Q23/P SITE SURVEY

ENVIRONMENT PLAN

Document ID	GEPL-Q23P-001	Revision	0	Date	24/03/2022

DOCUMENT HISTORY

Revision	Date	Description	Author	Reviewer	Approver
0	24/03/2022	Issued for use	RH	MC	WF

CONTENTS

LIST OF APPENDICES

List of tables

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

Term	Definition
ADIOS	Automated Data Inquiry for Oil Spills
AFMA	Australian Fisheries Management Authority
AFZ	Australian Fishing Zone
AHO	Australian Hydrographic Office
ALARP	As low as reasonably practicable
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Authority
AS/NZS	Australian and New Zealand Standard
AUV	Autonomous underwater vehicle
BIA	Biologically important area
CHIRP	Compressed high-intensity radar pulse
CO_2	Carbon dioxide
DP	Dynamic positioning
EMBA	Environment that may be affected
EMT	Emergency Management Team
ERT	Emergency Response Team
EP	Environment Plan
EPBC Act	(Commonwealth) *Environment Protection and Biodiversity Conservation Act 1999*
ESD	Ecologically sustainable development
GEPL	Gulf Energy Pty Limited
GoCCFA	Gulf of Carpentaria Commercial Fishermens Association (
HF	High frequency
HSE	Health, Safety and Environment
IAPP	International Air Pollution Prevention
IEE	International Energy Efficiency
IMO	International Maritime Organization
IMP	Invasive marine pest
IOPP	International Oil Pollution Prevention
IPCC	Intergovernmental Panel on Climate Change
ISPP	International Sewage Pollution Prevention
JRCC	Joint Rescue Coordination Centre
KEF	Key ecological feature
LF	Low frequency
MARPOL	International Convention for the Prevention of Pollution from Ships
MARS	Maritime Arrivals Reporting System
MBES	Multibeam echo sounders

Term	Definition
MDO	Marine diesel oil
MES	Monitoring, evaluation, and surveillance
MGO	Marine gas oil
MoC	Management of change
MODU	Mobile offshore drilling unit
N/A	Not applicable
NEPM	National Environmental Protection (Ambient Air Quality) Measure
NMFS	(United States) National Marine Fisheries Service
NO_2	Nitrogen dioxide
NO_x	Nitrous oxides
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NOPTA	National Offshore Petroleum Titles Administrator
NPFI	Northern Prawn Fishery Industry
OA	Operational Area
OGUK	Oil and Gas UK
OPGGS Act	(Commonwealth) *Offshore Petroleum and Greenhouse Gas Storage Act 2006*
OPEP	Oil Pollution Emergency Plan
OPGGS(E)R	(Commonwealth) Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
OSMP	Operational and Scientific Monitoring Plan
PCPT	Piezo cone penetration test
PK	Peak pressure levels
PTS	Permanent threshold shift
QFJA	Queensland Fisheries Joint Authority
QSIA	Queensland Seafood Industry Association
SBP	Sub-bottom profilers
SEEMP	Ship Energy Efficiency Management Plan
SEL	Sound exposure level
SIMA	Spill impact mitigation assessment
SNA	Safe navigation area
SOPEP	Ship Oil Pollution Emergency Plan
SPL	Sound pressure level
SSS	Side-scan sonar
TTS	Temporary threshold shift
US	United States
USBL	Ultra-short baseline
VHF	Very high frequency

UNITS

Term	Definition
km	Kilometres
km^2	Square kilometres
m	Metres
m^3	Cubic metres
nm	Nautical miles

1 ENVIRONMENT PLAN SUMMARY

This *Q23/P Site Survey Environment Plan Summary* (Table 1-1) has been prepared from material provided in this Environment Plan, and as required by Regulation 11(4) of the Commonwealth Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009.

Table 1-1: Environment Plan summary

Regulation	EP summary material requirement	Relevant section of the EP
11(4)(a)(i)	the location of the activity	Section 2.2, Section 3.1.1
11(4)(a)(ii)	a description of the receiving environment	Section 4
11(4)(a)(iii)	a description of the activity	Section 3
11(4)(a)(iv)	details of environmental impacts and risks	Section 7
11(4)(a)(v)	a summary of the control measures for the activity	Section 7
11(4)(a)(vi)	a summary of the arrangements for ongoing monitoring of the titleholder's environmental performance	Section 8
11(4)(a)(vii)	a summary of the response arrangements in the oil pollution emergency plan	Section 7.11, Appendix C
11(4)(a)(viii)	details of consultation already undertaken, and plans for ongoing consultation	Section 5
11(4)(a)(ix)	details of the titleholder's nominated liaison person for the activity	Section 2.4

2 INTRODUCTION

2.1 Overview

Gulf Energy Pty Limited (GEPL) propose to undertake a geophysical and geotechnical site survey within the Q23/P petroleum exploration permit in the Gulf of Carpentaria.

This Environment Plan (EP) documents the assessment and management of potential environmental impacts and risks associated with undertaking the site survey in Commonwealth waters. This EP has been prepared in accordance with the requirements of the Commonwealth *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGS Act) and the Offshore Petroleum Greenhouse Gas Storage (Environment) Regulations 2009 (OPGGS(E)R) as administered and for regulatory acceptance by the National Offshore Petroleum Safety and Environment Management Authority (NOPSEMA).

2.2 Location

The Q23/P petroleum exploration permit is in the Gulf of Carpentaria. The geophysical and geotechnical site survey will occur within a 5 km x 5 km Operational Area (OA) within the exploration permit, more than 170 km west of the Queensland coast, and more than 350 km east of the Northern Territory coast (Figure 2-1).

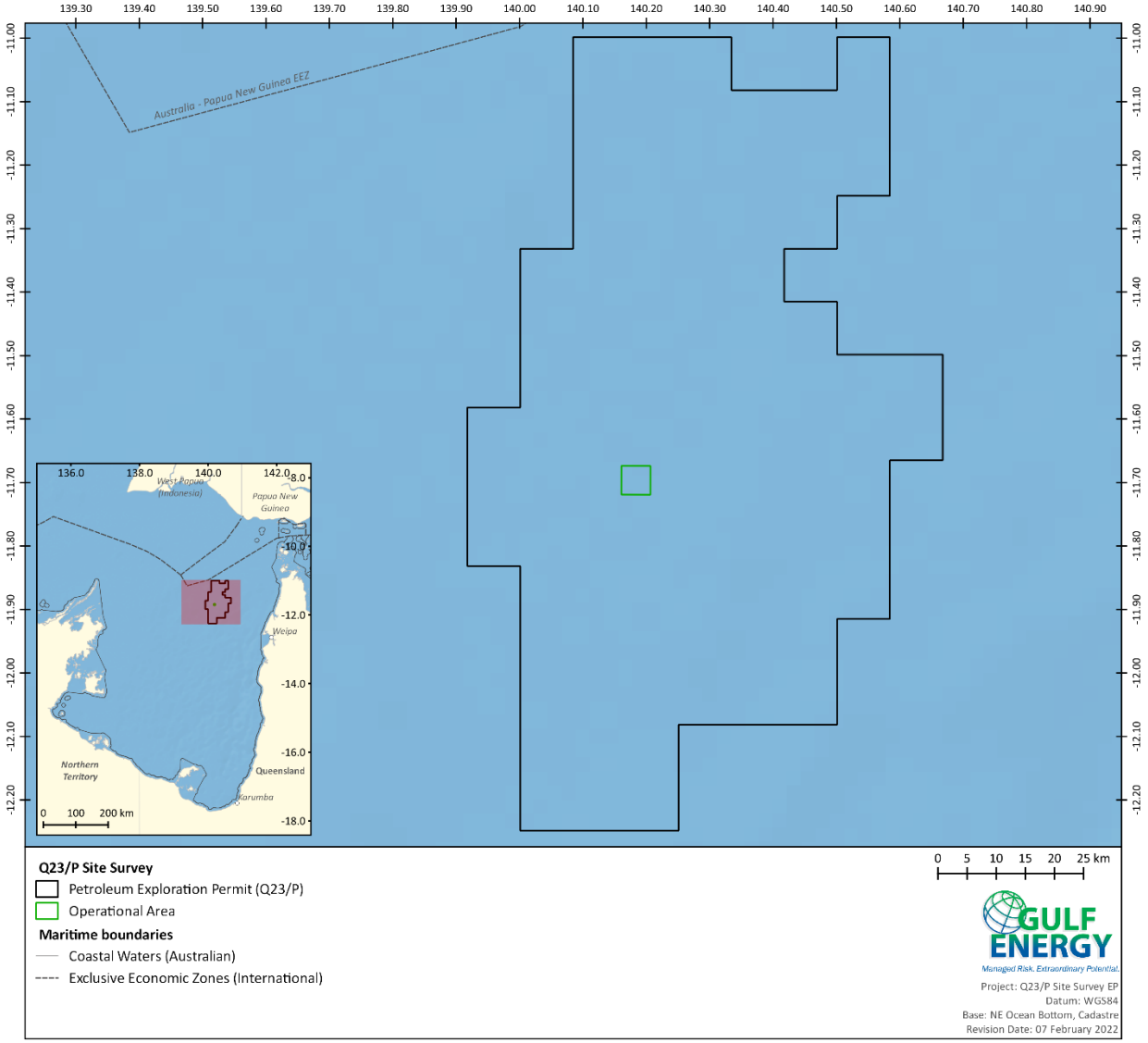


Figure 2-1: Location of the geophysical and geotechnical site survey

2.3 Scope

This EP addresses activities in Commonwealth waters associated with the site survey (the 'petroleum activity'), as further described in Section 3. Specifically, this EP addresses the following activities:

- geophysical survey
- geotechnical survey
- vessel operations.

The activities excluded from the scope of this EP are:

- vessels (including emergency response vessels) transiting to or from the OA; these vessels are deemed to be operating under the Commonwealth *Navigation Act 2012* and are not performing the petroleum activity.

2.4 Titleholder details

GEPL is the titleholder of petroleum exploration permit Q23/P (Table 2-1); and details of the nominated liaison person for this EP are listed in Table 2-2.

Regulation 15(3) of the OPGGS(E)R requires that GEPL notifies NOPSEMA of a change in the titleholder, a change to the titleholder's nominated liaison person, or a change in the contact details for either the titleholder or the nominated liaison person.

Regulation 286A of the OPGGS Act requires notification is provided to NOPSEMA and the National Offshore Petroleum Titles Administrator (NOPTA) if there is a change to a registered titleholder or contact details for the registered titleholder; this notification is to occur within 30 days of such a change.

Table 2-1: Titleholder details

Title	Q23/P
Title type	Exploration permit
Titleholder	Gulf Energy Pty Limited
Australian Company Number	094 620 176
Registered business address	c/- Hartford Partners, Suite 2, Level 10, 52 Alfred St, Milsons Point NSW 2061
Telephone number	+61 2 9923 1113
Email address	contact@gulfenergy.com.au

Table 2-2: Nominated liaison person

Company Name	Gulf Energy Pty Limited
Nominated liaison person	Wolfgang Fischer
Position	Managing Director
Business address	3 Stewart Place, Paddington NSW 2021
Telephone number	+61 2 9247 9888
Email address	wolfgang@gulfenergy.com.au

2.5 Legislative framework

In accordance with Regulation 13(4) of the OPGGS(E)R, the legislative framework relevant to the petroleum activity is described in Table 2-3 and Table 2-4.

Table 2-3: Commonwealth legislative requirements

Legislation	Description	Requirements relevant to the risks associated with the petroleum activity	Demonstration of how requirements are met
Australian Maritime Safety Authority Act 1990	Aims to promote maritime safety, protect the marine environment from pollution from ships or other environmental damage caused by shipping, and provide for a national search and rescue service	Requirements include the involvement of the Australian Maritime Safety Authority (AMSA) in response to relevant spill events	Roles and responsibilities are described in the Oil Pollution Emergency Plan (OPEP) (Appendix C).
Biosecurity Act 2015 Biosecurity Regulations 2016	Provides biosecurity protection in Australian waters beyond territorial limits	Pre-arrival information must be reported through the Maritime Arrivals Reporting System (MARS) before arrival in Australian waters	Section 7.7
		Australian Ballast Water Management Requirements (DAWE 2020)	
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) EPBC Regulations 2000	Provides for the protection and management of nationally and internationally important flora, fauna, ecological communities, and heritage places	The EP must describe matters protected under Part 3 of the EPBC Act and assess any impacts and risks to these protected matters	Sections 4, and 7
		EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans	Sections 7.1, and 7.5
		Injury or fatality caused to EPBC-listed fauna shall be reported	Section 8.5
Native Title Act 1993	Provides a process for claiming and recognising native tile land and waters in Australia	Identification of the presence of Native title claims and assessment of any impacts and risks to these sites	Sections 4, and 7
Navigation Act 2012	Provides for vessel and seafarer safety, and marine pollution prevention	Notice to Mariners	Sections 7.1,and 7.11
Navigation Act 2012 *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* *Protection of the Sea (Harmful*	Gives effect to the requirements under the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) in Australia	Marine Order 30—Prevention of collisions	Section 7.11
		Marine Order 91—Marine pollution prevention – oil	Sections 7.8, 7.9, and 7.11
		Marine Order 95—Marine pollution prevention - Garbage	Section 7.10
		Marine Order 96—Marine pollution prevention - Sewage	Section 7.8

Legislation	Description	Requirements relevant to the risks associated with the petroleum activity	Demonstration of how requirements are met
Anti-fouling Systems) Act 2006 Various marine orders		Marine Order 97—Marine pollution prevention—air pollution	Section 7.4
		Marine Order 98—Marine pollution prevention—anti-fouling systems	Section 7.7
OPGGS Act and OPGGS(E)R 2009	The OPGGS(E)R under the OPGGS Act require a titleholder to have an accepted EP in place for a petroleum activity; the regulations ensure petroleum activities are undertaken in an ecologically sustainable manner and in accordance with an EP	An EP for a petroleum activity must be accepted by NOPSEMA before activities commence	This EP, including the OPEP (Appendix C) and Operational and Scientific Monitoring Plan (OSMP) (Appendix D)
Underwater Cultural Heritage Act 2018	Provides protection for shipwrecks, sunken aircraft and other cultural heritage sites in Australian waters	Identification of the presence of protected cultural heritage sites and assessment of any impacts and risks to these sites	Sections 4, and 7

Table 2-4: Policies and guidelines

Policy/Guideline/Convention	Description	Requirements relevant to the risks associated with the petroleum activity	Demonstration of how requirements are met
Control and Management of Ships Biofouling to Minimise the Transfer of Invasive Aquatic Species (IMO 2012)	International Maritime Organization (IMO) guidelines for global management of biofouling	Requires a biofouling management plan and record book to be available and maintained	Section 7.7
National Light Pollution Guidelines for Wildlife, including Marine Turtles, Seabirds and Migratory Shorebirds (CoA 2020)	Outlines the process to be followed where there is the potential for artificial lighting to affect wildlife; applies to new projects, lighting upgrades and where there is evidence of wildlife being affected by existing artificial light	The EP must assess if artificial lighting is likely to affect wildlife and identify the management tools to minimise and mitigate impacts and risks	Section 7.3

3 DESCRIPTION OF THE PETROLEUM ACTIVITY

3.1 Overview

This section provides a description of the petroleum activity as required under Regulation 13(1) of the OPGGS(E)R. The description of the petroleum activity is presented in the following sections:

- geophysical survey (Section 3.2)
- geotechnical survey (Section 3.3)
- vessel operations (Section 3.4).

The site survey is required to determine the characteristics and suitability of the seabed as a drilling location, and to identify the presence of any hazards, prior to any future exploration drilling within the Bamaga Basin.

In addition to the specific geophysical and geotechnical survey techniques described in the following sections, the use of tow and/or drop cameras from the vessel may be used to provide a visual observation of the physical and biological environment.

3.1.1 Operational area

The OA for the petroleum activity within this EP has been defined as a 5 km x 5 km (25 km^2) area centred over the indicative location of the (future) exploration drilling well (Figure 2-1). The OA is located entirely within Q/23P, and in Commonwealth waters of depths ~65 m. The OA covers the spatial extent of all planned activities within scope of this EP.

The actual survey area will be refined prior to the commencement of activities and will typically be approximately 3 km x 3 km (9 km^2), to provide sufficient geophysical and geotechnical data over both the indicative exploration well location and a potential relief well location (in case of emergency events during a future exploration drilling program which may require a relief well to alleviate).

3.1.2 Timing

The site survey is scheduled to occur over a period of approximately four-weeks during Q3/Q4 2022, subject to environmental approvals, vessel availability, operational constraints, and favourable metocean conditions.

The site survey is likely to consist of two separate vessel mobilisations each of approximately two weeks duration; the geophysical survey will be completed first, followed by the geotechnical sampling survey. The exact duration of each survey is dependent on final survey methods/technology and metocean conditions during the survey.

Activities covered by this EP can occur 24 hours a day and 7 days a week.

3.2 Geophysical survey

The geophysical survey may include the use of: multibeam echo sounders (MBES), side-scan sonar (SSS), sub-bottom profilers (SBP), and magnetometry. The positioning of geophysical surveys may utilise ultra-short baseline (USBL) techniques. These geophysical surveys will provide data on water depth, seabed and shallow sub-seabed features and characteristics, and identification of any seabed hazards.

The MBES, SSS, and SBP will be conducted simultaneously. The magnetometer survey may also be conducted at the same time as the other geophysical surveys, or may be completed sequentially, depending on data quality implications and target areas.

3.2.1 Multibeam echo sounder

MBES use multiple sound signals to detect the sea floor and measure bathymetry and water depths. By using multiple beams, a swath of seabed can be mapped on a single line, reducing survey time while providing detailed information. As the vessel travels along the chosen lines, the MBES transmits a broad acoustic pulse from a transducer over a swath through the water to the seabed. The MBES then forms a series of received beams that are each much narrower and form a ‘fan’ across the seabed, perpendicular to the vessel track.

This reflected sound is measured by the receiver transducer, and this provides information on the bathymetry of the seabed. The fans of seabed coverage produce a series of strips along each vessel track, which are combined to generate a two-dimensional bathymetric map of the seabed.

For this survey, a hull mounted MBES is likely to be used, however an autonomous underwater vehicle (AUV) with inbuilt transmit and receive transducers may also be selected for use. The MBES equipment is generally operated at a vessel speed of 3-4 knots.

3.2.2 Side-scan sonar

SSS generates oblique acoustic images of the seabed, and is used to identify natural features (e.g., reefs) or other hazards (e.g., debris) present on the seafloor. SSS uses acoustic pulses that are reflected off the sea floor to create an image of morphology and differences in seabed texture. The SSS is equipped with a linear array of transducers that emit, and later receive, an acoustic energy pulse in a specific frequency range. Typically, a dual-channel, dual-frequency SSS is used. SSS is like MBES but operates at a wider fan angle. The SSS is typically towed 10-15 m above the seabed depending on water depth and the frequency range.

For this survey, a sonar 'towfish' is likely to be used, however an AUV with inbuilt transmit and receive transducers may also be selected for use. The towfish is provided with power and digital telemetry services from the vessel using a reinforced or armoured tow cable.

3.2.3 Sub-bottom profiler

Acoustic SBPs are used to determine the layering and thickness of the upper seabed sediments. The penetration depth and image resolution from SBPs vary depending on the frequency of the acoustic signal used.

Very high frequency systems including pingers, parametric echo sounding, and compressed high-intensity radar pulse (CHIRP) produce a swept-frequency signal. The transducer that emits the acoustic energy also receives the reflected signal. CHIRP signals typically penetrate only about 5-10 m into the seabed and provide the best resolution, but lowest penetration of the very high frequency systems. A CHIRP is normally hull mounted when used for shallow water operations but may also be towed by the vessel.

High frequency boomers generate a broadband, high amplitude impulsive acoustic signal in the water column that is directed vertically downward. Boomers are mostly surface towed but may also be towed below the surface to avoid sea surface wave related noise and movement. Depending on seabed geology, boomer signals can penetrate to depths of up to 100 m beneath the seabed.

Medium frequency sparkers create an electric arc between two electrodes; this arc vaporises water and generates a pressure have. Sparkers can provide low resolution data to much greater penetration depth below the seabed. Sparkers are typically surface towed.

The receiver for the boomer or sparkers system is usually a hydrophone or hydrophone array consisting of a string of individual hydrophone elements. They typically contain 8–12 hydrophone elements evenly spaced in a tube (~2.5–4.5 m length, ~25 mm diameter).

3.2.4 Magnetometry

A magnetometer is used to detect metallic objects on or below the seabed that may not have been fully resolved using the acoustic techniques described above. A magnetometer sensor is housed in a towfish and is towed as close to the seabed as possible (and away from the vessel to isolate the sensor from the magnetic field of the vessel itself). A magnetometer measures the ambient magnetic field, and no acoustic signals are emitted from a magnetometer.

Unless conducted simultaneously with the MBES, SSS, and SBP surveys (as the magnetometer can be powered using the same tow cable and power supply), the magnetometer survey may only be conducted if the SSS survey results identify an anomaly that requires further investigation.

3.2.5 Ultra-short baseline

USBL may be used to assist with positioning of the geophysical equipment or geotechnical sampling. The USBL transceiver would need to be calibrated on site, which requires the transponder to be deployed on the seabed at working depth, and then the vessel surveys a pattern around the transponder to ascertain the error (pitch, roll, heading, velocity) of the USBL transceiver. The transponder is lowered to the seabed with a sandbag fitted with an acoustic release. Once the calibration is complete, the acoustic release is triggered, and the transponder recovered. The sandbag anchor remains on the seabed (typical footprint of ~0.2 m^2). As the calibration must be completed at working depth and close passes are required it is impractical to buoy the transponder/sandbag, without the risk of entanglement; therefore, the sandbag will remain on the seabed.

3.3 Geotechnical survey

The geotechnical survey comprises in situ testing and recovery of sediment samples at locations within the OA, and may include the use of grab sampling, core samples, penetrometer tests, and borehole sampling. Geotechnical surveys are performed utilising seabed sampling equipment deployed over the side of a vessel. Once the equipment is placed upon the seabed, the test is performed and/or the sample is collected. These geotechnical surveys will provide data on sediment profile and characteristics below the seabed.

At each site, all samples and tests will be conducted consecutively.

3.3.1 Grab sampling

Grab sampling involves collecting samples of the surface layer of unconsolidated seabed sediments for analysis; these are typically collected using Van Veen grab sampler (or similar). Van Veen grab samplers are typically lightweight clamshell buckets, deployed over the side of the vessel, and can penetrate soft sediment up to ~0.2 m depth (dependant on the size of the sampler).

It is expected that between one to four samples may be collected at a proposed drilling location (i.e., either at the centre, or from each of the spud can locations). Therefore, for the purposes of this site survey, it is expected that up to eight grab samples may be collected; assuming ~0.4 m x 0.4 m footprint per sample gives a total ~1.3 m^2 disturbance footprint from grab sampling. Other additional grab samples may be obtained at areas of interest as determined by a review of the geophysical data.

3.3.2 Coring

Coring involves collecting samples of unconsolidated subsurface seabed sediments for analysis; these are typically collected using box, vibro, piston, or gravity corer samplers.

A box corer is lowered to the seabed, and then triggered via a self-releasing trigger mechanism that passes through its frame. The system may also use additional weights to aid penetration of the corer. The penetration is limited by a stopper to a depth of up to ~1 m. When removing the corer from the seabed, a spade closes underneath the box to prevent sample loss. Box corers are designed to collect a relatively undisturbed sediment sample. A box corer (with frame) can typically have a disturbance footprint of up to ~1 m^2 per sample.

The vibrocore unit is lowered from the vessel to the seafloor, then a vibrating device (typically electric motors) is used to drive a coring tube into the seabed. The core is extracted and then recovered to the vessel with the vibrocore unit. A vibrocore will penetrate to depths of up to ~4 m. A vibrocore (with frame) can typically have a disturbance footprint of up to ~25m^2 per sample.

Piston corers are deployed from the vessel using a core handling system. Piston corers have a piston mechanism that is triggered when the corer hits the seabed; the piston helps to reduce sample disturbance. A seal on the bottom of the device will retain the sediment sample during retrieval. Piston core lengths can vary and are typically available in 6 m lengths. A piston corer can typically have a disturbance footprint of up to ~0.02 m^2 per sample.

Gravity corers are lowered to a predetermined height above the seabed from the vessel using a wire rope before being allowed to freefall. The resulting core enters the internal sleeve and is held in place by a core

catcher. A gravity core can penetrate to depths of up to ~4 m, depending on the sediment type. A gravity corer can have a disturbance footprint of up to ~0.02 m^2 per sample.

It is expected that between one to four samples may be collected at a proposed drilling location (i.e., either at the centre, or from each of the spud can locations). Therefore, for the purposes of this site survey, it is expected that up to eight core samples of each type may be collected. Using the estimated footprints, gives a total ~208 m^2 disturbance footprint.

3.3.3 Penetrometer

Penetration tests are used to determine soil strength and to assist in delineating soil stratigraphy; this in situ test is typically conducted using a piezo cone penetration test (PCPT).

A PCPT involves lowering a frame to the seabed and pushing a probe into the seabed at a constant rate of penetration and continuously measuring resistance, friction, and water pressure. Since data are obtained continuously with depth, it can detect fine changes in stratigraphy. When the required penetration depth is reached, all equipment is withdrawn from the seabed. The PCPT frame used is ~5 m x 1 m. The penetrometer itself is small; this small hole will remain in the seabed; however, it is expected this will naturally collapse and/or infill with the natural movement of seabed sediments.

For the purposes of this site survey, it is expected that up to eight PCPT tests may be conducted. Using the estimated footprint from the frame, gives a total ~40 m^2 disturbance footprint.

3.3.4 Borehole sampling

Borehole sampling involves drilling through seabed sediments with an open-centred drill bit which is used to recover the seabed core sample. Drilling will either be undertaken from the survey vessel or using a sea floor drilling system.

If a seabed drilling system is used, it will be positioned on the seabed with a guide base and connected by a control umbilical, which provides power and video to allow for real-time high-speed control. Deployment and recovery are done with the vessel crane or a dedicated launch and recovery system. If drilling is undertaken from the survey vessel, the footprint is anticipated to be limited to the footprint of the subsea drill-string stabilisation frame with no need for wet storage of additional sea floor equipment. The footprint of both systems on the sea floor is expected to be similar and ~2.5 m x 2.5 m (~6.25 m^2). During coring, sediment samples are collected via a dedicated rotary coring drill string or a drop-in core barrel that latches inside the drill string. Once the core sample is extracted the borehole itself will remain in the seabed; however, it is expected this will naturally collapse and/or infill with the natural movement of seabed sediments. For this survey, borehole sampling will target depths of ~40–80 m below the seabed.

Borehole sampling generates minimal cuttings as the aim of the sample is to recover the core. For a nominal 75 mm diameter borehole at 80 m depth, the estimated volume of cuttings is up to ~0.5 m^3. Seawater and/or water-based muds (such as bentonite), will be used to lubricate and cool the drill bit. For a borehole 80 m deep, the volume of drilling fluid would be ~15 m^3.

Downhole sampling may also be undertaken at predetermined intervals during borehole sampling. Downhole sampling may include rotary cores/push cores and PCPT measurements.

For the purposes of this survey, it is expected that up to eight borehole samples may be collected. Using the estimated footprint from the subsea equipment, gives a total ~50 m^2 disturbance footprint.

3.4 Vessel operations

The site survey will involve two vessel mobilisations, likely with different vessels (given the different specifications needed for the geophysical and geotechnical surveys). There will only be one vessel undertaking activities within the OA at any time.

The survey vessel will use dynamic positioning (DP) with no anchoring planned to be undertaken. The vessel will use a light marine fuel such as marine diesel oil (MDO) or marine gas oil (MGO). No refuelling or crew changes at sea are required. Given the nature of activities described in this EP, the vessel is expected to be

either slow moving (e.g., 4-5 knots) during geophysical data acquisition, or stationary during geotechnical sampling.

There will be a 500 m radius Safe Navigation Area (SNA) requested around the survey vessel and any towed equipment for the duration of activities.

Vessels routinely discharge a variety of wastewater streams to the marine environment including sewage, greywater, food waste, cooling water, brine, and oily bilge water; vessels may also incinerate solid wastes.

In the event of unsafe environmental conditions (e.g., a cyclone passing over or close to survey area), equipment may be retrieved, and/or the survey vessel may transit away from the OA to a safer location. As per Section 2.3, once a vessel leaves the OA, it is no longer undertaking a petroleum activity.

4 DESCRIPTION OF THE ENVIRONMENT

This section provides a description of the environment as required under Regulation 13(2) of the OPGGS(E)R. For the purposes of this EP, GEPL have defined and described the following areas:

- OA – as described in Section 3.1.1, this is the area in which the petroleum activities will be undertaken, and is the area in which activities (with the exception of a vessel spill event) may result in environmental impacts
- Environment that May Be Affected (EMBA) – defined as the area in which an unplanned vessel spill event from GEPL's activities may result in environmental impacts.

These areas are shown in Figure 4-1.

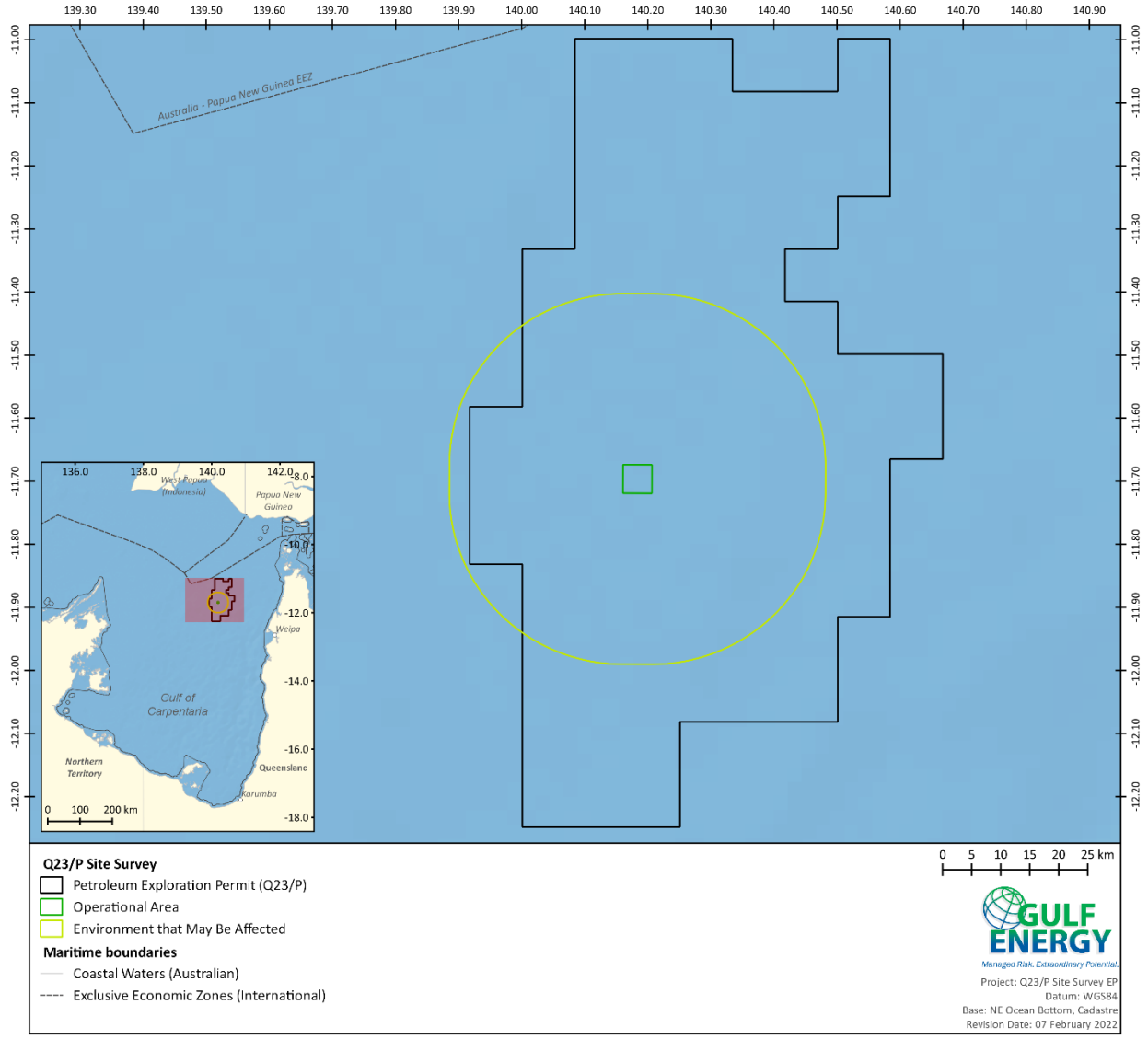


Figure 4-1: OA and EMBA for Q23/P Site Survey

4.1 Physical environment

The Q23/P exploration permit occurs within the Gulf of Carpentaria, a shallow epicontinental sea between Australia, Papua New Guinea, and West Papua (Indonesia).

