low risk to marine fauna in the region, rescheduling the activity will not	×

		result in significant environmental benefit.	
	Dedicated marine fauna observer on vessels	May improve ability to spot and identify marine fauna at risk of impact from noise. However, the high cost of contracting marine fauna observers is grossly disproportionate to the low risk (refer to Section 7.3.2.1) of vessel and MODU noise sources on marine fauna.	×

7.3.6 Acceptability Demonstration

Demonstration of Acceptability	
Compliance with Legal Requirements, Laws and Standards	The *EPBC Regulations 2000* Part 8 and the Australian National Guidelines for Whale and Dolphin Watching (DEH, 2005) will be implemented. The Petroleum Activities Program complies with the EPBC approval conditions (EPBC 2003/1180).
Policy Compliance	Eni's HSE Statement objectives will be met.
Social Acceptability	Stakeholder consultation has been undertaken. No stakeholder concerns have been raised with regard to underwater noise.
Area Sensitivity/ Biodiversity	The Operational Area does not contain any BIA for cetacean species. The Operational Area overlaps the foraging BIA for green turtles and Olive Ridley turtles. There are no resident sensitive water column environmental receptors in the Operational Area. Eni has considered information contained in relevant recovery plans, conservation management plans and approved conservation advice for marine fauna that identify noise interference and acoustic disturbance as a threat (Section 9). This includes the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia, 2017), which relate to noise emissions.
ESD Principles	The impact assessment presented throughout this EP demonstrates compliance with the principles of ESD.
ALARP	The residual risk has been demonstrated to be ALARP.

Given the duration of the Petroleum Activities Program (refer Section 3.4) and sensitivity of marine fauna to the vessels and MODU noise emissions, potential impacts are slight. A number of controls have been evaluated above and adopted in accordance with the ALARP criteria (Section 7.3.5). The residual risk is considered low, which is acceptable in accordance with Eni's acceptability criteria (Table 6-4). Potential impacts are therefore acceptable and ALARP.

7.4 Underwater Survey Equipment Noise (Risk ID P4)

7.4.1 Summary of Environmental Risk Assessment

Hazard	Underwater Survey Equipment Noise		
	Likelihood	**Severity**	**Risk**
Inherent Risk	B	2	L
Residual Risk	A	2	L

7.4.2 Description of Hazard

Geophysical survey instrumentation (boomer, MBES and SSS) is designed to characterize the seabed topography, bathymetry, potential geohazards, and other seafloor features prior to MODU placement at the WHP. The use of geophysical survey instrumentation is limited to any survey requirements prior to drilling the development wells.

The geophysical survey will use a range of sources (Table 7.5). The noise from this equipment is categorised as impulsive noise, which can be defined as a series of pulsed sound events that are brief, broadband, atonal and transient.

Table 7.5: Estimated frequency and sound ranges for geophysical survey equipment (Jimenez-Arranz et al., 2017)

Geophysical technique	Estimated source intensity (peak dB re 1µPa @ 1 m)	Estimated source level (rms dB re 1µPa @ 1 m)	Estimated sound exposure level (dB re 1µPa2s)	Frequency range (kHz)
MBES	210–245	221	188	150 – 700
SSS	200–235	234	200	75–500
Boomer	205–225	205.9	175.6	5-500

JASCO (2013) conducted noise modelling for low energy survey instruments off the coast of California. MBES, SSS and boomer equipment was modelled in a sandy bottom environment and at a water depth of 64 m, similar the environment in Operational Area. Given the similarities in equipment type, seafloor habitat and water depth, the modelling is considered comparable for the nature and scale of the low energy survey equipment used during the Petroleum Activities Program.

The modelling reported distances to specific threshold levels for different types of marine mammals. Where applicable m-weighted Rmax (the distance to the farthest occurrence of the threshold level) estimates were used. A marine mammal behavioural threshold of 160 dB re 1 µPa (rms SPL) was used, based United States (US) National Marine Fisheries Service (NMFS, 2018) acoustic threshold for behavioural effects in marine mammals (Table 7.6). The 160 dB re 1 µPa (rms SPL) threshold was reached at the following distances (Rmax) during the modelling:

- MBES – 290 m

- SSS – 682 m
- Boomer – 50 m

7.4.3 Potential Environmental Impact

Elevated underwater noise can affect marine fauna including cetaceans, fish, turtles, sharks and rays in three main ways (Richardson et al., 1995):

1. by causing direct physical effects on hearing or other organs, including:

- mortality/potential mortal injury resulting from exposure to noise (not considered credible given the noise sources associated the geophysical surveys)
- Permanent Threshold Shift (PTS) – permanent reduction in the ability to perceive sound after being exposed to noise
- Temporary Threshold Shift (TTS) – temporary reduction in the ability to perceive sound after being exposed to noise, with hearing returning to normal.

2. by masking or interfering with other biologically important sounds, including vocal communication, echolocation, signals and sounds produced by predators or prey
3. through disturbance leading to behavioural changes or displacement from important areas.

Criteria for impulsive noise exposure for impact / behavioural threshold to marine mammal, turtles and fish are presented Table 7.6 to Table 7.8. JASCO (2013) modelling shows that SSS has the furthest Rmax at 160 dB re 1 µPa (SPL) threshold and would be reached at 682 m from source, therefore any impacts would likely be restricted to within that distance from survey equipment noise.

Table 7.6: Criteria for impulsive noise exposure for marine mammal impact thresholds as derived from Southall et al. (2019) and NMFS (2018)

Potential Marine Fauna Receptor	PTS Onset Thresholds		TTS onset thresholds		Behaviour (SPL, dB re 1 µPa)
	Weighted SEL_{24h} (dB re 1 µPa²·s)	PK (dB re 1 µPa)	Weighted SEL_{24h} (dB re 1 µPa²·s)	PK (dB re 1 µPa)	
High-Frequency (HF) cetaceans	185	230	170	224	160
Low-Frequency (LF) cetaceans	183	219	168	213	

Table 7.7: Criteria for impulsive noise exposure for turtles, adapted from Popper et al. 2014

Potential Marine Fauna Receptor	Masking	Behaviour	TTS	Recoverable Injury	Mortality and Potential Mortal Injury
Marine Turtle	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low	(N) High (I) Low (F) Low	(N) High (I) Low (F) Low	>210 dB SEL_{24h} or >207 dB PK

Note: Relative risk (high, moderate, low) is given for animals at three distances from the source defined in relative terms as near (N) – tens of metres, intermediate (I) – hundreds of metres, and far (F) – thousands of metres.

Table 7.8: Criteria for impulsive noise exposure for fish, adapted from Popper et al. 2014

Potential Marine Fauna Receptor	Mortality and Potential Mortal Injury	Impairment			Behaviour
		Recoverable Injury	TTS	Masking	
Fish: No swim bladder (particle motion detection)	>219 dB SEL_{24h} or >213 dB PK	>216 dB SEL_{24h} or >213 dB PK	>186 dB SEL_{24h}	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low
Fish: Swim bladder not involved in hearing (particle motion detection)	210 dB SEL_{24h} or >207 dB PK	203 dB SEL_{24h} or >207 dB PK	>186 dB SEL_{24h}	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low
Fish: Swim bladder involved in hearing (primarily pressure detection)	207 dB SEL_{24h} or >207 dB PK	203 dB SEL_{24h} or >207 dB PK	186 dB SEL_{24h}	(N) Low (I) Low (F) Moderate	(N) High (I) High (F) Moderate
Fish eggs and fish larvae	>210 dB SEL_{24h} or >207 dB PK	(N) Moderate (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low

7.4.3.1 Cetaceans

Modelling of survey geophysical equipment has been undertaken at a number of locations (Zykov et al., 2013; Austin et al., 2012). These studies indicate that both peak and frequency-weighted SEL noise emissions from survey equipment such as MBES are typically below sound levels that could result in low and high-frequency marine mammal TTS or PTS from either PK or SEL criteria (Table 7.6) in a horizontal direction.

SSS impulses and MBES sound levels are outside the auditory range of low frequency species / baleen whales (e.g. humpback and pygmy blue whales) but within the mid-frequency and high frequency cetacean marine fauna auditory range (e.g. sperm whales and dolphins). However, PTS and TTS thresholds for these species (Table 7.6) are only expected to be exceeded close to the source.

When reviewing the JASCO (2013) modelling and considering the US National Marine Fisheries Service (NMFS, 2018) acoustic threshold for behavioural effects in marine mammals of 160 dB re 1 µPa (SPL) the boomer could potentially disturb marine mammals at horizontal distances of up to 50 m, the SSS at 682 m and the MBES at 290 m.

Marine mammals that may occur within the Operational Area are detailed in Table 4-7 and include low-frequency (such as baleen whales), medium-frequency (ondocetes such as orca and sperm whale) and high-frequency (such as dolphins) cetaceans. However, no cetacean BIAs overlap the Operational Area (refer Table 4-7). Given the lack of foraging areas in proximity to the Operational Area individuals are expected to be transitory only, displaying behavioural responses, and moving away from the source, before TTS and PTS thresholds are exceeded.

Marine mammals are sensitive to noise in the marine environment. Their extensive use of sound for communication, prey capture, predator avoidance, navigation and their physical makeup (i.e. large gas-filled organs) make them vulnerable to both disturbance and physiological damage from underwater noise of sufficient magnitude. Survey equipment could cause masking of vocalisations of cetaceans due to the overlap in frequency range between signals and vocalisations. However such masking impacts would be limited to within hundreds of metres from the sound source. Any impacts to marine fauna are anticipated to be minor and temporary, relating to behavioural impacts only.

7.4.3.2 Turtle

Electro-physical studies have indicated that marine turtle hearing is most sensitive to sounds between 100 to 700 Hz (McCauley, 1994), which is at the lowest frequency range of a geophysical survey (Table 7.5). The sound levels of the survey equipment are below those associated with the PK criteria for injury (Table 7.7) beyond a few metres, and due to the low per-pulse SEL, the SEL criteria will also not be exceeded (McPherson, 2020).

Six species of species of turtle may pass through the Operational Area (Section 4.4), and the Operational Area overlaps with the BIA for the olive ridley turtle and green turtle (foraging) (refer Table 4-7). However, turtle species are not likely to be resident or occur in the area in significant numbers. Water depths in the Operational Area suggest the area is unlikely to comprise important habitat for the turtles during any life history phase of the species. Popper *et al*. (2014) presents thresholds of risk (high, medium and low) for turtles at three distances from the source defined in relative terms as near (N), intermediate (I) and far (F) (Table 7.7). It would be expected that the noise from survey equipment could reach masking and behavioral thresholds near the sound source only and within hundreds of metres of the source. Any impacts to marine turtles are anticipated to be minor and temporary, relating to behavioural impacts only.

7.4.3.3 Fish

Behavioural impacts to fish from survey equipment noise may occur in individuals located within hundreds of metres of the source. None of the survey equipment has energy below 1 kHz, and therefore it is unable to be heard by most fish, which further reduces the risk of impact (Ladich and Fay, 2013).

Fish may temporarily be displaced from the immediate vicinity of a noise source; however, they would be expected to behave normally once the noise ceased. Thresholds and Rmax distances in JASCO (2013) suggest that TTS (207- 213 dB PK) in fish could occur within 1 m for the SSS, MBES and boomer. Fish are expected to move rapidly outside of the distances at which any TSS could occur and therefore behavioural impact is anticipated only.

Demersal and pelagic fish species are present in the Operational Area. Since species richness has been shown to correlate with habitat complexity, it is unlikely that the sand sediments that comprise the largest proportion of the Operational Area support a wide diversity of species.

7.4.4 Environmental Performance Outcomes and Control Measures

EPOs relating to this risk include:

- no injury or mortality to EPBC Act listed fauna during operational activities (EPO-06).

CMs relating to this risk include:

- regulations and measures for interacting with marine fauna (CM-07).

EPSs and MC relating to the above are presented in Section 10.

7.4.5 As Low As Reasonably Practicable Demonstration

Demonstration of ALARP			
Type	**Control / management**	**Evaluation**	**Adoption ?**
Eliminate	Eliminating the surveys	Underwater noise associated with the Petroleum Activities Program cannot be eliminated as the survey assessment techniques are the only way to effectively acquire the data needed to provide assurance to the drilling activity / MODU placement.	×
Substitute	Scheduling surveys around sensitive period	Given the low risk to marine fauna in the region, rescheduling the activity will not result in significant environmental benefit.	×

Engineering	Use of soft starts for noise equipment	The noise source is directed towards the sea floor minimising propagation of the noise source in a horizontal direction. The sound power of the acoustic source will be minimum practicable to obtain the required data. Soft starts are not feasible on geophysical equipment as there is not a typical array (as in seismic activities).	×
Isolation	N/A	N/A.	N/A
Administrative	The use of a dedicated marine fauna observer	Due to low noise levels generated by the geophysical survey equipment the cost of implementing a dedicated marine fauna observer is grossly disproportional to the environmental benefit.	×
	Compliance with administrative controls (such as EPBC Regulations 8 (Part 8)	Minor cost in complying, with benefit in reducing impact to marine fauna from noise impacts.	✓ (CM-07)

7.4.6 Acceptability Demonstration

Demonstration of Acceptability	
Compliance with Legal Requirements, Laws and Standards	The *EPBC Regulations 2000* Part 8 and the Australian National Guidelines for Whale and Dolphin Watching (DEH, 2005) will be implemented. The Petroleum Activities Program complies with the EPBC approval conditions (EPBC 2003/1180).
Policy Compliance	Eni's HSE Statement objectives will be met.
Social Acceptability	Stakeholder consultation has been undertaken. No stakeholder concerns have been raised with regard to underwater survey equipment noise.
Area Sensitivity/ Biodiversity	The Operational Area does not contain any BIA for cetacean species. The Operational Area overlaps the foraging BIA for green turtles and Olive Ridley turtles. There are no resident sensitive water column environmental receptors in the Operational Area. Eni has considered information contained in recovery plans and threat abatement plans (Section 9). This includes the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia, 2017).
ESD Principles	The impact assessment presented throughout this EP demonstrates compliance with the principles of ESD.
ALARP	The residual risk has been demonstrated to be ALARP.

Given the duration of the Petroleum Activities Program (refer Section 3.4) and sensitivity of marine fauna to the survey noise emissions, potential impacts are minor. A number of controls have been evaluated above and adopted in accordance with the ALARP criteria (Section 7.4.5). The residual risk is considered low, which is acceptable in accordance with Eni's acceptability criteria (Table 6-4). Potential impacts are therefore acceptable and ALARP.

7.5 Light Emissions (Risk Identification P5)

7.5.1 Summary of Environmental Risk

Hazard	Light Emissions		
	Likelihood	**Severity**	**Risk**
Inherent Risk	C	1	L
Residual Risk	B	1	L

7.5.2 Description of Hazard

Lights on the MODU and vessels will be required on a 24-hour basis during the subsea equipment recovery activities for safety and navigational purposes, in accordance with requirements of the *Navigation Act 2012* (Marine Order Part 30 [Prevention of collisions]). External lighting on the MODU and vessels will generate light glow and direct illumination of surrounding surface waters. The distance at which direct light and sky glow may be visible from the source depends on the vessel lighting and environmental conditions.

Flaring will occur for a period of up to 96 hours per development well. During this period additional light emissions will occur from the MODU at the flare stack.

The light assessment boundary of 20 km from the source is used as the extent of light exposure, in accordance with National Light Pollution Guidelines for Wildlife (DoEE, 2020). The demonstrated impacts on which this buffer is based were in response to light emissions associated with a liquified natural gas plant (which includes flaring). Although details around the individual light sources of the case study and the light sources on the MODU (including flare) and vessels are unknown, it is expected that light emissions associated with the MODU and vessels will be notably lower compared to a liquefied natural gas plant.

7.5.3 Potential Environmental Impact

Receptors that have important habitat within a 20 km buffer of the Operational Area are considered for the impact assessment within this section, based on recommendations of National Light Pollution Guidelines for Wildlife (DoEE, 2020). A 20 km buffer provides a precautionary limit based on observed effects of sky glow on marine turtle hatchlings, demonstrated to occur at 15 to 18 km, and fledgling seabirds grounded in response to artificial light 15 km away (DoEE, 2020).

The fauna within and immediately adjacent to the Operational Area are predominantly pelagic fish and zooplankton, with a low abundance of transient species such as marine turtles, whale sharks, cetaceans and migratory shorebirds and seabirds.

Potential impacts to marine fauna from artificial lighting may include:

- disorientation, attraction or repulsion to the light
- disruption to natural behaviour patterns and cycles
- indirect impacts such as increased predation risks through attraction of predators.

These potential impacts depend on:

- the wavelength and intensity of the lighting, and the extent to which the light spills into important wildlife habitat, such as foraging, breeding and nesting
- the timing of light spill relative to the timing of habitat use by marine fauna sensitive to lighting effects
- the physiological sensitivity and resilience of the fauna populations that are at risk of potential effects.

Light-sensitive species have been identified by reviewing the National Light Pollution Guidelines for Wildlife (DoEE, 2020).

Fish and Zooplankton

Fish and zooplankton may be directly or indirectly attracted to light. Light during night-time activities in particular is likely to result in aggregations of fish around the MODU and vessels, as they are attracted to the light and increased food availability. While there is the potential for increased predation activity, the impact to fish and zooplankton from light is anticipated to be slight and temporary.

Marine Turtles and Sea Snakes

The main implication of artificial lighting from offshore vessels for marine turtles is the disruption of hatchling sea-finding behaviour. Hatchling turtles can be disorientated and unable to find the ocean in the presence of direct light or sky glow (Witherington, 1992; Lorne & Salmon, 2007; Thums *et al*., 2016; Price *et al*., 2018). Adult marine turtles may also avoid nesting on beaches that are brightly lit (Witherington, 1992; Price *et al*., 2018). Sea finding behaviour of hatchlings may be disrupted by flares (Pendoley, 2000), however at distances far closer to nesting beaches.

Once in the ocean, hatchlings are thought to remain close to the surface, orient by wave fronts, and swim into deep offshore waters for several days to escape the more predator-filled shallow inshore waters. During this period, light spill from coastal port infrastructure and ships may ‘entrap’ hatchling swimming behaviour, reducing the success of their seaward dispersion and potentially increasing their exposure to predation via silhouetting (Salmon *et al*., 1992).

The Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia, 2017) highlights artificial light as one of several threats to marine turtles. Specifically, the plan indicates artificial light may cause a gradual decline in the reproductive output of a nesting area by:

- inhibiting nesting by females (Salmon, 2003)
- disrupting hatchling orientation and sea-finding behaviour (Whittock *et al*., 2016).

- creating pools of light that attract swimming hatchlings and increase their risk of predation (Thums *et al*., 2016).

The National Light Pollution Guidelines for Wildlife (DoEE, 2020) states that a 20 km buffer (based on sky glow), light emissions from the MODU (including flare) and vessels therefore are not expected to affect the sea-finding behaviour of hatchling turtles or impact reproductive output of a nesting area, given the distance of the Operational Area from turtle nesting beaches (95 km south).

Six species of marine turtle may pass through the Operational Area (Section 4.4), which overlaps with the BIA for the green turtle (foraging) and Olive Ridley turtle (foraging) (Table 4-7). The Operational Area is located more than 95 km south from the nearest marine turtle nesting sites at Cape Domett and Lacrosse Island in the Cambridge Gulf. It is possible individual turtles may be encountered traversing the Operational Area during the Petroleum Activities Program. However, considering the distance to nesting beaches (more than 95 km south), large numbers of internesting adults are not expected. The potential impacts of light emissions to turtles from the Petroleum Activities Program are expected to be restricted to localised attraction and temporary disorientation to individual species transiting the Operational Area. As such, behavioural impacts to marine turtles from light emissions from the vessels and the MODU (including flare) are anticipated to be temporary and slight. The Petroleum Activities Program will not displace females from nesting habitats. It is considered the Petroleum Activities Program will not compromise the objectives as set out in the Recovery Plan for Marine Turtles (Commonwealth of Australia, 2017).

Sea snakes may also occur within the Operational Area. While the direct effect of artificial light on sea snakes is largely unknown, they may experience indirect effects such as changes in predator-prey relationships and disorientation, attraction or repulsion.

Behavioural impacts to marine turtles and sea snakes from light emissions from the MODU and vessels are anticipated to be slight and temporary.

Seabirds and Migratory Shorebirds

Lighting can attract seabirds from large catchment areas (Wiese *et al*., 2001) and studies have shown seabirds are attracted to and accumulated around illuminated offshore infrastructure in the North Sea (Marquenie *et al*., 2008). Availability of roosting refuge at sea and increased food availability may be the most important reasons why seabirds are attracted to offshore oil and gas infrastructure (Wiese *et al*., 2001).

Potential impacts to seabirds and migratory shorebirds attracted by artificial lighting have been addressed in the National Light Pollution Guidelines for Wildlife (DoEE, 2020). Artificial lighting impacts can include disorientation causing collision, entrapment, stranding, grounding and interference with navigation (being drawn off course from usual migration routes) (DoEE, 2020). The degree of disruption is determined by a combination of physical, biological and environmental factors, including the location, visibility, colour and intensity of the light, its proximity to other infrastructure, landscape topography, moon phase, atmospheric and weather conditions and species present (DoEE, 2020).

During the Petroleum Activities Program, it is possible a small number of seabirds and migratory shorebirds may be attracted to the MODU and vessels within the Operational Area. However, as this is not expected to result in impacts to birds beyond a temporary change in behaviour, any impact is anticipated to be slight and temporary. Any collision between the birds and vessels as a result of the attraction are highly unlikely due to the slow-moving vessels undertaking the Petroleum Activities Program.

Marine Mammals

Marine mammals that may occur within the Operational Area are detailed in Section 4.4. Marine mammals predominantly use acoustic senses to monitor their environment rather than visual sources (Simmonds *et al*., 2004), so light is not considered to be a significant factor in marine mammal behaviour or survival. Marine mammals are not expected to be affected by light generated by the Petroleum Activities Program.

Species Recovery Plans, Approved Conservation Advice and Threat Abatement Plans

Eni has considered information contained in both the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia, 2017) and the National Light Pollution Guidelines for Wildlife (DoEE, 2020) (Section 9).

The overarching objective of the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia, 2017) is to reduce detrimental impacts on Australian populations of marine turtles and hence promote their recovery in the wild.

Given the Operational Area location (more than 95 km from turtle nesting beaches), lighting from the MODU (including flare) and vessels is not anticipated to displace marine turtles from critical habitats or impact nesting adults and emerging and dispersing hatchlings. Light emissions may cause localised and temporary behavioural disturbance to transient individual marine turtles (as described in the above sections).

Appropriate controls have been considered (refer Section 7.5.5), such as those within the National Light Pollution Guidelines for Wildlife (DoEE, 2020), to reduce the impacts of light emissions to ALARP and acceptable levels.

As per Section 9, the Petroleum Activities Program is not inconsistent with the actions and objectives within the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia, 2017) or the National Light Pollution Guidelines for Wildlife (DoEE, 2020).

7.5.4 Environmental Performance Outcomes and Control Measures

EPOs relating to this risk are:

- reduce impacts to marine fauna from lighting on the MODU and vessels through limiting lighting to that required by safety and navigational lighting requirements (EPO-07).

CMs relating to this risk include:

- navigation equipment and procedures (lighting as required for safe work conditions and navigational purposes) (CM-01).

EPSs and MC relating to the above are presented in Section 10.

7.5.5 As Low As Reasonably Practicable Demonstration

Demonstration of ALARP			
Type	**Control/management**	**Evaluation**	**Adoption?**
Eliminate	Eliminate light sources on the MODU and vessels	Lighting levels cannot be reduced or eliminated as this would introduce navigational and occupational safety hazards and non-compliance with codes and regulations.	×
	No night-time operations	Reducing lighting at night would restrict the activity hours to during the daytime, resulting in the activity taking approximately twice as long to complete. Given the low levels of lighting already on the vessels, there would be little environmental benefit.	×
Substitute	Adopt measures on the vessels / MODU which designed to minimise impacts and marine turtles (as per National Light Pollution Guidelines for Wildlife (management actions): • using flashing or intermittent lights instead of fixed beam • using motion sensors to turn lights on only when needed • using luminaires with spectral content appropriate for the species present • avoiding high-intensity light of any colour • extinguishing outdoor and deck lights not necessary for safety or navigation at night • using available block-out blinds on portholes and windows not necessary for safety or navigation at night	Substituting external lighting for lights such as those identified in the National Light Pollution Guidelines for Wildlife would result in significant cost sacrifice and time expenditure, as would the retrofitting of block-out blinds on portholes. Given the distance of the Operational Area from the nearest nesting sites and the already slight impacts of lighting from the Petroleum Activities Program on marine fauna, cost of adopting measures (management actions) within the National Light Pollution Guidelines for Wildlife outweighs the environmental benefit. Lighting is already applied to levels required for safe work conditions and navigational purposes on the vessel.	×

Demonstration of ALARP			
Engineering	Adopt measures designed to minimise impacts and marine turtles from flare (as per National Light Pollution Guidelines for Wildlife (management actions): • shield gas flares and locate inland and away from nesting beach	Shielding the gas flare will reduce the light emissions by using a containment structure and can shield sensitive areas (e.g. nesting locations). Given the distance of the Operational Area from the nearest nesting sites and the already slight impacts of lighting from the Petroleum Activities Program on marine fauna, cost of adopting measures this measure outweighs the environmental benefit. Flaring is also planned to occur over a very short period and is not a constant for the duration of the Petroleum Activities Program.	N/A
Isolation	N/A	N/A.	N/A
Administrative	Navigation lighting and aids in accordance with AMSA Marine Order Part 30: Prevention of collisions, and with Marine Order Part 21: Safety of navigation and emergency procedures	This control is already a requirement under Marine Orders and discussed in Section 7.1. It does not relate to reducing lighting effects on marine fauna.	✓ (as a control in Section 7.1- CM-01)

7.5.6 Acceptability Demonstration

Demonstration of Acceptability	
Compliance with Legal Requirements, Laws and Standards	MODU and vessels will comply with safety and navigation requirements outlined in the *Navigation Act 2012* (Marine Orders Part 30 [Prevention of collisions]), the Vessel Operating Procedure and APPEA Code of Environmental Practice 2008. The Petroleum Activities Program complies with EPBC 2001/365 approval. The Petroleum Activities Program is not inconsistent with Recovery Plans or Conservation Plans (Section 9) National Light Pollution Guidelines for Wildlife (DoEE, 2020) controls have been considered. The Petroleum Activities Program complies with the EPBC approval conditions (EPBC 2003/1180).
Policy Compliance	Eni's HSE Statement objectives will be met.
Social Acceptability	Stakeholder consultation has been undertaken. No stakeholder concerns have been raised with regard to light emissions.
Area Sensitivity/ Biodiversity	Artificial lighting can cause a change in the behaviour of fauna, particularly nesting turtles and birds. Light generated by activities is temporary and short-term in nature and given the limited area over which light emissions are likely to extend and location of the Operational Area, impacts to marine fauna are highly unlikely. Eni has considered information contained in recovery plans and threat abatement plans (Section 9). This includes the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia, 2017).
ESD Principles	The impact assessment presented throughout this EP demonstrates compliance with the principles of ESD.
ALARP	The residual risk has been demonstrated to be ALARP.

Lighting will be kept to a minimum required to satisfy safety and navigational requirements in accordance with requirements of the *Navigation Act 2012* (Marine Order Part 30 [Prevention of collisions]), the Vessel Operating Procedure and APPEA Code of Environmental Practice 2008.

Appropriate controls (management actions) have been considered (refer Section 7.5.5), such as those within the National Light Pollution Guidelines for Wildlife (DoEE, 2020) to reduce the impacts of light emissions to ALARP and acceptable levels.

Given the short duration of the Petroleum Activities Program (refer Section 3.4) and the distance of the Operational Area from the nearest turtle nesting beaches, impacts to marine fauna are slight. A number of controls have been evaluated and in accordance with the ALARP criteria (Section 7.5.5). The residual risk associated with light emissions is considered low, which is acceptable in accordance with Eni's acceptability criteria (Table 6-4). Therefore, potential impacts associated with light emission are acceptable and ALARP.

7.6 Grey Water, Sewage and Putrescible Waste Discharge (Risk Identification P6)

7.6.1 Summary of Environmental Impact

Hazard	Grey Water, Black Water and Putrescible Waste Discharges		
	Likelihood	Severity	Risk
Inherent Risk	C	2	M
Residual Risk	A	2	L

7.6.2 Description of Hazard

Vessels and MODU will produce putrescible wastes such as greywater, sewage and food scraps during vessel and MODU activities. Grey water and sewage as well as food wastes will be generated on-board the vessels; MODU and volumes will be directly proportional to the number of persons on board. The typical persons on board of the MODU and vessels to be used is in the order of 100 to 120 and 20 to 30, respectively. Typically, 30 to 40 L of sewage and greywater and approximately 1 L of food waste will be produced per person per day on the MODU and vessels.

Putrescible wastes are only released to the sea after the material has passed through a comminutor or macerator, such that the material to be released is capable of passing through a screen with openings no greater than 25 mm, as per MARPOL 73/78 Annex V (Regulation 3). Treated sewage will be disposed of in accordance with MARPOL 73/78 Annex IV (Regulation 11).

7.6.3 Potential Environmental Impact

Sewage discharge may result in an increase in nutrient availability and biological oxygen demand in the marine environment. In the open oceanic environment, the effect of the effluent biological oxygen demand on seawater oxygen concentrations is expected to be insignificant (Black *et al*., 1994).

Discharge of putrescible wastes may attract pelagic marine fauna, such as fish and sharks, and increased nutrient availability may result in the biostimulation of marine organisms and a slight increase in algal growth in the local environment near the outlet. The mass of nutrients to be discharged in sewage on a daily basis is likely to be small and, given the open ocean environment of the field, rapid dilution of the effluent is expected, resulting in highly localised effects (Black *et al*., 1994).

Monitoring of sewage and grey water discharges from a drill rig operating in the Timor Sea concluded that discharges were rapidly diluted in the surface layer of the water column (within 10 m of the surface), and there were no measurable impacts on water quality parameters 50 m from the release site (Woodside, 2011).

The discharge of sewage, grey water and putrescible wastes is considered unlikely to have any significant adverse effects on the marine environment.

7.6.4 Environmental Performance Outcomes and Control Measures

EPOs relating to this risk include:

- no unplanned discharges to sea of untreated sewage, greywater, putrescible wastes, bilge and deck drainage (EPO-08).

CMs relating to this risk include:

- sewage and waste management (CM-08).

EPSs and MC relating to the above are presented in Section 10.

7.6.5 As Low As Reasonably Practicable Demonstration

Demonstration of ALARP			
Type	**Control/ management**	**Evaluation**	**Adoption?**
Eliminate	Eliminating discharge on vessels and MODU	The generation of sewage, greywater and putrescible waste by personnel cannot be eliminated on the vessels or MODU, as storing the waste would present a safety issue. Transportation to shore was considered as an alternative to ocean discharge; however, this would be excessively costly and impractical, due to the lack of storage capacity onboard the vessels and MODU, and would result in increased vessel transits to provide ship-to-shore services. It also provides an increased exposure to biological health hazards, and safety hazards such as bulk transfer and heavy lifting operations. This discharge is permitted under Marine Orders and is not anticipated to present significant environmental impact.	×
Substitute	N/A	N/A.	N/A
Engineering	N/A	N/A.	N/A
Isolation	N/A	N/A.	N/A
Administrative	Implementation of measures in Marine Order 95 (Marine pollution prevention – garbage) and Marine Order 96 (Prevention of pollution – sewage).	Marine Order 95 reduces potential impacts of inappropriate discharge of sewage. Marine Order 96 reduces probability of garbage being discharged to sea, reducing potential impacts to marine fauna. Marine Order 95 stipulates putrescible (food) waste disposal conditions and limitations. Environmental benefit outweighs the minor administrative costs in implementing the Marine Orders.	✓ (CM-08) (through compliance with Marine Orders 95 and 96)

7.6.6 Acceptability Demonstration

Demonstration of Acceptability	
Compliance with Legal Requirements, Laws and Standards	Vessels and MODU compliant with MARPOL Annex V 73/78 and Marine Order 95. Vessels and MODU compliant with MARPOL 73/78 Annex IV/ Marine Order 96. The Petroleum Activities Program complies with the EPBC approval conditions (EPBC 2003/1180).
Policy Compliance	Eni's HSE Statement objectives will be met.
Social Acceptability	Stakeholder consultation has been undertaken. No stakeholder concerns have been raised with regard to discharge of sewage, greywater and putrescible waste.
Area Sensitivity/ Biodiversity	There are no resident sensitive water column environmental receptors in the Operational Area. The volumes of putrescible waste, sewage and grey water discharged will be small and will be rapidly broken down. Eni has considered information contained in relevant recovery plans and approved conservation advice for cetaceans and marine turtles that identify chemical discharges and pollution as a threat (Section 9). This includes the objectives and actions within the Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017), which relate to discharges. Control measures implemented will minimise the potential risks and impacts from the activity to relevant species identified in recovery plans and conservation advice.
ESD Principles	The impact assessment presented throughout this EP demonstrates compliance with the principles of ESD.
ALARP	The residual risk has been demonstrated to be ALARP.

Storage of sewage, greywater and putrescible wastes and transportation to shore was considered as an alternative to ocean discharge. However, it would be excessively costly, and impractical due to the lack of storage capacity onboard the vessels and MODU, and would result in increased vessel transits to provide ship-to-shore services. Additional energy use and emissions associated with onshore transport and treatment would also be introduced, as well as potential impact on the ultimate receiving terrestrial environment. Therefore, there is no net environmental benefit of waste storage and transfer for onshore disposal. It also provides an increased exposure to safety hazards and biological health hazards.

Given the short duration of the Petroleum Activities Program in the Operational Area, the potential impacts associated with discharge of sewage, greywater and putrescible wastes are considered to be minor. A number of controls have been evaluated above and adopted in accordance with the ALARP criteria (Section 7.6.5). The residual risk is considered to be low, which is acceptable in accordance with Eni's acceptability criteria (Table 6-4). Therefore, the potential impacts associated with discharge of sewage, greywater and putrescible wastes are acceptable and ALARP.

7.7 Discharge of Contaminated Water (Risk Identification P7)

7.7.1 Summary of Environmental Risk

Hazard	Discharge of Oily Water		
	Likelihood	Severity	Risk
Inherent Risk	C	1	L
Residual Risk	B	1	L

7.7.2 Description of Hazard

Deck drainage on the MODU and vessels consists of rain and washdown water that may contain small amounts of detergents, residual hydrocarbons and chemicals spilled or stored on the deck floor. Bilge water consists of deck drainage and machinery space water that has been directed to a bilge water tank. Bilge water shall be diverted to a holding tank, either for onshore disposal at an appropriately licenced facility, or for discharge with an oil content of less than 15 parts per million (ppm) in accordance with MARPOL 73/78 Annex I and Marine Order 91.

Potable water for drinking and domestic use on-board the vessels and MODU is produced from seawater, which is drawn from the ocean and treated by reverse osmosis. A by-product of reverse osmosis is reject brine water and cooling water, which is discharged to the marine environment. Cooling water is used as a heat exchange medium for cooling machinery engines on the vessels and MODU. Seawater is drawn from the ocean and flows counter-current through closed-circuit heat exchangers, transferring heat from engines and machinery to the seawater. The water is then discharged to the ocean. Cooling water temperatures vary depending upon the engine's workload and activity.

7.7.3 Potential Environmental Impact

The environmental impacts associated with an oily water discharge are likely to be highly localised and temporary, due to the low volumes and the high dilution rates expected at the open ocean environment of the Operational Area (Black *et al*., 1994). Hinwood *et al*. (1994) predicted dilution factors in excess of 10,000 within 100 m of the discharge point.

Cooling water will remain in the surface layer, where turbulent mixing and heat transfer with surrounding waters will occur. This will cause localised increases in water temperature. The potential impacts of increased seawater temperatures downstream of the cooling water discharge are localised changes to the physiological processes of marine organisms (particularly plankton), including attraction or avoidance behaviour. Given the temperature of the discharge is only marginally higher than that of the receiving waters and the receiving environment is subject to strong currents, the consequence of cooling water discharges is considered to be a slight, temporary and localised change in water quality.

7.7.4 Environmental Performance Outcomes and Control Measures

EPOs relating to this risk include:

- no unplanned discharge of oily water or chemicals that are not in accordance with Marine Order 91 requirements (EPO-09).

CMs relating to this risk include:

- oily water treatment system in place (CM-09)
- oily water prevention system in place (CM-10).

EPSs and MC relating to the above are presented in Section 10.

7.7.5 As Low As Reasonably Practicable Demonstration

Demonstration of ALARP			
Type	**Control/ management**	**Evaluation**	**Adoption?**
Eliminate	Eliminate contaminated water discharge on MODU and vessels	Eliminating the discharge would mean storing the liquids on the vessels and MODU. Storage space required for containment and an increase in transfers to shore for disposal would be required. Increased transfers result in increased fuel usage and increased safety risks.	×
Substitute	N/A	N/A.	N/A
Engineering	Equip vessels and MODU with oily water prevention system and International Maritime Organisation (IMO)-approved oil filtering equipment	Reduces potential impacts of planned discharge of oily water to the environment, with minor administrative and maintenance cost.	✓ (CM-09 through compliance with Marine Order 91)
	Continually plug the deck drains on vessels and MODU to prevent deck drainage	Would eliminate potential impacts of contaminants being discharged to sea from deck water; however, would present increased health and safety risks from wet deck and water on a vessel/MODU deck can also cause stability issues. Storage space required for containment of drained liquids and increase in transfers to vessels, resulting in increased potential impacts and risks.	×
Isolation	Capture contaminated waters/bilge water	Fixed equipment, such as engines and generators, are contained and captured in the bilge water tank for treatment via the OIW separator (on vessels and MODU) in compliance with Marine Order 91.	✓ (CM-10 through compliance with Marine Order 91)
Administrative	Treatment systems on-board the vessels and MODU comply with Marine Order 91 (Marine pollution prevention – oils) requirements	Environmental benefits outweigh the time and personnel costs in maintaining oil record book and implementation costs.	✓ (CM-10 through compliance with Marine Order 91)

7.7.6 Acceptability Demonstration

Demonstration of Acceptability	
Compliance with Legal Requirements, Laws and Standards	The existing water treatment systems on-board the MODU and vessels will comply with MARPOL 73/78 Annex I/Marine Order 91 (Marine pollution prevention – oils) requirements. The Petroleum Activities Program complies with the EPBC approval conditions (EPBC 2003/1180).
Policy Compliance	Eni's HSE Statement objectives will be met.
Social Acceptability	Stakeholder consultation has been undertaken. No stakeholder concerns have been raised with regard to discharge of contaminated water.
Area Sensitivity/ Biodiversity	Any water quality impacts are likely to be localised and subject to rapid mixing. Eni has considered information contained in relevant recovery plans and approved conservation advice for cetaceans and marine turtles that identify chemical discharges and pollution as a threat (Section 9). This includes the objectives and actions within the Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017), which relate to discharges.
ESD Principles	The impact assessment presented throughout this EP demonstrates compliance with the principles of ESD.
ALARP	The residual risk has been demonstrated to be ALARP.

Enhanced water treatment prior to disposal was considered but deemed impractical as the cost of retrofitting would be disproportionate to the benefit gained. The existing water treatment systems on vessels and the MODU will comply with MARPOL 73/78 Annex I and Marine Order 91 (Marine pollution prevention – oils) requirements.

Given the short, intermittent duration of the Petroleum Activities Program, the low volume of discharge from the MODU and vessels relating to contaminated water discharge and receptors in the Operational Area, the potential impacts associated with discharge of contaminated water are considered to be slight. A number of controls have been evaluated above and adopted in accordance with the ALARP criteria (Section 7.7.5). The residual risk is considered to be low, which is acceptable in accordance with Eni's acceptability criteria (Table 6-4). Therefore, the potential impacts associated with discharge of contaminated water are acceptable and ALARP.

7.8 Drilling Muds and Fluid Discharges (Risk Identification P8)

7.8.1 Summary of Environmental Risk Assessment

Hazard	Drilling Discharges		
	Likelihood	Severity	Risk
Inherent Risk	C	2	M
Residual Risk	B	2	L

7.8.2 Description of Hazard

During the Petroleum Activities Program, the expected drilling muds and fluids discharges to the marine environment are:

- WBM drill fluids and muds (on cuttings)
- cement
- wellbore clean-up fluids
- tank cleaning residue.

Impacts from the discharge of cuttings have been discussed in Section 7.9.

7.8.2.1 Drilling Fluids and Muds

The WBM drilling fluid will comprise water or brine (more than 90% aqueous) as the major liquid phase. The remainder of the WBM will be made up of low-toxicity drilling fluid solid additives (such as barite) and chemicals that are either completely inert or additives in such low concentrations they pose little or no risk to the environment.

WBM will be operationally discharged to the marine environment just below the sea surface as fluids on cuttings after passing through the solids control equipment (SCE). WBM solids on cuttings will be discharged from each development well (refer Table 3-5 and Table 3-6). The volume includes WBM that cannot be recirculated or reused through the drilling fluid system due to deterioration or contamination. WBM may also be discharged in instances where the WBM cannot be recirculated or re-used through the drilling fluid system (due to deterioration or contamination).

The requirement to re-spud a well is a low likelihood; however, if performed could result in additional WBM discharge in line with those volumes identified in the next sections.

7.8.2.2 Cement

During cement unit testing, commissioning and cleaning operations, cement (as a slurry) will be discharged to the sea surface from the cement discharge line. Such discharge events would be typically less than 5 m³ and may be performed on arrival at the drilling location.

When cementing conductor pipe, cement must be circulated to the seabed to ensure structural integrity of the well. Excess cement is pumped to achieve structural integrity. Most of the cement remains downhole but minor volumes may be discharged to the seafloor at the well location. A volume of 5 m^3 per well is estimated to be discharged at the surface (when cementing surface casing or flushing lines or tanks).

Cement spacers can be used as part of the cementing process, within the well casing, to assist with cleaning the casing sections prior to cement flowthrough. The spacers may consist of either seawater or a mixture of seawater and dye. The dye is used to provide a pre-indicator of cement overflow to the seabed surface, to ensure adequate cement height.

Unused excess dry bulk cement which is stored in the MODU silo and surplus to requirements of the well will be, where possible, provided to the next operator at the end of the drilling (as it remains on the MODU).

If this is not a feasible option, the excess cement will be discharged below the sea surface as a slurry. The volume of cement required for the operation is reasonably well understood and can be predicted fairly accurately; however, it is standard industry practice for additional cement as contingency. The maximum volume of excess dry bulk or slurry which could be discharged to the marine environment, below the sea surface, is approximately 20 m^3.

The design of the piping and the tanks on the MODU is such that the reverse pumping of the cement back to vessels or to shore is not possible. Therefore, return of excess cement to shore is not a feasible alternative.

The requirement to re-spud a well is a low likelihood; however, if performed, could result in additional cement jobs and associated discharge.

7.8.2.3 Wellbore Clean-Out Fluids

After drilling, the wellbore will need to be cleaned out of the drilling fluids. During well clean-up, a cleanout fluids train will be circulated until well cleanliness specifications are met. Brine is typically used to clean out the well and is circulated back to the MODU, along with any WBM from within the well, and subsequently discharged.

7.8.2.4 Bulk Storage and Cleaning Fluids

At stages during the activities, tanks need to be cleaned, including mud pits, cement mixing and holding tanks and bulk storage tanks. Cleaning may be required to remove ‘dead’ volumes of product, contaminated material and cement before it cures. In most instances, a tank would be flushed with seawater or drill water and the diluted fluid discharged to sea.

7.8.3 Potential Environmental Impact

Cement discharge impacts to the marine environment are associated with smothering of benthic and infauna communities in the vicinity of the well. Cement is the most common material currently used in artificial reefs around the world (OSPAR, 2010) and is not expected to pose any toxicological impacts to benthic and infauna from leaching or direct contact. In addition, cementing additives will be assessed in accordance with the chemical risk assessment (see Section 3.12).

Excess cement discharge may occur as a slurry below the sea surface. The cement may smother any surrounding benthic and infauna communities in the immediate vicinity of the well. Given the relatively low volume, it is anticipated excess slurry cement would be limited to the immediate vicinity of the well and in an area of previous seabed disturbance from drill cuttings discharge (see Section 7.9 for seabed disturbance from drilling cutting) and, therefore, present only a minor smothering impact to any surrounding benthic and infauna communities in the immediate vicinity of the well.

WBM is a drilling fluid in which water or brine is the major liquid phase as well as the wetting (external) phase. Apart from water or brine, WBM is made up of drilling fluid additives that are either completely inert in the marine environment, naturally occurring benign minerals, readily biodegradable organic polymers with a fast rate of biodegradation in the marine environment, or products in low concentrations with a very low potential for environmental impact. Bentonite sweeps or barite are typically used, as weighting agents in the WBM have very low toxicities and are considered by OSPAR to pose little or no risk to the environment. They may, however, cause physical damage to benthic organisms by abrasion or clogging, or through changes in sediment texture that can inhibit the settlement of planktonic polychaete and mollusc larvae (Hinwood *et al*., 1994). Impacts are not expected to be significant due to the rapid biodegradation and dispersion of WBM and no significant habitats and biota or sensitive receptors are considered to be present in the drilling Operational Area.

The discharge of WBM fluids on cutting is expected to increase turbidity and total suspended sediment (TSS) levels in the water column. Discharge of drill cuttings will be intermittent during the active drilling of the wells. Nelson *et al*. (2016) identified less than 10 mg/L of TSS as the no-effect or sub-lethal minimal effect concentration. The cuttings dispersion modelling (discussed in Section 7.9.2.2) predicts the concentration to total TSS to remain low and disperse rapidly from the well site. Given the generally low concentration of total TSS, the offshore open ocean environment in conjunction with rapid dispersion of sediment and the short period of intermittent discharge, the plume is not expected to have more than a very highly localised potential area of ecological impact and it is not predicted to impact productivity of the water column.

Components of WBM with potential toxicity to marine flora and fauna include metals associated with inorganic salt components, organic polymers and additional organic additives as well as barite and bentonite weighting agents (refer to Section 7.8.2.1). Metals present in WBM drilling fluid generally resemble that of marine sediments, albeit with concentrations of some metals higher than clean marine sediments (Neff, 2005). Metals associated with WBM drill cuttings have been shown to have a low bioavailability, as they tend to remain in a non-ionic form, remaining bound to other compounds, and present a low toxicity risk to marine fauna (Neff, 2005). In general, the acute toxicity of WBM is low (Neff, 2005).

Impacts from suspended sediments and TSS are not expected. While very high concentrations of suspended sediments have been shown to result in mortality of pelagic animals (more than 1830 mg/L), such concentrations do not occur as a result of drill cuttings discharges (International Oil & Gas Producers Association (IOGP), 2016). Given the opportunity for cuttings to disperse in the water column when discharged near the sea surface, the potential for smothering of pelagic fauna is greatly reduced. Fish are likely to swim away when elevated TSS concentrations are detected, while marine mammals and turtles are not expected to come into direct contact with the plume, given its proximity to the MODU.

The NPF previously raised concern over impacts on the prawn stock and commercial fishing operations (for drilling of the P3 development well, during consultation made in 2019 for the Blacktip Operations EP). As described above, there may be elevated levels of TSS in the water column which will be intermittent during the active drilling of the development wells. However, the impacts to marine fauna (including prawn) are likely to be short-lived and behavioural only. In addition, the cuttings dispersion modelling (discussed in Section 7.9.2.2) predicts the concentration of TSS to remain low and disperse rapidly from the well site; therefore, any impacts are highly restricted. Impacts to the northern prawn stock are not anticipated, given the low toxicity, low TSS concentration and rapid dispersion of WBM and associated cuttings.

The Operational Area is 500 km from the BIA for pygmy blue whale distribution and migration BIA and the BIA for humpback breeding and calving is 300 km south-west). There is low likelihood of encountering these cetaceans and those within the Operational Area would be transiting only. Impact to these species would be slight and temporary.

Other marine mammal species identified within the Operational Area include sei whale, fin whale, Bryde's whale, killer whale, Indo-Pacific humpback dolphin and spotted bottlenose dolphin. Within the Operational Area six species of turtle may be present (refer Table 4-5). The Operational Area and the expected area of cuttings deposition overlaps the foraging BIA for olive ridley turtles and green turtles (Figure 4-3). However, it is expected these species will be transiting or foraging for short periods only and are not likely to be resident or occur in the Operational Area in significant numbers, given the distance from shore and nesting beaches. Impacts are considered minor and temporary only.

Ecological impacts from mud and fluids discharge are not expected for mobile benthic fauna such as crabs and shrimps or pelagic and demersal fish, given their mobility (IOGP, 2016). Balcom *et al*. (2012) concluded that impacts associated with the discharge of cuttings and fluids are minimal, with impacts highly localised to the area of the discharge. For further impacts on benthic fauna from cuttings discharge, refer to Section 7.9.

Given the minor quantities of drilling discharges (see Table 3-5), the low toxicity of WBM and cement and high dispersion in the open, offshore environment, any consequence on the marine environment from the discharges are expected to be minor and temporary. Recovery of water quality conditions is expected within hours after the cessation of drilling. For impact to sediment quality, refer to Section 7.9.

7.8.4 Environmental Performance Outcomes and Control Measures

EPOs relating to this risk include:

- no impact to water quality or marine biota greater than a severity level of 2 from discharge of drilling cuttings or fluids (EPO-10).

CMs relating to this risk include:

- chemical risk assessment process (CM-11).

EPSs and MC relating to the above are presented in Section 10.

7.8.5 As Low As Reasonably Practicable Demonstration

Demonstration of ALARP			
Type	**Control/ management**	**Evaluation**	**Adoption?**
Eliminate	Eliminate the use of drilling fluids and muds	Drilling fluids and muds are technically required to drill the well and cannot be eliminated. The chemical risk assessment process will ensure any new chemicals are assessed before use in accordance with the procedure to reduce impact to ALARP and acceptable.	×
	Store fluids and muds on MODU and vessels for onshore processing	Storage of low-toxicity drilling discharges onboard the MODU and vessels and transportation to shore is considered to be impractical due to the high volume and number of vessels that would be required to provide ship-to-shore services. Additional energy use and emissions associated with onshore transport and treatment would also be introduced, as well as potential impact on the ultimate receiving terrestrial environment. Therefore, there is no net environmental benefit of transfer for onshore disposal. It also provides an increased exposure to biological health hazards, and safety hazards such as bulk transfer and heavy lifting operations.	×
	Eliminate discharge of cement to sea by returning excess cement to shore	The design of the piping and the tanks on the MODU is such that the reverse pumping of the cement back to marine vessels or to shore is not possible. Therefore, return of excess cement to shore is not a feasible option.	×
Substitute	Substitute out high-toxicity chemicals where possible	The chemical risk assessment process will ensure any impact from chemical discharge is ALARP and acceptable. See Section 3.12.	✓ (CM-11)
Engineering	Reduce chemical discharge through well design	The conductor on the WHP is already installed and therefore minimises the requirement for cementing and additional fluids.	✓ (already adopted due to design of the WHP)

Demonstration of ALARP			
Type	**Control/ management**	**Evaluation**	**Adoption?**
Isolation	N/A	N/A.	N/A
Administrative	Selection of chemicals to reduce impact to ALARP and acceptable	The chemical risk assessment process will ensure any new chemicals are assessed before use in accordance with the procedure to reduce impact to ALARP and acceptable. See Section 3.12.	✓ (CM-11)

7.8.6 Acceptability Demonstration

Demonstration of Acceptability	
Compliance with Legal Requirements, Laws and Standards	Eni chemical assessment process. See Section 3.12. The activity complies with EPBC approval conditions (EPBC 2003/1180) condition #2b 'The plan must address managing the collection, handling and disposal of NORMS that may occur': • To date Eni has only detected very low levels of radiation in pigging waste (collected at YGP). The Blacktip Waste Management Plan for YGP includes NORMS disposal in the event NORMS disposal is required at YGP. NORMS management is not required for the drilling of the development wells as no radiation is expected. The activity complies with EPBC approval conditions (EPBC 2003/1180) condition #2d 'The plan must address the use and disposal of drilling muds, including monitoring of water quality, in the event that low-toxicity, water-based drilling fluid additives cannot be used': • Low-toxicity, water-based drilling fluid additives will be used for drilling the development wells. Further information about the drilling fluids is contained in Section 7.8.2.1.
Policy Compliance	Eni HSE Statement objectives will be met.
Social Acceptability	Stakeholder consultation has been undertaken. NPF raised concern over drilling impacts on the prawn stock and commercial fishing operations. Impacts to prawn stocks are not considered significant, will be short-lived and restricted to the behaviour of a small number of the overall population.
Area Sensitivity/ Biodiversity	Benthic fauna are most at risk of potential impacts from drilling muds and fluid discharge. As the benthic fauna present in the Operational Area are widely represented in the JBG, no significant impacts are expected. No sensitive seabed habitats have been identified. The Operational Area does not contain any BIA for cetacean species. The Operational Area overlaps the foraging BIA for green turtles and olive ridley turtles. There are no resident sensitive water column environmental receptors in the Operational Area. Eni has considered information contained in relevant recovery plans and approved conservation advice for cetaceans and marine turtles that identify chemical discharges and pollution as a threat (Section 9). This includes the objectives and actions within the Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017), which relate to discharges.
ESD Principles	The impact assessment presented throughout this EP demonstrates compliance with the principles of ESD.
ALARP	The residual risk has been demonstrated to be ALARP.

Given the short, intermittent duration of the Petroleum Activities Program, the low volume of discharge from the MODU and receptors in the Operational Area, the potential impacts associated with discharge of drilling mud and fluid discharge are considered to be minor. A number of controls have been evaluated above and adopted in accordance with the ALARP criteria (Section 7.8.5). The residual risk is considered to be low, which is acceptable in accordance with Eni's acceptability criteria (Table 6-4). Therefore, the potential impacts are acceptable and ALARP.

7.9 Seabed Disturbance (Risk Identification P9)

7.9.1 Summary of Environmental Risk Assessment

Hazard	Seabed Disturbance - Disturbance from Cuttings		
	Likelihood	Severity	Risk
Inherent Risk	B	1	L
Residual Risk	A	1	L

Hazard	Seabed Disturbance - Placement of MODU Legs		
	Likelihood	Severity	Risk
Inherent Risk	B	1	L
Residual Risk	A	1	L

7.9.2 Description of Hazard

During the Petroleum Activities Program, seabed disturbance is anticipated from:

- disturbance from drillings cuttings from development wells depositing on the seabed (total area of approximately 5-7 km^2 based on an impact threshold of 10.0 g/m^2)
- placement of MODU legs on the seabed in the vicinity of the WHP (total area of 762 ft^2).

7.9.2.1 Drill Cuttings

Drill cuttings are the extracts of sedimentary layers that emerge from the drilling process and will range from very fine (0.016 mm) to coarse sizes (less than 1 cm). A total of 295 m^3 of drill cuttings is anticipated from the drilling of the P4 development well (Table 3-5) and a total of 545 m^3 of drill cuttings is anticipated from the drilling of the P3 development well (Table 3-6). Cutting discharge volumes are calculated based on hole size and interval length for the well. The total volume of drilling fluid and drill cuttings is an estimate based on previous drilling and completion programs in the Blacktip field. In the case of an unplanned event (such as re-spud, side tracking and interval length change), or change to the drilling or completion program, the total volume of fluids or drill cuttings will be comparable.

The conductor for drilling the development wells is already installed at the WHP and therefore all drilling will be conducted with a marine riser that enables cuttings and drilling fluid to be circulated back to the MODU. Once on the MODU, cuttings are separated from the WBM drilling fluids by the SCE. The SCE uses shale shakers to remove coarse cuttings from the drilling fluids. After processing by the shale shakers, the recovered fluids from the cuttings may be directed to centrifuges, which are used to remove fine solids (approximately 4.5 to 6 µm). The cuttings with retained residual fluids are then discharged below the water line, so as not to impact sea surface. Cuttings will typically deposit in the vicinity of the well site (confirmed in modelling, presented below), while the retained fluids (as referred to in Section 3.8) attached to fine cutting will disperse further, temporarily elevating TSS and sediment deposition. Cuttings modelling has been undertaken and a summary is presented in Section 7.9.2.2.

The requirement to re-spud a well is a low likelihood; however, if performed, could result in additional cuttings discharge in line with those presented in Table 3-5.

7.9.2.2 Cuttings Modelling

RPS APASA was commissioned to complete a sediment dispersion modelling study of 295 m³ of discharged cuttings and fluids during drilling at the WHP. The principal aim of the study was to calculate the fate of discharged drill cuttings and unrecoverable drilling muds, quantify the likely area of coverage and levels of suspended sediments and bottom deposition (thickness and accumulated load), and assess the risk to sensitive receptors of contact from cuttings and muds discharged during the operation. Whilst the P3 well has total of 545 m³ of drill cuttings, which is in excess of that modelled by RPS APASA, the outcome of the modelling is still useful to understand the extent of the drill cuttings and the results have been used to estimate the fate of a 545 m³ discharge.

A stochastic modelling approach was followed to assess drill cuttings and fluids discharge, with 75 replicate simulations performed over the annual period (25 per season). The results of all replicate simulations for each season – summer (December to February), winter (April to August) and transitional months (March and September to November) – were combined and statistically analysed to develop the distribution of outcomes based on time and event.

The model can track and predict sediment concentrations and thickness to very low levels that may not be of practical and ecological significance; therefore, a series of minimum detectable levels and impact thresholds were defined for reporting the model-predicted outcomes.

Table 7-9 presents a summary of the detectable levels and impact threshold levels used in this study.

Table 7-9: Detectable levels and impact threshold levels for assessment of sediment water column concentration, bottom thickness and sedimentation (APASA, 2019a)

Parameter	Detectable Level*	Impact threshold level
Water column concentration (TSS)	0.3 mg/L	1.0 mg/L
Bottom Thickness	0.001 mm	3.0 mm
Sedimentation	1.0 g/m² (bottom concentration)	10.0 g/m²/day (sedimentation rate)

**Detectable levels used in this study were based on external advice provided to RPS by Dr P. Ridd of James Cook University (JCU). Source: Ridd, 2015.*

A minimum TSS concentration of 0.3 mg/L is intended to represent the minimum measurable concentration of TSS in the water column. This detectable level is expected to be well below levels that result in a visible plume, which is generally 2 to 3 mg/L above background in regions with low naturally TSS concentrations. A value of 1.0 mg/L TSS concentration was defined as the impact threshold level.

A minimum sedimentation concentration of 1.0 g/m² was defined, which equates to approximately 0.001 mm bottom thickness. This detectable level is typically considered conservative and is expected to be far less than natural sedimentation rates. Therefore, the impact threshold level for sedimentation is expressed as a daily rate of mass per area and set at 10.0 g/m² per day. The impact threshold level for bottom thickness was defined as 3.0 mm.

The outcomes of the modelling assessment are summarised in Table 7-10.

A maximum sediment bottom thickness (or height of sediment mound) of 120.3 mm is predicted in the vicinity of the proposed well site. The maximum distance from the well location at which thicknesses greater than or equal to 3.0 mm occur are predicted is approximately 0.09 km. The maximum distances from the well location at which concentrations greater than or equal to 10.0 g/m² occur are predicted is approximately 4.62 km. Sediment bottom concentration at 1.0 g/m² occur at a maximum distance of 11.61 km from the well location.

No sensitive receptors (KEFs, Marine Parks) are reached at impact thresholds concentrations.

The modelling predicts the greatest distance any sediment is expected to disperse and settle on the seabed at impact threshold levels is 4.62 km (maximum area of impact 5.24 km^2) from a 295 m^3 cuttings discharge. It is expected that particles would exceed these distances with increased cuttings volumes, such as those from the P3 well which has total of 545 m³ of drill cuttings. It is reasonable to assume that the increased discharge could exceed impact threshold levels marginally further than 4.62 km as a worst case up to 7 km. The closest KEF is 18 km from the drill site and the closest Australian Marine Park is 50 km from the drill site. Given these distances, these sensitive features will not be impacted from a 545 m³ of drill cuttings discharge, even if assuming such increase in cuttings volume will impact an area twice as large as that determined by the RPS APASA modelling.

Table 7-10: Predicted maximum distance (across all seasons) to detectable and impact threshold exceedance (APASA, 2019a)

Variable	Description	Threshold	Maximum distance (km) or area of coverage (km²)
Water Column TSS Concentration	Maximum distance (km) from source at concentration ≥	0.3 mg/L	1.14
		1.0 mg/L	0.44
	Area of coverage (km²) at concentration ≥	0.3 mg/L	0.35
		1.0 mg/L	0.07
Bottom Thickness	Maximum distance (km) from source at thickness ≥	0.001 mm	8.14
		3.0 mm	0.09
	Area of coverage (km²) at thickness ≥	0.001 mm	24.13
		3.0 mm	0.005
Bottom Concentration	Maximum distance (km) from source at concentration ≥	1.0 g/m²	11.61
		10.0 g/m²	4.62
	Area of coverage (km²) at concentration ≥	1.0 g/m²	65.57
		10.0 g/m²	5.24
Sedimentation Rate	Maximum distance (km) from source at sedimentation ≥	10.0 g/m²/d	1.46
		100.0 g/m²/d	0.31
	Area of coverage (km²) at sedimentation ≥	10.0 g/m²/d	0.52
		100.0 g/m²/d	0.05

7.9.2.3 Mobile Offshore Drilling Unit Placement

The placement of the MODU's legs will result in physical disturbance of the sea floor. The MODU will be cantilevered over the Blacktip WHP; therefore, the disturbance will be within an area of seabed previously disturbed and impact may be contained within the footprint of the MODU's legs from the previous drilling campaign at the site. The seabed will be surveyed prior to positioning the drill MODU (under the scope of the Blacktip Operations EP) to verify any seabed features or hazards. Impact will be limited to three spud cans on the MODU, each impacting 254 ft² of seabed. Once drilling has occurred, the legs will be jacked down and the MODU will move off location.

7.9.2.4 Remotely Operated Vehicle Use

During ROV campaigns there may be instances where placement on the seafloor is required. The ROV has potential to impact an area of 4.25 m² when stationed on the seafloor.

7.9.3 Potential Environmental Impact

As outlined below, discharge of cuttings may lead to the impacts of:

- smothering of benthic fauna
- decrease in sediment quality
- cuttings pile legacy impacts.

Impacts from the drilling fluids on cuttings have been assessed in Section 7.8.

Smothering

The effects of drilling discharges on the benthic environment are related to the total mass of drilling solids and drilling fluids discharged, the relative energy of the water column, and benthic habitat at the discharge location (Neff, 2005). The effects of drilling fluids and cuttings piles on seabed communities are caused mainly by burial (smothering) and low sediment oxygen concentrations caused by organic enrichment (Neff, 2005). With increasing thickness of drill cuttings, the number of taxa, abundance, biomass and diversity of macrofauna have been found to significantly reduce (Trannum *et al*., 2010).

Organic enrichment as a result of WBM drilling cuttings discharge increases bacterial activity. A mild enrichment often sees an increase in both the abundance and diversity of the benthic community in the area of discharge. As more organic enrichment occurs, the seafloor bacteria colonies consume more and more of the oxygen in the sediment, resulting in anoxic conditions. In a highly organic-enriched area, the sediment can become anaerobic and both the abundance and diversity of species is much lower than normal (IOGP, 2021).

The benthic fauna and seabed at the WHP are widely represented on the JBG and previous surveys at the WHP have not indicated any sensitive habitats. The drilling location is over the Infaunal Plains habitat, which presents a total area of 93,524 km² of the gulf. A discharge of of cuttings will impact a total area of 5-7 km² (based on impact thresholds presented in Table 7-10). The potential impact from the cuttings is therefore less than 0.006% of the Infaunal Plains habitat.

Placement of the jack-up MODU's legs will impact a total area of 762 m² of seabed. The impact from placing the rig is therefore less than 0.001% of the Infaunal Plains habitat. The impact of placing the ROV on the seafloor will impact a significantly smaller percentage of the Infaunal Plains habitat.

Potential impacts from cuttings discharge are not considered significant at an ecosystem level, given the resultant cuttings mound on the seafloor would only occur directly adjacent to the well location where sediment thickness is greatest. Sediment bottom concentration at 1.0 g/m² occurs at a maximum distance of 11.61 km from the well location. A feature of the Sahul Shelf KEF is located 25 km to the south-west of the WHP (drilling location) and will therefore not receive cuttings at 1.0 g/m² sediment bottom concentration (detectable levels). The JBG AMP is approximately 50 km to the west and 55 km to the south of the area which receives 1.0 g/m² sediment bottom concentration and will therefore not be impacted.

No sensitive receptors (KEFs, Marine Parks) are reached at impact thresholds concentrations (APASA, 2019a).

It is not anticipated the area around the WHP will provide spawning grounds for mackerel, given their preference for spawning in oceanic conditions on reef edges and areas (NT Government, 2005; Department of Fisheries, 2010) or demersal species which are also more associated with reef habitat. Therefore, impact to spawning of these species is not anticipated from the seabed disturbance or disposal of cuttings.

Due to the localised area of disturbance, impacted benthic communities are expected to rapidly recolonise any disturbed areas upon completion of the activities. Overall, impacts from smothering would likely be temporary and slight, with rapid recolonisation of benthic infauna within the cuttings layer, given the low toxicity of the material. Surveys of previous seabed disturbances from drilling activities indicate recovery of benthic fauna in soft sediment substrates occurs within six to 12 months of cessation of drilling (Currie & Isaacs, 2005).

Decrease in Sediment Quality

A WBM drilling cuttings pile is effectively made up of:

- a rock fraction (the cuttings)
- WBM, including:
  - a weighting agent (barite or bentonite)
  - a liquid fraction (the liquid components of the drilling fluids).

Drill cuttings accumulation on seafloor sediments can cause changes in the physical properties and chemical composition of the seabed sediments. These include increased concentrations of organic material, a change in the appearance of the sediment surface, increased sediment grain size and increased concentrations of metals (relating to weighting agent use).

Barite is one of the main constituents used in WBM, and its use results in elevated levels of barium in cuttings. Other chemicals of concern in cuttings, either because of their potential toxicity or abundance in WBM, are arsenic (As), chromium (Cr), cadmium (Cd), copper (Cu), iron (Fe), lead (Pb), mercury (Hg), nickel (Ni) and zinc (Zn) (Breuer *et al*., 2004).

The sediments affected by cuttings discharges, have frequently shown elevated concentrations of barium from barite and potentially toxic metals such as Pb, Hg and Cd from barite impurities. Adverse effects from this heavy metal load on benthic communities have frequently been documented for affected areas in the North Sea (Wegeberg and Gustavson, 2019).

Total concentrations of mercury and methylmercury in near-field and farfield sediments to offshore drilling sites in the Gulf of Mexico were published by Trefry et al. (2008). Total Hg levels at the near-field sites were in general high, within the range 25-558 ppb, whereas total Hg levels at the far-field sites were distinctly lower, ranging between 11 and 92 ppb. Furthermore, a strong correlation between barium and total mercury concentrations in the sediments was demonstrated, which confirmed that barite from drilling mud most probable was the main source of the mercury contamination in nearfield sediment. Methylated mercury is strongly bioaccumulated and biomagnified in infauna. However, mercury bound to barite is not expected to be released and methylate readily (Neff 2008, Trefry et al. 2008). The solubility of barium sulfate in water is considered to be low, and because of the high concentrations of sulfate in marine environments, the concentrations of dissolved barium ions also is expected to be low (Wegeberg and Gustavson, 2019). However some degree of bioavailability of barite-bound mercury / methylated mercury cannot be ruled out (Norwegian Research Council 2012)

Dissolved barium and any heavy metal contaminants present in the barite may slowly leach out of an anoxic cuttings pile (Neff *et al*., 2005). Breuer *et al*. (2008) has also overserved that metals in cuttings migrate either upward to the overlying water (Ba, Mn and Fe) or diffuse downward (Cr, Cu and Pb), where they become incorporated into Fe monosulfides. The exposure of these Fe monosulfides to oxygen as a result of transporting oxygen into the cuttings via bioturbation or advection or pile resuspension may then lead to the release of the associated metals into the water column (Saulnier and Mucci, 2000; Huerta-Diaz *et al*., 1998).

In a stable cuttings pile with little physical disturbance or bioturbation, it is probable the fraction of the total cuttings pile metals that is in the dissolved, bioavailable fraction remains low. It is probable some dissolved metals diffuse into the overlying water column and escape from the pile, as identified by Neff *et al*. (2005). However, this efflux is not sufficient to raise the concentration of metals above natural background levels to an ecologically significant extent (Hartley *et al*., 2003). There is no indication the levels of trace metals in fish and shellfish collected close to offshore installations are significantly above natural background concentrations (Bakke *et al*., 2013).

Marine fauna that are exposed in the laboratory or field to cuttings in sediments do not bioaccumulate significant quantities of metals (Hartley *et al*., 2003). There is some evidence of a limited bioavailability of a few metals, such as Pb and Zn, which are present in cuttings piles; however, doubt remains that metal bioaccumulation in marine fauna from cuttings piles is sufficient to cause harmful effects in marine fauna living on or near cuttings piles (OSPAR, 2019).

Given the nature of the cuttings discharge, and the nature of the seabed in the vicinity of the Operational Area, the impact from a reduction of sediment quality is expected to be slight.

Cuttings Pile Legacy Impacts

In the event of cuttings pile disturbance (such as future decommissioning results in disturbance), a proportion of a disturbed cuttings pile is likely to resettle on seabed sediment that has not been previously impacted by cuttings. The potential impact this has on benthic communities results from a combination of physical smothering, changes in sediment texture and grain size, oxygen depletion, organic enrichment and direct toxicity from drilling fluids (impacts of which are described in Section 7.8). This can result in a decrease in both the abundance and diversity of benthic fauna (OSPAR, 2019). Resuspension of cuttings piles into the water column as a result of disturbance gives rise to the potential for exposure of marine fauna to contaminants in the cuttings (described in Section 7.8) (OSPAR, 2019).

Modelling of cuttings pile relocation (disturbance and re-deposition) has confirmed potential contamination by metals in the barite are bound to the immediate vicinity of the discharge and disturbance of cuttings drilled with WBM are not expected to result in any significant impact (OSPAR, 2019). Generally, impacts from disturbed cuttings drilled with WBM are expected to be minor and resemble the impacts from currently consented cuttings discharges, and any concern is more likely to focus on cuttings drilled with non-aqueous drilling fluids (OSPAR, 2019).

Eni have set controls within 7.9.5 which aim reduce cuttings legacy impacts and protect natural resources within the WA-33-L. This includes setting limits for contaminants within the barite.

Cumulative Cuttings

Impacts to the seabed will occur within a previously disturbed area (drilling of the P1 and P2 wells). Further discharge of cuttings over the already disturbed cuttings piles are not considered to pose significant impact other than smothering of benthic fauna already present over the area (impacts discussed above). The cuttings on the seabed (and legacy piles) may be thicker local to the WHP, however due the localised area of disturbance, impacted benthic communities are expected to rapidly recolonise any disturbed areas upon completion of the activities.

7.9.4 Environmental Performance Outcomes and Control Measures

EPOs relating to this risk include:

- seabed disturbance limited to planned activities (EPO-11).

CMs relating to this risk include:

- solids control equipment (CM-12)
- cuttings discharged below the water line (CM-13)
- quality control for barite (CM-14).

EPSs and MC relating to the above are presented in Section 10.

7.9.5 As Low As Reasonably Practicable Demonstration

Demonstration of ALARP			
Type	**Control / management**	**Evaluation**	**Adoption?**
Eliminate	Eliminate the use of the MODU	The use of the MODU is required for the drilling activity to be completed	×
	Eliminate cuttings discharge	The generation of cuttings cannot be eliminated if the well is to be drilled. Storage of cuttings onboard the MODU/vessels and transportation to shore is considered to be impractical due to the high volume and number of vessels that would be required to provide ship-to-shore services. Shipping cuttings to shore using vessels will result in increased fuel usage, increased safety risks to personnel during transfer and increased crane movements.	×
Substitute Engineering	Use a semi-submersible MODU with no anchoring requirements	The use of a semi-submersible which does not anchor would remove the impact to seabed from the MODU use. However, the WHP is designed to allow a jack-up MODU to be cantilevered over the WHP. The use of a semi-submersible MODU is therefore not appropriate.	×
	Cuttings injection	Cuttings reinjection into formation is not feasible due to no concurrent drilling planned or well to re-inject into.	×
	SCE, allowing reuse of mud, where possible, prior to discharge.	SCE will aim to recapture the WBM where possible, so it can be used on the next section of well. This will reduce the fluids on the cuttings and lower fluids discharge to the marine environment. Costs of equipment outweigh the environmental benefits and WBM can be reused, reducing project costs also.	✓ (CM-12)
	Cuttings are discharged overboard, below the water line	Reduces the spread of cuttings on the sea surface and therefore the disturbance area. The MODU is designed so cuttings are discharged below the water line (approx.. 10m below); therefore, minor or no cost involved.	✓ (CM-13)

Demonstration of ALARP			
Type	**Control / management**	**Evaluation**	**Adoption?**
	Use of WBM only	WBMs have been selected for the well, rather than non-water-based mud which presents increased toxicity risks to the marine environment when discharged with the cuttings. The well has been designed to be drilled with WBM; therefore, no additional cost to adopt.	N/A
Isolation	Not applicable	N/A.	N/A
Administrative	Bulk operational (cuttings) discharge is monitored	Monitoring can be used to verify cuttings discharge is in accordance with modelling. However, the high cost involved in monitoring cuttings outweighs the benefits. Cuttings bottom concentration at 1.0 g/m² is predicted to occur at a maximum distance of 11.61 km from the well location and not come into contact with any sensitive features, the nearest being Sahul Shelf KEF, located 25 km to the south-west of the WHP (drilling location). Given low sensitivity of the seabed over the cuttings deposition area and the distance from the Sahul Shelf KEF, monitoring has been determined to provide no environmental benefit.	×

Demonstration of ALARP			
Type	**Control / management**	**Evaluation**	**Adoption?**
	Quality control for Barite	Contaminant limit concentrations in barite: • mercury (Hg) – 1 mg/kg dry weight in stock barite • cadmium (Cd) – 3 mg/kg dry weight in stock barite. Puts a limit on the contaminants within the barite based on the US limit set by US EPA (2004). Selecting barite with low contaminants aims to minimise the potential transfer of mercury from drilling mud to the environment and the food web. Also reducing sediment contamination as a result of cuttings discharge or any future cuttings disturbance. Aims to ensure that Eni protect the natural resources in the permit area and minimise any legacy cuttings contamination. Low cost associated with ensuring the barite selected for drilling meets the contaminant limits.	✓ (CM-14)

7.9.6 Acceptability Demonstration

Demonstration of Acceptability	
Compliance with Legal Requirements, Laws and Standards	None identified. The Petroleum Activities Program complies with the EPBC approval conditions (EPBC 2003/1180). Discharge of cutting and limit of barite considers the Minamata Convention on Mercury 2013.
Policy Compliance	Eni HSE Statement objectives will be met.
Social Acceptability	Stakeholder consultation has been undertaken. No stakeholder concerns have been raised with regard to seabed disturbance.
Area Sensitivity/ Biodiversity	Benthic fauna and seabed over the cuttings deposition area is widely represented on the JBG. Seabed disturbance from drilling will impact less than 0.007% of the habitat. No sensitive seabed habitats have been identified and cuttings do not reach any KEF or AMP. Eni has considered information contained in relevant recovery plans and approved conservation advice for cetaceans and marine turtles that identify seabed disturbance and habitat modification as a threat (Section 9).
ESD Principles	The impact assessment presented throughout this EP demonstrates compliance with the principles of ESD.
ALARP	The residual risk has been demonstrated to be ALARP.

Given the limited seabed disturbance from the cuttings (approximately 5 km^2) and placement of the jack-up legs (762 m^2), which disturbs less than 0.007% of the Infaunal Plains habitat in the JBG, the potential impacts associated with seabed disturbance are considered to be slight. The residual risk is considered low, which is acceptable in accordance with Eni's acceptability criteria (Table 6-4). Potential impacts associated with seabed disturbance are acceptable and ALARP.

Minamata Convention on Mercury 2013

As reference in Table 2-6, Australia is signatory to the Minamata Convention on Mercury. The international treaty seeks to protect the environment from anthropogenic emissions and releases of mercury and mercury compounds. Mercury is associated with the barite used for as weighting agent in the WBM. The concentration of mercury impurities in barite varies with geographical origin, however the discharge of mercury to the environment can be minimised by using barite with low concentration of mercury. Eni have put a limit on the contaminants in barite (refer Section 7.9.5), based on the US limit set by US EPA (2004). Selecting barite with low contaminants aims to minimise the potential transfer of mercury from drilling mud to the environment and bioaccumulation potential.

8 ENVIRONMENTAL RISK ASSESSMENT – UNPLANNED EVENTS

8.1 Non-Hazardous and Hazardous Waste (Risk Identification U1)

8.1.1 Summary of Environmental Impact

Hazard	Non-Hazardous and Hazardous Waste		
	Likelihood	Severity	Risk
Inherent Risk	B	2	L
Residual Risk	A	2	L

8.1.2 Description of Hazard

Solid wastes generated on the MODU and vessels may be broadly classified into one of two categories, being:

1. general non-hazardous solid wastes
2. hazardous wastes.

Non-hazardous solid wastes produced on the MODU and vessels include cardboard, plastic, aluminium and paper. These waste materials will be stored on-board the vessels in suitable containers (segregated from hazardous waste materials) for transport back to shore for disposal or recycling in accordance with local regulations.

Hazardous wastes are defined as being waste materials that are harmful to health or the environment. Chemicals and other hazardous materials that may be stored on the vessels include:

- lubricating oils, cleaning and colling agents
- oil filters and batteries
- oily rags
- paint, aerosol cans
- acids, caustics and solvents.

Accidental release of these wastes may occur as a result of overfull or uncovered bins, incorrectly disposed items or spills during transfers of waste, or dropped objects and lost equipment. In addition, accidental discharge of non-hydrocarbon solid materials has the potential to occur during product transfers or storage of dry bulk product (such as cement) and solid additives (such as barite and bentonite).

All hazardous waste generated will be documented and tracked, segregated from other waste streams and stored in suitable containers. Recyclable hazardous wastes, such as oils and batteries, will be stored separately from non-recyclable materials. All hazardous waste materials will be transported to shore for disposal or recycled at an approved facility in accordance with local requirements.

8.1.3 Potential Environmental Impact

Potential impacts of hazardous and non-hazardous wastes accidentally released to the marine environment include the potential physical harm to marine fauna resulting from ingestion or entanglement with solid waste (garbage).

If accidentally lost overboard, hazardous waste liquids would result in a temporary and highly localised (restricted to the Operational Area) hazardous water quality zone. The exposure and toxicity would be highly temporary due to rapid dilution and dissipation in the marine environment. Potential impacts are likely to be limited to one or a few individual marine animals in the immediate vicinity of the accidental release site, with the most likely fauna affected being those within the surface waters.

Buoyant hazardous wastes, such as oily rags, aerosol cans and contaminated packaging, could also potentially drift out of the Operational Area in the direction of the prevailing wind and surface currents. Such wastes could potentially reach shallow waters along the coastlines of the region. It is considered, however, that there is a low potential for these materials to create a toxic impact to shallow water habitats and associated flora and fauna.

Non-buoyant dropped objects will sink to the seabed within the Operational Area. Dropped objects that sink could potentially impact benthic invertebrates. While soft sediment benthic habits will not be destroyed, disturbance of the communities on and within them (epifauna and infauna) will occur in the event of a dropped object, and depressions may remain on the seabed for some time after removal of the dropped object as it gradually infills over time. Any impact from sinking of waste material is likely to be minor and highly localised to a small area of seabed within the Operational Area.

8.1.4 Environmental Performance Outcomes and Control Measures

EPOs relating to this risk include:

- no unplanned releases of solid hazardous or non-hazardous waste to the marine environment (EPO-12).

CMs relating to this risk include:

- hazardous and non-hazardous waste management processes are implemented (CM-15)
- Lifting Operations Standard (ENI HSE ST 007) (CM 16).

EPSs and MC relating to the above are presented in Section 10.

8.1.5 As Low As Reasonably Practicable Demonstration

Demonstration of ALARP			
Type	**Control/ management**	**Evaluation**	**Adoption?**
Eliminate	Eliminate production of non-hazardous and hazardous waste	Eliminates the risk of releasing non-hazardous solids to the marine environment; however, eliminating the use of consumable products is not possible due to operational requirements. Waste will therefore be generated. Use of the MODU and vessels (which generate waste) is required to perform the Petroleum Activities Program and therefore risk cannot be eliminated.	×
Substitute	N/A	N/A.	N/A
Engineering	N/A	N/A.	N/A
Isolation	Hazardous and non-hazardous waste will be segregated in accordance with Marine Order 95	Securely segregating and isolating the hazardous and non-hazardous waste in accordance with Marine Order 95 will reduce the likelihood of it being lost to the marine environment. Minor cost involved in segregating the hazardous and non-hazardous waste.	✓ (CM 15)
Administrative	Implement a hazardous and non-hazardous waste management process in accordance with Marine Order 95	Reducing the risk of impact to the environment from loss of hazardous and non-hazardous waste outweighs the personnel cost associated with implementing procedures.	✓ (CM 15)
	Lifting Operations Standard (ENI HSE ST 007)	Details processes to reduce risk of dropped object, including: • competency of persons undertaking lift • planning and preparation process for undertaking lifts. Reducing the risk of dropped object outweighs the personnel cost associated with implementing standard.	✓ (CM 16)

8.1.6 Acceptability Demonstration

Demonstration of Acceptability	
Compliance with Legal Requirements, Laws and Standards	Compliance with MARPOL 73/78 Annex V (Prevention of pollution by garbage) and Marine Order 95 (Marine pollution prevention –garbage) as required by vessel class. The Petroleum Activities Program complies with the EPBC approval conditions (EPBC 2003/1180).
Policy Compliance	Eni's HSE Statement objectives will be met.
Social Acceptability	Stakeholder consultation has been undertaken. No stakeholder concerns have been raised with regard to unplanned waste discharge.
Area Sensitivity/ Biodiversity	Impacts are limited to a few individual marine fauna in the immediate vicinity of the accident release site. Eni has considered information contained in relevant recovery plans and advice for marine fauna that identify marine debris as a threat (Section 9). This includes the objectives and actions within the Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017) and Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans (Commonwealth of Australia, 2018), which relate to marine debris.
ESD Principles	The impact assessment presented throughout this EP demonstrates compliance with the principles of ESD.
ALARP	The residual risk has been demonstrated to be ALARP.

A number of controls have been evaluated above and adopted in accordance with the ALARP criteria (Section 8.1.5). The residual risk ranking for loss of waste is low. This is acceptable in accordance with Eni's acceptability criteria (Table 6-4) Given the short duration of the Petroleum Activities Program, the low potential risk and the controls that will be implemented, Eni considers that the risks associated with hazardous and non-hazardous waste are acceptable and managed to ALARP.

8.2 Vessel Collision with Marine Fauna (Risk Identification U2)

8.2.1 Summary of the Environmental Impact

Hazard	Vessel Collision with Marine Fauna		
	Frequency	Severity	Risk
Inherent Risk	B	2	L
Residual Risk	A	2	L

8.2.2 Description of Hazard

There is the potential for vessels to collide with marine fauna, including cetaceans, fish, marine reptiles and seabirds, during the Petroleum Activities Program. The main collision risk associated with the Petroleum Activities Program is through vessel collision with large, slow-moving cetaceans, potentially resulting in severe injury or mortality.

8.2.3 Potential Environmental Impact

Vessel collision with marine fauna may result in their injury or death. Marine fauna that are present in surface waters such as marine turtles and cetaceans are most susceptible to vessel strikes due to their proximity to the vessel (hull, propeller or equipment).

The Operational Area overlaps the foraging BIA for green turtles and Olive Ridley turtles (Section 4.4.1). It is possible individual turtles may be encountered during the Petroleum Activities Program; however, considering the water depths of the Operational Area compared to observed water depths of internesting turtles, large numbers of the species are not expected. Marine turtles on the sea surface have also been observed avoiding approaching vessels by typically moving away from the vessels track (Hazel *et al*., 2007).

Marine mammals that may occur within the Operational Area are detailed in Section 4.4. Cetaceans including humpback whales demonstrate a variety of behaviours in response to approaching vessels (attributed to vessel noise), including longer dive times and moving away from the vessel's path with increased speed. These behaviours may contribute to reducing the likelihood of a vessel strike.

The Operational Area is 420 km from the pygmy blue whale migration BIA and 365 km from the humpback migration BIA. As the Operational Area is not within or near BIAs or migratory routes for marine mammals, there is a low likelihood of these cetaceans occurring within the Operational Area, reducing the likelihood of a vessel collision with marine fauna.

Vessels within the Operational Area are usually stationary or slow moving; therefore, the risk of collision with marine fauna is extremely low, as the vessel size and underwater noise 'footprint' will alert marine fauna to its presence and thus illicit avoidance.

Given cetaceans, marine turtles and other marine fauna exhibit avoidance behaviour, the likelihood of vessel collision with marine fauna is low. During movements into or out of the Operational Area, vessels will move slowly (five knots or less). This also reduces the risk of collision, allowing time for any marine fauna to move out of the immediate area. Management controls will also be implemented to further reduce the potential risk of collision.

8.2.4 Environmental Performance Outcomes and Control Measures

EPOs relating to the risk include:

- no injury or mortality to EPBC Act listed fauna during operational activities (EPO-06).

CMs relating to this risk include:

- regulations and measures for interacting with marine fauna (CM-07).

EPSs and MC relating to the above are presented in Section 10.

8.2.5 As Low As Reasonably Practicable Demonstration

Demonstration of ALARP			
Type	**Control/ management**	**Evaluation**	**Adoption?**
Eliminate	Eliminate vessel and use	Would eliminate risk. However, vessel movements cannot be eliminated as the vessels are required to support the MODU.	×
Substitute	N/A	N/A.	N/A
Engineering	N/A	N/A.	N/A
Isolation	N/A	N/A.	N/A
Administrative	Regulations and measures for interacting with marine fauna	Vessels will comply with EPBC Regulations 2000 – Part 8 Division 8.1 (Interacting with cetaceans). Reduces risk of physical and behavioural impacts to marine fauna. Minor cost in complying. Is a legislated requirement.	✓ (CM-07)
	Use of a dedicated marine fauna observer	Improves ability to spot and identify marine fauna at risk of collision. However, costs involved with implementing a dedicated marine fauna observer is grossly disproportional to the environmental benefit, given low risk.	×
	Use of spotter planes to identify marine fauna in the region	Improves ability to spot and identify marine fauna at risk of collision. However, costs involved with implementing a dedicated marine fauna observer is grossly disproportional to the environmental benefit, given low risk.	×
	Plan vessel movements during periods when sensitive marine fauna are not present	May reduce the risk of vessel strikes during sensitive periods when more fauna may be present. However, limiting the vessel use to avoid sensitive periods would introduce other safety and environmental hazards, such as higher probability of inclement weather. In addition, there is a low likelihood of encountering marine mammals in the Operational Area.	×

8.2.6 Acceptability Demonstration

Demonstration of Acceptability	
Compliance with Legal Requirements, Laws and Standards	Vessels will comply with EPBC Regulations 2000 – Part 8 Division 8.1 (Interacting with cetaceans) and the Australian National Guidelines for Whale and Dolphin Watching 2017 (DoEE, 2017). The Petroleum Activities Program complies with EPBC 2001/365 approval.
Policy Compliance	Eni's HSE Statement objectives will be met.
Social Acceptability	Stakeholder consultation has been undertaken. No stakeholder concerns have been raised with regard to potential vessel collision with marine fauna.
Area Sensitivity/ Biodiversity	Pelagic marine megafauna including cetaceans and marine turtles are at most risk. However, no turtle nesting beaches or feeding or breeding areas are located near the Operational Area and cetaceans and marine turtles exhibit avoidance behaviour. The Operational Area does not contain any BIA for cetacean species. The Operational Area overlaps the foraging BIA for green turtles and olive ridley turtles. Eni has considered information contained in relevant recovery plans for marine fauna that identify vessel collision as a threat (Section 9). This includes the objectives and actions within the Conservation Management Plan for the Blue Whale 2015–2025 (Commonwealth of Australia, 2015a), which relate to vessel – whale collisions.
ESD Principles	The environmental impact assessment presented throughout this EP demonstrates compliance with the principles of ESD.
ALARP	The residual risk has been demonstrated to be ALARP.

A number of controls have been evaluated above and adopted in accordance with the ALARP criteria (Section 8.2.5). The residual risk ranking for vessel collision with marine fauna is low. This is acceptable in accordance with Eni's acceptability criteria (Table 6-4) Given the short duration of the Petroleum Activities Program, the low potential risk and the controls that will be implemented, Eni considers the risks associated with vessel collision with marine fauna are acceptable and managed to ALARP.

8.3 Introduction of Marine Pest Species (Risk Identification U3)

8.3.1 Summary of Environmental Impact

Hazard	Introduction of Marine Pest Species		
	Frequency	Severity	Risk
Inherent Risk	C	3	MH
Residual Risk	A	3	L

8.3.2 Description of Hazard

Activities which have the potential to result in the introduction of IMS are:

- discharges of vessel ballast water containing foreign species

- translocation of species on submerged equipment, such as an ROV
- translocation of species through biofouling of the MODU or vessel hull or niches, such as sea chests, bilges or strainers.

Vessels will ballast and de-ballast to improve stability, spread vessel stresses and adjust vessel draft, list and trim, with regard to the weight of equipment, fuel and potable water on-board at any time. Ballast water may contain organisms such as fish, invertebrate larvae and phytoplankton from foreign source waters.

Biofouling on MODU or vessel hulls and other external niche areas routinely immersed in water all pose a potential risk of introducing IMS into Australia, IMS establishment is greater in areas such as seams and unpainted surfaces which are easy to attach to or where water turbulence is lowest (such as niches and sea chests). Anti-fouling paints are used to coat the bottoms of MODU and vessels to prevent marine organisms such as algae and molluscs attaching themselves to the hull, thereby slowing down the ship and increasing fuel consumption.

The potential biofouling risk presented by the MODU and vessels will relate to the length of time the MODU or vessels have already been operating in Australian waters or, if they have been operating outside Australian waters, the location(s) of the operations they have been undertaking, the length of time spent at these location/s, and whether the vessels have undergone hull inspections, cleaning and application of new anti-foulant coating before returning to operate in Australia.

8.3.3 Potential Environmental Impact

The successful establishment of an exotic species transported via either ballast or hull fouling depends primarily on three factors, being:

1. colonisation and establishment of the marine pest on a vector (vessel, equipment or structure) in a donor region (for example, a home port, harbour or coastal project site where a marine pest is established)
2. survival of the marine pests on the vector during the voyage from the donor to the recipient region
3. colonisation (for example, by reproduction or dislodgement) of the recipient region by the marine pest, followed by successful establishment of a viable new local population.

When IMS achieve pest status, they can commonly cause a variety of adverse effects in a receiving environment, including:

- over-predation of native flora and fauna
- out-competing of native flora and fauna for food
- human illness through released toxins
- depletion of viable fishing areas and aquaculture stock
- reduction of coastal aesthetics
- damage to marine and industrial equipment and infrastructure.

The above impacts can result in flow-on detrimental effects to fisheries, tourism and recreation.

It is recognised artificial, disturbed and polluted habitats in tropical regions are susceptible to introductions, which is why ports are often areas of higher IMS risk (Neil *et al*., 2005). However, in Australia there are limited records of detrimental impact from IMS compared to other tropical regions, such as the Caribbean.

The risk of introducing IMS is limited by the depth of the Operational Area (greater than 50 m), which is not directly adjacent to any shallow shoals or banks, with hard substrate to which IMS can attach. IMS are generally unable to establish in deepwater ecosystems, most likely due to a lack of light or suitable habitat to sustain their growth and survival. The offshore open waters of the Operational Area are, therefore, not conducive to the settlement and establishment of IMS. The likelihood that any marine organisms could become established at the field is rare.

8.3.4 Environmental Performance Outcomes and Control Measures

EPOs relating to this risk include:

- no introduction of marine pest species to the Operational Area (EPO-13).

CMs relating to this risk include:

- implementation of an IMS risk assessment tool, applied to the MODU and vessels (CM-17)
- the MODU and vessels have an approved ballast water treatment method or system (CM-18)
- IMS management methods applied to the MODU and vessels (CM-18).

EPSs and MC relating to the above are presented in Section 10.

8.3.5 As Low As Reasonably Practicable Demonstration

Demonstration of ALARP			
Type	**Control/ management**	**Evaluation**	**Adoption?**
Eliminate	Do not use a MODU or vessels	The use of a MODU and vessels is unavoidable; therefore, the risk of exotic species being transported in ballast water or hull fouling cannot be completely eliminated.	×
	Do not exchange ballast	Exchange of ballast water is a safety-critical activity for marine operations and elimination of exchange could put the vessel at risk.	×
Substitute	Contract only local MODUs and vessels	Contract MODU only operating in local, State or National waters to reduce potential for IMS; however, may present significant costs and delay in activity schedule.	×

Demonstration of ALARP			
Type	**Control/ management**	**Evaluation**	**Adoption?**
	Alternative ballast system which does not require a discharge	Utilising an alternative ballast system to avoid uptake/discharge of water would reduce the requirement for ballast water exchange; however, sourcing such vessels may present significant costs and delay in activity scheduling and ballast water exchange is standard practice on many vessels.	×
Engineering	Heat treatment of ballast water to eliminate IMS	Would reduce potential for IMS to establish by eliminating individuals present in ballast water; however, discharge of water at much higher temperature than surrounding marine environment would likely result in death of native marine species.	×
Isolation	N/A	N/A.	N/A
Administrative	Dry-docking before entering field to clean vessel and equipment and remove biofouling	Would minimise risk of IMS; however, presents significant cost and would lead to scheduling delays. Would be considered only to reduce IMS risk level.	×
	Implementation of an IMS risk assessment tool, applied to the MODU and vessels	Ensures the MODU and vessels are assessed to low IMS risk before mobilising for the activity. Minimal cost involved in demonstrating the MODU and vessels are of 'low risk' of introducing IMS through completion of an IMS risk assessment. Additional controls (such as dry docking) would be considered based on the outcome of the IMS risk assessment.	✓ (CM-16)
	The MODU and support vessels have approved ballast water treatment method/system	Eni will adopt the *Biosecurity Act 2015* and Australian Ballast Water Management Requirements 2017 (DAWR). Pursuant to the requirements, the MODU and support vessel carrying ballast water and engaged in international voyages shall manage ballast water in accordance with a Ballast Water Management Plan so marine pest species are not introduced. Requirements also include: 1. Vessels carrying internationally sourced ballast water must conduct ballast water exchanges as far as possible from the nearest land, which is: • at least 14 nm from the nearest land and in water deeper than 50 m	P (CM 17)

Demonstration of ALARP			
Type	**Control/ management**	**Evaluation**	**Adoption?**
		• where possible, more than 200 nm from the nearest land and in water deeper than 200 m • no closer than 500 m from the offshore installation. 2. Ballast water exchange must be conducted to the equivalent of a 95% (or greater) volumetric exchange, using one of the acceptable methods under the Regulations. 3. Vessels constructed on or after 8 September 2017 will be required to meet the Regulation D-2 discharge standard from the date they are put into service. 4. Vessels constructed before 8 September 2017 will need to comply with the Regulation D-2 standard by either the first or second five-year renewal survey of the vessel associated with the International Oil Pollution Prevention Certificate under MARPOL Annex I. *Note:* *The D-2 standard specifies discharge ballast water that meets the criteria of:* • *less than ten viable organisms per cubic metre which are greater than or equal to 50 micrometres in minimum dimension* • *less than ten viable organisms per millilitre which are between 10 micrometres and 50 micrometres in minimum dimension* • *less than one colony-forming unit (cfu) per 100 millilitres of Toxicogenic Vibrio cholerae* • *less than 250 cfu per 100 millilitres of Escherichia coli* • *less than 100 cfu per 100 millilitres of Intestinal Enterococci.*	

Demonstration of ALARP			
Type	**Control/ management**	**Evaluation**	**Adoption?**
		Eni will implement the Australian Ballast Water Management Requirements 2017 (DAWR), which is a legal requirement. Pursuant to the requirements: • Vessels/MODU must carry a valid ballast water management plan. • Vessels/MODU will have ballast water management certificate (unless exemption has been granted). • Vessels/MODU with a ballast water management system (BWMS) will carry a Type Approval Certificate specific to the type of BWMS. • Vessels/MODU will maintain a complete and accurate record of all ballast water movements.	✓ (CM 17)
	IMS Management Methods applied to the MODU and vessels	IMS management measures will be applied to vessels/MODU according to risk to minimise the likelihood of IMS being introduced, such as the treatment of internal systems, IMS inspections or cleaning.	✓ (CM 18)

8.3.6 Acceptability Demonstration

Demonstration of Acceptability	
Compliance with Legal Requirements, Laws and Standards	Compliance with: • Australian Ballast Water Requirements – Version 7 (DAWR, 2017) • IMO'S Guidelines for the Control and Management of Ships' Biofouling to Minimise the Transfer of Invasive Aquatic Species • Annex 1 of the International Convention on the Control of Harmful Anti-Fouling Systems on Ships • Biosecurity Act 2015 • Fish Resources Management Regulations 1995 • WA DPIRD Biofouling and Biosecurity Policy. The Petroleum Activities Program complies with EPBC 2001/365 approval.
Policy Compliance	Eni's HSE Statement objectives will be met.
Social Acceptability	Stakeholder consultation has been undertaken. No stakeholder concerns have been raised with regard to the introduction of marine pest species.
Area Sensitivity/ Biodiversity	The main risks associated with the introduction of marine pest species are the displacement of native species or interference with ecosystem processes in other ways (such as through predation). Provided the biosecurity controls are implemented during the activities, the risk of introduction of marine pest species is deemed low. The offshore open waters of the Operational Area are not conducive to the settlement and establishment of IMS. The Operational Area is in waters deeper than 50 m, precluding light penetration to the seabed, distant from any coastline and shallow bank systems. The likelihood that any marine organisms could become established at the Operational Area is rare.
ESD Principles	The impact assessment presented throughout this EP demonstrates compliance with the principles of ESD.
ALARP	The residual risk has been demonstrated to be ALARP.

An IMS risk assessment process is undertaken on all vessels and MODU before contracting to ensure vessel IMS risk is 'low'. All vessels are required to provide Australian biosecurity documentation as part of pre-hire documentation. Pre-hire vessel audits are also undertaken, including checking recent movements, anti-fouling coating, internal cleaning and compliance against the Australian Ballast Water Requirements – Version 7 and the IMO's Guidelines for the Control and Management of Ships' Biofouling to Minimise the Transfer of Invasive Aquatic Species.

The assessment is designed to reduce the likelihood of transferring IMS and support ongoing effective management of vessel biofouling, encourage best practice, and may also provide evidence to support a defence to any change under the *Fish Resources Management Act 1994*. Factors affecting the risk output from the assessment tool include:

- presence and age of antifouling coating
- recent inspection, cleaning and treatment for IMS

- seawater pipework treatment
- duration of stay in interstate or overseas location
- vessel movements and history
- date of departure from last Port of Call.

Vessels and MODU are to be assessed before contracting. IMS management measures may be applied to ensure vessels and MODU are at 'low risk' of introducing IMS, as per the assessment. These may include measures such as:

- recoating of antifouling coating
- inspection (biofouling inspector considered suitably qualified by the Department), cleaning and treatment for IMS
- seawater pipework treatment.

Pursuant to the *Biosecurity Act 2015* and Australian Ballast Water Management Requirements 2017 (DAWR), vessels carrying ballast water shall manage ballast water in accordance with a Ballast Water Management Plan so marine pest species are not introduced. Pursuant to the Australian Ballast Water Management Requirements 2017:

- All vessels/MODU must carry a valid ballast water management plan.
- Vessels/MODU will have a ballast water management certificate (unless exemption has been granted).
- Vessels/MODU with a BWMS will carry a Type Approval Certificate specific to the type of BWMS.
- Vessels/MODU will maintain a complete and accurate record of all ballast water movements.

A number of controls have been evaluated above and adopted in accordance with the ALARP criteria (Section 8.3.5). The residual risk is considered low, which is acceptable in accordance with Eni's acceptability criteria (Table 6-4). Therefore, the risk associated with the introduction of marine pests is acceptable and ALARP.

8.4 Loss of Hydrocarbons, Hydraulic Fluid and Bulk Chemicals and Fluids (Minor Spill and Leaks) (Risk Identification U4)

8.4.1 Summary of Environmental Risk Assessment

Hazard	Loss of Hydraulic Fluid and Bulk Chemicals		
	Frequency	Severity	Risk
Inherent Risk	B	3	M
Residual Risk	B	1	L

Hazard	Flaring Drop-out		
	Frequency	Severity	Risk
Inherent Risk	B	3	M
Residual Risk	B	1	L

8.4.2 Description of Hazard

Causes for accidental minor spill and leaks include:

- hydrocarbon and hydraulic fluids (less than 1 m³) from:
  - ROV failure (including oil seal, hydraulic system hose and quick-disconnect system failures)
  - structural failure of infrastructure containing MDO on, vessel or MODU.
- fluid and diesel from flaring drop-out (less than 1 m³).

The types of fluids stored on the MODU and vessels range from lubricating fluids to hydraulic, fuel and cooling fluids. Leaks could occur due to a failure of a mechanical component, fitting or hose. Other than vessels, the largest credible spill would be a release of less than 1 m³ of stern tube oil (non-hydrocarbon-based lube oil) from a vessel thruster or propeller stern tube.

Accidental release of hydraulic fluids volumes from ROV failure are expected to be low (approximately 20 L) and may occasionally occur from operation of the ROV, if hydraulic lines are pinched during subsea work.

Clean-up via the MODU well test package will result in a flare emission from the MODU flare tip. Flare burn may be interrupted by pressure drops and inadequate combustion in the flaring system during well clean-up. As a result, flaring drop-out may occur. Subsequently a small volume (less than 1 m³) of diesel (burnt during clean-up) may be discharged into the marine environment before flow is shut off to the flare.

8.4.3 Potential Environmental Impact

The hydraulic fluid typically used during vessel operations is a water-based hydraulic fluid, Oceanic HW443. Oceanic HW443 is reported to have a low toxicity to the marine environment and has been classified under the OCNS as Class D, which represents a low toxicity (CEFAS, 2016). It has been used widely in marine environments worldwide with no observed environmental effect (MacDermid, 2007).

The release of hydraulic fluid has the potential to result in a localised temporary reduction in water quality. Hydraulic oils behave similarly to marine diesel when spilled to the marine environment. These are medium oils of light to moderate viscosity. They have a relatively rapid spreading rate and will dissipate quickly in ocean conditions. Similar to diesel, the spill will have a tendency to sit on the surface during calm conditions and will readily entrain during variable winds between four and 19 knots, readily returning to the surface when conditions return to calm.

Diesel from flare drop-out will rapidly evaporate and disperse in the marine environment. More detail on impacts specific to a spill of marine diesel and its behaviour in the marine environment is presented in Section 8.5.

In the event of minor spill and leaks, impacts will be localised, temporary and slight due to the low spill volume and rapid dilution in the marine environment. Accidental releases of chemicals to the marine environment will not result in potential impact greater than temporary contamination above background water quality or known effect concentrations.

8.4.4 Environmental Performance Outcome and Control Measures

EPOs relating to this risk include:

- no significant leaks to the marine environment from fittings and connections (EPO-14)
- no loss of containment of hydrocarbons to the marine environment (EPO-15).

CMs relating to this risk include:

- vessel spill response plan (Shipboard Oil Pollution Emergency Plan (SOPEP)) (CM-20)
- on board spill response kits (CM-21)
- oily water prevention system in place (CM-10)

EPSs and MC relating to the above are presented in Section 10.

8.4.5 As Low As Reasonably Practicable Demonstration

Demonstration of ALARP			
Type	**Control/ management**	**Evaluation**	**Adoption?**
Eliminate	Eliminate hydraulic systems and ROVs	Would eliminate the environmental risk associated with minor spill and leaks. The requirement for hydraulic systems and their hoses and connections cannot be eliminated and are required for operations.	×
Substitute	N/A	N/A.	N/A
Engineering	Support vessels and MODU are equipped with oily water prevention system and IMO-approved oil filtering equipment	Bunding of high-risk areas (such as machinery) and subsequent drainage to an IMO-approved oil filtering equipment will ensure discharge is compliant with Marine Order 91. Minor costs involved to implement, as vessels and MODU will be required to comply with Marine Order 91.	✓ (CM-21)
Isolation	N/A	N/A.	N/A
Administrative	Compliance with administrative aspects of Marine Order 91 requirements	Environmental benefit outweighs minor costs in implementing and complying with Marine Order 91 requirements for oily water prevention system.	✓ (CM-21)
	Placement of spill kits in high spill risk areas of MODU and vessel decks	Environmental benefit outweighs minor costs in implementing and locating spill response kits in proximity to hydrocarbon storage and bunkering areas.	✓ (CM-20)
	SOPEP, which contains plans to prevent spills reaching the marine environment	Environmental benefit outweighs minor costs in implementing and testing the vessel spill response plan (SOPEP), which contains plans to prevent spills reaching the marine environment. The SOPEP is a requirement under MARPOL Annex 1 requirements (all vessels over 400 gross tonnage have SOPEP or Shipboard Marine Pollution Emergency Plans outlining options to control the source of a hydrocarbon spill).	✓ (CM-19)

8.4.6 Acceptability Demonstration

Demonstration of Acceptability	
Compliance with Legal Requirements, Laws and Standards	Compliance with MARPOL 73/78 Annex I, as applied in Australia under the *Commonwealth Protection of the Sea (Prevention of Pollution from Ships) Act 1983* (Part II Prevention of pollution by oil); and Marine Order 91 (Marine pollution prevention – oil). The Petroleum Activities Program complies with EPBC 2001/365 approval.
Policy Compliance	Eni's HSE Statement objectives will be met.
Social Acceptability	Stakeholder consultation has been undertaken. No stakeholder concerns have been raised with regard to unplanned hydraulic fluid leak or chemical releases.
Area Sensitivity/ Biodiversity	A hydraulic fluid leak or chemical release has the potential to cause a localised temporary reduction in water quality. Given the low predicted release volume, the low toxicity and rapid dilution in the marine environment, toxicity impacts to marine fauna are highly unlikely. Eni has considered information contained in relevant recovery plans for marine fauna that identify marine pollution as a threat (Section 9). This includes the objectives and actions within the Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017), which relate to marine pollution.
ESD Principles	The impact assessment presented throughout this EP demonstrates compliance with the principles of ESD.
ALARP	The residual risk has been demonstrated to be ALARP.

The potential impacts associated with minor spill and leaks is considered to be minor. A number of controls have been evaluated above and adopted in accordance with the ALARP criteria (Section 8.4.5). The residual risk ranking is low. This is acceptable in accordance with Eni's acceptability criteria (Table 6-4). No additional controls were identified to further reduce risk. Given the low potential risk and the controls that will be implemented, Eni considers the risks are acceptable and managed to ALARP.

8.5 Spill Risk Assessment Modelling Methodology

Spill modelling was undertaken by RPS APASA on behalf of Eni (APASA, 2019b). The spill scenarios modelled was:

- a 74-day uncontrolled surface release of 4943 m³ (31,090 bbl) of Blacktip condensate from a development well

SIMAP modelling was used for the scenario. Surface oil spill modelling was undertaken using a three-dimensional oil spill trajectory and weathering model, SIMAP, which is designed to simulate the transport, spreading and weathering of specific oil types under the influence of changing meteorological and oceanographic forces.

Modelling is applied to repeatedly simulate the defined credible spill scenarios using different samples of current and wind data. These data samples were selected randomly from an historic time-series of wind and current data representative of the study area.

Results of the replicate simulations were then statistically analysed and mapped to define contours of percentage probability of contact at identified thresholds around the hydrocarbon release point. The stochastic approach captures a wide range of potential weathering outcomes under varying environmental conditions, which is reflected in the aggregated spatial outcomes showing the areas that might be affected by sea surface and subsurface oil.

The modelling outcomes provide a conservative understanding of where a large-scale hydrocarbon release could travel in any condition, plotted all in one figure. The modelling does not take into consideration any of the spill prevention, mitigation and response capabilities that would be implemented in response to the spill. Therefore, the modelling results represent the maximum extent that may be influenced by the released hydrocarbons.

The outputs of the spill modelling are used as a tool to assess the environmental risk if the modelled credible hydrocarbon spill scenario occurred. It can provide an insight into the areas of the marine environment that could be exposed to hydrocarbon levels exceeding hydrocarbon threshold concentrations (

Table 8-1).

8.5.1 Hydrocarbon Contact Exposure Thresholds

As described in Section 4.1, the spatial extent of the EMBA has been derived using appropriate hydrocarbon exposure thresholds, applied to each of the hydrocarbon components (

Table 8-1). NOPSEMA Bulletin #1 Oil Spill Modelling (April, 2019) recommends selecting hydrocarbon exposure values that broadly reflect the range of consequences that could occur at various concentrations.

The ZPI is used inform the environmental impact assessment (as detailed in Section 8.6) and may be representative of an area of biological impact from hydrocarbons. The EMBA establishes a planning area for scientific monitoring, based on the potential for exceeding water quality triggers or socioeconomic effects.

The hydrocarbon exposure thresholds applied to the EMBA and ZPI are presented in

Table 8-1. The selected hydrocarbon thresholds are discussed in Table 8-2 to Table 8-5. These tables explain how the threshold is relevant to the risk evaluation in Section 8.6 and provides context on how they are used to inform response planning (which is addressed further in the Blacktip Operations OPEP (000036_DV_PR.HSE.0388.000_Rev14).

Table 8-1: Summary of environmental hydrocarbon thresholds applied to the EMBA and ZPI

Zone	Surface hydrocarbon (g/m²)	Entrained hydrocarbon (ppb)	Dissolved aromatic hydrocarbon (ppb)	Shoreline contact hydrocarbon (g/m²)
EMBA	1	10	6	10
ZPI	10	100	50	10

Table 8-2: Floating hydrocarbons exposure thresholds

Concentration (g/m²)	Evaluation
1	Surface hydrocarbons at a concentration of 1 g/m² have rainbow sheen in appearance, according to the Bonn Agreement Oil Appearance Code (Bonn Agreement, 2009) and are the lowest practical limit of observing oil in the marine environment (AMSA, 2012). Although this is lower than the exposure value for ecological impacts, it may be relevant to socio-economic receptors and has been used as the exposure value to define the spatial extent of the EMBA
10	Thresholds for registering biological impacts resulting from contact of surface slicks have been estimated by different researchers at approximately 10–25 g/m² (French et al. 1999; Koops et al., 2004; NOAA, 1996). Potential impacts of surface slick concentrations in this threshold range may include harm to seabirds through ingestion from preening of contaminated feathers or the loss of the thermal protection of their feathers. Although based on birds, this hydrocarbon exposure value is also considered appropriate for turtles, sea snakes and marine mammals and has been used as the exposure value to define the spatial extent of the ZPI

Table 8-3: Shoreline hydrocarbon contact exposure thresholds

Concentration (g/m²)	Evaluation
1	
10	French-McCay (2009) defines accumulated hydrocarbons ≥ 100 g/m² to be the threshold that could impact the survival and reproductive capacity of benthic epifaunal invertebrates living in intertidal habitat. As a conservative measure a threshold of 10 g/m² has been applied to represent shoreline impact and

	represents a low contact value for interpreting shoreline accumulation modelling results (French-McCay, 2005, 2006). This value has been used as the exposure value to define the spatial extent of the ZPI and EMBA. Not specifically used for response planning because below the limit that can be effectively cleaned.
100	A shoreline concentration of 100 g/m^2, or above, is likely to be representative of the minimum limit that the oil can be effectively cleaned according (AMSA, 2015; NOPSEMA, 2019) and is therefore used as a guide for shoreline clean-up planning. At greater thicknesses, the potential for impact of accumulated oil to shoreline receptors increases.

Table 8-4: Entrained hydrocarbon exposure thresholds

Concentration (ppb)	Evaluation
10	The 10 ppb exposure value represents the very lowest concentration and corresponds generally with the lowest trigger levels for chronic exposure for entrained hydrocarbons in the ANZECC & ARMCANZ (2000) water quality guidelines. This value has been used as the exposure value to define the spatial extent of the EMBA.
100	Entrained hydrocarbons (also referred to as total Water Accommodated Fraction (WAF)) are insoluble oil droplets suspended in the water column). A wider range of LC50 values have been reported for species of crustacea and fish, ranging from 100 to 258,000,000 ppb (Gulec et al., 1997; Gulec and Holdway, 2000). The 100 ppb threshold is considered conservative in terms of potential for toxic effects leading to mortality for sensitive mature individuals and early life stages of species. This threshold has been defined to indicate a potential zone of acute exposure, which is more meaningful over shorter exposure durations. Contact within this exposure zone may result in impacts to the marine environment, such as sub-lethal impacts to most species and lethal impacts to sensitive species. This value has been used as the exposure value to define the spatial extent of the ZPI.

Table 8-5: Dissolved aromatic hydrocarbon exposure thresholds

Concentration (ppb)	Evaluation
6	The 6-ppb threshold value for species toxicity in the water column is based on global data from French et al. (1999) and French-McCay (2002, 2003), which showed that species sensitivity (fish and invertebrates) to dissolved aromatics exposure > 4 days (96-hour LC50) under different environmental conditions varied from 6 ppb-400 ppb, with an average of 50 ppb. This range covered 95% of aquatic organisms tested, which included species during sensitive life stages (eggs and larvae).

	Based on scientific literature, a minimum threshold of 6 ppb is used to define the low exposure zones (Engelhardt, 1983; Clark, 1984; Geraci & St. Aubin, 1988; Jenssen, 1994; Tsvetnenko, 1998). The exposure zone is not considered to be of significant biological impact. This value has been used as the exposure value to define the spatial extent of EMBA, and conservatively applied to the ZPI.
50	Approximates potential toxic effects, particularly sublethal effects to sensitive species (see the above text). Consistent with NOPSEMA Bulletin #1 Oil Spill Modelling (April, 2019) (NOPSMEA, 2019)

8.5.2 EMBA Extent

Whilst the EMBA is not presented in the impact assessment for the worst case hydrocarbon release (Section 8.6). A summary of the modelling (APASA, 2019b) in respect to the thresholds used shows:

- Floating oil concentrations equal to or greater than the 1 g/m^2 threshold could potentially be found, in the form of slicks, up to 19 km from the release location.
- No sensitive receptors are predicted to be contacted by floating oil at any threshold.
- The potential for accumulation of oil on shorelines is predicted to be low, with a worst-case local accumulated concentration and volume of 61 g/m^2 and 10 m^3, respectively, forecast at the Joseph Bonaparte Gulf East.
- Entrained oil concentrations at the 10 ppb thresholds could potentially be found up to 975 km from the release location.
- The probabilities of contact by entrained oil concentrations are predicted to be greatest at the Carbonate Bank and Terrace System of the Sahul Shelf KEF, Joseph Bonaparte Gulf AMP) Kimberley AMP, Joseph Bonaparte Gulf West and the Kimberley Coast, with probabilities of 17-84% at 10 ppb.
- Minimum time of arrival at the 10 ppb entrained oil thresholds are predicted for the Carbonate Bank and Terrace System of the Sahul Shelf KEF, Joseph Bonaparte Gulf AMP and the Kimberley AMP, with times of 26-95 hours at 10 ppb.
- Dissolved aromatic hydrocarbon concentrations at the 6 ppb threshold could potentially be found up to 532 km from the release location.
- The probabilities of contact by dissolved aromatic hydrocarbon concentrations are predicted to be greatest at the Carbonate Bank and Terrace System of the Sahul Shelf KEF, Joseph Bonaparte Gulf AMP, Joseph Bonaparte Gulf West and Kimberley AMP with probabilities of 28%, 3%, 1% and 1% at the 6 ppb threshold, respectively.

  Section 4 presents a summary of the environmental values and sensitivities over the EMBA.

8.6 Loss of Containment from Well Blowout (Risk Identification U5)

8.6.1 Summary of Environmental Risk Assessment

Hazard	Loss of Containment from Well Blowout – Surface Blowout		
	Frequency	Severity	Risk
Inherent Risk	B	4	MH
Residual Risk	A	4	M

Hazard	Loss of Containment from Well Blowout – Surface then Subsea Blowout		
	Frequency	Severity	Risk
Inherent Risk	B	4	MH
Residual Risk	A	4	M

8.6.2 Description of Hazard

A loss of well control is an uncontrolled release of reservoir hydrocarbon or other well fluids to the marine environment, resulting from an over-pressured reservoir. Eni has identified a blowout as the scenario with the worst case credible spill volume from of loss of well control. A blowout is an incident where formation fluid flows out of the well or between formation layers after all the predefined technical well barriers (e.g. the BOP) or activation of the same have failed.

Credible spill scenario for well blowout of Blacktip condensate are:

- Surface blowout: Loss of well control as a result of an over-pressured reservoir and multiple barrier failures during drilling of a development well resulting in a long-term (74 day) uncontrolled surface release of 4,943 m^3 Blacktip condensate.
- Surface then subsea blowout: Loss of well control during drilling of a development well as a result of an explosion / fire scenario resulting in short term (3 day) surface release and a long-term (71 day) uncontrolled subsea release of 4,943 m^3 Blacktip condensate.

A surface blowout is the most credible scenario from Petroleum Activities Program. The wellheads are located on the WHP and therefore a blowout of condensate would be release from the surface.

A subsea loss of well control is a credible scenario in the event of an explosion scenario at the MODU. In this event, the MODU is expected to sink due to an anticipated compromise in structural integrity and stability after a period of time. The most recent example of a similar scenario is the Deepwater Horizon incident, when the semi-submersible MODU sank after 36 hours after the loss of well control in the Gulf of Mexico in April 2010. Using this case as a base, the Blacktip condensate would be expected to be released at the surface for 36 hours before becoming a subsea release once the structure collapses. It is assumed the surface modelling presented in Section 8.6.2.4 is representative for informing the approximate spatial extent of this scenario, reason being that the water depth is relatively shallow (less than 50 m) and therefore the well fluids are expected to rise quickly as a coherent plume, driven by the buoyancy of the gas, and spread radially in a surface layer (Fannelop and Sjoen, 1980; National Research Council, 2003).

The following scenarios were considered but determined 'not credible':

- A subsea rupture of the GEP due to a dropped object during drilling (e.g. from a rig crane)

A dropped object study is been undertaken for the MODU. Rig cranes that reach over the GEP will not be operated.

- There is no credible scenario directly resulting in catastrophic damage to the conductors, the conductors and casings would continue to contain the well fluids. Even during drilling, by the time gas is reached, there would be multiple layers of impermeable casing installed within the conductor, eliminating the possibility of a subsea release.

8.6.2.1 Industry Experience

A risk assessment by AMSA of oil spills in Australian ports and waters (Det Norske Veritas, 2011) concluded:

- overall national exceedance frequency for oil spills from offshore drilling in Australia is 0.033 for spills greater than one tonne per year, decreasing to 0.008 for spills greater than 100 tonnes per year (Det Norske Veritas, 2011)
- blowout events during oil well development drilling has been reported at a frequency of 3.4 × 10-5 per drilled well (IOGP, 2019; development drilling operations at normal wells, North Sea Standard)

Therefore, a loss of well control is considered highly unlikely.

Eni has a good history of implementing industry-standard practice in well design and there have not been any incidents resulting in offshore loss of well control events in Australia that have resulted in significant releases or significant environmental impacts. Given this and the above industry experience, a well blowout is a 'rare' event under the Eni Risk Assessment Matrix (Figure 6-1).

8.6.2.2 Blowout Duration

The 74-day blowout duration has been determined as a worst-case duration and is based on the maximum depth of the hydrocarbon reservoir being open and the estimated time to drill a relief well under the APPEA Mutual Aid Memorandum of Understanding (MoU). Seventy-four days of relief well drilling is based on the details within Table 8-6.

Table 8-6: Blacktip relief well drill times

Phase	Justification	Duration (days)
Mobilisation	Time to secure the rig and mobilisation duration. Access to a MODU to drill the relief well would be via the APPEA MoU for mutual aid	35
Drill relief well	Based on Eni, production well design	25
Intersect and kill	Based on Eni, production well design	7
Plug and abandon	Based on Eni, production well design	7
Total days		**74**

8.6.2.3 Hydrocarbon Characteristics and Weathering

The physical and chemical properties of Blacktip condensate used for the oil spill modelling (described in Section 8.5) were determined from the Blacktip Condensate Assay Report (Intertek, 2009).