The Gulf of Carpentaria is comprised of a series of stacked sedimentary basins. The two shallower basins are the Karumba Basin and the Carpentaria Basin. Two-dimensional regional seismic data acquired in 2012, and

a second infill seismic survey in 2014 confirmed the presence of the third, and deeper, Bamaga Basin. The Bamaga Basin occurs almost entirely within the Q23/P exploration permit.

4.1.1 Climate

The North Marine Bioregion (which includes the Gulf of Carpentaria) experiences a tropical monsoonal climate, including high temperatures, heavy seasonal, and variable, rainfall and cyclones, alternating with extended periods of no rain (DEWHA 2008b). Cyclones affect the majority of the North Marine Bioregion, with a general frequency of two to three cyclone every year, mostly between November and April (BoM 2021).

4.1.2 Water quality

Marine water quality within the OA and EMBA is expected to be representative of typically pristine and high-water quality found in offshore waters.

The waters in the Gulf of Carpentaria have limited mixing with waters of the Arafura and Coral seas (Condie and Dunn 2006) (Forbes 1984), and as such form a distinct semi-enclosed system with limited inputs from either oceanographic or terrestrial sources.

During the wet season, Gulf of Carpentaria waters become stratified, resulting in the development of high concentrations of chlorophyll at depths of ~40 m. In the dry season, strong southeast trade winds mix Gulf of Carpentaria waters and resuspend nutrients generated from benthic microbial processes high in the euphotic zone; this results in primary productivity throughout the water column (Burford and Rothlisberg 1999).

4.1.3 Sediment quality

Marine sediment quality within the OA and EMBA is expected to be representative of typically pristine offshore waters.

The central part of the Gulf of Carpentaria is characterised by gently sloping soft sediments (DEWHA 2008b). Sediment types differ across the basin with shelf sandy muds (<50% sand) on the western side, shelf muddy sands (50-80% sand(on the eastern side, and relict sand and muddy sand dominating the seafloor of the southern basin (Long and Somers 1994) (DEWHA 2008b).

4.1.4 Air quality

The OA and EMBA are relatively remote from the mainland and therefore air quality is expected to be high. However, temporary and intermittent anthropogenic sources (e.g., transiting vessels) could contribute to minor local variations in air quality.

4.1.5 Ambient sound

Ambient sound within the offshore region is expected to be dominated by natural physical (e.g., wind, waves, rain) and biological (e.g., echolocation and communication noises generated by cetaceans and fish) sources. Temporary and intermittent anthropogenic sound sources may be experienced, due to shipping and commercial fisheries activities (Sections 4.3.2 and 4.3.3).

4.1.6 Ambient light

Natural ambient light within the offshore region is expected to predominantly be from solar/lunar luminance. Temporary and intermittent artificial ambient light sources associated with anthropogenic activities may also occur, including from transiting vessels.

4.2 Ecological environment

4.2.1 Benthic habitats and communities

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

The benthic substrate within the OA has been classified as mud and calcareous clay; and within the EMBA as mud and calcareous clay, and calcareous gravel, sand and silt (CSIRO 2015). The soft sediments of the basin are characterised by moderately abundant and diverse communities of infauna and mobile epifauna dominated by polychaetes, crustaceans, molluscs and echinoderms (DAWE n.d.).

In deeper waters of the Gulf of Carpentaria (>50 m) two main megabenthos communities are present; one community located in predominantly sandy sediments along the eastern and south-eastern margins that comprise mainly sessile suspension-feeding sponges, zoantharians, pennatulaceans, bivalve molluscs and ascidians. The other community is located in the muddier sediments in the central and western areas that comprise mainly deposit-feeding spatangoids and sand dollars (Long, Poiner and Wassenberg 1995). The two main megabenthos communities are widely distributed in the Gulf of Carpentaria, and throughout the Indo-West Pacific (Long, Poiner and Wassenberg 1995).

While nearshore areas of the Gulf of Carpentaria include seagrass meadows (DEWHA 2008b), these are not expected to occur within the OA and EMBA due to water depths and light availability.

There are no threatened ecological communities identified within the OA or EMBA (DAWE 2021c).

4.2.2 Seabirds and shorebirds

Multiple species (or species habitat) of seabirds and shorebirds may occur within the OA and EMBA (Table 4-1). The presence of these species is expected to be of a transitory nature only, with no important behaviours (e.g., roosting, nesting, etc.) identified from the protected matters database (DAWE 2021c) (Appendix E).

Biologically important areas[1] (BIAs) have also been identified for a single bird species (Table 4-2, Figure 4-2) within the EMBA; none occur within the OA. This BIA has been developed as a 200 km buffer noted as a foraging zone from a non-breeding roosting location at Weipa (DAWE 2016). Lesser Frigatebirds are one of the species known to nest on the Wellesley Islands (>500 km south of the OA).

Table 4-1: Seabird and shorebird species or species habitat that may occur within the OA or EMBA

		EPBC Status				Type of presence	
Scientific name	Common name	Threatened species*	Migratory species*	Listed marine species	Management plan	OA	EMBA
Actitis hypoleucos	Common Sandpiper		✓ (W)	✓		MO	MO
Anous stolidus	Common Noddy		✓ (M)	✓		MO	MO
Calidris acuminata	Sharp-tailed Sandpiper		✓ (W)	✓		MO	MO

[1] *Biologically important areas are spatially defined areas where aggregations of individuals of a species are known to display biologically important behaviour such as breeding, foraging, resting or migration.*

Scientific name	Common name	EPBC Status: Threatened species*	EPBC Status: Migratory species*	EPBC Status: Listed marine species	EPBC Status: Management plan	Type of presence: OA	Type of presence: EMBA
Calidris canutus	Red Knot	E	✓ (W)	✓	CA	MO	MO
Calidris ferruginea	Curlew Sandpiper	CE	✓ (W)	✓	CA	MO	MO
Calidris melanotos	Pectoral Sandpiper		✓ (W)	✓		MO	MO
Calonectris leucomelas	Streaked Shearwater		✓ (M)	✓		LO	LO
Fregata ariel	Lesser Frigatebird		✓ (M)	✓		MO	MO
Fregata minor	Greater Frigatebird		✓ (M)	✓		LO	LO
Numenius madagascariensis	Eastern Curlew	CE	✓ (W)	✓	CA	MO	MO

✓ *Present within area*
* *Matter of national environmental significance*

Threatened species:
CE *Critically Endangered*
E *Endangered*

Migratory species:
M *Marine*
W *Wetland*

EPBC management plan:
CA *Conservation Advice*

Type of Presence:
MO *Species of species habitat may occur within area*
LO *Species or species habitat likely to occur within area*

Table 4-2: Presence of BIAs for seabird and shorebird species that may occur within the OA or EMBA

Common name	BIA behaviour	Seasonal presence	OA	EMBA
Lesser Frigatebird	Foraging	Likely to be used all year round		✓

✓ *Present within area*

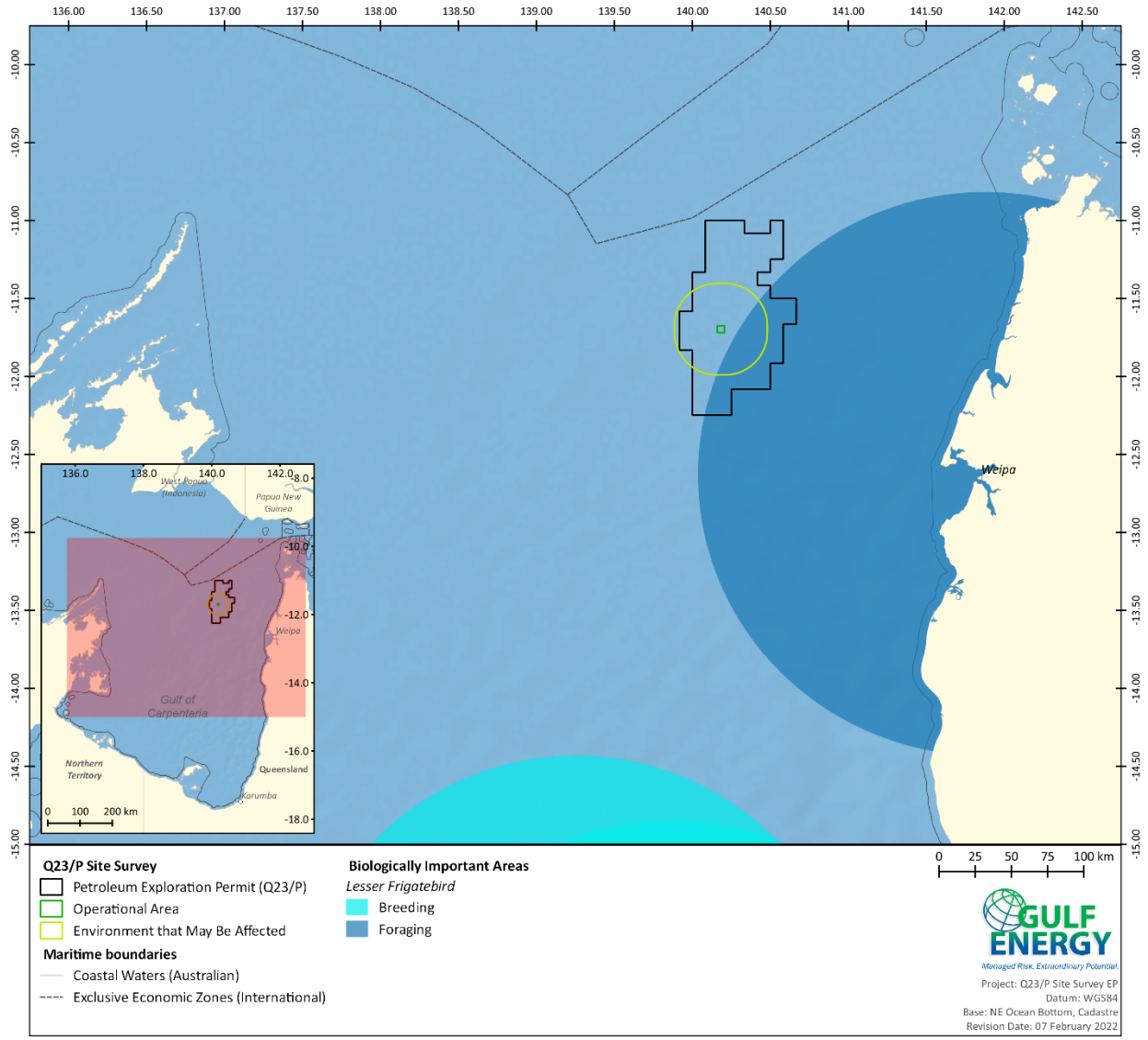


Figure 4-2: Biologically important areas for Lesser Frigatebird

4.2.3 Fish

Multiple species (or species habitat) of fish may occur within the OA and EMBA (Table 4-3). The presence of these species is expected to be of a transitory nature only, with no important behaviours (e.g., foraging) identified from the protected matters database (DAWE 2021c)(Appendix E).

No BIAs for fish species were identified within the OA or EMBA (DAWE 2016). The nearest BIAs occur off southeast coast of Queensland and northwest Western Australia.

Table 4-3: Fish species or species habitat that may occur within the OA or EMBA

Scientific name	Common name	EPBC Status				Type of presence	
		Threatened species*	Migratory species*	Listed marine species	Management plan	OA	EMBA
Sharks and Rays							
Anoxypristis cuspidata	Narrow Sawfish		✓			MO	MO
Carcharodon carcharias	White Shark	V	✓		RP	MO	MO
Glyphis glyphis	Speartooth Shark	CE			RP, CA	MO	MO
Manta alfredi	Reef Manta Ray		✓			MO	MO
Manta birostris	Giant Manta Ray		✓			MO	MO
Pristis pristis	Freshwater Sawfish	V	✓		RP, CA	KO	KO
Pristis zijsron	Green Sawfish	V	✓		RP, CA	KO	KO
Rhincodon typus	Whale Shark	V	✓		CA	MO	MO
Isurus paucus	Longfin Mako		✓			LO	LO
Pipefish, Pipehorse, and Seahorses							
Choeroichthys brachysoma	Pacific Short-bodied Pipefish			✓		MO	MO
Corythoichthys amplexus	Fijian Banded Pipefish			✓		MO	MO
Corythoichthys flavofasciatus	Reticulate Pipefish			✓		MO	MO
Doryrhamphus excisus	Bluestripe Pipefish			✓		MO	MO
Doryrhamphus janssi	Cleaner Pipefish			✓		MO	MO
Halicampus brocki	Brock's Pipefish			✓		MO	MO
Halicampus grayi	Mud Pipefish			✓		MO	MO
Halicampus spinirostris	Spiny-snout Pipefish			✓		MO	MO
Hippocampus angustus	Western Spiny Seahorse			✓		MO	MO
Hippocampus histrix	Spiny Seahorse			✓		MO	MO
Hippocampus kuda	Spotted Seahorse			✓		MO	MO
Hippocampus spinosissimus	Hedgehog Seahorse			✓		MO	MO
Solegnathus hardwickii	Pallid Pipehorse			✓		MO	MO
Trachyrhamphus bicoarctatus	Bentstick Pipefish			✓		MO	MO

Scientific name	Common name	EPBC Status: Threatened species*	Migratory species*	Listed marine species	Management plan	Type of presence: OA	EMBA
Trachyrhamphus longirostris	Straightstick Pipefish			✓		MO	MO

✓ *Present within area*
* *Matter of national environmental significance*
Threatened species:
CE *Critically Endangered*
V *Vulnerable*
EPBC management plan:
CA *Conservation Advice*
RP *Recovery Plan*
Type of Presence:
MO *Species of species habitat may occur within area*
LO *Species or species habitat likely to occur within area*
KO *Species or species habitat known to occur within area*

4.2.4 Mammals

Multiple species (or species habitat) of marine mammals may occur within the OA and EMBA (Table 4-4). The presence of these species is expected to be of a transitory nature only, with no important behaviours (e.g., foraging) identified from the protected matters database (DAWE 2021c) (Appendix E).

No BIAs for mammal species were identified within the OA or EMBA (DAWE 2016). The nearest is a breeding BIA for Indian Ocean Bottlenose Dolphin located ~185 km and ~155 km from the OA and EMBA respectively.

Table 4-4: Mammal species or species habitat that may occur within the OA or EMBA

Scientific name	Common name	EPBC Status: Threatened species*	Migratory species*	Listed marine species	Management plan	Type of presence: OA	EMBA
Whales							
Balaenoptera borealis	Sei Whale	V	✓	✓	CA	MO	MO
Balaenoptera edeni	Bryde's Whale		✓	✓		MO	MO
Balaenoptera musculus	Blue Whale	E	✓	✓	RP	MO	MO
Balaenoptera physalus	Fin Whale	V	✓	✓	CA	MO	MO
Dolphins							
Delphinus delphis	Common Dolphin			✓		MO	MO
Grampus griseus	Risso's Dolphin			✓		MO	MO
Orcinus orca	Killer Whale		✓	✓		MO	MO
Pseudorca crassidens	False Killer Whale			✓		LO	LO
Stenella attenuata	Spotted Dolphin			✓		MO	MO
Tursiops aduncus	Indian Ocean Bottlenose Dolphin			✓		MO	MO
Tursiops truncatus s. str.	Bottlenose Dolphin			✓		MO	MO

✓ *Present within area*
* *Matter of national environmental significance*
EPBC management plan:
CA *Conservation Advice*

Scientific name	Common name	EPBC Status: Threatened species*	EPBC Status: Migratory species*	EPBC Status: Listed marine species	Type of presence: Management plan	Type of presence: OA	Type of presence: EMBA
Threatened species:		*RP*	*Recovery Plan*				
E	*Endangered*	*Type of Presence:*					
V	*Vulnerable*	*MO*	*Species of species habitat may occur within area*				
		LO	*Species or species habitat likely to occur within area*				

4.2.5 Reptiles

Multiple species (or species habitat) of marine reptiles may occur within the OA and EMBA (Table 4-5). The presence of these species is expected to be of a transitory nature only, with no important behaviours (e.g., breeding, foraging) identified from the protected matters database (DAWE 2021c) (Appendix E).

No BIAs or critical habitat for reptile species were identified within the OA or EMBA (DAWE 2016). The nearest is an internesting BIA for Flatback Turtles located ~95 km and ~65 km from the OA and EMBA respectively; and an internesting critical habitat for Flatback Turtles located ~115 km and ~85 km from the OA and EMBA respectively.

Table 4-5: Reptile species or species habitat that may occur within the OA or EMBA

Scientific name	Common name	EPBC Status: Threatened species*	EPBC Status: Migratory species*	EPBC Status: Listed marine species	Type of presence: Management plan	Type of presence: OA	Type of presence: EMBA
Turtles							
Caretta	Loggerhead Turtle	E	✓	✓	RP	MO	MO
Chelonia mydas	Green Turtle	V	✓	✓	RP	MO	MO
Dermochelys coriacea	Leatherback Turtle	E	✓	✓	CA, RP	MO	MO
Eretmochelys imbricata	Hawksbill Turtle	V	✓		RP	MO	MO
Lepidochelys olivacea	Olive Ridley Turtle	E	✓		RP	MO	MO
Natator depressus	Flatback Turtle	V	✓		RP	MO	MO
Seasnakes							
Acalyptophis peronii	Horned Seasnake			✓		MO	MO
Aipysurus duboisii	Dubois' Seasnake			✓		MO	MO
Aipysurus eydouxii	Spine-tailed Seasnake			✓		MO	MO
Aipysurus laevis	Olive Seasnake			✓		MO	MO
Astrotia stokesii	Stokes' Seasnake			✓		MO	MO
Disteira kingii	Spectacled Seasnake			✓		MO	MO
Disteira major	Olive-headed Seasnake			✓		MO	MO

Scientific name	Common name	EPBC Status: Threatened species*	EPBC Status: Migratory species*	EPBC Status: Listed marine species	EPBC Status: Management plan	Type of presence: OA	Type of presence: EMBA
Enhydrina schistosa	Beaked Seasnake			✓		MO	MO
Hydrophis atriceps	Black-headed Seasnake			✓		MO	MO
Hydrophis elegans	Elegant Seasnake			✓		MO	MO
Hydrophis mcdowelli	N/A			✓		MO	MO
Hydrophis ornatus	Spotted Seasnake			✓		MO	MO
Hydrophis pacificus	Large-headed Seasnake			✓		MO	MO
Lapemis hardwickii	Spine-bellied Seasnake			✓		MO	MO
Pelamis platurus	Yellow-bellied Seasnake			✓		MO	MO

✓ *Present within area*
* *Matter of national environmental significance*
Threatened species:
E *Endangered*
V *Vulnerable*
EPBC management plan:
CA *Conservation Advice*
RP *Recovery Plan*
Type of Presence:
MO *Species of species habitat may occur within area*

4.3 Social, economic and cultural environment

4.3.1 Commonwealth marine area

The Commonwealth marine environment is a matter of national environment significance under the EPBC Act. The OA and EMBA for this activity occur within the Commonwealth North Marine Region, which comprises the Commonwealth waters from west Cape York Peninsula to the Northern Territory–Western Australian border (DSEWPaC 2012).

The North Marine Region is characterised by a wide continental shelf with water depths generally <70 m (but vary from ~10–360 m (DSEWPaC 2012). There are submerged patch and barrier reefs that form a broken margin around the perimeter of the Gulf of Carpentaria and provide complex habitats in an otherwise largely featureless basin (DSEWPaC 2012). Conversely, the Gulf of Carpentaria coastal zone (waters <20 m) are characterised by comparatively high levels of productivity and biodiversity (DSEWPaC 2012).

Conservation values of the Commonwealth marine area include:

- protected species and/or their habitat (Section 4.2)
- protected places including Australian Marine Parks (AMPs) (Section 4.3.1.1) and heritage places (Section 4.3.4)
- key ecological features (KEF) (Section 4.3.1.2).

4.3.1.1 Australian Marine Parks

AMPs occur within Commonwealth waters and were proclaimed as Commonwealth reserves under the EPBC Act in 2007 and 2013. There are no AMPs within the OA or EMBA. The nearest AMP is West Cape York Marine Park, located ~75 km and ~45 km north of the OA and EMBA respectively (Figure 4-3).

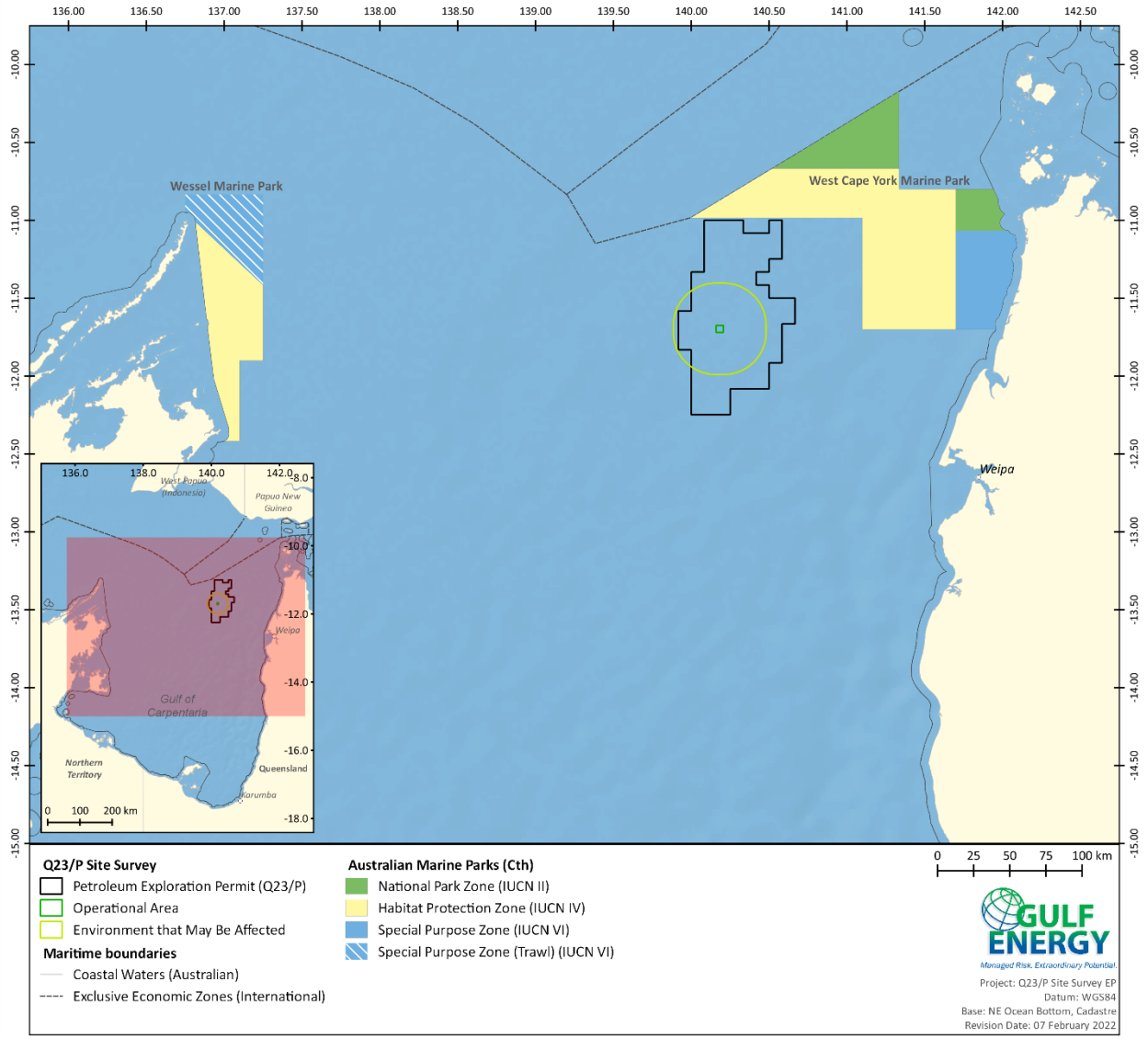


Figure 4-3: Australian Marine Parks within the vicinity of Q23/P

4.3.1.2 Key ecological features

KEFs are elements of the Commonwealth marine environment that are considered to be of regional importance for either a region's biodiversity or its ecosystem function and integrity. KEFs are not matters of national environmental significance and have no legal status in their own right; however, they may be considered as components of the Commonwealth marine area.

There is one KEF that intersects with the OA and EMBA (Figure 4-4). The importance and values have been identified within the SPRAT database (DAWE n.d.) and are summarised in Table 4-6.

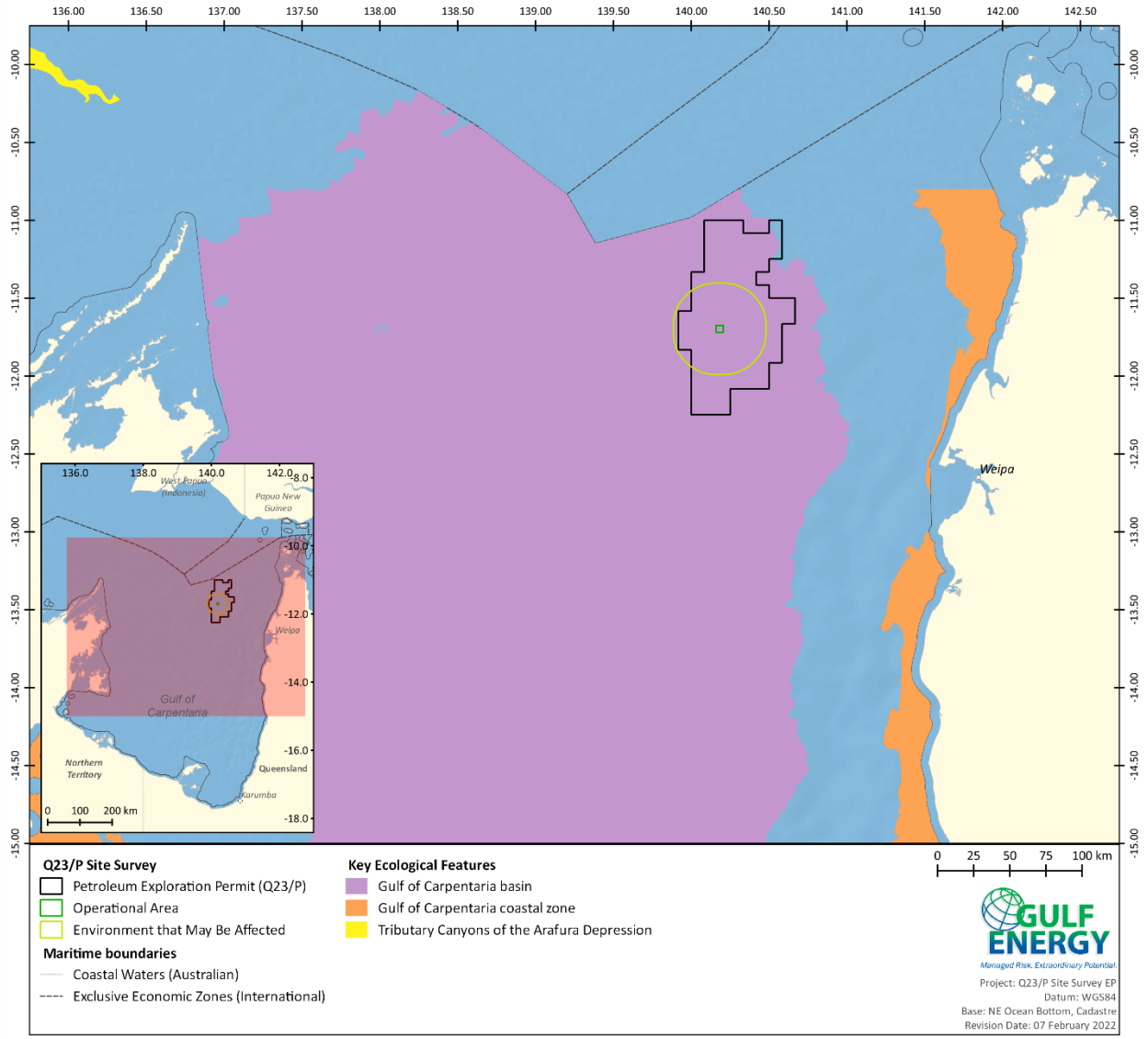


Figure 4-4: Key ecological features within the vicinity of Q23/P

Table 4-6: Importance and values of relevant KEF

Gulf of Carpentaria Basin
National and/or regional importance The Gulf of Carpentaria basin is defined as a key ecological feature for its regional importance for biodiversity, endemism and aggregations of marine life. These values apply to both the benthic and the pelagic habitats within the feature. **Location** The Gulf of Carpentaria basin is located in the Northern Shelf Province provincial bioregion and is characterised by gently sloping soft sediments and water varying in depth from around 45–80 m. Sediment types differ across the basin—shelf sandy muds (<50 % sand) are found on the western side, shelf muddy sands (50–80% sand) on the eastern side, and relict sands and muddy sands dominate the sea floor of the southern basin. The waters in the Gulf of Carpentaria mix little with waters of the Arafura and Coral seas, so that they form a distinct semi-enclosed system with limited inputs from either oceanographic or terrestrial sources. **Description and values** The Gulf of Carpentaria is believed to be one of the few remaining near-pristine marine environments in the world. Primary productivity in the Gulf of Carpentaria basin is mainly driven by cyanobacteria that fix nitrogen, but is also strongly influenced by seasonal processes. The soft sediments of the basin are characterised by moderately

abundant and diverse communities of infauna and mobile epifauna dominated by polychaetes, crustaceans, molluscs and echinoderms.

The Gulf of Carpentaria basin also supports assemblages of pelagic fish species including planktivorous and schooling fish, and top predators such as shark, snapper, tuna and mackerel. The Gulf is also an important migratory route for seabirds, shore birds and marine turtles.

During the monsoon, Gulf waters become stratified, resulting in the development of high concentrations of chlorophyll at depths of ~40 m. In the dry season (April–October), strong south-east trade winds mix Gulf waters and resuspend nutrients generated from benthic microbial processes high in the euphotic zone. This results in primary productivity throughout the water column. Higher-order species including cetaceans and large pelagic fish prey on pelagic species that benefit from this productivity.

Nitrogen is also derived from benthic pathways created by detrital rain that is degraded by microbes. This source of nutrients is consumed by epifauna and invertebrate infauna. Snapper and other detritus-feeding fish consume the epifauna, which links higher-order predators such as sharks to both the benthic and pelagic food webs.

The soft sediments of the Gulf of Carpentaria basin are characterised by benthic invertebrates including echinoids (e.g., heart urchins and sand dollars), sponges, solitary corals, molluscs, decapods, bryozoans, sea cucumbers and sessile tunicates. Deposit-feeding epifauna in the soft sediments are more abundant than suspension-feeding epifauna.

4.3.2 Commercial fisheries

4.3.2.1 Commonwealth fisheries

Commonwealth fisheries are managed by the Australian Fisheries Management Authority (AFMA) under the *Commonwealth Fisheries Management Act 1991*, with the fisheries typically operating within 3 nm to 200 nm offshore (i.e., to the extent of the Australian Fishing Zone [AFZ]).

Four Commonwealth managed commercial fisheries have management areas that intersect with the OA or EMBA (Table 4-7). However, not all the fisheries are active within the full extents of their management areas. Based on recent fishing status reporting (Patterson, et al. 2021):

- Northern Prawn Fishery is likely to be active within the Gulf of Carpentaria
- Southern Bluefin Tuna Fishery spans the AFZ; but fishing activity is concentrated within the Great Australian Bight and south-eastern Australia, and the spawning grounds for Southern Bluefin Tuna are located in the north-east Indian Ocean
- Skipjack Tuna Fishery has had no active fishing operations since the 2008–2009 season
- Western Tuna and Billfish Fishery spans the AFZ (and high seas of the Indian Ocean), but fishing effort is concentrated off south-west Western Australia and occasionally South Australia.

The previous five years of fishing effort data indicate that limited activity has occurred within the OA, with only two years (2019 and 2016) showing overlap with the 'maximum area fished'[2], and no overlap with areas with 'relative fishing intensity'[3] data available (ABARES 2021). A summary of the methods, seasons, and target species for the Northern Prawn Fishery is provided in Table 4-8.

White Banana Prawns are mainly caught during the day on the eastern side of the Gulf of Carpentaria, whereas Redleg Banana Prawns are typically caught during both day and night, and mainly in Joseph Bonaparte Gulf (Patterson, et al. 2021). Tiger prawns are primarily taken at night, with most catches from the southern and western Gulf of Carpentaria, and along the Arnhem Land coast (Patterson, et al. 2021). Endeavour prawns are generally a by-product, caught when fishing for tiger prawns (Patterson, et al. 2021). The highest catches of Banana prawns are offshore from mangrove forests, which are the juvenile nursery

[2] *'Maximum area fished' is defined as the maximum area within which fishing occurred during a given fishing season as polygon cells of one degree of longitude by one degree of latitude (~111 km x 111 km). A cell is included if any fishing activity occurred anywhere within that one degree by one degree cell. Note that cells included in this dataset may also partially cover land.*

[3] *'Relative fishing intensity' is defined as the total fishing effort within a given fishing season, divided by the total area fished in square kilometres. The unit of effort in the Northern Prawn Fishery is measured as the number of days fishing.*

areas for these species, whereas the highest catches for Tiger prawns are from areas near coastal seagrass beds, the nursery habitat for tiger prawns (Patterson, et al. 2021).

Table 4-7: Management areas and fishing effort for Commonwealth managed fisheries within the OA and EMBA

Fishery	OA	EMBA
Northern Prawn Fishery	✓ (a)	✓ (a)
Southern Bluefin Tuna Fishery	✓ (n)	✓ (n)
Skipjack Tuna Fishery	✓ (n)	✓ (n)
Western Tuna and Billfish Fishery	✓ (n)	✓ (n)

✓(a) = Fishery management area present and active fishing expected; ✓(n) = Fishery management area present and no active fishing expected; X = Fishery management area does not overlap

Table 4-8: Characteristics of the Northern Prawn Fishery

Management Area	Method	Seasons	Target species	Primary landing ports
The Northern Prawn Fishery extends from Joseph Bonaparte Gulf across the top end to the Gulf of Carpentaria	Otter trawl gear	1 April to 15 June (predominantly banana prawns caught) 1 August to 30 November (predominantly tiger prawns caught)	Redleg Banana Prawn White Banana Prawn Brown Tiger Prawn Grooved Tiger Prawn Blue Endeavour Prawn Red Endeavour Prawn	Darwin (NT) Cairns (QLD) Karumba (QLD)

AFMA is involved in the management of several fisheries via joint authority arrangements. The joint authorities consist of the Commonwealth and the relevant State or Territory Ministers responsible for fisheries, who collectively oversee the strategic direction of the fisheries. Routine management of fisheries under joint authority jurisdiction is carried out by the relevant State or Territory management in accordance with its relevant fisheries legislation. One of the joint authorities is the Queensland Fisheries Joint Authority (QFJA); these fisheries are described further in Section 1.1.1.1. AFMA participates in the management of the fisheries through an advisory role to the Commonwealth Minister and through participation in the Northern Australian Fisheries Committee.

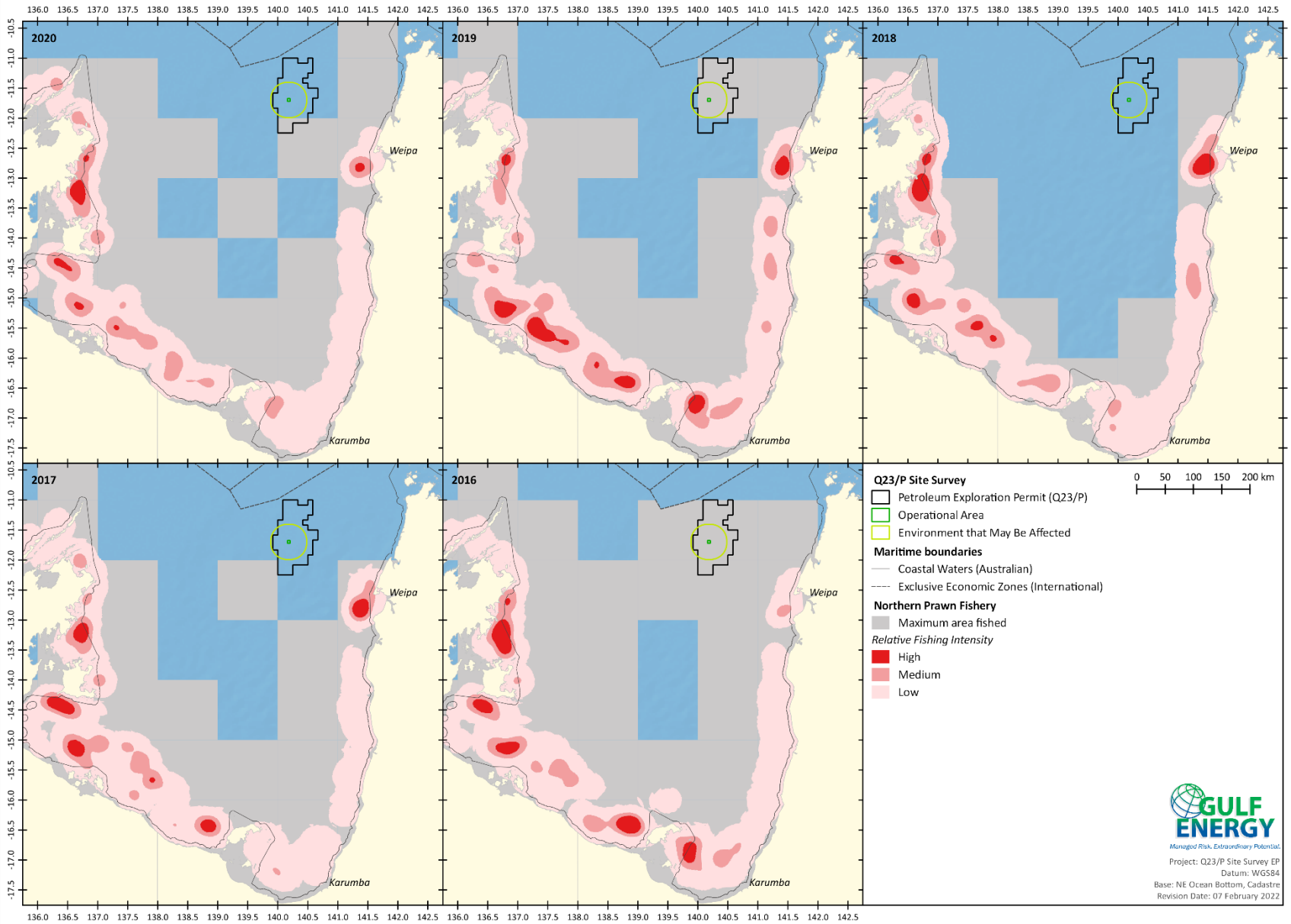


Figure 4-5: Fishing effort footprints and relative fishing intensity for Northern Prawn Fishery within vicinity of OA and EMBA

4.3.2.2 State fisheries

The QFJA has responsibility for the management of the following fisheries in all waters adjacent to Queensland:

- Gulf of Carpentaria Inshore Fin Fish Fishery
- Gulf of Carpentaria Line Fishery
- Gulf of Carpentaria Developmental Fin Fish Trawl Fishery.

These fisheries are managed in accordance with the provisions of the Queensland *Fisheries Act 1994*.

The Gulf of Carpentaria Inshore Fin Fish Fishery is a multi-species net fishery, comprising a commercial inshore (N3), commercial offshore (N12, N13), and commercial small net (N11) fisheries. The N3 fishery operates in estuarine and nearshore <7 nm from the coast, the N11 operates in waters <25 nm from the coast, the N12 fishery operates in waters >7 nm from the coast, and the N13 fishery operates in waters >25 nm from coast. The Gulf of Carpentaria Line Fishery is a multi-species line fishery (designated fishery symbol L4), operating in all tidal waters. The Gulf of Carpentaria Developmental Fin Fish Trawl Fishery operates in northern Gulf of Carpentaria waters from 25 nm off the coast to the AFZ boundary. As such, only the N12, N13, L4 and trawl fisheries have management areas that overlap with the OA and EMBA (Table 4-9).

However, not all the fisheries are active within the full extents of their management areas. Based on fishing effort data reported by the Queensland Department of Agriculture and Fisheries (DAF), no fishing effort has been recorded within the OA or EMBA during the previous five-year (2016–2020) period (DAF 2022). Most fishing effort from State managed fisheries is focussed closer inshore.

Table 4-9: Managed areas and fishing effort for State managed fisheries within the Gulf of Carpentaria

Fishery	OA	EMBA
Gulf of Carpentaria Inshore Fin Fish Fishery (N3)	X	X
Gulf of Carpentaria Inshore Fin Fish Fishery (N11)	X	X
Gulf of Carpentaria Inshore Fin Fish Fishery (N12)	✓ (n)	✓ (n)
Gulf of Carpentaria Inshore Fin Fish Fishery (N13)	✓ (n)	✓ (n)
Gulf of Carpentaria Line Fishery (L4)	✓ (n)	✓ (n)
Gulf of Carpentaria Developmental Fin Fish Trawl Fishery	✓ (n)	✓ (n)

✓(a) = Fishery management area present and active fishing expected; ✓(n) = Fishery management area present and no active fishing expected; X = Fishery management area does not overlap

4.3.3 Other marine and coastal industries

There is expected to be limited activity within the OA and EMBA, with the exception of commercial shipping. Several coastal ports occur within the Gulf of Carpentaria, including Weipa (~200 km from the OA). These ports are generally linked with onshore mining activity. AMSA collects vessel traffic data from a variety of sources, including satellite shipborne automated identification system data, across Australia's Search and Rescue region. This data (AMSA 2022) has been used to develop Figure 4-6, which shows recent vessel traffic within the vicinity of the OA.

Currently there are no oil and gas exploration or production activities within the Gulf of Carpentaria. One exploration well, Duyken-1, was drilled in the central Gulf of Carpentaria region in 1984, but no commercial discovery was reported and the well was plugged and abandoned (Geoscience Australia 2010).

Marine-based tourism in northern Australia is mainly associated with recreational fishing, diving and bird watching (DEWHA 2008b). These types of activities are typically associated with shallower and coastal waters, and are not expected to occur within the OA and EMBA.

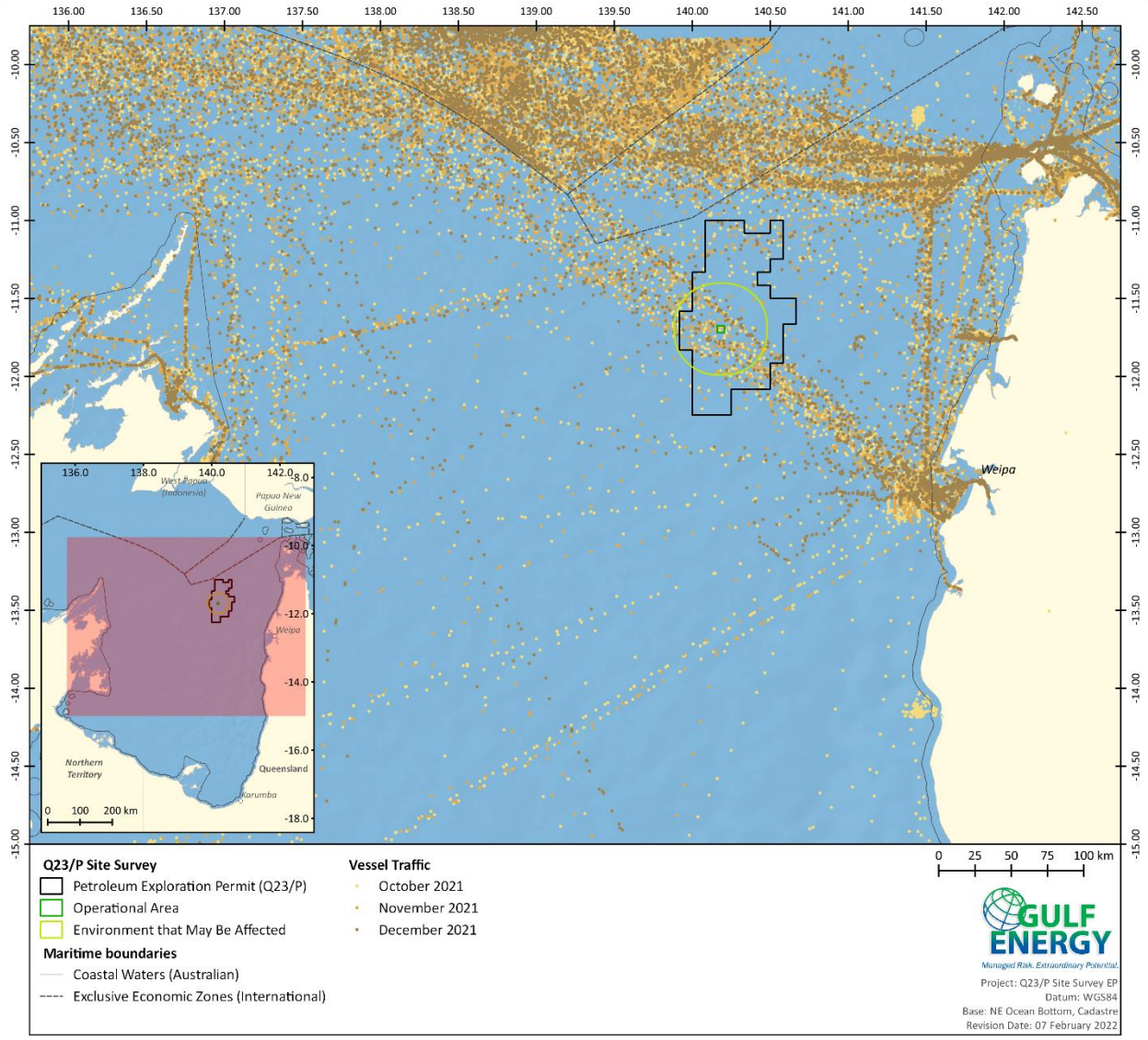


Figure 4-6: Vessel traffic within the vicinity of the OA and EMBA

4.3.4 Heritage and cultural features

The EPBC Act enhances the management and protection of Australia's heritage places, and provides for listings under three categories:

- World Heritage, places considered as the best examples of world cultural and natural heritage and that have been included in the World Heritage List or declared by the Minister to be a World Heritage property
- National Heritage, places of natural, historic or Indigenous heritage value
- Commonwealth Heritage, places of natural, historic or Indigenous heritage value on Commonwealth lands and waters.

World Heritage Properties and National Heritage Places are both listed as matters of national environmental significance under the EPBC Act. The OA and EMBA do not intersect within any World Heritage Properties, National Heritage Places or Commonwealth Heritage Places.

Indigenous Protected Areas are a component of Australia's National Reserve System (i.e., the network of formally recognised parks, reserves and protected areas across Australia). IPAs recognise Aboriginal people as landowners and managers and supports them to look after biodiversity hotspots and highly sensitive areas they want protected (KLC 2022). As well as protecting biodiversity, Indigenous Protected Areas deliver environmental, cultural, social, health and wellbeing and economic benefits to Indigenous communities (DAWE 2021b). The OA and EMBA do not intersect within any Indigenous Protected Areas.

The Commonwealth *Native Title Act 1993* provides a process for claiming and recognising native title land and waters in Australia. No native title claims were identified within the OA or EMBA.

Australia's underwater cultural heritage is protected under the Commonwealth *Underwater Cultural Heritage Act 2019*; this legislation protects shipwrecks, sunken aircraft, and other types of underwater heritage. No underwater heritage sites have been identified within the OA or EMBA.

5 STAKEHOLDER CONSULTATION

5.1 Methodology

GEPL applied the following methodology when undertaking consultation for this petroleum activity:

- identify relevant stakeholders
- provide sufficient information to enable stakeholders to understand how this activity may affect their functions, interests, or activities
- assess the merit of any objections or claims raised by the stakeholders
- provide a response to the objection or claim, and ensure this is captured in the EP.

This methodology has been developed with guidance sourced from:

- NOPSEMA's *Environment plan decision making guideline* (NOPSEMA 2021)
- NOPSEMA's *Consultation with Commonwealth agencies with responsibilities in the marine area guideline* (NOPSEMA 2020a).

5.2 Identification of relevant stakeholder

Establishing relevance under the OPGGS(E)R depends on the nature and scale of the petroleum activity and its associated impacts and risks. In accordance with Regulation 11A of the OPGGS(E)R, a 'relevant person' is defined as:

- each Department or agency of the Commonwealth to which the activities to be carried out under the EP, or the revision of the EP, may be relevant
- each Department or agency of a State or the Northern Territory to which the activities to be carried out under the EP, or the revision of the EP, may be relevant
- the Department of the responsible State Minister, or the responsible Northern Territory Minister
- person or organisation whose functions, interests or activities may be affected by the activities to be carried out under the EP, or the revision of the EP
- any other person or organisation that the titleholder considers relevant.

With regards to Commonwealth agencies, advice provided in the NOPSEMA guideline (NOPSEMA 2020a) has been taken into consideration in identifying relevance with respect to the activities provided for in this EP.

- to a hypothetical, remote or speculative consequence from an activity such as a major oil spill.

To facilitate successful stakeholder interaction appropriate to the nature and scale of the activities under this EP, GEPL have adopted the approach that there must be a direct connection between the activities that the EP provides for and the potential effect to a department, person, or organisation functions, interests, or activities. Based on the impact and risk assessment undertaken in this EP, GEPL understands that the impacts of the planned activities are limited to the vicinity of the OA, thus persons or organisations directly connected with functions, interests, or activities within the OA have been taken to be relevant.

GEPL acknowledges that the EP also includes a risk assessment for an emergency event that has the potential to effect areas extending beyond the OA. If an emergency event occurs, additional stakeholder consultation would be undertaken in accordance with Section 5.5.1.

GEPL have developed a list of stakeholders who are considered relevant to the potential impacts and risks associated with the activities within scope of this EP (Table 5-1).

Table 5-1: Relevant stakeholders

Groups	Stakeholder
Commonwealth departments or agencies	• Australian Fisheries Management Authority (AMFA) • Australian Hydrographic Office (AHO) • Australian Maritime Safety Authority (AMSA) • Department of Agriculture, Water and the Environment (DAWE) - Fisheries - Biosecurity
State departments or agencies	• Queensland Department of Resources • Maritime Safety Queensland • Queensland Department of Agriculture and Fisheries (DAF)
Commercial fisheries	• Commonwealth Fisheries Association • Northern Prawn Fishery Industry (NPFI) • Fisherman's Portal • Queensland Seafood Industry Association (QSIA) • Licence holders from QFJA trawl fishery • Licence holders from L4, N12, N13 line and net fisheries

5.3 Provision of material

Under NOPSEMA's *Environment plan decision making guideline* (NOPSEMA 2021), stakeholders must be provided with sufficient information to enable them to understand how a petroleum activity may affect their functions, interests, or activities.

GEPL provided a factsheet to stakeholders during January and February 2022. This factsheet summarised the activity, aspects, and the proposed control measures to manage impacts and risks. A copy of the consultation materials is included in Appendix B.

All records and responses from relevant persons are included in a sensitive information report provided separately to NOPSEMA to preserve the privacy of those persons or organisations consulted. Specifically, these records and responses were considered to contain personal information (as defined by the Commonwealth *Privacy Act 1988*) or information that at the request of the relevant persons are not to be published as per Regulation 11(A) of the OPGGS(E)R.

5.4 Assessment and response

Table 5-2 summarises the objections or claims made during consultation with relevant stakeholders, assesses their merits, and describes how GEPL will manage the objection or claim in this EP.

Table 5-2: Summary of stakeholder objection or claims and titleholder response

Stakeholder	Date	Sensitive information reference	Matter	Objection of claim	Assessment of merit	Titleholder response
AHO	17/01/2022	003	Response to GEPL Site Survey factsheet	No objection or claim. Confirmation of receipt.	N/A	GEPL acknowledged receipt of feedback.
AMSA	20/01/2022	004	Response to GEPL Site Survey factsheet	No objection or claim. Requested that relevant Maritime Safety Information is promulgated as per: • contact AHO less than four weeks before operations, with details relevant to the operations • notify AMSA's Joint Rescue Coordination Centre (JRCC) at least 24–48 hours before operations commence, as well as at start and end of operations. Also requires that updates are provided to both AHO and JRCC on progress, and if any changes to intended operations.	AMSA have the authority to request such notifications given that their functions, interests, and activities have the potential to be affected by the activity. These requests are in line with standard industry practice.	GEPL acknowledged receipt of feedback, and confirmed that notifications are included as control measures within this EP.
Department of Agriculture and Fisheries	18/01/2022	007	Response to GEPL Site Survey factsheet	No objection or claim. Confirmation of receipt, and notification that stakeholder factsheet had been forward to the Queensland Department of Resources.	N/A	GEPL acknowledged receipt of feedback.
Department of Resources	27/01/2022	011,	Response to GEPL Site Survey factsheet	No objection or claim. Confirmation of receipt, and advice on alternate contact for stakeholder correspondence.	N/A	GEPL re-directed factsheet to supplied contact details.

Stakeholder	Date	Sensitive information reference	Matter	Objection of claim	Assessment of merit	Titleholder response
	03/02/2022	012, 013		No objection or claim. Confirmation of receipt, and noted that Gulf Energy is required to provide 6-monthly exploration activity updates to NOPTA.		
NPF Industry Pty Ltd	18/01/2022	017	Response to GEPL Site Survey factsheet	Noted that seismic proposal had the potential to impact on prawn resources and fishing operations in the Northern Prawn Fishery. Requested a shapefile of the survey area to enable NPFI to review historical catch and effort data, to be able to provide advice accordingly.	Management area for the Northern Prawn Fishery intersects with the OA; thus, the request is in line with the commercial fishers' interests, functions, and activities.	GEPL acknowledged receipt of feedback, provided shapefile of the Operational Area, and provided some additional information around the type of geophysical surveys being undertaken. GEPL also noted that the data they've used for the risk assessment did not indicate overlap with recent fishing activity; however, any additional detail that could be provided by NPFI would be considered within the EP.
	27/01/2022	018		No objection or claim. Following up on request for supply of shapefile.		
Maritime Safety Queensland	20/01/2022	015, 016	Response to GEPL Site Survey factsheet	No objection or claim. Confirmation of receipt.	N/A	GEPL acknowledged receipt of feedback.
Queensland Seafood Industry Association	23/03/2022	019, 091, 092	Response to GEPL Site Survey factsheet	No objection or claim. Letter from Gulf of Carpentaria Commercial Fishermens Association (GoCCFA) noting concerns with exploratory drilling within fishery licence areas, and potential impacts on future sustainability and business profitability of the fisheries within the Gulf of Carpentaria.	QSIA is the peak industry body representing the Queensland seafood industry. The GoCCFA is a representative body for the Gulf Fishers of Queensland. Thus, the request is in line with the commercial fishers' interests, functions, and activities.	GEPL acknowledged receipt of feedback to both GoCCFA and QSIA, and clarified that the exploration drilling activities will be covered via a separate EP and are not within scope of this Site Survey EP.

5.5 Ongoing consultation

The stakeholder notifications and ongoing consultation required for this petroleum activity is captured in Table 5-3.

Any objections or claims arising from ongoing consultation that have merit and have the potential to result in changes to the description of environment, impact or risk assessment, or control measures, will be subject to GEPL's Management of Change (MoC) process, in accordance with Section 8.1.2.

Table 5-3: Notification and ongoing consultation

Stakeholder	Notification or ongoing consultation requirements	Timing	Frequency
Notifications			
AHO	Provide information to enable promulgation of Notice to Mariners Notify AHO via datacentre@hydro.gov.au	At least four weeks before commencing activities,	Once, prior to activities commencing
AMSA	Provide information to enable promulgation of radionavigation warnings	At least 24 to 48 hours before commencing activities	Once, prior to activities commencing
	Notify AMSA's Joint Rescue Coordination Centre (JRCC) via rccaus@amsa.gov.au (phone: 1800 641 792 or 02 6230 6811)	At the start, and at the end of operations	Once, prior to activities commencing, and post activities completion
Ongoing consultation			
Interested parties, potentially affected parties, government agencies including: • DNP • Commercial fisheries	GEPL to advise of any new or significant changes to activities or impacts/risks within the scope of the EP, following an evaluation as per Section 8.1.2, that may potentially impact marine users	Prior to new or significant changes to activities or impacts/risks occurring	As required

5.5.1 Stakeholder consultation in the event of an emergency

In the event of an emergency spill event, GEPL will implement monitoring, evaluation, and surveillance (MES) tactics to predict trajectory, as described in the OPEP (Appendix C).

GEPL will start engaging with potentially affected stakeholders (those considered relevant from Table 5-1 and any others identified from the MES). The process for reaching out to these stakeholders includes direct contact (phone or email) or indirect contact via the GEPL website.

6 ENVIRONMENTAL IMPACT AND RISK ASSESSMENT METHODOLOGY

This section provides a description of the methods used to identify and evaluate the environmental impacts and risks associated with the petroleum activities (as described in Section 3) and any potential emergency conditions associated with these activities. These methods support the environmental impact and risk assessment as required under Regulation 13(5) of the OPGGS(E)R. The impact and risk assessment approach generally aligns with the processes outlined in:

- Australian and New Zealand Standard (AS/NZS) ISO 31000:2018 Risk management – Principles and guidelines (AS/NZS 2018)
- AS/NZS ISO 14001 Environmental Management System (AS/NZS 2015).

Risks considered and covered in this EP were identified and informed by:

- expertise and experience of GEPL personnel
- stakeholder engagement (Section 5).

6.1 Identification and description of the petroleum activity

All components of the petroleum activity and potential emergency conditions relevant to the scope of this EP were described and evaluated during the impact and risk assessment. The petroleum activity is described in detail in Section 3.

6.2 Identification of particular environmental values and sensitivities

The presence of environmental values and sensitivities within the OA and EMBA is described in Section 4. In accordance with Regulation 13(3) of the OPGGS(E)R, the particular values and sensitivities to be:

- the world heritage values of a declared World Heritage property within the meaning of the EPBC Act
- the national heritage values of a National Heritage place within the meaning of the EPBC Act
- the ecological character of a declared Ramsar wetland within the meaning of the EPBC Act
- the presence of a listed threatened species or listed threatened ecological community within the meaning of the EPBC Act
- the presence of a listed migratory species within the meaning of the EPBC Act
- any values and sensitivities that exist in, or in relation to, part or all of:
  - a Commonwealth marine area within the meaning of the EPBC Act
  - Commonwealth land within the meaning of the EPBC Act.

Because many protected, rare, or endangered fauna have the potential to transit through the OA and EMBA, the habitat and/or temporal area that supports protected and endangered fauna (including areas defined as BIAs for these species) is considered the particular value or sensitivity.

6.3 Identification of relevant environmental aspects

An aspect is an element of GEPL's activities, products, or services related to an activity that has the potential to interact with the environment now or in the future.

After describing the petroleum activity, an assessment was carried out to identify potential interactions between the petroleum activity and the receiving environment. The outcomes of stakeholder consultation also contributed to this scoping process.

Note: Potential interactions with safety, health, and assets are outside the scope of this EP.

These potential interactions, or environmental aspects, were categorised for use in the risk assessment of this petroleum activity:

- physical presence

- light emissions
- atmospheric emissions
- underwater sound emissions
- seabed disturbance
- invasive marine pests
- planned discharges
- unplanned releases.

6.4 Identification of relevant environmental impacts and risks

Potential impacts and risks arising from the aspects were then identified during a scoping exercise and then evaluated in detail.

6.5 Evaluation of impacts and risk

6.5.1 Consequence

After identifying the aspects, and associated potential impacts and risks, the potential consequences were evaluated using the risk matrix (Table 6-3). The level of consequence is determined by considering:

- the spatial scale or extent of potential interactions within the receiving environment
- the nature of the receiving environment (within the spatial extent), including proximity to sensitive receptors, relative importance, and sensitivity or resilience to change
- the impact mechanisms (cause and effect) of the aspect within the receiving environment (e.g., persistence, toxicity, mobility, bioaccumulation potential)
- the duration and frequency of potential effects and time for recovery
- the potential degree of change relative to the existing environment or to acceptability criteria.

GEPL's consequence definitions are defined in Table 6-1.

Table 6-1: Consequence definitions

Consequence	Description
Incidental	Limited (no or negligible) environmental impact
Minor	Localised, short-term environmental impact
Moderate	Localised, long-term environmental impact; or short-term, widespread environmental impact
Major	Long-term widespread environmental impact
Catastrophic	Persistent landscape-scale environmental impact

6.5.2 Control measures and ALARP

Control measures are used to demonstrate that environmental impacts and risks are reduced to levels that are considered as low as reasonably practicable (ALARP) in accordance with the defined environmental performance outcomes.

6.5.2.1 ALARP decision context

In alignment with NOPSEMA's ALARP Guidance Note (NOPSEMA 2020b), GEPL has adapted the approach developed by Oil and Gas UK (OGUK 2014) for use in an environmental context to determine the assessment technique required to demonstrate that potential impacts and risks are ALARP. Specifically, the framework considers impact severity and several guiding factors:

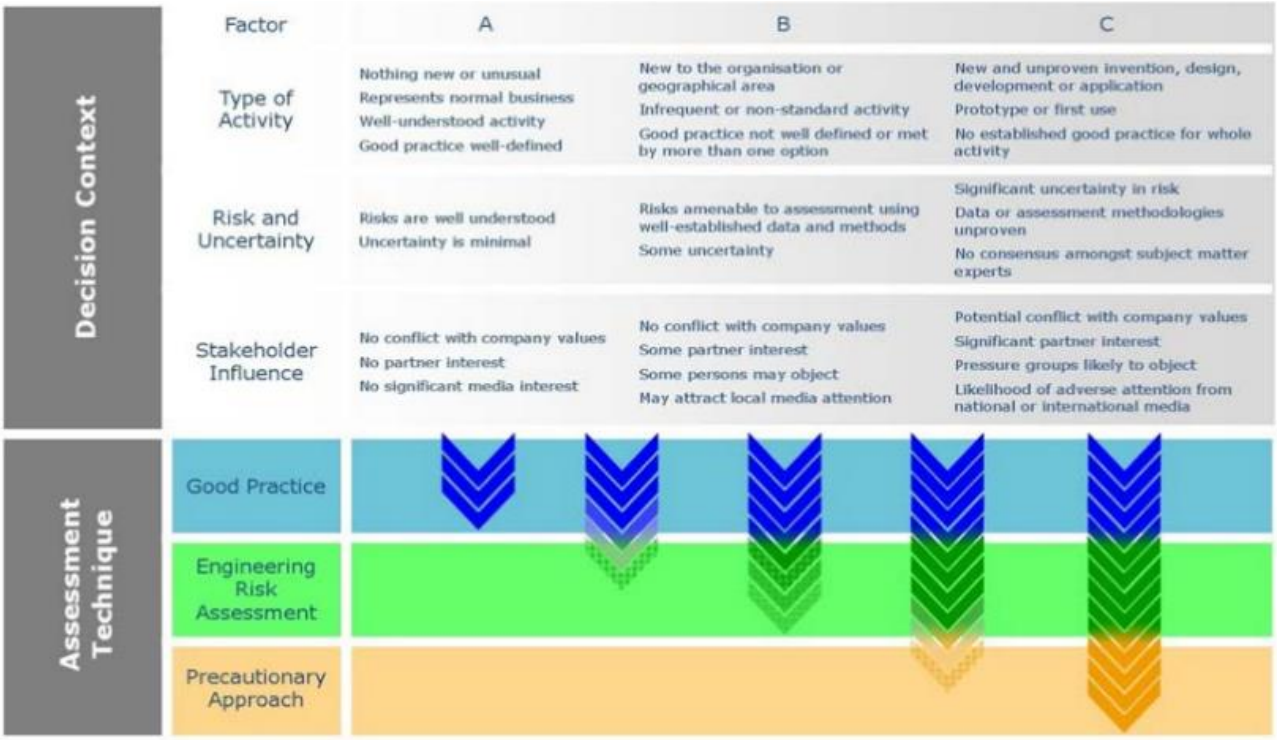
- activity type

- risk and uncertainty
- stakeholder influence.

A Type A decision (Figure 6-1) is made for lower-order impacts and risks (Table 6-5) where they are relatively well understood, activities are well-practised, and there is no significant stakeholder interest. However, if good practice is not sufficiently well defined, additional assessment may be required. In addition, where an aspect associated with the activity is listed as either a key threat to a protected matter under a document made or implemented under the EPBC Act (such as recovery plans, conservation management plans, or a conservation advice), or identified as an aspect of concern to a listed conservation value under an EPBC Act marine bioregional plan, and can result in a credible impact or risk to these sensitivities, additional control consideration will be undertaken

A Type B decision (Figure 6-1) is made for higher-order impacts and risks (Table 6-5) if there is greater uncertainty or complexity around the activity, and there are relevant concerns from stakeholders. In this instance, established good practice is not considered sufficient, and further assessment is required to support the decision and ensure that the risk is ALARP.

A Type C decision (Figure 6-1) typically involves sufficient complexity, higher-order impact and risks (Table 6-5), uncertainty, or stakeholder interest to require a precautionary approach. In this case, relevant good practice will still have to be met, additional assessment will be required, and the precautionary approach applied for those controls that only have a marginal cost benefit.