Table 8-7 and Table 8-8 show the physical characteristics and boiling point ranges for Blacktip condensate, respectively. The hydrocarbon property category and hydrocarbon persistence classification were derived from AMSA (2015a) guidelines. The classification is based on a hydrocarbon's specific gravity in combination with relevant boiling point ranges.

Table 8-7: Physical properties of Blacktip condensate (Intertek, 2009)

Physical Properties	Blacktip Condensate
Density (kg/m^3)	790.0 (at 15 °C)
API	46.7
Dynamic viscosity (cP)	0.975 (at 20 °C)
Pour point (°C)	-36.0
Hydrocarbon property category	Group I
Hydrocarbon persistence classification	Non-persistent

Table 8-8: Boiling-point breakdown of Blacktip condensate (Intertek, 2009)

Oil Type	Volatiles (%)	Semi-Volatiles (%)	Low Volatiles (%)	Residual (%)	Aromatics (%)
Boiling point (°C)	<180 (C4 to C10)	180 to 265 (C11 to C15)	265 to 380 (C16 to C20)	>380 (>C20)	Of whole oil <380 boiling point
	Non-persistent			Persistent	
Blacktip condensate	63.6	35.0	0.4	1.0	15.8

Blacktip condensate (API 46.7) contains a low proportion (1% by mass) of hydrocarbon compounds that will not evaporate at atmospheric temperatures. These compounds will persist in the marine environment. The whole condensate has low asphaltene content (less than 0.5%), indicating a low tendency for the hydrocarbons to take up water to form water-in-oil emulsion over the weathering cycle.

The condensate is composed of hydrocarbons that have a wide range of boiling points and volatilities at atmospheric temperatures, and which will begin to evaporate at different rates on exposure to the atmosphere. Evaporation rates will increase with temperature, but in general about 63.6% of the hydrocarbon mass should evaporate within the first 12 hours; a further 35% should evaporate within the first 24 and a further 0.4% should evaporate over several days.

Weathering processes under realistic variable wind conditions are illustrated in the example mass balance weathering graph for a discrete spill of 50 m³ of Blacktip condensate released at the surface, which is considered informative for this scenario. The results for the variable-wind case indicate a slightly reduced level of evaporation (94% within 24 hours) due to an increased level of entrainment (3.3% within 24 hours) (APASA, 2019b).

A weathering study on Blacktip condensate by Intertek in 2013 showed the rate of evaporation of Blacktip condensate is rapid, with 67% of the volume of the condensate lost within the first two hours and 89% by eight hours. Between eight and 72 hours, only a further 7% is lost, reaching a maximum weathering at 72 hours of 95% lost volume (Intertek, 2013) (Figure 8-1).

The weathering test showed changes in hydrocarbon composition due to evaporative loss occur in a systematic manner, with the lightest, most volatile compounds weathered first, followed by hydrocarbons with increasing boiling point (Figure 8-3). The relative percentage of wax content in Blacktip condensate increases from 4% in the original to 76% by 72 hours. Blacktip condensate was also monitored for the presence and change in the BTEX and polycyclic aromatic hydrocarbons concentration in the oil. The results are provided in Figure 8-2. The results showed an overall decrease in the concentrations of what may be considered volatile aromatics, such as the BTEX compounds and naphthalene. The loss of most of this material is likely to be atmospheric, although dissolution in the water table is possible. Of the remaining polycyclic aromatic hydrocarbons identified – fluorene and phenanthrene – slight increases in the levels can be observed, possibly due to the concentration of the oil over time (Intertek, 2013).

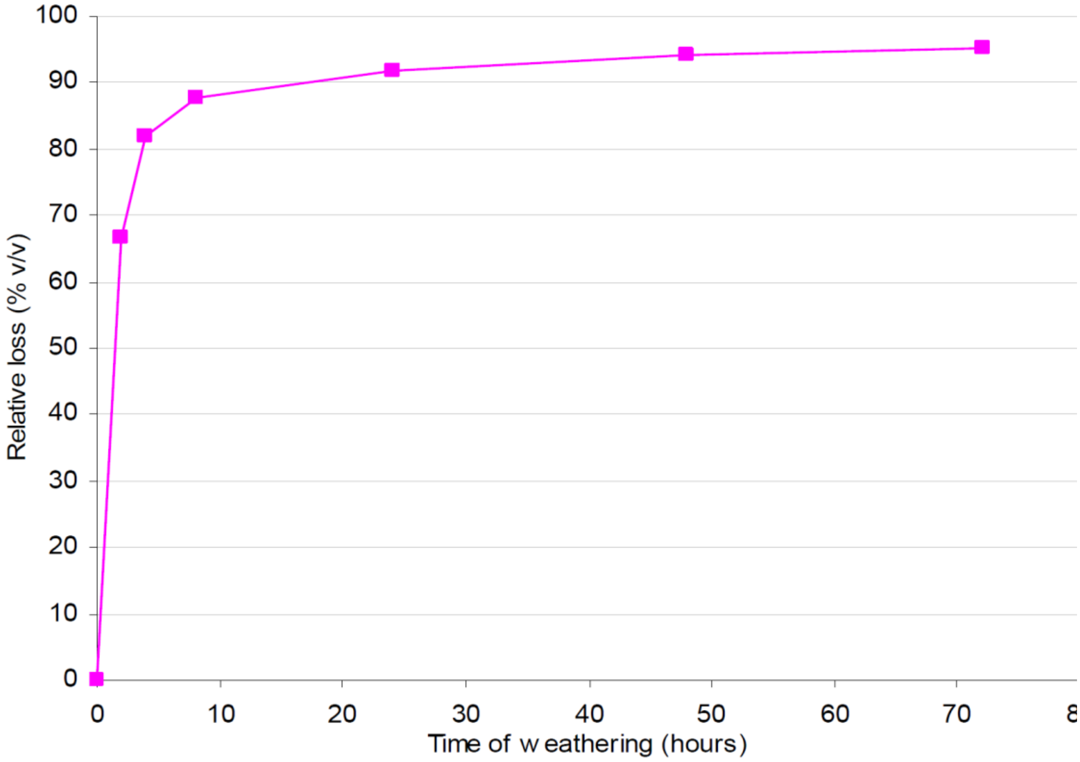


Figure 8-1: A summary of the weathering (loss) for the Blacktip condensate over 72 hours (Intertek, 2013)

	Weathered Time (hours)							
Compounds	**Units**	**0**	**1**	**4**	**8**	**24**	**48**	**72**
Naphthalene	ppb	204	409	502	579	215	nd	nd
Acenaphthalene	ppb	nd	nd	nd	nd	nd	nd	nd
Acenaphthene	ppb	nd	nd	nd	nd	nd	nd	nd
9H-Fluorene	ppb	42	99	135	194	250	266	366
Phenanthrene	ppb	33	86	113	167	224	320	426
Anthracene	ppb	nd	nd	nd	nd	nd	nd	nd
Fluoranthene	ppb	nd	nd	nd	nd	nd	nd	nd
Pyrene	ppb	nd	nd	nd	nd	nd	nd	nd
Benzo(a)anthracene	ppb	nd	nd	nd	nd	nd	nd	nd
Chrysene	ppb	nd	nd	nd	nd	nd	nd	nd
Benzo(b)fluoranthene	ppb	nd	nd	nd	nd	nd	nd	nd
Benzo(k)fluoranthene	ppb	nd	nd	nd	nd	nd	nd	nd
Benzo(a)pyrene	ppb	nd	nd	nd	nd	nd	nd	nd
Indeno(123cd)pyrene	ppb	nd	nd	nd	nd	nd	nd	nd
Dibenzo(ah)anthracene	ppb	nd	nd	nd	nd	nd	nd	nd
Benzo(ghi)perylene	ppb	nd	nd	nd	nd	nd	nd	nd
Benzene	ppm	610	nd	nd	nd	nd	nd	nd
Toluene	ppm	3338	300	33	nd	nd	nd	nd
EthylBenzene	ppm	1395	450	45	nd	nd	nd	nd
Xlyene	ppm	6429	3200	320	nd	nd	nd	nd

Figure 8-2: Changes in benzene, ethylbenzene, toluene and xylene and polycyclic aromatic hydrocarbon content during weathering of the Blacktip condensate in winter and summer conditions over 72 hours (Intertek, 2013)

8.6.2.4 Oil Spill Modelling

A 4,943 m³ surface condensate release was modelled by RPS APASA (2019b) at the WHP for all seasons (annualised) and is considered appropriate, although conservative, for informing the approximate spatial extent of potential impacts from a well blowout event during the Petroleum Activities Program.

Table 8-9 presents the parameters and justification used in the modelling.

Table 8-9: Summary of parameter and justifications for condensate spill modelling from a well blowout

Parameter	Description
Number of spill simulations	100
Hydrocarbon type	Blacktip condensate (see Table 8-7)
Release type	Well blowout
Total spill volume	4,943 m³ over 74 days, assuming constant flow
Spill volume justification	Open hole flowrate
Release depth	Surface
Release depth justification	Most credible spill scenario is from the surface wellheads on the WHP
Release duration	74 days
Release duration justification	See Table 8-6

8.6.2.5 Floating and Shoreline Oil

Hydrocarbons are predicted to remain relatively localised around the release location, with very low probabilities of contact to the nearest shoreline receptors (1%). The maximum distance to the outer extent of the 1 g/m² is predicted to be 19 km (Figure 8-3). Floating oil concentrations are not predicted to exceed 10 g/m² and 25 g/m² thresholds at probabilities greater than 1%.

Kimberley Coast, JBG East and JBG West receptors are predicted to have a 1% probability of receiving shoreline oil at 10 g/m², with corresponding minimum times of arrival forecast as 47 days (1130 hours), 50 days (1194 hours) and 85 days (2049 hours), respectively.

The potential for accumulation of oil on shorelines is predicted to be low (Figure 8-4), with a worst-case local accumulated concentration and volume of 61 g/m² and 10 m³, respectively, forecast at the JBG East receptor. Table 8-10 presents floating and shoreline oil outcomes at sensitive receptors.

Table 8-10: Expected annualised floating and shoreline oil outcomes at sensitive receptors resulting from a 74-day surface release of Blacktip condensate at the Blacktip development wells (APASA, 2019b)

Receptor	Maximum local accumulated concentration (g/m²) in the worst replicate spill	Maximum accumulated volume (m³) along this shoreline, in the worst replicate simulation
Joseph Bonaparte Gulf East	61	10
Joseph Bonaparte Gulf West	11	<1
Kimberley Coast	26	<1

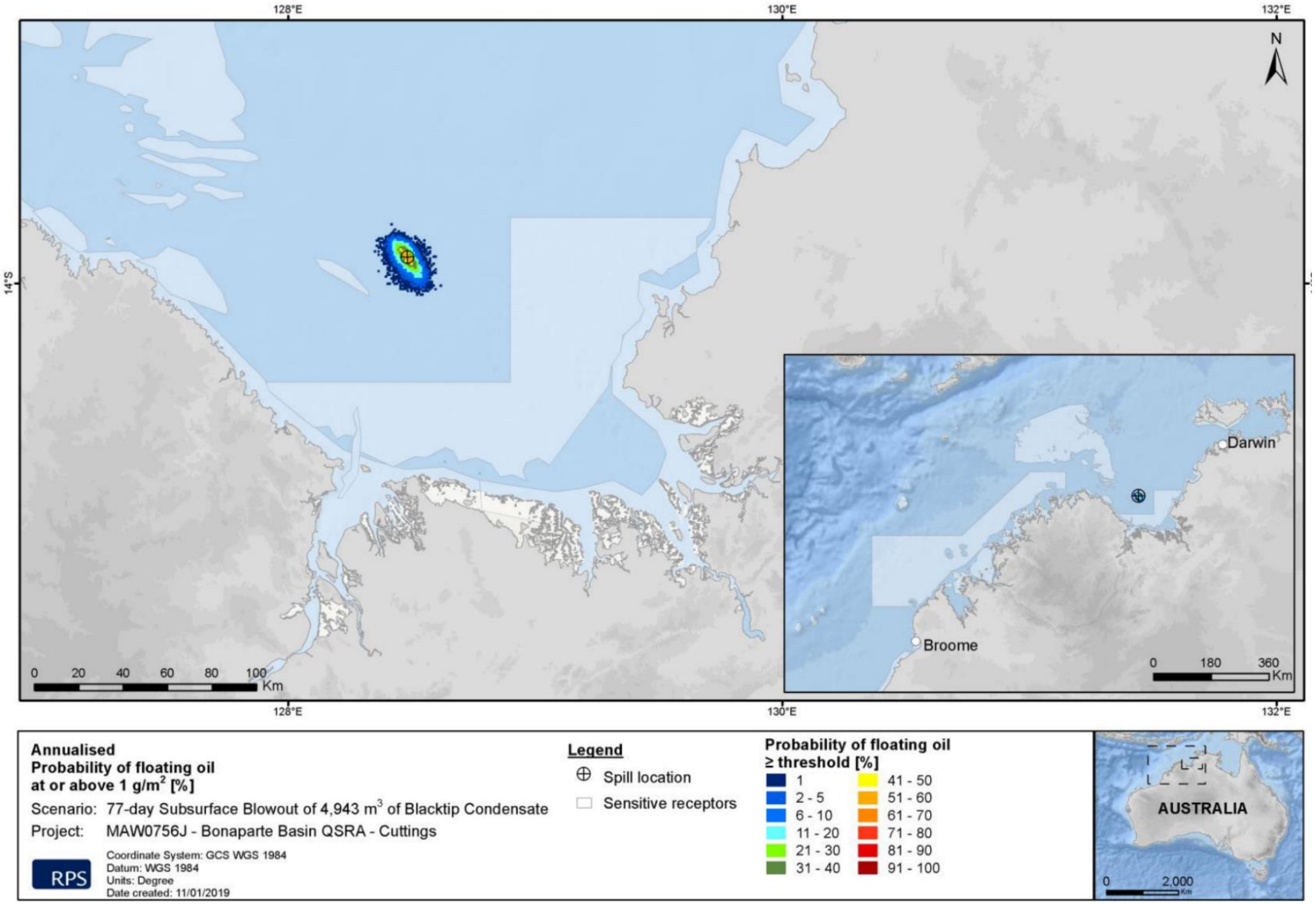


Figure 8-3: Predicted annualised probability of floating oil concentrations at or above 1 g/m² resulting from a 74-day surface release of Blacktip condensate at the Blacktip development wells (APASA, 2019b)

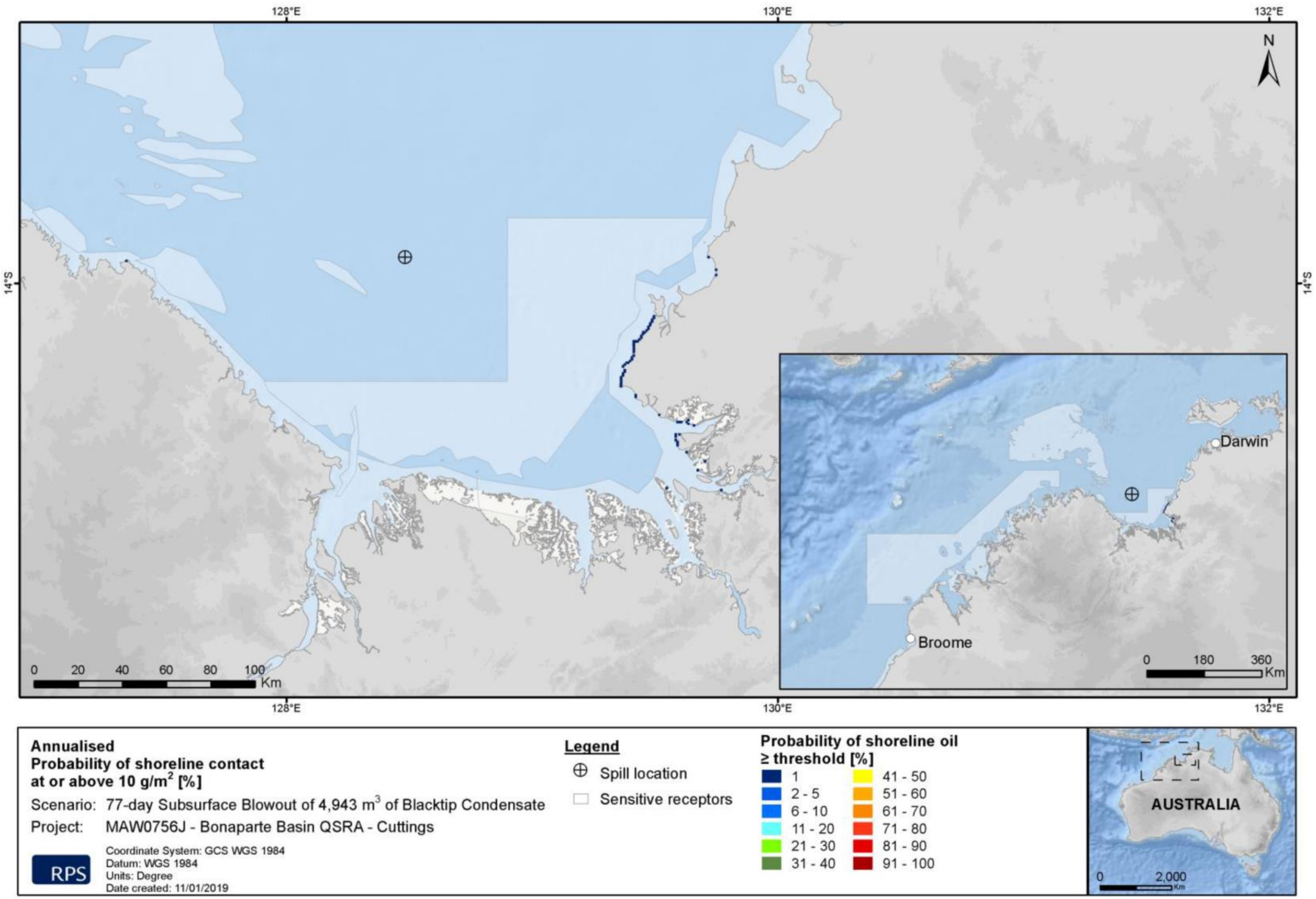


Figure 8-4: Predicted annualised probability of shoreline oil concentrations at or above 10 g/m² resulting from a 74-day surface release of Blacktip condensate at the Blacktip development wells (APASA, 2019b)

8.6.2.6 Subsurface – Entrained Oil

Entrained oil concentrations at or greater than 100 ppb could travel up to 310 km from the release location. Concentrations are not predicted to exceed 500 ppb. Probability contours calculated for entrained oil at or greater than 100 ppb reveal oil will typically migrate in longshore directions towards Darwin to the north and Broome to the south, with each of these opposing trajectories more likely in certain seasons (Figure 8-5).

The probabilities of contact by entrained oil concentrations are predicted to be greatest at the Carbonate Bank and Terrace System of the Sahul Shelf KEF (4% at 100 ppb), JBG AMP (1% at 100 ppb), Kimberley AMP (1% at 100 ppb) and the Kimberley Coast (1% at 100 ppb) (Table 8-11).

Minimum times of arrival at the 100 ppb entrained oil thresholds are predicted for the Carbonate Bank and Terrace System of the Sahul Shelf KEF (34 hours at 100 ppb), JBG AMP (319 hours at 100 ppb), the Kimberley AMP (1077 hours at 100 ppb) and the Kimberley Coast (671 hours at 100 ppb).

The worst-case instantaneous entrained oil concentration at any receptor is predicted at the Carbonate Bank and Terrace System of the Sahul Shelf KEF as 256 ppb.

Table 8-11: Expected annualised entrained oil outcomes (≥100 ppb) at sensitive receptors resulting from a 74-day surface release of Blacktip condensate at the Blacktip P3 development well (APASA, 2019b)

Receptor	Probability (%) of entrained hydrocarbon	Minimum time to receptor waters (hours)	Maximum entrained hydrocarbon concentration (ppb)
Carbonate Bank and Terrace System of the Sahul Shelf KEF	4	34	256
Joseph Bonaparte Gulf AMP	1	319	186
Kimberley AMP	1	1077	104
Kimberley Coast	1	671	110

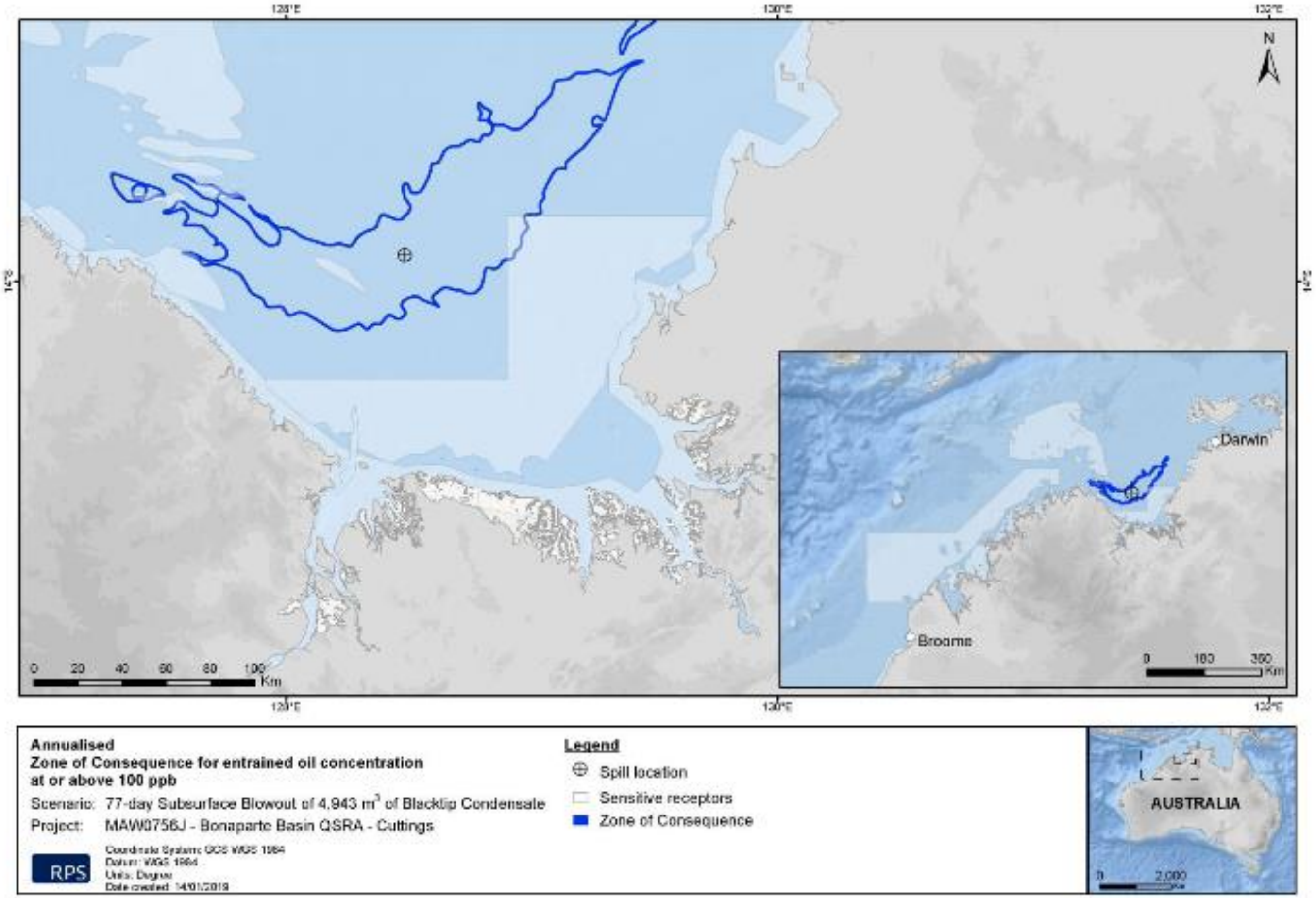


Figure 8-5: Predicted annualised zone of consequence of entrained oil concentrations at or above 100 ppb resulting from a 74-day surface release of Blacktip condensate at the Blacktip development wells (APASA, 2019b)

8.6.2.7 Subsurface – Aromatics

Dissolved aromatic hydrocarbon concentrations at or greater than 6 ppb could travel up to 532 km from the release location. The probability contours calculated for dissolved aromatic hydrocarbons reveal the directions of travel follow those of the entrained oil (Figure 8-6).

The probabilities of contact by dissolved aromatic hydrocarbon concentrations are predicted to be greatest at the Carbonate Bank and Terrace System of the Sahul Shelf KEF, JBG AMP, JBG West and Kimberley AMP, with probabilities of 28%, 3%, 1% and 1% at the 6 ppb threshold, respectively (Table 8-12).

The worst-case instantaneous dissolved aromatic hydrocarbon concentration at any receptor is predicted at the Carbonate Bank and Terrace System of the Sahul Shelf KEF as 44 ppb.

Table 8-12: Expected annualised dissolved aromatic hydrocarbon (>6 ppb) outcomes at sensitive receptors resulting from a 74-day surface release of Blacktip condensate at the Blacktip development wells (APASA, 2019b)

Receptor	Probability (%) of dissolved aromatic hydrocarbon concentration contact	Maximum entrained hydrocarbon concentration (ppb), at any depth in worst case replicate
Carbonate Bank and Terrace System of the Sahul Shelf KEF	28	44
Joseph Bonaparte Gulf AMP	3	20
Joseph Bonaparte Gulf West	1	7
Kimberley AMP	1	26

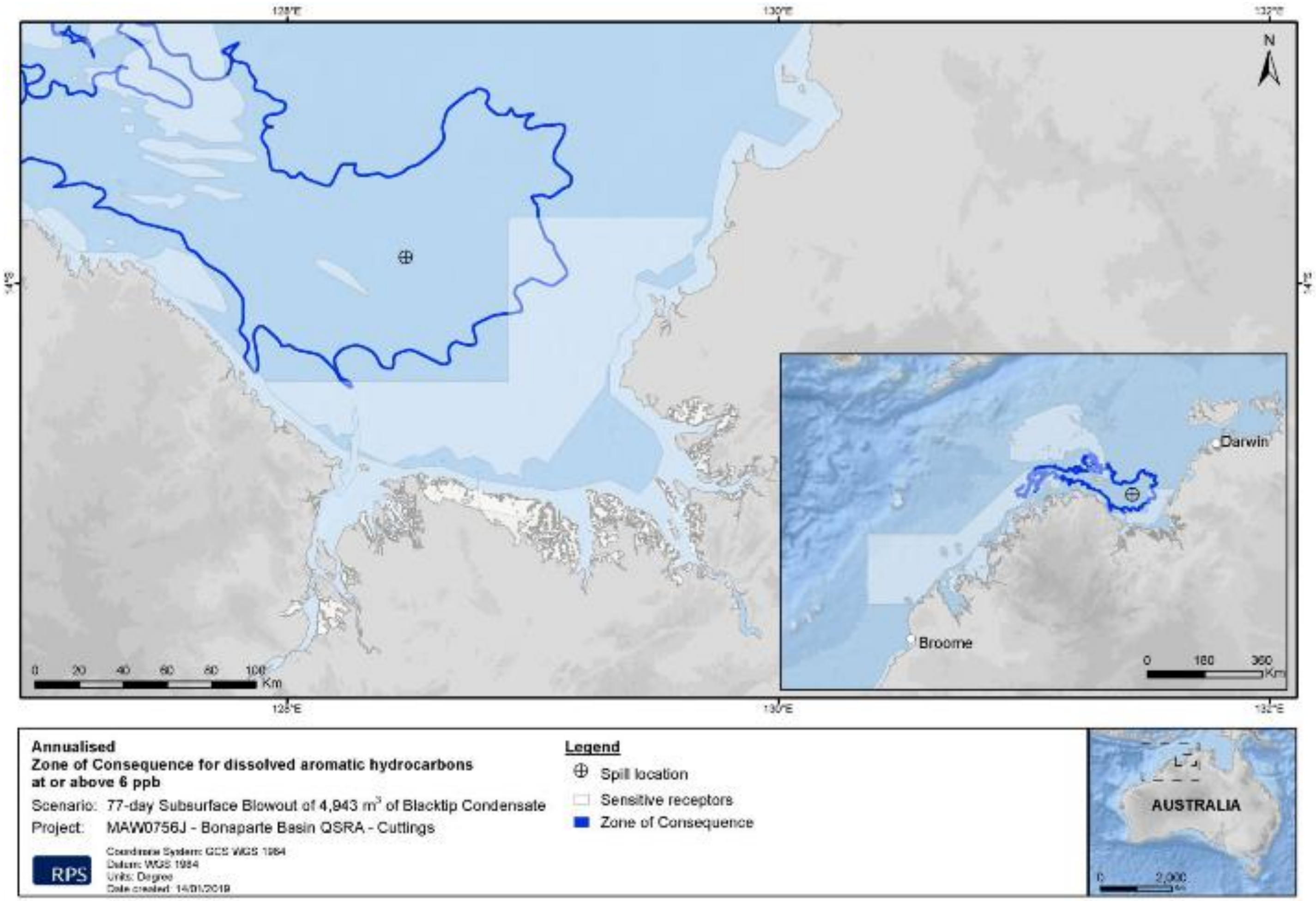


Figure 8-6: Predicted annualised zone of consequence of dissolved aromatic hydrocarbon concentrations at or above 6 ppb resulting from a 74-day surface release of Blacktip condensate at the Blacktip development wells (APASA, 2019b)

8.6.3 Potential Environmental Impact

A loss of 4943 m³ Blacktip condensate to the marine environment would result in a localised reduction in water quality on the sea surface. As described above, the maximum distance a surface spill could travel at 1 g/m² is predicted to be 19 km. Dissolved aromatic hydrocarbon concentrations at or greater than 6 ppb could travel up to 532 km from the release location, which forms the extent of the ZPI for the well blowout event.

Kimberley Coast, JBG East and JBG West receptors are predicted to have a 1% probability of receiving shoreline oil at 10 g/m², with corresponding minimum times of arrival forecast as 47 days (1130 hours), 50 days (1194 hours) and 85 days (2049 hours), respectively. Maximum accumulated shoreline concentration is predicted to be 61 g/m² at JBG East; therefore, shoreline impact is not anticipated, as the ≥100 g/m² threshold based on French-McCay (2009) that could impact the survival and reproductive capacity of intertidal benthic epifaunal has not been met and the volumes of accumulated hydrocarbons (10 m³) are relatively minor. It is therefore not anticipated shorelines will be significantly impacted from a well blowout of 4943 m³ of Blacktip condensate.

In addition to sensitivities found at the shorelines, transient fauna may traverse the area potentially impacted by a hydrocarbon spill. The impacts of surface, entrained and beached hydrocarbons to both shoreline and transient receptors are summarised in Table 8-13.

The JBG AMP, Kimberley AMP and Carbonate Bank and Terrace System of the Sahul Shelf KEF have the potential to receive concentrations of entrained (at 100 ppb) and dissolved aromatics (at 6 ppb), at low probabilities and maximum concentrations (see Table 8-11 and Table 8-12). Potential impacts, however, may include the contamination of sediments, impacts to benthic fauna and habitats and associated impacts to demersal fish populations, and reduced biodiversity. However, given the low maximum concentrations reaching the AMPs and low residuals in the hydrocarbon (Section 8.6.2.3), it is not anticipated the values will be compromised or significantly impacted from a well blowout of 4943 m³ of Blacktip condensate. A more comprehensive evaluation of the impacts to the JBG AMP, which is 50 km from the Operational Area are provided below:

The values of the JBG AMP which may be impacted for a period include:

- Natural Value
- Cultural Values
- Socio economic values.

The below discusses the impact to each of the values:

Natural Values

The key ecological feature in the Marine Park is the carbonate bank and terrace system of the Sahul Shelf—characterised by terraces, banks, channels and valleys supporting sponges, soft corals, sessile filter feeders, polychaetes and ascidians. These features may be impacted from entrained condensate, however the high evaporation and light components of the condensate will reduce the entrainment volume within the water column. Condensate is less dense than water and will also settle on the surface rather than entrain in the water column and impact the key seabed features of the park.

The JBG experiences a mixed semidiurnal tide with a very large range in tidal elevations and correspondingly strong tidal currents (Przeslawski et al., 2011). High energy tidal currents along much of the JBG coastline stimulate mixing and sediment movement throughout the year, contributing to the highly turbid environment which will further evaporation and dispersion of the condensate.

The AMP supports a range of species, including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the Marine Park include foraging habitat for marine turtles and the Australian snubfin dolphin. Impacts to the range of species which the JBG AMP supports has been discussed in Table 8-13.

The susceptibility of marine fauna to hydrocarbons is dependent on hydrocarbon type and exposure duration however given that exposures would be limited in extent and duration, exposure to marine fauna from this hazard is not expected to result in a fatality.

Cultural Values

The Miriuwung, Gajerrong, Doolboong, Wardenybeng and Gija and Balangarra people have responsibilities for sea country in the JBG AMP. As described above a condensate spill will impact the JBG AMP for a short period, whilst the condensate disperses and weathers, however lasting impact is not anticipated.

Socio-economic Values.

Tourism, commercial fishing and recreation including fishing, are important activities in the Marine Park. As described above an condensate spill will impact the JBG AMP for a short period, whilst the condensate disperses and weathers, however lasting impact is not anticipated.

Species Recovery Plans and Threat Abatement Plans

Eni has considered information contained in relevant recovery plans for marine fauna that identify marine pollution as a threat (Section 9). This includes the objectives and actions within the Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017), which relate to marine pollution.

Table 8-13: Impacts of entrained and surface hydrocarbons on sensitive receptors found within the zone of potential impact

<table>
<tr><th rowspan="2">Receptor</th><th colspan="3">Impacts of a hydrocarbon spill (Blacktip condensate or MDO)</th></tr>
<tr><th>Surface</th><th>Entrained and dissolved aromatic hydrocarbons</th><th>Shoreline</th></tr>
<tr><td colspan="4">Marine fauna</td></tr>
<tr><td rowspan="2">Plankton (including zooplankton; fish and coral larvae)</td><td>Surface hydrocarbons will have no impact on plankton as plankton is present in the water column only.</td><td>There is potential for localised mortality of plankton due to reduced water quality and toxicity. Effects will be greatest in the upper 10 m of the water column and areas close to the spill source where hydrocarbon concentrations are likely to be highest.</td><td>N/A.</td></tr>
<tr><td colspan="2">As fish and sharks dwell in the water column, impacts are most likely from the entrained hydrocarbons, through the pathways of ingestion or the coating of gill structures. This could lead to respiratory problems or accumulation of hydrocarbons in tissues. In the worst instance this could lead to mortality, or sub-lethal stress.
Site-attached fish, such as reef fish, have small home ranges and are at higher risk from hydrocarbon exposure than more wide-ranging species. The exact impact on resident fish populations at impacted shoals or reefs will be dependent on actual hydrocarbon concentration, duration of exposure and water depth of the affected communities.
The larval stage of fish is more likely to be susceptible; however, in comparison to predation and natural loss, any impacts would be over a small proportion of the marine environment in which they may occur and any measurable impact at the population level is considered to be low. The Operational Area is not anticipated to provide spawning grounds for fish species, given their preference for spawning in oceanic conditions on reef edges and area.</td><td>N/A.</td></tr>
</table>

Receptor	Impacts of a hydrocarbon spill (Blacktip condensate or MDO)		
	Surface	**Entrained and dissolved aromatic hydrocarbons**	**Shoreline**
Marine mammals	Marine mammals may be come in contact with hydrocarbons due to surfacing within slick. Effects include irritation of eyes/mouth and potential illness. Surface respiration could lead to accidental ingestion of hydrocarbons or result in the coating of sensitive epidermal surfaces. Fresh hydrocarbons may have a higher potential to cause toxic effects when ingested, while weathered hydrocarbons are considered to be less likely to result in toxic effects. The hydrocarbons associated with potential Blacktip spills (MDO, condensate) will rapidly evaporate and disperse. Condensate modelling in the blowout scenario indicates that the maximum distance to the outer extent of the 1 g/m² surface hydrocarbons is predicted to be 19 km and floating oil concentrations are not predicted to exceed 10 g/m² and 25 g/m² thresholds at probabilities greater than 1%. It is therefore predicted the impact area from surface hydrocarbons is confined to around the spill site and not the wider JBG region. Behavioural disturbance (i.e. avoiding spilled hydrocarbons) in some instances has been observed (Geraci, 1988) or several species of cetacean suggesting that cetaceans have the ability to detect and avoid surface slicks. Observations during spills have noted larger whales (both mysticetes and odontocetes) and smaller delphinids traveling through and feeding in oil slicks (Aichinger Dias *et al.*, 2017).	Direct physical contact with surface, entrained or dissolved aromatic hydrocarbons may suffer surface fouling, ingestion of hydrocarbons (from prey, water and sediments), aspiration of oily water or droplets and inhalation of toxic vapours (Deepwater Horizon Natural Resource Damage Assessment Trustees 2016). Effects such as irritation of eyes/mouth and potential illness may occur.	N/A.

	Ten migratory marine mammal species were identified by the EPBC Protected Matters search (Section 4.4). Of these, three are listed as threatened and one as vulnerable: • Humpback whale: No BIA for humpback breeding and calving is within the ZPI (nearest BIA is 300 km south-west). It is possible but unlikely humpback whale may be present. Significant numbers are not expected and given the rapid evaporation of hydrocarbons, humpback whales are unlikely to be impacted. • Blue whales: The Petroleum Activities Program may overlap with the blue whale migratory period. Since blue whales show preference for water deeper than 500 m, a small number of individuals may encounter entrained or surface hydrocarbons. However, the absence of any known feeding, resting or breeding areas in the Operational Area or ZPI means significant numbers are unlikely to be impacted. • Fin whale: In the unlikely event of a hydrocarbon spill, transient individuals may encounter entrained and surface hydrocarbons. The ZPI is 500 km from the BIA for pygmy blue whale distribution and 500 km from the migration BIA; significant numbers are therefore unlikely to be impacted. • Sei whale: In the unlikely event of a hydrocarbons spill, transient individuals may encounter entrained and surface MDO. However, the absence of any known feeding, resting or breeding areas means significant numbers are unlikely to be impacted. Other migratory marine mammals may encounter either surface or entrained hydrocarbons; however, the absence of any known feeding, resting or breeding areas means significant numbers are unlikely to be impacted: • Dugong: Dugongs have been reported to be present along the coastline from Cape Hay to Point Pearce, with main concentrations of species around Dorcherty Island (Woodside, 2004a), 10 km to the east of the ZPI. However, seagrass habitat is limited (Woodside, 2004a) and the JBG is therefore not expected to provide a habitat for dugong. Significant numbers are not expected to be impacted by surface, entrained or dissolved aromatic hydrocarbons. • Indo-Pacific Humpback Dolphin: Given the shallow water depths (less than 100 m) in the ZPI and the Operational Area (20 to 50 m), as well as the distance from shore that the species have been observed (up to 55 km from shore), it is possible Indo-Pacific humpback dolphins may transit through the ZPI. However, significant numbers are not expected to be impacted by surface, entrained or dissolved aromatic hydrocarbons. • Australian Snubfin Dolphin: Sightings indicate Australian snubfin dolphins occur mostly in protected shallow coast waters, and near river and creek mouths (Parra, 2006; Parra & Corkeron, 2001; Parra et al., 2002a). The species is likely to occur in the nearshore areas of	N/A.

Receptor	Impacts of a hydrocarbon spill (Blacktip condensate or MDO)		
	Surface	Entrained and dissolved aromatic hydrocarbons	Shoreline
	the ZPI and is unlikely to occur within the Operational Area. Significant numbers are not expected to be impacted by surface, entrained or dissolved aromatic hydrocarbons, particularly given the majority of the spill will remain in offshore waters. Given the hydrocarbons (MDO and Blacktip condensate) are expected to weather rapidly when released to the environment, relatively fresh entrained hydrocarbons (closer to the release location) are considered to have the greatest potential for impact.		
Marine reptiles	Risk of direct contact with hydrocarbons is due to chance of surfacing within the slick. Effects include potential illness and irritation of eyes and mouth. Irritation of mucous membranes in the nose, throat and eyes has been observed to cause inflammation and infection. Surface respiration could lead to accidental ingestion of hydrocarbons or result in the coating of sensitive epidermal surfaces, and may also impact turtles if they inhale toxic vapours. This can lead to lung damage and congestion, interstitial emphysema, inhalant pneumonia and neurological impairment. Adult sea turtles exhibit no avoidance behaviour when they encounter hydrocarbon spills. The hydrocarbons associated with potential Blacktip spills (MDO, condensate) will rapidly evaporate and disperse. Condensate modelling in the blowout scenario indicates the maximum distance to the outer extent of the 1 g/m² surface hydrocarbons is predicted to be 19 km and floating oil concentrations are not predicted to exceed 10 g/m² and 25 g/m² thresholds at probabilities greater than 1%. It is therefore predicted the impact area from surface	Lethal or sub-lethal physical and toxic effects such as irritation of eyes and mouth and potential illness. Irritation of mucous membranes in the nose, throat and eyes has been observed to cause inflammation and infection.	Shoreline contact and beached hydrocarbons may result in toxic impacts to turtle nesting habitat, potentially impacting adults, eggs and hatchlings. There is flatback turtle nesting activity in the area of Northern Yelcherr Beach and Injin Beach to the north and along the coastline from Cape Hay to Pearce Point (along the JBG east coastline – 100km to the east of the Operational Area). Turtle monitoring was undertaken during the construction of the Blacktip facilities in 2009. This confirmed a maximum of 12 nests being laid on Yelcherr Beach. These beaches have the potential to be receive very low volumes of condensate (<10 m^3 across all JBG east shorelines, refer Section 8.6.2.5).

<table>
<tr><th rowspan="2">Receptor</th><th colspan="3">Impacts of a hydrocarbon spill (Blacktip condensate or MDO)</th></tr>
<tr><th>Surface</th><th>Entrained and dissolved aromatic hydrocarbons</th><th>Shoreline</th></tr>
<tr><td rowspan="2"></td><td>hydrocarbons is confined to around the spill site and not the wider JBG region.

Surface MDO from a is predicted to be confined within a 35 km radius and condensate within 19 km. Blacktip condensate is not predicted to exceed 10 g/m² and 25 g/m² surface oil thresholds at probabilities greater 1%, respectively. Therefore, impacts from surface oil are considered localised and temporary.

Other spill scenarios' surface impacts are considered to be within the above-mentioned distances.</td><td></td><td rowspan="2">From survey observations it is anticipated some tens to hundreds of flatback turtles nest approximately 20 km to the north around Cape Hay, and near Point Pearce to the south of the Operational Area.

While the impacts to nesting turtles, eggs and hatchlings may be severe, the small volumes and quick evaporation of the condensate potentially stranded and the short duration of persistence means the number of individuals potentially affected would be low, population level impacts will not occur. Stranded hydrocarbons are anticipated to be less than 1 m³ on the north Kimberley Coastline where lies Cape Domett, WA, a major flatback turtle beach. Given the volume of stranded hydrocarbon, significant impacts are not anticipated.</td></tr>
<tr><td colspan="2">Seven species of threatened marine reptile were identified as possibly being impacted by a hydrocarbon spill.

Short-nosed sea snake, flatback, hawksbill, leatherback, green, Olive Ridley and loggerhead turtles are widely dispersed in the JBG and, in the unlikely event of a hydrocarbon spill occurring, individuals traversing open water may come into contact with entrained, dissolved aromatic or surface hydrocarbons. Given the distance to turtle nesting beaches (over 95 km from the Operational Area), should a spill occur during hatchling season, hatchlings could be impacted.

MDO and condensate spills will quickly weather and evaporate; the number of hatchlings or transient adults encountering hydrocarbons is likely to be low and would not represent a significant proportion of the local population.

Given the hydrocarbons (MDO and Blacktip condensate) are expected to weather rapidly when released to the environment, relatively fresh entrained hydrocarbons (closer to the release location are considered to have the greatest potential for impact.</td></tr>
</table>

Receptor	Impacts of a hydrocarbon spill (Blacktip condensate or MDO)		
	Surface	**Entrained and dissolved aromatic hydrocarbons**	**Shoreline**
Seabirds	Seabirds are particularly vulnerable to surface hydrocarbons. As most fish survive beneath floating slicks, they will continue to attract foraging seabirds, which typically do not exhibit avoidance behaviour. Smothering can lead to reduced water proofing of feathers and ingestion while preening. In addition, hydrocarbons can erode feathers, causing chemical damage to the feather structure that subsequently affects ability to thermoregulate and maintain buoyancy on water. The hydrocarbons associated with potential Blacktip spills (MDO, condensate) will rapidly evaporate and disperse. Condensate modelling in the blowout scenario indicates the maximum distance to the outer extent of the 1 g/m² surface hydrocarbons is predicted to be 19 km and floating oil concentrations are not predicted to exceed 10 g/m² and 25 g/m² thresholds at probabilities greater than 1%. It is therefore predicted the impact area from surface hydrocarbons is confined to around the spill site and not the wider JBG region. Surface MDO from a spill is predicted to be confined within a 35 km radius. Other spill scenarios' surface impacts are considered to be within the above-mentioned distances.	Lethal or sub-lethal physical and toxic effects such as potential illness and irritation of eyes and mouth. May encounter entrained and dissolved aromatics while diving and foraging.	Beached hydrocarbons pose a risk to species that use the shoreline for foraging. A variety of endemic and migratory bird species are dependent on the productive feeding grounds of the NT mangroves and intertidal flats. Some species are mangrove specialists, such as the mangrove robin, white-breasted whistler, mangrove honeyeater and mangrove kingfisher. Wading and waterbirds that use mangroves include jabiru and various egret and heron species. Beaches have the potential to be receive very low volumes of condensate (<10 m³ across all JBG east shorelines, refer Section 8.6.2.5). Small volumes and quick evaporation of the potentially stranded condensate and the short duration of persistence means the number of individuals potentially affected would be low.

<table>
<tr><th rowspan="2">Receptor</th><th colspan="3">Impacts of a hydrocarbon spill (Blacktip condensate or MDO)</th></tr>
<tr><th>Surface</th><th>Entrained and dissolved aromatic hydrocarbons</th><th>Shoreline</th></tr>
<tr><td></td><td colspan="2">A number of bird species were identified by the EPBC Protected Matters search (Section 4.4) for the ZPI.
The following species have pollution as a key threat in their conservation advice:
• Abbott’s booby
• curlew sandpiper
• red knot
• eastern curlew
• bar-tailed godwit (baueri)
• Northern Siberian bar-tailed godwit
• Australian painted snipe.
Due to the quick evaporation and dispersion of the hydrocarbons, significant impacts are not anticipated. Surface MDO and condensate are predicted to be confined within 35 km and 19 km from the spill site, respectively. While the great frigatebird, lesser frigatebird, roseate tern and red-footed booby have BIAs for breeding over the ZPI, these areas do not overlap the surface and are unlikely to be impacted, given the nature of the hydrocarbons and the localised area of floating hydrocarbons.
Given the relatively low likelihood of encounters between seabirds and the floating quick weathering of the hydrocarbons limiting the area of floating hydrocarbons on surface, impacts to seabirds in offshore waters are expected to consist of effects such as reduced prey abundance.</td><td>Beached hydrocarbons will evaporate quickly in the temperatures experienced in the JBG. However, reduced prey may be available to foraging shorebirds due to mortality or avoidance, and nesting individuals may be temporarily disrupted.</td></tr>
</table>

Receptor	Impacts of a hydrocarbon spill (Blacktip condensate or MDO)		
	Surface	**Entrained and dissolved aromatic hydrocarbons**	**Shoreline**
Fish and sharks	While fish and sharks do not generally break the sea surface, individuals may feed at the surface. However, since the MDO and Blacktip condensate are expected to fully disperse and evaporate within eight hours and 24 hours (90% evaporated), respectively, the probability of prolonged exposure to a surface slick by fish and shark species is low. In addition, surface MDO and condensate are predicted to be confined within 35 km and 19 km from the spill site, respectively, presenting a localised area of floating hydrocarbon.	Hydrocarbon droplets can physically affect fish and sharks exposed for an extended duration (weeks to months). Smothering through coating of gills can lead to the lethal and sub-lethal effects of reduced oxygen exchange, and coating of body surfaces may lead to increased incidence of irritation and infection. Fish may also ingest hydrocarbon droplets or contaminated food, leading to reduced growth. There is potential for localised mortality of fish eggs and larva due to reduced water quality and toxicity. Effects will be greatest in the upper 10 m of the water column and areas close to the spill source where hydrocarbon concentrations are likely to be highest, and therefore demersal fish communities are not expected to be impacted.	N/A.
	The JBG supports a diverse assemblage of fish, particularly in shallower water near the mainland and islands. Threatened species identified by the EPBC protected matters search include the great white shark, whale shark, green, narrow and dwarf sawfish, and the shortfin and longfin mako which may be present in the affected area. However, given the absence of critical habitat for most of these species, significant numbers are not expected to be impacted.		

<table>
<tr><th rowspan="2">Receptor</th><th colspan="3">Impacts of a hydrocarbon spill (Blacktip condensate or MDO)</th></tr>
<tr><th>Surface</th><th>Entrained and dissolved aromatic hydrocarbons</th><th>Shoreline</th></tr>
<tr><td colspan="4">Habitats</td></tr>
<tr><td>Sandy beaches (including intertidal and subtidal sand)</td><td colspan="3">Sandy beaches have a relatively low biodiversity, although they do provide important habitats for nesting turtles, breeding and foraging seabirds, and shorebirds. They also provide habitat for polychaetes, molluscs, marine crustaceans, semi-terrestrial crustaceans and insects.
Beaches have the potential to be receive very low volumes of condensate (<10 m^3 across all shoreline, refer Section 8.6.2.5). Sandy beaches at Yelcherr Beach, Northern Yelcherr Beach and Injin Beach occur within the ZPI and could potentially be contacted by a spill. However, given the relatively small volumes potentially making contact with shorelines, and the rapid evaporation of hydrocarbons, impacts are expected to be temporary and slight.</td></tr>
<tr><td>Intertidal reefs (including coral communities, intertidal limestone pavement and macroalgae communities)</td><td colspan="3">Physical effects from entrained oil have the potential to coat contacted coral reefs. The phenomena of smothering of exposed coral surfaces or polyps by oil spills has only been reported where very large oil spill quantities, or very sticky oil slicks, have been encountered. Response to hydrocarbon exposure can include impaired feeding, fertilisation, larval settlement and metamorphosis, larval and tissue death and decreased growth rates. Entrained oil also has the potential to impact reef fauna (fish, turtles, and marine mammals), as outlined in rows above.
Intertidal reefs occur within the area potentially impacted by a spill; therefore, impacts to this receptor may occur due to an unplanned release of hydrocarbons. Significant impacts to intertidal reef habitats are not expected, due to the quick dispersal and evaporation of hydrocarbons in the marine environment and the low concentrations of entrained oil which could make contact with the intertidal area of the Kimberley (less than 110 ppm, see Table 8-11). Impacts to species associated with intertidal habitats are assessed above.</td></tr>
</table>

Receptor	Impacts of a hydrocarbon spill (Blacktip condensate or MDO)		
	Surface	**Entrained and dissolved aromatic hydrocarbons**	**Shoreline**
Submerged reefs	Submerged reefs and shallow shoals are found at the Carbonate Bank and Terrace System of the Sahul Shelf KEF, within the ZPI. The likelihood of surface hydrocarbons contacting submerged reefs and shoals is low, largely due to the distance between the sea surface and the submerged habitat. Physical effects from entrained oil have the potential to coat contacted coral reefs. The phenomena of smothering of exposed coral surfaces or polyps by oil spills has only been reported where very large oil spill quantities, or very sticky oil slicks, have been encountered. Response to hydrocarbon exposure can include impaired feeding, fertilisation, larval settlement and metamorphosis, including larval and tissue death and decreased growth rates (Villanueva *et al*., 2008). Filter feeders such as molluscs are especially liable to ingest oil with lethal and various sub-lethal effects. This includes alteration in respiration rates, decreases in filter-feeding activity, reduced growth rates, biochemical effects, increased predation, reproductive failure and mechanical destruction by waves due to inability to maintain a hold on substrate (Ballou *et al*., 1989; Connell and Miller, 1981). Entrained oil also has the potential to impact marine fauna (fish, turtles, marine mammals), as outlined in rows above. Impacts are expected to be temporary and slight.		
Socioeconomic			
Fisheries	Exclusion zones surrounding a spill can directly impact fisheries by restricting access for fishermen.	Entrained hydrocarbon can have toxic effects on fish (as outlined above), reducing catch rates and rendering fish unsafe for consumption.	N/A.
	Both entrained and surface hydrocarbons have the potential to lead to temporary financial losses.		N/A.
Tourism	In the waters immediately surrounding the Operational Area, tourism activities are expected to be low. However, nearer shore areas, there are many sources of marine-based tourism within the environment that may be affected. Expedition cruise boats operate in the dry months (April to October) between Broome and Wyndham and Darwin, exploring the Kimberley Coastline (DPaW, 2016). Recreational fishing over the area is possible; occasional passing private motor vessels or yachts may also occur. Exclusion zones surrounding a spill will reduce access for vessels for the duration of the response undertaken for spill clean-up (if applicable).		Stranding of hydrocarbons on sandy beaches is anticipated to be very low (<10 m^3 on JBG east and less than 1 m^3 on the Kimberley Coastline). However, tourism activity on the JBG beaches is very low and, given the low volumes of accumulated hydrocarbons, impact is not anticipated to be significant.

Receptor	Impacts of a hydrocarbon spill (Blacktip condensate or MDO)		
	Surface	**Entrained and dissolved aromatic hydrocarbons**	**Shoreline**
Shipping	Exclusion zones surrounding a spill will reduce access for shipping vessels for the duration of the response undertaken for spill clean-up (if applicable); vessel may have to take large detours leading to potential delays and increased costs.	Entrained oil will have no effect on shipping.	N/A.
Defence	The level of defence activities performed is in the airspace only; therefore, interference of defence activities due to a hydrocarbon spill are likely to be minimal.		Beached hydrocarbons will have no impacts on defence activities.
Shipwrecks	Surface oil will have no impact on shipwrecks. Entrained oil from a vessel collision will remain in the surface waters and is therefore unlikely to have an impact on shipwrecks.		N/A.
Indigenous	The level of activities undertaken by indigenous users is expected to be low. Along the north-western coastline of Australia, traditional and subsistence fishing is generally limited to shorelines, creeks and nearshore reefs (Leprovost *et al.*, 1997). Interference due to a hydrocarbon spill is likely to be minimal; however, in the event there is a requirement for land-based response activities and disturbance, relevant representatives will be contacted as outlined in the Blacktip OPEP (Section 12).		Stranding of hydrocarbons and response activities may impact indigenous values of land masses.
Existing oil and gas activity	Exclusion zones surrounding spills will reduce access, potentially leading to delays to work schedules with subsequent financial implications. However, there is no oil and gas infrastructure in the vicinity of the ZPI; therefore, no impact is anticipated.		N/A.

<table>
<tr><th rowspan="2">Receptor</th><th colspan="3">Impacts of a hydrocarbon spill (Blacktip condensate or MDO)</th></tr>
<tr><th>Surface</th><th>Entrained and dissolved aromatic hydrocarbons</th><th>Shoreline</th></tr>
<tr><td rowspan="2">Protected areas</td><td colspan="2">Protected areas are described in Section 4 but are summarised below.
JBG Marine Park
The Operational Area is within the JBG AMP. The JBG AMP has a designated multiple use zone which allows for petroleum activities to be undertaken within it. This AMP exists to protect foraging areas and habitats for EPBC-listed species, including whales, sharks, turtles, migratory birds and some seafloor features.
North Kimberley Marine Park
The North Kimberley Marine Park overlaps with the western extent of the ZPI and is located 80 km south-west of the Operational Area. There are more than 1000 islands within the boundaries of the North Kimberley Marine Park, each providing an array of intertidal and subtidal habitats. There are extensive coral reefs, large estuaries, mudflats and mangrove forests supporting many threatened, protected and culturally important species, such as dugongs, turtles and sawfish</td><td rowspan="2">N/A.</td></tr>
<tr><td colspan="2">As discussed above, marine mammals, seabirds, sharks and reptiles are at risk of direct contact with hydrocarbons, due to the chance of surfacing within the slick. Effects include potential illness and irritation of eyes and mouth. Surface respiration could lead to accidental ingestion of hydrocarbons or result in the coating of sensitive epidermal surfaces.</td></tr>
</table>

8.6.4 Environmental Performance Outcomes and Control Measures

EPOs relating to this risk include:

- no loss of containment of hydrocarbons to the marine environment (EPO-15).

CMs relating to this risk include:

- NOPSEMA accepted MODU Safety Case (CM-22)
- NOPSEMA accepted Well Operations Management Plan (WOMP) (CM-23)
- BOP specification and function testing (CM-24)
- Mutual Aid MoU for relief well drilling (CM-25)
- Eni Source Control Response Plan (ENI-WOP-PL-001) (CM-26)
- Relevant well site personnel hold International Well Control Forum certificates (CM-27)

EPSs and MC relating to the above are presented in Section 10.

8.6.5 As Low As Reasonably Practicable Demonstration

Demonstration of ALARP			
Type	**Control/management**	**Evaluation**	**Adoption?**
Eliminate	Eliminate drilling activity	Drilling activities are required to continue supply of gas and condensate to the YGP and the activities cannot be eliminated.	×
Substitute	Manage the timing of the activity to avoid sensitive periods	Reduce risk of impacts from well blowout during environmentally sensitive periods for listed marine fauna. High cost in moving or delaying activity schedule outweighs the environmental benefit	N/A
Engineering	N/A	N/A.	N/A
Isolation	N/A	N/A.	N/A
Administrative	Accepted Safety Case includes control measures for well control that reduce the risk of an unplanned release of hydrocarbons	The Safety Case includes design control measures for well control that reduce the risk of an unplanned release of hydrocarbons. Is a legislative requirement to have an approved Safety Case in place under the OPGGS Act.	✓ (CM-22)

Demonstration of ALARP			
Type	**Control/management**	**Evaluation**	**Adoption?**
	Accepted WOMP ensures a number of well barriers are in place and verified	WOMP will ensure well barriers are in place and verified, reducing the likelihood of a loss of containment event occurring. At least two isolation barriers are in place between the reservoir and the environment, reducing the likelihood of a release occurring. A release may occur in the unlikely event of simultaneous failure of all barriers and cannot be isolated further. Is a legislative requirement to have an approved WOMP in place under the OPGGS Act.	✓ (CM-23)
	BOP specification and function testing	Testing of the BOP will reduce the likelihood of a blowout, resulting in release of hydrocarbons to the marine environment. Environmental benefit outweighs the minor cost involved in testing the BOP	✓ (CM-24)
	Eni Source Control Response Plan (ENI-WOP-PL-001) is in place and details steps to expedite the drilling of a relief well, including: • relief well design • simulation of the dynamic kill • high-level requirement for the rig and the equipment, volumes and the pumping pressures	Following the Source Control Response Plan in the event of a loss of well control will reduce the time taken to control the well, limiting the volume released to the environment. Environmental benefit outweighs the administrative costs of preparing documents and large costs of preparing for and implementing response strategies.	✓ (CM-26)
	Mutual Aid MoU for relief well drilling	Mutual aid MoU for relief well drilling is in place which allows for expedited use of drilling rig for relief well drilling. Environmental benefit outweighs the administrative costs of preparing and maintaining MOU.	✓ (CM-25)
	Relevant well site personnel hold International Well Control Forum certificates	Ensures well site personnel are competent in well control practices. Environmental benefit outweighs the administrative costs.	✓ (CM-27)

Demonstration of ALARP			
Type	**Control/management**	**Evaluation**	**Adoption?**
	A dedicated second MODU on standby for the purpose of relief well drilling	Could reduce the length of time taken to drill a relief well and may reduce the timeframe for stopping a blowout by up to two weeks; although planning/approval/setup requirements mean the reduction would likely be less. The cost of having a MODU and personnel/equipment on standby would double the cost of the activity, making it unviable. Cost outweighs environmental benefit.	×

8.6.6 Acceptability Demonstration

Demonstration of Acceptability	
Compliance with Legal Requirements, Laws and Standards	Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011: Accepted WOMP. BOP function testing in accordance with API Standard 53, 4th Edition. Mutual Aid MoU for relief well drilling is in place. Well Blowout Contingency Plan is in place in accordance with Eni (Section 8.6). EPBC approval conditions (EPBC 2003/1180) were considered for this risk. Condition number 3 relates to potential spills. The Blacktip Operations OPEP (000036_DV_PR.HSE.0388.000_Rev14) is considered to meet this condition.
Policy Compliance	Eni HSE Statement objectives will be met.
Social Acceptability	Stakeholder consultation has been undertaken.
Area Sensitivity/ Biodiversity	See Table 8-13. Habitat modification, degradation, disruption and loss, deteriorating water quality and marine pollution are identified as potential threats to a number of marine fauna species in relevant recovery plans and conservation advice (Table 4-6). However, with controls in place, the objectives of the plans and advice will be met.
ESD Principles	The impact assessment presented throughout this EP demonstrates compliance with the principles of ESD.
ALARP	The residual risk has been demonstrated to be ALARP.