Source: (OGUK 2014)

Figure 6-1: ALARP decision support framework

In accordance with the regulatory requirement to demonstrate that environmental impacts and risks are ALARP, GEPL has considered the above decision context in guiding the assessment level required. This is applied to each aspect as they are described in Section 7.

The assessment techniques considered include:

- good practice
- engineering risk assessment
- precautionary approach.

6.5.2.2 Good practice

OGUK (2014) defines Good Practice as "*the recognised risk management practices and measures that are used by competent organisations to manage well-understood hazards arising from their activities*".

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

- requirements from Australian legislation and regulations
- relevant Commonwealth government policies
- relevant Commonwealth government guidance
- relevant industry standards
- relevant international conventions.

If the ALARP technique is determined to be good practice, further assessment (i.e., an engineering risk assessment) is not required to identify additional controls. However, additional controls were identified if they provided a suitable environmental benefit for an insignificant cost. In such cases, the sources of good practice will be identified, and the relevant control measures applied to the activity.

6.5.2.3 Engineering risk assessment

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

6.5.2.4 Precautionary approach

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

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

6.5.3 Likelihood

For environmental impacts (where there is a planned emission or discharge resulting in a known change to the environment) likelihood is not considered.

For risks where the aspect or event may lead to environmental impacts under certain circumstances, the likelihood (probability) of the defined consequence occurring is determined. The likelihood is considered on the assumption that all control measures are in place. The likelihood of a consequence occurring was identified using one of the categories shown in Table 6-2.

Table 6-2: Likelihood

Likelihood	Description
Likely	Expected to occur
Occasional	Conditions may allow to occur
Possible	Exceptional conditions may allow to occur
Unlikely	Reasonable to expect will not occur
Rare	Rare or unheard of, will only occur in exceptional circumstances

6.5.4 Quantification of the level of risk

The risk matrix considers the consequence and likelihood, which when combined result in a risk level, as defined in Table 6-3. Risk assessment outcomes are based solely on risk assessment to the environment (as defined under the OPGGS(E)R).

Table 6-3: Risk matrix

		Likelihood				
		Likely	**Occasional**	**Possible**	**Unlikely**	**Rare**
Consequence	**Catastrophic**	E	E	E	E	H
	Major	E	E	E	H	M
	Moderate	E	H	H	M	M
	Minor	H	H	M	L	L
	Incidental	H	M	L	L	L

E: Extreme risk; H: High risk; M: Medium risk; L: Low risk.

6.6 Risk and impact acceptable criteria

NOPSEMA provides guidance on demonstrating that impacts and risks will be of an acceptable level (NOPSEMA 2021). This guidance indicates that an acceptable level is the level of impact or risk to the environment that may be considered broadly acceptable with regard to all relevant considerations including:

- principles of ecologically sustainable development (ESD)
- legislative and other requirements (including laws, policies, standards, conventions)
- matters protected under Part 3 of the EPBC Act, consistent with relevant policies, guidelines, threatened species recovery plans, management plans, management principles etc.
- internal context (titleholder policy, culture, processes, standards, and systems)
- external context (existing environment, stakeholder expectations).

6.6.1 Principles of ESD and precautionary principle

The principles of ESD are considered in Table 6-4 in relation to acceptability evaluations.

Under the EPBC Act, the Minister must also take into account the precautionary principle in determining whether or not to approve the taking of an action. The precautionary principle (Section 391(2) of the EPBC Act) is that lack of full scientific certainty should not be used as a reason for postponing a measure to prevent degradation of the environment where there may be threats of serious or irreversible environmental damage.

Table 6-4: Principles of ESD

Principles of ESD	How they have been applied
(a) decision-making processes should effectively integrate both long-term and short-term economic, environmental, social, and equitable considerations	GEPL's impact and risk assessment process integrates long-term and short-term economic, environmental, social, and equitable considerations. This is demonstrated through the risk matrix (Table 6-3), which includes provision for understanding the long-term and short-term impacts associated with its activities, and the ALARP process, which balances the economic cost against environmental benefit. As this principle is inherently met by applying the EP assessment process, it is not considered separately for each evaluation.
(b) if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation	Consider if there is serious or irreversible environmental damage (i.e., consequence level of Major or Catastrophic). If so, assess whether there is significant uncertainty associated with the aspect.
(c) the principle of inter-generational equity – that the present generation should ensure that the health, diversity, and productivity of the environment is maintained or enhanced for the benefit of future generations	The risk assessment methodology ensures that impacts and risks are reduced to levels that are considered ALARP. If the impacts and risk are determined to be serious or irreversible, the precautionary principle is implemented to ensure that risks are managed to ensure that the environment is maintained for the benefit of future generations.
(d) the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making	Evaluate if there is the potential to affect biological diversity and ecological integrity.
(e) improved valuation, pricing, and incentive mechanisms should be promoted	Not considered relevant for petroleum activity acceptability demonstrations.

6.6.2 Defining an acceptable level of impact and risk

In alignment with NOPSEMA's ALARP guidance note (NOPSEMA 2020b), GEPL has applied the approach that lower-order environmental impacts or risks (Table 6-5) assessed as Decision Context A are 'broadly acceptable', while higher-order environmental impacts or risks determined to be Decision Context B or C require further evaluation against a defined acceptable level because they are not inherently 'broadly acceptable'. However, in alignment with NOPSEMA's decision making guidance (NOPSEMA 2021) even where the impact or risk is evaluated as being a lower-order impact or risk, but the aspect associated with the activity is listed as a key threat to a protected matter under a document made or implemented under the EPBC Act, or identified as an aspect of concern to a listed conservation value under an EPBC Act Marine Bioregional Plans and can result in a credible impact or risk, GEPL will define an acceptable level of impact and risk in accordance with a document made or implemented under the EPBC Act.

GEPL will consider these types of documents when defining the acceptable level of impact or risk:

- bioregional plans
- Australian Marine Park plans
- conservation advice
- recovery plans
- government guidelines.

The objectives of the documents are identified and, having regard for the described activity, GEPL will set an acceptable level of impact that aligns with these objectives. Where the impact arising from the activity is inconsistent with the defined level (or objectives of the relevant documents), it is unacceptable.

Table 6-5: GEPL definition of lower- and higher-order impacts and risk

Magnitude	Impacts	Risk	Decision context
Lower-order	Consequence Level: Incidental to Moderate	Risk Level: Low to Medium	A
Higher-order	Consequence Level: Major or Catastrophic	Risk Level: High to Extreme	B or C

6.6.3 Summary of acceptance criteria

Table 6-6 outlines the criteria that GEPL used to demonstrate that impacts and risks from each identified aspect are acceptable.

Table 6-6: Acceptability criteria

Criteria	Test
Principles of ESD	Is there the potential to affect biological diversity and ecological integrity? Do activities have the potential to result in permanent/irreversible, medium-large scale, and/or moderate-high intensity environmental damage?
	If yes: Is there significant scientific uncertainty associated with the aspect?
	If yes: Are there additional measures to prevent degradation of the environment from this aspect?
Relevant environmental legislation and other requirements	Confirm that impact and risk management is consistent with relevant Australian environmental management laws and other regulatory/statutory requirements.
Internal context	Confirm that all good practice control measures were identified for this aspect through GEPL's management systems, and that impact and risk management is consistent with company policy, culture, processes, standards, and systems
External context	What objections and claims regarding this aspect were made, and how were they considered/addressed?
Defined acceptable level	Is the impact and risk broadly acceptable (i.e., Decision Context A)?
	If no: For higher-order environmental impacts and risks (Decision Context B or C), what is the defined level of impact, and does the activity meet this level?

6.7 Environmental performance outcomes, standards, and measurement criteria

Environmental performance outcomes, performance standards, and measurement criteria were defined to address the potential environmental impacts and risks identified during the risk assessment.

GEPL is committed to conducting activities associated with the petroleum activity in an environmentally responsible manner and aims to implement best practice environmental management as part of a program of continual improvement to reduce potential impacts and risks to ALARP. GEPL defines environmental performance outcomes, standards, and measurement criteria that relate to managing the identified environmental risks as:

- **Environmental Performance Outcomes**: a measurable level of performance required for the management of environmental aspects of an activity to ensure that environmental impacts and risks will be of an acceptable level
- **Environmental Performance Standards**: a statement of the performance required of a control measure

  - these statements will consider the effectiveness of the control measures, and, in accordance with NOPSEMA's decision making guidance (NOPSEMA 2021), effectiveness will be considered with regards to the control's functionality, availability, reliability, survivability, independence, and compatibility with other control measures.
- **Measurement Criteria**: compliance and assurance statements or records that detail how GEPL enacts the outlined performance standard; these are used to determine whether the environmental performance outcomes and standards were met and whether the implementation strategy was complied with. If no practicable quantitative target exists, a qualitative criterion is set.

7 EVALUATION OF ENVIRONMENTAL IMPACTS AND RISKS

To meet the requirements of, Regulation 13(5), 13(6), and 13(7) of the OPGGS(E)R, this section evaluates the impacts and risks associated with the petroleum activity appropriate to the nature and scale of each impact and risk, details the control measures that are used to reduce the risks to ALARP and an acceptable level, and identifies environmental performance outcomes, performance standards, and measurement criteria.

Table 7-1 summarises the impacts and risks that were identified and evaluated for this activity.

Table 7-1: Summary of impact and risk evaluation

		Impact	Risk					
Section	Aspect	C^	C^	L	R	Decision context	ALARP	Acceptable
7.1	Physical presence (marine fauna)	–	Incidental	Unlikely	Low	A	Yes	Yes
7.2	Physical presence (marine users)	–	Incidental	Unlikely	Low	A	Yes	Yes
7.3	Light emissions	Incidental	Incidental	Rare	Low	A	Yes	Yes
7.4	Atmospheric emissions	Incidental	–	–	–	A	Yes	Yes
7.5	Underwater sound emissions	Incidental	Incidental	Unlikely	Low	A	Yes	Yes
7.6	Seabed disturbance	Minor	–	–	–	A	Yes	Yes
7.7	Invasive marine pests	–	Major	Rare	Medium	A	Yes	Yes
7.8	Planned discharges (vessel operations)	Incidental	Incidental	Rare	Low	A	Yes	Yes
7.9	Unplanned release (loss of containment)	–	Incidental	Unlikely	Low	A	Yes	Yes
7.10	Unplanned release (waste)	–	Incidental	Rare	Low	A	Yes	Yes
7.11	Unplanned release (light marine fuel)	–	Incidental	Rare	Low	A	Yes	Yes

C = consequence, L = likelihood, R = risk

^ Where an aspect is identified as having both potential impacts and risks, the highest-level consequence was evaluated in detail to ensure that justification is provided to support the highest consequence level for that aspect.

7.1 Physical presence (marine fauna)

Source of Aspect	The following activities were identified as having the potential to result in a physical interaction with marine fauna within the OA: • vessel operations • towed equipment from the survey vessels.

Impacts	**Risks**
N/A	Unplanned physical interaction with marine fauna may result in: • injury or death to fauna

Consequence Evaluation

Injury or death to fauna

The potential for unplanned interactions with marine fauna is limited to within the OA. The duration of exposure to physical presence is limited to the length of the geotechnical and geophysical campaigns, which, based on the scope and estimated time frames described in Section 3.1.2, is estimated to be approximately four weeks.

Surface-dwelling fauna are the species most at risk from this aspect and thus are the focus of this evaluation. As identified in Section 4.2, several marine species listed as threatened and/or migratory under the EPBC Act have the potential to occur within the OA. However, the presence of these species is expected to be of a transitory nature only, with no important behaviours (e.g., foraging, migrating, etc.) are expected to occur within the OA. No BIAs or critical habitat for the listed species overlaps with the OA.

The *Recovery Plan for Marine Turtles in Australia* (CoA 2017) identifies vessel disturbance as a key threat; however, it also notes that this is particularly an issue in shallow coastal foraging habitats. Given vessel activity is limited to within the OA and is not in shallow water, vessel disturbance to turtles is not evaluated further.

As such, the focus of this evaluation is on sharks and cetaceans, as they provide a representative case to enable an indicative consequence evaluation to be undertaken. A review of the documents made or implemented under the EPBC Act for shark and cetacean species that may occur within the OA (i.e., Whale Sharks, Fin Whale (TSSC 2015b), Sei Whale (TSSC 2015a), and Blue Whale (DoE 2015)) indicates that either vessel disturbance or interaction (such as collisions) as a key threat to the recovery of the species. This threat has not been identified for White Shark (DSEWPaC 2013), Speartooth Shark (TSSC 2014) or sawfish species (DotE 2015a).

The conservation advice for Whale Sharks (TSSC 2015c) indicates that management actions should consider minimising offshore developments and transit time of large vessels in areas close to marine features likely to correlate with whale shark aggregations (Ningaloo Reef, Christmas Island, and the Coral Sea). On the basis that vessels activities for this EP are outside any whale shark aggregation areas, and given the nature and scale of the activities of this EP, the activity it is considered to be consistent with all management action, vessel disturbance to Whale Sharks is not evaluated further.

For all cetacean species with the potential to be present within the OA, these documents indicate that management actions are limited to reporting of incidents via the national database (included within the reporting requirements in Section 8.5) and ensuring that the risk of vessel strike is assessed (see the following text below).

Cetaceans are naturally inquisitive marine mammals that are often attracted to offshore vessels and facilities. The reaction of whales to the approach of a vessel is quite variable. Some species remain motionless when near a vessel, while others are curious and often approach vessels that have stopped or are slow moving, although they generally do not approach, and sometimes avoid, faster-moving vessels (Richardson, et al. 1995).

The *Conservation Management Plan for the Blue Whale 2015–2025* (DoE 2015) indicates that although all forms of vessels can collide with whales, severe or lethal injuries are more likely to occur by larger or faster vessels. Laist et al. (2001) found that larger vessels with reduced manoeuvrability moving >10 knots may cause fatal or severe injuries to cetaceans, with the most severe injuries caused by vessels travelling faster than 14 knots. Given that vessels that will be stationary or slow moving whilst undertaking the activities within the scope of this EP, any interaction with marine fauna would not be expected to cause severe injuries.

Any fauna strike during survey activities is most likely to result in a recoverable injury, not death, because of the survey vessel travelling at slow speeds. The national strategy for reducing vessel strikes on cetaceans and marine megafauna (DoEE 2017) reports on the link between vessel speed and the increase in occurrence and severity of collision with cetaceans, whereby slower moving vessels provide greater opportunity for both fauna and vessel to avoid collision.

Consequently, incidences of fauna strike are not expected considering the slow vessel speed, the single vessel within the OA at any one time and the low and transitory nature of marine fauna presence within the OA. If a fauna strike did occur and resulted in death, it is not expected to have a detrimental effect on the overall population; this event would result in a limited environmental impact (individual impacts).

Historically turtles have been recorded as becoming trapped in the streamer tail buoys. Tail buoys are now either of a design that does not represent an entrapment risk to turtles, or turtle guards are used as standard equipment (if the tail buoy is not of the newer design). Thus, there is no cause effect pathway for entrapment of turtles in streamer buoys, and this risk is not evaluated further.

Consequently, incidences of fauna strike are not expected considering the slow vessel speed, the single vessel within the OA at any one time and the low and transitory nature of marine fauna presence within the OA. If a fauna strike did occur and resulted in death, it is not expected to have a detrimental effect on the overall population; this event would result in a limited environmental impact (individual impacts).

In summary, the physical presence of vessels or towed equipment is not expected to cause significant impacts to marine fauna, and the risks are considered limited with potential consequences. Therefore, GEPL has ranked the potential consequence to marine fauna from physical presence as **Incidental**.

ALARP Decision Context Justification

Offshore commercial vessel operations are commonplace and well-practised nationally and internationally. The control measures to manage the risks associated with unplanned interactions with marine fauna are well defined via legislative requirements that are considered standard industry practice. These are well understood and implemented by the petroleum industry.

During stakeholder consultation, no objections or claims were raised regarding interaction with marine fauna arising from this activity.

The risks associated with physical presence are considered lower-order impacts in accordance with Table 6-5. As such, GEPL applied Decision Context A for this aspect.

Control Measure	Source of Good Practice Control Measure
EPBC Regulations 2000 – Part 8 Division 8.1 – Interacting with cetaceans	The requirements to manage interactions between vessels and cetaceans are detailed in the EPBC Regulations 2000 – Part 8 Division 8.1 – Interacting with cetaceans. These regulations describe strategies to ensure cetaceans are not harmed during offshore interactions with people.

Likelihood and Risk Level Summary	
Likelihood	Due to the nature and scale of vessel activities within the scope of this EP, the slow-moving nature of vessels within the OA, and the limited area of operation, the likelihood of a vessel collision with marine fauna or entanglement with towed equipment is considered low. As such, GEPL consider that the likelihood of the consequences occurring is **Unlikely**.
Risk	**Low**

Determination of Acceptability	
Principles of ESD	The risks associated with this aspect are associated with unplanned interactions causing individual fauna injury or death, which is not considered as having the potential to affect biological diversity and ecological integrity. The consequence associated with this aspect is Incidental. Therefore, no further evaluation against the Principles of ESD is required.
Relevant environmental legislation and other requirements	Legislation and other requirements considered relevant for this aspect include: • EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans • *Conservation Management Plan for the Blue Whale 2015–2025* (DoE 2015) • *Conservation Advice Balaenoptera borealis Sei Whale* (TSSC 2015a) • *Conservation Advice Balaenoptera physalus Fin Whale* (TSSC 2015b) • *Conservation Advice Rhincodon typus Whale Shark* (TSSC 2015c) • *Recovery Plan for the White Shark* (DSEWPaC 2013) • *Conservation Advice for Glyphis glyphis Speartooth Shark* (TSSC 2014)

	• *Sawfish and River Sharks Multispecies Recovery Plan* (DotE 2015a) • *Recovery Plan for Marine Turtles in Australia* (CoA 2017) • *Approved Conservation Advice for Dermochelys coriacea (Leatherback Turtle)* (DEWHA 2008a)	
Internal context	No GEPL systems, standards, or procedures were deemed relevant for this aspect.	
External context	During stakeholder consultation, no objections or claims were raised regarding interaction with marine fauna arising from the activity.	
Defined acceptable level	These risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 6-5. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan. However, given that vessel strike is listed as a threat to protected matters under documents made or implemented under the EPBC Act, GEPL has defined an acceptable level of impact such that it is not inconsistent with these documents. The Conservation Advices for Blue Whales, Sei Whales, and Fin Whales [(DoE 2015); (TSSC 2015a); (TSSC 2015b)] all specify the following action: • ensure all vessel strike incidents are reported in the National Ship Strike Database. This action is incorporated into reporting requirements under this EP (Section 8.5).	
Environmental Performance Outcome	**Environmental Performance Standard**	**Measurement Criteria**
No injury or mortality to marine fauna within the OA from petroleum activities	**EPBC Regulations 2000** Vessels will implement caution and no approach zones, where practicable: • caution Zone (300 m either side of whales and 150 m either side of dolphins)–vessels must operate at ≤6 knots within this zone, maximum of three vessels within zone, and vessels should not enter if a calf is present • no approach zone (300 m to the front and rear of whales and 100 m either side; 300 m for whale calves; 150 m to the front and rear of dolphins and 50 m either side)–vessels should not enter this zone, and should not wait in front of the direction of travel or an animal or pod, or follow directly behind.	Induction materials include relevant marine fauna caution and no approach zone requirements Training records confirm relevant personnel have completed the induction Vessel records show if marine fauna interaction occurred within caution or approach zones, and what mitigation (e.g., divert or slow vessel) measure was implemented

7.2 Physical presence (marine users)

Source of Aspect	The following activities were identified as having the potential to result in a physical interaction with other marine users within the OA: • vessel operations.

Impacts	**Risks**
N/A	Unplanned physical interaction with other marine users has the potential to result in: • disruption to commercial activities

Consequence Evaluation

Disruption to commercial activities

The use of vessels during site survey activities has the potential to result in a disruption to other marine users, including commercial shipping or fishing vessels. The duration of potential disruption to commercial activities is limited to the length of the geotechnical and geophysical campaigns, which, based on the scope and estimated time frames described in Section 3.1.2, is estimated to be approximately weeks. There will be a 500 m SNA around the survey vessel and towed equipment.

As identified in Section 4.3.2, one Commonwealth managed fishery (Northern Prawn Fishery) has a management area that overlaps with the OA. The extent to which the OA overlaps the fishery management area is <1%. Limited fishing effort has occurred within the OA in the previous five years (ABARES 2021). As shown in Figure 4-5, the higher fishing intensity for the Northern Prawn Fishery is limited to coastal regions. The site survey is scheduled to occur over a period of approximately four weeks during Q3/Q4 2022. As identified in Table 4-8, the proposed activity schedule potentially overlaps with one of the two Northern Prawn Fishery fishing seasons: the predominantly tiger prawns season between August and November. Tiger prawns are primarily caught from the southern and western Gulf of Carpentaria, and along the Arnhem Land coast (Patterson, et al. 2021). Based on this and the relative fishing intensity, the OA is not considered a significant area for the Northern Prawn Fishery.

As identified in Section 4.3.2, four State managed fisheries have management areas that overlap with the OA. However, based on the previous five years (DAF 2022), no active fishing effort from State managed fisheries is expected to occur within the OA.

As discussed in Section 4.3.3 and shown in Figure 4-6, there is commercial vessel traffic within the OA. Due to the limited duration of site survey activities, small SNA, and that only one vessel will be within the OA at any time, the potential for disruption is considered limited. Any deviation required by these vessels is not expected to impact on the functions, interests, or activities of other marine users.

The physical presence of the survey vessel undertaking activities within the OA is not expected to cause significant impacts to commercial fishing and shipping vessels, and the consequences are considered limited in nature. While marine traffic within the OA is expected, any potential impact is limited due to the duration and scale of the activity. Therefore, the potential disruption impacts to marine users from the physical presence of vessels is ranked as **Incidental**.

ALARP Decision Context Justification

Offshore commercial vessel operations are commonplace and well-practised nationally and internationally. The control measures to manage the risks associated with unplanned interactions with other marine users are well defined and understood by the industry.

During stakeholder consultation, no objections or claims were raised regarding interaction with other marine users arising from this activity.

The risks associated with physical presence are lower-order impacts in accordance with Table 6-5. As such, GEPL applied Decision Context A for this aspect.

Control Measure	**Source of Good Practice Control Measure**
Maritime safety information	Maritime safety information, such as AUSCOAST navigational warnings, are issued by the Joint Rescue Coordination Centre (JRCC) Australia, part of AMSA. Under the *Navigation Act 2012*, the AHO is also responsible for maintaining and disseminating navigational charts and publications, including providing safety-critical information to mariners (including any change to prohibited/restricted areas, obstructions to surface navigation, etc.)

	via the Notice to Mariners system. Notice to Mariners can be permanent or temporary notifications. Prior to commencement of activities, AUSCOAST and/or Notice to Mariners will be issued; thus enabling other marine users to also safely plan their activities.	
Likelihood and Risk Level Summary		
Likelihood	Due to the nature and scale of vessel activities within the scope of this EP, the slow-moving nature of vessels within the OA, and the limited area of operation, the likelihood of disruption of commercial vessels is considered low. As such, GEPL consider that the likelihood of the consequences occurring is **Unlikely**.	
Risk	**Low**	
Determination of Acceptability		
Principles of ESD	The risks associated with this aspect are associated with unplanned interactions causing incidental disruption to other marine users, which is not considered as having the potential to affect biological diversity and ecological integrity. The consequence associated with this aspect is Incidental. Therefore, no further evaluation against the Principles of ESD is required.	
Relevant environmental legislation and other requirements	Legislation and other requirements considered relevant for this aspect include: • Commonwealth *Navigation Act 2012.*	
Internal context	No GEPL systems, standards, or procedures were deemed relevant for this aspect.	
External context	During stakeholder consultation, no objections or claims were raised regarding interaction with other marine users arising from the activity.	
Defined acceptable level	These risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 6-5. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.	
Environmental Performance Outcome	**Environmental Performance Standard**	**Measurement Criteria**
No impacts to other marine users outside of the OA from petroleum activities	**Maritime safety information** Where required, Notice to Mariners and/or AUSCOAST warnings are issued prior to commencing site survey works	Record of lodgment of notification to relevant agency

7.3 Light emissions

Source of Aspect	The following activities were identified as having the potential to result in light emissions: • vessel operations.
Impacts	**Risks**
Light emissions will result in: • localised and temporary change in ambient light	A change in ambient light may result in: • attraction of light sensitive species and in turn affect predator prey dynamics

Consequence Evaluation

Localised and temporary change in ambient light

As the site survey may be undertaken 24 hours a day, lighting is required at night for navigation and to ensure safe operations when working on the vessel. The duration of emissions is limited to the length of the geotechnical and geophysical campaigns, which, based on the scope and estimated time frames described in Section 3.1.2, is estimated to be approximately four weeks.

Monitoring undertaken by Woodside (WEL 2014) indicates that light density from navigational lighting on a mobile offshore drilling unit (MODU) attenuated to below 1.0 lux and 0.03 lux at distances of ~300 m and ~1.4 km, respectively. Light densities of 1.0 lux and 0.03 lux are comparable to natural light densities experienced during deep twilight and during a quarter moon.

Based on Woodside (WEL 2014), GEPL expects that the vessel will result in temporary changes to ambient light emissions no larger than a radius of ~1.4 km. Operational and navigational lighting is expected to be less on survey vessels in comparison to a MODU, therefore referencing this modelling is considered an overly conservative approach for this consequence evaluation.

Given the limited extent of the change arising from navigational lighting, the impacts associated with a direct change in ambient light levels was determined to be **Incidental.**

Attraction of light sensitive species and in turn affect predator prey dynamics

There is no evidence to suggest that artificial light sources adversely affect the migratory, feeding, or breeding behaviours of cetaceans. Cetaceans predominantly use acoustic senses rather than visual sources to monitor their environment (Simmonds, Dolman and Weilgart 2004), so light is not considered to be a significant factor in cetacean behaviour or survival. As such, light-sensitive fauna (including reptiles, birds, and fish) are the species most at risk from this aspect and thus are the focus of this evaluation.

As per Section 4.2, while several threatened and migratory species have been identified as having the potential to occur within the OA, no BIAs or critical habitat were identified within the OA.

The *National Light Pollution Guidelines* (CoA 2020) indicate that a 20 km buffer or exposure area can provide a general precautionary light impact limit based on observed effects of sky glow on marine turtle hatchlings demonstrated to occur at 15–18 km (Kamrowski, et al. 2014, Hodge, Limpus and Smissen 2007) and fledgling seabirds grounded in response to artificial light 15 km away (Rodríguez, et al. 2014).

The *Recovery Plan for Marine Turtles in Australia* (CoA 2017) identifies light emissions as a key threat as it disrupts critical behaviours such as nesting, hatchling orientation, sea finding, and dispersal behaviour. The Recovery Plan defines the critical habitat for internesting as a distance seaward from nesting critical habitat of 60 km for Flatback Turtles. The closest internesting critical habitat to the OA is associated with the Flatback Turtle and is located ~115 km away, along the western Queensland coast (Section 4.2.5). Given the OA is located offshore and distant from potential nesting habitats and is ~115 km from the closest critical habitats for marine turtles, and as light emissions from vessels are expected to result in a change to ambient conditions up to a maximum of ~1.4 km from the vessel, light emissions associated this activity is not expected to affect critical behaviours discussed in the Recovery Plan.

Studies conducted between 1992 and 2002 in the North Sea confirmed that artificial light was the reason that birds were attracted to and accumulated around illuminated offshore infrastructure (Wiese, et al. 2001) and that lighting can attract birds from large catchment areas (Shell 2010). These studies indicate that migratory birds are attracted to lights from offshore platforms when travelling within a radius of 5 km from the light source, but their migratory paths are unaffected outside this zone (Kamrowski, et al. 2014). As the OA is located over 170 km from the coast, and as light emissions from vessels are expected to result in a change to ambient conditions up to a maximum of ~1.4 km from the vessel, no coastal areas (and therefore fledgling seabirds) are expected to be exposed.

Fishes will likely not be affected by navigational lighting for mariners (Morandi, et al. 2018). However, other light emissions from the survey vessel (such as deck lights for operational survey requirements) in the OA may result in localised aggregation of fish in the immediate vicinity of the vessel. This may result in an increase in predation on prey species aggregating in the area, or exclusion of nocturnal foragers/predators from the area (Marchesan, et al. 2006). The areas affected would be highly localised and short term due to the transient nature of the survey and limited to night-time operations. Based on the distance to coastal habitats, limited sensitivities, and expected outcome that the limited exposure will not result in any impacts at an individual or population level, GEPL has ranked the consequence associated with this risk as **Incidental**.	
ALARP Decision Context Justification	
Offshore commercial vessel operations and subsequent light emissions arising from these activities are commonplace in offshore environments nationally and internationally. During stakeholder consultation, no objections or claims were raised regarding light emissions arising from the activity. The impacts and risks associated with this aspect are lower-order impacts in accordance with Table 6-5. As such, GEPL applied Decision Context A for this aspect.	
Control Measure	**Source of Good Practice Control Measure**
Light management	The site survey is not predicted to result in large increases to ambient light and does not occur within any area identified as biological important or critical habitat. However, as a conservative management measure, survey vessels working at night will be required to reduce lighting to the minimum required for safe operations.
Likelihood and Risk Level Summary	
Likelihood	Given the nature and scale of this activity, including that vessel activity is located within offshore waters away from coastal habitats, and with the control measures in place, it is considered **Rare** that the light emissions resulting from this activity would result in in the identified consequences.
Risk	**Low**
Determination of Acceptability	
Principles of ESD	The risk associated with this aspect is disruption to light-sensitive species behaviour, which given the location, is not considered as having the potential to affect biological diversity and ecological integrity The consequence associated with this aspect is Incidental. Therefore, no further evaluation against the Principles of ESD is required.
Relevant environmental legislation and other requirements	Legislation and other requirements considered relevant for this aspect include: • National Light Pollution Guidelines (CoA 2020) • *Recovery Plan for Marine Turtles in Australia* (CoA 2017).
Internal context	No GEPL systems, standards, or procedures were deemed relevant for this aspect.
External context	During stakeholder consultation, no objections or claims were raised regarding interaction with marine fauna arising from the activity.
Defined acceptable level	These impacts are inherently acceptable as they are considered lower-order impacts in accordance with Table 6-5. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan. However, given that light pollution is listed as a threat to protected matters under documents made or implemented under the EPBC Act, GEPL has defined an acceptable level of impact such that it is not inconsistent with these documents. The *Recovery Plan for Marine Turtles in Australia* (CoA 2017) specifies the following relevant action:

	• 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. As per previous discussions, the OA does note intersect with critical habitat as identified within the *Recovery Plan for Marine Turtles in Australia* (CoA 2017). No other specific relevant actions were identified within other documents implemented under the EPBC Act.	
Environmental Performance Outcome	**Environmental Performance Standard**	**Measurement Criteria**
Manage light emissions within the OA from petroleum activities	**Light management** Vessels working at night will be required to reduce lighting to the minimum required for safe operations	Inspection records during night operations confirm lighting is limited to that required for navigation and safe operations

7.4 Atmospheric emissions

Source of Aspect	The following activities were identified as having the potential to result in atmospheric emissions within the OA: • vessel operations.

Impacts	**Risks**
Atmospheric emissions may result in: • localised and temporary reduction in air quality • contribution to the reduction of the global atmospheric carbon budget	N/A

Consequence Evaluation

Localised and temporary reduction in air quality

The potential for atmospheric emissions is limited to within the OA. The duration of exposure to atmospheric emissions is limited to the length of the geotechnical and geophysical campaigns, which, based on the scope and estimated time frames described in Section 3.1.2, is estimated to be approximately four weeks. Upon release, atmospheric emissions rapidly disperse, limiting the extent of any potential impact to the immediate vicinity other the release location.

Modelling was undertaken for nitrogen dioxide (NO_2) emissions from MODU power generation for another offshore project (BP 2013). NO_2 is the focus of the modelling because it is considered the main (non-greenhouse) atmospheric pollutant of concern, with larger predicted emission volumes compared to other pollutants, and has potential to impact on human health (as a proxy for environmental receptors). Results of this modelling indicate that on an hourly average, there is the potential for an increase in ambient NO_2 concentrations of 0.0005 ppm within 10 km of the emission source and an increase of <0.1 µg/m^3 (0.00005 ppm) in ambient NO_2 concentrations >40 km away.

The *National Environmental Protection (Ambient Air Quality) Measure* (NEPM) recommends that hourly exposure to NO_2 is <0.12 ppm with annual average exposure <0.03 ppm.