Eni has considered information contained in relevant recovery plans for marine fauna that identify marine pollution as a threat (Section 9). The potential impacts of an condensate release as a result of well blowout are discussed in Table 8-13. Physical contact with hydrocarbons from a spill from the Petroleum Activities Program to marine fauna is likely to have biological consequences; however, it is unlikely to affect an entire population and not predicted to impact on the overall population viability.

The drilling of Blacktip development wells is consistent with applicable laws, policies, standards and conventions. An accepted WOMP and MoU for relief well drilling is in place for all Blacktip production wells and before drilling the Blacktip development wells. Since the daily rate of a MODU is approximately $555,000 per day, the cost of having a MODU on standby is disproportionate to the environmental benefit.

The potential impacts associated with a well blowout is major. A number of controls have been evaluated above and adopted in accordance with the ALARP criteria (Section 8.6.5). The residual risk ranking is medium. This is acceptable in accordance with Eni's acceptability criteria (Table 6-4). No additional controls were identified to further reduce risk. Given the low potential risk and the controls that will be implemented, Eni considers the risks are acceptable and managed to ALARP.

The acceptability of the oil spill response strategies is described in Table 8-18.

8.7 Marine Diesel Oil Spills to Sea (Risk Identification U6)

8.7.1 Summary of Environmental Risk Assessment

Hazard	MDO Spills to Sea - Vessel Collision		
	Frequency	Severity	Risk
Inherent Risk	B	3	M
Residual Risk	A	3	L

Hazard	MDO Spills to Sea - Bunkering Incident		
	Frequency	Severity	Risk
Inherent Risk	C	2	M
Residual Risk	B	2	L

8.7.2 Description of Hazard

MDO will be used by all vessels and the MODU. No intermediate or heavy fuel oil powered vessels will be used.

There are two causes of loss of marine diesel from the vessels during the Petroleum Activities Program.

- refuelling/bunkering incident
- collision with another vessel

Refuelling/bunkering at sea will occur during the Petroleum Activities Program. Spills of MDO to sea surface during refuelling can be caused by a damaged refuelling hose, coupling failures, loss of connection, vessel collision or loss of vessel position. Spills resulting from overfilling will be contained within the vessel drains and slops tank system. In the event the refuelling pipe is ruptured, the fuel bunkering activity will cease by turning off the pump; the fuel remaining in the transfer line will escape to the environment as well as fuel that was released prior to the transfer operation being stopped. The guidance provided by AMSA (2013) for a refuelling spill under continuous supervision is considered appropriate given refuelling will be constantly supervised. The maximum credible spill volume during refuelling is calculated as transfer rate multiplied by 15 minutes of flow. The detection time of 15 minutes is seen as conservative but applicable following failure of multiple barriers followed by manual detection and isolation of the fuel supply. Based on an expected pumping rate of 150 m^3/hour and a conservative time of 15 minutes to shut down the pumping operation once the fuel spill had been identified, a total spill volume of approximately 37.5 m^3 is proposed as the worst-case credible volume for a refuelling incident.

A surface release of marine diesel from a vessel may result from an external impact (e.g. vessel collision through operator error) which ruptures a fuel tank. Fuel is stored in multiple tanks on vessels. The largest tank for a Petroleum Activities Program vessel (see Section 3.6.1) is 100 m^3. AMSA (2015) defines the maximum credible spill volume of a vessel collision to be the volume of the largest fuel tank. Therefore, the maximum release in the event of a collision is 100 m^3. This release would provide a conservative cover of all credible vessel spill scenarios.

Scenarios which were considered but determined 'not credible' include:

- A tank rupture as a result of vessel grounding, as the water depths are approximately 50 m and there are no emergent features within the Operational Area.
- MODU fuel tank loss from a collision with a third party or support vessel, as the tanks are located above sea level. The draught of vessel and location of tanks in terms of water line prevent the tanks from being breached.

8.7.2.1 Marine Diesel Oil

MDO with a sulphur content of less than 3.50% m/m is the only fuel that will be used by a vessel during the Petroleum Activities Program. Following is a description of MDO key components and predicted behaviour when released into the marine environment.

In the marine environment:

- MDO will generally spread rapidly in the direction of prevailing wind and current.
- MDO will generally evaporate rapidly from the sea surface. Under calm conditions, this will be the dominant process of removing oil from the marine environment.
- The evaporation rate of MDO will increase in warmer air and sea temperatures, such as those experienced at the activity location.
- As wind speed increases and breaking waves form, entrainment of MDO under the sea surface will increase.

- MDO residues (5% of total volume) are made up of larger carbon chain compounds that are likely to persist longer in the environment.

AMOSC (2011) categorises MDO as a light Group II hydrocarbon (Table 8-14). MDO is a mixture of volatile and persistent hydrocarbons, with a low percentage of volatile C4 to C10 hydrocarbons (6%) and a greater proportion of moderate to very low volatile C11 to C20 hydrocarbons (89%). In the marine environment, a small residual volume (5%) of the total quantity of MDO spilled may remain after the volatilisation and solubilisation processes associated with weathering. The heavier (low volatile) components of the oil have a tendency to entrain into the upper water column due to wind-generated waves but can subsequently resurface if wind waves abate.

Table 8-14: Characteristics of marine diesel oil

Hydrocarbon	MDO		
Initial density	0.83678 g/cm³ (150°C)		
Viscosity	4.0 cP (20°C)		
Hydrocarbon component	**Hydrocarbon boiling point ranges (carbon chain range in parenthesis)**		**% of Total**
Volatiles	Non-Persistent	<180°C (C4 to C10)	6.0%
Semi-volatiles		180 to 265°C (C11 to C15)	34.6%
Low volatility		265 to 380°C (C16 to C20)	54.4%
Residual	Persistent	>380°C (>C20)	5.0%
Aromatics	<380 °C (whole oil)		3.0%

Estimates of the fate of 100 m³ of MDO released to the marine environment were assessed using the modelling program ADIOS II. Since the activity could occur at any time of year, the model was run using environmental parameters (water temperature, wind speed, current speed and salinity) for different seasons (Table 8-15). The modelling showed conditions in winter led to the worst-case scenario (in terms of MDO persistence and potential distance travelled) and therefore was used as the basis for the following impact assessment.

Table 8-15: Parameters used in ADIOS oil spill modelling

Parameter	Summer	Winter	Autumn	Spring
Surface water temperature (°C)	35	35	35	35
Wind speed (m/s)	14	14	12	12
Current speed (m/s)	1	1	1	1
Salinity (ppt)	35	35	35	35

Modelling suggests the surface life for an instantaneous MDO spill of 100 m³ from a vessel collision incident is estimated at eight hours (Table 8-14). Using guidance supplied by International Tanker Owner Pollution Federation (2011) in this time, surface MDO may travel up to 35 km, based on an estimate in which the surface spill will travel at 100% of the speed and direction of ambient currents, and 3% of the speed and direction of local winds. This provides the maximum possible speed of a surface slick. Should wind and current direction differ, the slick would be slower moving; therefore, this is a conservative estimate.

The ADIOS II model cannot predict entrained oil or aromatic concentrations from the spill. The MDO will rapidly evaporate and weather on the sea surface, limiting entrained and dissolved aromatic volumes in the water column. Given the parameters used in the ADIOS modelling are worst-case and based on maximum wind speeds and maximum currents in one direction, a 35 km radius is therefore considered a very conservative ZPI for an MDO release, as it is also based on highest wind speed and currents in all directions from the spill source. The high rate of evaporation means that little MDO will become entrained and few aromatic hydrocarbons are predicted to become dissolved reducing impact to marine fauna. It is highly likely any entrained or dissolved aromatics at impact thresholds will be within this ZPI.

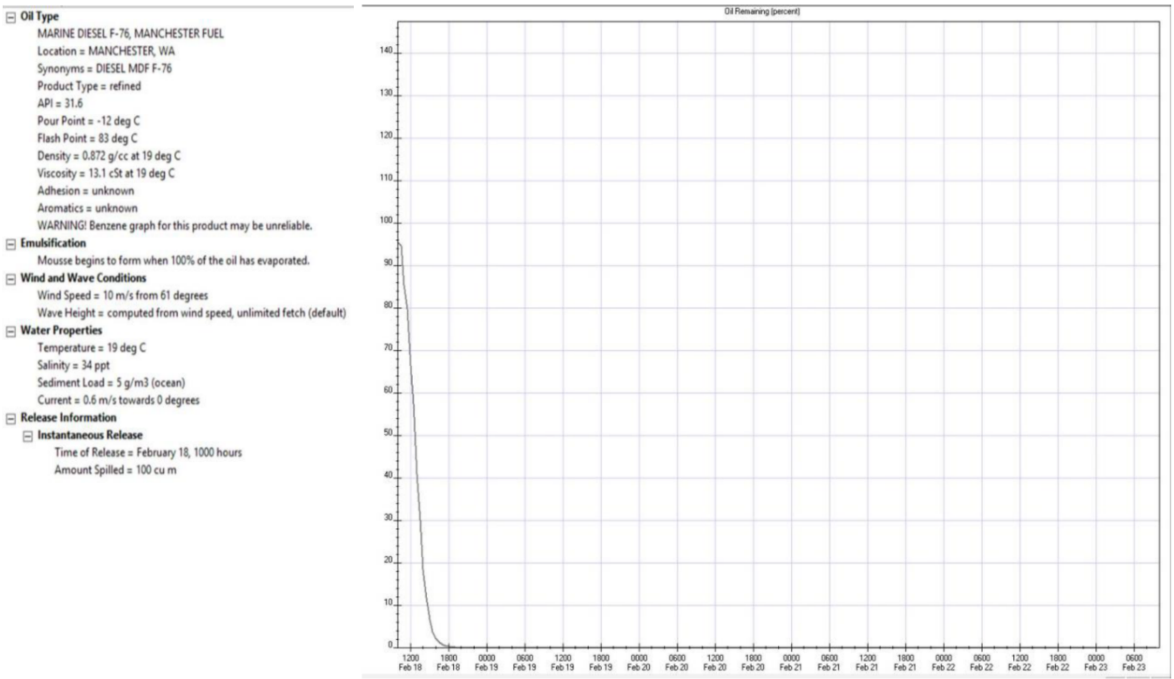


Figure 8-7: ADIOS II modelling output for a 100 m³ marine diesel oil spill release instantaneously due to a vessel collision

8.7.2.2 Zone of Potential Impact

A 35 km radius around the Operational Area therefore presents the ZPI from a diesel spill, this is considered within the ZPI for the condensate release (Section 8.6). Any smaller spills, such MDO during refuelling, would be encapsulated within this ZPI. No shoreline contact is expected.

8.7.3 Potential Environmental Impact

The impacts of surface, entrained and dissolved hydrocarbons from an MDO release on the marine environment receptors are described in Table 8-13.

The MDO ZPI contains only open waters where transient fauna may traverse. Impacts to transient marine fauna within the vicinity of the spill include the potential to impact air breathing animals such as cetaceans, turtles and sea snakes due to of inhalation of vapours if they surface in the MDO slick. Seabirds have also been identified as at risk if they contact the MDO slick by oiling their feathers leading to loss of buoyancy and the potential for hypothermia. However, the rapid rates of evaporation will limit exposure to transient animals and limit the extent of potential impacts.

Surface MDO once spilled is predicted to evaporate within eight hours. This will limit time for entrainment of hydrocarbons within the water column. MDO also has low volatile C4 to C10 hydrocarbons (6%) (AMOSC, 2011) and low aromatics (3%, see Table 8-14), limiting the toxicity effects of entrained hydrocarbons. Given the low aromatics, the high evaporation potential and the weathering to which the MDO will be subject, impacts to the marine environment are considered local and recovery will be rapid once the MDO disperses.

A loss of MDO from a vessel to the marine environment would result in a localised reduction in water quality in the upper surface waters of the water column. As described in Section 8.7.2.2, the maximum distance a surface spill could travel is 35 km from the source. Given the proximity of the Operational Area to land, shoreline contact is not expected. Surface oil, and entrained hydrocarbon in the sea surface layer, could have the physical effect of coating fauna interacting within and under the surface, including plankton, pelagic invertebrates and fishes, marine reptiles, marine mammals and seabirds, and may also cause slight secondary effects through ingestion after preening for seabirds, or through ingestion of oiled fish (as described in Table 8-13). Impacts are considered local and not at a population level.

A release of MDO during bunkering will be much reduced in terms of spatial and temporal scales compared to a worst-case loss of MDO as a result of vessel collision. Marine fauna may be exposed to the more toxic aromatic components of the MDO release, however toxic effects are considered unlikely given the release volume. A loss of MDO from leaking or ruptured bunker transfer equipment, has the potential to impact the immediate marine environment and is of minor consequence.

The MDO spills are not anticipated to reach the AMPs, the closest being the JBG AMP, 50 km to the east.

The low shipping and fishing activity (refer Section 4.5.5) expected in the direct area of the Petroleum Activities Program, and the PSZ around the WHP are considered to result in a rare likelihood of a vessel collision occurring.

Species Recovery Plans and Threat Abatement Plans

Eni has considered information contained in relevant recovery plans for marine fauna that identify marine pollution as a threat (Section 9). This includes the objectives and actions within the Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017), which relate to marine pollution.

8.7.4 Environmental Performance Outcomes and Control Measures

EPOs relating to this risk include:

- no loss of containment of hydrocarbons to the marine environment (EPO-15).

CMs relating to this risk include:

- bulk refuelling transfer procedures (CM-28)
- MDO use on vessels (CM-29)
- vessel spill response plan (Shipboard Oil Pollution Emergency Plan (SOPEP)) (CM-20)
- on board spill response kits (CM-21)
- navigation equipment and procedures (lighting as required for safe work conditions and navigational purposes) (CM-01)
- Petroleum Safety Zone (CM-03).

EPSs and MC relating to the above are presented in Section 10.

8.7.5 As Low As Reasonably Practicable Demonstration

Demonstration of ALARP			
Type	**Control management**	**Evaluation**	**Adoption?**
Eliminate	Eliminate vessel use	The potential for vessel collision leading to diesel spill is highly unlikely but the likelihood cannot be completely eliminated, as the vessels are necessary to undertake the Petroleum Activities Program.	×
	Eliminate bunkering activities during drilling	Would remove the spill risk from bunkering. However, the duration of the Petroleum Activities Program requires that bunkering of fuel occur, so the activity can be completed.	×
Substitute	Zero fuel bunkering via hose	Removes spill risk from hose operations. Drums could be used; however, presents cost associated with multiple vessel transits and health and safety issues during transfer of drums.	×

Demonstration of ALARP			
Type	**Control management**	**Evaluation**	**Adoption?**
	Use of MDO rather than Heavy Fuel Oil (HFO) on vessels	MDO is lighter than HFO and will evaporate faster and persist less in the marine environment. Marine diesel is already used on the vessels and IV in accordance with Marine Orders.	✓ (CM-29)
Engineering	Navigation equipment	Vessels will comply with standard maritime safety and navigation procedures, including AMSA Marine Order Part 30 (Prevention of collisions) 2009. Negligible costs of operating navigational equipment.	✓ (CM-01)
	Contract double-hulled vessels only	Vessels are subject to availability and are required to meet Eni standards. Double-hull requirement would be of high cost and subject to vessel availability, which could cause project delay.	×
Isolation	N/A	N/A.	N/A
Administrative	Compliance with administrative control measures, such as: • contractor bunkering / bulk refuelling procedures.	Administrative control, such as bunkering / bulk refuelling procedures can reduce potential for bunkering spills with minimal cost involved.	✓ (CM-28)
	Establishment and enforcement of a 500 PSZ around the MODU	No additional costs. Other marine users may be temporarily excluded from areas, reducing the risk of a vessel collision. A 500 m PSZ is already present around the WHP (drilling is from the WHP).	✓ (CM-03)
	Vessel spill response plan (SOPEP)	Environmental benefit outweighs minor costs in implementing and testing the vessel spill response plan (SOPEP), which contains plans to prevent spills reaching the marine environment. The SOPEP is a requirement under MARPOL Annex 1 requirements (all vessels larger than 400 gross tonnage have Shipboard Oil Pollution Emergency Plan (SOPEP) or Shipboard Marine Pollution Emergency Plans (SMPEP) outlining options to control the source of a hydrocarbon spill).	✓ (CM-19)

8.7.6 Acceptability Demonstration

Demonstration of Acceptability	
Compliance with Legal Requirements, Laws and Standards	Vessels compliant (where applicable) with standard maritime safety/navigation procedures including AMSA Marine Order Part 30 (Prevention of Collisions) Vessels compliant (where applicable) with standard maritime safety/navigation procedures including AMSA Marine Order Part 21 (Safety of navigation and emergency procedures) Vessels comply with MARPOL 73/78 Annex I EPBC approval conditions (EPBC 2003/1180) were considered for this risk. Condition number 3 relates to potential spills. The Blacktip Operations OPEP (000036_DV_PR.HSE.0388.000_Rev14) is considered to meet this condition.
Policy Compliance	Eni HSE Statement objectives will be met.
Social Acceptability	Stakeholder consultation has been undertaken. No stakeholder concerns have been raised with regard to the potential risk of a marine diesel spill to sea.
Area Sensitivity/ Biodiversity	See Table 8-13. In the unlikely event of a 100 m³ MDO spill impacts are considered local. The MDO ZPI contains only open waters where transient fauna may traverse. Impacts to transient marine fauna within the vicinity of the spill include the potential to impact air breathing animals such as cetaceans, turtles and sea snakes due to of inhalation of vapours if they surface in the MDO slick. Seabirds have also been identified as at risk if they contact the MDO slick by oiling their feathers leading to loss of buoyancy and the potential for hypothermia. However, the rapid rates of evaporation will limit exposure to transient animals and limit the extent of potential impacts. Habitat modification, degradation, disruption and loss, deteriorating water quality and marine pollution are identified as potential threats to a number of marine fauna species in relevant recovery plans and conservation advice (Table 4-6). Eni has considered information contained in relevant recovery plans for marine fauna that identify marine pollution as a threat (Section 9).
ESD Principles	The impact assessment presented throughout this EP demonstrates compliance with the principles of ESD.
ALARP	The residual risk has been demonstrated to be ALARP.

Eni has considered information contained in relevant recovery plans for marine fauna that identify marine pollution as a threat (Section 9). The potential impacts of an MDO release are discussed in Table 8-13. Physical contact with hydrocarbons from a spill from the Petroleum Activities Program to marine fauna is likely to have biological consequences; however, it is unlikely to affect an entire population and not predicted to impact on the overall population viability.

The potential impacts associated with an MDO spill is local effect. A number of controls have been evaluated above and adopted in accordance with the ALARP criteria (Section 8.7.5). The residual risk ranking is low. This is acceptable in accordance with Eni's acceptability criteria (Table 6-4). No additional controls were identified to further reduce risk. Given the low potential risk and the controls that will be implemented, Eni considers the risks are acceptable and managed to ALARP.

8.8 Oil Spill Response Operations (Risk Identification U7)

8.8.1 Summary of Environmental Risk Assessment

Hazard	Oil Spill Response Operations		
	Frequency	**Severity**	**Risk**
Inherent Risk	C	3	MH
Residual Risk	B	2	L

8.8.2 Description of Hazard

In the event of a hydrocarbon spill, response strategies will be implemented where possible to reduce environmental impacts to ALARP. The selection of strategies will be undertaken through the net environmental benefit analysis (NEBA) process, outlined in the OPEP. Spill response will be under the direction of the relevant Control Agency, as defined within the Blacktip Operations OPEP (000036_DV_PR.HSE.0388.000_Rev14). The response strategies and supporting activities deemed appropriate for the oil spill scenarios for the Petroleum Activities Program are detailed in the Blacktip OPEP (000036_DV_PR.HSE.0388.000_Rev14) and identified as:

- operational monitoring
- source control
- shoreline protection and deflection
- shoreline clean-up
- oiled wildlife response
- scientific monitoring.

Response strategies are intended to reduce the environmental consequences of a hydrocarbon spill. However, the nature of some of the strategies (such as those requiring vessel use) means environmental risk from their implementation is inevitable. In addition, lack of planned and coordinated response activities or guidance can result in inadequate response implementation, causing further environmental impact.

All potential risks that may arise through implementation of response strategies are summarised in Table 8-16.

Table 8-16: Summary of risks associated with implementation of response strategy

	Operational monitoring	Source control	Protection and deflection	Shoreline clean-up	Oiled wildlife	Scientific monitoring
Vessel movements	×	×	×	×	-	×
Light emissions	×	×	×	×	×	×
Noise	×	×	×	-	×	×
Atmospheric emissions	×	×	×	×	-	×
Disturbance to natural habitat	-	-	×	×	×	
Operational discharge of waste	-	×	×	×	-	-

Offshore risks are consistent with vessel operations described within this EP for the planned operations. The greatest potential for impacts additional to those described for planned operations are from oiled wildlife response, nearshore protection and deflection and shoreline clean-up operations, where disturbance to the environment may occur through implementation efforts. Specific risks relating to response operations are described further in the next subsections.

8.8.2.1 Light Emissions

Spill response activities will involve the use of vessels which are required, at a minimum, to display navigational lighting. Vessels may operate close to shoreline areas during spill response activities.

Onshore operations are not expected, however if required is confined to isolated areas and beaches and a shoreline response will only occur during daylight hours. A significant onshore response is not envisaged. However, spill response activities may involve onshore operations, including the use of vehicles and temporary camps which may require lighting.

8.8.2.2 Noise Emissions

Spill response activities will involve the use of vessels which will generate noise, both offshore and in proximity to sensitive receptors in coastal areas.

Spill response activities will also involve the use of equipment on coastal areas during clean-up of shorelines (such as pumps and vehicles), for accessing shoreline areas (such as vehicles) and for supporting temporary camps (such as diesel generators).

8.8.2.3 Atmospheric Emissions

The use of fuels to power vessel engines, generators and mobile equipment used during spill response activities will result in emissions of GHGs.

Atmospheric emissions from spill response equipment will be localised and, while there is potential for fauna and flora impacts, the use of mobile equipment, vessels and vehicles is not considered to create emissions on a scale where noticeable impacts would be predicted. Emissions may occur in protected areas; however, the scale of the impact relative to potential oil spill impacts is not considered great.

8.8.2.4 Physical Presence and Disturbance

The movement and operation of response vessels, including anchoring and operating in the nearshore environment, has potential to cause disturbance to the marine environment. Onshore, vehicles, personnel and equipment associated with the response strategy have the potential to disturb the physical marine and coastal habitats and fauna. Vehicle, equipment and personnel associated with the strategy could also introduce or spread non-indigenous flora and fauna.

Oiled wildlife response activities may involve deliberate disturbance (hazing), capture, handling, cleaning, rehabilitation and release of wildlife, which could lead to additional impacts to wildlife.

8.8.2.5 Operational Discharges and Waste

Operational discharges offshore include those routine discharges from vessels used during spill response and will be the same as planned activities described in Section 7.6. Other specific waste streams include cleaning materials used for cleaning oily equipment, flushing water used for cleaning the shoreline habitats, any waste from shoreline clean-up personnel or camps.

8.8.2.6 Potential Environmental Impact

Offshore impacts are consistent with vessel operations described within this EP for the planned drilling operations. Specific impacts relating to response operations risks, identified above, are described further in the next subsections.

8.8.2.7 Light Emissions

Offshore lighting may cause behavioural changes to fish (including sharks), birds and marine turtles and have been described in planned risks (Section 7.5).

Spill response activities which require lighting may also occur nearshore and on shorelines through response strategy implementation. The receptors considered most sensitive to lighting from vessel and shoreline operations (in the event of shoreline clean-up operations) are seabirds and marine turtles. The JBG East shoreline has a number of turtle nesting beaches. During the nesting period (November to January) and hatching periods (December to March), turtle sensitivity to light will be greater.

However, given the scale of the response, any impacts are expected to be short-term, geographically confined and minor. In addition, shoreline operations will only be conducted in daytime hours and light impacts would be considered when locating any shoreline camps. Light impacts will also be considered in the operational NEBA process.

8.8.2.8 Noise Emissions

Offshore noise may cause behavioural changes to marine mammals, turtles and fish and have been described in planned risks (Section 7.3).

Spill response activity from onshore operations (noise-generating mobile equipment and vehicles) has the potential to disturb nesting, roosting or feeding birds, as well as nesting turtles and other onshore fauna, through noise and vibration. The shoreline response equipment used is not considered to have excessive sound levels and its use will also be considered in the operational NEBA process. The consequence to onshore fauna from noise is expected to be low. Given the scale of the response, any impacts are expected to be short-term, geographically confined and minor.

8.8.2.9 Atmospheric Emissions

Offshore atmospherics may result in a temporary, localised reduction of air quality and have been described in planned risks (Section 7.2).

Atmospheric emissions from spill response equipment will be localised and while there is potential for fauna and flora impacts, the use of mobile equipment, vessels and vehicles is not considered to create emissions on a scale where noticeable impacts would be predicted. Atmospheric emissions from spill response equipment are expected to be low.

8.8.2.10 Physical Presence and Disturbance

The use of vessels may result from deployment of anchor and chain, nearshore booms and grounding, and may disturb benthic habitats in coastal waters, including corals, seagrass, macroalgae and mangroves if used in nearshore waters. Vessel use in shallow coastal waters also increases the chance of contact or physical disturbance with marine fauna such as turtles and dolphins, which have been identified along the shorelines of the JBG. The use of booms creates a physical barrier on the surface water and has the potential to entangle passing marine fauna that are either surface-breathing or -feeding.

Shoreline response activities may require vehicles, clean-up equipment and deployment of clean-up personnel, which have the potential to damage coastal habitats such as dune vegetation, mangroves and habitats important to threatened and migratory fauna, including nests of turtles and birds and bird roosting and feeding areas. Similarly, in the event camps are required to be set up, there is the potential shorebird and turtle nesting and feeding behaviours could be impacted.

Impacts from offshore IMS released from vessel biofouling include out-competition, predation and interference with other ecosystem processes as described in Section 7.1. In shallower coastal areas, such as areas where vessel-based spill response activities may occur, conditions are likely to be more favourable.

Impacts from terrestrial invasive species are similar to offshore, whereby the invasive species can out-compete local species (such as weeds) and interfere with ecosystem processes. Non-native species may be transported attached to equipment, vehicles and clothing. Such an introduction would be especially detrimental to the relatively undisturbed flora and fauna communities along the JBG coastline.

The disturbance to marine and coastal natural habitat, as well as the potential for disruption to culturally sensitive areas may have flow-on impacts to socio-economic values and industry (such as tourism, fisheries).

An NEBA will take into account the vehicles and equipment selected and will aim to reduce habitat damage. The establishment of access routes and demarcation zones, and operational restrictions on equipment ad vehicle use, will limit damage to important fauna areas and sensitive habitat. Camps will only be set up after consultation with the relevant regulatory bodies. Following these and other control measures, the resultant consequence to the physical environment and habitat is assessed as low.

As with all spill response activities, response strategies which may cause habitat disturbance will be considered in the operational NEBA process. It is not considered an extensive shoreline clean-up operation, requiring multiple camps and significant vehicle and equipment use if required, given the MDO and Blacktip condensate will evaporate and weather rapidly. Disturbance will therefore be short-term, geographically confined and minor, and only occur if there is a net benefit to accessing and cleaning shoreline areas.

8.8.2.11 Operational Discharges and Waste

Offshore operational discharges from vessels may create a localised, slight and temporary reduction in water quality and have been described in planned risks (Sections 7.6 to 7.8).

In nearshore areas, operational discharges could potentially occur adjacent to marine habitats such as corals, seagrass and macroalgae, which support a more diverse faunal community. However, discharges are expected to be very localised and temporary.

Cleaning of oil-contaminated equipment or -vehicle may spread oil from contaminated areas to those areas not impacted by a spill, potentially spreading the impact area if not contained and moving oil into a more sensitive environment.

Flushing of oil from shoreline habitats is used to remove oil from the receptor that has been oiled and remobilise back into the marine environment and result in further dispersion and evaporation of the oil. The process of flushing has the potential to physically damage shoreline receptors such as mangrove communities and increase levels of erosion. Flushing and associated risks will be considered in the operational NEBA process and only undertaken if there is a net benefit.

Sewage, putrescible and municipal waste will be generated from onshore activities at temporary camps, which may include toilet and washing facilities. These wastes have the potential to attract fauna, impact habitats, flora and fauna and reduce the aesthetic value of the environment. Sewage, putrescible and municipal waste generated onshore will be stored and disposed of at approved locations.

As with all spill response activities, response strategies which may result in waste streams will be considered in the operational NEBA process and will only occur if there is a net benefit. There will be low volumes of waste expected, as the MDO and Blacktip condensate are anticipated to rapidly evaporate and weather. Minimal waste is therefore expected to be generated and impacts from waste are anticipated to be short-term, geographically confined and slight.

8.8.2.12 Spill Response Strategies

A number of oil spill response strategies have been evaluated for implementation in the event of a spill. Strategy identification is based on strategies which have been implemented in the past or considered to be good industry practice. Table 8-17 presents the evaluation on the implementation of these strategies based on their suitability for the credible spill scenarios identified in this EP.

The key considerations taken into account in the evaluation were:

- properties and weathering profile of the Blacktip condensate and MDO
- nature and scale of the credible spill scenario
- safety and environmental risks and impacts involved with the response.

Table 8-17: Spill response strategies considered for the mitigation of contact from hydrocarbon spills

Strategy	Description	Applicability and environmental benefit	Hydrocarbon type	Adopt/ reject
Source control	Subsea well intervention	The Blacktip wellheads are located on the WHP and the drilling of the Blacktip well is through an existing slot on the WHP. No wellheads are on the seabed. Subsea intervention operations are therefore not applicable.	Blacktip condensate	Reject
			MDO	Reject
	Deployment of Subsea First Response Toolkit	Subsea first-response equipment has the ability to clean around the well and prepare for relief well drilling and installation of a capping device. The wellheads for the Blacktip production wells (and the drilling of development wells) are located on the WHP and are therefore surface wellheads. All equipment listed as Subsea First Response Toolkit cannot be used for surface spill response. In the event the WHP collapses and there is an uncontrolled subsurface release, the development wells will have no wellhead and no BOP, hydrocarbons will be flowing through an open hole via the conductor on the seabed. Therefore the capping stack is unable to attach and seal.	Blacktip condensate	Reject
			MDO	Reject
	Installation of a capping stack	A capping stack is designed to be installed on a subsea well and provides a temporary means of sealing the well, until a permanent well kill can be performed through either a relief well or well re-entry. The wellheads for the Blacktip production wells (and the drilling of development wells) are located on the WHP and are therefore surface wellheads. The capping stack is not suitable for use above sea level. In the event the WHP collapses and there is an uncontrolled subsurface release, the well will have no wellhead and no BOP (these would have been lost during platform collapse) and hydrocarbons will be flowing through an open hole via the conductor on the seabed. There is an operational need that the stack is able to attach and seal on a subsea well during a well blowout, then shut it in safely. To achieve this, a mandrel or hub profile must be exposed (either at the wellhead or on top of the BOP). This will not be available in the event the WHP collapses; therefore, the use of the capping stack is not applicable.	Blacktip condensate	Reject
			MDO	Reject

Strategy	Description	Applicability and environmental benefit	Hydrocarbon type	Adopt/ reject
	Drilling of a relief well	Applicable to: • loss of well control during drilling of the development wells as well as working over the P1 well, resulting in a long-term (74-day) uncontrolled surface release of 4,943 m³ Blacktip condensate in the worst-case scenario (blowing out from the lowest zone in the well). The drilling of a relief well is considered to be the primary control in the event of a loss of well control and will be implemented regardless of any other controls in place. This control when implemented successfully will prevent further loss of hydrocarbon to the environment.	Blacktip condensate	Adopt
			MDO	Reject
	Vessel SOPEP	Applicable to MDO spills from vessels only: • vessel collision resulting in fuel tank rupture and release of MDO releasing a maximum volume 100 m³ • refuelling. SOPEP is the procedure for responding to a ruptured fuel tank or bunkering incident.	Blacktip condensate	Reject
			MDO	Adopt
Monitor and evaluate	Monitoring and evaluation is used to predict and monitor the trajectory and fate of the spill, to determine the effectiveness of response strategies and to identify and report on any potential and actual contacts to flora that occurs.	Applicable to: • all spill scenarios. There are various specific techniques (vessel and aerial surveillance, oil spill modelling) within this response strategy which may be suitable. Use will be based on the spill fate and volumes as well as other considerations such as access to locations and environmental and metocean conditions. Monitoring and evaluation is used to inform further response planning and execution and the operational NEBA.	Blacktip condensate	Adopt
			MDO	Adopt

Strategy	Description	Applicability and environmental benefit	Hydrocarbon type	Adopt/ reject
Subsea chemical dispersant	Subsurface chemical dispersant involves dispersant applied directly into the wellhead location at the release point. Subsea chemical dispersant injection is used to disperse the oil to enable safe implementation of the subsequent controls.	The Blacktip wellheads are located on the WHP and the drilling of the Blacktip well is through an existing slot on the WHP. Therefore subsea chemical dispersion is not applicable.	Blacktip condensate	Reject
			MDO	Reject
Surface chemical dispersion	Chemical dispersant is applied to break down the hydrocarbons and allow and enhance dispersion into the water column, thereby preventing and reducing potential shoreline contact and increasing biodegradation.	MDO and condensates are not conducive to chemical dispersion due to rapid evaporation and low surface concentrations. In addition, a weathering study on Blacktip condensate by Intertek in 2013 showed the rate of evaporation of Blacktip condensate is rapid with 67% of the volume of the condensate is lost within the first two hours and 89% by eight hours. Between eight and 72 hours only a further 7% is lost, reaching a maximum weathering at 72 hours of 95% lost volume (Intertek, 2013).	Blacktip condensate	Reject
			MDO	Reject
Physical dispersion	Physical dispersion is undertaken by running vessels through the hydrocarbon plume and using the turbulence developed by the propellers or hydro-blasting from vessel hydrants to break up the slick. The process enhances dispersion.	MDO and Blacktip condensate are not conducive to physical dispersion due to low surface concentrations. Surface hydrocarbons in the event of a 900 bbl per day well-blowout are only expected to exceed 10 g/m² in the immediate vicinity of the well.	Blacktip condensate	Reject
			MDO	Reject

Strategy	Description	Applicability and environmental benefit	Hydrocarbon type	Adopt/ reject
Containment and recovery	Containment and recovery of hydrocarbons can offer a preventive form of protection to sensitive receptors. Skimmers (mechanical) and booms will be used at sea. This strategy is only effective in calm conditions.	MDO and Blacktip condensate are not conducive to physical dispersion due to low surface concentrations. Containment and recovery is effective on oil concentrations greater than 50 g/m². Surface oil concentrations from a well blowout of 4943 m³ o Blacktip condensate are not predicted to exceed 10 g/m² and 25 g/m² surface oil thresholds at probabilities greater than 10% and 1%, respectively. The maximum distance to the outer extent of the 1 g/m² is predicted to be 19 km. Containment and recovery is therefore not effective. Containment and recovery is not effective on MDO due to its rapid evaporation.	Blacktip condensate	Reject
			MDO	Reject
Protection and deflection	Protection and deflection activities involve the use of booms to deflect spills away from sensitive receptors and toward an area that provides increased opportunity for recovery activities.	Protection and deflection is effective on oil concentrations greater than 50 g/m². Surface oil concentrations from a well blowout of 4943 m³ Blacktip condensate are not predicted to exceed 10 g/m² and 25 g/m² surface oil thresholds at probabilities greater than 10% and 1%, respectively. The maximum distance to the outer extent of the 1 g/m² is predicted to be 19 km. Protection and deflection is therefore not effective for Blacktip condensate releases. MDO is not conducive to protection and deflection due to high evaporation potential and resultant low surface concentrations.	Blacktip condensate	Reject
			MDO	Reject
Shoreline clean-up	During a spill response, clean-up of the oiled shorelines		Blacktip condensate	Adopt

Strategy	Description	Applicability and environmental benefit	Hydrocarbon type	Adopt/ reject
	will be implemented using suitable methods, provided it will be beneficial to the environment based on the NEBA performed on the affected areas based on actual site conditions.	There is not expected to be shoreline accumulation from a well blowout event or MDO release. However as a precaution shoreline cleanup is included as a response strategy. A shoreline assessment will advise whether there is any clean-up potential for any shoreline accumulation volumes. Natural collection points along the coastline will be the focus of the shoreline clean-up'. Contacted shorelines will be assessed for their shoreline clean-up potential based on an Operational NEBA (informed by the shoreline assessment). The clean-up can have the potential to remediate the shoreline quicker than if being left to natural remediation. If turtle or seabird nesting season, there may be less impact not undertaking shoreline clean-up.	MDO	Adopt
Oiled wildlife response (OWR)	OWR aims to prevent wildlife from becoming oiled and treat animals that do become oiled.	There is not expected to be shoreline accumulation from a well blowout event or MDO release. However as a precaution OWR is included as a response strategy. Options for wildlife management have to be considered and a strategy determined guided by the Western Australian Oiled Wildlife Response Plan and the NT Wildlife Response Plan for Oil Spills. Turtle nesting occurs between the months of December to January, and hatchlings can be expected between February and March. Avifauna are present year-round. Offshore OWR is not applicable due to the low concentrations of surface hydrocarbons.	Blacktip condensate	Adopt
			MDO	Adopt
In-situ burning	Technique involves the controlled burning of oil that	For in-situ burning to be undertaken oil has to be thicker than 1 to 2 mm.	Blacktip condensate	Reject

Strategy	Description	Applicability and environmental benefit	Hydrocarbon type	Adopt/ reject
	has spilled (from a vessel or a facility). On conducive hydrocarbons, and when conditions are favourable and conducted properly, in situ burning will reduce the amount of oil on the water.	MDO is not conducive to in situ burning due to rapid evaporation and low surface concentrations. Blacktip condensate and MDO weathers rapidly and would likely become unsuitable for burning within 24 hours. Floating oil concentrations from a well blowout of 4943 m^3 of Blacktip condensate are not predicted to exceed 10 g/m^2 and 25 g/m^2 surface oil thresholds at probabilities greater than 10% and 1%, respectively. The maximum distance to the outer extent of the 1 g/m^2 is predicted to be 19 km. In situ burning is therefore not effective.	MDO	Reject
Scientific Monitoring	This is the main tool for determining the extent, severity and persistence of environmental impacts from an oil spill and allows operators to determine whether their environmental protection outcomes have been met (via scientific monitoring activities). This strategy also evaluates the recovery from the spill.	Scientific monitoring is especially beneficial for the purpose of monitoring entrained and dissolved oil impacts, as response strategies are generally targeted to manage the surface oil impacts. See Appendix G of the Blacktip Operations OPEP (000036_DV_PR.HSE.0388.000_Rev14).	Blacktip condensate	Adopt
			MDO	Adopt

8.8.3 Spill Response and Operational Monitoring Plan Strategies ALARP Assessment

Table 8-18 presents an ALARP assessment on the level of resourcing for spill response strategies identified in Table 8-17 for adoption.

Table 8-19 presents an ALARP assessment on the level of resourcing for Operational Monitoring Plan (OMP) strategies spill response strategies identified in the Blacktip Operational and Scientific Monitoring Plan (000036_DV_PR.HSE.0860.000).

Table 8-18: As low as reasonably practicable assessment of the level of resourcing available for spill response strategies

Strategy	Resourcing	Justification	Additional resource consideration	Proportionality - cost/benefit	ALARP assessment
Source control					
Relief well	Relief well plan in place for Blacktip wells. APPEA MoU provides for access to other operator's rigs.	A number of source control options have been evaluated in Table 8-17. Of these source control options, the drilling of a relief well is considered the primary means of controlling the source in the event of an unplanned well release.	Having a MODU on location permanently and under contract to Eni for relief well drilling. This additional control could reduce the length of time taken to source a relief well.	Having a MODU on location (and personnel on standby) for drilling top-hole sections of a relief well would reduce the timeframe to source a relief well. However, given the location of the field within a relative high oil and gas area, it is likely a MODU could be sourced within relative proximity. Since the daily spread rate of a MODU is ~$650,000 per day, the approximate cost of having a MODU on standby or contracted for drilling top holes is disproportionate to the environmental benefit, particularly given the low likelihood of shoreline contact.	Having a MODU and personnel and equipment on standby would double the cost of drilling a well; this is considered grossly disproportionate to the environmental benefit (reduction of two weeks of release volumes), particularly considering the spill is predicted to largely weather and evaporate offshore with minimal shoreline contact.

Strategy	Resourcing	Justification	Additional resource consideration	Proportionality - cost/benefit	ALARP assessment
Monitor and Evaluate					
Aerial surveillance	Helicopter services available through Eni, primary contracted supplier based out of Darwin. Aircraft are also available through AMOSC and AMSA. Initial aerial observation using helicopter will occur within three hours of notification of the spill. Trained observers will be sourced from AMOSC, AMSA and OSRL to undertake the required aerial surveillance in the event of a spill.	Given location of spill site, mobilisation of helicopters from Darwin is considered adequate for surveillance. If aerial surveillance is required, an over-flight schedule is developed by the Incident Management Team (IMT). The frequency of flights will be sufficient to ensure the information collected during each flight (as in, observer log and spill mapping) meets the information needs to validate dispersion of the spill.	Resource not considered limiting. Primary supplier on contract with additional providers available to provide desired overpass frequency. Trained observers can be provided on rotation from Day 2.	No additional cost to maintain capability as helicopters are currently contracted for operations to and from Eni facilities. In the event additional overpasses are required due to data gaps, the cost of the additional flights will be added to the cost of the response.	There is no value in increasing dedicated overpasses and therefore the arrangements are considered ALARP; however, opportunistic aerial surveillance can be provided through the shared use of aircraft deployed for other purposes.

Strategy	Resourcing	Justification	Additional resource consideration	Proportionality - cost/benefit	ALARP assessment
Tracker buoys (available on MODU or support vessel during drilling)	One tracker buoy to be deployed from support and contracted vessels. Subscription to tracker buoy tracking website. Subject to weather and vessel availability the tracker buoys can be mobilised within three hours from support vessel upon request from IMT or on-scene commander.	Tracker buoys will be used in addition to aerial surveillance to provide real-time verification data (particularly beneficial at night and in conditions limiting aerial surveillance. Vessels for buoy deployment will be Eni-contracted vessels and other vessels of opportunity. Vessels can be shared across this and other tasks (such as surveillance).	Additional buoys are available through secondary suppliers (such as AMOSC, OSRL and AMSA – more than 20 buoys available) if required. Dedicated vessels are not required, given need is met through vessel-sharing.	Other tracking buoy availability through AMSA, AMOSC, OSRL within days. There is no additional upfront cost for accessing these secondary buoys. Given the WHP is unmanned, a tracking buoy cannot be deployed. A tracking buoy will be available on a support vessel; therefore, it is not considered a requirement to have an additional buoy on the MODU during drilling.	The number of buoys immediately available (one can be deployed from a vessel if during contracted periods) and the availability of secondary buoys within days is sufficient to cover tracking of oil fronts, especially given the spread of oil will be limited within the initial days of the spill. No additional response requirements and the response is considered ALARP.

Strategy	Resourcing	Justification	Additional resource consideration	Proportionality - cost/benefit	ALARP assessment
Vessel surveillance	Vessels contracted to Eni for the activity duration. Vessels of opportunity from other operators. Additional vessels contracted through Eni vessel providers out of Darwin. In event of a spill when a vessel is not on site (such as during ongoing production), a vessel will be sourced within 24 hours.	Some activities under the Petroleum Activities Program involve multiple vessels. Should a spill incident occur, those not involved in the incident can provide surveillance. Additional mobilisation from Darwin can be made through Eni's contracted vessel providers within 24 hours. This strategy is not designed to perform 'whole of spill' coverage, which is provided by aerial surveillance (as in, it is a secondary strategy).	Based on the likelihood of vessels available on site during activities (drilling, IMR and survey), additional vessels for the purpose of oil spill surveillance is not considered required, given the need is met through vessel-sharing. In the event of a spill when a vessel is not available (WHP spill during ongoing operations), it is considered aerial surveillance will be adequate to monitor the spill. Surveillance will also be conducted through complementary strategies (aerial surveillance, oil spill trajectory modelling, tracker buoys).	The current vessels arrangements and contracts are considered to provide the required function. Dedicated vessels on standby for vessel surveillance would cost tens of thousands of dollars per day and are not considered required.	There is no benefit in having additional dedicated surveillance vessels, given surveillance can be performed from any vessel and these duties will be shared among spill response vessels.

Strategy	Resourcing	Justification	Additional resource consideration	Proportionality - cost/benefit	ALARP assessment
Satellite Monitoring	Eni has access to emergency satellite monitoring for its operations through the AMOSC services. 24/7 emergency image delivery service and standby support.	Provides near real-time services for oil spill and support vessel detection targeting delivery in 15 minutes from data availability (in the case of a spill being detected or suspected). The SAR satellites will provide two images per day and a report shall be provided daily to Eni.	Resource is not considered limiting, with no environmental benefit from dedicating additional monitoring capability.	Provides satellite monitoring covered under the AMOSC services.	There is no environmental benefit in having additional satellite monitoring capabilities.
Oil spill trajectory modelling	The oil spill trajectory modelling will be sourced, via AMOSC or Eni headquarters, within 24 hours using its 24/7 emergency capability. Oil spill trajectory modelling is also available through panel consultants.	The modelling supplier can provide updates to the IMT of trajectory model outputs to inform response planning.	Predictive oil spill modelling will be used to forecast (using real-time data) the trajectory and fate of the spill. Resource is not considered limiting with no environmental benefit from dedicating additional modelling capability.	Supplied through AMOSC or Eni headquarters. As a member company of AMOSC, Eni has access to AMOSC's oil spill recovery and response equipment, training, technical capabilities along with those resources held by member companies as outlined in the AMOSPlan. Eni headquarters in Milan maintains oil spill trajectory modelling capability and also has 24/7 emergency capability.	There is no environmental benefit in having additional modelling capabilities.

Strategy	Resourcing	Justification	Additional resource consideration	Proportionality - cost/benefit	ALARP assessment
Protection and deflection					
Protection and deflection booms	Shoreline and nearshore boom is available through AMOSC, OSRL or AMSA, including various lengths of land and sea boom, shoreline protection booms, sorbent booms from stockpiles in Darwin and other Australian cities. Spill response teams (AMOSC, AMSA and OSRL responders).	Shoreline and nearshore boom provided through AMOSC or AMSA is available from Mutual Aid arrangements. AMOSC also provides access to additional boom from other operators. Offshore protection and deflection aims to prevent oil from reaching a sensitive location. If successfully implemented, offshore protection and deflection can eliminate the requirement to access shorelines, if all oil is deflected.	Boom equipment is not considered limiting as stocks through AMOSC, OSRL or AMSA are considered adequate. Prepositioning or having personnel and equipment at an enhanced standby footing would reduce deployment time. However, pre-deploying boom at sensitive locations creates potential for impacts which, weighed against the uncertainty of an oil spill reaching the location, are deemed to be disproportional.	The cost of boom, vessels and personnel on an enhanced standby is disproportionate to the environmental benefit, based on the timeframes needed to undertake oil spill modelling and surveillance activities and a NEBA in order to establish the areas to be protected by boom.	The environmental benefits in having additional or pre-positioned resources cannot be confirmed. MDO and Blacktip condensate weather and evaporate at quick rates and therefore are unlikely to be present on the surface for a significant period, which would require extensive boom use. The current arrangements are considered ALARP.
Shoreline clean-up					
Shoreline clean-up	Manual clean-up and flushing equipment (AMOSC, AMSA). Clean-up team leaders (through AMOSC and AMSA).	Whilst no shoreline accumulation at >100 g/m^2 is predicted to occur, and an extensive shoreline response requirements are not anticipated, the strategy is available to Eni and is adopted as a precautionary measure for	The main limitation of undertaking a shoreline clean-up response is based around access for plant and personnel to remote offshore island locations. Particularly given the	During a spill event, the cost of additional resources is not considered; the limiting factor is considered to be numbers of personnel available to	The level of resources available are considered to be appropriate, given shoreline accumulation volumes are not expected. The outcome of oil spill modelling

Strategy	Resourcing	Justification	Additional resource consideration	Proportionality - cost/benefit	ALARP assessment
	Labour personnel (labour hire as required). Eni has arrangements in place with TOLL Group, which includes vessel hire such as barges, vessels and landing craft from Darwin.	the event that monitoring predicts impacts to key shoreline sensitives.	remote nature of the north Kimberley Coastline and the JBG East and West coast. Additional resources may include permanent pre-positioning clean-up equipment on the shoreline prior to a spill event occurring.	undertake shoreline clean-up. Mobilising additional personnel to undertake shoreline clean-up via vessel to remote offshore locations presents increased associated health and safety risks. Personnel mobilised via helicopter is limited to ten passengers per trip. Once at the locations, there is a need to provide adequate facilities.	and surveillance and a NEBA would be used to identify priorities for protection at specific locations, given the time of year, such as during turtle nesting season, where shoreline clean-up efforts would be directed at nesting beaches. Therefore, the response is considered ALARP. Decision to implement shoreline clean-up will be undertaken by the IMT when the findings of the NEBA demonstrate shoreline clean-up techniques used will deliver environmental benefits.

Strategy	Resourcing	Justification	Additional resource consideration	Proportionality - cost/benefit	ALARP assessment
Waste management					
Waste management	Assorted waste receptacles and trucks. Waste personnel – project manager, local responsible personnel and operations personnel. Eni has arrangements in place with a logistics provider, which has a number of barges, vessels and landing craft available in Darwin. A standing contract exists between Darwin Veolia and Eni for the disposal of waste.	Eni's waste service provider, Veolia, is contracted to ongoing waste storage, transport and disposal requirements.	Veolia has sufficient resources for the worst-case waste clean-up requirements; there is no benefit to acquiring additional resources specifically for the activity.	Veolia contract provides resources to meet waste management requirements.	Resources are considered to be adequate and ALARP. MDO and condensate waste volumes recovered from clean-up are considered to be low, given the MDO and condensate quick evaporation and weathering potentials.

Strategy	Resourcing	Justification	Additional resource consideration	Proportionality - cost/benefit	ALARP assessment
Oiled wildlife response					
Oiled wildlife response	Oiled wildlife response kits and containers. OWR personnel.	All OWR efforts would be undertaken in consultation with DBCA and Parks and Wildlife (NT), and Eni would undertake the response after the outcome of an operational NEBA that would direct efforts for maximum effectiveness. Whilst an extensive OWR is not anticipated, the strategy is available to Eni and is adopted as a precautionary measure for the event that monitoring predicts impacts to key shoreline sensitives and species.	Pre-positioning of staging areas and responders has been considered for this spill scenario, given the worst-case timeframe for oil on shorelines may be as soon as two hours from an MDO spill. As Eni has access to OWR kits through third-party agreements that can be mobilised in a timely manner, it is not considered to be necessary to increase resources. Purchasing of an OWR kit by Eni has been discounted as any OWR would be in consultation with DBCA and Parks and Wildlife (NT) upon completion of a NEBA.	The cost of personnel (Level 1 responders) on standby is $1,500 per person per day. Given personnel on this level can be arranged within relatively short timeframes through other bodies, there is not considered sufficient environmental value in having dedicated OWR responders on standby.	Given shoreline accumulation / contact above 100 g/m^3 is not expected. If required, resourcing required for OWR is considered to be within the capacity of existing response arrangements and are considered ALARP.

Table 8-19: As low as reasonably practicable assessment of the level of resourcing available for Operational Monitoring Plan strategies

Strategy	Resourcing	Justification	Additional resource consideration	Proportionality – cost/benefit	ALARP assessment
OMP1: Monitoring of Surface Hydrocarbon Distribution at Sea and Marine Megafauna Observations					
Aerial surveillance	Refer to Monitor and Evaluate in Table 8-18, above.				
Vessel surveillance	Refer to Monitor and Evaluate in Table 8-18, above.				
Satellite Monitoring	Refer to Monitor and Evaluate in Table 8-18, above.				
Oil spill trajectory modelling (OTSM)	Refer to Monitor and Evaluate in Table 8-18, above.				
Unmanned aerial vehicle (UAV)	Access to various Unmanned Ariel Vehicle (UAV) providers via OSRL on a best endeavours basis	UAVs provide an additional monitoring capacity to cover specific areas of interest identified during the response via aerial or vessel surveillance. UAVs are accessed through OSRL as they require trained operators and specific maintenance.	Purchasing UAVs and training Eni personnel as operators, so UAV access can be guaranteed immediately in the event of a spill.	Cost of purchasing UAVs and training personnel outweighs benefit. Given that the main strategy for monitoring the spill is from aerial surveillance (helicopter) and vessel surveillance, purchasing UAVs specifically and training Eni personnel as operators does not result in better coverage of the spill initially and is a costly process. The access to UAVs through an existing OSRL contract is aimed to monitor specific areas identified by	There is no environmental benefit in purchasing UAVs and training Eni personnel as UAV operators given coverage of the spill can initially be made using vessels and aerial observation.

Strategy	Resourcing	Justification	Additional resource consideration	Proportionality – cost/benefit	ALARP assessment
				the vessel and aerial surveillance and its use is not required immediately during the spill event. In addition, sensitive shoreline receptors which may be monitored using a UAV are not anticipated to be contacted in the event of a hydrocarbon release.	
Aerial surveillance trained observer	Trained observers will be sourced from AMOSC, AMSA and OSRL to undertake the required aerial surveillance in the event of a spill. Can make visual observations within 24 hours of mobilisation.	The spill will move with the currents and sensitive receptors are not anticipated to be contacted by surface oil. Given the spill size, a large scale response is not required. Mobilising aerial surveillance trained observers within 24 hours is considered adequate.	Access to personnel in less than 24 hours to monitor the spill	Does not provide any additional environmental benefit or quicker coverage of the spill. Visual observation – from aircraft/ helicopter can be made within 24 hours of mobilisation. Access to vessels and aerial surveillance would be a limiting factor and has been discussed in Table 8-18, above.	Costs of having personnel ready to mobilise in less than 24 hours to monitor the spill grossly outweighs the environmental benefit. Access to personnel is not a limiting factor Does not provide any additional environmental benefit or quicker coverage of the spill.
OMP2: Monitoring of Hydrocarbons: Weathering and Behaviour in Marine Waters					
Water sampling equipment to detect hydrocarbon presence and	Access to: 1 x Turner C3 Fluorometer (submersible)	Fluorometers and backscatter sensors to detect hydrocarbon presence and estimate oil concentrations in the marine environment.	Access to additional fluorometers	Provides no additional benefit. Additional fluorometers can be mobilised, however not within 24 hours. Given the size of the spill, one	No additional environmental benefit gained

Strategy	Resourcing	Justification	Additional resource consideration	Proportionality – cost/benefit	ALARP assessment
estimate oil concentrations	1 x OSRL fluorometry unit operator Within 24 hours via OSRL	Access timing aligns with access to the vessel (24 hours)		fluorometer has been determined to be required initially.	
Autonomous underwater vehicle to provide understanding of entrained hydrocarbons	Access to: 1 x Autonomous underwater vehicle (AUV) with fluorometry sensor 1 x AUV engineer On a best endeavours basis via OSRL	Autonomous underwater vehicle to provide understanding of entrained hydrocarbons.	Contracted access within a defined timeframe (e.g. 34 hours)	High cost with little environmental benefit. Submersible fluorometers are able to provide an assessment of hydrocarbon presence in first instance.	No additional environmental benefit gained.
OMP3: Shoreline Assessment Surveys					
Shoreline assessment team and surveyors	Shoreline assessment team Shoreline surveyors Onsite within 5 days, or 24 hours prior to shoreline contact (if prolonged time to shoreline contact). Access through: AMOSC, National Plan resources through AMSA, OSRL	Shoreline contact is not anticipated at a threshold at which a response can be effectively undertaken. The spill will move with the currents and sensitive receptors are not anticipated to be contacted by surface oil. Access to personnel through AMOSC, National Plan resources through AMSA, OSRL is determined adequate.	Additional access of shoreline assessment personnel within 5 days.	Does not provide any additional benefit given the no shoreline contact is expected.	No additional environmental benefit gained.
Unmanned aerial vehicle (UAV)	Refer to OMP1: Monitoring of Surface Hydrocarbon Distribution at Sea and Marine Megafauna Observations, above				

Strategy	Resourcing	Justification	Additional resource consideration	Proportionality – cost/benefit	ALARP assessment
Aerial surveillance	Refer to Monitor and Evaluate in Table 8-18, above.				
Vessel surveillance	Refer to Monitor and Evaluate in Table 8-18, above.				

8.8.4 Environmental Performance Outcomes and Control Measures

For EPOs, EPS and MC relating to spill response in event of a spill during this activity, refer to the Blacktip OPEP (000036_DV_PR.HSE.0388.000_Rev14).

9 RECOVERY PLAN AND THREAT ABATEMENT PLAN ASSESSMENT

This section provides an assessment to demonstrate that the Petroleum Activities Program is not inconsistent with any relevant recovery plans or threat abatement plans.

Relevant recovery plans and threat abatement plans to the Petroleum Activities Program and the receiving environment are:

- Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017)
- Conservation Management Plan for the Blue Whale 2015–2025 (Commonwealth of Australia, 2015a)
- Sawfish and River Shark Multispecies Recovery Plan (Commonwealth of Australia, 2015b)
- Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans 2018 (Commonwealth of Australia, 2018)
- Conservation Management Plan for the Southern Right Whale 2011–2021 (2012)
- Recovery Plan for the White Shark (*Carcharodon carcharias*) (Commonwealth of Australia, 2013).

Objectives and relevant actions from the above plans have been identified in Table 9-1. The table includes an assessment on whether the Petroleum Activities Program, including resulting impacts and risks identified in Sections 7 and 8 are inconsistent with those objectives and actions.

Table 9-1: Assessment of the Petroleum Activities Program's consistency with objectives and actions in relevant recovery plans and threat abatement plans

Recovery plans and threat abatement plans	Relevant Action Areas/Objectives	Assessment of consistency
Recovery Plan for Marine Turtles in Australia 2017–2027	Action Area A3: Reduce the impacts from marine debris. • Understand the threat posed by marine debris. • Determine the extent to which marine debris is impacting turtles.	**Not inconsistent** Section 8.1 considers the impacts of unplanned releases of solid hazardous and non-hazardous wastes and considers the potential risks to marine turtles. Appropriate controls have been considered and adopted to reduce the risk of unplanned releases of solid hazardous and non-hazardous wastes to ALARP and acceptable levels.
	Action Area A4: Minimise chemical and terrestrial discharge. • Ensure spill risk strategies and response programs adequately include management for marine turtles and their habitats, particularly in reference to 'slow to recover habitats', such as nesting habitat, seagrass meadows or coral reefs.	**Not inconsistent** Section 7.8 address the impacts from routine discharges and drilling fluids to marine turtles. Section 8.4 considers the risks from accidental release of chemicals and hydrocarbons to marine turtles. Spill risk strategies and response program include management measures for turtles and their nesting habitats. Appropriate controls have been considered and adopted to reduce the impacts and risks of planned and unplanned releases of chemicals to the marine environment to ALARP and acceptable levels.
	Action Area A8: Minimise light pollution. • Artificial light within or adjacent to habitat critical to the survival of marine turtles will be managed such that marine turtles are not displaced from these habitats.	**Not inconsistent** Section 7.5 considers the impacts from project vessel lighting on marine turtles. Given the Operational Area location from shorelines, vessel lighting is not anticipated to displace marine turtles from critical habitats. Light emissions may cause localised and temporary behavioural disturbance to transient individual marine turtles. The level of disturbance is not considered to result in displacement of adult turtles from critical habitat. Appropriate controls have been considered and adopted to reduce the impacts of light emissions to ALARP and acceptable levels.

Recovery plans and threat abatement plans	Relevant Action Areas/Objectives	Assessment of consistency
Conservation Management Plan for the Blue Whale 2015–2025	Action Area A.2: Assessing and addressing anthropogenic noise. • Assess the effect of anthropogenic noise on blue whale behaviour.	**Not inconsistent** Section 7.3 and 7.4 consider the potential impacts to pygmy blue whales. Noise generated by the Petroleum Activities Program is anticipated to result in localised, slight and temporary behavioural disturbance to individuals only. Appropriate controls have been considered and adopted to reduce the impacts of noise emissions to ALARP and acceptable levels.
	Action Area A.3: Anthropogenic noise in biologically important areas will be managed such that any blue whale continues to utilise the area without injury.	**Not inconsistent** Section 7.3 and 7.4 consider the potential impacts to pygmy blue whales. Noise generated by the Petroleum Activities Program is anticipated to result in localised, slight and temporary behavioural disturbance to individuals only. Appropriate controls have been considered and adopted to reduce the impacts of noise emissions to ALARP and acceptable levels.
	Action Area A.4: Minimising vessel collisions. • Ensure the risk of vessel strikes on blue whales is considered when assessing actions that increase vessel traffic in areas where blue whales occur and, if required, appropriate mitigation measures are implemented.	**Not inconsistent** Section 8.2 considers the potential impacts to pygmy blue whales. Vessel collisions with pygmy blue whales are unlikely to occur, given the very slow vessel speeds within the confined Operational Area. Appropriate controls, including adherence to EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.05 and 8.06) Interacting with cetaceans, have been adopted to reduce the risks of marine fauna interactions to ALARP and acceptable levels.
	Action Area B.3: Describing spatial and temporal distribution and defining biologically important habitat. • Identify migratory pathways between breeding and feeding grounds. • Assess timing and residency within BIAs.	**Not inconsistent** Appendix B presents details of the timing and residency of pygmy blue whales within the region. The Operational Area does not overlap the pygmy blue whale BIA. Migratory presence is considered rare.

Recovery plans and threat abatement plans	Relevant Action Areas/Objectives	Assessment of consistency
Sawfish and River Shark Multispecies Recovery Plan	Objective 5: Reduce and, where possible, eliminate adverse impacts of habitat degradation and modification on sawfish and river shark species. • Identify risks to important sawfish and river shark habitat and measures needed to reduce those risks.	**Not inconsistent** Section 7.9 considers the impact of seabed disturbance on sawfish and river shark species. Given the low level of seabed disturbance from the Petroleum Activities Program and the lack of suitable habitat for sawfish and river shark within the Operational Area, impacts are not anticipated. Section 8.4 considers the impact of a hydrocarbon release on a variety of habitats, including sawfish and river shark habitat within the EMBA. Appropriate controls have been considered and adopted to reduce the risk of unplanned hydrocarbon releases to ALARP and acceptable levels.
	Objective 6: Reduce and, where possible, eliminate any adverse impacts of marine debris on sawfish and river shark species.	**Not inconsistent** Section 8.1 considers the impacts of unplanned releases of solid hazardous and non-hazardous wastes and considers the potential risks to sawfish and river shark species. Appropriate controls have been considered and adopted to reduce the risk of unplanned releases of hazardous and non-hazardous wastes to ALARP and acceptable levels.
Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans	Objective 1: Contribute to long-term prevention of marine debris. • Limit the amount of single use plastic material lost to the environment in Australia.	**Not inconsistent** Section 8.1 considers the impacts of unplanned releases of hazardous and non-hazardous wastes and considers the potential risks to marine fauna. Appropriate controls have been considered and adopted to reduce the risk of unplanned releases of hazardous and non-hazardous wastes to ALARP and acceptable levels.

Recovery plans and threat abatement plans	Relevant Action Areas/Objectives	Assessment of consistency
Conservation Management Plan for the Southern Right Whale 2011–2021 (2012)	Action Area A.2: Assessing and addressing anthropogenic noise (shipping, industrial and seismic).	**Not inconsistent** Section 7.3 and 7.4 consider the potential impacts to southern right whales. Noise generated by the Petroleum Activities Program is anticipated to result in localised, slight and temporary behavioural disturbance to individuals only. Appropriate controls have been considered and adopted to reduce the impacts of noise emissions to ALARP and acceptable levels.
	Action Area A.5: Addressing vessel collisions.	**Not inconsistent** Section 8.2 considers the potential impacts to southern right whales. Vessel collisions with southern right whales are unlikely to occur, given the very slow vessel speeds within the confined Operational Area. Appropriate controls, including adherence to EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.05 and 8.06) Interacting with cetaceans, have been adopted to reduce the risks of marine fauna interactions to ALARP and acceptable levels.
Recovery Plan for the White Shark (*Carcharodon carcharias*)	Objective 7: Continue to identify and protect habitat critical to the survival of the white shark and minimise the impact of threatening processes within these areas.	**Not inconsistent** Section 8.4 considers the risks from accidental release of chemicals and hydrocarbons to grey nurse shark. Appropriate controls have been considered and adopted to reduce the risk of unplanned hydrocarbon release to ALARP and acceptable levels.

10 ENVIRONMENT OUTCOMES, STANDARDS AND MEASUREMENT CRITERIA

Regulation 13(7) of the OPGGS(E) Regulations requires an EP to include EPOs, EPSs and MC that:

- address legislative and other controls that manage environmental features of the activity
- define objectives and set standards for measuring Eni's performance in protecting the environment during its operations
- include measurement criteria for assessing whether performance outcomes and standards have been met.

The terms used for measuring the environmental performance are defined below:

- Performance outcome – a statement of the goal that Eni aims to achieve with regard to the management of a given hazard.
- Performance standard – a statement of performance required of a system, an item of equipment, a person or a procedure that is used as a basis for managing environmental risk. Generally, a number of standards may relate to a single objective.
- Measurement criteria – defines how the application of the performance standard will be verified. Several measurement criteria may relate to a single performance standard. Measure criteria are defined in a manner that enables efficient inspection and audit against the performance outcomes and allows for an audit trail.

To ensure environmental risks and impacts will be of an acceptable level, EPOs have been defined and are listed in Table 10-1. These outcomes will be achieved by implementing the identified control measures to the defined performance standards.

Table 10-1: Environmental performance outcomes

Reference	Environmental Performance Outcomes
EPO-01	Information provided to regulatory authorities and marine users directly affected by planned activities
EPO-02	Activity is managed in accordance with navigational and safety requirements
EPO-03	No unplanned interactions with other users
EPO-04	Atmospheric emissions in compliance with Marine Order 97 requirements to restrict emissions to those necessary to perform the activity
EPO-05	Maximise efficiency of combustion during flaring
EPO-06	No injury or mortality to EPBC Act listed fauna during operational activities
EPO-07	Reduce impacts to marine fauna from lighting on the MODU and vessels through limiting lighting to that required by safety and navigational lighting requirements
EPO-08	No unplanned discharges to sea of untreated sewage, greywater, putrescible wastes, bilge and deck drainage
EPO-09	No unplanned discharge of oily water or chemicals that are not in accordance with Marine Order 91 requirements
EPO-10	No impact to water quality or marine biota greater than a severity level of 2 from discharge of drilling cuttings or fluids
EPO-11	Seabed disturbance limited to planned activities
EPO-12	No unplanned releases of solid hazardous or non-hazardous waste to the marine environment
EPO-13	No introduction of marine pest species to the Operational Area
EPO-14	No significant leaks to the marine environment from fittings and connections
EPO-15	No loss of containment of hydrocarbons to the marine environment

10.1 Control Measures and Performance Standards

The CMs that will be used to manage identified environmental impacts and risks, and the associated statements of performance required of the control measure (as in, EPSs) are listed in Table 10-2. MC outlining how compliance with the CM, and the expected environmental performance, could be evidenced are also listed. A separate set of performance standards based on the oil spill response operational control measures are included in the Blacktip OPEP (000036_DV_PR.HSE.0388.000_Rev14).

Table 10-2: Control measures and environmental performance standards

EPO references	Control measure	Environmental performance standard	Measurement criteria	Risk ID reference
EPO-2 **EPO-3** **EPO-7**	**CM-01** Navigation equipment and procedures (lighting required for safe work conditions and navigational purposes)	**EPS-1.1.** Vessels and MODU compliant (where applicable) with standard maritime safety/navigation procedures including AMSA Marine Order Part 30 (Prevention of Collisions) 2009: • adhere to steering and sailing rules including maintaining lookouts (e.g. visual, hearing, radar etc.), proceeding at safe speeds, assessing risk of collision and taking action to avoid collision (monitoring radar). • adhere to navigation light display requirements, including visibility, light position/shape appropriate to activity. • adhere to navigation noise signals as required.	Vessels and MODU have a current (< 12 months) IMCA or OVID certificate prior to mobilisation.	**P1** **P5** **U6**
		EPS-1.2. Vessels and MODU compliant (where applicable) with standard maritime safety/navigation procedures including AMSA Marine Order Part 21 (Safety of Navigation and Emergency Procedure) 2012: • adherence to minimum safe manning levels. • maintenance of navigation equipment in efficient working order (compass/radar). • navigational systems and equipment required are those specified in Safety of Life at Sea (SOLAS) Chapter V (Regulation 19). • automatic Identification System (AIS) installed as required by vessel class in accordance with SOLAS Chapter V (Regulation 19).		

EPO references	Control measure	Environmental performance standard	Measurement criteria	Risk ID reference
EPO-01 **EPO-03**	**CM-02** Maritime and stakeholder notices	**EPS-2.1** The AHO is notified 4 weeks prior to commencing activities so they can then issue a Notice to Mariners.	**MC-2.1** Notice to AHO completed.	**P1**
		EPS-2.2 The AMSA Rescue Coordination Centre (RCC) (as part of marine safety division) will be notified of the activities 4 weeks prior to mobilisation to ensure navigation AUSCOAST warnings can be issued and kept up to date.	**MC-2.2** Notice to AMSA RCC completed.	
		EPS-2.3 Defence is notified a minimum of five weeks prior to the commencement of activities. Notification will be provided to Offshore.Petroleum@defence.gov.au Note: Defence will also be made aware of any high velocity exhaust gas plumes and/or burn-offs that could impact safety of flights.	**MC-2.3** Notice to Defence completed.	
EPO-01 **EPO-02** **EPO-03**	**CM-03** Use of existing 500 m PSZ around WHP during drilling and communicated to marine users. *Note the drilling is at the WHP, which already has an in-force 500 m PSZ.*	**EPS-3.1** A 500 m PSZ maintained around the WHP and MODU and communicated to marine users to prevent unauthorised vessels entering the 500 m PSZ.	**MC-3.1** Operations records shows no vessels entered the 500 m PSZ without permission.	**P1** **U6**

EPO references	Control measure	Environmental performance standard	Measurement criteria	Risk ID reference
EPO-04	**CM-04** Air pollution prevention certificate	**EPS-4.1** Vessels and MODU comply with MARPOL 73/78 Annex VI, as applied in Australia under the Commonwealth Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (Part IIID Prevention of air pollution), and Marine Order 97 (marine pollution prevention – air pollution 2007, as required by vessel class: • vessels and MODU vessels will have valid International Air Pollution Prevention Certificate (IAPP) where required.	**MC-4.1** MODU and vessels have valid International Air Pollution Prevention Certificate where required.	**P2**
	CM-05 Fuel type used	**EPS-5.1** Marine Order 97 compliant fuel oil is used by vessels.	**MC-5.1** Records of fuel type for vessels show use of low sulphur fuel when available.	
EPO-05	**CM-06** Use of a test package with an efficient flare design to minimise potential impacts.	**EPS-6.1** Flaring will be conducted in accordance with a testing package with an efficient flare and will be designed to minimise potential impacts, including: • prevention of the need for cold venting • process controls • requirement for flare watcher • alarms and safety shutdown devices • dual-redundancy ignition • operational pilot light • back-up equipment.	**MC-6.1** Records demonstrate testing package includes: • flare watcher • alarms and safety shutdown devices • dual-redundancy ignition • operational pilot light • back-up equipment.	**P2**

EPO references	Control measure	Environmental performance standard	Measurement criteria	Risk ID reference
EPO-06	**CM-07** Regulations and measures for interacting with fauna	**EPS-7.1** EPBC Regulations 2000 – Part 8 for interacting with marine fauna are enforced during the activities, including Part 8 Division 8.1 (Regulation 8.05): • a vessel will not travel greater than 6 knots within 300 m of a whale (caution zone) and not approach closer than 100 m from a whale • a vessel will not approach closer than 50 m of a dolphin and/or 100 m of a whale (with the exception of animals bow riding)	**MC-7.1** Conformance to EPBC Regulations 2000 – Part 8 is checked on receipt of marine fauna sighting datasheets.	**P3** **P4** **U2**
		EPS-7.2 EPBC Regulations 2000 – Part 8 for interacting with marine fauna are enforced during the activities, including Part 8 Division 8.1 (Regulation 8.06) – Interacting with calves, which requires: • vessel will not approach closer than 300 m to a calf (whale or dolphin) (the exclusion zone) • then the vessel must be immediately stopped; and must either: • turn off the vessel’s engines, or • disengage the gears, or • withdraw the vessel from the caution zone at a constant speed of less than 6 knots		

EPO references	Control measure	Environmental performance standard	Measurement criteria	Risk ID reference
		EPS-7.3 Helicopters will comply with EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.07), which includes the following measure: • helicopters shall not operate lower than 1,650 feet or within a horizontal radius of 500 m of a cetacean known to be present in the area, except for take-off and landing.		

EPO references	Control measure	Environmental performance standard	Measurement criteria	Risk ID reference
EPO-08	**CM-08** Sewage and waste management	**EPS-8.1** Vessels and MODU comply with MARPOL 73/78 Annex V (Prevention of pollution by garbage)/Marine Order 95 (Marine pollution prevention – garbage): • putrescible waste will only be discharged to sea if comminuted to 25 mm or less and discharged en route when greater than 3 nautical miles from the 'territorial sea baseline'. • if putrescible waste is not comminuted to 25 mm or less, it will be discharged greater than 12 nautical miles from the territorial sea baseline while en route.	**MC 8.1** Records demonstrate vessels are compliant with Marine Order 95 – pollution prevention (as appropriate to vessel class).	**P6**

EPO references	Control measure	Environmental performance standard	Measurement criteria	Risk ID reference
		EPS-8.2 Vessels and MODU comply with Marine Order 96 – pollution prevention – sewage (as appropriate to vessel class) which include the following requirements: • a valid International Sewage Pollution Prevention Certificate, as required by vessel class • an ASMA approved sewage treatment plant • a sewage comminuting and disinfecting system • a sewage holding tank sized appropriately to contain all generated waste (black and grey water) • discharge of sewage which is not comminuted or disinfected will only occur at a distance of more than 12 NM from the nearest land • discharge of sewage which is comminuted or disinfected using a certified approved sewage treatment plant will only occur at a distance of more than 3 NM from the nearest land • discharge of sewage will occur at a moderate rate while support vessel is proceeding (> 4 knots), to avoid discharges in environmentally sensitive areas.	**MC-8.2** Records demonstrate vessels have valid International Sewage Pollution Prevention Certificates.	
EPO-09 **EPO-14** **EPO-15**	**CM-09** Oily water treatment system in place	**EPS-9.1** Vessels and MODU comply with Marine Orders 91 – oil (as relevant to vessel class) requirements which include mandatory measures for the processing of oily water prior to discharge including: • machinery space bilge/oily water shall have International Maritime Organisation (IMO) approved oil filtering equipment (oil/water	**MC-9.1** Records demonstrate vessels are compliant with Marine Order 91 – pollution prevention (as appropriate to vessel).	**P7** **U4**

EPO references	Control measure	Environmental performance standard	Measurement criteria	Risk ID reference
		separator) with an on-line monitoring device to measure oil in water (OIW) content to be less than 15 ppm prior to discharge. • IMO approved oil filtering equipment shall also have an alarm and an automatic stopping device or be capably of recirculating in the event that OIW concentration exceeds 15 ppm. • a deck drainage system shall be capable of controlling the content of discharges for areas of high risk of fuel/oil/grease or hazardous chemical contamination. • there shall be a waste oil storage tank available, to restrict oil discharges. In the event that machinery space bilge and deck drainage discharges cannot meet the oil content standard of <15 ppm without dilution or be treated by an IMO approved oil/water separator, they will be contained on-board and disposed of onshore.		
	CM-10 Oily water prevention system in place	**EPS-10.1** Valid International Oil Pollution Prevention Certificate, which confirms that required measures to reduce impacts of planned oil discharges are in place on vessels.	**MC-10.1** Current International Oil Pollution Prevention Certificate or equivalent is available for vessels.	
		EPS-10.2 Preventative maintenance on oil filtering equipment completed as scheduled on vessels.	**MC-10.2** Maintenance records or evidence of maintenance in operational reports available for vessels.	

EPO references	Control measure	Environmental performance standard	Measurement criteria	Risk ID reference
EPO-10	**CM-11** Chemical risk assessment process.	**EPS-11.1** Cement, clean-up fluids and WBM chemicals intended or likely to be discharged into the marine environment approved before use in accordance with the chemical risk assessment process detailed in Section 3.12.	**MC-11.1** ALARP assessment documentation shows chemicals requiring further assessment are ALARP and selected in accordance with the chemical assessment process detailed in Section 3.12.	**P8**
EPO-11	**CM-12** Solids control equipment	**EPS-12.1** WBM cuttings returned to the MODU will be processed using SCE, allowing reuse of mud, where possible, before discharge.	**MC-12.1** Records demonstrate operational SCE is in use during riser in-place drilling.	**P9**
	CM-13 Cuttings discharged below the water line	**EPS-13.1** Where cuttings are discharged overboard, they must be discharged below the water line (approx. 10 m).	**MC-13.1** Inspections and records verify cuttings discharge chute and line is below the water line.	
	CM-14 Quality control for barite	**EPS-14.1** Contaminant limit concentrations in barite: • mercury (Hg) – 1 mg/kg dry weight in stock barite • cadmium (Cd) – 3 mg/kg dry weight in stock barite.	**MC-14.1** Records show contaminant limit concentrations in barite: • mercury (Hg) – 1 mg/kg dry weight in stock barite • cadmium (Cd) – 3 mg/kg dry weight in stock barite.	
EPO-12	**CM-15** Hazardous and non-hazardous waste management processes are implemented.	**EPS-15.1** Vessels and MODU comply with measures outlined in Marine Order 95 (Marine pollution prevention – garbage) as required by vessel class: • vessel(s) will have a Garbage Management Plan in place which outlines procedures for handling storing, processing and disposing of garbage.	**MC-15.1** Compliant Garbage Management Plan in place for vessels and MODU.	**U1**

EPO references	Control measure	Environmental performance standard	Measurement criteria	Risk ID reference
		EPS-15.2 A garbage record book shall be maintained with details of non-hazardous and hazardous waste volumes generated and transferred for onshore recycling or disposal.	**MC-15.2** Garbage record book is maintained and available for the vessels and MODU.	
		EPS-15.3 All hazardous and non-hazardous wastes generated at sea are retained on vessel/MODU and disposed of onshore by a licenced waste management contractor (excluding putrescible waste and sewage).	**MC-15.3** Hazardous and non-hazardous wastes records maintained and available for the vessels and MODU.	
		EPS-15.4 All personnel will be notified of the correct waste management procedures through the induction process.	**MC-15.4** Waste management procedures included in induction material.	
		EPS-15.5 All waste material that could reasonably be lost overboard is stored securely (such as lidded bins).	**MC-15.5** Inspection Report completed vessels and MODU shows waste material that could reasonably be lost overboard is stored securely.	
		EPS-15.6 All wastes, including hazardous wastes and chemicals, will be segregated into clearly marked containers.	**MC-15.6** Inspection Report completed for vessels and MODU shows hazardous wastes and chemicals will be segregated into clearly marked containers.	

EPO references	Control measure	Environmental performance standard	Measurement criteria	Risk ID reference
		EPS-15.7 All hazardous wastes and chemicals will be stored in a bunded area capable of containing leakage or spillage before onshore disposal.	**MC-15.7** Inspection Report completed for vessels and MODU shows all hazardous wastes and chemicals are stored in a bunded area capable of containing leakage or spillage.	
	CM-16 Lifting Operations Standard (ENI-HSE-ST-007)	**EPS-16.1** Lifting operations have been performed in accordance with Lifting Operations Standard (ENI-HSE-ST-007) including: • competency of persons undertaking lift • planning and preparation process for undertaking lifts	**MC-16.1** Records show compliance with Lifting Operations Standard (ENI-HSE-ST-007).	
EPO-11	**CM-17** Implementation of an IMS risk assessment tool, applied to the MODU and vessels.	**EPS-17.1** MODU and vessels to be risk assessed (e.g. the DPIRD vessel check tool or similar) demonstrating support vessels and IV are at 'low risk; of introducing invasive marine species. IMS management measures will be applied to vessels to reduce IMS risk to 'low risk'.	**MC-17.1** Completed vessel check report demonstrating MODU and vessels are 'low risk' of IMS.	**U3**
		EPS-17.2 Vessel check assessment has been reviewed or completed by member of the Eni HSE Team.	**MC-17.2** Records show vessel check assessment has been reviewed completed by member of the Eni HSE Team.	

EPO references	Control measure	Environmental performance standard	Measurement criteria	Risk ID reference
	CM-18 The MODU and vessels have an approved ballast water treatment method or system	**EPS-18.1** Compliance with Australian Ballast Water Management Requirements (as defined under the Biosecurity Act 2015) (aligned with the International Convention for the Control and Management of Ships' Ballast Water and Sediments) to prevent the introduction of IMS..	**MC-18.1** Administrator-approved ballast water management plan Completed ballast water record book or log.	
	CM-19 IMS management methods applied to the MODU and vessels	**EPS-19.1** IMS management measures will be applied to IV and support vessels according to risk to minimise the likelihood of IMS being introduced (such as the treatment of internal systems, IMS Inspections or cleaning) to minimise the likelihood of IMS being introduced and reduce risk to 'low risk'.	**MC-19.1** Records of management measures which have been implemented where identified to reduce risk to 'low'.	
EPO-14 **EPO-15**	**CM-20** Vessel spill response plan (Shipboard Oil Pollution Emergency Plan (SOPEP)).	**EPS-20.1** SOPEP kept onboard MODU and vessels and contains plans in case of an oil spill to prevent spills reaching the marine environment, as appropriate to vessel class.	**MC-20.1** Approved SOPEP available onboard MODU and vessels, as appropriate to vessel class.	**U4** **U6**
	CM-21 Spill response kits located in proximity to hydrocarbon storage and bunkering areas and appropriately stocked and replenished as required.	**EPS-21.1** Spill response kits have been located in proximity to hydrocarbon storage and bunkering areas and appropriately stocked as required to prevent spills reaching the marine environment..	**MC-21.1** Inspection report completed shows spill kits located in proximity to hydrocarbon storage and bunkering areas.	
EPO-14	**CM-22** NOPSEMA accepted MODU Safety Case	**EPS-22.1** MODU Safety Case includes control measures for well control that reduce the risk of an unplanned release of hydrocarbons.	**MC-22.1.** Acceptance letter from NOPSEMA demonstrates the Safety Case is accepted before drilling.	**U5**

EPO references	Control measure	Environmental performance standard	Measurement criteria	Risk ID reference
	CM-23 NOPSEMA accepted Well Operations Management Plan	**EPS-23.1** Well Operations Management Plan (WOMP) in place before drilling the development wells includes control measures for well integrity that reduce the risk of an unplanned release of hydrocarbons, including: • at least two isolation barriers are in place between the reservoir and the environment.	**MC-23.1** Acceptance letter from NOPSEMA demonstrates the WOMP and application to drill were accepted by NOPSEMA before the drilling activity commencing.	
	CM-24 BOP specification and function testing	**EPS-24.1** BOP installed during relevant drilling operations and has specification and function testings undertaken in accordance with: • Eni Well Control Manual STAP-P-1-MG-26524 • OEM Standards • API Standard 53.	**MC-24.1** Records demonstrate BOP and BOP control system specifications and function testing were in accordance with minimum standards for the expected drilling conditions.	
	CM-25 Mutual Aid MoU for relief well drilling is in place	**EPS-25.1** Mutual Aid MoU for relief well drilling is in place which allows for expedited use of drilling rig for relief well drilling.	**MC-25.1** Records show Mutual Aid MoU for relief well drilling is in place.	
	CM-26 Eni Source Control Response Plan (ENI-WOP-PL-001).	**EPS-26.1** Eni Source Control Response Plan (ENI-WOP-PL-001) and its addendum is in place and details the steps to expedite the drilling of a relief well, including: • relief well design • simulation of the dynamic kill • high-level requirement for the rig and the equipment, volumes and the pumping pressures.	**MC-26.1** Source Control Response Plan and addendum detail: • relief well design • simulation of the dynamic kill • high-level requirement for the rig and the equipment, volumes and the pumping pressures.	

EPO references	Control measure	Environmental performance standard	Measurement criteria	Risk ID reference
	CM-27 Relevant well site personnel hold International Well Control Forum certificates.	**EPS-27.1** Relevant well site personnel to hold valid International Well Control Forum certificates.	**MC-27.1.** Relevant well site personnel to hold valid International Well Control Forum certificates.	
EPO-14	**CM-28** Bulk refuelling transfer procedures	**EPS-28.1** Vessel/MODU contractor bunkering procedure implemented for all hydrocarbon vessel bunkering and helicopter refuelling activities includes the requirements for: • a completed Permit to Work or JSA implemented for the hydrocarbon bunkering and refuelling operation • visual monitoring of gauges, hoses, fittings and the sea surface during the operation • hose checks before commencement	**MC-28.1** Records demonstrate refuelling undertaken in accordance with contractor bunkering procedures.	**U6**
		EPS-28.2 Bunkering is completed in accordance with the following: • all hoses that have a potential environmental risk after damage or failure shall be placed on a hose register that is linked to the MODU's preventative maintenance system. • there shall be dry-break couplings and flotation on fuel hoses. • there shall be an adequate number of appropriately stocked, located and maintained spill kits. • all bulk transfer hoses shall be certified for integrity before use (in accordance with OEM recommendations).	**MC-28.2** Records confirm the MODU bunkering equipment complies with the management measures to prevent bunkering spills.	

EPO references	Control measure	Environmental performance standard	Measurement criteria	Risk ID reference
		EPS-28.3 Bunkering is not undertaken in adverse weather conditions and is addressed within a JSA.	**MC-28.3** Records demonstrate consideration of daylight and weather conditions before undertaking bunkering and refuelling operations.	
	CM-29 MDO use on vessels (no IFO or HFO fuel use)	**EPS-29.1** MDO use on vessels (no IFO or HFO fuel use).	**MC-29.1** Fuel records show MDO use on vessels (no IFO or HFO fuel use).	

11 IMPLEMENTATION STRATEGY

The purpose of the implementation strategy section is to manage the activities and their associated environmental risks to ALARP and ensure environmental performance is monitored. Regulation 14(1) of the OPGGS(E) Regulations requires that the EP contain an implementation strategy. To meet this Regulation, this section:

- describes the environmental management system for the activity, including specific measures to be used to ensure that, for the duration of the activity:
  - the environmental impacts and risks of the activity continue to be identified and reduced to a level that is as ALARP
  - 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
  - environmental performance outcomes and standards set out in the environment plan are being met. (Regulation 14[3]).
- establishes a clear chain of command and sets out the roles and responsibilities of personnel responsible for implementing, managing and reviewing the EP (Regulation 14[4])
- presents measures to ensure all personnel directly undertaking works or associated works related to the activity have the appropriate competencies and training and are aware of their responsibilities under this EP (Regulation 14[5])
- provides sufficient monitoring, recording, audit, management of non-conformance and review of the titleholder's environmental performance and the implementation strategy to ensure the environmental performance outcomes and standards in the environment plan are being met (Regulation 14[6])
- provides for sufficient monitoring of, and maintaining a quantitative record of, emissions and discharges (whether occurring during normal operations or otherwise), such that the record can be used to assess whether the environmental performance outcomes and standards in the environment plan are being met (Regulation 14[7])
- includes a process for maintaining an OPEP (Regulation 14[8]).

This section presents the implementation strategy for the Petroleum Activities Program.

11.1 Systems, Practices and Procedures

11.1.1 Health, Safety and Environment Management System Overview

Eni's management of HSE matters is arranged hierarchically in three distinct levels:

- Corporate-level Management System
- Regional (Eni Australia)-level HSE Integrated Management System (HSE IMS)
- Blacktip Facilities Management System.

Within Eni Australia, HSE management is delivered at the regional and asset level through the Eni HSE IMS, which is the means by which all HSE hazards and risks are controlled. The HSE IMS refers to the totality of Eni Australia's management systems in terms of:

- the concepts, policies, strategies, HSE goals, processes, procedures and work instructions that comprise the formal content of the HSE IMS
- the organisational structures, communication systems, safety-related data, roles and responsibilities, competencies and training needed by the personnel
- the physical elements that are critical to safety (equipment, structures and engineered systems), including the codes and standards used to design and construct them.

This section provides a description of Eni's IMS from the corporate level through to implementation.

11.1.2 Eni Corporate Management System Guidelines

Eni Australia adopts the guidelines provided by its corporate parent, Eni Natural Resources, which issued a Divisional Directive for developing a Management System Guideline –HSE (MSG-HSE-ENI-SPA-ENG). This chapter provides structure and guidance notes for Safety Management System development based on the five main elements and 18 sub-elements of the system shown in Figure 11-1.

These elements are largely based on the structure of the ISO 14001 and OSHAS 18001 series of standards and therefore provide a consistent and recognisable platform for managing safety, while also ensuring the intent of the principle of continuous improvement is followed.

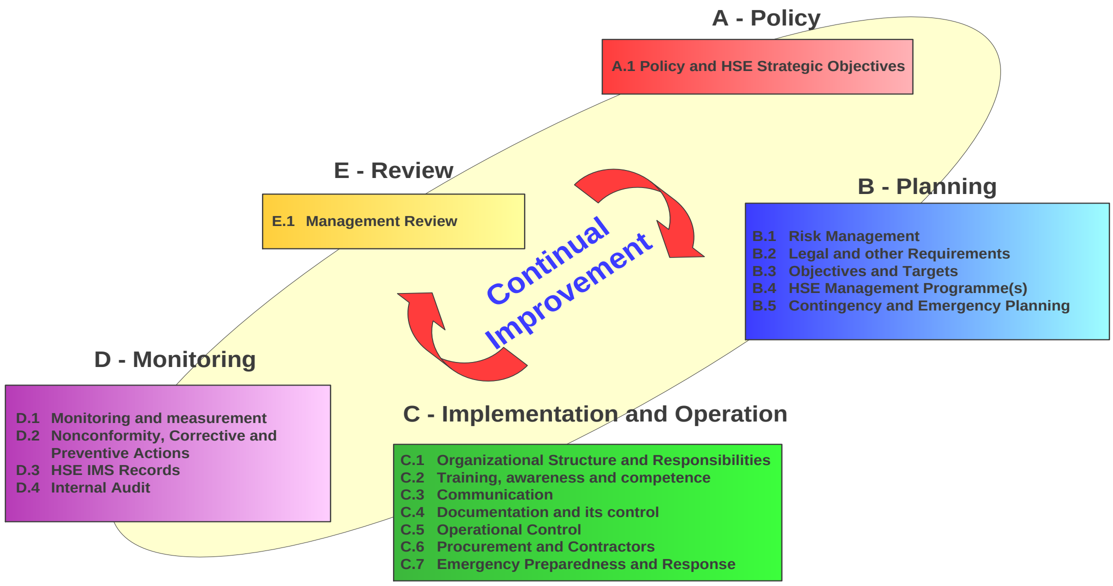


Figure 11-1: The five elements of the Eni health, safety and environment integrated management system

11.1.3 Regional Eni Australia Health, Safety and Environment Integrated Management System

The Eni Australia HSE IMS, which covers Petroleum Activities Program, has been certified against the standards of :

- ISO 14001: Environmental Management System
- ISO 45001: Occupational Health and Safety Management
- AS/NZS 4801: Occupational Health and Safety Management.

In addition, the system uses the guidelines of ISO 17776 in its overall risk assessment approach.

Audits are performed to verify conformance with these standards and the Eni Natural Resources Corporate Directive.

The HSE IMS Framework Document (ENI-HSE-IN-002) serves as the key reference for Eni Australia's HSE IMS and is an information source for Eni employees and contractors.

The HSE IMS Framework Document provides an overview of the strategies that are used to manage HSE aspects of Eni Australia's operations, including emergency response, risk and security, and ensure their continual improvement in line with established objectives and targets. This document also describes the core elements of the HSE IMS and their interaction with related documentation.

The HSE IMS Framework Document sets out a number of functional requirements for HSE management. Eni Australia has developed a set of supporting documents that provide standards, processes, guidelines and criteria and information by which the functional requirements can be met. The documents are generally classified as either information, standards, procedures or specification documents.

The HSE Standards cover a broad range of high-risk activities and outline Eni Australia's minimum requirements and expectations across its operations. The HSE Standards complement the Eni Australia HSE Golden Rules and are based on worldwide IOGP and company best practices.

The HSE Standards apply to all personnel working on Eni sites, whether they are an employee, contractor or visitor. The Standards apply to activities where Eni has direct operational control but also apply to activities where Eni has a prevailing influence over the performance of its contractors and suppliers.

The HSE IMS Framework Document also describes how occupational health and safety are managed by Eni Australia in a style promoted by a philosophy of objective- or risk-based regulation and continuous improvement.

At the apex of the system is Eni's HSE Statement (Appendix C). The statement is approved by the Managing Director and provides a public statement of Eni's commitment to the environment and improving environmental performance.

11.2 Roles and Responsibilities

Table 11-1 summarises key roles and responsibilities of Eni personnel and contractors for implementing the Petroleum Activities Program.

Table 11-1: Key roles and responsibilities for health, safety and environment management for the Petroleum Activities Program

Role	Responsibilities
Onshore personnel	
Eni Drilling Manager	Reviewing this EP and confirming all environmental risks have been identified, mitigation strategies are effective and will be undertaken during field management and field management and P&A activities, including emergencies or potential emergencies. Ensuring: • compliance with all environmental regulations and the EP • the requirements of the EP are communicated to third-party contractors • all personnel are inducted and are aware of their environmental responsibilities • environmental audits are undertaken on project vessels to verify compliance with the EP • all equipment is maintained and in an operable condition • actions are tracked in an action register, implemented and closed out, including corrective actions identified during audits • waste is managed on all vessels according to this EP. Reporting all environmental incidents to the Eni Operations Manager, HSE & Corporate Social Responsibility Manager and IMT Leader. Notifying NOPSEMA of all activities ten days before commencing the activity and ten days after completing the activity. Reporting to NOPSEMA any environmental incident (as in, reporting 'reportable incidents' and 'recordable incidents') (Section 11.8.2).
Eni Drilling Superintendent	Ongoing communications with Offshore Installation Manager (OIM). Reviewing this EP and confirming all environmental risks have been identified, mitigation strategies are effective and will be undertaken during field management and field management and P&A activities, including emergencies or potential emergencies. Ensuring compliance with all environmental regulations and the EP. Reporting all environmental incidents to the Eni Drilling Manager, HSE Manager and IMT Leader.
SEQ Manager (office-based)	Reviewing this EP and confirming all environmental risks have been identified, mitigation strategies are effective and will be undertaken during activities, including emergencies or potential emergencies. Providing and maintaining effective emergency response arrangements for project activities where there is potential environmental risk. Performing incident investigations. Submitting annual environmental compliance report to NOPSEMA.

Role	Responsibilities
Senior Environmental Advisor (office-based)	Reviewing HSE Management Plans for acceptability and ensuring compliance with this EP. Reporting all incidents to NOPSEMA in accordance with Section 11.8.2. Coordinating and reviewing environmental audits to ensure compliance with the agreed EPOs. Providing advice in the event of an oil spill or other environmental incident.
HSE Assurance Advisor	NOPSEMA monthly environment reporting of 'recordable incidents'.
Eni IMT Leader	Directing the Eni response in the event of an incident. Notifying NOPSEMA of the details of reportable incidents and providing updates on the status of the incident Notifying AMSA in the case of vessel incidents. Communicating with IMT and Crisis Management Team (CMT), government, stakeholders and media in the event of an incident.
Eni IMT Duty Officer	Acting as the first point of contact in an incident. Notifying the Eni IMT Leader of the incident.
Offshore personnel	
Eni Offshore Representative	Reviewing this EP and confirming all environmental risks have been identified and mitigation strategies are effective and will be undertaken during activities, including emergencies or potential emergencies. Notifying the Eni Operations Manager, HSE & Corporate Social Responsibility Manager and Drilling Manager, should additional environmental risks arise during the activities that have not been identified in this EP. Ensuring all offshore personnel comply with the health, safety and environmental requirements. Ensuring all personnel receive the Eni environmental induction before commencing drilling activities. Providing a daily log of activities and reporting reportable and recordable incidents to the Drilling Manager. In the event of an emergency, communicating between the support vessel(s) and the Eni IMT in Perth. Implementing and complying with all operational plans, including this EP. Ensuring all required plans, audits and reviews are undertaken in accordance with the regulatory requirements and as required by this EP. Implementing and closing out actions in the Campaign Action Register. Ensuring all monitoring is undertaken in accordance with this EP (Section 11.5) and data is made available to the Drilling Manager. Ensuring adherence to management and mitigation measures outlined to minimise interaction with cetaceans and other marine fauna.

Role	Responsibilities
	Ensuring all whale interaction reports are submitted to the Environment Advisor. Notifying NOPSEMA of the details of reportable incidents and providing updates about the status of the incident(Section 11.8.2). Investigating hydrocarbon spills, should they occur.
MODU OIM/Vessel Master	Ensuring full compliance with all applicable navigational safety standards and regulations. Conducting emergency drills. Supervising MODU/vessel crew to ensure they are fit for duty and undertaking work only within their area of qualification and training. Monitoring, reporting and taking appropriate action to remedy any MODU/vessel or equipment defects that may impact on safety and environmental performance of the vessel. Maintaining logs with respect to MARPOL 73/78 regulations. Ensuring all crew are appropriately qualified, trained and equipped for their roles on the MODU/vessel. Ensuring MODU/vessel activities comply with the requirements of this EP. Notifying all MODU/vessel-related incidents immediately to the Eni Site Representative.
MODU/vessel operators, technicians and crew	Applying operating procedures in letter and in spirit. Following good housekeeping procedures and work practices. Encouraging improvement in environmental performance, wherever possible. Immediately reporting environmental incidents or spillage of hydrocarbons or chemicals to the MODU OIM/Vessel Master.

11.3 Training

11.3.1 General Arrangements

All staff and contractors working on the Petroleum Activities Program must undertake an induction. The induction programs include:

- Company Induction

Training is provided to employees and contractors at Eni as appropriate in order to ensure individuals have the skills, knowledge and competencies to fulfil their roles.

The training process has been established to ensure training activities are interactive, effective, competency-based and auditable, in terms of frequency of sessions and attendance of individuals.

Mandatory HSE training for both contractors and employees includes:

- Eni company induction, which includes:
  - Eni Golden Rules
  - HSE IMS

  - substance abuse.

Other HSE training, based on roles and responsibilities, includes:

- dangerous goods awareness
- management of change
- Safety Case awareness and legislation
- hazard identification and risk management
- manual handling
- HSE Management System and auditing
- Taproot incident investigation
- HSE for supervisors.

OPEP training requirements are outlined in the Blacktip Operations OPEP (000036_DV_PR.HSE.0388.000_Rev14).

11.3.2 Drilling and Workover-Specific Arrangements

All personnel will be required to undertake an environmental induction upon boarding the MODU undertaking drilling activities. The environmental induction will instruct personnel on the issues and management actions identified in this EP as well as their roles and responsibilities with regards to environmental performance. The induction will cover aspects such as:

- environmental regulatory requirements of the drilling activity
- marine mammal interaction:
  - requirement to record and report sightings of whales and dolphins.
- requirements for waste, segregation, labelling, handling and storage
- requirements for recording waste movements and transfers in garbage record book
- housekeeping and spill prevention:
  - requirements to store chemicals, oils and wastes in designated area
  - location of spill kits.
- spill preparedness and response:
  - alerting procedure and immediate spill response actions.
- environmental incident reporting:
  - requirements for reporting reportable and recordable incidents.

11.4 Competency

11.4.1 Contractor Selection and Management

All Eni contractors must have satisfied the general HSE prerequisites in the contractor selection process in accordance with the Contractor HSE Management Procedure (ENI-HSE-PR-008) and Contractor HSE Specification and Requirements (ENI-HSE-SP-002).

In addition to this, Eni Australia ensures contractor personnel receive appropriate training on their HSE responsibilities in connection with Petroleum Activities Program. This may be achieved in a number of ways; in particular all workforce, including contractors, attend HSE Forums which contain a range of HSE awareness presentations and training.

Eni will agree and approve the competencies of the contractor's technicians before they start work in relation to the Petroleum Activities Program. All subcontractors and specialist services providers engaged under the maintenance services contract will similarly be approved by Eni.

11.4.2 Verification of Competence

Personnel qualification and training records will be sampled before and/or during an activity. Such checks will be performed during the procurement process, inductions, crew change, and operational inspections and audits using the Eni CAMS process .

11.5 Monitoring

For the Petroleum Activities Program, information is collected for monitoring compliance to the EPOs, CMs, EPSs and MC in this EP (refer Section 10). At a minimum, evidence identified in the MC in Table 10-2 will be collected and used to demonstrate the EPOs and EPSs are met.

Systems that may be used by Eni and contractors to monitor environmental performance for the Petroleum Activities Program are:

- daily vessel or drilling reports during relevant offshore activities
- monthly drilling reports, which include the number of toolboxes and training undertaken, waste, discharges and cetacean sightings
- reports from monitoring as detailed in Table 11-2
- contractor inspections and audits
- review of waste management and recycling records
- audits against the management system, EP requirements or other requirements (Section 11.6).

Eni will have the ability to identify compliance issues, identify non-conformance, activity risks and impacts through the monitoring and auditing systems and tools described above.

Table 11-2: Environmental monitoring parameters

Sources of risk	Monitoring criteria	Threshold limit	Monitoring method
Atmospheric emissions from combustion engines	Volume of diesel consumed	Not prescriptive limit but principle of ALARP to be applied	Diesel consumption
Generation and disposal of non-hazardous and hazardous wastes	Volume of solid waste transferred for onshore disposal	No prescriptive limit but principle of ALARP to be applied	Calculated based on capacity of storage containers
Discharge of sewage, grey water and putrescible wastes	Estimated volume of sewage, greywater, and mass of food scraps discharged overboard	No prescriptive limit but principle of ALARP to be applied	Estimated based on persons on board, storage capacity and dimensions of discharge point
Discharge of contaminated water	OIW concentration of treated wastewater	≤ 15 mg/L	Continuous automatic OIW monitor

11.5.1 Waste Monitoring

Waste management records shall include:

- waste manifests for all wastes transferred to shore
- waste type and volumes disposed of to landfill
- waste type and volumes recycled
- estimate of macerated food and sewage waste discharged offshore.

All waste transported from offshore will be properly manifested. Waste manifests will include information about:

- manifest identification number
- quantity (m^3/Kg)
- waste description
- waste container(s) number and description
- date of shipment
- final destination description (such as incineration, landfill)
- generator data
- transporter(s) data and waste acceptance declaration
- receiver data and waste acceptance declaration
- dangerous goods class and United Nations number (for environmentally hazardous waste)
- special handling instructions
- any other information required by the waste contractor.

11.6 Auditing and Inspection

Compliance verification and auditing processes for managing HSE is performed on a number of levels.

At the Eni Australia HSE IMS level, there is a management system element dedicated to the audit and review process and an HSE Auditing Procedure (ENI-HSE-PR-005). This requires that the management system be formally reviewed to ensure ongoing effectiveness and continual HSE improvement. It also ensures critical HSE processes are in place; for example, the HSE auditing of contractors and sub-contractors, and annual audit of the Permit to Work system.

At a contractor management level, the HSE performance of the maintenance services contractor, and other contractors, is assessed as part of the contractual performance review process. Eni also reserves the right to undertake HSE audits on contractors and their subcontractors.

At an activity level, HSE monitoring is performed as part of the execution of discrete work scopes. For these activities, a project-specific plan is prepared that will identify HSE audits, such as pre-mobilisation, during activity execution. This process applies to the audit and inspection of vessels and equipment to be used in projects (such as ROV).

Environmental audits and inspections aim to:

- identify potential new, or changes to existing, environmental impacts and risk, and methods for reducing those to ALARP
- confirm mitigation measures detailed in this EP are effectively reducing environmental impacts and risk, that mitigation measures proposed are practicable and provide appropriate information to verify compliance
- confirm compliance with the EPOs, CMs and EPSs detailed in this EP.

Eni is certified against the relevant standards, including the OHSA 18001, ISO 14001 and AS/NZ 4801 management systems, by a third-party verification body.

Further details regarding specific audits are outlined in Sections 11.6.1 to 11.6.2.

11.6.1 Vessel Audits

Before chartering or subcontracting new vessels, technical evaluation will be undertaken to verify compliance with applicable international rules, regulations and conventions, State and Commonwealth requirements and Eni standards and best practice. New vessels (not previously used by Eni Australia) will be subject to an audit of the complete set of vessel documents and an Offshore Vehicle Inspection Database or International Marine Contractors Association inspection will be requested. Vessels used regularly are required to have a vessel audit completed every 12 months.

Internal auditing is also undertaken for vessels to collect evidence for and assure compliance with EP commitments. Compliance documentation and evidence is collected on an ongoing basis.

Before drilling, the proposed rig will also be inspected to verify suitability and compliance with Eni requirements.

11.6.2 Environmental Inspections

An environment inspection will be conducted during the development drilling, to ensure the requirements of this EP are being met. Table 10-2 will be used as a basis for the inspection checklist.

The environmental inspection will be conducted by the Offshore HSE Representative or Environmental Advisor and may include verification of:

- Bunkering and transfers between vessels and MODU and offshore supporting vessels
- environment containment, including chemical storage, spill response equipment and housekeeping
- general MODU environment risks, including waste management, drilling fluids oil/water separation and inspection of subsea and moonpool areas
- other relevant MC applicable during the activity.

11.7 Non-Conformance, Corrective and Preventative Actions

The incident investigation team makeup is based upon the investigation level. As a general guide, the investigation teams consist of:

- Level A: team may be comprised exclusively of site personnel
- Level B: team should consist of combined site and office personnel
- Level C: team should consist of combined site, office and external or headquarters experts.

Non-conformances can result from audits. Close-outs of non-conformances are recorded and tracked in an action tracking database in accordance with Corrective Action Tracking and Non-Conformance Reporting (ENI-HSE-PR-015).

Corrective and preventative actions are raised for all identified hazards and incidents according to Eni Australia Hazard and Incident Reporting Procedure (ENI-HSE-PR-003). Corrective and preventative actions are registered and maintained within the SharePoint system.

It is the responsibility of Department Managers to ensure corrective and preventative actions relevant to their area of responsibility are undertaken, tracked and completed. The HSE Manager ensures all corrective and preventative actions are tracked and that appropriate reminders are communicated to relevant Department Managers.

HSE hazards and incidents are investigated in accordance with Procedure Incident Investigation (ENI-HSE-PR-025*)*. Root cause analysis of incidents is performed to determine the cause and aid identification of corrective actions.

External incident reporting is detailed in Section 11.8.3.

11.8 External Reporting

11.8.1 Routine Reporting

Routine regulatory reporting requirements for the Petroleum Activities Program are summarised in Table 11-3. The requirements include that Eni develops and submits an end-of-activity EP Performance Report to NOPSEMA for the drilling, in accordance with Regulation 26C(c) of the OPGGS(E) Regulations.

Table 11-3: Routine external reporting requirements

Requirements	Recipient	Timing	Content
Before the Activity			
Notify AHO of the activity commencement date and duration to enable a Notice to Mariners to be issued	AHO	Email AHO four weeks before the confirmed activity start date.	Written.
Notify AMSA's Joint Rescue Coordination Centre through rccaus@amsa.gov.au (Phone: 1800 641 792 or +61 2 6230 6811) for promulgation of radio-navigation warnings	AMSA	24 to 48 hours before activities commence.	Written.
Notify NOPSEMA of the start date of the activity in accordance with Regulation 29 of the OPGGS(E) (submissions@nopsema.gov.au)	NOPSEMA	Email NOPSEMA at least ten days before the activity starting.	Complete NOPSEMA's Regulation 29 Start or End of Activity Notification Form before petroleum activity.
Defence is notified a minimum of five weeks prior to the commencement of activities. Notification will be provided to Offshore.Petroleum@defence.gov.au	Defence	Minimum of five weeks before the confirmed activity start date.	Notification will be provided to Offshore.Petroleum@defence.gov.au.
During the Activity			
Notify NOPSEMA of the end date of the activity in accordance with Regulation 29 of the OPGGS(E) Regulations (submissions@nopsema.gov.au)	NOPSEMA	Email NOPSEMA within ten days of the end of the activity.	Written.
Notify DMIRS of the end date of the subsea equipment recovery executions (petroleum.environment@dmirs.wa.gov.au)	DMIRS	Before subsea equipment recovery.	Notify DMIRS of the end-date recovery executions, (petroleum.environment@dmirs.wa.gov.au).

Requirements	Recipient	Timing	Content
Notify AMSA of any oil pollution incidents in Commonwealth waters	AMSA	Within two hours of any oil pollution incidents in Commonwealth waters.	In accordance with the *Navigation Act 2012*, any oil pollution incidents in Commonwealth waters will be reported by the Vessel Master to AMSA within two hours via the national emergency notification contacts and a written report within 24 hours of the request by AMSA. The national 24-hour emergency notification contact details are: Freecall: 1800 641 792 Fax: (02) 6230 6868 Email: mdo@amsa.gov.au.
Department of Transport reporting All actual or impending marine oil pollution incidents that are in, or may impact, State waters resulting from an offshore petroleum activity	Oil Spill Response Coordination	Within two hours.	Oral. Notification of actual or impending spillage, release or escape of oil or an oily mixture that is capable of causing loss of life, injury to a person or damage to the health of a person, property or the environment. All oil pollution incidents in WA State waters will be reported by the Vessel Master to the Oil Spill Response Coordination Unit within DoT as soon as practicable (within two hours of spill occurring) via the 24-hour reporting number (08) 9480 9924. The Duty Officer will then advise whether the following forms are required to be submitted: • Marine Pollution Form (POLREP); http://www.transport.wa.gov.au/mediaFiles/marine/MAC-F-PollutionReport.pdf • Marine Pollution Situation Report: http://www.transport.wa.gov.au/mediaFiles/marine/MAC-F-SituationReport.pdf.

Requirements	Recipient	Timing	Content
Director of National Parks reporting Notification of the event of oil pollution within a marine park or where an oil spill response action must be taken within a marine park; or if there are any changes to intended operations (requested through consultation)	DNP	So far as reasonably practicable before writing response action.	Oral and written. DNP should be made aware of oil and gas pollution incidences which occur within a marine park, or are likely to impact on a marine park, as soon as possible. Notification should be provided to the 24-hour Marine Compliance Duty Officer on 0419 293 465. The notification should include: • titleholder details • time and location of the incident (including name of marine park likely to be affected) • proposed response arrangements as per the OPEP (such as dispersant, containment) • confirmation of providing access to relevant monitoring and evaluation reports when available • contact details for the response coordinator. Note DNP may request daily or weekly Situation Reports, depending on the scale and severity of the pollution incident.
DPIRD reporting If marine pests or disease are suspected, this must be reported to DPIRD	DPIRD	Within 24 hours.	Notification (written) of any suspected marine pests or diseases, including any organism listed in the Western Australian Prevention List for Introduced Marine Pests and any other non-endemic organism that demonstrates invasive characteristics.
DCCEEW reporting Any harm or mortality to EPBC Act listed threatened marine fauna	DCCEEW	Within seven days to EPBC.permits@environment.gov.au.	Notification (written) of any harm or mortality to an EPBC-listed species of marine fauna, whether attributable to the activity or not.
DBCA reporting Any harm or mortality to fauna listed as threatened under the WA *Biodiversity Conservation Act 2016*	DBCA	Fauna report submitted within seven days to fauna@dbca.wa.gov.au.	Notification of any harm or mortality to fauna listed as a threatened species under the WA *Biodiversity Conservation Act 2016* as a result of activities.

Requirements	Recipient	Timing	Content
Australian Marine Mammal Centre reporting Any ship strike incident with cetaceans will also be reported to the National Ship Strike Database	DCCEEW	As soon as practicable.	Ship strike report provided to the Australian Marine Mammal Centre: https://data.marinemammals.gov.au/report/shipstrike.
NOPSEMA reportable incident	Refer Section 11.8.2.		
NOPSEMA recordable incident	Refer Section 11.8.2.		
After the Activity			
Submit an end-of-activity EP Performance Report to NOPSEMA, in accordance with Regulation 26C(c) of the OPGGS(E) Regulations	NOPSEMA	Submit to NOPSEMA within three months of submission of each Regulation 29(2) end-of-activity notification to NOPSEMA. For example, three months of decommissioning subsea equipment recovery completion.	This reports compliance against each of the performance outcomes and standards as outlined in Section 11 of this EP and: • reportable and reportable incidents, investigation details, corrective actions determined and actioned • monitoring records • inspection and audit outcomes • summary of the activity operations conducted. The total amount of waste disposed will be included in the environmental performance report (details about waste records are included in Section 11.5.1) As detailed in draft Section 270 NOPSEMA Advice – Consent to Surrender Title (NOPSEMA, 2021), the report will also cover: • demonstration that all conditions and obligations included in the EP have been met • evidence that assumptions, performance standards and measurement criteria have been met where applied to conditions or obligations • detail of any criteria or obligation that has not been met, and any changes to the conditions or obligations approved in the accepted EP • any variations from the accepted decommissioning operations and work plan

Requirements	Recipient	Timing	Content
			• confirmation that the control measures applied to manage the impacts and risks associated with an accepted deviation have been effective • any immediate consequences observed as a result of decommissioning operations and works.
DCCEEW Marine fauna observation data	DCCEEW	Submit to DCCEEW within three months of activity completion.	Provide marine fauna observation data to DCCEEW through its online Cetacean Sightings Application.

11.8.2 Incident Reporting (Reportable and Recordable)

11.8.3 Reportable Incidents

Under OPGGS(E) Regulation 16(c), 26 and 26A – Reportable Incident, NOPSEMA must be notified of any reportable incidents. For the purposes of Regulation 16(c), a reportable incident is defined as an incident relating to the activity that has caused, or has the potential to cause, moderate to significant environmental damage.

- For the Petroleum Activities Program, a reportable incident includes:
  - oil spills of more than 80 L in Commonwealth waters
  - an incident that has caused or has the potential to cause environmental damage with a consequence level of Local (3) or above (Table 6-2). This includes:
    - Introduction of IMS (Section 8.3)
    - Loss of Containment from Well Blowout (Section 8.6).

Table 11-4 details the reportable incident requirements.

Table 11-4: Reportable Incident reporting requirements

Requirement/required information	Timing	Type	Recipient
The oral notification must contain: • all material facts and circumstances concerning the reportable incident known or that by reasonable search or enquiry could be found out • any action taken to avoid or mitigate any adverse environmental impacts of the reportable incident • the corrective action that has been taken, or is proposed to be taken, to stop, control or remedy the reportable incident.	As soon as practicable, and in any case not later than two hours after the first occurrence of a reportable incident or, if the incident was not detected at the time of the first occurrence, at the time of becoming aware of the reportable incident.	Oral	NOPSEMA
A written record of the oral notification must be submitted. The written record is not required to include anything that was not included in the oral notification.	As soon as practicable after the oral notification.	Written	NOPSEMA NOPTA
A written report must contain: • all material facts and circumstances concerning the reportable incident known or that by reasonable search or enquiry could be found out • any action taken to avoid or mitigate any adverse environmental impacts of the reportable incident • the corrective action that has been taken, or is proposed to be taken, to stop, control or remedy the reportable incident • the action that has been taken, or is proposed to be taken, to prevent a similar incident occurring in the future. Consider reporting using NOPSEMA's Report of an Accident, Dangerous Occurrence or Environmental Incident Form.	Must be submitted as soon as practicable, and in any case not later than three days after the first occurrence of the reportable incident, unless NOPSEMA specifies otherwise. Same report to be submitted to NOPTA and DMIRS within seven days after giving the written report to NOPSEMA.	Written	NOPSEMA NOPTA

In addition:

- any injury or death of whales, dolphins or turtles related to the activity (such as vessel strike) must be reported immediately to DCCEEW, as these species are protected under the EPBC Act.
- Defence will be made aware of any high velocity exhaust gas plumes and/or burn-offs that could impact safety of flights.

In addition, as per the Blacktip Drilling OPEP, Eni will:

- contact the DPIRD Response Officer within 24 hours after reporting to NOPSEMA an oil spill or discharge of any other pollutant into the marine environment
- as soon as possible, make DNP aware of incidences that occur within an AMP or are likely to impact an AMP.

11.8.4 Recordable Incidents

Under the OPGGS Act, a 'recordable incident' for an operator of an activity is 'a breach of an EPO or EPS that applies to the activity and is not a reportable incident'.

Recordable incidents will be reported to the Regulatory Authority as per the OPGGS(E) Regulations (as in, monthly report of recordable incidents sent by the 15th of the following month), including the submission of 'nil' reports if no environmental incidents have occurred.

11.9 Internal Reporting

All environmental incidents, deviations from this EP, or events that do not meet the EPOs of the EP will be recorded and reported to Eni, using the Eni Procedure Hazard and Incident Reporting and Investigation (ENI-HSE-PR-003). This includes entering the incident into the incident tracking database, accessible by contractor supervisors and Eni personnel.

Some examples of environmental incidents that need to be reported to Eni include:

- the uncontrollable escape or ignition of petroleum or any other flammable or combustible material causing a potentially hazardous situation
- spills of hydrocarbons, hydraulic fluids or any other chemicals, of any volume
- unplanned releases of gas
- overboard disposal of solid waste (accidental or intentional)
- loss of equipment to the ocean (dropped objects)
- incorrect disposal of wastes onshore by waste contractors.

11.10 Knowledge-Sharing and Health, Safety and Environment Communication

HSE communications include both internal communication to employees and external communication to stakeholders and is managed in accordance with Procedure HSE Communications, Consultation and Participation (ENI-HSE-PR-016). Emergency communications are described in the Emergency Response Plan (000036_DV_PR.HSE.0675.000).

HSE commitments and obligations are established, recorded, maintained, communicated and managed within Eni in accordance with Procedure Maintaining Knowledge of HSE Commitments and Obligations (ENI-HSE-PR-006).

11.10.1 Internal Communications with Eni Exploration and Production Division

Regular communications from the Eni Natural Resources Division regarding HSE matters include:

- guidelines for establishing annual HSE objectives
- requests of monthly, quarterly and annual reports
- documentation relevant to establishing budgetary provisions for HSE activities
- highlighting of actions to improve certain objectives
- reports about HSE audits that may have occurred
- incident reporting and investigation and lessons learned
- publication of HSE articles in the Company's publications
- distribution of the policy, procedures and other documents of the HSE Management System
- publication of Eni's annual Sustainability Report
- any other communication specific to a particular HSE event.

Eni Australia regularly communicates HSE performance information to Eni's Natural Resources Division through:

- monthly, quarterly and annual reports
- accident and incident reports and investigation
- audit and corrective action close out status
- HSE Qualitative Report (Four Year Plan) (ENI-HSE-RP-011) and HSE Annual Plan (ENI-HSE-PL-031).

11.10.2 Internal Eni Australia Communications

Typical examples of key internal Eni communications are:

- weekly management meetings
- morning call
- back-to-back roster handovers

- Blacktip HSE meetings
- pre-start meetings
- safety initiatives and communications
- management safety visits.

11.10.3 Non-Verbal Communication

In addition to the meetings described above, there are non-verbal means of communicating HSE issues within Eni, including:

- Eni Intranet websites
- emails
- HSE noticeboards.

The Eni Intranet site has a HSE page that contains links to:

- HSE IMS
- reporting forms
- incident and crisis management documentation
- Blacktip Safety Case documentation
- Blacktip Environmental Management Plan
- Blacktip Emergency Response documentation
- Blacktip Health Risk Assessment.