Given that referencing this modelling is considered overly conservative as the volume of fuel required for power generation is expected to be significantly less for the survey vessel when compared to MODU operations, and as the highest hourly averages (0.00039 ppm or 0.74 µg/m^3) were restricted to a distance ~5 km from the MODU (BP 2013), exposures from vessel activities covered under this EP would be well below NEPM standards. As such, exposures from vessel activities covered under this EP would be well below NEPM standards and thus any impacts are considered to be **Incidental**.

Contribution to the global atmospheric carbon budget

Direct greenhouse gas emissions from activities within this EP are estimated to be ~0.002 Mt CO_2-e[4], which represents ~0.0004% of the national Australian emissions (when compared to 2021 inventory) (DISER 2021b).

The IPCC defines the term "carbon budget" as "refer[ing] to the maximum amount of cumulative net global anthropogenic CO_2 emissions that would result in limiting global warming to a given level with a given probability, taking into account the effect of other anthropogenic climate forcers. This is referred to as the total carbon budget when expressed starting from the pre-industrial period, and as the remaining carbon budget when expressed from a recent specified date. Historical cumulative CO_2 emissions determine to a large degree warming to date, while future emissions cause future additional warming. The remaining carbon budget indicates how much CO_2 could still be emitted while keeping warming below a specific temperature level." (IPCC 2021)

The remaining carbon budget for a 50% likelihood to limit global warming to 1.5°C, 1.7°C, and 2°C is respectively, 500 Gt CO_2, 850 Gt CO_2, and 1,350 Gt CO_2 (IPCC 2021).

If the total direct greenhouse emissions from activities associated with this EP are ~0.002 Mt CO_2-e, then the activities under this EP may contribute ~1.5–4.0 x 10^{-7} percent to the reduction in the total remaining global carbon budget, which is a *de minimis* decrease.

Due to the overall *de minimis* contribution to the reduction of the global carbon budget from the activities under this EP, the impact of contribution to the global carbon budget has been evaluated as **Incidental**.

[4] *Emissions calculation is based on 28 days of vessel activity and using energy content and emissions factors (DISER 2021a).*

ALARP Decision Context Justification	
Offshore commercial vessel operations and subsequent atmospheric emissions arising from these activities are commonplace in offshore environments, both nationally and internationally. The control measures to manage the risk associated with atmospheric emissions are well defined via legislative requirements that are considered standard industry practice. These are well understood and implemented by the petroleum industry. During stakeholder consultation, no objections or claims were raised regarding atmospheric emissions arising from this activity. The impacts associated with this aspect are lower-order impacts in accordance with Table 6-5. As such, GEPL applied Decision Context A for this aspect.	
Control Measure	**Source of Good Practice Control Measure**
Low-sulphur fuel	Sulphur content of diesel/fuel oil complies with Marine Order 97 and Regulation 14 of MARPOL 73/78 Annex VI. Only low-sulphur (0.50 mass % concentration [m/m]) fuel oil will be used in order to minimise sulfur oxides (So_x) emissions when available.
Marine Order 97 - Marine Pollution Prevention – Air Pollution	All vessels will comply with Marine Order 97 - Marine Pollution Prevention – Air Pollution (as appropriate to vessel class) for emissions from combusting fuel, including: • Vessels will hold a valid International Air Pollution Prevention (IAPP) certificate and a valid International Energy Efficiency (IEE) certificate • All vessels (as appropriate to vessel class) will have a Ship Energy Efficiency Management Plan (SEEMP) as per MARPOL 73/78 Annex VI • Vessel engine nitrous oxides (NO_x) emission levels will comply with Regulation 13 of MARPOL 73/78 Annex VI.
Likelihood and Risk Level Summary	
Likelihood	N/A
Risk	N/A
Determination of Acceptability	
Principles of ESD	The impact associated with this aspect is limited to a direct reduction in air quality for a localised area for a short time, which is not considered to have the potential to affect biological diversity and ecological integrity. The impact associated with this aspect is a *de minimis* contribution to the reduction of the global carbon budget, which is not considered to have the potential to affect intergenerational equity. The control measures identified above are considered to reduce this impact to ALARP. The consequence associated with this aspect is Incidental. Therefore, no further evaluation against the Principles of ESD is required.
Relevant environmental legislation and other requirements	Legislation and other requirements considered relevant to this aspect include: • Marine Order 97 – Marine pollution prevention – air pollution • MARPOL 73/78.
Internal context	No GEPL systems, standards, or procedures were deemed relevant for this aspect.
External context	During stakeholder consultation, no objections or claims were raised regarding interaction with marine fauna arising from the activity.
Defined acceptable level	These impacts are inherently acceptable as they are considered lower-order impacts in accordance with Table 6-5. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.

Environmental Performance Outcome	Environmental Performance Standard	Measurement Criteria
No impacts to air quality outside of the OA from petroleum activities	**Low-sulphur fuel** Where available, only low-sulphur (<3.5% m/m) fuel oil will be used in order to minimise SO_x emissions.	Bunker receipts verify the use of low-sulfur fuel oil
	Marine Order 97- Marine Pollution Prevention – Air Pollution Prior to commencement of activities, the following will be verified: • vessels will hold a valid IAPP certificate and a valid IEE certificate • all vessels (as appropriate to vessel class) will have a SEEMP as per MARPOL 73/78 Annex VI • vessel engine nitrous oxides (NO_x) emission levels will comply with Regulation 13 of MARPOL 73/78 Annex VI.	Review of records confirm vessels hold valid IAPP and IEE certificates, and a SEEMP is in place (as appropriate to class), and NO_x emission levels comply with regulations

7.5 Underwater sound emissions

7.5.1 Source

Underwater sound will be generated as part of the site survey, from both general vessel operations and the geophysical survey techniques. Table 7-2 details typical noise levels emitted by each source type.

Table 7-2: Typical sound pressure levels for site survey activities

Activity	Sound Pressure Level	Reference
Impulsive sound		
MBES	~218 dB re 1 µPa RMS @ 1 m	(MacGillivray, Racca and Zizheng 2013)
SSS	~229 dB re 1 µPa RMS @ 1 m	(Geoscience Australia n.d.) (Tritech n.d.) (MacGillivray, Racca and Zizheng 2013)
SBP	~200 dB re 1 µPa RMS @ 1 m	(Geoscience Australia n.d.) (MacGillivray, Racca and Zizheng 2013)
Transponders	183–202 dB re 1 µPa RMS @ 1 m	(Sonardyne 2018) (Sonardyne 2021)
Continuous sound		
Vessel operations	165–192 dB re 1 µPa RMS @ 1 m	(Hannay, et al. 2004) (Richardson, et al. 1995)

7.5.2 Acoustic modelling

Acoustic modelling has been used to predict the potential spatial extent of underwater sound emissions. An un-weighted spherical spreading model (Richardson, et al. 1995) has been used to predict distances to noise effect thresholds for different marine fauna.

It is acknowledged that the spherical spreading model is highly simplified, and does not consider directionality, reflection, refraction, or absorption of sound at the seabed. However, it is considered to provide a conservative indication of distances at which received sound levels from are likely to decrease to below relevant threshold values, and therefore is appropriate for use in impact and risk assessment.

7.5.2.1 Scenario

As described above (Section 7.5.1), underwater sound emissions include both impulsive and continuous sources. For the purposes of impact assessment, the highest source of both impulsive and continuous has been selected for modelling, as these are considered to represent the greatest spatial extent of potential impacts for each sound type. The two sound levels modelled are:

- impulsive: 229 dB re 1 µPa RMS @ 1 m
- continuous: 192 dB re 1 µPa RMS @ 1 m.

7.5.2.2 Exposure criteria

Southall et al. (2019) has assigned species of marine mammals (cetaceans, pinnipeds, sirenians) to one of six functional hearing groups based on behavioural psychophysics, evoked potential audiometry and auditory morphology. Pinnipeds and sirenians are not expected within the OA or EMBA and therefore these are not discussed further. Cetacean species have been grouped as low frequency (LF), high frequency (HF), and very high frequency (VHF).

Different species groups perceive and respond to sound differently, and so a variety of thresholds for the different types of impacts and species groups are considered. GEPL have selected the following noise effect thresholds, based on current best available science, for use in the impact assessment:

- peak pressure levels (PK) and frequency-weighted SEL_{24h} for the onset of permanent threshold shift (PTS)[5] and temporary threshold shift (TTS)[6] in marine mammals for impulsive and continuous noise (NMFS 2018) (Southall, et al. 2019)
- Un-weighted SPL for behavioural threshold for marine mammals for impulsive and continuous noise (NOAA 2021)
- peak pressure levels (PK) and frequency-weighted SEL_{24h} for the onset of PTS and TTS in marine turtles for impulsive and continuous noise (Finneran, et al. 2017)
- Un-weighted SPL for behavioural threshold for marine turtles for impulsive noise (McCauley, et al. 2000) (McCauley et al. 2000)
- Sound exposure guidelines for fish, eggs and larvae (Popper, et al. 2014).

The selected noise effect thresholds are shown in Table 7-3 and Table 7-4. The frequency weight SEL_{24h} is a cumulative metric that assumes a receptor is consistently exposed to the relevant noise effect criteria for a 24-hour period.

It is noted that PTS is considered injurious in marine mammals, but there are no published data on the sound levels that cause PTS in these animals. Onset levels of PTS are typically extrapolated from TTS onset levels and assumed growth functions (Southall, et al. 2007). Recent Commonwealth guidance has defined "injury to Blue Whales" as both PTS and TTS hearing impairment, as well as any other form of physical harm arising from anthropogenic sources of underwater noise (DAWE 2021a).

[5] PTS is a physical injury to an animals hearing organs.

[6] TTS is a temporary reduction in an animals hearing sensitivity due to receptor hair cells in the cochlea becoming fatigued.

Table 7-3: Noise effect thresholds for impulsive sound for different types of impacts and species groups

Receptor	Mortal or potential mortal injury	Recoverable injury	Permanent threshold shift	Temporary threshold shift	Masking	Behavioural
Low frequency cetaceans	N/A	N/A	SEL_{24h}: 183 dB re 1 µPa^2s PK: 219 dB re 1 µPa	SEL_{24h}: 168 dB re 1 µPa^2s PK: 213 dB re 1 µPa	N/A	SPL: 160 dB re 1 µPa
High frequency cetaceans	N/A	N/A	SEL_{24h}: 185 dB re 1 µPa^2s PK: 230 dB re 1 µPa	SEL_{24h}: 170 dB re 1 µPa^2s PK: 224 dB re 1 µPa	N/A	SPL: 160 dB re 1 µPa
Very high frequency cetaceans	N/A	N/A	SEL_{24h}: 155 dB re 1 µPa^2s PK: 202 dB re 1 µPa	SEL_{24h}: 140 dB re 1 µPa^2s PK: 196 dB re 1 µPa	N/A	SPL: 160 dB re 1 µPa
Marine turtles	N/A	N/A	SEL_{24h}: 204 dB re 1 µPa^2s PK: 232 dB re 1 µPa	SEL_{24h}: 189 dB re 1 µPa^2s PK: 226 dB re 1 µPa	N/A	SPL: 166 dB re 1 µPa SPL: 175 dB re 1 µPa
Fish (no swim bladder) (relevant to sharks)	SEL_{24h}: >219 dB PK: >213 dB	SEL_{24h}: >216 dB PK: >213 dB	N/A	SEL_{24h}: >>186 dB	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low
Fish (swim bladder not involved in hearing)	SEL_{24h}: 210 dB PK: >207 dB	SEL_{24h}: 203 dB PK: >207 dB	N/A	SEL_{24h}: >>186 dB	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low
Fish (swim bladder involved in hearing)	SEL_{24h}: 207 dB PK: >207 dB	SEL_{24h}: 203 dB PK: >207 dB	N/A	SEL_{24h}: 186 dB	(N) Low (I) Low (F) Moderate	(N) High (I) High (F) Moderate
Fish eggs and fish larvae (relevant to plankton)	SEL_{24h}: >210 dB PK: >207 dB	(N) Moderate (I) Low (F) Low	N/A	(N) Moderate (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low

Relative risk (high, moderate, low) is given for fauna at three distances from the source (near [N], intermediate [I] and far [F]).

Table 7-4: Noise effect thresholds for continuous sound for different types of impacts and species groups

Receptor	Mortal or potential mortal injury	Recoverable injury	Permanent threshold shift	Temporary threshold shift	Masking	Behavioural
Low frequency cetaceans	N/A	N/A	SEL_{24h}: 199 dB re 1 µPa^{2}s	SEL_{24h}: 179 dB re 1 µPa^{2}s	N/A	SPL: 120 dB re 1 µPa
High frequency cetaceans	N/A	N/A	SEL_{24h}: 198 dB re 1 µPa^{2}s	SEL_{24h}: 178 dB re 1 µPa^{2}s	N/A	SPL: 120 dB re 1 µPa
Very high frequency cetaceans	N/A	N/A	SEL_{24h}: 173 dB re 1 µPa^{2}s	SEL_{24h}: 153 dB re 1 µPa^{2}s	N/A	SPL: 120 dB re 1 µPa
Marine turtles	N/A	N/A	SEL_{24h}: 220 dB re 1 µPa^{2}s	SEL_{24h}: 200 dB re 1 µPa^{2}s	N/A	N/A
Fish (no swim bladder) (relevant to sharks)	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	N/A	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low
Fish (swim bladder not involved in hearing)	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	N/A	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low
Fish (swim bladder involved in hearing)	(N) Low (I) Low (F) Low	SEL_{48h}: 170 dB	N/A	SEL_{12h}: 158 dB	(N) High (I) High (F) High	(N) High (I) Moderate (F) Low
Fish eggs and fish larvae (relevant to plankton)	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	N/A	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low	(N) High (I) Moderate (F) Low

Relative risk (high, moderate, low) is given for fauna at three distances from the source (near [N], intermediate [I] and far [F]).

7.5.2.3 Results

The results from the spherical modelling of the highest impulsive (229 dB re 1 µPa RMS @ 1 m) and continuous (192 dB re 1 µPa RMS @ 1 m) sound emissions are shown in Table 7-5. Conversions have then been applied to convert SPL RMS to unweighted SEL for impulsive sound (Richardson, et al. 1995) (McCauley, et al. 2000).

Table 7-5: Predicted sound levels for highest impulsive and continuous sound emissions

Distance (m)	Impulsive SPL (dB re 1 µPa RMS)	Impulsive SEL^ (dB re 1 µPa^{2}s)	Continuous SPL (dB re 1 µPa RMS)
1	229	216	192
50	195	182	158
100	189	176	152
200	183	170	146
300	179	166	142
400	177	164	140
500	175	162	138
1,000	169	156	132
2,000	163	140	126
3,000	159	146	122
4,000	157	144	120
5,000	155	142	118

^ The converted SEL_{SS} values are unweighted per pulse (i.e., not cumulative over 24 hours, SEL_{24h}).

7.5.3 Risk assessment

Source of Aspect	The following activities were identified as having the potential to result in the generation of underwater sound emissions: • geophysical survey • vessel operations.
Impacts	**Risks**
Underwater sound emissions may result in: • localised and temporary change in ambient underwater sound	A change in ambient underwater sound has the potential to result in: • behavioural disturbance • auditory impairment, TTS, PTS, recoverable or non-recoverable injury
Consequence Evaluation	
Localised and temporary change in ambient underwater sound Anthropogenic underwater sound emitted during the site survey will result in a change in ambient sound levels. The rate of sound attenuation from the source is dependent on local sound propagation characteristics, including seawater temperature and salinity profiles, water depth, bathymetry and the geoacoustic properties of the seabed. Underwater broadband ambient sound spectrum levels range from 45–60 dB re 1 µPa in quiet regions (light shipping and calm seas) to 80–100 dB re 1 µPa for more typical conditions, and >120 dB re 1 µPa during periods of high winds, rain or 'biological choruses' (many individuals of the same species vocalise near simultaneously in reasonably close proximity to each other) (INPEX 2009). Low-frequency ambient sound levels (20–500 Hz) are frequently dominated by distant shipping plus some great whale species. Light weather-related sounds will be in the 300–400 Hz range, with wave conditions and rainfall dominating the 500–50,000 Hz range (INPEX 2009).	

Acoustic sources detailed in Table 7-2 represent the range of anthropogenic sound levels during the site survey. The highest impulsive SPL is associated with SSS surveys (~229 dB re 1 µPa RMS @ 1 m). SSS equipment generates sound pulses with high frequencies (100–500 kHz), which are expected to decrease rapidly through the water column. The sound source from SSS is typically a short, discrete, non-continuous low-frequency pulse generated by a single or small series of airguns.

Studies of underwater sound generated from propellers of offshore vessels when holding position indicate highest measured SPL up to 137 dB re 1 µPa and 120 dB re 1mPa at 405 m and ~3-4 km from the sound source (R. D. McCauley 1998). When underway at ~12 knots vessel sound of 120 dB re 1 µPa was recorded at 0.5–1 km (R. D. McCauley 1998). Generally, during survey operations, the vessel will be only going a speed of ~4–5 knots within the OA, producing lower underwater sound emissions than what were recorded by the study.

Given the details above, the consequence of site survey activities causing a change in ambient underwater sound has been assessed as **Incidental**.

Behavioural disturbance – Continuous sound

Cetaceans

Results from spherical modelling estimate that SPL would be below the continuous sound behavioural threshold for cetaceans within ~4 km of the sound source (Table 7-5).

As identified in Section 4.2, several marine species listed as threatened and/or migratory under the EPBC Act have the potential to occur within the OA. However, the presence of these species is expected to be of a transitory nature only, with no important behaviours (e.g., foraging, migrating, etc.) expected to occur within the OA. No BIAs for the listed species overlaps with the OA.

Given the short duration of site survey activities (estimated to be approximately four weeks) and as marine mammal species are expected to display transient (not sedentary) behaviours with the OA, any behavioural disturbance or displacement is expected to be localised and only to individuals. As such, GEPL has classed the consequence as **Incidental**.

Fish

Continuous sound sources have been identified as a moderate risk of causing behavioural changes, a high risk of causing masking changes, within the near and intermediate vicinity of a sound source for all fish groups (Table 7-4).

As identified in Section 4.2, several marine species listed as threatened and/or migratory under the EPBC Act have the potential to occur within the OA. However, the presence of these species is expected to be of a transitory nature only, with no important behaviours (e.g., foraging, migrating, etc.) expected to occur within the OA. No BIAs for the listed species overlaps with the OA.

Continuous sound of any level that is detectable by fishes can mask signal detection, and thus may have a pervasive effect on fish behaviour. However, the consequences of this masking and any attendant behavioural changes for the survival of fishes are unknown (Popper, et al. 2014). If the fish are within the immediate vicinity of the sound source, behavioural responses are expected to be limited to an initial startle reaction before either returning to normal or resulting in the fish moving away from the area (Wardle, et al. 2001). It is expected that most fish (including sharks and rays) will exhibit avoidance behaviour from a sound source if it reaches levels that may cause behavioural or physiological effects.

Given the short duration of site survey activities (estimated to be approximately four weeks) and as fish species are expected to display transient (not sedentary) behaviours with the OA, any behavioural disturbance or displacement is expected to be localised and only to individuals. As such, GEPL has classed the consequence as **Incidental**.

Behavioural disturbance – Impulsive sound

Cetaceans

Results from spherical modelling estimate that SPL would be below the impulsive sound behavioural threshold for cetaceans within ~3 km of the sound source (Table 7-5).

As identified in Section 4.2, several marine species listed as threatened and/or migratory under the EPBC Act have the potential to occur within the OA. However, the presence of these species is expected to be of a transitory nature only, with no important behaviours (e.g., foraging, migrating, etc.) expected to occur within the OA. No BIAs for the listed species overlaps with the OA.

Given the short duration of geophysical survey activities (estimated to be approximately two weeks) and as cetacean species are expected to display transient (not sedentary) behaviours with the OA, any behavioural disturbance or displacement is expected to be localised and only to individuals. As such, GEPL has classed the consequence as **Incidental**.

Turtles

Results from spherical modelling estimate that SPL would be below the impulsive sound behavioural threshold for turtles within ~0.5–2 km of the sound source (Table 7-5).

As identified in Section 4.2, several marine species listed as threatened and/or migratory under the EPBC Act have the potential to occur within the OA. However, the presence of these species is expected to be of a transitory nature only, with no important behaviours (e.g., foraging, internesting, etc.) expected to occur within the OA. No BIAs or critical habitat for the listed species overlaps with the OA.

Given the short duration of geophysical site survey activities (estimated to be approximately two weeks) and as turtles species are expected to display transient (not sedentary) behaviours with the OA, any behavioural disturbance or displacement is expected to be localised and only to individuals. As such, GEPL has classed the consequence as **Incidental**.

Fish

Impulsive sound sources have been identified as a high risk causing behavioural changes within the near vicinity of a sound source for all fish with no swim bladder or a bladder not involved in hearing; and high at both near and intermediate vicinity for fish that use their swim bladder for hearing Table 7-3). There is a low risk of causing masking behaviours for all fish groups from impulsive noise sources (Table 7-3).

As identified in Section 4.2, several marine species listed as threatened and/or migratory under the EPBC Act have the potential to occur within the OA. However, the presence of these species is expected to be of a transitory nature only, with no important behaviours (e.g., foraging, migrating, etc.) expected to occur within the OA. No BIAs for the listed species overlaps with the OA.

Potential behavioural impacts to finfish from impulsive sounds include temporary stunning, changes in position in the water, displacement from area and effects on breeding behaviours (Webster, et al. 2018). However, due to the short duration of impulsive sounds, while fish may initially be startled and move away from the sound source, once the source moves on fish would be expected to move back into the area.

Given the short duration of geophysical survey activities (estimated to be approximately two weeks) and as fish species are expected to display transient (not sedentary) behaviours with the OA, any behavioural disturbance or displacement is expected to be localised and only to individuals. As such, GEPL has classed the consequence as **Incidental**.

Auditory impairment, TTS, PTS, recoverable or non-recoverable injury – Continuous sound

Cetaceans

Low frequency (baleen whales [e.g., Blue, Bryde's, Fin, Sei, whales]) cetaceans have been identified as having the potential to be present within the OA (Section 4.2). High frequency (e.g., dolphins, toothed whales) cetaceans have been identified as having the potential to be present within the OA (Section 4.2). However, the presence of these species is expected to be of a transitory nature only, with no important behaviours (e.g., foraging, migrating, etc.) expected to occur within the OA, and no BIAs for the listed species identified within the OA.

Results from spherical modelling estimates that SEL would be below the continuous sound PTS and TTS thresholds for low and high frequency cetaceans within ~0.05 km of the sound source (Table 7-5).

Given the short duration of site survey activities (estimated to be approximately four weeks) and as marine mammal species are expected to display transient (not sedentary) behaviours with the OA, any auditory impairment or injury is expected to be localised and only to individuals. As such, GEPL has classed the consequence as **Incidental**.

Turtles

Continuous sound sources from the site survey are not at a level to result in auditory impairment or injury to marine turtles, and as such are not discussed further.

Fish

Continuous sound sources have been identified as low risk of causing injury or mortality to fish with no swim bladders, or those with bladders not involved in hearing (Table 7-4). For fish species with a swim bladder involved in hearing, a numerical threshold has been defined, but would be met within ~0.05 km of the sound source (Table 7-5).

As identified in Section 4.2, several marine species listed as threatened and/or migratory under the EPBC Act have the potential to occur within the OA. However, the presence of these species is expected to be of a transitory nature only, with no important behaviours (e.g., foraging, migrating, etc.) expected to occur within the OA. No BIAs for the listed species overlaps with the OA.

Given the short duration of site survey activities (estimated to be approximately four weeks) and as fish species are expected to display transient (not sedentary) behaviours with the OA, any auditory impairment or injury is expected to be localised and only to individuals. As such, GEPL has classed the consequence as **Incidental**.

Auditory impairment, TTS, PTS, recoverable or non-recoverable injury – Impulsive sound

Cetaceans

Low frequency (baleen whales [e.g., Blue, Bryde's, Fin, Sei, whales]) cetaceans have been identified as having the potential to be present within the OA (Section 4.2). High frequency (e.g., dolphins, toothed whales) cetaceans have been identified as having the potential to be present within the OA (Section 4.2). However, the presence of these species is expected to be of a transitory nature only, with no important behaviours (e.g., foraging, migrating, etc.) expected to occur within the OA, and no BIAs for the listed species identified within the OA.

Results from spherical modelling estimate that SPL would be below the impulsive sound PTS and TTS thresholds for marine mammals within ~0.05 km of the sound source (Table 7-5). Using single source SEL, results from spherical modelling estimates that SEL would be below the impulsive sound PTS and TTS thresholds for low and high frequency cetaceans within ~0.05 km and ~0.3 km of the sound source respectively (Table 7-5).

Given the short duration of geophysical survey activities (estimated to be approximately two weeks) and as cetacean species are expected to display transient (not sedentary) behaviours with the OA, any auditory impairment or injury is expected to be localised and only to individuals. As such, GEPL has classed the consequence as **Incidental**.

Turtles

Results from spherical modelling estimate that SPL would be below the impulsive sound TTS thresholds for turtles within ~0.05 km of the sound source (Table 7-5). The SPL threshold for PTS is not reached. Using single source SEL, results from spherical modelling estimates that SEL would be below the impulsive sound PTS and TTS thresholds for turtles within ~0.05 km of the sound source respectively (Table 7-5).

As identified in Section 4.2, several marine species listed as threatened and/or migratory under the EPBC Act have the potential to occur within the OA. However, the presence of these species is expected to be of a transitory nature only, with no important behaviours (e.g., foraging, internesting, etc.) expected to occur within the OA. No BIAs or critical habitat for the listed species overlaps with the OA.

Given the short duration of geophysical survey activities (estimated to be approximately two weeks) and as turtle species are expected to display transient (not sedentary) behaviours with the OA, any auditory impairment or injury is expected to be localised and only to individuals. As such, GEPL has classed the consequence as **Incidental**.

Fish

Using single source SEL, results from spherical modelling estimates that SEL would be below the impulsive sound TTS, mortal or potential mortal injury, or recoverable injury thresholds for fish within ~0.05 km of the sound source respectively (Table 7-5).

As identified in Section 4.2, several marine species listed as threatened and/or migratory under the EPBC Act have the potential to occur within the OA. However, the presence of these species is expected to be of a transitory nature only, with no important behaviours (e.g., foraging, migrating, etc.) expected to occur within the OA. No BIAs for the listed species overlaps with the OA.

Given the short duration of geophysical survey activities (estimated to be approximately two weeks) and as fish species are expected to display transient (not sedentary) behaviours with the OA, any auditory impairment or injury is expected to be localised and only to individuals. As such, GEPL has classed the consequence as **Incidental**.

ALARP Decision Context Justification

Offshore commercial vessel operations and geophysical surveys are commonplace and well-practised nationally and internationally. The application of control measures to manage impacts and risks arising from this aspect are well defined, understood by the industry, and are considered standard industry practice.

During stakeholder consultation, no objections or claims were raised regarding underwater sound emissions arising from the activity.

The impacts and risks arising from underwater sound emissions are considered lower-order impacts and risks in accordance with Table 6-5. As such, GEPL applied ALARP Decision Context A for this aspect.

Control Measure	Source of Good Practice Control Measure
EPBC Regulations 2000 – Part 8 Division 8.1	The requirements to manage interactions between vessels and cetaceans are detailed in the EPBC Regulations 2000 – Part 8 Division 8.1 – Interacting with cetaceans. These

interacting with cetaceans	regulations describe strategies to ensure whales are not harmed during offshore interactions with people. By implementing these control measures and managing interactions with cetaceans near the vessels or any site surveys, the potential impacts from underwater sound are limited.
Likelihood and Risk Level Summary	
Likelihood	With the identified controls implemented it is unlikely that impacts such as mortality, mortal injury, injury, PTS or TTS will occur to receptors. It is more likely that receptors would exhibit short term behavioural avoidance to the underwater sound source as both the fauna and survey vessel transit through the OA. Although localised and temporary behaviour disturbance may occur, it is unlikely that this would result in any impact to a sensitive life stage of the fauna identified. Consequently, GEPL consider the likelihood of the consequence occurring as being **Unlikely**.
Risk	Low
Determination of Acceptability	
Principles of ESD	The impacts and risks associated with this aspect are assessed as localised and short-term. There is no threat of serious or irreversible environmental damage or significant impact to biological diversity or ecological integrity associated with underwater sound emissions from the site survey. The aspect and potential interactions are well understood and managed in accordance with applicable industry standards and industry good practice. The consequence associated with this aspect is Incidental. Therefore, no further evaluation against the Principles of ESD is required.
Relevant environmental legislation and other requirements	Legislation and other requirements considered applicable for this aspect include: • EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans • *Conservation Management Plan for the Blue Whale 2015–2025* (DoE 2015) • *Conservation Advice Balaenoptera borealis Sei Whale* (TSSC 2015a) • *Conservation Advice Balaenoptera physalus Fin Whale* (TSSC 2015b) • *Conservation Advice Rhincodon typus Whale Shark* (TSSC 2015c) • *Recovery Plan for the White Shark* (DSEWPaC 2013) • *Conservation Advice for Glyphis Speartooth Shark* (TSSC 2014) • *Sawfish and River Sharks Multispecies Recovery Plan* (DotE 2015a) • *Recovery Plan for Marine Turtles in Australia* (CoA 2017) • *Approved Conservation Advice for Dermochelys coriacea (Leatherback Turtle)* (DEWHA 2008a).
Internal context	No GEPL systems, standards, or procedures were deemed relevant for this aspect.
External context	During stakeholder consultation, no objections or claims were raised regarding interaction with marine fauna arising from the activity.
Defined acceptable level	These impacts are inherently acceptable as they are considered lower-order impacts in accordance with Table 6-5. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan. However, given that underwater sound is listed as a threat to protected matters under documents made or implemented under the EPBC Act, GEPL has defined an acceptable level of impact such that it is not inconsistent with these documents. The *Conservation Management Plan for the Blue Whale 2015–2025* (DoE 2015) specifies the following relevant action: • anthropogenic noise in BIAs will be managed such that any Blue Whale continues to utilise the area without injury, and is not displaced from a foraging area. The OA does not intersect with any BIAs for the Pygmy Blue Whale, and as such is not exposed to underwater sound emissions resulting from activities under this EP.

	No other specific relevant actions were identified within other documents implemented under the EPBC Act.	
Environmental Performance Outcome	**Environmental Performance Standard**	**Measurement Criteria**
No injury to marine fauna from underwater sound emissions from petroleum activities	**EPBC Regulations 2000 – Part 8 Division 8.1 – Interacting with cetaceans** Vessels will implement caution and no approach zones, where practicable: • caution zone (300 m either side of whales and 150 m either side of dolphins)–vessels must operate at ≤6 knots within this zone, maximum of three vessels within zone, and vessels should not enter if a calf is present • no approach zone (300 m to the front and rear of whales and 100 m either side; 300 m for whale calves; 150 m to front and rear of dolphins and 50 m either side;)–vessels should not enter this zone and should not wait in front of the direction of travel or an animal or pod, or follow directly behind.	Induction materials include relevant marine fauna caution and no approach zone requirements Training records confirm relevant personnel have completed the induction Vessel records show if marine fauna interaction occurred within caution or approach zones, and what mitigation (e.g., divert or slow vessel) measure was implemented

7.6 Seabed disturbance

Source of Aspect	The following activities were identified as having the potential to result in seabed disturbance within the OA: • geophysical survey • geotechnical survey • unplanned vessel anchoring.

Impacts	**Risks**
Seabed disturbance may result in: • alteration of benthic habitats.	N/A

Consequence Evaluation

Alteration of benthic habitats

As per Section 3.2, the use of USBL during the geophysical survey may result in a very small seabed disturbance, typical footprint of ~0.2 m^2, associated with a sandbag anchor. As described in Section 3.3, the geotechnical survey is expected to result in disturbance to the seabed within proximity to each sampling location. Indicative disturbance footprints associated with each deployment of sampling equipment is estimated to be ~300 m^2 (0.003 km^2). This indicative seabed disturbance area represents <0.01% of the OA. Borehole cuttings are estimated at ~0.5 m^3 per sample, with this discharged material within the indicative borehole disturbance footprint. Drill fluids (seawater and/or bentonite clay) have no toxic components.

Although anchoring is not a planned activity, it has been carried through as a contingent activity in the anchoring is required within the OA due to a significant weather event. As detailed by NERA (2018), a vessel anchored within water depths greater than 70 m with a single anchor could result in a total disturbance area of up to 1,300 m^2 (0.0013 km^2). This indicative seabed disturbance area represents <0.1% of the OA.

The particular values and sensitivities within the OA with the potential to be impacted by seabed disturbance include the following KEFs:

- Gulf of Carpentaria basin.

The Gulf of Carpentaria basin KEF is characterised by gently sloping soft sediments (Table 4-6). The soft sediments of the basin are characterised by moderately abundant and diverse communities of infauna and mobile epifauna dominated by polychaetes, crustaceans, molluscs and echinoderms (DAWE n.d.). Any alteration to soft sediment habitats and communities are expected to be limited to a limited spatial and temporal extent. Results of previous surveys of seabed disturbances from oil and gas activities indicating that recovery of benthic fauna in soft sediment substrates occurs within ~6–12 months of cessation of the activity (URS 2001).

Given the nature of the receiving environment within the OA, any potential impacts will be highly localised, and survey activities are not expected to affect ecosystem function or connectivity of communities. As such, GEPL have ranked the consequence as **Minor**.

ALARP Decision Context Justification

Seabed disturbance from geotechnical activities cannot be avoided with these surveys essential for informing early engineering and project decisions for large offshore activities. While this activity will interact with a KEF, the benthic area is expected to be limited to soft sediment communities. The control measures to manage the impacts associated with seabed disturbance are well understood and implemented by the industry.

During stakeholder consultation, no objections or claims were raised regarding interaction with marine fauna or other marine users arising from this activity.

The impacts associated with this aspect are lower-order impacts in accordance with Table 6-5. As such, GEPL applied Decision Context A for this aspect.

Control Measure	**Source of Good Practice Control Measure**
Review geophysical data	Geophysical data will reviewed prior to the geotechnical survey to confirm that proposed sampling locations do not coincide with any areas of sensitive habitat.

Likelihood and Risk Level Summary	
Likelihood	N/A
Risk	N/A

Determination of Acceptability		
Principles of ESD	The impacts associated with this aspect are associated with a localised and short-term effects that are not considered as having he potential to affect biological diversity and ecological integrity. The consequence associated with this aspect is Minor. Therefore, no further evaluation against the Principles of ESD is required.	
Relevant environmental legislation and other requirements	No environmental legislation or other requirements were deemed relevant.	
Internal context	No GEPL systems, standards, or procedures were deemed relevant for this aspect.	
External context	During stakeholder consultation, no objections or claims were raised regarding interaction with marine fauna arising from the activity.	
Defined acceptable level	These impacts are inherently acceptable as they are considered lower-order impacts in accordance with Table 6-5. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.	
Environmental Performance Outcome	**Environmental Performance Standard**	**Measurement Criteria**
Reduce the risk of impacts to sensitive habitats within the OA from petroleum activities	**Review geophysical data** Geophysical data will be used to identify any areas of sensitive habitat prior to geotechnical sampling	Records confirm that geophysical survey data was reviewed prior to the geotechnical survey commencing

7.7 Invasive marine pests

Source of Aspect	The following activity was identified as having the potential to result in the introduction of an invasive marine pest (IMP)within the OA: • planned discharge of ballast water or the presence of biofouling on vessels.

Impacts	Risks
N/A	An introduction of an IMP may result in: • displacement of, or compete with, native species

Consequence Evaluation

Displacement of, or compete with, native species

IMPs are likely to have little or no natural competition or predators, thus potentially outcompeting native species for food or space, preying on native species, or changing the nature of the environment. It is estimated that Australia has >250 introduced marine pests, and that approximately one in six introduced marine species becomes a pest (DotE 2015b).

IMPs primarily occur in shallow waters with high levels of slow-moving or stationary shipping traffic (such as ports). The probability of successful IMP settlement and recruitment decreases in well-mixed, deep ocean waters away from coastal habitats. IMP colonisation also requires a suitable habitat in which to establish itself, such as rocky and hard substrates or subsea infrastructure. The Australian Government Bureau of Resource Sciences (BRS) established that the relative risk of an IMP becoming established around Australia decreases with distance from the coast. Modelling conducted by BRS (2007) estimates: 33% chance of colonisation at 3 nm, 8% chance at 12 nm, and 2% chance at 24 nm.

The OA is more than 170 km (>92 nm) west of the Queensland coast, in waters of depths of ~65 m.

The particular values and sensitivities within the OA with the potential to be impacted by introduction of an IMP include the following KEFs:

- Gulf of Carpentaria basin.

The Gulf of Carpentaria basin KEF is characterised by gently sloping soft sediments (Table 4-6). The soft sediments of the basin are characterised by moderately abundant and diverse communities of infauna and mobile epifauna dominated by polychaetes, crustaceans, molluscs and echinoderms (DAWE n.d.). Any alteration to soft sediment habitats and communities are expected to be limited to a limited spatial and temporal extent.

The OA does not present a benthic habitat or community structure that is typically favourable to IMP survival. The OA is in water depths of ~65 m, and is comprised of soft sediment habitats; thus, the typical requirements of hard substrate and light for IMP survival do not occur within the OA.

Once established, some pests can be difficult to eradicate (Hewitt, et al. 2002) and therefore there is the potential for a long-term or persistent change in habitat structure. It was found that highly disturbed environments (such as marinas) are more susceptible to colonisation than open-water environments where the number of dilutions and the degree of dispersal are high (Paulay, Lambert and Meyer 2002). Although invasive species are identified as being of concern to marine reptile species under the North Marine Bioregional Plan (DEWHA 2008b), the risk is associated with terrestrial based invasive marine species thus is not relevant to the activities covered under this EP.

If IMP were introduced, and if it did colonise an area, there is the potential for that colony to spread outside the OA resulting in a widespread and medium to long-term impact. Given there is potential for persistent changes to the marine habitat, GEPL have ranked the consequence as **Major**.

ALARP Decision Context Justification

Offshore commercial vessel operations, and subsequent planned discharges, are commonplace and well-practiced locally, nationally, and internationally. The causes resulting in an introduction of an IMP from a planned release of ballast water or hull biofouling are well understood by the industry and GEPL. The control measures to manage the risk associated with the introduction of an IMP are well defined via legislative requirements that are considered standard industry practice. These control measures are well understood and implemented by the petroleum industry.

During stakeholder consultation, no objections or claims were raised regarding interaction with marine fauna or other marine users arising from this activity.

The risks associated with this aspect are lower-order impacts in accordance with Table 6-5. As such, GEPL applied Decision Context A for this aspect.

Control Measure	Source of Good Practice Control Measure
MARS	Under the Commonwealth *Biosecurity Act 2015*, pre-arrival information must be reported through MARS before a vessel arrives in Australian waters.
Ballast water management	The *Australian Ballast Water Management Requirements* (DAWE 2020) describes the management requirements for ballast water exchange, including: • non-discharge of 'high-risk' ballast water in Australian ports or waters • full ballast exchange outside Australian territorial seas • documentation of all ballast exchange activities.
Anti-fouling certificate	The Commonwealth *Protection of the Sea (Harmful Anti-fouling Systems) Act 2006* enacts Marine Order 98 - Marine pollution – anti-fouling systems. This marine order describes the conditions for when an antifouling certificate is required.
Biofouling management	The following guidelines describe the management requirements for biofouling management: • undertaking biofouling risk assessments in line with the with the *National Biofouling Management Guidance for the Petroleum Production and Exploration Industry* (Marine Pest Sectoral Committee 2018) • requirements for biofouling management plans and/or biofouling record books, in accordance with the *Control and Management of Ships' Biofouling to Minimize the Transfer of Invasive Aquatic Species (Biofouling Guidelines) MPEC.207(62) 2011* (IMO 2012).
Likelihood and Risk Level Summary	
Likelihood	As vessel activities are occurring in deeper Commonwealth waters (not within shallow coastal areas), and with the well-known and implemented IMP control measures in place, it is considered **Rare** that an IMP would be introduced resulting in impacts to the ecological functions of the KEFs.
Risk	Medium
Determination of Acceptability	
Principles of ESD	The potential impact associated with this aspect is a widespread and persistent change to benthic communities, which are expected to comprise soft sediment communities. The introduction of an IMP to these communities has the potential to affect biological diversity and ecological integrity. The consequence associated with this aspect is Major. Therefore, further evaluation against the Principles of ESD is required. Little scientific uncertainty is associated with this aspect. The activities are well known, the pathways for introducing an IMP are well understood, well regulated, and managed. As such, the precautionary principle has not been applied.
Relevant environmental legislation and other requirements	Legislation and other requirements considered relevant for this aspect include: • Commonwealth *Biosecurity Act 2015* • Commonwealth *Protection of the Sea (Harmful Anti-fouling Systems) Act 2006* (enacted by Marine Order 98 - Marine pollution – anti-fouling systems) • *Australian Ballast Water Management Requirements* (DAWE 2020) • *Control and Management of Ships' Biofouling to Minimize the Transfer of Invasive Aquatic Species (Biofouling Guidelines) MPEC.207(62)) 2011* (IMO 2012) • *National Biofouling Management Guidance for the Petroleum Production and Exploration Industry* (Marine Pest Sectoral Committee 2018).
Internal context	No GEPL systems, standards, or procedures were deemed relevant for this aspect.
External context	During stakeholder consultation, no objections or claims were raised regarding IMPs arising from the activity.

Defined acceptable level	These risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 6-5. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.	
Environmental Performance Outcome	**Environmental Performance Standard**	**Measurement Criteria**
No introduction and establishment of IMPs within the OA due to petroleum activities	**MARS** Vessels entering into the Australian territorial sea from outside Australian territory will complete pre-arrival reporting (unless Excepted under Biosecurity Determination 2016), in accordance with the *Biosecurity Act 2015*	Records confirm that international vessels completed pre-arrival reporting (or can demonstrate meeting conditions for an exception).
	Ballast water management International marine vessels will be required to comply with the key *Australian Ballast Water Management Requirements*, which are: • non-discharge of 'high-risk' ballast water in Australian ports or waters • full ballast exchange outside Australian territorial seas • documentation of all ballast exchange activities	For international marine vessels, records show compliance with the *Australian Ballast Water Management Requirements*
	Anti-fouling certificate Marine vessels greater than 400 GT with an anti-foul coating are to maintain up-to-date international antifouling coating certification in accordance with *Protection of the Sea (Harmful Anti-fouling Systems) Act 2006* and/or the International Convention on the Control of Harmful Anti-fouling Systems on Ships	Records or inspection reports (or equivalent) confirm that international antifouling coating certifications are up to date
	Biofouling management All marine vessels undertaking activities in the OA must meet the following, where relevant: • biofouling risk assessments are completed • biofouling management plans and/or biofouling record books are available.	Records or inspection reports (or equivalent) confirm that relevant vessels meet biofouling management requirements

7.8 Planned discharges (vessel operations)

Source of Aspect	The following activities were identified as having the potential to result in planned discharges within the OA: • vessel operations. The types of planned vessel discharges may include deck wash-water, oily bilge water, cooling water, brine, fire-fighting foam, sewage, greywater and putrescible waste.

Impacts	**Risks**
Planned vessel discharges may result in: • localised and temporary reduction in water quality	A change to water quality has the potential to result in: • changes to predator-prey dynamics

Consequence Evaluation

Localised and temporary reduction in water quality

Open marine waters are typically influenced by regional wind and large-scale ocean current patterns resulting in the rapid mixing of surface and near-surface waters (NERA 2017). Vessel discharges would occur in these surface and near-surface waters. Therefore, nutrients from sewage, or other similar, discharges will not accumulate or lead to eutrophication due to the highly dispersive environment (NERA 2017). This outcome was verified by sewage discharge monitoring for another offshore project (WEL 2014), which determined that a 10 m^3 sewage discharge reduced to ~1% of its original concentration within 50 m of the discharge location. In addition, monitoring at distances 50 m, 100 m, and 200 m downstream, and at five different water depths, confirmed that discharges were rapidly diluted and no elevations in water quality monitoring parameters (e.g., total nitrogen, total phosphorous, and selected metals) were recorded above background levels at any station. This modelling was based on volumes that far exceed volumes expected during vessel operations. Therefore, the extent of impacts is expected to be localised to the discharge location.

Monitoring of desalination brine of continuous wastewater discharges (including cooling water) undertaken by Woodside for its Torosa South-1 drilling program in the Scott Reef complex found that discharge water temperature decreases quickly as it mixes with the receiving waters, with the discharge water temperature being <1°C above ambient within 100 m (horizontally) of the discharge point, and 10 m vertically (WEL 2014).

A vessel's bilge system is designed to safely collect, contain and dispose of oily water so that discharge of hydrocarbons to the marine environment is minimised or avoided. Bilge water is processed via an oil-water separator before being discharged to sea. Discharge is intermittent and occurs at or near surface waters. As such, oily bilge discharges are expected to readily dilute and disperse under the action of waves and currents in surface waters. In addition, once exposed to air, any volatile components of the oil will readily evaporate.

Testing of fire-fighting deluge systems onboard vessels often leads to a release of fire-fighting foams offshore. Toxicological effects from these types of foams are typically only associated with prolonged or frequent exposures, such as on land and in watercourses near firefighting training areas (McDonald, et al. 1996) (Moody and Field 200). These conditions are not consistent with the use under this EP where use of the systems may arise once or twice over the duration of this EP. In their diluted form (as applied in the event of a fire or test), fire-fighting foams are generally considered to have a relatively low toxicity to aquatic species (Schaefer 2013) (IFSEC Global 2014) and further dilution of the foam mixtures in dispersive aquatic environments may then occur before there is any substantial demand for dissolved oxygen (ANSUL 2007).

Consequently, GEPL believes that the change in water quality from these standard discharges is limited to a localised area and returns to ambient following completion of the discharge; therefore, any impacts are **Incidental**.

Changes to predator-prey dynamics

The overboard discharge of sewage and macerated food waste creates a localised and temporary food source for scavenging marine fauna or seabirds, whose numbers may temporarily increase as a result, thus increasing the food source for predatory species.

However, the rapid consumption of this food waste by scavenging fauna, and physical and microbial breakdown, ensures that the impacts of food waste discharges are insignificant and temporary and that all receptors that may potentially be in the water column are not impacted.

The particular values and sensitivities within the OA with the potential to be affected by changes in predator–prey dynamics include:

- fish communities (associated with the Gulf of Carpentaria KEF).

Effects on environmental receptors along the food chain—fish, reptiles, birds, and cetaceans—are not expected beyond the immediate vicinity of the discharge in open waters (NERA 2017).

Studies into the effects of nutrient enrichment from offshore sewage discharges indicate that the influence of nutrients in open marine areas is much less significant than that experienced in enclosed areas (McIntyre and Johnson 1975) and suggest that zooplankton composition and distribution in areas associated with sewage dumping grounds are not affected. However, if any changes in phytoplankton or zooplankton abundance and composition occur, they are expected to be localised, typically returning to background conditions within tens to a few hundred metres of the discharge location (Abdellatif, et al. 1993, Axelrad, et al. 1981, Parnell 2003).

As described above, plankton communities are not affected by sewage discharges, but if they are, such effects would be highly localised (expected to return to background conditions within tens to a few hundred metres of the discharge location). Consequently, subsequent indirect impacts to other marine fauna are not expected, and thus are not considered further.

Although fish are likely to be attracted to these discharges, any attraction and consequent change to predator–prey dynamics is expected to be limited to close to the release and thus is expected to result in localised impacts to species. Any increased predation is not expected to result in more than a limited environmental impact; therefore, the consequence is **Incidental**.

ALARP Decision Context Justification

Offshore commercial vessel operations, and subsequent planned discharges, are commonplace and well-practiced locally, nationally, and internationally. The control measures to manage the risk associated with these planned discharges are well defined via legislative requirements that are considered standard industry practice. These are well understood and implemented by the petroleum industry.

During stakeholder consultation, no objections or claims were raised regarding vessel discharges arising from the activity.

The impacts and risks associated with this aspect are lower-order impacts in accordance with Table 6-5. As such, GEPL applied Decision Context A for this aspect.

Control Measure	Source of Good Practice Control Measure
MARPOL 73/78 sewage discharge	Marine Order 96 - Marine pollution prevention - sewage gives effect to MARPOL 73/78 Annex IV. MARPOL is the International Convention for the Prevention of Pollution from Ships is aimed at preventing both accidental pollution and pollution from routine operations.
MARPOL 73/78 food waste discharge	Marine Order 95 - Marine pollution prevention – garbage gives effect to MARPOL 73/78 Annex V, which details the conditions in which macerated and unmacerated food waste can be discharged to the environment.
MARPOL 73/78 oily bilge discharge	Marine Order 91 - Marine pollution prevention – oil gives effect to MARPOL 73/78 Annex I, which details the conditions by which oily bilge is authorized to be discharged to the environment.

Likelihood and Risk Level Summary	
Likelihood	Given the nature and scale of this activity with standard control measures in place, it is considered **Rare** that these discharges would result in any impact to the ecological function of the particular values and sensitivities present within the OA.
Risk	Low

Determination of Acceptability	
Principles of ESD	The potential impacts and risks associated with this aspect are not considered as having the potential to affect biological diversity and ecological integrity. The consequence associated with this aspect is Incidental. Therefore, no further evaluation against the Principles of ESD is required.
Relevant environmental legislation and other requirements	Legislation and other requirements considered relevant for this aspect include: • Marine Order 91- Marine pollution prevention – oil • Marine Order 95 - Marine pollution prevention – garbage • Marine Order 96 - Marine pollution prevention - sewage • MARPOL 73/78 Annex I, IV and V.

Internal context	No GEPL systems, standards, or procedures were deemed relevant for this aspect.	
External context	During stakeholder consultation, no objections or claims were raised regarding interaction with marine fauna arising from the activity.	
Defined acceptable level	These impacts and risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 6-5. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.	
Environmental Performance Outcome	**Environmental Performance Standard**	**Measurement Criteria**
No impacts to marine habitats or marine fauna outside the OA from vessel discharges during petroleum activities	**MARPOL 73/78 sewage discharge** Offshore discharge of sewage from vessels will be in accordance with these MARPOL 73/78 Annex IV requirements: • an IMO approved comminution and disinfection system to discharge (greater than 3 nm from the nearest land), or • an IMO approved Sewage Treatment Plant at any location, or • untreated sewage discharged ≥12 nm from the nearest land while the vessel is proceeding at no less than 4 knots	Records show sewage is discharged in accordance with MARPOL 73/78 Annex IV, including a valid International Sewage Pollution Prevention (ISPP) Certificate (for marine vessels >400 T or certified to carry more than 15 persons)
	MARPOL 73/78 food waste discharge Offshore discharge of food waste from vessels will be in accordance with these MARPOL 73/78 Annex V requirements: • macerated to no greater than 25 mm and when the marine vessel is at least 3 nm from the nearest land; or • unmacerated when the marine vessel is at least 12 nm from the nearest land	Records show food waste is discharged in accordance with MARPOL 73/78 Annex V
	MARPOL 73/78 oily bilge discharge Oily bilge water will be discharged to marine environment only when the concentration is <15 ppm in accordance with MARPOL 73/78, Annex I: • through an IMO approved on board oil-water separator • when the marine vessel is en route	Records show oily bilge water is discharged in accordance with MARPOL 73/78 Annex I, including a valid International Oil Pollution Prevention (IOPP) Certificate

7.9 Unplanned release (loss of containment)

Source of Aspect	The following activities were identified as having the potential to result in a minor loss of containment: • geophysical survey • vessel operations. Based on the activities described in this EP, the following potential minor loss of containment scenarios were identified: • hydraulic line failure from deployed equipment (<1 m^3) • using, handling, and transferring hazardous materials on board vessel (<1 m^3). A range of hazardous materials may be on board the vessel during survey activities; however, the maximum credible volume associated with a single-point failure was estimated to be ~1 m^3 based on the loss of an entire intermediate bulk container due to rupture while handling.

Impacts	**Risks**
N/A	An unplanned release of hazardous material to the marine environment has the potential to result in: • indirect impacts to fauna arising from chemical toxicity

Consequence Evaluation

Indirect impacts to fauna arising from chemical toxicity

As the potential release volumes are small (<1 m^3), the extent of water quality changes will be spatially restricted to the immediate vicinity around the release, prior to the expected rapid dispersion and dilution into the open ocean waters.

As identified in Section 4.2, several marine species listed as threatened and/or migratory under the EPBC Act have the potential to occur within the OA. However, the presence of these species is expected to be of a transitory nature only, with no important behaviours (e.g., foraging, migrating, etc.) expected to occur within the OA. No BIAs or critical habitat for the listed species overlaps with the OA.

Based on the nature of these unplanned releases, which are non-continuous and expected to occur in a location where no specific sedentary behaviours for values and sensitivities have been identified, the extent and severity of any potential impact is expected to be limited.

Given the small volumes and transient nature of identified values and sensitivities, only individual fauna passing directly though the released substance would be expected to be temporarily affected, so any potential impact is localised. As such, the consequence was ranked as **Incidental**.

ALARP Decision Context Justification

Offshore operations are commonplace and well-practiced industry activities. The control measures to manage the risk associated with loss of containment scenarios from these activities are well defined via legislative requirements that are considered standard industry practice. There is a good understanding of potential spill sources, and the control measures required to managed these are well understood and implemented by the petroleum industry

During stakeholder consultation, no objections or claims were raised regarding unplanned discharges arising from the activity.

The impacts and risks associated with this aspect are lower-order impacts in accordance with Table 6-5. As such, GEPL applied Decision Context A for this aspect.

Control Measure	**Source of Good Practice Control Measure**
Vessel inspections	A pre-mobilisation vessel inspection will include: • visual checks of accessible equipment and hydraulic hoses for defects • secondary containment is available for hydrocarbons and chemicals stored on the deck of marine vessels.

Ship Oil Pollution Emergency Plan (SOPEP)/Shipboard Marine Pollution Emergency Plan	MARPOL 73/78 Annex I and Marine Order 91 - Marine pollution prevention – oil requires that each vessel has an approved SOPEP in place. To prepare for a spill event, the SOPEP details: • response equipment available to control a spill event • review cycle to ensure that the SOPEP is kept up to date • testing requirements, including the frequency and nature of these tests. In the event of a spill, the SOPEP details: • reporting requirements and a list of authorities to be contacted • activities to be undertaken to control the discharge of oil • procedures for coordinating with local officials.	
Likelihood and Risk Level Summary		
Likelihood	The likelihood that a minor loss of containment event results in an Incidental consequence was determined to be **Unlikely**. With the control measures in place, it was considered unlikely that a minor loss of containment event associated with this activity would occur, and even more unlikely that such an event would impact any of the identified values and sensitivities, which are known to be transient and unlikely to be present at the exact location of the minor loss of containment.	
Risk	Low	
Determination of Acceptability		
Principles of ESD	The potential risk associated with this aspect would be short term, apply to some individuals, which is not considered as having the potential to affect biological diversity and ecological integrity. The consequence associated with this aspect is Incidental. Therefore, no further evaluation against the Principles of ESD is required.	
Relevant environmental legislation and other requirements	Legislation and other requirements considered relevant for this aspect include: • Marine Order 91 - Marine pollution prevention – oil • MARPOL 73/78.	
Internal context	No GEPL systems, standards, or procedures were deemed relevant for this aspect.	
External context	During stakeholder consultation, no objections or claims were raised regarding interaction with marine fauna arising from the activity.	
Defined acceptable level	These risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 6-5. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.	
Environmental Performance Outcome	**Environmental Performance Standard**	**Measurement Criteria**
No leak or spill of hydrocarbons or hazardous materials to the marine environment during petroleum activities	**Vessel inspection** Prior to commencement of activities, the following will be undertaken during a pre-mobilisation vessel inspection: • visual checks of accessible equipment and hydraulic hoses for defects • confirmation that secondary containment is available for hydrocarbons and chemicals stored on the deck of marine vessels	Inspection records (or similar) confirms that equipment and hydraulic hoses are visually free of defects, and secondary containment is available on the deck of the marine vessel

Reduce the risk of impacts to the environment from the unplanned release of hydrocarbons or hazardous materials during petroleum activities	**SOPEP** Marine vessels >400 T will carry on board a Shipboard Oil Pollution Emergency Plan (SOPEP) in accordance with MARPOL 73/78 Annex I – Prevention of Oil Pollution	Inspection records (or similar) confirms an approved SOPEP is on board marine vessels >400 T
		Inspection records (or similar) show drills conducted in accordance with SOPEP
		Inspection records (or similar) show spill kits available in accordance with SOPEP
	SOPEP In the event of a vessel-based spill event, emergency response activities will be implemented in accordance with the vessel SOPEP (or equivalent)	Records confirm that emergency response activities were implemented in accordance with the vessel SOPEP in the event of a vessel-based spill

7.10 Unplanned release (waste)

Source of Aspect	The following activities were identified as having the potential to result in an unplanned release of waste to the environment: • vessel operations.
Impacts	**Risks**
N/A	An unplanned release of waste to the environment has the potential to result in: • marine pollution resulting in injury and/r entanglement of marine fauna
Consequence Evaluation	
Injury and/or entanglement of marine fauna If hazardous/non-hazardous waste is lost overboard, the extent of exposure to the environment is limited. Marine fauna most at risk from marine pollution include marine reptiles and seabirds, through ingestion or entanglement (CoA 2017) (TSSC 2001). Ingestion or entanglement has the potential to limit feeding or foraging behaviours and thus can result in marine fauna injury or death. In 2003, "[i]njury and fatality to vertebrate marine life caused by ingestion of, or entanglement in, harmful marine debris" was listed as a key threatening process under the EPBC Act (DoEE 2018). However, the national Threat Abatement Plan (DoEE 2018) identifies that harmful marine debris includes "land-sourced garbage, fishing gear from recreational and commercial fishing abandoned or lost to the sea, and vessel-sourced, solid, non-biodegradable floating materials disposed of or lost at sea". This type of waste is not associated with the activities described under this EP. Given the restricted exposures and limited quantity of waste with the potential to generate marine pollution that could be expected from the site survey activities, it is expected that any impacts from marine pollution would not have a detrimental effect on the overall population of marine fauna species, and only result in a localised impact to individuals. As such, the consequence is **Incidental**.	
Control Measure	**Source of Good Practice Control Measure**
Marine Order 95 - Marine pollution prevention – garbage	MARPOL 73/78 is the International Convention for the Prevention of Pollution from Ships and is aimed at preventing both accidental pollution, and pollution from routine operations. Specifically, MARPOL 73/78 Annex V requires that a garbage management plan and garbage record book is in place and implemented and describes various requirements that are to be applied when managing waste offshore. Marine Order 95 - Marine pollution prevention – garbage gives effect to MARPOL 73/78 Annex V.
ALARP Decision Context Justification	
Offshore vessel operations, and the subsequent management of waste, are commonplace and well-practiced activities within the industry. The control measures to manage the risk associated with an unplanned release of waste are well defined via legislative requirements that are considered standard industry practice. There is a good understanding of the release pathways, and the control measures required to manage these events are well understood and implemented by the petroleum industry. During stakeholder consultation, no objections or claims were raised regarding waste management arising from the activity. An unplanned release of waste is a lower-order risk in accordance with Table 6-5. As such, GEPL applied ALARP Decision Context A for this aspect.	
Likelihood and Risk Level Summary	
Likelihood	Marine pollution arising from mismanaged waste offshore has occurred previously in the industry but is not expected to occur during these activities, given the control measures in place. As such, the likelihood of incidental consequences to values and sensitivities from an unplanned release of waste is considered **Rare.**
Risk	Low

<table>
<tr><th colspan="3">Determination of Acceptability</th></tr>
<tr><td>Principles of ESD</td><td colspan="2">The potential risks associated with this aspect is limited to individuals and consequently is not expected to affect biological diversity and ecological integrity.
The consequence associated with this aspect is Incidental.
Therefore, no further evaluation against the Principles of ESD is required.</td></tr>
<tr><td>Relevant environmental legislation and other requirements</td><td colspan="2">Legislation and other requirements considered relevant for this aspect include:
Marine Order 95 - Marine pollution prevention – oil
MARPOL 73/78
Conservation Advice Rhincodon typus Whale Shark (TSSC 2015c)
Recovery Plan for Marine Turtles in Australia (CoA 2017)
Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia’s coasts and oceans (DoEE 2018)
Conservation Management Plan for the Blue Whale 2015–2025 (DoE 2015).</td></tr>
<tr><td>Internal context</td><td colspan="2">No GEPL systems, standards, or procedures were deemed relevant for this aspect.</td></tr>
<tr><td>External context</td><td colspan="2">During stakeholder consultation, no objections or claims were raised regarding waste management arising from the activity.</td></tr>
<tr><td>Defined acceptable level</td><td colspan="2">These risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 6-5. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.</td></tr>
<tr><th>Environmental Performance Outcome</th><th>Environmental Performance Standard</th><th>Measurement Criteria</th></tr>
<tr><td rowspan="4">No uncontrolled release of waste to the environment during petroleum activities</td><td>Marine Order 95 - Marine pollution prevention – garbage
Marine vessels >100 T (or certified to carry >15 persons) will have a Garbage Management Plan on board, in accordance with MARPOL 73/78 Annex V</td><td>Review of records verifies that a Garbage Management Plan is on board marine vessels >100 T or certified to carry >15 persons</td></tr>
<tr><td>Marine Order 95 - Marine pollution prevention – garbage)
Marine vessels >400 T (or certified to carry >15 persons) will have a Garbage Record Book on board, in accordance with MARPOL 73/78 Annex V</td><td>Current and completed Garbage Record Book (for marine vessels >400 T or certified to carry >15 persons)</td></tr>
<tr><td rowspan="2">Marine Order 95 - Marine pollution prevention – garbage
For waste that is incinerated on board a marine vessel, the incinerator is to be IMO-approved and the waste incinerated is to be recorded in accordance with MARPOL 73/78 Annex V</td><td>Current IAPP Certificate (for marine vessels >400 T or certified to carry >15 persons)</td></tr>
<tr><td>Current and completed Garbage Record Book (for marine vessels >400 T or certified to carry >15 persons)</td></tr>
</table>

7.11 Unplanned release (light marine fuel)

7.11.1 Credible scenario

A vessel collision event within the OA is considered a credible (but unlikely) unplanned event. A major marine spill because of vessel collision is only likely to occur under exceptional circumstances (e.g., loss of DP, navigational error, inclement weather conditions). Given the location, water depths, and lack of submerged features within the OA, grounding is not considered credible, and is not considered further.

Based upon the types of vessels typically used for site surveys, size of largest fuel tanks and fuel type to be utilised for the activities in this EP, GEPL was able to identify the typical credible worst-case scenario (as per AMSA guidelines (AMSA 2015a)) as being a surface release of ~200 m^3 of a light marine fuel (e.g., MDO).

7.11.2 Oil spill modelling

In order to determine the environment that may be affected in the unlikely event of a hydrocarbon spill from a vessel collision the Automated Data Inquiry for Oil Spills (ADIOS) was used. Typical metocean conditions selected for used in the ADIOS model are shown in Table 7-6. Table 7-7 outlines the hydrocarbon parameters used in the ADIOS model.

Table 7-6: Parameters used in the ADIOS model

	Volume	Current	Wind	Water Temperature	Salinity
Details	200 m^3	0.2 knots	10 knots	26°C	32 ppt
Direction	–	Northeast	Southeast	–	–

Table 7-7: Hydrocarbon properties used in the ADIOS model

Characteristic	Details
Density (g/cc)	0.867 at 26°C
API	31.6
Dynamic viscosity (cP)	4.2 at 40°C
Pour Point (°C)	-12°C
Oil property category	Group II
Oil persistence classification	Light persistent oil

7.11.2.1 Weathering and Fate

MDO is a light-persistent fuel oil used in the maritime industry. MDO is characterised by predominantly volatile, semi-volatile, and low-volatility (typically ~95%) hydrocarbon compounds, with a very low (typically ~5%) persistent component. The low viscosity indicates that this oil will spread quickly when released and will form a thin film on the sea surface, increasing the evaporation rate.

While MDO will typically remain on the water surface (where it is subject to evaporation), some of the heavier components have a tendency to physically entrain into the upper water column in the presence of moderate winds (i.e., >12 knots) and breaking waves but can re-float to the surface if these energies abate. Around 95% of MDO will typically evaporate within a few days of the spill release, depending on the prevailing conditions.

7.11.2.2 Results

The key outcomes from the ADIOS modelling is:

- the surface life for an instantaneous MDO spill of 200 m^3 from a worst-case vessel collision incident is estimated at ~72 hours
- after ~12 hours approximately 50 m^3 of the 200 m^3 spill has evaporated, and another approximately 60 m^3 has been dispersed into the water column

- shoreline contact is not expected.

The results of the modelling are shown in Figure 7-1 and Figure 7-2.