Emails are regularly used to communicate HSE issues within Eni. Typically, these would be:

- HSE Alerts – HSE Alerts are specific alert notices that arise from Hazard and Incident Reports and are typically only considered for high-potential incidents. The HSE Manager will decide whether to issue a HSE Alert to inform the wider workforce.
- HSE Bulletins – Notices on HSE topics that need to be raised in the workforce can be done so using HSE Bulletins. They can focus on a HSE theme or just raise a specific item of interest. The HSE Manager coordinates the development of new HSE Bulletins.

HSE noticeboards are present in all Eni offices and plants. They function to inform the workforce about HSE issues. The content of the noticeboard is managed by the POS. Regular items which are placed on the HSE noticeboards include:

- HSE Commitment Statement
- incident statistics
- incident descriptions
- audit reports
- hazard cards (for reporting hazards).

11.10.4 External Communications

External communication about HSE matters is typically made to a range of recipients, including governments (including government agencies and regulators), community groups, non-government organisations, customers, industry bodies and the media (Table 11-5).

Table 11-5: External communication summary

External communication	Details on communication level
Government	Eni Australia's HSE communications with government authorities is undertaken according to legislative requirements and guidelines or, where none exist, best practice. Generally, HSE communications between Eni Australia and relevant government departments are performed through the Eni Operations and HSE Departments. Records of key communications are maintained by the relevant Eni department. The Managing Director may address communications with government bodies in certain circumstances (such as major accident investigation), in which case Eni Natural Resources may also become involved.
Non-Government Organisations and Community Groups	HSE communication and consultation with non-government organisations and community groups will generally be coordinated by the HSE Department. Technical HSE communications to non-government organisations and community groups may be handled via an HSE specialist assigned to the particular project. Technical HSE communications may be undertaken by an HSE specialist.
Customers	Eni Australia actively engages with its customers, to ensure there is a common understanding of HSE issues as they relate to the supply of products. HSE communication with customers will generally be coordinated by the relevant department(s) with advice from the HSE Department.
Business and Industry Organisations	Eni is a member of the APPEA and the WA and NT Chambers of Commerce. Interaction with the business community also occurs in Eni's day-to-day business. Industry forums, such as the APPEA conferences and South East Asian & Australian Offshore Conference, allow Eni to further communicate HSE aspects. HSE communication with unions is coordinated by the Human Resources Department with advice from the HSE Department.
Media	Media liaison in relation to crisis and emergency situations is managed in accordance with the Eni Crisis Management Plan.
Public HSE Reporting	Eni Australia, through its corporate head company Eni Natural Resources, communicates externally to the public about Eni's significant HSE aspects through a public Sustainability Report. This report contains information about the HSE performance of Eni Divisions and Business Units, including Eni Australia. The Sustainability Report enables Eni to share its vision and commitment to sustainable development with its staff, all relevant stakeholders and the public. It is available on the Eni internet site (www.eni.it).

11.11 Management Review and Improvement

The HSE IMS is reviewed on a minimum five-yearly basis in association with risk assessment outcomes and incident reviews for required changes. This review includes the review of any triggers requiring update to the HSE IMS (as detailed below), as well as general business planning outcomes and assessments of the effectiveness of performance standards. The review also documents actions and requirements for items, including the review and update of procedures and systems as identified in the HSE IMS review.

The HSE IMS review also incorporates feedback from the public and regulators with respect to performance and expectations.

The changes that may initiate review of the HSE IMS include:

- legislative changes, including changes to regulatory regime (modification to Pipeline Licence conditions)
- advancement in technology
- significant changes arising from hazard and event investigations to prevent recurrence
- significant changes due to complaints and changing community expectations
- significant changes and improvements identified from various risk assessments, including ongoing HAZOPs, HAZIDs, JHAs and other hazard identification processes
- significant changes in activities (methodology in work processes)
- significant changes in organisation structure, and business policies and objectives
- significant changes resulting from monitoring of HSE key performance indicators
- remedial actions from audits.

11.11.1 Health, Safety and Environment Management Review

A formal management review is conducted yearly to assess overall implementation of the HSE IMS as per the Procedure HSE Management Review (ENI-HSE-PR-014). Areas in need of reinforcement are identified and as a result the elements of the system that need to be reinforced are highlighted. Action plans and responsibilities are agreed to improve risk management and the overall HSE performance of Eni Australia.

This typically includes reviews of the:

- changes in:
  - external and internal issues that are relevant to the environmental management system
  - the needs and expectations of interested parties, including compliance obligations
  - significant environmental aspects
  - risks and opportunities.

- information about environmental performance, including trends in:
  - non-conformances and corrective actions
  - monitoring and measurement results
  - fulfilment of compliance obligations
  - audit results.
- adequacy of resources
- relevant communication(s) from interested parties, including complaints
- opportunities for continual improvement
- changes in legislation or guidance, such as current requirements for AMPs
- advances in relevant environmental technology and new scientific information.

Oil spill arrangements and testing are reviewed in accordance with the Blacktip Operations OPEP (000036_DV_PR.HSE.0388.000_Rev14).

11.11.2 Continuous Improvement

Continuous environmental improvement of performance is driven at the Blacktip facilities by a number of mechanisms. These include:

- corporate initiatives
- auditing (Section 11.6)
- hazard and incident reporting (Section 11.8.2).
- incident investigation (Section 11.13)
- HSE data monitoring and reporting (Section 11.5).

Reporting of incidents and the monitoring of this data draws management's attention to trends resulting from potential weaknesses. Thorough investigation of incidents can be used to alert management to system failures.

HSE auditing can uncover system failures before incidents occur. Auditing, reporting and monitoring can notify management of a deficiency in the HSE IMS or of a problem with implementation of the HSE IMS.

Eni is responsible for implementing an ongoing process to identify and assess suitable measures for improving plant reliability and availability, plant safety levels and for reducing maintenance activities' workload and material costs.

11.12 Management of Change and Reviews of this Environment Plan

Change is managed in accordance with the Eni Australia Procedure Management of Change (MoC) (ENI-DRL-PR-007) which is aligned with Eni processes.

The MoC procedure applies to changes in operational assets, systems, processes, operations, products, organisation and staffing that have the potential to alter hazard or risk levels, affect environmental outcomes, including compliance with applicable laws or standards, or to significantly affect a stakeholder involved with the above items. Standard modification or changes that occur within existing work processes (such as Permit to Work system) or are of a routine nature are not included in this procedure. Descriptions of changes where this procedure applies are listed in Table 11-6.

Table 11-6: Example of changes (health, safety and environment-critical) to which the Management of Change procedure applies

Type of change	Explanation
Changes to design or operating conditions	• Alteration to critical design or key assumptions operating data. • Change in composition or rate of feed or products. • Alternative type or manufacturer of workplace substances. • Operating outside design or manufacturer's recommendations.
Deviations from critical procedures	Deviations from: • Work Management Procedures • Critical Operating Procedures • Critical Maintenance Procedures.
Critical non-routine operations	Critical non-routine operations, with potential for significant risk (not covered by an existing critical procedure) managed with special preparation and procedures to ensure positive control.
Statutory-approved processes	Changes to operations, drilling or seismic programs approved through Safety Cases, EPs or Oil Spill Contingency Plans, or other statutory processes.
Changes in engineering	Where equipment being replaced is not 'like for like'. Design changes for improvements in equipment and process.
Major plant and equipment tests	Includes tests which could: • result in operating outside normal operating limits • adversely affect product quality • breach regulatory limits • require isolation of safety or shutdown systems • result in major equipment or plant shutdown • create an additional hazard or increase in risk • cause a change in risk profile.
Software changes	Permanent changes to alarm and shutdown settings. Permanent changes to control software, logic or configuration changes.
Systems changes	Changes to existing work systems and procedures that manage HSE risks or hazards.
People and organisation changes	Changes, introduction of removal of key personnel, work groups or functions within the business.

Potential changes in risk originating from internal and external factors may lead to EP reviews. Changes which may lead to an EP review may include:

- those concerning the scope of the activity descriptions (Section 3),
- advances in technology

- new scientific information
- changes in understanding of the environment, such as advice about species protected under the EPBC Act and current requirements for AMPs (Section 4.5.1)
- potential new advice from external stakeholders (Section 5), which will be reviewed in regard to Regulation 17 of the OPGGS(E) Regulations.

Factors which may lead to an EP review are identified through a number of means, including:

- internal knowledge sharing and HSE communication (Section 11.10.1)
- internal communications (Section 11.10.1)
- HSE management review (Section 11.11.1)
- non-verbal communications (Section 11.10.3)
- external communications (Section 11.10.4).

If a review of the activity and the environmental risks and impacts does not trigger a requirement for a revision, the change is considered minor. Minor change will be considered a 'minor revision', under Regulation 17 of the OPGGS(E) Regulations. Minor administrative changes to this EP, where an assessment of the environmental risks and impacts is not required (such as document references, phone numbers), will also be considered a 'minor revision'. Minor revisions will be tracked by Eni through its document change register on SharePoint and incorporated during internal reviews.

In accordance with the requirements of Regulation 19 of the OPGGS(E) Regulations, Eni will submit a proposed revision to this EP to NOPSEMA at least 14 days before the end of each period of five years, commencing on the day on which the original and subsequent revisions of the EP is accepted under Regulation 11 of the OPGGS(E) Regulations.

Regulation 23 of the Petroleum Pipelines (Environment) Regulations 2012 requires the Blacktip Operations OPEP (000036_DV_PR.HSE.0388.000_Rev14) to be revised every two and a half years.

Management review (Section 11.11) or further understanding of environment risks through knowledge-sharing (Section 11.10) may trigger a review of the EP. Internal reviews will address matters such as the overall design and effectiveness of the EP, progress in environmental performance, changes in environmental risks, changes in business conditions, and any relevant emerging environmental issues or change in understanding of the environment (such as protected matters requirements). Reviews may also trigger adoption or reconsideration of once-rejected controls within the EP.

This EP will be revised:

- if and when an environmental inspection and audit (see Section 11.6) of the activity finds significant breaches of the EP requirements
- if any significant new environmental risk or effect, or significant increase in an existing environmental risk or effect, occurs that is not provided for in the existing EP as required by OPGGS(E) Regulation 17.

11.13 Incident Management

11.13.1 Overview

The basic principle of incident and crisis management (ICM) within Eni is to utilise the entire organisation in the most optimal way, to ensure the incident is brought under control, and the organisation is then returned to a normal state. All responses to an emergency or a crisis are based on the priorities of:

P protection of **people**

E protection of the **environment**

A protection and minimisation of damage to financial and material **assets**

R protection of Eni's **reputation**.

The response should be proactive and sufficiently robust to manage all foreseeable events, be prepared for any reasonable variation, be able to flexibly meet an escalation of events and make the best use of the entire organisation.

11.13.2 Incident and Crisis Management Organisational Structure

The Eni ICM organisational structure consists of three core levels:

1. Crisis Management
2. Incident Management
3. Field Response.

Figure 11-2: Incident and crisis management core levels

Principal duties of each level and the timescale in which they shall endeavour to operate are illustrated in Figure 11-3.

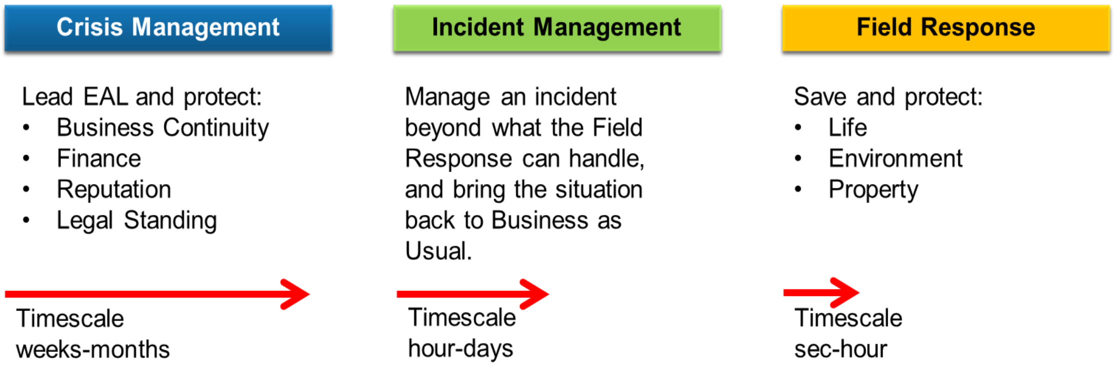


Figure 11-3: Incident and crisis management organisation's principal duties and timescales

11.13.3 Chain of Command

Eni Australia's ICM Chain of Command is a three-level structure. This is represented in Figure 11-4.

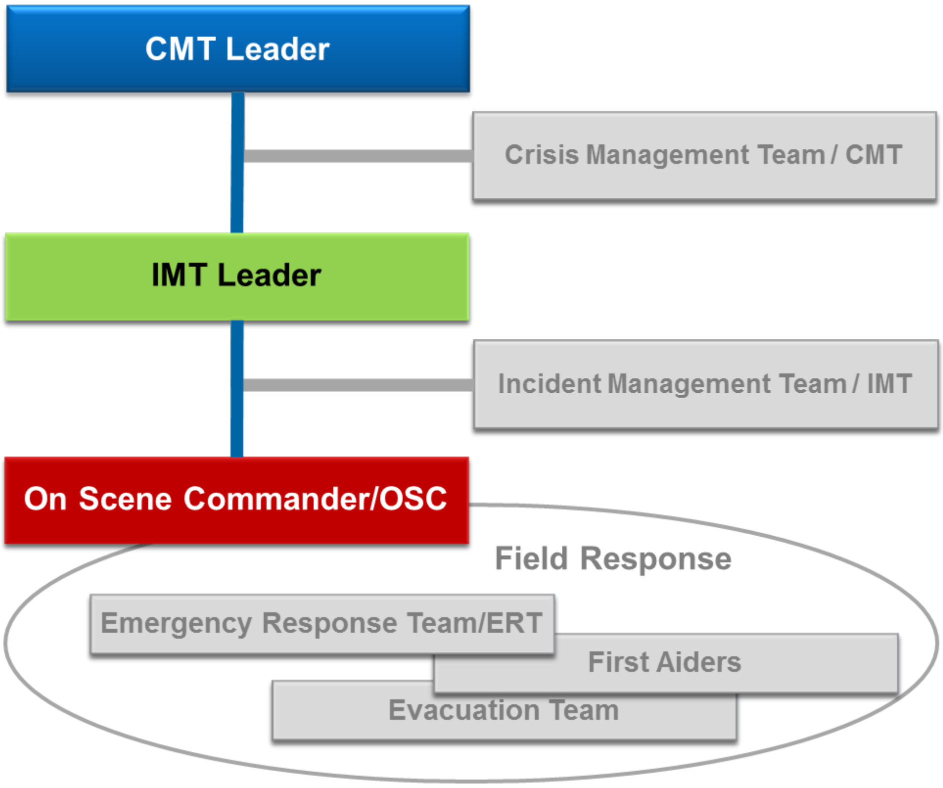


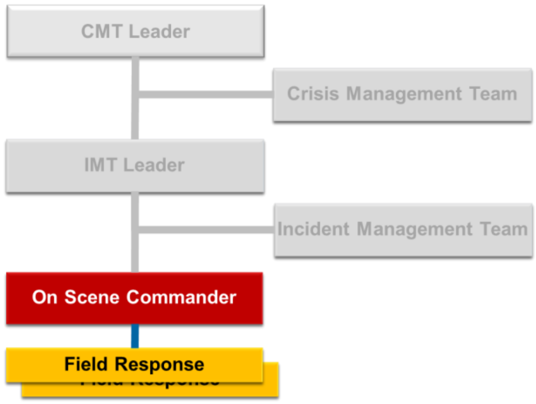
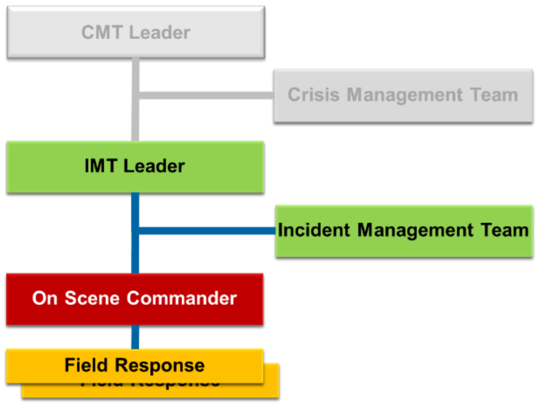
Figure 11-4: Incident and crisis management organisation chain of command

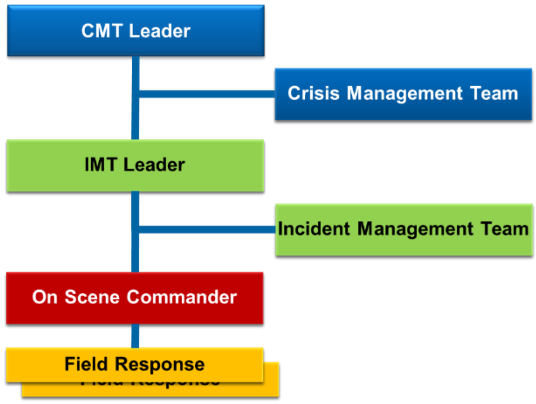
The role holders in the ICM organisation can vary over time. As the responsibility for the response to the incident moves from one organisation to another, a role holder is replaced with a more suitable or more competent individual from the same organisation, or the incident is of such duration that shift changeover is required due to fatigue risk.

11.13.4 Activation

Activation of the ICM organisation is to be executed in the steps shown in Table 11-7.

Table 11-7: Activation of levels in the incident and crisis management organisation

Severity Level	Activation and notification	Illustration (activated parts of the organisation in colour)
Level 1 An event that can be managed at site level with the personnel and means available there, under the responsibility of the Employer of reference.	The Field Response is activated. IMT Leader is informed.	
Level 2 An event that can be managed locally under the responsibility of the Employer of reference, with assistance from the central functions of the business unit/foreign subsidiary and/or from Authorities and public administrations at a peripheral level.	The Field Response and IMT are activated. Managing Director of Eni Australia and EMRIL informed by IMT Leader.	

Level 3 An event capable of determining a very dangerous condition for the site and/or the surrounding area that is managed by EAL by activating the plan and/or calling upon the emergency team of the business unit and/or, for sites presenting major accident hazard, the external emergency plan and/or with the authorities and public administration at a central level. If a level 3 emergency is significant, Eni may have to coordinate, at a central level, the technical and specialist support available in the different business units.	Field Response, IMT and CMT are activated. EMRIL informed by the CMT Lead.	
Crisis	As per CMT Lead's decision.	

11.13.5 Blacktip Field Response

The field response conducts the mitigation work at a facility. A field response can involve, but is not limited to, emergency response teams, first aiders, evacuation team and oil spill response teams.

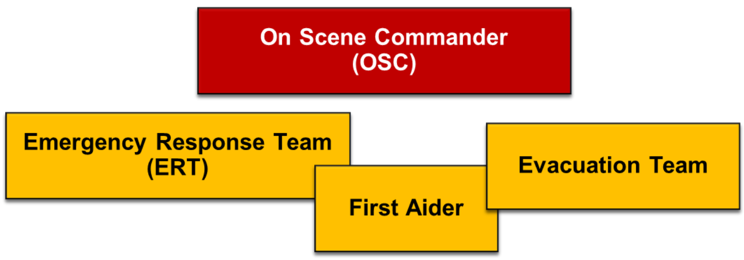


Figure 11-5: On-scene command

For each field response, irrespective of its extent or complexity, there shall always be an On-Scene Commander in direct command of the operation (Figure 11-5).

Blacktip Operations Emergency Response Manual 000036.DV.PR.HSE.0772.000 establishes an understanding of the roles and responsibilities for managing, controlling and responding to an emergency associated with Eni's Blacktip facilities. The manual outlines the:

- emergency management structure within Eni Limited
- emergency management structure for Blacktip operations

- procedures for response, control and coordination
- critical internal and external support links and relationships with external response agencies
- facilities and response equipment and inventories for facilities
- training and exercises.

The Emergency Response Manual refers to the Blacktip Emergency Response Plan 000036_DV_PR.HSE.0675.000, which outlines responses for scenarios at the Blacktip facilities. In addition, the Manual is supported by or supports the:

- Eni Crisis and Incident Management Plans
- Offshore WHP Security Plan 00710200PFRV05691
- Contractors' Emergency Response Plans.

Eni's emergency response strategy is based on the principles of:

- protection of people
- protection of the environment
- protection and minimisation of damage to financial and material assets
- protection of Eni's reputation.

This strategy establishes a clear order of the safety of people over other objectives.

The Blacktip Emergency Response Plan 000036_DV_PR.HSE.0675.000 addresses a wide range of emergencies involving threats to the health and safety of personnel at or near the Blacktip facilities. The emergencies associated with the WHP addressed in the plan include:

- topsides loss of containment or blowout
- pipeline loss of containment
- ship collision
- helicopter emergency
- person overboard
- medevac.

The Emergency Response Plan details the course of action to be followed for each event to ensure personnel safety is maintained as far as possible during emergency events.

Emergency response documentation is reviewed annually; a review is also undertaken after any incidents. Eni evaluates the effectiveness of the emergency management system via audits and monitoring of exercises.

11.13.6 Coordination with Other Organisations

During an incident, Eni will manage all contacts and coordination with Australian local Public Authorities and Agencies from the IMT and CMT.

In some cases, Eni's ICM organisation will operate in parallel or integrated with other organisations; for example, a contractor company, joint venture partner or a company operating in the vicinity of an Eni facility. In these cases, it is important liaison is established on 'equivalent levels' and in accordance with common principles for incident management.

11.13.7 Emergency Response Training

The emergency response training required for each functional role on the Blacktip facilities are detailed in the Blacktip Emergency Response Training Matrix (ENI-HRO-ST-001). Eni engages external consultants to provide nationally-recognised training for emergency roles.

Members of the ICM organisation have the necessary competence and formal authorisation to efficiently and effectively perform their tasks. Comprehensive training is provided to all personnel in the ICM organisation comprising theoretical training, exercises and drills. A competency assessment system is integral in the ICM system in order to verify the competency of post holders.

It is a requirement for all personnel working offshore to undergo the formal Offshore Petroleum Industry Training Organization-accredited Tropical Basic Offshore Safety Induction and Emergency Training course. This requirement applies to contractors and visitors.

11.13.8 Dangerous Weather Response

Tropical cyclones and other storm conditions have the potential to cause damage to personnel, the environment and equipment. Standard Adverse Weather (ENI-HSE-ST-031) and Cyclone Preparation Plan (000036_DV_EX.OPS.0758.000) include detailed procedures for preparing for and responding to cyclone events. The response goal during a cyclone event is to protect personnel, the environment, equipment and the subsea equipment integrity. The corresponding priorities include:

- securing any subsea equipment in the process of being moved
- vessel(s) sail away to sheltered location
- evacuating personnel.

Eni uses experienced weather service providers, such as the Bureau of Meteorology and Weatherzone, to provide current, location-specific forecasts. Eni uses specifically tailored services for its real-time forecasting and severe weather forecasting capabilities. They advise key Eni personnel of any actual or potential severe weather to support Eni's operations and strategic planning. The POS must ensure he or she receives email notification of cyclones from the provider. This includes:

- Tropical Cyclone seven-day outlook
- Tropical Cyclone forecast.

The Cyclone Preparation Plan (000036_DV_EX.OPS.0758.000) outlines the responsibilities for implementing the plan and a checklist for decision-making.

The MODU and vessels or any vessels used during the Petroleum Activities Program will receive daily forecasts from the Bureau of Meteorology. In the event the cyclone (or severe weather) is forecast and it has the potential to affect the Petroleum Activities Program, the cyclone management plan will be actioned. If required, vessels can transit from the proposed track of the cyclone (or severe weather).

12 OIL POLLUTION EMERGENCY PLAN

12.1 Overview

The requirements of the OPEP and the location of the information required is given in Table 12-1.

Eni will be utilising the accepted Blacktip Operations OPEP (000036_DV_PR.HSE.0388.000_Rev14) for spill response arrangements.

Table 12-1: Oil Pollution Emergency Plan requirements

Regulation	Description	Location
14 (8)	The implementation strategy must contain an oil pollution emergency plan and provide for the updating of the plan.	Blacktip Operations OPEP (000036_DV_PR.HSE.0388.000_Rev14)
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	Blacktip Operations OPEP (000036_DV_PR.HSE.0388.000_Rev14)
(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	Blacktip Operations OPEP (000036_DV_PR.HSE.0388.000_Rev14)
(c)	• the arrangements and capability that will be in place for monitoring the effectiveness of the control measures and ensuring the environmental performance standards for the control measures are met	Blacktip Operations OPEP (000036_DV_PR.HSE.0388.000_Rev14)
(d)	• the arrangements and capability in place for monitoring oil pollution to inform response activities.	Blacktip Operations OPEP (000036_DV_PR.HSE.0388.000_Rev14)
14 (8A), (8B0 and (8C)	The implementation strategy must include arrangements for testing the response arrangements in the oil pollution emergency plan that are appropriate to the response arrangements and to the nature and scale of the risk of oil pollution for the activity.	Section 12.2

Regulation	Description	Location
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.	Section 11 and the Blacktip Operations OPEP (000036_DV_PR.HSE.0388.000_Rev14)
14(8E)	The implementation strategy must include information demonstrating that the response arrangements in the oil pollution emergency plan are consistent with the national system for oil pollution preparedness and response.	Blacktip Operations OPEP (000036_DV_PR.HSE.0388.000_Rev14)

12.2 Arrangements for Testing the Oil Pollution Emergency Plan

A summary of arrangements for testing the response arrangements is provided in Table 12-2.

Table 12-2: Testing requirements and arrangements

OPGGS(E) Regulation Requirements	Description
As per Regulation 14(8B) of the OPGGS(E) Regulations 2009, the arrangements for testing the response arrangements must include:	
A statement of the objectives of testing	SOPEP testing provides an opportunity for crew to gain confidence in using onboard spill equipment and implementing incident response procedures, increase efficiency in the event of an emergency, review the efficiency of procedures and detect any failures in equipment.
	Testing will be organised in accordance with the Professional Operating Instruction for Planning and Execution of Emergency Drills, including setting an objective for the emergency drill. Testing oil spill preparedness is performed against defined oil spill preparedness performance objectives and standards which are provided in the OPEP. Testing will also ensure the timings presented in the OPEP are able to be met, that contracts are in place and contractors have maintained their response capabilities as per the contract.
A proposed schedule of tests	Regular drills and exercises (three monthly) are performed on all vessels in line with IMO and SOPEP. These drills include spill response, collision and grounding, fire and explosion and helicopter emergency.

OPGGS(E) Regulation Requirements	Description
	A desk-based Level 2/3 OPEP exercise will occur before the development drilling activities commencing.
Mechanisms to examine the effectiveness of response arrangements against the objectives of testing	In particular: • issues raised (if any) described in daily report • weekly checklist ensures spill monitoring equipment is in place and fully stocked • rudiments described for the review of the EP and OPEP • requirements described for testing below.
	Testing will be organised in accordance with the Professional Operating Instruction for Planning and Execution of Emergency Drills, including setting an objective for the emergency drill. Testing oil spill preparedness is performed against defined oil spill preparedness performance objectives and standards which are provided in the OPEP and with the aim of ensuring strategies within this OPEP are able to be implemented efficiently.
Mechanisms to address recommendations arising from tests	As mentioned, issues raised (if any) resulting from IMO and SOPEP testing will be described in the daily report. The OIM (Drilling) and Vessel Master is made aware that the change is managed to this OPEP and this EP through MoC.
	The OPEP drill reports will be used to issue action plans that will identify corrective actions needed and assign responsibilities, roles and schedules for their implementation.
As per Regulation 14(8C) of the OPGGS(E) Regulations 2009, the proposed schedule of tests must provide for the following:	
Testing the response arrangements when they are introduced	A SOPEP to drill onboard all vessels will be performed before commencing the activity.
	A desk-based Level 2/3 OPEP exercise will occur before the development drilling activities commencing.
Testing the response arrangements when they are significantly amended	Any changes to the OPEP or EP will be introduced through the MoC. Where changes reasonably affect the arrangements in place, the changed arrangements will be tested before finalising the MoC.
Testing the response arrangements no later than 12 months after the most recent test	SOPEP drills will occur every three months.
	A desk-based Level 2/3 OPEP exercise will occur before the development drilling activities commencing.
If a new location for the activity is added to the environment plan after the response arrangements have been tested, and before the next test is conducted, testing the response arrangements in relation to the new location as soon as practicable after it is added to the plan	No activity will occur outside the Operational Area.

OPGGS(E) Regulation Requirements	Description
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	Not applicable.

13 FINANCIAL ASSURANCE

Eni has calculated the level of Financial Assurance required for the activities described in this Environment Plan. Financial assurance calculations are made in accordance with the 2018 APPEA Method.

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APPENDICES

APPENDIX A:

EPBC APPROVAL

Australian Government

Department of the Environment, Water, Heritage and the Arts

Notification of
VARIATION TO APPROVAL DECISION

Blacktip Gas Field Development, WA and NT (EPBC 2003/1180)

This decision to vary a condition of approval is made under section 143 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Proposed action

Person to whom the approval is granted	ENI Australia
Proposed action	To develop the Blacktip Gas Field, Joseph Bonaparte Gulf and associated marine and terrestrial facilities and activities as described in the referral under the Act received on 9 September 2003 (EPBC 2003/1180).

Approval decision

Relevant controlling provisions	The approval has effect for: • Listed threatened species and communities (sections 18 & 18A) • Listed migratory species (sections 20 and 20A) • Commonwealth Marine Area (sections 23 and 24A)
Variation of conditions of approval	Delete Conditions 1 to 9 of the approval dated 29 November 2005, and substitute the conditions specified below.
Expiry date of approval	This approval has effect until November 2040.

Person authorised to make decision

Name and position	Michelle Wicks A/g Assistant Secretary Environment Assessment Branch
Signature	Wicks
Date of decision	7 August 2008

Varied conditions attached to the approval

1. The person taking the action must submit, for the Minister's approval, a plan for managing the offshore impacts of construction. The plan must address the following:

    a) design and construction of facilities to allow for the complete removal of all structures and components (except flowlines) above the sea floor;

    b) sea floor surveys around proposed flowline paths and well sites to identify sensitive marine ecosystems such as reefs, sponge beds and sea grasses and historic shipwrecks;

    c) selection of flowline paths and well sites to avoid impacts on sensitive marine ecosystems referred to in 1. b), and historic shipwrecks;

    d) a schedule of works;

    e) managing the impacts on cetaceans, including interaction procedures for aircraft and supply and construction vessels that are consistent with *Part 8 of the Environment Protection and Biodiversity Conservation Regulations 2000*;

    f) ballast water management for international construction or tanker vessels arriving in Australia in accordance with Australian Quarantine and Inspection Service *Australian Ballast Water Management Requirements*;

    Offshore construction may not commence until the plan is approved. The approved plan must be implemented.

2. The person taking the action must submit, for the Minister's approval, a plan for managing the offshore impacts of operation. The plan must address the following:

    a. the monitoring and disposal of produced water (PW) including the following:

        i. Analysis of expected PW chemistry;

        ii. Baseline biological and physical information at the PW outfall site;

        iii. Toxic impacts of PW on marine flora and fauna based on ecotoxicological, bioaccumulation and biodegradation studies;

        iv. Industry best practice disposal of PW;

        v. Monitoring and reporting of biological and physical indicators; and

        vi. Contingency measures if adverse impacts occur

    b. managing the collection, handling and disposal of naturally occurring radioactive materials that may occur;

    c. the use and disposal of hydrotest water additives, based on modelling of the hydrotest water discharge plume;

    d. the use and disposal of drilling muds, including monitoring of water quality, in the event that low toxicity, water based drilling fluid additives cannot be used.

    Operations may not commence until the plan is approved. The approved plan must be implemented.

3. The person taking the action must submit for the Minister's approval an oil spill contingency plan to mitigate the environmental effects of any hydrocarbon spills. The plan must identify oil sensitive marine environments and biota, and address spill response and cleanup strategies, the equipment to be used and the identification of capacity to maintain and implement rapid response equipment, the rehabilitation of impacted ecosystems, the training of staff in oil spill response measures and the reporting of oil spill incidents to the Minister. The plan must include details of insurance arrangements that have been made in respect of the costs associated with repairing any environmental damage arising from potential oil spills.

    Offshore construction may not commence until the plan is approved. The approved plan must be implemented.

4. The person taking the action must submit, for the Minister's approval, a plan or plans to address measures for minimising the potential for listed threatened turtles to be impacted during pipeline construction and for monitoring of the impacts on turtles. The plan or plans must address the impacts of onshore and near shore lighting, the construction, any seabed or onshore blasting required, and the rehabilitation of potential turtle habitat after construction.

   Onshore construction may not commence until the plan or plans are approved. The approved plan or plans must be implemented.

5. At least twelve months before the expiry of this approval, the person taking the action must submit a decommissioning plan to the Minister for approval, addressing the removal of all structures and components above the sea floor.

   Decommissioning may not commence until the plan is approved. The approved plan must be implemented.

6. On 1 July of each year, the person taking the action must provide a certificate stating that the person taking the action has complied with the conditions of this Approval.

7. If the person taking the action wishes to carry out any activity otherwise than in accordance with the plans referred to in conditions 1, 2, 3, 4 and 5 the person taking the action may submit for the Minister's approval a revised version of any such plan. If the Minister approves a revised plan so submitted, the person taking the action must implement that plan instead of the plan as originally approved.

8. If the Minister believes that it is necessary or desirable for the better protection of the environment to do so, the Minister may request the person taking the action to make specified revisions to a plan approved pursuant to conditions 1, 2, 3, 4 and 5 and to submit the revised plan for the Minister's approval. The person taking the action must comply with any such request. If the Minister approves a revised plan pursuant to this condition, the person taking the action must implement that plan instead of the plan as originally approved.

9. The person taking the action must ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the Minister within 12 months of commencement of construction and within 2 years of commencement of operations. The independent auditor must be approved by the Minister prior to commencement of the audit. Audit criteria must be agreed to by the Minister and the audit report must address the criteria to the satisfaction of the Minister.

Definitions

Structures and components: above sea floor infrastructure associated with the development of the Blacktip gas field includes sub sea wellheads, offshore wellhead platform, sub sea gas export pipeline, and condensate and produced water pipelines from the onshore gas processing facility.

Onshore construction: the commencement of any works above the low water mark that may impact on flora and fauna due to disturbance of habitat, including disturbance resulting from plant removal, disturbance of soil, increased noise and/or lighting.

Offshore construction: all activities occurring below the low water mark that relate to the construction and installation of facilities associated with the commissioning of the Blacktip Gas Field and the transport of resources.

APPENDIX B:

ENVIRONMENTAL VALUES AND SENSITIVITIES

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1 DESCRIPTION OF THE ENVIRONMENT

This Appendix supplements Section 4 of the Blacktip EP (000036_DV_PR.HSE.0887.000) and describes the environment within the Operational Area and EMBA. It includes details of the relevant values and sensitivities of the environment as required by the Commonwealth Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 and State Western Australian Petroleum (Submerged Lands) (Environment) Regulations 2012.

Searches for protected species listed under the EPBC Act were undertaken for the Operational Area, Zone of Potential Impact (ZPI) and EMBA (refer Attachment B1-B3), using the DCCEEW Protected Matters Search Tool (PMST) for the purpose of identifying matters of national environmental significance listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This document is informed by this search.

Descriptions of all fauna returned by the PMST for the Operational Area and EMBA are provided, with a focus on protected species that are threatened and migratory.

For a description of the Operational Area, ZPI and EMBA, refer to the EP.

1.1 Physical Environment

1.1.1 Climate

The climate in the region is monsoonal with a wet summer and a dry winter. The wet season commences between September and November as the south-east trade winds weaken over northern Australia and land temperatures rise. This results in two or more semi-permanent heat lows forming over central Australia, one over the Kimberley and Great Sandy Desert, and often another just south of the Gulf of Carpentaria.

The early part of the wet season is marked by frequent thunderstorms. As the season progresses, moist ocean air from the north and north-west streams into the lows and several days of heavy rain may occur.

Mean daily maximum temperatures for Port Keats range from about 30°C to 34°C, and minima from 14.5°C to 25°C (BOM, 2008). Annual rainfall is 1,521 mm. Almost all rainfall occurs between November and April (wet season), with the greatest falls being in January and February. The frequency and severity of the thunderstorms produce a large variation in the monthly rainfall. Rainfall during the dry months is sporadic and light.

1.1.2 Wind Pattern

Figure 1.1 shows the seasonal wind roses for the Climate Forecast System Reanalysis (CFSR) data point closest to the Blacktip P3 Development Well (13° 53′ 24″ S, 128° 19′ 48″ E). This point is around 16.7 km west of the spill location. The data shows that the wind speeds and directions vary between seasons. During summer (December to February), the winds blow predominantly from the west, and in winter (April to August) the winds blow predominantly from the south-east. During transitional conditions, wind directionality is more variable and wind speeds are generally lower than in the other season. The greatest average wind speeds are observed during winter (6.0 m/s), and peak wind speeds exceeding 20 m/s are most commonly observed in summer and winter.

Winds are predominantly from the north-west between September and February and from the south-east between April and July. Winds are more variable during the transition periods between the two seasons in March and August. Tropical cyclones can develop between November and April resulting in short lived, severe storm events often with strong but variable winds.

During the wet season cyclones are a feature of the region. On average there are 7.7 days per season when cyclones exist in the region which typically occur between December and April bringing gale force winds and severe storms. Cyclones in the region typically form south of the equator in the Timor or Arafura seas when sea temperatures are above 26.5^{0}C and head east.

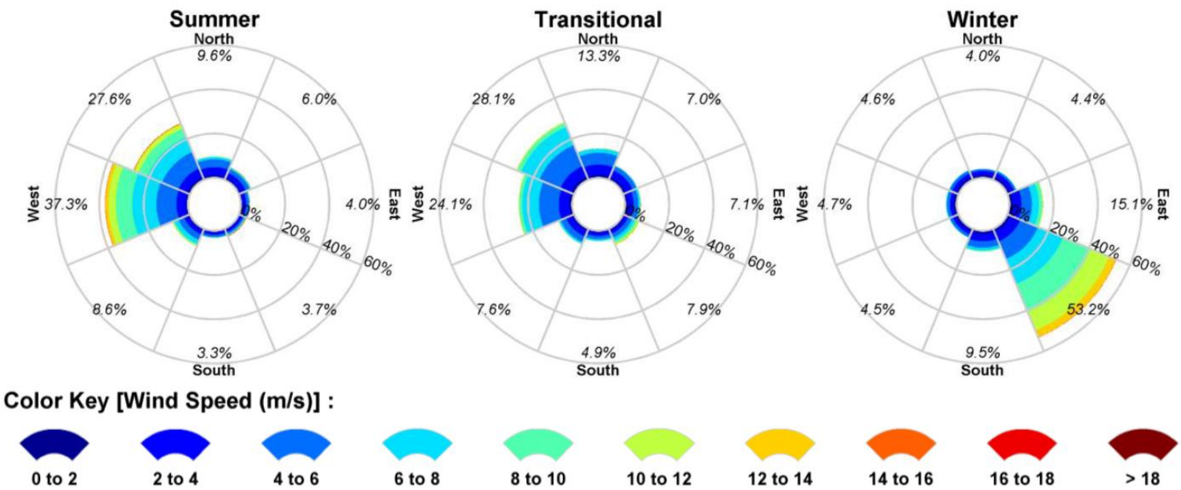
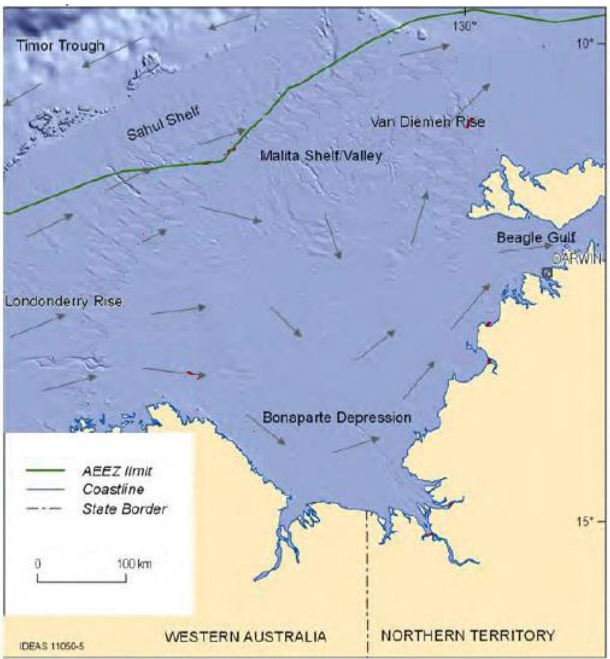


Figure 1.1: Seasonal wind distribution (1997-2006, inclusive) derived from the CFSR database near to the WHP

1.1.3 Oceanography

Circulation in the JBG is dominated by the large tidal currents. Maximum current speeds at the Blacktip WHP range from to 0.2 m/s on neap tides to 0.9 m/s on springs (Metocean Engineers, 2004). The currents rotate in a clockwise direction with the major flood and ebb directions towards the south-east and northwest, respectively. Further towards the shoreline, current speeds increase with tidal range and become directed more longshore. These large currents are responsible for the generation of dune forms on the seabed as noted in Admiralty Charts for the region. Very nearshore currents are influenced by the coastal topography with an anticlockwise gyre forming on the flood tide and a clockwise gyre on the ebb.



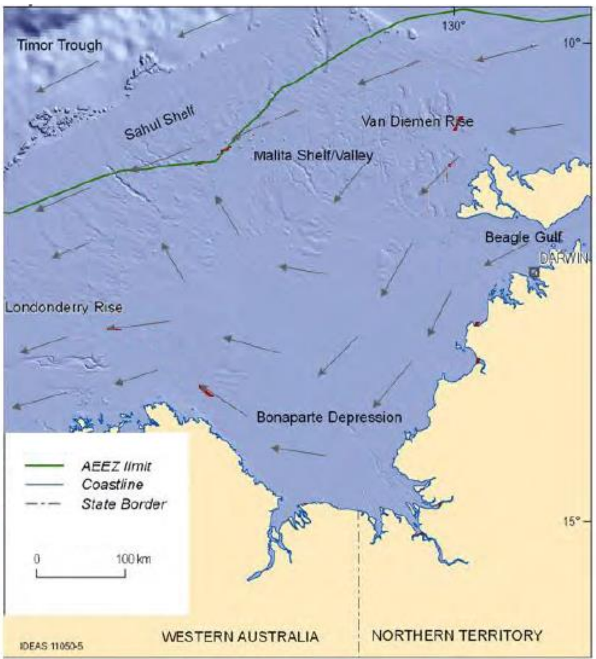


Figure 1.2: Joseph Bonaparte Gulf wind driven currents for monsoon (January, left) and trade wind (July, right) conditions (DoEE, 2013)

Large scale ocean circulations are forced by synoptic scale winds. The south-east trade winds drive a mean westerly current of up to 0.2 m/s in the Timor Sea. In the wet season, currents reverse to flow towards the east. The influence of these large-scale circulations in the JBG is unknown.

The JBG experiences a mixed semidiurnal tide with a very large range in tidal elevations and correspondingly strong tidal currents (Przeslawski *et al*., 2011). The region is also affected by cyclones at an average annual rate of 0.6 cyclones per year (Woodside, 2004). Cyclone events generate the strongest currents in the Gulf, with current speeds in some areas expected to reach 1.4 m/s; however, the ambient, non-cyclonic wind-driven currents are generally less than 0.1 m/s (Woodside, 2004a; Przeslawski *et al*., 2011). Ambient wind-driven currents are generally directed from west to east during the monsoon season (December to March) and east to west during the trade wind season (April to November), while an offshore westward current persists throughout the year.

The tides in the JBG propagate in from the Timor Sea and circulate around an Amphidromic Point located offshore from Cape Londonderry in the north-west. The JBG is subject to a tidal range of greater than four meters which is the highest tidal range in Northern Australia. The tides in the JBG are semi diurnal and the tidal wave propagates in from the Timor Sea and circulates around an amphidromic point located offshore from Cape Londonderry in the north-west. Tidal ranges increase shorewards with maximum tidal ranges exceeding 8 m along the shoreline between Wyndham and Darwin.

The closest tidal station to the Operational Area is Port Keats, which is a secondary port located between the two standard ports of Darwin and Cape Domett. The tides are semidiurnal (two highs and lows each day) with a slight diurnal inequality (difference in heights between successive highs and low). There is a well-defined spring-neap lunar cycle, with spring tides occurring two days after the new and full moon. Table 1.1 provides the standard levels for Port Keats. Highest astronomical tide exceeds 8 m and the mean ranges for spring and neap tides are 5.6 m and 1.9 m, respectively. Tidal ranges reduce offshore towards the Operational Area.

High energy tidal currents along much of the region's coastline stimulate mixing and sediment movement throughout the year, contributing to the highly turbid and relatively productive inshore environment. Terrestrial inputs of freshwater, sediments and detritus are generally compartmentalised within a fairly distinct coastal boundary layer, which is particularly well-developed within the JBG.

Superimposed on the astronomical tide are 'meteorological' tides resulting from changes in atmospheric pressure and strong onshore or offshore winds. Storm surges during cyclones, in particular, can appreciably raise sea levels above the predicted astronomical tidal height and inundate low lying areas.

Table 1.1: Standard tide levels for Port Keats (AHS, 2003)

Port Keats	Level (m)
Highest Astronomic Tide	8.2
Mean High Water Springs	7.2
Mean High Water Neaps	5.3
Mean Sea Level	4.4
Mean Low Water Neaps	3.4
Mean Low Water Springs	1.6

During the winter season, the ambient wave climate at the Operational Area will be composed of waves generated from the prevailing south and south-easterly trade winds. Wave generation will be fetch limited and mean monthly significant wave heights are predicted to be fairly constant, ranging between 0.8 m and 1.0 m with mean period of between 8 to 9 seconds.

During the summer season, the Operational Area is exposed to both sea and swell generated from the prevailing north-westerly monsoon winds blowing across the Timor Sea. As such, the predominant swell direction is from the northwest with mean monthly periods of between 7 to 10 seconds. Monthly mean significant wave heights range from a minimum of 0.45 m in September to a maximum of 1.6 m during February. Shorter period swells (6 to 10 seconds) may result from tropical cyclones, winter easterlies over the Arafura Sea and the eastern portions of the Timor Sea, and summer westerlies over the western portions of the Timor Sea.

Extreme waves are generated by cyclones during the summer season. The 100-year return period wave is estimated to be of the order of 5 m.

Mean monthly surface temperatures in the vicinity of the Operational Area vary between about 25.8°C in August and 30.5°C in December (AODC, 2004). Due to the large tidal range and high currents, the water column is expected to be well mixed all year round with no temperature stratification during the winter months. During heavy rainfall, there may be some salinity stratification in the south of the Gulf.

1.1.4 Geomorphology and Geology

The Operational Area is located in the Petrel Sub-Basin, in the Southern Bonaparte Basin, which contains a thick sequence of Palaezoic sediments with a thin cover of Mesozoic rocks.

To date, 29 exploration wells have been drilled in the Southern Bonaparte Basin offshore, resulting in five significant discoveries. The Blacktip, Tern and Petrel Fields comprise gas-bearing Permian—Late Carboniferous sandstones; and the Turtle and Barnett Fields consist of stacked oil-bearing sandstones of Permian-Carboniferous age (Figure 1.3). The fields are charged from mature early Carboniferous and Permian source kitchens. Basin modelling indicated that hydrocarbons expulsion took place from late Triassic to late Cretaceous.

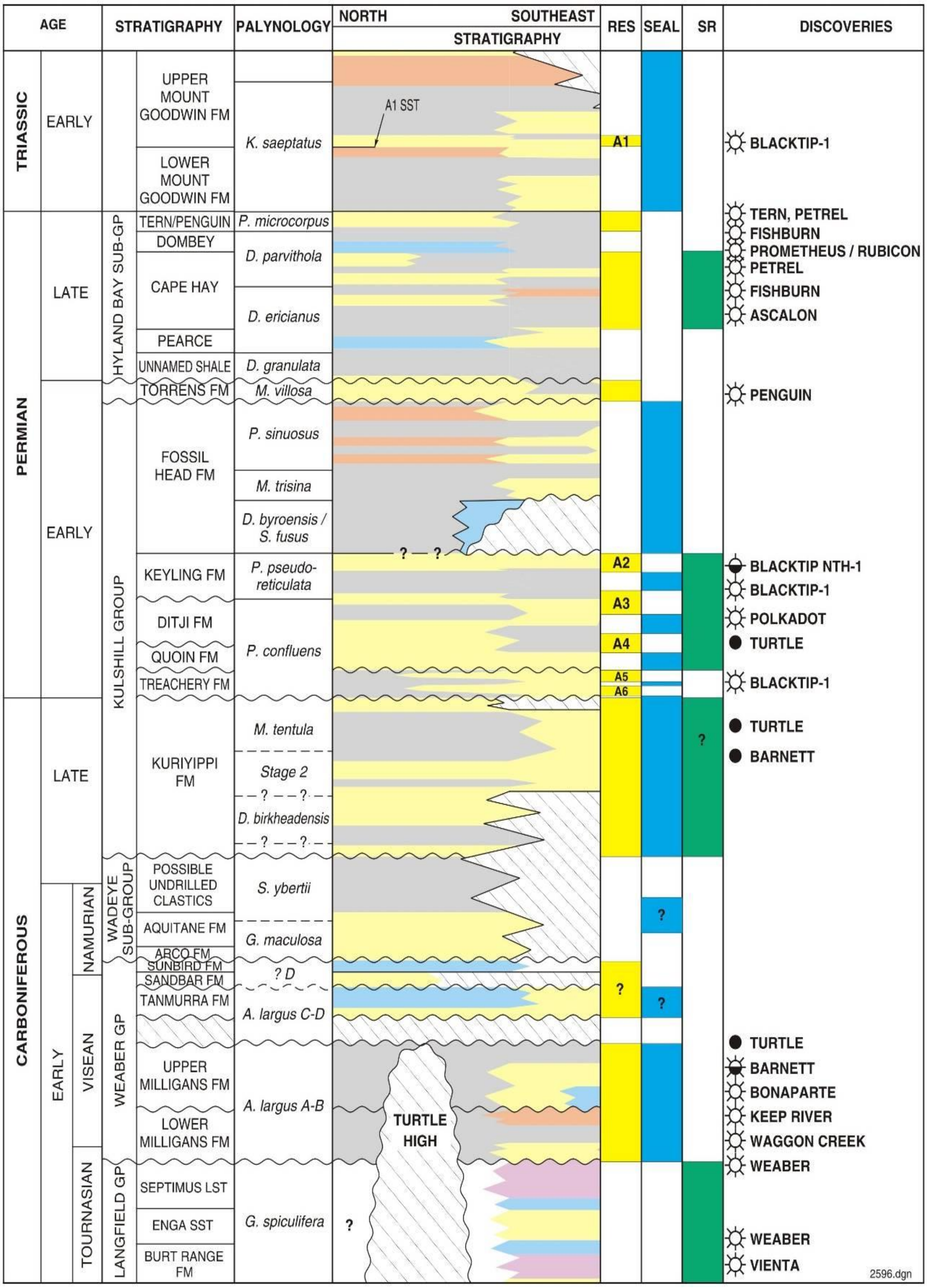


Figure 1.3: Southern Bonaparte Basin stratigraphy

1.2 Key Marine Habitats

1.2.1 Seabed and Sedimentation

The top layer of sediment in the JBG from approximately 3 to 35 km offshore are expected to be greater than 1 m in depth and consists of sands and gravels with variable proportions of clay. This material is primarily alluvium, derived from sedimentary sandstones and basal conglomerate. Sonar images indicate some minor paloeochannels in this area containing mega ripple or sand waves. The sediments are generally unconsolidated coarse sand, fine gravel interspersed with areas of flat and featureless seabed containing very soft to firm gravelly clays (Woodside, 2004a).

The Operational Area is located in the upper (outer) reaches of the JBG, in an area of relatively flat featureless seabed. Sediments are predominately very soft, grey-green, gravelly sand clays (Woodside, 2004a).

The EMBA overlaps with the carbonate bank and terrace system of the Sahul Shelf KEF (Figure 4.10 in the EP). The nearest feature of the carbonate bank and terrace system of the Sahul Shelf KEF is 20 km to the south east of the Operational Area. The Sahul banks are a chain of complex submerged algal banks on the middle and outer continental shelf (Heap & Harris, 2008). The system is of regional significance due to enhanced biodiversity and productivity compared with surrounding areas. The Sahul banks feature hard substrate suitable for sessile species in an otherwise soft sediment environment. Banks within the KEF rise steeply from 80 m to 30 m water depth in some areas, with the elevated hard substrates providing suitable surfaces for organisms to adhere to, and ideal sites for exposure to passing nutrients and light (in areas <45 m water depth).

Sessile benthic invertebrate communities including hard and soft corals, sponges, fans, whips and bryozoans are found within the KEF (Nichol *et al*., 2013, NERP MBH, 2014). The banks are considered a biodiversity hotspot for sponges with more species and different communities than the surrounding seafloor (NERP MBH, 2014).

Further information on the Sahul Shelf KEF and other relevant KEFs within the EMBA are presented in Section 1.4.3.

1.2.2 Open Water Benthic Habitats

The dominant offshore features in the lower Gulf are the elongated parallel sand shoals extending out from the Victoria River and the extensive sand shoals on either side of the entrances to the Cambridge Gulf, known as the King Shoals and Medusa Banks. Depth increases gradually out to the continental margin; however, the continental shelf is dissected by numerous paleo-channels. Shallow shoals, small seamounts and occasionally a few islands and tidally exposed reefs occur along the edge of the continental shelf.

The Operational Area is within areas of infaunal plains identified by flat, soft substrate with occasional rocky outcrops, scattered epifauna, biota dominated by infauna (Figure 1.4). Previous surveys at the Blacktip WHP have not identified any sensitive seabed habitats (Woodside, 2004a).

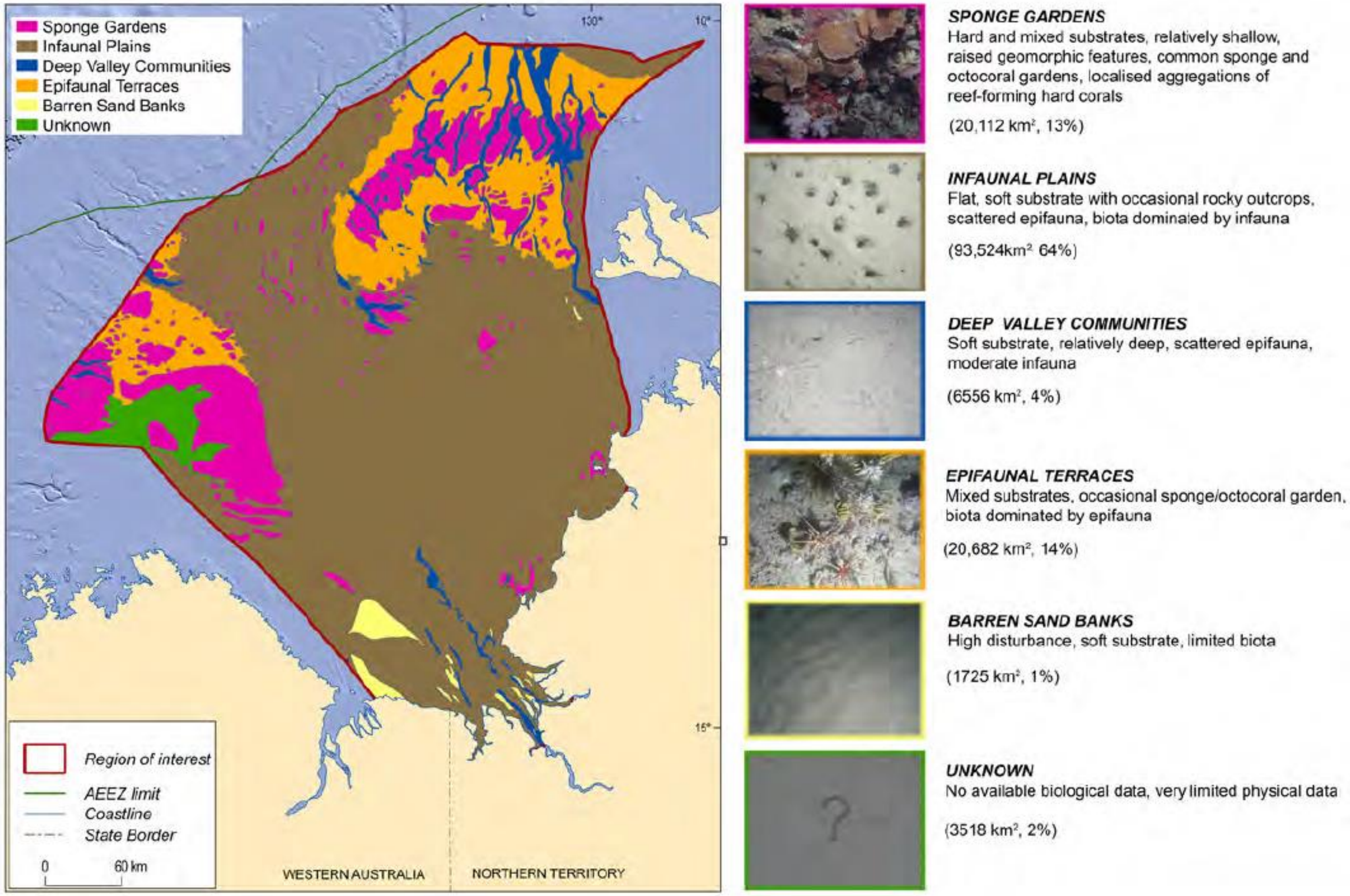


Figure 1.4: Distribution of habitats and biological communities in the JBG (Przeslawski & Nichol, 2012)

1.2.3 Intertidal Shorelines

1.2.3.1 Joseph Bonaparte Gulf

The lower part of JBG, to the south and east of the Operational Area is relatively shallow with a coastline dominated by sand banks, extensive mudflats, mangrove systems, tidal creeks and the estuaries of the Victoria River system and Cambridge Gulf (Figure 1.5).

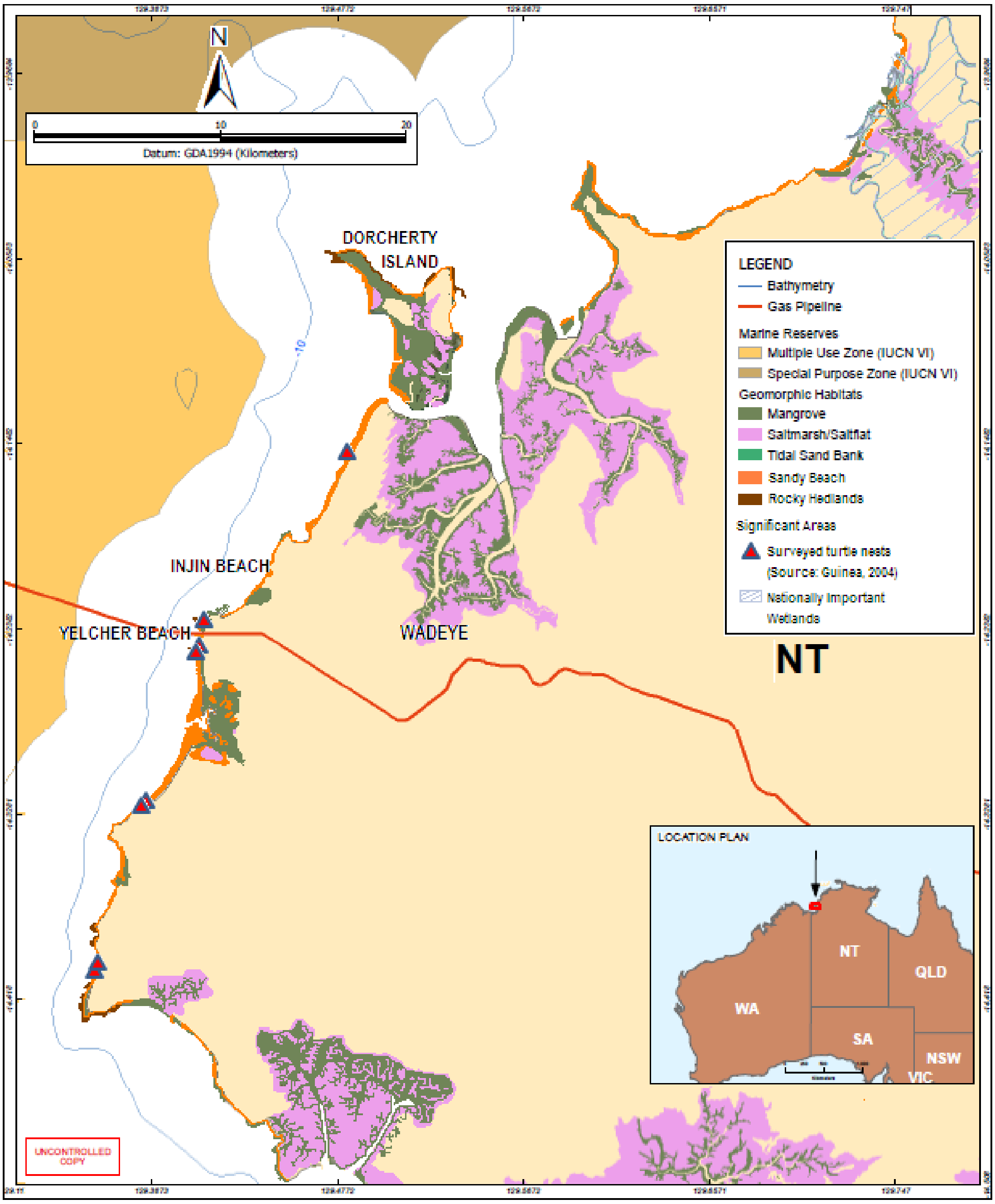


Figure 1.5: Shoreline to the south and east of the Operational Area

1.2.3.2 Kimberly Coastline

Around 5,102 km of the Kimberly coastline was surveyed, analysed and mapped after the Montara spill to provide spatial and quantitative characterisation of vulnerable coastal ecological features. Mangroves, the most vulnerable coastal habitat present, grow along 63% of the surveyed shoreline, covering over 3,200 km (Table 1.2). Saltmarsh occurs on more than 1,200 km of coastline or 23.8% survey region and the coastline is rocky for 2,763 km of shoreline (DPAW, 2014).