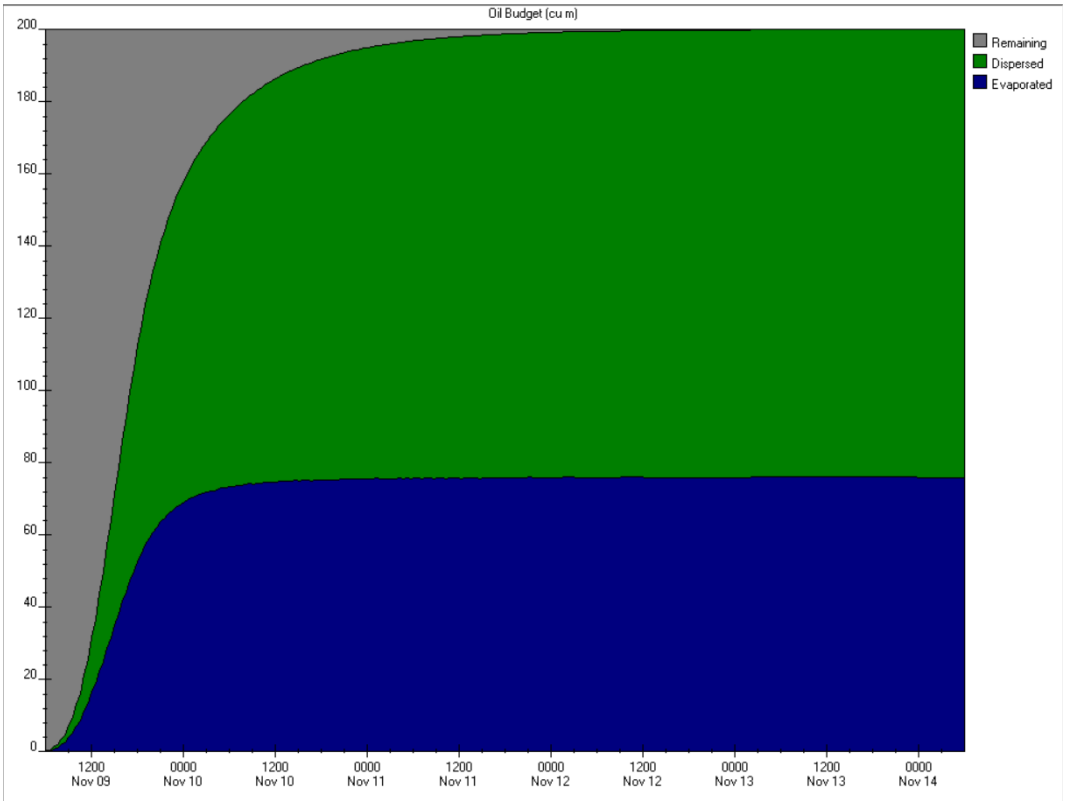


Figure 7-1 Oil spill modelling results

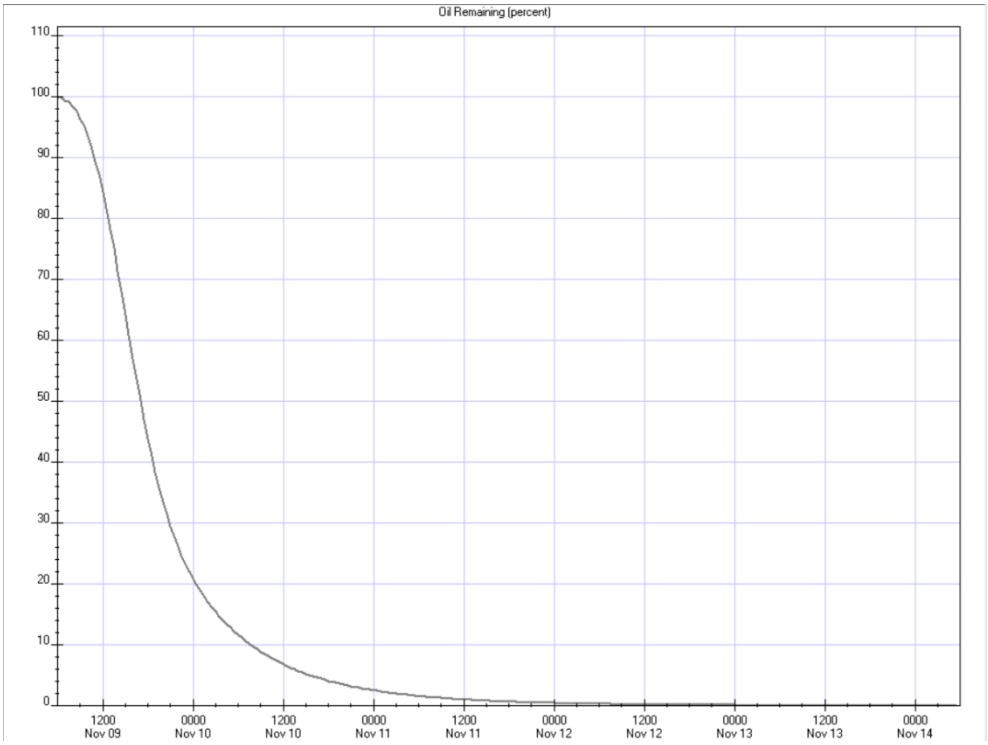


Figure 7-2 Percent of oil remaining over time

7.11.2.3 EMBA

Diesel oil droplets move solely with the currents while dispersed within the water column, while on the surface are affected by both wind and currents. Therefore, to estimate the spatial extent of hydrocarbon

exposure from this type of spill event, GEPL has considered the influence of current speed and the results of the ADIOS modelling.

As the MDO is expected to evaporate or disperse within ~72 hours, based on a current speed of 0.2 knots, the horizontal extent of associated with a 200 m^3 MDO spill is estimated at ~26 km from the release location. This distance has been used to inform the EMBA, which has been defined as a 30 km radius buffer around the OA (Figure 4-1).

7.11.3 Risk assessment

Source of Aspect	The following activities were identified as having the potential to result in a vessel collision event: • vessel operations. A vessel collision event may occur as a result of a loss of DP, navigational error or floundering due to weather.
Impacts	**Risks**
N/A	An unplanned release of hydrocarbons to the environment has the potential to result in: • marine pollution resulting in sublethal or lethal effects to marine fauna • indirect impacts to commercial fisheries • reduction in amenity resulting in impacts to tourism and recreation
Consequence Evaluation	
Marine pollution resulting in sublethal or lethal effects to marine fauna *Marine mammals* Marine mammals may be exposed to hydrocarbons from an oil spill at the water surface or within the water column. Marine mammals can be exposed to oil externally (e.g., swimming through surface slick) or internally (e.g., swallowing the oil, consuming oil-affected prey, or inhaling of volatile oil related compounds) (AMSA 2015a, IPIECA 1995). Direct contact with hydrocarbons may result in skin and eye irritation, burns to mucous membranes of eyes and mouth, and increased susceptibility to infection (Geraci and Aubin 1988). However, direct contact with surface oil is considered to have little deleterious effect on whales, possibly due to the skin's effectiveness as a barrier. Furthermore, effect of oil on cetacean skin is probably minor and temporary (Geraci and Aubin 1988). The physical impacts from ingested hydrocarbons with subsequent lethal or sublethal impacts are applicable; however, the susceptibility of cetaceans varies with feeding habits. Baleen whales are not particularly susceptible to ingestion of oil in the water column as they feed by skimming the surface (i.e., they are more susceptible to surface slicks). Toothed whales and dolphins may be susceptible to ingestion of dissolved and entrained oil as they gulp feed at depth. As highly mobile species, in general it is very unlikely that these animals will be constantly exposed to concentrations of hydrocarbons in the water column for continuous durations (e.g., >48–96 hours) that would lead to chronic effects. Studies have shown little impact on Bottlenose Dolphins after hydraulic and mineral oil immersion and ingestion, although there was evidence of temporary skin damage in dolphins from contact with various oil products including crude oil (Geraci and Aubin 1988, Englehardt 1983). Marine mammals are vulnerable if they inhale volatiles when they surface within a hydrocarbon slick. For the short period that they persist, vapours from the spill are a significant risk to mammal health, with the potential to damage mucous membranes of the airways and the eyes, which will reduce the health and potential survivability of an animal. Inhaled volatile hydrocarbons are transferred rapidly to the bloodstream and may also accumulate in tissues (Geraci and Aubin 1988). The marine mammal values and sensitivities with the potential to be affected by surface hydrocarbon exposure include species listed as threatened and/or migratory under the EPBC Act, as identified in Section 4.2.4. No BIAs associated with marine mammals overlap with the EMBA.	

As discussed in Section 7.11.2.3, the EMBA has been conservatively estimated at a 30 km radius of the OA. Modelling indicates that for the worst-case release of MDO from vessel collision, surface exposure is expected to occur for 72 hours.

Based on an assessment of the predicted magnitude and duration of exposure from an MDO spill, it is expected that only a small proportion (if any) of any marine mammal population would experience lethal or sublethal effects resulting from hydrocarbon exposure. As such, GEPL have ranked the consequence to be **Incidental**.

Reptiles

Marine reptiles may be exposed to hydrocarbons from an oil spill at the water surface or on the shoreline. No shoreline accumulation is predicted to occur, and as such this is not evaluated further.

Marine reptiles can be exposed to oil externally (e.g., swimming through surface slick) or internally (e.g., swallowing the oil, consuming oil-affected prey, or inhaling of volatile oil related compounds) (NOAA 2010).

Marine turtles are vulnerable to the effects of oil at all life stages: eggs, hatchlings, juveniles, and adults. Several aspects of turtle biology and behaviour place them at risk, including a lack of avoidance behaviour, indiscriminate feeding in convergence zones, and large pre-dive inhalations (AMSA 2015b). Oil effects on turtles can include impacts to the skin, blood, digestive, and immune systems, and increased mortality due to oiling.

The marine reptile values and sensitivities with the potential to be affected by surface hydrocarbon exposure include species listed as threatened and/or migratory under the EPBC Act, as identified in Section 4.2.5. No BIAs or critical habitat associated with marine reptiles overlap with the EMBA.

Based on an assessment of the predicted magnitude and duration of exposure from an MDO spill, it is expected that only a small proportion (if any) of any marine reptile population would experience lethal or sublethal effects resulting from hydrocarbon exposure. As such, GEPL have ranked the consequence to be **Incidental**.

Fish

Fish, including sharks and rays, may be exposed to hydrocarbons from an oil spill within the water column. Most fish do not break the sea surface, and therefore the risk from surface oil is not relevant; however, some shark species (including Whale Sharks) feed in surface waters, so there is also the potential for surface hydrocarbons to be ingested.

Potential effects include damage to the liver and lining of the stomach and intestine, and toxic effects on embryos (Lee, et al. 2011). Fish are most vulnerable to oil during embryonic, larval and juvenile life stages. However, very few studies have demonstrated increased mortality of fish as a result of oil spills (Fodrie, et al. 2014, Hjermann, et al. 2007, IPIECA 1999).

In-water hydrocarbon exposure has the potential to cause chronic impacts to planktonic organisms, and pelagic fish that might move within the plume. As identified in Section 4.2.3, there are fish species listed as threatened and/or migratory with the potential to be present within the EMBA. As no BIAs overlap within the EMBA, any listed species observed are expected to be transient. No planktonic organisms were identified as particular sensitivities in this area.

Pelagic free-swimming fish and sharks such as Whale Sharks in the EMBA are unlikely to suffer long-term damage from oil spill exposure because dissolved/entrained hydrocarbons in water are typically not expected to be sufficient to cause harm (ITOPF 2011)

Based on an assessment of the predicted magnitude and duration of exposure from an MDO spill, it is expected that only a small proportion (if any) of any fish population would experience lethal or sublethal effects resulting from hydrocarbon exposure. As such, GEPL have ranked the consequence to be **Incidental**.

Seabirds and shorebirds

Birds that rest at the water's surface or surface-plunging birds are particularly vulnerable to surface hydrocarbons (AMSA 2015b, Clark 1984). Damage to external tissues, including skin and eyes, can occur, along with internal tissue irritation in lungs and stomachs (Peakall, Wells and Mackay 1987). Acute and chronic toxic effects may result where the product is ingested as the bird attempts to preen its feathers (Peakall, Wells and Mackay 1987).

As identified in Section 4.2.2, there are bird species listed as threatened and/or migratory with the potential to be present within the EMBA. The presence of most species within the EMBA are expected to be of a transient nature only. There is a foraging BIA for the Lesser Frigatebird that does overlap with the EMBA. The Lesser Frigatebird typically catches its prey either while airborne or just beneath the water surface. The extent of surface exposures was predicted to be limited to <1% of the entire foraging BIA. This indicates that if a vessel spill event occurred, it is unlikely to impact entire local populations.

Based on an assessment of the predicted magnitude and duration of surface oil, it is expected that only a small proportion of any seabird or shorebird population would experience lethal or sublethal effects resulting from hydrocarbon exposure. As such, GEL have ranked the consequence to be **Incidental**.

Indirect impacts to commercial fisheries

As identified in Section 4.3.2, there is one commercial fishery that has a management area and recent fishing effort recorded within the EMBA (the Northern Prawn Fishery). Based on the fishing effort footprints and the relative fishing intensity (as shown in Figure 4-5), the EMBA is not identified as a significant area for the Northern Prawn Fishery. In addition, the nursery areas for prawns are located nearshore in the vicinity of seagrass meadows and mangrove habitat; both distant to the EMBA.

Spill events have the potential to impact commercial fisheries through indirect impacts associated with tainting. Tainting is a change in the characteristic smell or flavour, and renders the catch unfit for human consumption or sale due to public perception. Tainting may not be a permanent condition but will persist if the organisms are continuously exposed; but when exposure is terminated, depuration will quickly occur (McIntyre, Baker, et al. 1982). Regardless of the small potential for tainting, customer perception that tainting has occurred may cause a larger impact then the direct impact itself. However, as this event is singular, non-continuous, and will result in a limited volume of hydrocarbon being released over a short time period, and the low persistence of the hydrocarbon in the environment, customer perceptions are not expected to be altered for a prolonged period.

As such, GEPL have ranked the consequence to commercial fisheries as **Incidental**.

Reduction in amenity resulting in impacts to tourism and recreation

Modelling predicts surface exposure from a vessel spill event has the potential to evaporate or disperse within ~72 hours and extend a distance of up to ~30 km from the spill location. No shoreline exposure is expected.

Surface exposure can impact the visual amenity of offshore areas and limit tourism and recreation activities. As discussed in Section 4.3.3, most marine tourism and recreation occurs within nearshore and coastal waters. As the EMBA is located over 100 km from the coast and considering the EMBA accounts for a small proportion of the Gulf of Carpentaria region, limited tourism and recreation vessels are expected to be impacted in the event of a spill.

As such, GEPL have ranked the consequence to tourism and recreation as **Incidental**.

ALARP Decision Context Justification

Offshore commercial vessel operations are widely undertaken both locally, nationally, and internationally. These activities are well regulated with associated control measures well understood and implemented by the offshore industry.

During stakeholder consultation, no objections or claims were raised regarding waste management arising from the activity.

An unplanned release of waste is a lower-order risk in accordance with Table 6-5. As such, GEPL applied ALARP Decision Context A for this aspect.

Control Measure	Source of Good Practice Control Measure
Vessel inspections	A pre-mobilisation vessel inspection ensures relevant legislative requirements are met, specifically: • crew meet the minimum standards for safely operating a vessel, including watchkeeping requirements • navigation, radar equipment, and lighting meet industry standards. These requirements will ensure that direct vessel radio contact is available to other marine users operating in this area to enable ease of communication in highlighting risks and nearby SNAs.
Maritime safety information	Maritime safety information, such as AUSCOAST navigational warnings, are issued by the JRCC Australia, part of AMSA. Under the *Navigation Act 2012*, the AHO is also responsible for maintaining and disseminating navigational charts and publications, including providing safety-critical information to mariners (including any change to prohibited/restricted areas, obstructions to surface navigation, etc.) via the Notice to Mariners system. Notice to Mariners can be permanent or temporary notifications. Prior to commencement of activities, AUSCOAST and/or Notice to Mariners will be issued; thus, enabling other marine users to also safely plan their activities.
SOPEP	MARPOL 73/78 Annex I and Marine Order 91 - Marine pollution prevention – oil requires that each vessel has an approved SOPEP in place. To prepare for a spill event, the SOPEP details:

	• response equipment available to control a spill event • review cycle to ensure that the SOPEP is kept up to date • testing requirements, including the frequency and nature of these tests. In the event of a spill, the SOPEP details: • reporting requirements and a list of authorities to be contacted • activities to be undertaken to control the discharge of oil • procedures for coordinating with local officials.
OPEP	Under the OPGG(E)R, NOPSEMA require that the petroleum activity have an accepted OPEP in place before commencing the activity. If a vessel collision occurs, the OPEP will be implemented. GEPL has developed an OPEP (Appendix C) to support spill response for activities under this EP.
OSMP	The OSMP details the arrangements and capability in place for operational and scientific monitoring. Operational monitoring collects information about the oil spill to aid planning and decision making for executing spill response or clean-up operations. Scientific monitoring focuses on the environmental impact attributable to the spill or the associated response activities and informs requirements for remediation (if required). GEPL has developed an OSMP (Appendix D) to support spill monitoring for activities under this EP.
Likelihood and Risk Level Summary	
Likelihood	Based on industry data, vessel collisions are considered rare, with only 3% of all marine incidents that occurred in Australian waters between 2005 and 2012 associated with a vessel collision event. As most vessel collisions involve the loss of containment of a forward tank, which are generally double-lined and smaller than other tanks, the loss of the maximum credible volumes used in this scenario is unlikely. Considering the inherent low likelihood of a collision occurring, the safeguards in place, and enactment of the OPEP, the potential likelihood of causing the consequences described in this section is **Rare**.
Risk	Low
Determination of Acceptability	
Principles of ESD	The potential risks associated with this aspect would be short term, and apply to some individuals, which is not considered as having the potential to affect biological diversity and ecological integrity. The consequence associated with this aspect is Incidental. Therefore, no further evaluation against the Principles of ESD is required.
Relevant environmental legislation and other requirements	Legislation and other requirements considered relevant for this aspect include: • Commonwealth *Navigation Act 2012* • Marine Order 30 - Prevention of collisions • Marine Order Part 91 - Marine Pollution Prevention – oil • *Conservation Management Plan for the Blue Whale 2015–2025* (DoE 2015) • *Conservation Advice Balaenoptera borealis Sei Whale* (TSSC 2015a) • *Conservation Advice Balaenoptera physalus Fin Whale* (TSSC 2015b) • *Conservation Advice Rhincodon typus Whale Shark* (TSSC 2015c) • *Recovery Plan for the White Shark* (DSEWPaC 2013) • *Conservation Advice for Glyphis Speartooth Shark* (TSSC 2014) • *Sawfish and River Sharks Multispecies Recovery Plan* (DotE 2015a) • *Recovery Plan for Marine Turtles in Australia* (CoA 2017)

	• *Approved Conservation Advice for Dermochelys coriacea (Leatherback Turtle)* (DEWHA 2008a)	
Internal context	These GEPL systems, standards, or procedures were deemed relevant for this aspect: • OPEP (Appendix C) • OSMP (Appendix D).	
External context	During stakeholder consultation, no objections or claims were raised regarding interaction with marine fauna arising from the activity.	
Defined acceptable level	These risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 6-5. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan. However, given that chemical discharge and/or pollution (of which an oil spill is a component) is listed as a threat to protected matters under documents made or implemented under the EPBC Act, GEPL has defined an acceptable level of impact such that it is not inconsistent with these documents. The *Recovery Plan for Marine Turtles in Australia* (CoA 2017) specifies the following relevant action areas and action: • 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', e.g. nesting habitat, seagrass meadows or coral reefs. No other specific relevant actions were identified within other documents implemented under the EPBC Act. GEPL addresses spill response and monitoring within their OPEP (Appendix C) and OSMP (Appendix D). Therefore, GEPL has defined an acceptable level of impact as minimising the risk of impacts to the environment from spills from vessel operations.	
Environmental Performance Outcome	**Environmental Performance Standard**	**Measurement Criteria**
No leak or spill of hydrocarbons or hazardous materials to the marine environment during petroleum activities	**Vessel inspection** Prior to commencement of activities, the following will be undertaken during a pre-mobilisation vessel inspection: • crew meet the minimum standards for safely operating a vessel, including watchkeeping requirements • navigation, radar equipment, and lighting meet industry standards	Inspection records (or similar) confirms that vessels meet the crew competency, navigation equipment, and radar requirements
	Maritime safety information Where required, Notice to Mariners and/or AUSCOAST warnings are issued prior to commencing site survey works.	Record of lodgment of notification to relevant agency
Reduce the risk of impacts to the environment from the unplanned release of hydrocarbons or hazardous materials during	**SOPEP** Marine vessels >400 T will carry on board a Shipboard Oil Pollution Emergency Plan (SOPEP) in accordance with MARPOL 73/78 Annex I – Prevention of Oil Pollution	Inspection records (or similar) confirms an approved SOPEP is on board marine vessels >400 T
		Inspection records (or similar) show drills conducted in accordance with SOPEP
	SOPEP In the event of a vessel-based spill event, emergency response activities will be	Records confirm that emergency response activities were implemented in accordance

petroleum activities	implemented in accordance with the vessel SOPEP (or equivalent)	with the vessel SOPEP in the event of a vessel-based spill
	OPEP In the event of a spill occurring, the OPEP will be implemented	Records confirm the OPEP has been implemented
	OSMP In the event of a spill occurring, the OSMP will be implemented	Records confirm the OSMP has been implemented

8 IMPLEMENTATION STRATEGY

To meet the requirements of Regulation 14 of the OPGGS(E)R, this section describes the implementation strategy, which identifies the systems, practices, and procedures used to ensure the environmental impacts and risks of the activities are continuously reduced to ALARP and the environmental performance outcomes and standards detailed in Section 7 are achieved.

8.1 Management framework

GEPL's operations are managed in accordance with their *Health, Safety and Environment (HSE) Management Manual* .

The HSE Management Manual provides guiding principles and objectives to ensure a safe working environment by promoting and maintaining the highest standards of health, safety, and environment management within all company activities.

The HSE Management Manual outlines GEPL's commitment to achieving HSE objectives. The manual has been designed to function in accordance with the principles of AS/NZS 4801:2001 Occupational Health and Safety Management Systems, AS/NZS ISO 14001:2004 Environmental Management Systems and AS/NZS ISO 9001:2008 Quality Management Systems. This HSE Management Manual includes GEPL's HSE Policy.

The site survey will be managed to comply with this HSE Policy, which includes commitments to:

- identify and manage risks to ALARP where they have the potential to cause an accident, injury, or illness to people, or unacceptable impacts on the environment or the community
- provide safe workplaces and systems of work, empower employees and contractors to address unsafe or hazardous situations and carry out their work in a manner that does not present a risk to themselves, others, or the environment.
- promote a safe culture that encourages people to proactively manage health safety and environmental risk through education, instruction, information, and supervision
- clearly define and communicate staff and contractor responsibilities in relation to health and safety
- monitor operations and those of contractors by evaluating performance against systems, procedures and regulations, report HSE performance whilst providing a foundation for continuous improvement.

8.1.1 Environmental policy

GEPL's Environmental Policy (Appendix A) shows their commitment to environmental management in all their operations.

8.1.2 Management of change

The GEPL management of change (MoC) process aims to manage proposed changes to design, equipment, operations, and products before they are implemented. The MoC process is followed to document and assess the impact of changes to activities described in this EP. These changes will be addressed to determine if there is potential for any new or increased environmental impact or risk not already provided for in this EP. If these changes do not trigger relevant petroleum regulations, as detailed below, this EP will be revised, and changes recorded in the EP without resubmission.

In accordance with Regulation 17 of the OPGGS(E)R this EP must be resubmitted to NOPSEMA under the relevant jurisdiction in the following circumstances:

- before commencing a new activity, or any significantly modification or new stage of the activity, not provided for in this EP
- if a change in the titleholder results in a change in the manner in which the impacts and risks of the activity are managed

- as soon as practicable after the occurrence of any significant new environmental impact or risk, or significant increase in an existing environmental impact or risk, that is not provided for in this EP
- as soon as practicable after the occurrence of a series of new environmental impacts or risks, or a series of increases in existing environmental impacts or risks, occur which, taken together, amount to the occurrence of a significant new environmental impact or risk, or a significant increase in an existing environmental impact or risk, not provided for in this EP.

8.1.3 Assurance

The GEPL assurance process aims to manage assurance and compliance of GEPL petroleum activities and identify and resolve potential non-conformances.

Assurance activities are scheduled on a risk-based approach and conducted to verify the effectiveness of safeguards and verifications and the extent to which requirements are met by GEPL.

Assurance activities focus on in-field activities and administrative processes, depending on the activities being undertaken and assurance priorities (these priorities are based on risk) and provide sufficient demonstration that environmental performance outcomes and environmental performance standards have been met and the activity implemented in accordance with this implementation strategy. A record of all assurance activities undertaken, and the outcomes, are maintained and actions are tracked until closure.

Environmental performance standards in the EP will undergo a compliance review and evidence will be gathered for each environmental performance standard to support the end of activity environmental report. Assurance related to the site survey activities described in this EP will be summarised in the end of activity report submitted to NOPSEMA (Section 8.6).

8.1.3.1 Management potential non-conformance

This process applies to instances where the requirements of this EP have not been met. All GEPL employees and subcontractors are required to report all instances where the requirements of this EP have not been met. This process is used if audit findings or personnel reports identify that activities in the scope of this EP are not being implemented in accordance with the risk and impact control measures identified in Section 7.

Findings and corrective actions are recorded and tracked by GEPL. Findings that identify a breach of an environmental performance outcome or environmental performance standard will be reported in accordance with Section 8.5.

Any suggested changes to activities or control measures arising from audit findings or instances of potential noncompliance will be subject to a MoC process in accordance with Section 8.1.2.

8.1.4 Incident investigation

Incident investigations shall be conducted by appropriately trained personnel in order to identify contributing factors as well as any root causes of the incident, and to identify and implement appropriate continual improvement actions to prevent the incident from re-occurring.

Responsibility shall be assigned to specific personnel for implementation of corrective actions arising from investigation reports. Corrective actions shall be discussed with all stakeholders affected prior to implementation.

8.2 Petroleum activity management

8.2.1 Chain of command

In accordance with Regulation 14(4) of the OPGGS(E)R, a clear chain of command for the implementation of the petroleum activity is outlined in Figure 8-1.

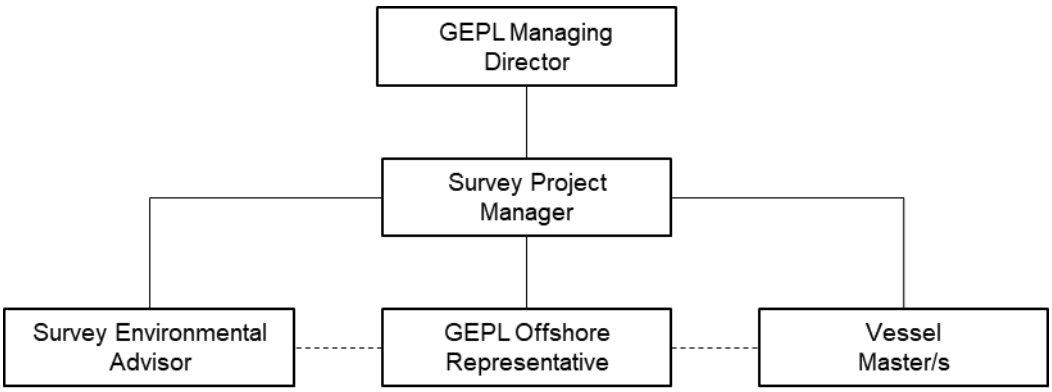


Figure 8-1: Chain of command (petroleum activities)

8.2.2 Roles and responsibilities

The roles and responsibilities of key GEPL and contract personnel for implementing task-specific control measures as detailed in Section 7, and are summarised in Table 8-1.

Table 8-1: Roles and responsibilities

Roles	Responsibilities
GEPL Managing Director	• Overall responsibility for implementing, managing, and reviewing this EP.
Survey Project Manager	Ensure that: • all third-party vessels or contractors are aware of any requirements within this EP • ongoing consultation is conducted in accordance with Section 5.5
GEPL Offshore Representative	Ensure that: • all personnel are made aware of their requirements under this EP • impacts and risks are continually reduced to ALARP by implementing this EP in accordance with Section 7 • all incidents are reported to Survey Project Manager
Survey Environmental Advisor	Ensure that: • all personnel are made aware of their requirements under this EP • impacts and risks are continually reduced to ALARP by implementing this EP in accordance with Section 7 • all changes to this EP are subject to a Management of Change assessment as described in Section 8.1.2 • compliance with this EP is verified in accordance with Section 8.1.3 • this EP is reviewed in accordance with Section 8.7.
Vessel Master	Ensure that: • impacts and risks are continually reduced to ALARP by implementing this EP in accordance with Section 7 • all necessary vessel-related documentation (e.g., SOPEPs, certificates, etc.) is available in accordance with Section 7 • all marine safety information notifications are issued in accordance with Table 5-3 and Section 7 • visual observations for marine fauna in accordance with Section 7 • all incidents are reported to GEPL Offshore Representative • all emissions and discharges are monitored and recorded in accordance with Section 7.

8.2.3 Training and competency

In accordance with Regulation 14(5) of the OPGGS(E)R, each person responsible for the implementation of task-specific control measures during operational activities shall be aware of their specific responsibilities detailed in this EP. People who hold responsibilities relating to the implementation of this EP are hired by GEPL based on their particular qualifications, experience, and competency.

All external contractor personnel involved with activities within scope of this EP will hold qualifications or training certification relevant to their role, which will be confirmed through the contractor selection process, audits, and review processes.

Personnel with specific responsibilities under this EP will be made aware of their role-specific responsibilities under this EP. All personnel (including contractors) are required to attend inductions that are relevant to their role (Table 8-2).

Table 8-2: Induction requirements

Induction	Required Personnel	Scope
Site Survey Induction	All relevant personnel	All geophysical and geotechnical survey personnel, including subcontractors, will attend an induction that includes an overview of this EP. This induction fosters environmental stewardship amongst all personnel and ensures that they are aware of the control measures implemented to minimise the potential impact on the environment, before commencing operations. The induction will include: • awareness of GEPL's policy statement (Appendix A) • an overview of environmental sensitivities, and key risks from the petroleum activity • cetacean interaction requirements under Part 8 of the EPBC Regulations 2000 • whale interaction requirements under EPBC Act Policy 2.1 • good waste management and hazardous materials housekeeping requirements • an outline of the control measures in this EP to achieve the environmental performance outcomes • incident reporting requirements • incident response arrangements.

8.3 Emergency management

GEPL's emergency management implementation strategy is described in the following sub-sections. To establish emergency response arrangements that can be scaled up or down depending on the nature of the incident by integrating with other local, regional, national, and industry plans and resources, GEPL has adopted a tiered approach in its response system. This tiered-response model scales the number of resources mobilised for a response, and the emergency team activated, according to the severity of the incident. This approach is consistent with the National Plan for Maritime Environmental Emergencies (AMSA 2020). The response resources that may be mobilised for an oil spill incident within GEPL are further described in Section 3 of the OPEP (Appendix C).

Given the site survey activities covered under this EP, any emergency event will be a vessel-related event. This includes the worst-case credible spill scenario which was identified as a vessel spill event within the OA, and the surface release of a ~200 m^3 of a light marine fuel (e.g., MDO or MGO). GEPL note that the risks from this scale of vessel spill event, and the associated response activities are anticipated to be limited to Level 1 event (with potential to increase to Level 2 in extraordinary circumstances).

In addition to GEPL's overarching emergency management strategies, and with specific reference to vessel-based activities, an approved SOPEP will also be in place (in accordance with vessel class requirements) as

required by MARPOL 73/78 Annex I and Marine Order 91 - Marine pollution prevention – oil. In the event of a vessel-based spill event the SOPEP will be implemented by the Vessel Master. Control measures and environmental performance standards relating to SOPEPs are described in Sections 7.9 and 7.11, and requirement have not been duplicated here.

8.3.1 Chain of command

GEPL's emergency management structure is scalable according to the level of incident (Figure 8-2) and is further described in Section 3 of the OPEP (Appendix C). Although the identity of those filling command positions may change over the course of the incident, the continuity of responsibility and accountability will be maintained. Throughout an incident, a formal handover will be conducted whenever any command or control position is transferred from one person to another.

In the event of any type of vessel emergency the Vessel Master will assume the role of On Scene Commander (Section 8.2.2). All persons aboard the vessel/s will be required to act under the On Scene Commander's directions. Emergency response support can be provided by GEPL if requested by the On Scene Commander (refer to Figure 3-3 of the OPEP; Appendix C).