Marine megafauna sightings were also common along almost the entire shoreline during the aerial survey. The greatest concentrations of megafauna (~60% observed) were recorded in the area from Cape Londonderry to Admiralty Gulf. The majority (67%) of megafauna sightings were of marine turtles (DPAW, 2014).

Table 1.2: Summary of coastal characteristics from Darwin (NT) to Broome (WA). Category percentages do not add to 100 as categories overlap in some locations (DPAW, 2014)

	Feature	km	% of shoreline
Physical characteristics	Rocky	2,762.8	54.2
	Beach	1,663.7	32.6
	Flat	2,185.5	42.8
	Dune	1,536.9	30.1
	Other wetland	15.9	0.3
Vegetated habitat type	Mangrove	3,214.1	63.0
	Saltmarsh	1,215.4	23.8
	Fringing coral	350.9	6.9
	Seagrass verge	11.5	0.2
	Coastal woodland	3,886.6	76.2
Sate of erosion and deposition	Deposition	548.8	10.8
	Erosion	544.7	10.7
	Stable	3,576.7	70.1
Tidal wetland	Mangrove	3,214.1	63.0
	Saltmarsh	1,215.4	23.8
	Sand and mudflats	1,379.2	27.0
	Salt flat	1,396.8	27.4
Other	Human modified	169.8	3.3
	Water reach	514.2	10.1

1.2.4 Plankton

Plankton is divided into two categories: phytoplankton (microscopic plants) and zooplankton (animal larvae). Phytoplanktonic algae support the entire primary production of the oceans and range in size from 0.2 to 200 mm. Zooplankton are small, mostly microscopic animals that drift with the ocean currents, and it has been estimated that 80% of the zooplankton in waters off the Australian continental shelf and shelf margin are the larval stages of fauna that normally live on the seabed. A common feature of plankton populations is the high degree of temporal and spatial variability. Phytoplankton, in tropical regions, had marked seasonal cycles, with higher concentrations occurring during the winter months (June-August) and low in summer months (December-March) (Schroeder *et al.*, 2009). Zooplankton that rely on them for food are subject to similar seasonality. Spatial distribution of plankton is patchy and uneven, both vertically and horizontally.

Phytoplankton species rapidly multiply in response to bursts of nutrient availability and are subsequently consumed by zooplankton that in turn are consumed by small pelagic fish and some whales. The spawn of commercial fish species (that comprise part of the zooplankton community) may be present in and around the Operational Area.

1.3 Threatened and Migratory Species and ecological communities

1.3.1 Marine Mammals

Threatened and migratory marine mammal species within the Operational Area and EMBA are listed and presented in Section 4.4 of the EP, along with identified BIAs.

Details on the species identified by the EPBC Act PMSTs for the Operational Area and EMBA are included the sections below.

1.3.1.1 Sei Whale

Sei whales (*Balaenoptera borealis*) have been infrequently recorded in Australian waters (DCCEEW, 2022a). Sei whales are considered a cosmopolitan species, ranging from polar to tropical waters, but tend to be found more offshore than other species of large whales. The proportion of the global population in Australian waters is unknown as there are no estimates for sei whales in Australian (DCCEEW, 2022a). It is likely that threats affecting the global population of sei whales would also affect Australian populations (Horwood, 1987).

The National Conservation Values Atlas records no BIAs for this species (DCCEEW, 2020b). It is possible that individual sei whales may be present in low numbers within the northern part of the EMBA.

1.3.1.2 Blue Whale

Blue whale (*Balaenoptera musculus*) sightings in Australian waters are widespread, and it is likely that the whales occur around the continent at various times of the year. However, much of the Australian continental shelf and coastal waters have no particular significance to the whales and are used only for migration and opportunistic feeding.

In Australia there are two recognised subspecies of blue whale; the Antarctic (*Balaenoptera musculus intermedia*) and the pygmy blue whale (*B.m. brevicauda*). Blue whales have a worldwide distribution and move between low altitudes for breeding and high altitudes for feeding. Pygmy blue whales are thought to migrate from Australian feeding grounds to breed in grounds over Indonesia, whilst the Antarctic blue whale winter migration is south to lower latitudes of the Pacific and Indian ocean (DCCEEW, 2022b). Therefore, the Pygmy blue whale is more likely to be encountered in the JBG.

Tracking of pygmy blue whales suggest that they migrate north from the Perth Canyon (feeding area) in March / April, reaching Indonesia by June where they remain until at least September. Southern migration occurs December as the animals migrate back to the Perth Canyon arriving in March / April. Migration is likely to follow the deep oceanic routes and a tagging study by Double *et al* (2014) identified that the shallowest waters occupied was approximately 1,300m.

Given a BIA has been identified within the EMBA it is likely that pygmy blue whales transit through the EMBA. Individuals may transit through the Operational Area.

1.3.1.3 Fin Whale

Fin whale (*Balaenoptera physalus*) distribution in Australian waters is known primarily from stranding events and whaling records. Fin whales have been observed in South Australian waters between November and May but the presence in NT water is unknown (DCCEEW, 2022c).

Reliable estimates of fin whale population size in Australia are not currently possible. The proportion of time that this species spends at the surface varies considerably depending on their behaviour and local ecology (e.g. whether they are traveling or foraging; depth at which prey occurs): thus, extrapolation of accurate population estimates are difficult. There are no known mating or calving areas in Australian waters (DCCEEW, 2022c).

There are no known mating or calving areas in Australian waters and no BIAs for the fin whale are currently identified. However, given their known distribution and movements, it is possible that individual fin whales may pass through the EMBA in low numbers.

1.3.1.4 Humpback Whale

The humpback whale (*Megaptera novaeangliae*) is the most commonly sighted whale in north WA waters. Major breeding areas have been identified for the western Australian population in the Kimberley region and particularly between Lacepede Islands (16.8° S) and Camden Sound (15.38° S) (Jenner *et al*., 2001). Camden sound appears to be the northern most limit for the majority of west coast whales and is considered to be an important breeding area (Jenner et al. 2001). Double and colleagues (2010) found that satellite tagged whales in the area of Camden sound tended to move in an inconsistent direction, which suggests this area is used for breeding. The species migrates annually from feeding grounds in Antarctic waters during the summer months to their breeding and calving grounds along the west coast (DCCEEW, 2022d).

Studies conducted by Jenner *et al*. (2001) indicate that during the southern migration most humpback whales, particularly cow/calf pairs, stay closer to the coast than during the northern migration. On their southern migration, cow-calf pairs frequently rest in aggregation areas along the Western Australian coastline. Important resting areas during the southern migration include Shark Bay, Exmouth Gulf, and the southern Kimberley region (DCCEEW, 2022d).

A migration BIA is within the EMBA, 750 km south-west of the Operational Area. It is possible that individual whales may pass through the EMBA in low numbers.

1.3.1.5 Bryde's Whale

Bryde's whales (*Balaenoptera edeni*) migrate seasonally in temperate to tropical waters, in depths ranging from 200m to 1,000m although they more commonly migrate at depths nearer to 200m (DCCEEW, 2022e). Bryde's whales have been sighted in all areas of Australia except NT, with the majority recorded in South Australia, however no specific breeding or feeding grounds have been found within Australia (DCCEEW, 2022e).

It is possible the coastal form of Bryde's whales may also occasionally transit through the EMBA; however, they are not expected to be present in significant numbers.

1.3.1.6 Killer Whale

Killer whales (*Orcinus orca*) prefer deep, cold waters (Bannister *et al*., 1996) and have been recorded along continental slopes (DCCEEW, 2022f). The species is found throughout the world's oceans and has been recorded in all areas of Australia, however no important breeding, nesting or resting grounds have been identified in Australia (DCCEEW, 2022f).

No BIAs have been identified for this species within the EMBA, although the species may be present in low numbers.

1.3.1.7 Indo-Pacific humback dolphin

In Australia, Indo-Pacific humpback dolphins (*Sousa chinensis*) are known to occur along the northern coastline, extending to Exmouth Gulf on the west coast (25° S), and the Queensland/NSW border region on the east coast (34° S). A recent helicopter survey along the eastern half of the NT found Australian humpback dolphins were sparsely distributed across this region (DCCEEW, 2022g). Indo-Pacific humpback dolphins inhabit shallow coastal, estuarine, and occasionally riverine habitats, in tropical and subtropical regions. Most studies to date indicate that Australian humpback dolphins occur mostly close to the coast (within 20 km from land) and in relatively sheltered offshore waters near reefs or islands, but they have been seen 55 km offshore in shallow water (DCCEEW, 2022g).

Given their preference for shallow coastal habitats, the species is expected to transit the shallow water sections of the EMBA only (e.g. coastlines).

1.3.1.8 Spotted bottlenose dolphin

Spotted bottlenose dolphins (*Tursiops aduncus*) occur in four main regions around Australia, being the eastern Indian ocean, the Tasman sea, the Coral sea and the Arafura/Timor Sea (DCCEEW, 2022h). The species are generally distributed in the tropical waters of the North-West Marine Region, along the Pilbara and Kimberley coasts and inhabiting shallow coastal waters along the continental shelf (DCCEEW, 2022h).

Given the species' use of relatively deeper waters and the potential for long-range migratory movements, it is likely this species will occasionally transit the Operational Area and EMBA.

1.3.1.9 Dugong

Dugongs are not expected to be common inhabitants of the JBG. The dugong (*Dugong dugon*) is listed as vulnerable under the IUCN. Dugongs are patchily distributed throughout tropical and subtropical waters of the Indian and Pacific Oceans, with major concentrations of dugongs coinciding with sizeable seagrass beds, on which they feed. The lack of seagrass in JBG is expected to limit the distribution of dugongs in the region. Specific areas supporting dugongs in the Northern Territory include: the northern coast (Daly River to Millingimbi, including Melville Island and Vernon Islands and the Darwin region); and the Gulf of Carpentaria, including the Sir Edward Pellew Group of Islands, the mouth of the Limmen Bight River, and the waters between Blue Mud Bay and Groote Eylandt. Specific areas supporting dugongs along the Queensland coast of the Gulf of Carpentaria include: the Wellesley Islands (Mornington and Bentick Islands), the mouth of the Norman River, and Albatross Bay. Within the Gulf of Carpentaria, the Sir Edward Pellew and Wellesley Islands are the most important dugong habitats (DCCEEW, 2022i).

Observations from aerial surveys in the NT focused on dugong populations in the Gulf of Carpentaria and in the northern parts of the NT, such as the Tiwi Islands and Coburg Peninsula. No surveys have been undertaken in the JBG. However, seagrass habitat is limited (Woodside, 2004a) and the JBG is therefore not expected to provide a habitat for dugong.

1.3.1.10 Australian Snubfin Dolphin

Australian snubfin dolphins (*Orcaella heinsohni*) occur in the offshore waters of northern Australia, ranging from Broome to Brisbane River (Parra et al. 2002a). The species has been recorded up to 23 km offshore. Sightings indicate that Australian snubfin dolphins occur mostly in protected shallow coast waters, and near river and creek mouths (Parra, 2006; Parra & Corkeron, 2001; Parra *et al*., 2002a).

Given their preference for shallow coastal habitats, the species is expected to transit the shallow water sections of the EMBA only (e.g. coastlines).

1.3.2 Marine Reptiles

Threatened and migratory marine reptile species within the Operational Area and EMBA are listed in Section 4.4 of the EP, along with identified BIAs.

Details on the species identified by the EPBC Act PMST for the Operational Area and EMBA are included in the sections below.

1.3.2.1 Green turtle

Green turtles (*Chelonia mydas*) are generally found in tropical and subtropical waters at around 20°C although the species can be present in temperate waters. Green turtles are known to nest, forage and migrate across tropical northern Australia, with significant nesting grounds including Dampier Archipelago, Ashmore Reef and the Lacepede Islands (DCCEEW, 2022j).

Green turtles are common in the North-west Marine Region, with the JBG AMP (which the EMBA overlaps and is 50 km east of the Operational Area) identified as an important foraging area for the species (DCCEEW, 2022j) (Figure 4.8 of the EP). Additionally, the Operational Area overlaps with a number of green turtles BIAs and Habitat Critical to the Survival of Marine Turtles (HCMT). Green turtles are likely to forage within the EMBA and may forage out to the Operational Area, albeit in low numbers.

1.3.2.2 Flatback Turtle

A significant flatback turtle nesting area occurs on the north side of Cape Domett, WA (DCCEEW, 2022k). and low levels of turtle nesting are reported on Pelican Island, both approximately 95 km to the south of the Operational Area. In western Northern Territory, some nesting occurs year-round though nesting density reaches a peak in July. This dry season peak of nesting activity may be adaptive to protect the eggs from the high lethal sand temperatures that occur in the wet season (DCCEEW, 2022k).

A survey was undertaken to address the lack of data on turtle activity between Cape Hay to Pearce Point (including the shoreline of the eastern-most extent of the EMBA). The complete findings of this study are contained in the Blacktip Environmental Impact Statement (EIS) (Woodside, 2004b). The results indicated that there are low levels of flatback turtle activity in the area of Northern Yelcherr Beach and Injin Beach to the north. Two flatback nests and a track of a flatback that came ashore but did not lay at Northern Yelcherr Beach were found during the survey. This suggests that there could be some tens of nests laid on this beach per year by possibly less than 20 individuals. Immediately south, on Yelcherr Beach, there was no sign of sea turtle nesting. Injin Beach, Northern Yelcherr Beach and Yelcherr Beach overlap the eastern-most extent of the EMBA.

The coastline from Cape Hay to Pearce Point (within the eastern-most extent of the EMBA) includes many sandy beaches, and turtles have been reported to utilise all of these beaches for nesting (LDM, 1994).

Turtle monitoring was undertaken during the construction of the Blacktip facilities in 2009. This confirmed a maximum of 12 nests being laid on Yelcherr Beach per season.

Other nesting areas include Cape Domett to the south-most extent of the EMBA, which appears to be one of the largest known nesting populations of this species, with an estimated yearly population in the order of several thousand turtles (Whiting *et al*., 2008).

Flatback turtles nest at Cape Dommet throughout the year, with peak occurring August and September (Whiting *et al*., 2008). Flatback turtles are likely to forage within the EMBA and may forage out to the Operational Area, albeit in low numbers.

1.3.2.3 Hawksbill Turtle

Hawksbill turtles (*Eretmochelys imbricate*) have a large migratory pattern and are found in both tropical and temperate waters where they are known to forage in coral and rocky reef habitats. They feed on plankton in the open ocean and then on sponges, hydroids, cephalopods, gastropods, jellyfish, seagrass and algae as an adult (DCCEEW, 2022l). The North-west Marine Region supports one of the largest nesting populations of hawksbill turtles in the world, with significant rookeries occurring at Varanus and Rosemary Islands, outside the EMBA (Pendoley, 2005). The closest nesting grounds to the EMBA is located to the approximately 350 km north-east at Coburg Peninsula. Although hawksbill turtles are known to nest any time of the year, the peak nesting period in Northern Australia occurs between July and October (DCCEEW, 2022l).

Hawksbills are likely to forage within the EMBA and may forage to the Operational Area, albeit in low numbers.

1.3.2.4 Loggerhead Turtle

Loggerhead turtles (*Caretta caretta)* have a global distribution throughout tropical, sub-tropical and temperate waters (Marquez, 1990). In Australia, they generally occur around coral and rocky reefs, seagrass beds and muddy bays throughout Eastern, Northern and Western Australia (DCCEEW, 2022m). Known nesting areas in WA extend from Shark Bay to the North West Cape, with the closest nesting ground to the EMBA located at the Dampier Archipelago (DCCEEW, 2022m), southwest of the EMBA.

Loggerhead turtles show fidelity to both their foraging and breeding areas and can migrate over 2,600 km between the two (DCCEEW, 2022m). The WA stock forages from Shark Bay through to Arnhem Land in the NY (DCCEEW, 2022m). Loggerhead turtles are known to forage around the pinnacles of the JBG and the carbonate bank and terrace of the Sahul Shelf KEF (which overlaps the EMBA).

The EMBA overlaps with a foraging BIA for the loggerhead turtle, therefore loggerhead turtles are likely to occur within the EMBA.

1.3.2.5 Leatherback turtle

The leatherback turtle (*Dermochelys coriacea*) has the widest distribution of any marine turtle species, and can be found in tropical, subtropical and temperate waters throughout the world (Marquez, 1990). Leatherback turtles are relatively rare in northern Australian waters. The species is more commonly observed in southern coastal waters around Australia.

No major breeding sites of leatherback turtles have been recorded in Australia (Limpus, 2009); however, scattered nesting occurs in the Northern Territory, along the coast of Arnhem Land. For example, low numbers of nesting females have been recorded at Cobourg Peninsula in north-west Arnhem Land (Chatto & Baker, 2008), with breeding occurring mostly during December and January.

Nesting occurs on tropical beaches and subtropical beaches (Marquez 1990) but no major centres of nesting activity have been recorded in Australia, although scattered isolated nesting (1-3 nests per annum) occurs in southern Queensland and Northern

Territory (Limpus & McLachlin, 1994). However, leatherback turtles are the most pelagic of all marine turtles, and make long migrations between foraging areas and nesting beaches (DCCEEW, 2022n).

1.3.2.6 Olive ridley turtle

The olive ridley turtle (*Lepidochelys olivacea*) is the smallest Australian marine turtle and is the most numerous of all marine turtles. Nesting aggregations occur worldwide, although no large rookeries have been identified in WA and no major breeding areas have been recorded in Australia (DCCEEW, 2022o).The species forages on shallow benthic habitats and is commonly found in soft-bottomed habitats around the northern parts of Australia (DCCEEW, 2022o). Nesting occurs all year round in Northern Australia and important foraging areas are found within the along the JBG shoreline (DCCEEW, 2022o). The Operational Area overlaps with the olive ridley turtle foraging BIA (Figure 4.6 of the EP).

Olive ridley turtles may forage within the EMBA and Operational Area, albeit in low numbers as the waters present a potential feeding area.

1.3.2.7 Salt-water crocodile

The salt-water crocodile (*Crocodylus porosus*) is distributed throughout northern Australian coastal waters and floodplains, lower reaches of rivers and in swamps and marshes and can be found up to 150 km from the coast (Webb *et al*., 1987). The species is found in most major river systems within the Kimberley region in WA, including the Ord, Durack Pentecost and Forrest rivers which enter the JBG via the Cambridge Gulf estuary (DCCEEW, 2022p). This species nests in elevated isolated freshwater swamps (DCCEEW, 2022p).

It is unlikely that saltwater crocodile will be present in the EMBA or Operational Area, given their preference for river system habitats.

1.3.2.8 Short-nosed seasnake

The short-nosed seasnake is endemic to Western Australia. The species prefers to inhabit reef flats or shallow waters along the outer reef edge in water depths to 10 m (Cogger 2000). Individuals have been observed in daylight hours, resting beneath small coral overhangs or coral heads in water 1 – 2 m deep (McCosker, 1975). Guinea and Whiting (2005) reported that some short-nosed seasnakes may move up to 50 m away from the reef flat.

The short-nosed seasnake has been recorded from the Exmouth Gulf, Western Australia (Storr *et al*., 2002) to the reefs of the Sahul Shelf, which lie in the eastern Indian Ocean. As there are no reefs or shallow waters in the Operational Area it is extremely unlikely the short nosed seasnake would be present. However, seasnakes may occur within the EMBA in shallow waters and reefs.

1.3.3 Fish, Sharks and Rays

Threatened and migratory fish, shark and ray species within the Operational Area and EMBA are listed in Section 4.4 of the EP, along with identified BIAs.

Details on the species identified by the EPBC Act PMST for the Operational Area and EMBA are included in the sections below.

1.3.4 Whale Shark

The whale shark (*Rhincodon typus*) are normally oceanic and cosmopolitan in their distribution. Whale sharks are widely distributed in tropical to warm temperate oceanic and coastal waters. Their known aggregation sites in Northern Australia are at Ningaloo Reef, outside the EMBA. The species filter feeds in areas of upwelling, with surface waters between 25-35 °C, preferably with upwelling waters of 17 °C or less (Norman, 1999). Offshore sightings are not uncommon; however, they are more commonly observed in coastal waters sitting high in the water column. Wilson et al. (2006) found that whale sharks can travel up to 1,500 km northeast after departing Ningaloo Reef.

It is unlikely that the species will be present in the Operational Area or EMBA in significant numbers.

1.3.4.1 Great White Shark

The great white shark (*Carcharodon carcharias*) is a close relative of the Mako shark and porbeagle shark. The species is long living reaching ages of 40 to 50 years (Bruce, 2006). The species has relatively slow development and low reproductive rates and with gestation periods, estimated at up to 18 months. These characteristics imply a low reproductive potential which has implications for the vulnerability of the species (DCCEEW, 2022q). Great white sharks occur worldwide in coastal temperate and subtropical regions but can also occur in tropical regions.

The Operational Area or EMBA do not overlap any BIA for the great white shark, however individuals may pass through the area infrequently.

1.3.4.2 Northern River Shark

The Northern river shark (*Glyphis garricki*) is so far known to only occur in the Adelaide and Alligator River systems in the Northern Territory (NT) of Australia. This species is probably restricted to the relatively shallow, upper freshwater to brackish (0-26 ppt) reaches of the Adelaide and Alligator River systems of the NT. Despite considerable fishing and collecting activity in the NT, no specimens have ever been found in coastal marine habitats.

The species is only likely to occur in certain nearshore areas of the EMBA and is unlikely to occur in the Operational Are given its preference for estuaries and river mouths.

1.3.4.3 Shortfin Mako

The shortfin mako shark (*Isurus oxyrinchus*) is an active, offshore littoral and epipelagic species, found in tropical and warm-temperate seas from the surface down to at least 500 m, seldom occurring where water temperature is below 16°C (Cailliet *et al.*, 2009). This species has been occasionally found close inshore where the continental shelf is narrow, and may occur from 20-50° between Australia and Chile, and to almost 60° south east of New Zealand (Cailliet *et al.*, 2009).

Due to the broad distribution of this species, they are unlikely to be found in significant numbers in the Operational Area or EMBA.

1.3.4.4 Longfin Mako

The longfin mako shark (*Isurus paucus*) is an oceanic tropical species and is only rarely encountered globally (Reardon *et al*., 2006). This species is believed to be cosmopolitan in tropical and warm temperate waters and common in the Western Atlantic and possibly the Central Pacific. However, its distribution in Australian waters is poorly known, with only sporadic sightings (Reardon *et al*., 2006). This is in part due to confusion with the more common shortfin mako shark (Compagno, 2001).

Due to the wide distribution range of the species and the absence of any recognised important habitat in the EMBA, the longfin mako shark is not expected to occur in the Operational Area or EMBA in significant numbers.

1.3.4.5 Freshwater Sawfish

The freshwater sawfish (*Pristis pristis*) appears to be confined to freshwater drainages and the upper reaches of estuaries in northern Australian waters including the Ord, Daly and Victoria rivers (Woodside, 2004a).

The PMST species profile indicates that the species occur in all large rivers of northern Australia from the Fitzroy River, Western Australia, to the western side of Cape York Peninsula, Queensland. Juveniles and sub-adult Freshwater Sawfish predominantly occur in rivers and estuaries, while large mature fish tend to occur more often in coastal and offshore waters up to 25 m depth (Giles *et al*., 2006)

It is unlikely that the species will be present in the Operational Area or EMBA in significant numbers. Any individuals present will likely be limited to larger, more mature fish.

1.3.4.6 Dwarf Sawfish

The distribution of the dwarf sawfish (*Pristis clavata*) is considered to extend north from Cairns around the Cape York Peninsula in Queensland, across northern Australian waters to the Pilbara coast in WA (DCCEEW, 2022r). The dwarf sawfish usually inhabits shallow (2–3 m) coastal waters and estuarine habitats (DCCEEW, 2022r).

It is unlikely that the species will be present in the Operational Area or EMBA, particularly given its preference to coastal waters and estuarine habitats.

1.3.4.7 Green Sawfish

Green sawfish (*Pristis zijsron*) have been recorded in the coastal waters off Broome in WA (DCCEEW, 2022s), however there is little known about their distribution in the NT. The species prefer shallow water with muddy bottom habitats, usually within inshore marine waters, including estuaries and river mouths (DCCEEW, 2022s). It is unlikely that the species will be present in the Operational Area or EMBA, particularly given its preference to estuaries and river mouths.

1.3.4.8 Narrow Sawfish

The narrow sawfish (*Anoxypristis cuspidata*) occurs from the northern Persian Gulf to Australia and north to Japan, inhabiting estuarine waters and nearshore waters up to depths of 100 m (D'Anastasi *et al.*, 2013). While population declines have been observed globally, the narrow sawfish is not currently listed as threatened. Northern Western Australia, the NT, the Gulf of Carpentaria and Queensland east coast waters comprise the most ecologically functional populations worldwide, however these populations are suspected to have declined significantly from historic levels (D'Anastasi *et al.*, 2013).

The species may occur within the nearshore estuarine environments of the EMBA and is unlikely to occur in the Operational Area given its preference for estuarine environments.

1.3.4.9 Giant Manta Ray and Reef Manta Ray

Manta rays consist of two individual species; the giant manta ray (*mobula birostris*) and the reef, or coastal manta ray (*mobula alfredi*). The giant manta ray is the largest ray species in the world and is found in tropical marine waters worldwide and occasionally in temperate regions (Marshall *et al.*, 2018a). The giant manta ray spends time on the surface, sometimes even jumping out of the water, and has also been observed diving to depths of over 1,000 metres (Marshall *et al.*, 2018). The species is a seasonal visitor to coastal and offshore sites and is commonly recorded on productive coastlines with regular upwellings. Giant manta rays also visit shallow reefs to be cleaned by 'cleaner fishes' and to feed.

Giant manta rays aggregate at Ningaloo Reef, in particular between March and April, outside of the EMBA. Reef manta rays usually occur closer to shore; therefore they may occur in the nearshore areas of the EMBA and infrequently transit through the Operational Area.

Reef manta rays are commonly sighted inshore, but also frequent offshore coral reefs, rocky reefs and seamounts. Sightings suggest the species is more resident to tropical waters and may have smaller home ranges and shorter seasonal migrations than the giant manta ray (Marshall *et al.*, 2018b). Individuals in Australia have been recorded in offshore waters up to 190 km from the coast and making seasonal migrations of several hundred kilometres between aggregation sites (Marshall *et al.*, 2018b).

1.3.5 Speartooth Shark

The Speartooth Shark (Glyphis glyphis) has so far only been recorded in tidal rivers and estuaries within the Northern Territory and Queensland. To date, the Speartooth Shark has only been captured in tidal rivers and estuaries indicating that large tropical river systems appear to be the primary habitat for this shark. It is inferred that this species may be largely restricted to low salinity environments such as freshwater and brackish areas of rivers (DCCEEW, 2022t).

The species may occur within the nearshore estuarine environments of the EMBA and is unlikely to occur in the Operational Area given its preference for estuarine environments.

1.3.6 Seabirds/Shorebirds

Threatened and migratory seabird and shorebird species within the Operational Area and EMBA are listed in Section 4.4 of the EP, along with identified BIAs.

Details on the species identified by the EPBC Act PMST for the Operational Area and EMBA are included in the sections below.

1.3.6.1 Red Knot

Distribution of the red knot (*Calidris canutus*) in Western Australia is widespread, including the coast from Ningaloo and Barrow Island to the south-west Kimberly Division. Migration occurs to high northern latitudes during the northern hemisphere summer to breeding grounds where food is readily abundant, then southward to escape severe winter conditions under which energy demands are high and prey is scarce. Both Australia and New Zealand host significant populations of red knots during the non-breeding period (Bamford *et al*., 2008). Important sites for the red knot in Western Australia include Eighty Mile Bay (population of 80,700) and Roebuck Bay (11,200) (Bamford *et al*., 2008) located over at the furthest south-western extent of the EMBA. Similar to other migratory shorebirds, the red knot frequents intertidal sands, mudflats and coastal wetlands. As these habitats are not present within the Operational Area, occurrence of the species within the area is unlikely outside of brief migratory transit. However, the red knot may be present in these habitats within coastal areas of the EMBA during the non-breeding period.

1.3.6.2 Eastern Curlew

The Eastern Curlew (*Numenius madagascariensis*) is Australia's largest shorebird. It is a long-haul flyer and easily distinguished by its long, downwards curving bill. The Eastern Curlew breeds in the Northern Hemisphere and arrives in Australia in August to forage for crabs and molluscs in intertidal mudflats (DCCEEW, 2015). The species occurs within Western Australia at Barrow Island, the Damper Archipelago, through the Kimberley and along the NT coasts (DCCEEW, 2015). Eastern Curlews may transit through the Operational Area and are likely to occur within coastal areas of the EMBA.

1.3.6.3 Fork-tailed Swift

The fork-tailed swift (*Apus pacificus*) is native to over 30 countries and occurs in all Australian states and territories outside of breeding periods. The species is widely distributed in Western Australia from coastal and subcoastal areas between Augusta and Carnarvon (including islands), to the Pilbara and Kimberly regions, the north and north-west Gascoyne region, along the south coast and within Timor Sea (Higgins, 1999). In the NT there are widespread but scattered records of the species in the north (Higgins, 1999).

The fork-tailed swift leaves breeding grounds in Siberia in August-September for warmer climactic conditions, with some populations arriving in Western Australia around October-November. The species is typically present in the Pilbara region from September to late April when they depart northwards (Higgins, 1999). Although almost exclusively aerial, including roosting, the species mostly occurs over inland plains, cliffs, beaches and dry/open habitats, foraging aerially for insects (Higgins, 1999). There is currently no BIA for the fork-tailed swift, however they are likely to be present within the Operational Area and EMBA, particularly near land and during migratory periods.

1.3.6.4 Streaked Shearwater

The streaked shearwater (*Calonectris leucomelas*) is distributed throughout the western Pacific, breeding on islands off the coast of China, North Korea, South Korea and at the coast or offshore islands of Japan and Russia (del Hoyo *et al*., 1992). Breeding occurs during March in colonies, typically within burrows on forested hills. During the northern hemisphere winter, the species migrates south to the coasts of Australia, New Guinea, the Philippines, Vietnam, Sri Lanka and southern India (del Hoyo *et al*., 1992). Foraging occurs over pelagic and inshore waters, from which the species seizes food from just below the surface (del Hoyo *et al*., 1992). There is currently no BIA for the streaked shearwater. However, it is likely to occur within the Operational Area and EMBA during non-breeding periods.

1.3.6.5 Lesser Frigatebird

The lesser frigatebird (*Fregata ariel*) is native to numerous countries between latitudes 30° N and 20° S, with significant breeding populations found in tropical waters of the Indian and Pacific oceans (del Hoyo *et al*., 1992). Individuals disperse throughout tropical seas during non-breeding periods, foraging in marine waters for fish and squid. The species’ preferred breeding habitat is on remote tropical and sub-tropical islands, within bushes and mangroves or on bare ground (del Hoyo *et al*., 1992).

1.3.6.6 Common Sandpiper

The common sandpiper (*Actitis hypoleucos*) has a wide breeding distribution, ranging from eastern Russia to western Europe, and is found throughout Australia, south and south east Asia and Africa (except near the equator) during non-breeding periods (Bamford *et al*., 2008). Breeding occurs during May-June, with southward migration between mid-July and August until a return to breeding grounds around April (del Hoyo *et al*., 1996). During non-breeding periods, the species inhabits inland wetland and coastal areas, such as estuaries, streams, pools, tidal creeks and freshwater seeps on coastal shores, but typically avoids large coastal mudflats (del Hoyo *et al*., 1996). The common sandpiper is unlikely to occur within the operational area except during migratory movements but may occur during non-breeding periods at wetland and coastal areas within the EMBA.

1.3.6.7 Roseate Tern

In Western Australia, the roseate tern (Sterna dougallii) has been recorded north from Mandurah to around Eighty Mile Beach, in the Pilbara region, and occurs in coastal and marine areas in subtropical and tropical seas (Higgins & Davies, 1996). Records of the species are scattered along the north coast of the NT, mainly from Darwin to Gove

Peninsula, and at North Peron Island (Higgins & Davies, 1996). Breeding occurs in two quite distinct periods, with peak months for laying April to November. At some sites, breeding occurs during both late spring-summer and late autumn-winter (Higgins & Davies, 1996). Colonies may be resident or dispersive. The species inhabits rocky and sandy beaches, coral reefs, sand cays and offshore islands. They usually roost or in the intertidal zone on islands, including on the upper sections of beaches, above the high-water mark (Higgins & Davies, 1996). The EMBA overlaps with the breeding BIA for the Roseate Tern; the species is also likely to occur within the EMBA, particularly in coastal areas. Individuals may transit the Operational Area.

1.3.6.8 Great Knot

The Great Knot (Calidris tenuirostris) has been recorded around the entirety of the Australian coast, with a few scattered records inland. It is now absent from some sites along the south coast where it used to be a regular visitor. The greatest numbers are found in northern Australia; where the species is common on the coasts of the Pilbara and Kimberley, from the Dampier Archipelago to the Northern Territory border, and in the Northern Territory from Darwin and Melville Island, through Arnhem Land to the south-east Gulf of Carpentaria In Australasia, the species typically prefers sheltered coastal habitats, with large intertidal mudflats or sandflats. This includes inlets, bays, harbours, estuaries and lagoons. They are occasionally found on exposed reefs or rock platforms, shorelines with mangrove vegetation, ponds in saltworks, at swamps near the coast, saltlakes and non-tidal lagoons. Typically, the Great Knot roosts in large groups in open areas, often at the waters edge or in shallow water close to feeding grounds (DCCEEW, 2022u).

1.3.6.9 Lesser Sand Plover

Within Australia, the Lesser Sand-Plover (Lesser Sand Plover) is widespread in coastal regions, and has been recorded in all states. The internationally important sites for the species closest to the EMBA include Roebuck Bay, Broome, and the Darwin area. The species roosts and feed around beach areas and occasionally forages on coral reefs, and roosts around beach areas and breeding occurs outside of Australia (DCCEEW, 2022v)

1.3.6.10 Abott's Booby

The Abbott's booby (Papasula abbotti) spends most of its time at sea and traverse large distances, but needs to come ashore to breed. Currently, Abbott's Booby is only known to breed on Christmas Island (Stokes 1988) and to forage in the waters surrounding the island (DCCEEW, 2022w).

1.4 Protected and Significant Areas

There are a number of key sensitive areas that overlap the Operational Area and EMBA. These are summarised in Table 4.10 of the EP and described further below.

1.4.1 Australian Marine Parks

As described in Section 4.5.1 of the EP, the Operational Area does not overlap with any Australian Marine Parks (AMP) however the EMBA overlaps with Joseph Bonaparte Gulf Marine Park, Kimberley AMP, Eighty Mile Beach AMP and Oceanic Shoals AMP.

1.4.1.1 Joseph Bonaparte Gulf Marine Park

A summary of characteristics of the JBG AMP is presented in Table 1.3. The JBG AMP is approximately 50 km east of the Operational Area.

Table 1.3: Summary of Characteristics of the Joseph Bonaparte Gulf AMP (Parks Australia, 2018a)

Name	Joseph Bonaparte Gulf AMP
Area	8,597 km^2
Depth range	Approximately 5–75 m (Average 22 m)
Types of zoning	Multiple Use Zone (IUCN Category VI) – 6,346 km^2 Special Purpose Zone (IUCN Category VI) – 2,251 km^2

Values are to inform the Director's decisions when authorising activities in marine parks. Activities will be assessed in relation to their impacts on and risk to values, to ensure activities are undertaken in a manner that minimises impacts to as small as reasonably practicable. The following values are applicable to the JBG AMP (Parks Australia, 2018b):

- Natural Values
- Cultural Values
- Heritage Values
- Socio-economic values.

Table 1.4 presents details of the value of the AMP.

Table 1.4: Summary of value of the Joseph Bonaparte Gulf AMP (Parks Australia, 2018a)

Value	Summary
Natural Values	Contains habitats, species and ecological communities associated with the Northwest Shelf Transition bioregion. It includes one key ecological feature: the carbonate bank and terrace system of the Sahul Shelf (valued as a unique seafloor feature with ecological properties of regional significance). Contains a number of prominent shallow seafloor features including an emergent reef system, shoals, and sand banks The key ecological feature in the Marine Park is the carbonate bank and terrace system of the Sahul Shelf—characterised by terraces, banks, channels and valleys supporting sponges, soft corals, sessile filter feeders, polychaetes and ascidians 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 marine turtles and the Australian snubfin dolphin.
Cultural Values	The Miriuwung, Gajerrong, Doolboong, Wardenybeng and Gija and Balangarra people have responsibilities for sea country in the Marine Park
Heritage Values	No international, Commonwealth or national heritage listings apply to the Marine Park at commencement of this plan, however the Marine Park is adjacent to the West Kimberley National Heritage Place.

Socio-economic values.	Tourism, commercial fishing, mining, and recreation including fishing, are important activities in the Marine Park

1.4.1.2 Kimberley Marine Park

Characteristics of the Kimberley AMP are presented in Table 1.5. The Kimberley AMP is approximately 220 km to the west of the Operational Area.

Table 1.5: Characteristics of the Kimberley AMP (DPAW, 2016)

Name	Kimberley AMP
Area	74,469 km^2
Depth range	Approximately 15-800 m
Types of zoning	Multiple Use Zone (IUCN Category VI) – 66,563 km^2 Habitat Protection Zone (IUCN Category IV) – 1,131 km^2 Marine National Park Zone (IUCN Category II) – 6,775 km^2

The Kimberley AMP is significant because it includes habitats, species and ecological communities associated with the Northwest Shelf Province, Northwest Shelf Transition and Timor Province. It includes two key ecological features: the ancient coastline at the 125 m depth contour (an area of enhanced productivity and migratory pathway for cetaceans and pelagic marine species); and continental slope demersal fish communities (valued for high levels of endemism and diversity and the second richest area for demersal fish species in Australia) (Parks Australia, 2018b).

The following values are applicable to the Kimberly AMP (Parks Australia, 2018a):

- Natural Values
- Cultural Values
- Heritage Values
- Socio-economic values.

Table 1.6 presents details of the value of the AMP.

Table 1.6 Summary of value of the Kimberley AMP Marine Park (Parks Australia, 2018b)

Value	Summary
Natural Values	Important foraging areas for: – migratory seabirds – migratory dugongs – the Australian snubfin dolphin, Indo-Pacific humpback dolphin and spotted bottlenose dolphin – marine turtles Supports a range of species, including protected species listed as threatened, migratory, marine or cetacean under the EPBC Act. Biologically important areas within the Marine Park include breeding and foraging habitat for seabirds, internesting and nesting habitat for marine turtles, breeding, calving and foraging habitat for inshore dolphins, calving, migratory pathway and nursing habitat for humpback whales,

	migratory pathway for pygmy blue whales, foraging habitat for dugong and foraging habitat for whale sharks. Extent comprises a range of geological features including the continental shelf, slope, plateau, pinnacle, terrace, banks and shoals and valley seafloor Extent contains two key ecological features: the ancient coastline and continental slope demersal fish communities
Cultural Values	The Wunambal Gaambera, Dambimangari, Bardi Jawi and the Nyul people's sea country extends into the Kimberley Marine Park
Heritage Values	No International, Commonwealth or national heritage listings apply to the AMP, however the AMP is adjacent to the national heritage place of The West Kimberley.
Socio-economic values.	Tourism, commercial fishing, mining, recreation, including fishing, and traditional use are important activities in the AMP.

1.4.1.3 Eighty Mile Beach Marine Park

Characteristics of the Eighty Mile Beach AMP are presented Table 1.7. Eighty Mile Beach AMP is approximately 815 km to the south-west of the Operational Area and within the EMBA.

Table 1.7: Summary of Characteristics of the Eighty Mile Beach AMP (Parks Australia, 2018b)

Name	Eighty Mile Beach AMP
Area	10,785 km^2
Depth range	less than 15 m to 70 m
Types of zoning	Multiple Use Zone (IUCN Category VI) 10, 785 km^2

Values are to inform the Director's decisions when authorising activities in marine parks. Activities will be assessed in relation to their impacts on and risk to values, to ensure activities are undertaken in a manner that minimises impacts to as small as reasonably practicable. The following values are applicable to the Eighty Mile Beach AMP (Parks Australia, 2018c):

- Natural Values
- Cultural Values
- Heritage Values
- Socio-economic values.

Table 1.8 presents details of the value of the AMP.

Table 1.8: Summary of Value of the Eighty Mile Beach AMP (Parks Australia, 2018b)

Value	Summary
Natural Values	The Marine Park includes examples of ecosystems representative of the Northwest Shelf Province—a dynamic environment influenced by strong tides, cyclonic storms, long-period swells and internal tides. The bioregion includes diverse benthic and pelagic fish communities, and ancient coastline thought to be an important seafloor feature and migratory pathway for humpback whales. 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 breeding, foraging and resting habitat for seabirds, internesting and nesting habitat for marine turtles, foraging, nursing and pupping habitat for sawfish and a migratory pathway for humpback whales.
Cultural Values	Sea country is valued for Indigenous cultural identity, health and wellbeing. Across Australia, Indigenous people have been sustainably using and managing their sea country for tens of thousands of years. The sea country of the Nyangumarta, Karajarri and Ngarla people extends into Eighty Mile Beach Marine Park. Sea country is culturally significant and important to their identity. They have an unbroken, deep spiritual connection to their sea country, with traditional practices continuing today. Staple foods of living cultural value for the Nyangumarta, Karajarri and Ngarla people include saltwater fish, turtles, dugong, crabs and oysters. Access to sea country by families is important for cultural traditions, livelihoods and future socio-economic development opportunities. The native title holders for the Nyangumarta, Karajarri and Ngarla people are represented by the Karajarri Aboriginal Corporation, Nyangumarta Karajarri Aboriginal Corporation, Nyangumarta Warrarn Aboriginal Corporation, and Wanparta Aboriginal Corporation. These Prescribed Body Corporates represent traditional owners with native title over coastal area adjacent to the Marine Park and are the points of contact for their respective areas of responsibility for sea country in the Marine Park. The Kimberley Land Council and the Yamatji Marlpa Aboriginal Corporation are the Native Title Representative Bodies for Kimberley and Pilbara regions.
Heritage Values	No international, Commonwealth or national listings apply to the Marine Park The Marine Park contains three known shipwrecks listed under the Historic Shipwrecks Act 1976: Lorna Doone (wrecked in 1923), Nellie (wrecked in 1908), and Tifera (wrecked in 1923).
Socio-economic values.	Tourism, commercial fishing, pearling and recreation are important activities in the Marine Park

1.4.1.4 Oceanic Shoals Marine Park

Characteristics of the Oceanic Shoals AMP are presented in Table 1.9. The Oceanic Shoals AMP is approximately 140 km to the north of the Operational Area.

Table 1.9: Summary of Characteristics of the Oceanic Shoals AMP (Parks Australia, 2018a)

Name	Oceanic Shoals AMP
Area	71, 743 km^2
Depth range	Approximately 15-500 m
Types of zoning	National Park Zone (IUCN Category II) 406 km^2 Habitat Protection Zone (IUCN Category IV) 6929 km^2 Multiple Use Zone (IUCN Category VI) 39,964 km^2 Special Purpose Zone (Trawl) (IUCN Category VI) 24,444 km^2

Values are to inform the Director's decisions when authorising activities in marine parks. Activities will be assessed in relation to their impacts on and risk to values, to ensure activities are undertaken in a manner that minimises impacts to as small as reasonably practicable. The following values are applicable to the Oceanic Shoals AMP (Parks Australia, 2018a):

- Natural Values
- Cultural Values
- Heritage Values
- Socio-economic values.

Table 1.10 presents details of the value of the AMP.

Table 1.10: Summary of Value of the Oceanic Shoals AMP (Parks Australia, 2018a)

Value	Summary
Natural Values	The Marine Park includes examples of ecosystems representative of the Northwest Shelf Transition— a dynamic environment influenced by strong tidal currents, upwellings of nutrient-rich waters, and a range of prominent seafloor features. The pinnacles, carbonate banks and shoals are sites of enhanced biological productivity. Key ecological features of the Marine Park are: – carbonate bank and terrace systems of the Van Diemen Rise—an area characterised by terraces, banks, channels and valleys supporting sponges, soft coral, polychaetes, ascidians, turtles, snakes and sharks; – carbonate bank and terrace system of the Sahul Shelf—an area characterised by terraces, banks, channels and valleys, supporting sponges, soft corals, sessile filter feeders, polychaetes and ascidians; – pinnacles of the Bonaparte Basin—an area that contains the largest concentration of pinnacles along the Australian margin, where local upwellings of nutrient-rich water attract aggregations of fish, seabirds and turtles; and – shelf break and slope of the Arafura Shelf—an area characterised by continental slope, patch reefs and hard substrate pinnacles that support over 280 demersal fish species.

	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 and internesting habitat for marine turtles.
Cultural Values	Sea country is valued for Indigenous cultural identity, health and wellbeing. Across Australia, Indigenous people have been sustainably using and 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. The Northern Land Council and the Kimberley Land Council are the Native Title Representative Bodies for the Northern Territory's northern region, and the Kimberley region. The Tiwi Land Council collectively represents traditional owners of the Tiwi Islands.
Heritage Values	No International, Commonwealth or national heritage listings apply to the AMP.
Socio-economic values.	Commercial fishing and mining are important activities in the AMP.

1.4.1.5 Roebuck Bay Marine Park

Characteristics of the Roebuck Bay AMP are presented in Table 1.11. Roebuck AMP is approximately 815 km to the south-west of the Operational Area and within the EMBA.

Table 1.11: Summary of Characteristics of the Roebuck AMP (Parks Australia, 2018b)

Name	Roebuck AMP
Area	304 km^2
Depth range	less than 15 m to 70 m
Types of zoning	Multiple Use Zone (IUCN Category VI) 304 km^2

Values are to inform the Director's decisions when authorising activities in marine parks. Activities will be assessed in relation to their impacts on and risk to values, to ensure activities are undertaken in a manner that minimises impacts to as small as reasonably practicable. The following values are applicable to the Oceanic Shoals AMP (Parks Australia, 2018c):

- Natural Values
- Cultural Values
- Heritage Values
- Socio-economic values.

Table 1.12 presents details of the value of the AMP.

Table 1.12: Summary of value of the Roebuck AMP (Parks Australia, 2018b)

Value	Summary
Natural Values	The Marine Park includes examples of ecosystems representative of the Northwest Shelf Province—a dynamic environment influenced by strong tides, cyclonic storms, long-period swells and internal tides. The bioregion includes diverse benthic and pelagic fish communities, and ancient coastline thought to be an important seafloor feature and migratory pathway for humpback whales. 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 breeding and resting habitat for seabirds, foraging and internesting habitat for marine turtles, a migratory pathway for humpback whales and foraging habitat for dugong.
Cultural Values	Sea country is valued for Indigenous cultural identity, health and wellbeing. Across Australia, Indigenous people have been sustainably using and managing their sea country for tens of thousands of years. Yawuru people have always recognised the waters of Roebuck Bay as nagula (Yawuru sea country), and have customary responsibilities to care for it. They have a deep spiritual connection to offshore landscapes from Bugarrigarra (creator beings), and believe that snake-like metaphysical beings inhabit the sea. Cultural sites in sea country are also a source of law. The Yawuru people harvest marine resources according to the six Yawuru seasons. They have harvested pearl shell for food and cultural purposes. Fish are a staple food source, and fishing a form of cultural expression, connecting people to their country, modelled on tradition and based in traditional law. Access to sea country by families is important to cultural traditions, livelihoods and future socio-economic development opportunities. The Yawuru Native Title Holders Aboriginal Corporation is the Prescribed Body Corporate representing traditional owners with native title over coastal areas adjacent to the Marine Park, and is the point of contact for sea country in the Marine Park. The Kimberley Land Council is the Native Title Representative Body for the Kimberley region
Heritage Values	No international, Commonwealth or national listings apply to the Marine Park at commencement of this plan, however the Marine Park is adjacent to the West Kimberley National Heritage Place.
Socio-economic values.	Tourism, commercial fishing, pearling and recreation, including fishing, are important activities that occur in the Marine Park. These activities contribute to the wellbeing of regional communities and the prosperity of the nation.

1.4.2 State Marine Protected Areas

As described in Section 4.5.1 of the EP, no State-managed Marine Parks occur within the Operational Area, however the North Kimberley Marine Park, Camden Sound Marine Park, Eighty Mile Beach Marine Park and Horizontal Falls Marine Park overlaps the EMBA. The newly establish Bardi Jawi Gaarra, Mayala and Maiyalam Marine Parks in the Buccaneer Archipelago also overlap the far most western extent of the EMBA.

1.4.2.1 North Kimberley Marine Park

The North Kimberley Marine Park overlaps with the western extent of the EMBA and is located 130 km west of the Operational Area. The Marine Park is within the west Kimberley region, included in the National Heritage list for significant natural, Aboriginal and historical values (See Section 4.5.3 of the EP). There are more than 1000 islands within the boundaries of the North Kimberley Marine Park, each providing an array of intertidal and subtidal habitats. There are extensive coral reefs, large estuaries, mudflats and mangroves forests supporting many threatened, protected and culturally important species such as dugongs, turtles and sawfish (DPaW, 2016).

Table 1.13 presents details of the value of the North Kimberley Marine Park.

Table 1.13: Summary of value of the North Kimberley Marine Park (DPaW, 2016)

Value	Summary
Aboriginal heritage	Contains many places of cultural and spiritual importance to traditional owners
Natural Values	Contains many islands, bays and estuaries with mangroves, sandy beaches, coral reefs, seagrass meadows and sponge gardens. Marine turtle nesting sites and breeding sites for sea and shorebird have been identified on the majority of the islands in the Kimberley, and fringing reefs line the shores of almost all the Islands. Open sea reef provide foraging habitat for marine mammals and pelagic fish. Marine fauna in the Marine Park include: – Marine turtle species (green, flatback, loggerhead, hawksbill, leatherback turtles. – Dugong – Finfish (barramundi, threadfin salmon, mangrove jack) – Snubfin dolphin
Social Values (recreation, tourism and community)	Tourism is significant for the Kimberley, generating economic, social and employment benefits for regional communities. Expedition cruise boat operates in the dry months (April to October) between Broome and Wyndham and Darwin Remote communities and towns close to the park use the area for fishing, hunting and recreational areas. The nearest town within the marine park to the EMBA is Wyndham, approximately 130km to the south of the EMBA.
Commercial values and resource	The commercial fishing industry in the marine park provides regional economic benefits, employment

1.4.2.2 Lalang-garram/Camden Sound Marine Parks

The Lalang-garram/Camden Sound Marine Park was created on 19 June 2012 under Section 13 of the Conservation and Land Management Act 1984 (CALM Act). It is a multiple zone marine park that includes; Sanctuary, Special Purpose, and General Use zones (DPaW 2013). The marine park falls within the west Kimberley, which was recently added to the Australian National Heritage List because of its natural, indigenous and historic values to the nation.

The marine park is located about 150 km north of Derby (or 300 km north of Broome) and lies within the traditional country of three Aboriginal native title groups. The Dambimangari people's determination overlies the majority of the marine park. A section of the Wunambal Gaambera people's Uunguu determination includes a small portion of St George Basin, while a small section of the Mayala people's claim (native title not determined at the time of writing of Management Plan) overlies the southwest corner of the marine park (DPaW 2013).

The marine park covers an area of approximately 705,000 ha. It recognises and provides special management arrangements for this area of the Kimberley, which is a principal calving habitat of the humpback whale (*Megaptera novaeangliae*) population that migrates annually along Western Australia's coast. The marine park also conserves a range of species listed as having special conservation status including marine turtles, snubfin and Indo-Pacific humpback dolphins, dugong, saltwater crocodiles, and several species of sawfish. The park also includes a wide range of marine habitats and associated marine life, such as coral reef communities, rocky shoals, and the extensive mangrove forests and marine life of the St George Basin and Prince Regent River (DPaW 2013).

1.4.2.3 Eighty Mile Beach Marine Park

The Eighty Mile Beach Marine Park, located between Port Hedland and Broome, was gazetted on 29 January 2013. It covers an area of approximately 200,000 ha stretching for some 220 km from Cape Missiessy to Cape Keraudren, and includes sanctuary, recreation, general use and special purpose zones. The park is managed under the Eighty Mile Beach Marine Park Management Plan 2014-20124 (DPaW, 2014).

The listed ecological values of the Eighty Mile Beach Marine Park include its high sediment and water quality, the juxtaposition of the beach, coastal topography and seabed and the diverse and ecologically important habitats and marine/coastal flora and fauna. The listed habitat values of the marine park are as follows:

- The intertidal sand and mudflat communities supporting a high abundance and diversity of invertebrate life and providing a valuable food source for shorebirds (including migratory species) and other fauna
- The diverse subtidal filter-feeding communities
- Macroalgal and seagrass communities providing habitat and feeding opportunities for fish, invertebrates and dugongs
- High diversity intertidal and subtidal coral reef communities
- Mangrove communities and adjacent saltmarshes provide nutrients to the surrounding waters and habitat for fish and invertebrates.

The listed marine and coastal fauna values are as follows:

- A high diversity and abundance of nationally and internationally important shorebirds and waders (including migratory species) are found in the marine park
- Flatback turtles are endemic to northern Australia and nest at Eighty Mile Beach
- Dugongs and several whale and dolphin species inhabit or migrate through the marine park

- A highly diverse marine invertebrate fauna provides an important food source for a variety of animals, including birds, fish and turtles, along with recreational and commercial fishing opportunities
- A diversity of fish species provides recreational and commercial fishing opportunities; and
- A diversity of sharks and rays, including several protected species, are found in the park.

In addition to these natural values, the marine park contains land and sea important to traditional Indigenous owners through identity and place, family networks, spiritual practice and resource gathering. The marine park also has a history of European activity including exploration, pastoralism and commercial fishing (e.g. the pearl oyster fishery). The park contains a historical WWII plane wreck (*Dornier Do-24 X-36*) and shipwrecks (two pearl luggers). The marine park provides tourism opportunity and recreational value through its remoteness, diversity and abundance of habitats and marine fauna and the pristine nature of the marine and coastal environment.

The marine park contains vast intertidal sand and mudflats that extend up to 4 km wide at low tide and provide a rich source of food for many species. Eighty Mile Beach Marine Park is one of the world's most important feeding grounds for small wading birds that migrate to the area each summer, travelling from countries thousands of kilometres away (DPaW 2014)

1.4.2.4 Lalang-garram/ Horizontal Falls and North Lalang-garram Marine Parks

The Lalang-garram/ Horizontal Falls and North Lalang-garram Marine Parks were established in 2016 under the State Government's Kimberley Science and Conservation Strategy and are jointly managed by Dambimangari Traditional Owners and the Department of Parks and Wildlife (DPaW 2016). The marine parks fall within the west Kimberly region, included in the Australian National Heritage List for its nationally significant natural, indigenous and historic values (DoEE 2017).

The Lalang-garram/ Horizontal Falls Marine Park extends from Talbot Bay (Ganbadba) in the west to Walcott Inlet (Iledda) and Glenelg River (Molor Moloiyn) in the east and covers approximately 353,000 ha (DPaW 2016). The marine park protects the internationally recognised Horizontal Falls and is important for the region's tourism. The North Lalang-garram Marine Park lies between the Lalang-garram / Camden Sound and North Kimberley Marine Parks and covers approximately 110,000 ha (DPaW 2016).

The area's large tidal range results in extensive intertidal areas with diverse ecosystems such as fringing coral reefs, mangroves and mudflat communities. Subtidal habitats and communities common to the marine parks include filter feeding communities of sponges and hard and soft corals. These intertidal and subtidal habitats provide critical foraging and nursery areas for dugong, marine turtles, estuarine crocodiles, snubfin and Indo-Pacific humpback dolphins, several species of sawfish and migratory seabirds. The marine parks are also a principal calving habitat for humpback whales (DPaW 2016).

1.4.2.5 Bardi Jawi Gaarra, Mayala and Maiyalam Marine Parks

These Marine Parks were established in July 2022 within the Buccaneer Archipelago, 500 km south west of the Operational Area and within the EMBA. The Marine Parks protect a diverse range of marine life. Fringing marnany (reefs) have formed around the coast and between the many islands of the Buccaneer Archipelago, withstanding a tidal range in excess of 11m, the highest in Australia. The wide intertidal areas are home to vast numbers of plants and animals, all adapted to the coastal environment of the Kimberley. Mangrove-lined creeks and noomool / julum (seagrass) meadows create important nursery areas for aarli/ / jaiya (fish), and goorlil / julawadda (turtles) are regularly seen foraging and nesting in the area. Sea Country is forever changing with the seasons and tides.

From June to November each year miinimbi / ngunubange (humpback whales) migrate from Antarctica to the Kimberley to give birth to their young, and dugongs visit the proposed marine parks in the cooler months from May to July.

The Marine Parks also protect the significant cultural values of the area including seasonal camping areas, areas important for customary food and other resources, and culturally significant features such as cultural sites reefs, seagrass beds and mangrove communities. The Marine Parks also help to protect intangible values such as those related to Law, ceremony and oral histories (DPAW, 2020).

1.4.3 Key Ecological Features

An EPBC Protected Matters Search shows that the Operational Area contains no KEF.

As described in Section 4.5.2 of the EP, the closest KEF is the carbonate bank and terrace system of the Sahul Shelf, approximately 22 km west from the Operational Area and within the EMBA.

1.4.3.1 Carbonate bank and terrace system of the Sahul Shelf

The carbonate bank and terrace system of the Sahul Shelf is located in the western Joseph Bonaparte Gulf and to the north of Cape Bougainville and Cape Londonderry. The banks consist of a hard substrate and flat tops at depths of 150–300 m. Each bank occupies an area generally less than 10 km^2 and is separated from the next bank by narrow sinuous channels with depths up to 150 m. The origin of the banks is uncertain, though the area contains predictably high levels of productivity, in comparison to the generally low productivity of the region (DSEWPaC, 2012a).

The banks are foraging areas for loggerhead, olive ridley and flatback turtles and provide habitat for humpback whales, and green and freshwater sawfish (Donovan et al. 2008 in DSEWPaC, 2012a). The hard substrate of the banks is thought to support diverse organisms including sessile benthic invertebrates such as sponges, soft and hard corals, gorgonians, bryozoans, ascidians and associated reef fish and elasmobranchs (Brewer et al. 2007). Cetaceans, green and fresh sawfish are also likely to occur in the area, as well as possibly the Australian snubfin dolphin, a migratory species occurring mostly on the northern extent of the Sahul Shelf (DSEWPaC 2012a).

According to DSEWPaC (2012a) the carbonate banks and terrace system of the Sahul Shelf are regionally important because of their role in enhancing productivity relative to their surrounds. Little is known about the banks, terraces and associated channels but they are believed to be areas of enhanced productivity and biodiversity due to the upwellings of cold nutrient-rich water at the heads of the channels and the availability of hard substrate (Brewer et al. 2007).

1.4.3.2 Continental Slope Demersal Fish Communities

The Australian Continental Slope provides important habitat for demersal fish communities, characterised by high endemism and species diversity. Specifically, the continental slope between North West Cape and the Montebello Trough is the most diverse slope bioregion in Australia with more than 500 fish species, 76 of which are endemic (Last et al. 2005 in DSEWPaC 2012).

The Continental Slope consists of two distinct community types, associated with the upper and mid slope, 225 – 500 m and 750 – 1000 m respectively. The Timor Province and Northwest Transition bioregions are the second-richest areas for demersal fish across the entire continental slope (DSEWPaC 2012). The bacteria and fauna that is present in the system on the Continental Slope are the basis for the food web for demersal fish and higher order consumers in the system. Further information of this system has been poorly researched, though it has been suggested that it is a detritus-based system, where infauna and epifauna become prey for a range of teleost fish, molluscs and crustaceans (Brewer et al. 2007). The higher order consumers supported by this system are likely to be carnivorous fish, deep water sharks, large squid and toothed whales (Brewer et al. 2007). The pelagic production is known to be phytoplankton based, with hotspots located around oceanic reefs and islands (Brewer et al. 2007).

It is believed that the loss of the benthic habitat along this continental shelf region would likely lead to a decline in the species diversity and endemism that this feature is associated with (DoEE 2017e). The endemism of the region is not supported by large data sets and is scarce. It is consequently not well understood what interactions exist between the physical processes and trophic structures that lead to this high diversity of fish and the suggested presence of endemic species in the region (DoEE 2017e).

1.4.3.3 Ancient Coastline at 125 m Depth Contour

The shelf of the North-west Marine Region contains several terraces and steps which reflect changes in sea level that occurred over the last 100,000 years. The most prominent of these features occurs at a depth of 125m as an escarpment along the North West Shelf and Sahul Shelf (DSEWPaC 2012). Where the ancient submerged coastline provides areas of hard substrate it may contribute to higher biological diversity. Little detailed knowledge is available, but the hard substrate of the escarpment is likely to support sponges, crinoids, molluscs, echinoderms (DSEWPaC 2012). It is understood that changes in topography at these depths are critical points for the generation of internal waves (Holloway *et al.* 2001 cited in DEWHA 2008b), playing a minor role in aiding localised upwelling or at least regional mixing associated with the seasonal changes in currents and winds. It is also believed that this prominent floor feature could be important as a migratory pathway for cetaceans and pelagic species such as the whale shark and humpback whale, as they move north and south between feeding and breeding grounds (DEWHA 2008b).

Parts of the ancient coastline are thought to provide biologically important habitats in areas otherwise dominated by soft sediments. The topographic complexity of these escarpments may also facilitate vertical mixing of the water column providing a relatively nutrient-rich environment for species present on the escarpment (DSEWPaC 2012). This enhanced productivity could potentially be attracting baitfish, which in turn provide food for the migratory species. The pressures of potential concern on the biodiversity value of this feature generally include ocean acidification as a result of climate change (DoEE 2017).

1.4.3.4 Carbonate bank and terrace system of the Van Diemen Rise

Lying on the north-eastern side of the Joseph Bonaparte Gulf, the carbonate banks and valleys of the Van Diemen Rise provide more habitat diversity than in the central gulf, resulting in a higher diversity of epifauna (Przeslawski et al. 2011). The region has been identified as a sponge biodiversity hotspot (Przeslawski et al. 2014).

The banks, ridges and terraces of the Van Diemen rise are raised geomorphic features with relatively high proportions of hard substrate which support sponge and octocoral gardens. These, in turn, provide habitat to other epifauna, by providing structure in an otherwise flat environment (Przeslawski et al. 2011). As they are further from the coast, these raised features are influenced less by tides and the associated increased turbidity compared to the central Joseph Bonaparte Gulf. The variability in water depth and substrate composition may contribute to the presence of unique ecosystems in the channels. This may also contribute to the richness of epifauna found here.

Rich sponge gardens and octocorals have been identified on the eastern Joseph Bonaparte Gulf along the banks, ridges and some terraces (Heap et al. 2010, Przeslawski et al. 2014). Plains and deep holes/valleys are characterised by scattered epifauna and infauna that include polychaetes and ascidians. Epibenthic communities such as the sponges found in the channels support first and second-order consumers. Biophysical maps associated with clustering analysis (Ellis & Pitcher 2009) show greater clustering in this area, which indicates greater environmental variability compared with the rest of the North Marine Region.

The Carbonate bank and terrace system of the Van Diemen rise is defined as a key ecological feature considered important for its role in enhancing biodiversity and local productivity relative to its surrounds and for supporting relatively high species diversity.

1.4.3.5 Pinnacles of the Bonaparte Basin

Covering more than 520 km^2 within the Bonaparte Basin, this feature contains the largest concentration of pinnacles along the Australian margin. The pinnacles of the Bonaparte Basin are thought to be the eroded remnants of underlying strata; it is likely that the vertical walls generate local upwelling of nutrient-rich water, leading to phytoplankton productivity that attracts aggregations of planktivorous and predatory fish, seabirds and foraging turtles (CoA, 2008).

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ATTACHMENT B1: OPERATIONAL AREA PMST RESULTS

Australian Government
Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

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

Report created: 14-Jun-2022

- Summary
- Details
  - Matters of NES
  - Other Matters Protected by the EPBC Act
  - Extra Information
- Caveat
- Acknowledgements

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	19
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

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 Lands:	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
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	9
Key Ecological Features (Marine):	1
Biologically Important Areas:	3
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name
EEZ and Territorial Sea

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
MAMMAL		
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Species or species habitat may occur within area
REPTILE		

Scientific Name	Threatened Category	Presence Text
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
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat likely to occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
SHARK		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Glyphis garricki Northern River Shark, New Guinea River Shark [82454]	Endangered	Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sphyrna lewini Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat 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
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat may occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may 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
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	Species or species habitat likely to occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	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

Scientific Name	Threatened Category	Presence Text
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat likely to occur within area
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat likely to occur within area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Tursiops aduncus (Arafura/Timor Sea populations)		
Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Anous stolidus		
Common Noddy [825]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat 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
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area
Fish		
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		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 flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Corythoichthys schultzi Schultz's Pipefish [66205]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		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 spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		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 lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		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
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

Scientific Name	Threatened Category	Presence Text
Trachyrhamphus longirostris		
Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammal		
Dugong dugon		
Dugong [28]		Species or species habitat may occur within area
Reptile		
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 eydouxii		
Spine-tailed Seasnake [1117]		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	Species or species habitat likely to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Chitulia ornata as Hydrophis ornatus		
Spotted Seasnake, Ornate Reef Seasnake [87377]		Species or species habitat may occur within area
Crocodylus porosus		
Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
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
Enhydrina schistosa Beaked Seasnake [1126]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat likely to occur within area
Hydrelaps darwiniensis Black-ringed Seasnake [1100]		Species or species habitat may occur within area
Hydrophis atriceps Black-headed Seasnake [1101]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis macdowelli as Hydrophis mcdowelli Small-headed Seasnake [75601]		Species or species habitat may occur within area
Lapemis curtus as Lapemis hardwickii Spine-bellied Seasnake [83554]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation 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]

Current Scientific Name	Status	Type of Presence
Mammal		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat may 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 may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat may occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
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
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat may occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Development of Blacktip Gas Field	2003/1180	Controlled Action	Post-Approval
Not controlled action			
2D Seismic Survey in Permit Areas WA-318-P & WA-319-P, near Cape Londonderry	2004/1687	Not Controlled Action	Completed
Nexus Drilling Program NT-P66	2007/3745	Not Controlled Action	Completed
Not controlled action (particular manner)			
2D and 3D Seismic Survey	2011/6197	Not Controlled Action (Particular Manner)	Post-Approval
2D Marine Seismic Survey	2009/4728	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
2D Seismic survey	2009/5076	Not Controlled Action (Particular Manner)	Post-Approval
Bonaparte 2D & 3D marine seismic survey	2011/5962	Not Controlled Action (Particular Manner)	Post-Approval
Petrel MC2D Marine Seismic Survey	2010/5368	Not Controlled Action (Particular Manner)	Post-Approval
Westralia SPAN Marine Seismic Survey, WA & NT	2012/6463	Not Controlled Action (Particular Manner)	Post-Approval

Key Ecological Features

[Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Carbonate bank and terrace system of the Sahul Shelf	North-west

Biologically Important Areas

Scientific Name	Behaviour	Presence
Marine Turtles		
Chelonia mydas Green Turtle [1765]	Foraging	Known to occur
Lepidochelys olivacea Olive Ridley Turtle [1767]	Foraging	Known to occur
Natator depressus Flatback Turtle [59257]	Internesting buffer	Known to occur

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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ATTACHMENT B2: ZPI PMST RESULTS

EPBC Act Protected Matters Report

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

Report created: 14-Jun-2022

- Summary
- Details
  - Matters of NES
  - Other Matters Protected by the EPBC Act
  - Extra Information
- Caveat
- Acknowledgements

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	38
Listed Migratory Species:	55

Other Matters Protected by the EPBC Act

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

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 Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	98
Whales and Other Cetaceans:	15
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	3
Habitat Critical to the Survival of Marine Turtles:	2

Extra Information

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

State and Territory Reserves:	4
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	25
Key Ecological Features (Marine):	1
Biologically Important Areas:	19
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

National Heritage Places [Resource Information]

Name	State	Legal Status
Natural		
The West Kimberley	WA	Listed place

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name
EEZ and Territorial Sea

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Charadrius leschenaultii		
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Erythrotriorchis radiatus		
Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area
Erythrura gouldiae		
Gouldian Finch [413]	Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Falcunculus frontatus whitei Crested Shrike-tit (northern), Northern Shrike-tit [26013]	Vulnerable	Species or species habitat likely to occur within area
Geophaps smithii blaauwi Partridge Pigeon (western) [66501]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Critically Endangered	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
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species habitat likely to occur within area
FISH		
Thunnus maccoyii Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area
MAMMAL		
Balaenoptera borealis Sei Whale [34]	Vulnerable	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	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Conilurus penicillatus Brush-tailed Rabbit-rat, Brush-tailed Tree-rat, Pakooma [132]	Vulnerable	Species or species habitat may 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
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Mesembriomys gouldii gouldii Black-footed Tree-rat (Kimberley and mainland Northern Territory), Djintamoonga, Manbul [87618]	Endangered	Species or species habitat may occur within area
Petrogale concinna monastria Nabarlek (Kimberley) [87607]	Endangered	Species or species habitat likely to occur within area
Saccolaimus saccolaimus nudicluniatus Bare-rumped Sheath-tailed Bat, Bare-rumped Sheathtail Bat [66889]	Vulnerable	Species or species habitat likely to occur within area
Trichosurus vulpecula arnhemensis Northern Brushtail Possum [83091]	Vulnerable	Species or species habitat may occur within area
REPTILE		
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Aipysurus foliosquama Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Scientific Name	Threatened Category	Presence Text
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Lepidochelys olivacea		
Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	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
SHARK		
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Glyphis garricki		
Northern River Shark, New Guinea River Shark [82454]	Endangered	Species or species habitat may occur within area
Pristis clavata		
Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis		
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area
Pristis zijsron		
Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Sphyrna lewini		
Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Anous stolidus		
Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat known to occur within area
Fregata ariel		
Lesser Frigatebird, Least Frigatebird [1012]		Breeding known to occur within area
Fregata minor		
Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Onychoprion anaethetus		
Bridled Tern [82845]		Breeding known to occur within area
Phaethon lepturus		
White-tailed Tropicbird [1014]		Species or species habitat likely to occur within area
Sterna dougallii		
Roseate Tern [817]		Breeding likely to occur within area
Sternula albifrons		
Little Tern [82849]		Species or species habitat may occur within area
Migratory Marine Species		
Anoxypristis cuspidata		
Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat may 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	Species or species habitat may occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour 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 likely to occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour likely 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
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat likely to occur within area
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat known to occur within area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		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
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Pristis pristis		
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area
Pristis zijsron		
Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa sahulensis as Sousa chinensis		
Australian Humpback Dolphin [87942]		Foraging, feeding or related behaviour known to occur within area
Tursiops aduncus (Arafura/Timor Sea populations)		
Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cecropis daurica		
Red-rumped Swallow [80610]		Species or species habitat may occur within area
Cuculus optatus		
Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat known to occur within area
Hirundo rustica		
Barn Swallow [662]		Species or species habitat may occur within area
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Acrocephalus orientalis		
Oriental Reed-Warbler [59570]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to 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
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Thalasseus bergii Greater Crested Tern [83000]		Breeding known to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Bird		
Acrocephalus orientalis Oriental Reed-Warbler [59570]		Species or species habitat may occur within area overfly marine area
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area overfly marine area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Cecropis daurica as Hirundo daurica Red-rumped Swallow [80610]		Species or species habitat may occur within area overfly marine area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area overfly marine area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Breeding known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Hirundo rustica		
Barn Swallow [662]		Species or species habitat may occur within area overfly marine area
Limosa lapponica		
Bar-tailed Godwit [844]		Species or species habitat may occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Onychoprion anaethetus as Sterna anaethetus		
Bridled Tern [82845]		Breeding known to occur within area
Pandion haliaetus		
Osprey [952]		Breeding known to occur within area
Phaethon lepturus		
White-tailed Tropicbird [1014]		Species or species habitat likely to occur within area
Rostratula australis as Rostratula benghalensis (sensu lato)		
Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area overfly marine area
Sterna dougallii		
Roseate Tern [817]		Breeding likely to occur within area

Scientific Name	Threatened Category	Presence Text
Sternula albifrons as Sterna albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalasseus bengalensis as Sterna bengalensis Lesser Crested Tern [66546]		Breeding known to occur within area
Thalasseus bergii as Sterna bergii Greater Crested Tern [83000]		Breeding known to occur within area
Fish		
Bhanotia fasciolata Corrugated Pipefish, Barbed Pipefish [66188]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		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 flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Corythoichthys haematopterus Reef-top Pipefish [66201]		Species or species habitat may occur within area
Corythoichthys intestinalis Australian Messmate Pipefish, Banded Pipefish [66202]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Corythoichthys schultzi Schultz's Pipefish [66205]		Species or species habitat may occur within area
Cosmocampus banneri Roughridge Pipefish [66206]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		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 brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus dunckeri Red-hair Pipefish, Duncker's Pipefish [66220]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		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 parvicarinatus Short-keel Pipefish, Short-keeled Pipefish [66230]		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 histrix Spiny Seahorse, Thorny Seahorse [66236]		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 spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		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 lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Solenostomus cyanopterus		
Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		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
Trachyrhamphus longirostris		
Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammal		
Dugong dugon		
Dugong [28]		Species or species habitat may occur within area
Reptile		
Acalyptophis peronii		
Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus apraefrontalis		
Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Aipysurus duboisii		
Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii		
Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus foliosquama		
Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat may occur within area
Aipysurus laevis		
Olive Seasnake [1120]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Chitulia inornata as Hydrophis inornatus Plain Seasnake [87379]		Species or species habitat may occur within area
Chitulia ornata as Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [87377]		Species or species habitat may occur within area
Crocodylus johnstoni Freshwater Crocodile, Johnston's Crocodile, Johnstone's Crocodile [1773]		Species or species habitat may 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 likely 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
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Enhydrina schistosa Beaked Seasnake [1126]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Hydrelaps darwiniensis Black-ringed Seasnake [1100]		Species or species habitat may occur within area
Hydrophis atriceps Black-headed Seasnake [1101]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis macdowelli as Hydrophis mcdowelli Small-headed Seasnake [75601]		Species or species habitat may occur within area
Lapemis curtus as Lapemis hardwickii Spine-bellied Seasnake [83554]		Species or species habitat may occur within area
Leioselasma coggeri as Hydrophis coggeri Black-headed Sea Snake, Slender-necked Seasnake [87373]		Species or species habitat may occur within area
Leioselasma pacifica as Hydrophis pacificus Large-headed Seasnake, Pacific Seasnake [87378]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	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

Scientific Name	Threatened Category	Presence Text
Parahydrophis mertoni Northern Mangrove Seasnake [1090]		Species or species habitat may occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and Other Cetaceans [Resource Information]

Current Scientific Name	Status	Type of Presence
Mammal		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat may 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	Species or species habitat may occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat likely to occur within area
Orcaella heinsohni as Orcaella brevirostris Australian Snubfin Dolphin [81322]		Species or species habitat known to occur within area

Current Scientific Name	Status	Type of Presence
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Foraging, feeding or related behaviour known to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		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 aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Australian Marine Parks

[Resource Information]

Park Name	Zone & IUCN Categories
Joseph Bonaparte Gulf	Multiple Use Zone (IUCN VI)
Kimberley	Multiple Use Zone (IUCN VI)
Joseph Bonaparte Gulf	Special Purpose Zone (IUCN VI)

Habitat Critical to the Survival of Marine Turtles

Scientific Name	Behaviour	Presence
Aug - Sep		
Natator depressus Flatback Turtle [59257]	Nesting	Known to occur
Dec - Jan		

Scientific Name	Behaviour	Presence
Chelonia mydas Green Turtle [1765]	Nesting	Known to occur

Extra Information

State and Territory Reserves		[Resource Information]
Protected Area Name	Reserve Type	State
Lesueur Island	Nature Reserve	WA
North Kimberley	Marine Park	WA
Unnamed WA44677	5(1)(h) Reserve	WA
Uunguu	Indigenous Protected Area	WA

EPBC Act Referrals			[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Bonaparte Liquified Natural Gas Project	2011/6141	Controlled Action	Post-Approval
Development of Blacktip Gas Field	2003/1180	Controlled Action	Post-Approval
Not controlled action			
2D seismic survey, exploration permit NT/P67	2004/1587	Not Controlled Action	Completed
2D Seismic Survey in Permit Areas WA-318-P & WA-319-P, near Cape Londonderry	2004/1687	Not Controlled Action	Completed
Drilling of Marina-1 Exploration Well	2007/3586	Not Controlled Action	Completed
Nexus Drilling Program NT-P66	2007/3745	Not Controlled Action	Completed
Not controlled action (particular manner)			
2D and 3D Seismic Survey	2011/6197	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
2D Marine Seismic Survey	2009/4728	Not Controlled Action (Particular Manner)	Post-Approval
2D marine seismic survey within permit area WA-318-P	2007/3879	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic survey	2009/5076	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Survey in WA Permit Area TP/22 and Commonwealth Permit Area WA-280-P	2005/2100	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Survey	2009/4681	Not Controlled Action (Particular Manner)	Post-Approval
Bonaparte 2D & 3D marine seismic survey	2011/5962	Not Controlled Action (Particular Manner)	Post-Approval
Bonaparte Seismic and Bathymetric Survey	2012/6295	Not Controlled Action (Particular Manner)	Post-Approval
Fishburn2D Marine Seismic Survey	2012/6659	Not Controlled Action (Particular Manner)	Post-Approval
Floyd 3D and Chisel 3D Seismic Surveys	2011/6220	Not Controlled Action (Particular Manner)	Post-Approval
Gold 2D Marine Seismic Survey Permit Areas WA375P and WA376P	2009/4698	Not Controlled Action (Particular Manner)	Post-Approval
Kingtree & Ironstone-1 Exploration Wells	2011/5935	Not Controlled Action (Particular Manner)	Post-Approval
Marine Environmental Survey 2012	2012/6310	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Nova 3D Seismic Survey	2013/6825	Not Controlled Action (Particular Manner)	Post-Approval
NT/P77 3D Marine Seismic Survey	2009/4683	Not Controlled Action (Particular Manner)	Post-Approval
Petrel MC2D Marine Seismic Survey	2010/5368	Not Controlled Action (Particular Manner)	Post-Approval
Westralia SPAN Marine Seismic Survey, WA & NT	2012/6463	Not Controlled Action (Particular Manner)	Post-Approval
Referral decision			
2D Marine Seismic Survey	2008/4623	Referral Decision	Completed
Nova 3D Seismic Survey, WA 442-NT/P81, Joseph Bonaparte Gulf	2013/6820	Referral Decision	Completed

Key Ecological Features [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Carbonate bank and terrace system of the Sahul Shelf	North-west

Biologically Important Areas

Scientific Name	Behaviour	Presence
Dolphins		
Orcaella heinsohni Australian Snubfin Dolphin [81322]	Breeding	Known to occur
Orcaella heinsohni Australian Snubfin Dolphin [81322]	Calving	Known to occur
Orcaella heinsohni Australian Snubfin Dolphin [81322]	Foraging (high density prey)	Known to occur

Scientific Name	Behaviour	Presence
Orcaella heinsohni Australian Snubfin Dolphin [81322]	Resting	Known to occur
Sousa chinensis Indo-Pacific Humpback Dolphin [50]	Foraging	Known to occur
Sousa chinensis Indo-Pacific Humpback Dolphin [50]	Foraging	Likely to occur
Sousa chinensis Indo-Pacific Humpback Dolphin [50]	Foraging (high density prey)	Known to occur
Sousa chinensis Indo-Pacific Humpback Dolphin [50]	Significant habitat	Known to occur
Sousa chinensis Indo-Pacific Humpback Dolphin [50]	Significant habitat - unknown behaviour	Likely to occur
Marine Turtles		
Caretta caretta Loggerhead Turtle [1763]	Foraging	Known to occur
Chelonia mydas Green Turtle [1765]	Foraging	Known to occur
Chelonia mydas Green Turtle [1765]	Internesting buffer	Known to occur
Chelonia mydas Green Turtle [1765]	Nesting	Known to occur
Lepidochelys olivacea Olive Ridley Turtle [1767]	Foraging	Known to occur
Natator depressus Flatback Turtle [59257]	Foraging	Known to occur
Natator depressus Flatback Turtle [59257]	Internesting buffer	Known to occur
Seabirds		

Scientific Name	Behaviour	Presence
Fregata ariel Lesser Frigatebird [1012]	Breeding	Known to occur
Sterna dougallii Roseate Tern [817]	Breeding	Known to occur
Thalasseus bengalensis Lesser Crested Tern [66546]	Breeding	Known to occur

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- -Office of Environment and Heritage, New South Wales
- -Department of Environment and Primary Industries, Victoria
- -Department of Primary Industries, Parks, Water and Environment, Tasmania
- -Department of Environment, Water and Natural Resources, South Australia
- -Department of Land and Resource Management, Northern Territory
- -Department of Environmental and Heritage Protection, Queensland
- -Department of Parks and Wildlife, Western Australia
- -Environment and Planning Directorate, ACT
- -Birdlife Australia
- -Australian Bird and Bat Banding Scheme
- -Australian National Wildlife Collection
- -Natural history museums of Australia
- -Museum Victoria
- -Australian Museum
- -South Australian Museum
- -Queensland Museum
- -Online Zoological Collections of Australian Museums
- -Queensland Herbarium
- -National Herbarium of NSW
- -Royal Botanic Gardens and National Herbarium of Victoria
- -Tasmanian Herbarium
- -State Herbarium of South Australia
- -Northern Territory Herbarium
- -Western Australian Herbarium
- -Australian National Herbarium, Canberra
- -University of New England
- -Ocean Biogeographic Information System
- -Australian Government, Department of Defence
- Forestry Corporation, NSW
- -Geoscience Australia
- -CSIRO
- -Australian Tropical Herbarium, Cairns
- -eBird Australia
- -Australian Government – Australian Antarctic Data Centre
- -Museum and Art Gallery of the Northern Territory
- -Australian Government National Environmental Science Program
- -Australian Institute of Marine Science
- -Reef Life Survey Australia
- -American Museum of Natural History
- -Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
- -Tasmanian Museum and Art Gallery, Hobart, Tasmania
- -Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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ATTACHMENT B3: EMBA PMST RESULTS

Australian Government
Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

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

Report created: 02-Aug-2022

- Summary
- Details
  - Matters of NES
  - Other Matters Protected by the EPBC Act
  - Extra Information
- Caveat
- Acknowledgements

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance (Ramsar	3
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	3
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	56
Listed Migratory Species:	81

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	3
Commonwealth Heritage Places:	2
Listed Marine Species:	135
Whales and Other Cetaceans:	27
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	13
Habitat Critical to the Survival of Marine Turtles:	3

Extra Information

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

State and Territory Reserves:	32
Regional Forest Agreements:	None
Nationally Important Wetlands:	5
EPBC Act Referrals:	122
Key Ecological Features (Marine):	6
Biologically Important Areas:	65
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

National Heritage Places [Resource Information]

Name	State	Legal Status
Natural		
The West Kimberley	WA	Listed place

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

Ramsar Site Name	Proximity
Eighty-mile beach	Within Ramsar site
Ord river floodplain	Within Ramsar site
Roebuck bay	Within 10km of Ramsar site

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name
EEZ and Territorial Sea
Extended Continental Shelf
Extended Continental Shelf

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text
Monsoon vine thickets on the coastal sand dunes of Dampier Peninsula	Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		

Scientific Name	Threatened Category	Presence Text
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Breeding 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	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat known to occur within area
Erythrura gouldiae Gouldian Finch [413]	Endangered	Species or species habitat known to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat known to occur within area
Falcunculus frontatus whitei Crested Shrike-tit (northern), Northern Shrike-tit [26013]	Vulnerable	Species or species habitat likely to occur within area
Geophaps smithii blaauwi Partridge Pigeon (western) [66501]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Critically Endangered	Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Papasula abbotti Abbott's Booby [59297]	Endangered	Species or species habitat may occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Polytelis alexandrae Princess Parrot, Alexandra's Parrot [758]	Vulnerable	Species or species habitat known to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species habitat likely to occur within area
FISH		
Thunnus maccoyii Southern Bluefin Tuna [69402]	Conservation Dependent	Breeding known to occur within area
MAMMAL		
Antechinus bellus Fawn Antechinus [344]	Vulnerable	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 musculus Blue Whale [36]	Endangered	Migration route known to occur within area

Scientific Name	Threatened Category	Presence Text
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Conilurus penicillatus Brush-tailed Rabbit-rat, Brush-tailed Tree-rat, Pakooma [132]	Vulnerable	Species or species habitat may occur within area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area
Isoodon auratus auratus Golden Bandicoot (mainland) [66665]	Vulnerable	Species or species habitat likely to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat known to occur within area
Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat known to occur within area
Mesembriomys gouldii gouldii Black-footed Tree-rat (Kimberley and mainland Northern Territory), Djintamoonga, Manbul [87618]	Endangered	Species or species habitat may occur within area
Petrogale concinna canescens Nabarlek (Top End) [87606]	Endangered	Species or species habitat likely to occur within area
Petrogale concinna concinna Nabarlek (Victoria River District) [87605]	Critically Endangered	Species or species habitat likely to occur within area
Petrogale concinna monastria Nabarlek (Kimberley) [87607]	Endangered	Species or species habitat known to occur within area
Phascogale pirata Northern Brush-tailed Phascogale [82954]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Phascogale tapoatafa kimberleyensis Kimberley brush-tailed phascogale, Brush-tailed Phascogale (Kimberley) [88453]	Vulnerable	Species or species habitat likely to occur within area
Saccolaimus saccolaimus nudicluniatus Bare-rumped Sheath-tailed Bat, Bare-rumped Sheathtail Bat [66889]	Vulnerable	Species or species habitat likely to occur within area
Trichosurus vulpecula arnhemensis Northern Brushtail Possum [83091]	Vulnerable	Species or species habitat likely to occur within area
Xeromys myoides Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat likely to occur within area
REPTILE		
Acanthophis hawkei Plains Death Adder [83821]	Vulnerable	Species or species habitat may occur within area
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Aipysurus foliosquama Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat may 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	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Scientific Name	Threatened Category	Presence Text
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Foraging, feeding or related behaviour known to occur within area
Liopholis kintorei Great Desert Skink, Tjakura, Warrarna, Mulyamiji [83160]	Vulnerable	Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
SHARK		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Glyphis garricki Northern River Shark, New Guinea River Shark [82454]	Endangered	Breeding known to occur within area
Glyphis glyphis Speartooth Shark [82453]	Critically Endangered	Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Breeding known to occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Breeding known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sphyrna lewini Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		

Scientific Name	Threatened Category	Presence Text
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
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Breeding known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Breeding known to occur within area
Hydroprogne caspia Caspian Tern [808]		Breeding known to occur within area
Onychoprion anaethetus Bridled Tern [82845]		Breeding known to occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat known to occur within area
Sterna dougallii Roseate Tern [817]		Breeding known 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
Sula leucogaster Brown Booby [1022]		Breeding known to occur within area
Sula sula Red-footed Booby [1023]		Breeding known to occur within area

Migratory Marine Species

Scientific Name	Threatened Category	Presence Text
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		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	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may 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	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	Breeding likely to occur within area

Scientific Name	Threatened Category	Presence Text
Dugong dugon Dugong [28]		Migration route 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
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Foraging, feeding or related behaviour known to occur within area
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat known to occur within area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat likely 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 known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Breeding known to occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Breeding known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Breeding known to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Migratory Terrestrial Species		
Cecropis daurica Red-rumped Swallow [80610]		Species or species habitat may occur within area
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat known to occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
Acrocephalus orientalis Oriental Reed-Warbler [59570]		Species or species habitat known to occur within area
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

Scientific Name	Threatened Category	Presence Text
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat 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 megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Glareola maldivarum Oriental Pratincole [840]		Roosting known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limnodromus semipalmatus Asian Dowitcher [843]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
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

Scientific Name	Threatened Category	Presence Text
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 Greater Crested Tern [83000]		Breeding 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
Tringa totanus Common Redshank, Redshank [835]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State
Defence	
Defence - BRADSHAW FIELD TRAINING AREA [70043]	NT
Defence - MT GOODWIN RADAR SITE [70063]	NT

Commonwealth Land Name	State
Defence - YAMPI SOUND TRAINING AREA [50145]	WA

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Natural		
Bradshaw Defence Area	NT	Listed place
Yampi Defence Area	WA	Listed place

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Bird		
Acrocephalus orientalis Oriental Reed-Warbler [59570]		Species or species habitat known to occur within area overfly marine area
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
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Breeding known to occur within area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area overfly marine area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area overfly marine area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area overfly marine area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area overfly marine area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Cecropis daurica as Hirundo daurica Red-rumped Swallow [80610]		Species or species habitat may occur within area overfly marine area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area overfly marine area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Roosting known to occur within area overfly marine area
Chroicocephalus novaehollandiae as Larus novaehollandiae Silver Gull [82326]		Breeding known to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Breeding known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Breeding known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area overfly marine area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area overfly marine area
Glareola maldivarum Oriental Pratincole [840]		Roosting known to occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area overfly marine area
Hirundo rustica Barn Swallow [662]		Species or species habitat known to occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Hydroprogne caspia as Sterna caspia Caspian Tern [808]		Breeding known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area overfly marine area
Limnodromus semipalmatus Asian Dowitcher [843]		Species or species habitat known to occur within area overfly marine area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area overfly marine area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat known to occur within area overfly marine area
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to occur within area overfly marine area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting known to occur within area overfly marine area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area

Scientific Name	Threatened Category	Presence Text
Onychoprion anaethetus as Sterna anaethetus		
Bridled Tern [82845]		Breeding known to occur within area
Pandion haliaetus		
Osprey [952]		Breeding known to occur within area
Papasula abbotti		
Abbott's Booby [59297]	Endangered	Species or species habitat may occur within area
Phaethon lepturus		
White-tailed Tropicbird [1014]		Species or species habitat known to occur within area
Philomachus pugnax		
Ruff (Reeve) [850]		Roosting known to occur within area overfly marine area
Pluvialis fulva		
Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola		
Grey Plover [865]		Roosting known to occur within area overfly marine area
Recurvirostra novaehollandiae		
Red-necked Avocet [871]		Roosting known to occur within area overfly marine area
Rhipidura rufifrons		
Rufous Fantail [592]		Species or species habitat likely to occur within area overfly marine area
Rostratula australis as Rostratula benghalensis (sensu lato)		
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area
Sterna dougallii		
Roseate Tern [817]		Breeding known to occur within area
Sternula albifrons as Sterna albifrons		
Little Tern [82849]		Breeding known to occur within area

Scientific Name	Threatened Category	Presence Text
Stiltia isabella Australian Pratincole [818]		Roosting known to occur within area overfly marine area
Sula dactylatra Masked Booby [1021]		Breeding known to occur within area
Sula leucogaster Brown Booby [1022]		Breeding known to occur within area
Sula sula Red-footed Booby [1023]		Breeding known to occur within area
Thalasseus bengalensis as Sterna bengalensis Lesser Crested Tern [66546]		Breeding known to occur within area
Thalasseus bergii as Sterna bergii Greater Crested Tern [83000]		Breeding known to occur within area
Tringa brevipes as Heteroscelus brevipes Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area overfly marine area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area overfly marine area
Tringa totanus Common Redshank, Redshank [835]		Roosting known to occur within area overfly marine area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area overfly marine area
Fish		
Bhanotia fasciolata Corrugated Pipefish, Barbed Pipefish [66188]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		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 flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Corythoichthys haematopterus Reef-top Pipefish [66201]		Species or species habitat may occur within area
Corythoichthys intestinalis Australian Messmate Pipefish, Banded Pipefish [66202]		Species or species habitat may occur within area
Corythoichthys schultzi Schultz's Pipefish [66205]		Species or species habitat may occur within area
Cosmocampus banneri Roughridge Pipefish [66206]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		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 brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus dunckeri Red-hair Pipefish, Duncker's Pipefish [66220]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		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 parvicarinatus Short-keel Pipefish, Short-keeled Pipefish [66230]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		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 spinosissimus Hedgehog Seahorse [66239]		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
Micrognathus micronotopterus Tidepool Pipefish [66255]		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 lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		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

Scientific Name	Threatened Category	Presence Text
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
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammal		
Dugong dugon Dugong [28]		Migration route known to occur within area
Reptile		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus foliosquama Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat may occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Aipysurus tenuis Brown-lined Seasnake [1121]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may 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	Breeding known to occur within area
Chitulia inornata as Hydrophis inornatus Plain Seasnake [87379]		Species or species habitat may occur within area
Chitulia ornata as Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [87377]		Species or species habitat may occur within area
Crocodylus johnstoni Freshwater Crocodile, Johnston's Crocodile, Johnstone's Crocodile [1773]		Species or species habitat may 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	Breeding likely 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
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Enhydrina schistosa Beaked Seasnake [1126]		Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Hydrelaps darwiniensis Black-ringed Seasnake [1100]		Species or species habitat may occur within area
Hydrophis atriceps Black-headed Seasnake [1101]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis macdowelli as Hydrophis mcdowelli Small-headed Seasnake [75601]		Species or species habitat may occur within area
Lapemis curtus as Lapemis hardwickii Spine-bellied Seasnake [83554]		Species or species habitat may occur within area
Leioselasma coggeri as Hydrophis coggeri Black-headed Sea Snake, Slender-necked Seasnake [87373]		Species or species habitat may occur within area
Leioselasma pacifica as Hydrophis pacificus Large-headed Seasnake, Pacific Seasnake [87378]		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

Scientific Name	Threatened Category	Presence Text
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Parahydrophis mertoni Northern Mangrove Seasnake [1090]		Species or species habitat may occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and Other Cetaceans [Resource Information]

Current Scientific Name	Status	Type of Presence
Mammal		
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	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may 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
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia sima as Kogia simus Dwarf Sperm Whale [85043]		Species or species habitat may occur within area
Lagenodelphis hosei Fraser's Dolphin, Sarawak Dolphin [41]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Orcaella heinsohni as Orcaella brevirostris Australian Snubfin Dolphin [81322]		Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may 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
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Breeding known to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
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 aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Australian Marine Parks [Resource Information]

Park Name	Zone & IUCN Categories
Kimberley	Habitat Protection Zone (IUCN IV)
Kimberley	Habitat Protection Zone (IUCN IV)
Oceanic Shoals	Habitat Protection Zone (IUCN IV)
Eighty Mile Beach	Multiple Use Zone (IUCN VI)
Joseph Bonaparte Gulf	Multiple Use Zone (IUCN VI)
Kimberley	Multiple Use Zone (IUCN VI)
Oceanic Shoals	Multiple Use Zone (IUCN VI)

Park Name	Zone & IUCN Categories
Oceanic Shoals	Multiple Use Zone (IUCN VI)
Roebuck	Multiple Use Zone (IUCN VI)
Kimberley	National Park Zone (IUCN II)
Oceanic Shoals	National Park Zone (IUCN II)
Joseph Bonaparte Gulf	Special Purpose Zone (IUCN VI)
Oceanic Shoals	Special Purpose Zone (Trawl) (IUCN VI)

Habitat Critical to the Survival of Marine Turtles

Scientific Name	Behaviour	Presence
Aug - Sep		
Natator depressus Flatback Turtle [59257]	Nesting	Known to occur
Dec - Jan		
Chelonia mydas Green Turtle [1765]	Nesting	Known to occur
May - Jul		
Lepidochelys olivacea Olive Ridley Turtle [1767]	Nesting	Known to occur

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State
Adele Island	Nature Reserve	WA
Balanggarra	Indigenous Protected Area	WA
Bardi Jawi	Indigenous Protected Area	WA
Browse Island	Nature Reserve	WA
Coulomb Point	Nature Reserve	WA
Dambimangari	Indigenous Protected Area	WA
Eighty Mile Beach	Marine Park	WA

Protected Area Name	Reserve Type	State
Jinmarnkur	Conservation Park	WA
Jinmarnkur Kulja	Nature Reserve	WA
Karajarri	Indigenous Protected Area	WA
Keep River	Proposed National Parks Act park or park addition	NT
Lacepede Islands	Nature Reserve	WA
Lalang-garram / Camden Sound	Marine Park	WA
Lalang-garram / Horizontal Falls	Marine Park	WA
Lesueur Island	Nature Reserve	WA
Low Rocks	Nature Reserve	WA
Niiwalarra Islands	National Park	WA
North Kimberley	Marine Park	WA
North Lalang-garram	Marine Park	WA
Ord River	Nature Reserve	WA
Swan Island	Nature Reserve	WA
Tanner Island	Nature Reserve	WA
Unnamed WA28968	5(1)(h) Reserve	WA
Unnamed WA37168	5(1)(h) Reserve	WA
Unnamed WA41775	5(1)(h) Reserve	WA
Unnamed WA44669	5(1)(h) Reserve	WA
Unnamed WA44673	5(1)(h) Reserve	WA
Unnamed WA44677	5(1)(h) Reserve	WA
Unnamed WA53015	Nature Reserve	WA
Uunguu	Indigenous Protected Area	WA
Yawuru	Indigenous Protected Area	WA
Yawuru Nagulagun / Roebuck Bay	Marine Park	WA

Nationally Important Wetlands [Resource Information]

Wetland Name	State
Bunda-Bunda Mound Springs	WA
Legune Wetlands	NT
Ord Estuary System	WA
Willie Creek Wetlands	WA
Yampi Sound Training Area	WA

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status
Ocean Barramundi Expansion Project	2022/09272		Referral Decision
Controlled action			
275 km gas pipeline from Wadeye to existing Darwin gas pipeline	2006/2930	Controlled Action	Post-Approval
2-D seismic survey Scott Reef	2000/125	Controlled Action	Post-Approval
Australia-ASEAN Power Link	2020/8818	Controlled Action	Proposed Decision
Blacktip Project - Wharf Construction	2007/3293	Controlled Action	Completed
Bonaparte Liquified Natural Gas Project	2011/6141	Controlled Action	Post-Approval
Cockatoo Island Multi-User Supply Base, WA	2017/7986	Controlled Action	Referral Decision
Decommissioning of Buffalo Oil Field	2003/984	Controlled Action	Post-Approval
Develop Ichthys gas-condensate field permit area W	2006/2767	Controlled Action	Completed
Development of Blacktip Gas Field	2003/1180	Controlled Action	Post-Approval
Development of Browse Basin Gas Fields (Upstream)	2008/4111	Controlled Action	Completed
Ichthys Gas Field, Offshore and onshore processing facilities and subsea pipeline	2008/4208	Controlled Action	Post-Approval
Iron ore mine	2006/2522	Controlled Action	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Montara 4, 5, and 6 Oil Production Wells, and Montara 3 Gas Re-Injection Well	2002/755	Controlled Action	Post-Approval
Pluton Irvine Island Iron Ore Project	2011/6064	Controlled Action	Proposed Decision
Prelude Floating Liquefied Natural Gas Facility and Gas Field Development	2008/4146	Controlled Action	Post-Approval
Project Sea Dragon stage 1 prawn aquaculture project, NT	2015/7527	Controlled Action	Post-Approval
PTTEP AA Floating LNG Facility	2011/6025	Controlled Action	Completed
Trans-territory Gas Pipeline	2003/1186	Controlled Action	Completed
Not controlled action			
2D seismic survey, exploration permit NT/P67	2004/1587	Not Controlled Action	Completed
2D Seismic Survey in Permit Areas WA-318-P & WA-319-P, near Cape Londonderry	2004/1687	Not Controlled Action	Completed
3D marine seismic survey in WA 314P and WA 315P	2004/1927	Not Controlled Action	Completed
Adele Trend TQ3D Seismic Survey	2001/252	Not Controlled Action	Completed
Aquaculture - Barramundi grow out, Yampi Sound	2005/2476	Not Controlled Action	Completed
Backpacker-1 Offshore Hydrocarbon Exploration Well	2001/300	Not Controlled Action	Completed
Buffalo In-Fill Production Wells	2001/475	Not Controlled Action	Completed
Construction and operation of Radar Infrastructure	2004/1406	Not Controlled Action	Completed
Controlled Source Electromagnetic 2D Survey	2009/4980	Not Controlled Action	Completed
Controlled Source Electromagnetic Survey	2010/5434	Not Controlled Action	Completed
Coot-1 hydrocarbon exploration well, Permit Area AC/L2 or AC/L3	2001/296	Not Controlled Action	Completed
Crux-A and Crux-B appraisal wells, Petroleum Permit Area AC/P23	2006/2748	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Crux gas-liquids development in permit AC/P23	2006/3154	Not Controlled Action	Completed
Drilling of 12 Hydrocarbon Exploration Wells, Permit Area WA-371-P	2006/3005	Not Controlled Action	Completed
Drilling of Marina-1 Exploration Well	2007/3586	Not Controlled Action	Completed
Establish a 4m wide trace line along the road allignment for James Price Point	2010/5682	Not Controlled Action	Completed
Exploration Well AC/P23	2001/234	Not Controlled Action	Completed
Koolan Island Mine - Reconstruction of seawall and capital dewatering of mine pit,130km northwest of	2016/7848	Not Controlled Action	Completed
Marine Seismic Survey in WA-239-P	2000/24	Not Controlled Action	Completed
Marine Survey for the Australia-ASEAN Power Link AAPL	2020/8714	Not Controlled Action	Completed
Montara-3 Offshore Hydrocarbon Exploration Well Permit Area AC/RL3	2001/489	Not Controlled Action	Completed
Nexus Drilling Program NT-P66	2007/3745	Not Controlled Action	Completed
P30 Hydrocarbon Exploration Well	2001/293	Not Controlled Action	Completed
Project Highclere Geophysical Survey	2021/9023	Not Controlled Action	Completed
Saucepan 1 Exploration Well ACP23	2000/2	Not Controlled Action	Completed
Strumbo-1 Gas Exploration Well Permit Area WA-288-P	2002/884	Not Controlled Action	Completed
Thresher-1 Well	2000/84	Not Controlled Action	Completed
Not controlled action (particular manner)			
2D and 3D Seismic Survey	2011/6197	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
2D and 3D Seismic Survey WA-405-P	2008/4133	Not Controlled Action (Particular Manner)	Post-Approval
2D and 3D Seismic Survey WA-405-P	2009/5104	Not Controlled Action (Particular Manner)	Post-Approval
2D Marine Seismic Survey	2009/4728	Not Controlled Action (Particular Manner)	Post-Approval
2D marine seismic survey of Braveheart,Kurrajong,Sunshine and Crocodile	2006/2917	Not Controlled Action (Particular Manner)	Post-Approval
2D marine seismic survey within permit area WA-318-P	2007/3879	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Marine Survey	2001/363	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic survey	2009/5076	Not Controlled Action (Particular Manner)	Post-Approval
2D seismic survey in permit areas WA-274P and WA-281P	2004/1521	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Survey in WA Permit Area TP/22 and Commonwealth Permit Area WA-280-P	2005/2100	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Survey	2009/4681	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Survey, Permit AC/P 23	2005/2364	Not Controlled Action (Particular Manner)	Post-Approval
3D Seismic Survey	2006/2729	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
3D Seismic Survey (NT/P68)	2006/2980	Not Controlled Action (Particular Manner)	Post-Approval
3D seismic survey of AC/P4, AC/P17 and AC/P24	2006/2857	Not Controlled Action (Particular Manner)	Post-Approval
3D Seismic Survey WA-406-P Bonaparte Basin	2007/3904	Not Controlled Action (Particular Manner)	Post-Approval
Acacia East Pit Cutback Mining Project,northern Kimberley, WA	2013/6752	Not Controlled Action (Particular Manner)	Post-Approval
Aurora MC3D Marine Seismic Survey	2010/5510	Not Controlled Action (Particular Manner)	Post-Approval
Bassett 3D Marine Seismic Survey	2010/5538	Not Controlled Action (Particular Manner)	Post-Approval
Blacktip Gas Project Yelcherr Beach Wharf Construction	2007/3537	Not Controlled Action (Particular Manner)	Post-Approval
Bonaparte 2D & 3D marine seismic survey	2011/5962	Not Controlled Action (Particular Manner)	Post-Approval
Bonaparte 3D & 2D Seismic Survey, in NT/P82, Timor Sea	2012/6398	Not Controlled Action (Particular Manner)	Post-Approval
Bonaparte Basin Seabed Mapping Survey	2009/4951	Not Controlled Action (Particular Manner)	Post-Approval
Bonaparte Seismic and Bathymetric Survey	2012/6295	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Braveheart 2D Infill Marine Seismic Survey 100km offshore	2008/4442	Not Controlled Action (Particular Manner)	Post-Approval
Braveheart 2D Marine Seismic Survey	2005/2322	Not Controlled Action (Particular Manner)	Post-Approval
Canis 3D Marine Seismic Survey	2008/4492	Not Controlled Action (Particular Manner)	Post-Approval
Cartier East and Cartier West 3D Marine Seismic Surveys	2009/5230	Not Controlled Action (Particular Manner)	Post-Approval
Caswell MC3D Marine Seismic Survey	2012/6594	Not Controlled Action (Particular Manner)	Post-Approval
Construction of a 43km long sealed access road to the Browse LNG precinct	2011/5852	Not Controlled Action (Particular Manner)	Post-Approval
Deep Water Northwest Shelf 2D Seismic Survey	2007/3260	Not Controlled Action (Particular Manner)	Post-Approval
Drilling of Exploration & Appraisal Wells Braveheart-1 & Cornea-3	2009/5160	Not Controlled Action (Particular Manner)	Post-Approval
Effect of marine seismic sounds to demersal fish and pearl oysters, north-west WA	2018/8169	Not Controlled Action (Particular Manner)	Post-Approval
Endurance 3D Marine Seismic Data Acquisition Survey	2007/3667	Not Controlled Action (Particular Manner)	Post-Approval
Exploration Drilling Campaign	2011/6047	Not Controlled Action (Particular Manner)	Post-Approval
Exploration Drilling in Permit Areas WA-402-P & WA-403-P	2010/5297	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Fishburn2D Marine Seismic Survey	2012/6659	Not Controlled Action (Particular Manner)	Post-Approval
Floyd 3D and Chisel 3D Seismic Surveys	2011/6220	Not Controlled Action (Particular Manner)	Post-Approval
Geoscience Australia - Marine survey in Browse Basin to acquire data to assist assessment of CO2 sto	2013/6747	Not Controlled Action (Particular Manner)	Post-Approval
Gicea 3D Marine Seismic Survey	2008/4389	Not Controlled Action (Particular Manner)	Post-Approval
Gold 2D Marine Seismic Survey Permit Areas WA375P and WA376P	2009/4698	Not Controlled Action (Particular Manner)	Post-Approval
Ichthys 3D Marine Seismic Survey	2010/5550	Not Controlled Action (Particular Manner)	Post-Approval
Joseph Bonaparte Gulf Seabed mapping survey	2010/5517	Not Controlled Action (Particular Manner)	Post-Approval
Kingtree & Ironstone-1 Exploration Wells	2011/5935	Not Controlled Action (Particular Manner)	Post-Approval
Koolama 2D Seismic Survey Dampier Basin	2010/5420	Not Controlled Action (Particular Manner)	Post-Approval
Malita West 3D Seismic Survey WA-402-P and WA-403-P	2007/3936	Not Controlled Action (Particular Manner)	Post-Approval
Marine Environmental Survey 2012	2012/6310	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Nova 3D Seismic Survey	2013/6825	Not Controlled Action (Particular Manner)	Post-Approval
NT/P77 3D Marine Seismic Survey	2009/4683	Not Controlled Action (Particular Manner)	Post-Approval
NT/P80 2010 2D Marine Seismic Survey	2010/5487	Not Controlled Action (Particular Manner)	Post-Approval
Octantis 3D Marine Seismic Survey, Permit Area AC/P41 off northern Western Australia	2007/3369	Not Controlled Action (Particular Manner)	Post-Approval
Offshore Exploration Drilling Campaign	2011/6222	Not Controlled Action (Particular Manner)	Post-Approval
Offshore Fibre Optic Cable Network Construction & Operation, Port Hedland WA to Darwin NT	2014/7223	Not Controlled Action (Particular Manner)	Post-Approval
Offshore Gas Exploration Drilling Campaign	2012/6384	Not Controlled Action (Particular Manner)	Post-Approval
Petrel MC2D Marine Seismic Survey	2010/5368	Not Controlled Action (Particular Manner)	Post-Approval
Removal of Potential Unexploded Ordnance within NAXA	2012/6503	Not Controlled Action (Particular Manner)	Post-Approval
Santos Petrel-7 Offshore Appraisal Drilling Programme (Bonaparte Basin)	2011/5934	Not Controlled Action (Particular Manner)	Post-Approval
Schild MC3D Marine Seismic Survey	2012/6373	Not Controlled Action (Particular Manner)	Post-Approval
Schild Phase 11 MC3D Marine Seismic Survey, Browse Basin	2013/6894	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Sonar and Acoustic Trials	2001/345	Not Controlled Action (Particular Manner)	Post-Approval
Songa Venus Drilling Programme, Bonaparte Basin	2009/4990	Not Controlled Action (Particular Manner)	Post-Approval
Sunshine Infill 2D and Mimosa 2D Marine Seismic Surveys	2009/4699	Not Controlled Action (Particular Manner)	Post-Approval
Tow West Atlas wreck from present location to boundary of EEZ	2010/5652	Not Controlled Action (Particular Manner)	Post-Approval
Vampire 2D Non Exclusive Seismic Survey, WA	2010/5543	Not Controlled Action (Particular Manner)	Post-Approval
Westralia SPAN Marine Seismic Survey, WA & NT	2012/6463	Not Controlled Action (Particular Manner)	Post-Approval
Zeemeermin MC3D seismic survey, Browse Basin, Offshore WA	2009/5023	Not Controlled Action (Particular Manner)	Post-Approval
Zeppelin 3D Seismic Survey	2011/6148	Not Controlled Action (Particular Manner)	Post-Approval
Referral decision			
2D Marine Seismic Survey	2008/4623	Referral Decision	Completed
3D Seismic Survey (NT/P68)	2006/2949	Referral Decision	Completed
Aurora extension MC3D Marine Seismic Survey	2011/5887	Referral Decision	Completed
BRSN08 3D Marine Seismic Survey	2008/4582	Referral Decision	Completed
Darwin Pipeline Duplication DPD Project	2022/9166	Referral Decision	Referral Publication

Title of referral	Reference	Referral Outcome	Assessment Status
Referral decision			
Field efficacy trial of the Hisstory bait for feral cats, at Yampi Sound Defence Training Area, Kimb	2017/7977	Referral Decision	Completed
Nova 3D Seismic Survey, WA 442-NT/P81, Joseph Bonaparte Gulf	2013/6820	Referral Decision	Completed
Seismic Data Acquisition, Browse Basin	2010/5475	Referral Decision	Completed
Tidal Power Generation Turbine	2009/5235	Referral Decision	Completed

Key Ecological Features [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Ancient coastline at 125 m depth contour	North-west
Carbonate bank and terrace system of the Sahul Shelf	North-west
Carbonate bank and terrace system of the Van Diemen Rise	North
Continental Slope Demersal Fish Communities	North-west
Pinnacles of the Bonaparte Basin	North
Pinnacles of the Bonaparte Basin	North-west

Biologically Important Areas

Scientific Name	Behaviour	Presence
Dolphins		
Orcaella heinsohni Australian Snubfin Dolphin [81322]	Breeding	Known to occur
Orcaella heinsohni Australian Snubfin Dolphin [81322]	Calving	Known to occur
Orcaella heinsohni Australian Snubfin Dolphin [81322]	Foraging	Known to occur
Orcaella heinsohni Australian Snubfin Dolphin [81322]	Foraging (high density prey)	Known to occur

Scientific Name	Behaviour	Presence
Orcaella heinsohni Australian Snubfin Dolphin [81322]	Foraging likely	Known to occur
Orcaella heinsohni Australian Snubfin Dolphin [81322]	Resting	Known to occur
Sousa chinensis Indo-Pacific Humpback Dolphin [50]	Breeding	Known to occur
Sousa chinensis Indo-Pacific Humpback Dolphin [50]	Breeding	Likely to occur
Sousa chinensis Indo-Pacific Humpback Dolphin [50]	Calving	Likely to occur
Sousa chinensis Indo-Pacific Humpback Dolphin [50]	Calving	Known to occur
Sousa chinensis Indo-Pacific Humpback Dolphin [50]	Foraging	Known to occur
Sousa chinensis Indo-Pacific Humpback Dolphin [50]	Foraging	Likely to occur
Sousa chinensis Indo-Pacific Humpback Dolphin [50]	Foraging (high density prey)	Likely to occur
Sousa chinensis Indo-Pacific Humpback Dolphin [50]	Foraging (high density prey)	Known to occur
Sousa chinensis Indo-Pacific Humpback Dolphin [50]	Significant habitat	Known to occur
Sousa chinensis Indo-Pacific Humpback Dolphin [50]	Significant habitat - unknown behaviour	Likely to occur
Tursiops aduncus Indo-Pacific/Spotted Bottlenose Dolphin [68418]	Breeding	Known to occur
Tursiops aduncus Indo-Pacific/Spotted Bottlenose Dolphin [68418]	Calving	Known to occur

Scientific Name	Behaviour	Presence
Tursiops aduncus Indo-Pacific/Spotted Bottlenose Dolphin [68418]	Foraging	Known to occur
Tursiops aduncus Indo-Pacific/Spotted Bottlenose Dolphin [68418]	Foraging likely	Known to occur
Tursiops aduncus Indo-Pacific/Spotted Bottlenose Dolphin [68418]	Migration likely	Known to occur
Dugong		
Dugong dugon Dugong [28]	Foraging	Likely to occur
Dugong dugon Dugong [28]	Migration likely	Known to occur
Marine Turtles		
Caretta caretta Loggerhead Turtle [1763]	Foraging	Known to occur
Chelonia mydas Green Turtle [1765]	Foraging	Likely to occur
Chelonia mydas Green Turtle [1765]	Foraging	Known to occur
Chelonia mydas Green Turtle [1765]	Internesting	Known to occur
Chelonia mydas Green Turtle [1765]	Internesting buffer	Known to occur
Chelonia mydas Green Turtle [1765]	Nesting	Known to occur
Lepidochelys olivacea Olive Ridley Turtle [1767]	Foraging	Known to occur
Natator depressus Flatback Turtle [59257]	Foraging	Known to occur
Natator depressus Flatback Turtle [59257]	Internesting	Known to occur

Scientific Name	Behaviour	Presence
Natator depressus Flatback Turtle [59257]	Internesting	Likely to occur
Natator depressus Flatback Turtle [59257]	Internesting buffer	Known to occur
Natator depressus Flatback Turtle [59257]	Nesting	Known to occur
River shark		
Pristis clavata Dwarf Sawfish [68447]	Foraging	Known to occur
Pristis clavata Dwarf Sawfish [68447]	Juvenile	Known to occur
Pristis clavata Dwarf Sawfish [68447]	Nursing	Known to occur
Pristis clavata Dwarf Sawfish [68447]	Pupping	Known to occur
Pristis pristis Freshwater Sawfish [60756]	Foraging	Known to occur
Pristis pristis Freshwater Sawfish [60756]	Nursing	Known to occur
Pristis pristis Freshwater Sawfish [60756]	Nursing	Likely to occur
Pristis pristis Freshwater Sawfish [60756]	Pupping	Likely to occur
Pristis zijsron Green Sawfish [68442]	Foraging	Known to occur
Pristis zijsron Green Sawfish [68442]	Nursing	Known to occur
Pristis zijsron Green Sawfish [68442]	Pupping	Known to occur
Seabirds		

Scientific Name	Behaviour	Presence
Ardenna pacifica Wedge-tailed Shearwater [84292]	Breeding	Known to occur
Fregata ariel Lesser Frigatebird [1012]	Breeding	Known to occur
Fregata minor Greater Frigatebird [1013]	Breeding	Known to occur
Phaethon lepturus White-tailed Tropicbird [1014]	Breeding	Known to occur
Sterna dougallii Roseate Tern [817]	Breeding	Known to occur
Sterna dougallii Roseate Tern [817]	Resting	Known to occur
Sternula albifrons sinensis Little Tern [82850]	Breeding	Known to occur
Sternula albifrons sinensis Little Tern [82850]	Resting	Known to occur
Sula leucogaster Brown Booby [1022]	Breeding	Known to occur
Sula sula Red-footed Booby [1023]	Breeding	Known to occur
Thalasseus bengalensis Lesser Crested Tern [66546]	Breeding	Known to occur
Sharks		
Rhincodon typus Whale Shark [66680]	Foraging	Known to occur
Whales		
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Migration	Known to occur

Scientific Name	Behaviour	Presence
Megaptera novaeangliae Humpback Whale [38]	Calving	Known to occur
Megaptera novaeangliae Humpback Whale [38]	Migration	Known to occur
Megaptera novaeangliae Humpback Whale [38]	Migration (north and south)	Known to occur
Megaptera novaeangliae Humpback Whale [38]	Nursing	Known to occur
Megaptera novaeangliae Humpback Whale [38]	Resting	Known to occur

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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APPENDIX C:

ENI HSE STATEMENT

health safety & environment statement

Eni Australia Ltd, in its natural resources and energy evolution activities is committed to providing a safe work place, safe systems of work, a competent workforce and a culture conducive to exercising prudent Health, Safety and Environment (HSE) practices and behaviours.

This commitment statement applies to all operational activities undertaken by Eni Australia Ltd, including activities carried out by our contractors.

Eni Australia Ltd will:

- Provide a safe and healthy workplace for the prevention of worker related injury and ill health.
- Set objectives and targets to ensure continual improvement in overall HSE performance.
- Comply with relevant legislation and other obligations, or apply company standards where laws and regulations do not exist.
- Assess and manage HSE risks across the business life cycle.
- Adopt high management and technical standards to prevent and mitigate major accidents associated with process safety events.
- Include HSE performance in appraisal of staff and contractors.
- Respect the environment and prevent pollution by actively monitoring and managing emissions, effluents, discharges and other impacts on the environment.
- Endeavour to reduce greenhouse gas emission intensity, fugitive emissions and process flaring as part of our climate strategy.
- Provide systems, resources and skills to maintain emergency response capabilities.
- Consult with stakeholders, local communities and public interest groups, workers and their representatives.
- Remain committed to sustainable development and the welfare of our host communities, and
- Promote HSE best practice in all our activities.

All staff and contractors at Eni Australia Ltd have a personal responsibility to support this HSE Statement and are encouraged to openly report any HSE issue or concern. In addition, everyone is obliged to intervene in unsafe acts or conditions to prevent injury, environmental impact or damage to assets.

Managing Director ______________ Ernie Delfos

Date 10 August 2020

eni australia