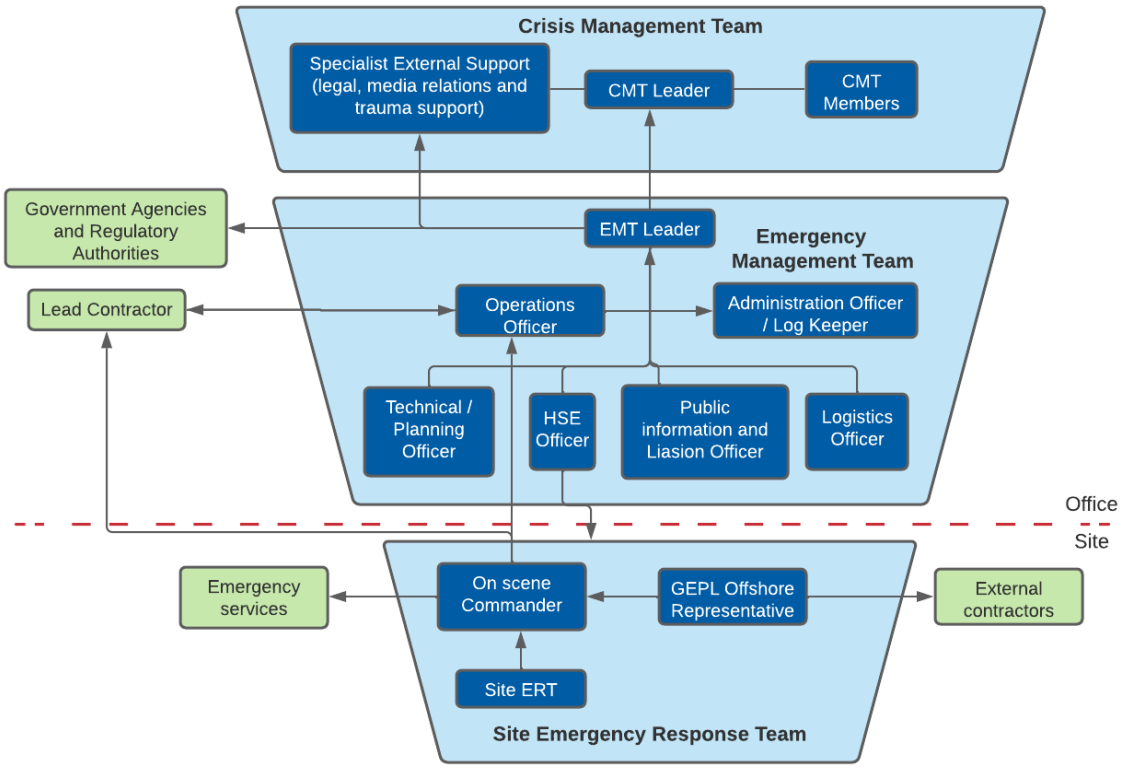


Figure 8-2: Emergency response organisation

8.3.2 Roles and responsibilities

Table 8-3 provides a summary of key individual roles and responsibilities during emergency response; these are further described in Section 3 of the OPEP (Appendix C). The emergency response roles may be filled by GEPL personnel or suitably competent external personnel.

Table 8-3: Key roles and responsibilities (emergency response)

Role	Responsibilities
Site Emergency Response Team (Site ERT)	
On Scene Commander	• Management of the Site ERT response operations • Contact the Control Agency

Role	Responsibilities
	• Keeps the EMT informed as required
Site ERT	• Implement onsite response using onsite resources
Emergency Management Team (EMT)	
EMT Leader	• If required, activate the EMT • Approve, implement, and evaluate the Incident Action Plan (IAP) • Assigns additional support from other response teams (as appropriate to the incident) for Level 2 and 3 incidents that require support beyond the Site ERT
Operations Officer	• Provide the primary communications interface between the Site ERT and the EMT • Supervise the execution of the IAP • Advise on tactical response operations

8.3.3 Training and competency

Training and competency requirements for personnel during implementation of the OPEP (Appendix C) are outlined in Table 8-4. Competency and training records for personnel, including contractors and subcontractors, are maintained.

Table 8-4: Training and competency requirements (emergency response)

Role	Summary	Training Standard
Note: Personnel with no specialist emergency response duties should undergo training in line with their responsibilities as indicated below for 'All personnel'. In addition, personnel responsible for roles with specialist oil spill response duties should undergo further training and practice in line with the EMT standards set out below.		
All personnel		
All personnel	• Provide basic first response to an incident, including, but not limited to: conducting a quick assessment; making safe; notifying anyone else in danger; and raising the alarm • Complete basic procedures in response to an alarm and evacuate to a muster point (as necessary) • Frequency: every 3 years if not involved in a response or more frequently occurring drills/exercises	
Emergency Management Teams (EMTs)		
EMT Leader	• Competencies: overall management of emergency response operations and ensure operations are performed safely, effectively, and efficiently. Commands the EMT • Frequency: once a year (maintenance of competencies may be through response or training/drills/exercises)	• ICS-100 Introduction to the Incident Command System • ICS-200 Basic Incident Command System training • ICS-220 Initial Response Team • ICS-300 Intermediate Incident Command System Training • Oil Spill Awareness Training
EMT Personnel	• Competencies: provides strategic direction, internal planning, logistics, and operational support. Operates from the emergency command centre and supports the Incident Commander who is responsible for the overall control of the incident • Frequency: once a year (maintenance of competencies may be through response or training/drills/exercises)	• ICS-100 Introduction to the Incident Command System • ICS-200 Basic Incident Command System training • ICS-220 Initial Response Team • ICS-300 Intermediate Incident Command System Training • Oil Spill Awareness Training

8.3.4 Testing arrangements

Emergency response arrangements as detailed in this EP and the OPEP (Appendix C) shall be tested:

- when they are introduced
- when they are significantly amended
- not later than 12 months after the most recent test.

Prior to commencing the activities under this EP, GEPL commits to undertaking a test of emergency response arrangements applicable to a vessel-based event.

The arrangements for testing the response arrangements should include:

- a statement of the objectives of testing
- mechanisms to examine the effectiveness of response arrangements against the objectives of testing
- mechanisms to address recommendations arising from tests.

Records of all exercises are kept, including event logs and action registers. Any lessons learnt, requiring changes to emergency management procedures are recorded, and changes implemented as per the GEPL's MoC process (Section 8.1.2).

8.3.5 Spill response

8.3.5.1 Response option selection

Not all response options and tactics are appropriate for every oil spill. Different oil types, spill locations, and volumes require different response options and tactics, or a combination of response options and tactics, to form an effective response strategy.

Spill impact mitigation assessment (SIMA) is the process used to compare response effectiveness as well as the possible impacts arising from implementing various response options (IPIECA 2017). SIMA helps determine the most appropriate strategy to respond adequately to an oil spill event. SIMA is undertaken at a strategic level to identify pre-determined recommended response strategies, and an operational SIMA is undertaken throughout the emergency response.

As there is no shoreline contact predicted for the worst-case credible spill scenario under this EP, nearshore and shoreline response is not required. Therefore, the response options considered appropriate for this EP include is monitoring, evaluation, and surveillance (MES) (refer to Section 6.4 of the OPEP; Appendix C).

8.3.5.2 Spill response capability assessment

Based on the spill response arrangements that GEPL has in place (as detailed within the OPEP [Appendix C]), the capability of these arrangements was determined. This process involved:

- defining the response package for each response option, and identifying the critical components for each response package (i.e., equipment or personnel that are limited in number and cannot be purchased or accessed readily)
- determining the number of critical components available to GEPL under existing arrangements
- identify the number of response packages available to GEPL under existing arrangements

The outcome of this evaluation is included within Section 9 of the OPEP (Appendix C).

To understand the spill response capability required for activities under this EP, GEPL assessed the worst-case credible spill event to understand the number of packages per response technique that may be required to respond to that event. The steps involved in this assessment were:

- review the SIMA to understand the planned response to an event
- review the number of response packages available to determine if the capability exists.

In accordance with the SIMA (see Section 6.4 of the OPEP [Appendix C]), the response strategies proposed to be used for this spill scenario and response package calculations are described below.

A MES response will commence for a surface release as soon as the spill is identified. This may range from very simplistic visual observation only, through to more involved monitoring and evaluating tactics. Section 5 of the OPEP (Appendix C) has documented the arrangements that GEPL have in place to implement all the required MES tactics; therefore, this technique is not discussed further. Confirmation that GEPL has the arrangements in place to implement the required number of packages is provided in Table 8-5.

Table 8-5 Response package deployment timeline

Response Technique	Days Following Event							Weeks Following Event				
	1	2	3	4	5	6	7	2	3	4	5	6
Number of packages - MES	1	1	1	1	1	1	1	1	0	0	0	0
Does Gulf Energy have the required capability?	Y	Y	Y	Y	Y	Y	Y	Y				

8.4 Environmental monitoring

Regulation 14(7) of the OPGGS(E)R requires that the implementation strategy provides for sufficient monitoring of, and maintaining a quantitative record of, emissions and discharges such that a record can be used to assess whether the environmental performance outcomes and standards in the EP are being met.

GEPL and vessel contractors will monitor, and record emissions and discharges as detailed in Section 7 to ensure that that this record can be used to assess whether the environmental performance outcomes and standards in this EP are being met.

If an emergency event resulting in a Level 2 or 3 spill occurs, GEPL will implement the OSMP (Appendix D). This OSMP is identified as a control measure in Section 7.11.3. The OSMP describes a program of monitoring, and is the principal tool for determining the extent, severity, and persistence of environmental impacts from an emergency condition and the emergency response activities to be undertaken by GEPL.

8.5 Incident reporting

All environmental incidents will be reported by GEPL in accordance with Table 8-6.

Table 8-6: Incident reporting

Recordable Incident Reporting – Regulation 26B	
Legislative definition of 'recordable incident': 'Recordable incident, for an activity, means a breach of an environmental performance outcome or environmental performance standard, in the environment plan that applies to the activity, that is not a reportable incident' Recordable incidents are breaches of environmental performance outcomes and standards described in Section 7.	
Reporting Requirements	**Report to/Timing**
Written notification to NOPSEMA by the 15th of each month. As a minimum, the written incident report must describe: • the incidents and all material facts and circumstances concerning the incidents • any actions taken to avoid or mitigate any adverse environmental impacts • any corrective actions already taken, or that may be taken, to prevent a repeat of similar incidents If no recordable incidents occur during the reporting month, a 'nil report' will be submitted.	Submit written report to NOPSEMA by the 15th of each month

Reportable Incident Reporting – Regulations 26, 26A, and 26AA	
Legislative definition of 'reportable incident': 'Reportable incident, for an activity means an incident relating to an activity that has caused or has the potential to cause an adverse environmental impact; and under the environmental risk assessment process the environmental impact is categorised as moderate or more serious than moderate.' Therefore, reportable incidents under this EP are those events (not planned activities) that have a moderate or greater consequence (or risk) level. In accordance with this definition, the reportable incidents identified under this EP are: • introduction of an IMP.	
Reporting Requirements	**Report to**
Verbal or written notification must be undertaken within two hours of the incident or as soon as practicable. This information is required: • the incident and all material facts and circumstances known at the time • any actions taken to avoid or mitigate any adverse environmental impacts.	Report verbally to NOPSEMA within two hours or as soon as practicable and provide written record of notification by email. Phone: (08) 6461 7090 Email: submissions@nopsema.gov.au
Verbal notifications must be followed by a written report as soon as practicable, and not later than 3 days following the incident. At a minimum, the written incident report will include: • the incident and all material facts and circumstances • actions taken to avoid or mitigate any adverse environmental impacts • any corrective actions already taken, or that may be taken, to prevent a recurrence. If the initial notification of the reportable incident was verbal, this information must be included in the written report.	Written report to be provided to NOPSEMA and NOPTA. Email: submissions@nopsema.gov.au Email: info@nopta.gov.au

Additional Reporting Requirements	
Reporting Requirements	**Report to**
An oil/gas pollution incident that occurs within a marine park or is likely to impact on a marine park. 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 (e.g., dispersant, containment, etc.) • confirmation of providing access to relevant monitoring and evaluation reports when available • contact details for the response coordinator.	Report verbally to the DNP (24-hour) Marine Duty Officer as soon as practicable, and also provide a follow-up email. Phone: 0419 293 465 Email: marine.compliance@environment.gov.au
Death or injury to individual(s) from a EPBC Act Listed Species as a result of the petroleum activities	Report injury to or mortality of EPBC Act listed threatened or migratory species within seven business days of observation to DAWE or equivalent: Phone: +61 2 6274 1111 Email: EPBC.Permits@environment.gov.au
Vessel collision with marine mammals (whales) to the National Vessel Strike Database	Reported as soon as practicable. https://data.marinemammals.gov.au/report/shipstrike

Presence of any suspected biosecurity pest or disease	Report a biosecurity pest of disease to the Department of Agriculture and Fisheries (Queensland): Website: Report a biosecurity pest or disease | Department of Agriculture and Fisheries, Queensland (daf.qld.gov.au) Phone: 13 25 23

8.6 Routine reporting

Regulation 26C of the OPGGS(E)R requires the reporting of environmental performance of this EP. This is described in Table 8-7. Routine notifications required by Regulations 29 and 30 of the OPGGS(E)R are also included in Table 8-7.

Table 8-7: Routine external reporting requirements

Reporting Requirement	Description	Reporting to	Timing
Environmental performance reporting	A report detailing environmental performance of the activity detailed in this EP of the activity detailed in this EP	NOPSEMA submissions@nopsema.gov.au Phone: +61 8 6461 7090	Within three months of completion of activities
Notification of start and end of activity	GEPL shall complete Form (FM1405) and submit to NOPSEMA at least 10 days before activity commencement	NOPSEMA submissions@nopsema.gov.au or https://securefile@nopsema.gov.au/filedrop/submissions	Once prior to activity commencement
End of EP Notification	GEPL shall complete Form (FM1405) and submit to NOPSEMA within 10 days of activity completion		Once post activity completion

8.7 Environment Plan review

If required, any revisions and/or resubmission of this EP to NOPSEMA, in accordance with Regulation 17 of the OPGGS(E), will be undertaken in accordance with the MoC process (Section 8.1.2).

9 REFERENCES

ABARES. 2021. "ABARES Fisheries Status Report map data: Northern Prawn Fishery (NPF): fishing intensity and maximum area fished, annual map data for 2010 to 2020." Canberra, Australia: Australian Bureau of Agricultural and Resource Economics and Sciences.

Abdellatif, E.M., O.M. Ali, I.F. Khalil, and B.M. Nyonje. 1993. "Effects of Sewage Disposal into the White Nile on the Plankton Community." *Hydrobiologia, Vol 259* 195-201.

AMSA. 2022. "Craft Tracking System spatial data." https://www.operations.amsa.gov.au/Spatial/.

AMSA. 2020. *National Plan for Maritime Environmnetal Emergencies - 2020 Edition.* Canberra, Australia: e Australian Maritime Safety Authority, Australian Government.

—. 2015a. "Technical guidelines for preparing contingency plans for MArine and Coastal Facilities." https://www.amsa.gov.au/sites/default/files/2015-04-np-gui012-contingency-planning.pdf.

—. 2015b. "The Effects of Maritime Oil Spills on Wildlife including Non-avian Marine Life." http://www.amsa.gov.au/environment/maritime-environmental-emergencies/national-plan/general-information/oiled-wildlife/marine-life/index.asp.

ANSUL. 2007. "Environmental impact of ANSULITE AFF Products." *Technical Bulletin No. 52 Forn No. F 82289-3.*

AS/NZS. 2015. "AS/NZS ISO 14001:2015 Environmental management systems—Requirements with guidance for use." Sydney, Australia / Wellington, New Zealand.

AS/NZS. 2018. "ISO 31000:2009 Risk management – Principles and guidelines." Sydney, Australia / Wellington, New Zealand.

Axelrad, D.M., G.C.B. Poore, G.H. Arnott, J Bault, V Brown, R.R.C. Edwards, and N Hickman. 1981. "The Effects of Treated Sewage Discharge on the Biota of Port Phillip Bay, Victoria, Australia." *Estuaries and Nutrients, Contemporary Issues in Science and Society. The Human Press Inc.*

BoM. 2021. *Tropical Cyclone Seasonal Outlook for the Northern Territory.* Bureau of Meterology, Australian Government. Accessed February 2022. http://www.bom.gov.au/cyclone/outlooks/seasonal/nt.shtml.

BP. 2013. "Shah Deniz 2 Project. Environmental & Socio-Economic Impact Assessment." *BP Development Pty Ltd.* Accessed December 2019. https://www.bp.com/en_az/azerbaijan/home/news/environmental-and-socialdocumentation/shah-deniz-.html.

BRS. 2007. "Designated Exchange Areas Project – Providing Informed Decision on the Discharge of Ballast Water in Australia (Phase II) Ed. Knight, E., Barry, S., Summerson, R., Cameron S., Darbyshire R." *Bureau of Rural sciences.*

Burford, MA , and Rothlisberg. 1999. "Factors limiting phytoplankton production in a tropical continental shelf ecosystem." In *Estuarine, Coastal and Shelf Science*, 48: 541-549. PC.

Clark, R. 1984. "Impacts of oil pollution on seabirds." *Environmental Pollution Series: Ecology and Biology* 33: 1–22.

CoA. 2020. *National Light Pollution Guidelines for Wildlife including marine turtles, seabirds and migratory shorebirds.* Department of the Environment and Energy, Canberra, Australia: Commonwealth of Australia.

CoA. 2017. *Recovery Plan for Marine Turtles in Australia, 2017-2027.* Department of the Environment and Energy, Commonwealth of Australia. http://www.environment.gov.au/system/files/resources/46eedcfc-204b-43de-99c5-4d6f6e72704f/files/recovery-plan-marine-turtles-2017.pdf.

Condie , SA , and JR Dunn. 2006. “Seasonal characteristics of the surface mixed layer in the Australasian region: implications for primary production regimes and biogeography.” In *Marine and Freshwater Research*, 57: 569-90.

CSIRO . 2015. *Marine Benthic Substrate Database - CAMRIS - Marsed. v1.* Data Collection, CSIRO.

DAF. 2022. “QFish.” Queensland, Australia: Department of Agriculture and Fisheries. https://qfish.fisheries.qld.gov.au/.

DAWE. 2020. *Australian Ballast Water Management Requirements. Version 8.* Canberra, Australian Capital Territory: Department of Agriculture, Water and the Environment.

—. 2016. “Biologically Important Areas of Regionally Significant Marine Species.” Canberra, Australia: Department of Agriculture, Water and the Environment. Accessed September 2020. http://www.environment.gov.au/fed/catalog/search/resource/details.page?uuid=%7B2ed86f5a-4598-4ae9-924f-ac821c701003%7D.

DAWE. 2021a. *Guidance on key terms within the Blue Whale Conservation Management Plan.* Canberra, Australia: Department of Agriculture, Water and the Environment, Australian Government.

—. 2021b. *Indigenous Protected Areas.* Accessed February 2022. https://www.awe.gov.au/agriculture-land/land/indigenous-protected-areas.

—. 2021c. “Protected Matters Search Tool.” Accessed October 2021. https://www.awe.gov.au/environment/epbc/protected-matters-search-tool.

—. n.d. *Species Profile and Threats Database - Key Ecological Features.* Department of Agriculture, Water and the Environment. Accessed January 2022. https://www.environment.gov.au/sprat-public/action/kef/search.

DEWHA. 2008a. “Approved Conservation Advice for Dermochelys coriacea (Leatherback Turtle).” Accessed December 2021. http://www.environment.gov.au/biodiversity/threatened/species/pubs/1768-conservation-advice.pdf.

—. 2008b. “North Marine Bioregional Plan: Bioregional Profile: A Description of the Ecosystems.” http://www.environment.gov.au/coasts/mbp/publications/north/pubs/bioregionalprofile.pdf.

DISER. 2021a. *National Greenhouse Accounts Factors, Australian National Greenhouse Accounts, August 2021.* Department of Industry, Science, Energy and Resources, Canberra, Australia: Australian Government.

—. 2021b. “Quarterly Update of Australia’s National Greenhouse Gas Inventory: June 2021.” Accessed February 10, 2022. https://www.industry.gov.au/sites/default/files/November%202021/document/nggi-quarterly-update-june-2021-data-sources.pdf.

DoE. 2015. “Conservation Management Plan for the Blue Whale (2015-2025).” *A Recovery Plan under the Environment Protection and Biodiversity Conservation Act 1999.* Accessed March 2021. http://www.environment.gov.au/system/files/resources/9c058c02-afd1-4e5d-abff-11cac2ebc486/files/blue-whale-conservation-management-plan.pdf.

DoEE. 2017. “National Strategy for Reducing Vessel Strike on Cetaceans and other Marine Megafauna.” https://www.awe.gov.au/sites/default/files/documents/vessel-strike-strategy.pdf.

—. 2018. “Threat abatement plan for the impacts of marine debris on the vertebrate wildlife of Australia’s coasts and oceans (2018).” *Department of the Environment and Energy.* https://www.environment.gov.au/biodiversity/threatened/publications/tap/marine-debris-2018.

DotE. 2015a. *Sawfish and River Sharks - Multispecies Recovery Plan.* Department of the Environment, Canberra, Australia: Australian Government.

DotE. 2015b. “The introduction of Marine Pests to the Australian Environment via Shipping.” Department of the Environment. Accessed December 2019.

http://www.environment.gov.au/biodiversity/threatened/nominations/ineligiblektp/introduction-marine-pests-via-shipping.

DSEWPaC. 2012. *Marine bioregional plan for the North Marine Region.* Department of Sustainability, Environment, Water, Population and Communities, Canberra, Australia: Australian Government. http://www.environment.gov.au/coasts/marineplans/north/pubs/north-marine-plan.pdf.

—. 2013. "Recovery plan for the White Shark (Carcharodon carcharias)." https://www.environment.gov.au/system/files/resources/ce979f1b-dcaf-4f16-9e13-010d1f62a4a3/files/white-shark.pdf.

Englehardt, F. 1983. "Petroleum effects on marine mammals." *Aquatic Toxicity, 4* 199-217.

Finneran, J J, E E Henderson, D S Houser, K Jenkins, S Kotecki, and J Mulsow. 2017. *Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase III).* Technical report by Space and Naval Warfare Systems Center Pacific (SSC Pacific).

Fodrie, F.J., K.W. Able, F. Galvez, K.L. Heck, O.P. Jensen, P.C. López-Duarte, C.W. Martin, R.E. Turner, and A. Whitehead. 2014. "Integrating Organismal and Population Responses of Estuarine Fishes in Macondo Spill Research." *BioScience, Volume 64, Issue 9, September 2014* 778-788.

Forbes, AMG. 1984. "The contribution of local processes to seasonal hydrology of the Gulf of Carpentaria." In *Oceanographie Tropicale*, 19: 193-201.

Geoscience Australia. n.d. *Sidescan sonar, Applying geoscience to Australia's most important challenges.* Accessed December 2021. https://www.ga.gov.au/scientific-topics/marine/survey-techniques/sonar/sidescan-sonar.

—. 2010. "Well Report: Petroleum Wells Online Database." Accessed October 26, 2021. http://dbforms.ga.gov.au/www/npm.well.search.

Geraci, J.R., and D.J. Aubin. 1988. "Synthesis of Effects of Oil on Marine Mammals." *Report to U.S. Department of the Interior, Minerals Management Service, Atlantic OCS Region, OCS Study.*

Hannay, D E, A O MacGillivray, M Laurinolli, and R Racca. 2004. *Sakhalin Energy: source level measurements from 2004 acoustics program (Ver. 1.5).* Technical report by JASCO Research, Victoria, BC, for Sakhalin Energy Investment Company, Yuzhno-Sakhalinsk.

Hewitt, C.L., R.B. Martin, C Sliwa, F.R. McEnnulty, N.E. Murphy, T Jones, and S Cooper. 2002. "National introduced marine pest information system." Accessed April 2017. http://www.marinepests.gov.au/Pages/default.aspx.

Hjermann, D.Ø., A. Melsom, G.E. Dingsør, J.M. Durant, A.M. Eikeset, L.P. Roed, G. Ottersen, G. Storvik, and N. Stenseth. 2007. "Fish and oil in the Lofoten-Barents Sea system: synoptic review of the effect of oil spills on fish populations." *Mar. Ecol. Prog. Ser., 339 (2007)* 283–299.

Hodge, W, C.J. Limpus, and P Smissen. 2007. "Queensland turtle conservation project: Hummock Hill Island Nesting Turtle Study December 2006 Conservation Technical and Data Report." *Environmental Protection Agency, Queensland.*

IFSEC Global. 2014. "Environmental Impact of Foam."

IMO. 2012. *Control and Management of Ships Biofouling to Minimise the Transfer of Invasive Aquatic Species.* London, United Kingdom: International Maritime Organisation.

INPEX. 2009. *Ichthys Gas Filed Development Project: Appendix 15, Review of Literature on Sound in the Ocean and Effects of Noise on Marine Fauna.* Perth, Australia: INPEX Browse Ltd.

IPCC. 2021. "Summary for Policymakers." In *Climate Science 2021: The Physical Science Basis*, by Intergovernmental Panel on Climate Change. Cambridge University Press.

IPIECA. 1995. " Biological Impacts of Oil Pollution: Rocky Shores." *International Petroleum Industry Environmental Conservation Association, No. 7. 209–215.*

IPIECA. 1999. “Biological impacts of oil pollution: Sedimentary shores.” *IPIECA Report Series. Volume Nine.*

IPIECA. 2017. *Guidelines on implementing spill impact mitigation assessment (SIMA).* Report 593, IPIECA-API-IOGP. https://www.ipieca.org/media/4867/guidelines_on_implementing_spill_impact_mitigation_assessment_sima_2017.pdf.

ITOPF. 2011. “Effects of Oil Pollution on the Marine Environment.” *Technical Information Paper. Number 13.* Accessed November 2021. https://www.itopf.org .

Kamrowski, R L, C J Limpus, K Pendoley, and M Hamann. 2014. *Influence of industrial light pollution on the sea-finding behaviour of flatback turtle hatchlings.* Wildlife Research.

KLC. 2022. *Indigenous Protected Areas.* Accessed February 2022. https://www.klc.org.au/indigenous-protected-areas.

Laist, D.W., A.R. Knowlton, J.G. Mead, A.S. Collet, and M Podesta. 2001. “Collisions between ships and whales.” *Marine Mammal Science 17(1)* 35–75.

Lee, K, T.L. King, B Robinson, Z Li, L Burridge, M Lyons, D Wong, et al. 2011. “Toxicity Effects of Chemically Dispersed Crude Oil on Fish.” *International Oil Spill Conference Proceedings: March 2011, 2011(1)* 163.

Long, B, I Poiner, and T Wassenberg. 1995. “Distribution, Biomass and Community Structure of Megabenthos of the Gulf of Carpentaria, Australia.” *Marine Ecology Progress Series, 129* 127-139.

Long, Brian , and IF Somers. 1994. “Note on the sediments and hydrology of the Gulf of Carpentaria, Australia.” *Marine and Freshwater Research - MAR FRESHWATER RES* 45. doi:10.1071/MF9940283.

MacGillivray, A O, R Racca, and L Zizheng. 2013. “Marine Mammal Audibility of Selected Shallow-water Survey Sources.” *The Journal of the Acoustical Society of America.* doi:0.1121/1.4838296.

Marchesan, M, M Spotto, L Verginella, and E.A. Ferrero. 2006. *Behavioural Effects of Artificial Light on Fish Species of Commercial Interest.* Fisheries Research, vol. 73.

Marine Pest Sectoral Committee. 2018. “National biofouling management guidelines for the petroleum production and exploration industry.” *Department of Agriculture and Water Resources.* https://www.marinepests.gov.au/sites/default/files/Documents/petroleum-exploration-biofouling-guidelines.pdf.

McCauley, R D. 1998. *Radiated underwater noise measured from the drilling rig ocean general, rig tenders Pacific Ariki and Pacific Frontier, fishing vessel Reef Ventures and natural sources in the Timor Sea, Northern AUstralia.* Report for Shell Australia.

McCauley, R.D., J Fewtrell, A.J. Duncan, C Jenner, M.N. Jenner, J.D. Penrose, R.I.T. Prince, A Adihyta, J Murdoch, and K McCabe. 2000. “Marine seismic surveys: A study of environmental implications.” *The APPEA Journal* 40: 692-708.

McDonald, S F, S J Hamilton, K J Buhl, and J F Heisinger. 1996. “Acute toxicity of fire control chemicals to Daphnia magna (Straus) and Selenastrum capriocornutum (Printz).” *Ecotoxicology and Environmental Safety* 33: 66-72.

McIntyre, A.D., and R Johnson. 1975. *Effects of nutrient enrichment from sewage in the sea.* New York: Pergamon Press.

McIntyre, A.D., J.M. Baker, A.J. Southward, W.R.P. Bourne, S.J. Hawkins, and J.S. Gray. 1982. “The Long-Term Effects of Oil Pollution on Marine Populations, Communities and Ecosystems.” *Biological Sciences Vol. 297, No. 1087* 401-411.

Moody, C A, and J A Field. 200. “Perfluorinated Surfactants and the Environmental Implications of their use in Fire-Fighting Foams.” *Environmental Science and Technology* 34 (18): 3864-3870.

Morandi, A, S Berkman, J Rowe, R Balouskus, D.S. Etkin, C Moelter, and D Reich. 2018. *Environmental Sensitivity and Associated Risk to Habitats and Species on the Pacific West Coast and Hawaii with*

Offshore Floating Wind Technologies; Volume 1: Final Report. Camarillo, CA.: US Department of the Interior, Bureau of Ocean Energy Management, Pacific OCS Region.

NERA. 2017. "Environment Plan Reference Case – Planned discharge of sewage, putrescible waste and grey-water." Accessed December 2019. https://referencecases.nopsema.gov.au/assets/reference-case-project/2017-1001-Sewage-grey-water-and-putrescible-waste-discharges.pdf .

NERA. 2018. *Environmenta Plan Reference Case.* National Energy Resources Australia, Perth, Australia: Australian Government.

NMFS. 2018. *Revision to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts.* Washington, USA: National Marine Fisheries Service, National Oceanic and Atmospheric Administration.

NOAA. 2021. *ESA Section 7 Consultation Tools for Marine Mammals on the West Coast.* Accessed January 2022. https://www.fisheries.noaa.gov/west-coast/endangered-species-conservation/esa-section-7-consultation-tools-marine-mammals-west.

NOAA. 2010. *Oil and sea turtles: biology planning and response.* Washington, USA: National Oceanic and Atmospheric Administration.

NOPSEMA. 2020a. *Consultation with Commonwealth agencies with responsibilities in the marine area.* Perth, Western Australia: National Offshore Petroleum Safety and Environmental Management Authority. Accessed May 2021. https://www.nopsema.gov.au/assets/Guidelines/A705589.pdf.

NOPSEMA. 2020b. *Guidance Note: ALARP.* Perth, Australia: National Offshore Petroleum Safety and Environmental Management Authority. https://www.nopsema.gov.au/sites/default/files/documents/2021-03/A138249.pdf.

NOPSEMA. 2021. *Guideline: Environment plan decision making.* Perth, Australia: National Offshore Petroleum Safety and Environmental Management Authority. https://www.nopsema.gov.au/sites/default/files/documents/2021-06/A524696.pdf.

OGUK. 2014. "Guidance on Risk Related Decision Making Issue 2 July 2014."

Parnell, P.E. 2003. "The effects of sewage discharge on water quality and phytoplankton of Hawai'ian Coastal Waters." *Marine Environmental Research, Vol. 44* 293-311.

Patterson, H, D Bromhead, D Galeano, J Larcombe, J Woodhams, and R Curtotti. 2021. *Fishery status reports 2021.* Canberra, Australia: Australian Bureau of Agricultural and .

Paulay, G. Kirkendale, G Lambert, and C Meyer. 2002. "Anthropogenic biotic interchange in a coral reef ecosystem: A case study from Guam." *Pacific Science 56(4)* 403–422.

Peakall, D.B., P.G. Wells, and D. Mackay. 1987. "A hazard assessment of chemically dispersed oil spills and seabirds." *Marine Environmental Research* 22(2):91–106.

Popper, A.N, A.D. Hawkins, R.R Fay, D.A. Mann, S Bartol, T.J. Carlson, S Coombs, et al. 2014. *Sound Exposure Guidelines for Fishes and Sea Turtles: : A Technical Report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI.* Springer.

Richardson, W J, C R Greene, C I Maime, and D H Thomson. 1995. *Marine Mammals and Noise.* San Diego, California: Acadamic Press.

Rodríguez, A, G Burgan, P Dann, R Jessop, J.J. Negro, and A Chiaradia. 2014. "Fatal attraction of short-tailed shearwaters to artificial lights." *PLoS ONE 9(10):e110114.*

Schaefer, T. 2013. "Aquatic Impacts of Fire Fighting Foams." *Whitepaper Form Number F-2012007.*

Shell. 2010. *Prelude Floating LNG Project EIS Supplement—Response to Submissions. .* Perth, Western Australia: Shell Developments (Australia) Pty Ltd.

Simmonds, M, S Dolman, and L Weilgart. 2004. *Oceans of Noise.* Wiltshire, United Kingdom: Whale and Dolphin Conservation Society.

Sonardyne. 2018. "Construction Survey Positioning Systems Wideband Fusion LBL and USBL." Accessed December 2021. https://rts.as/wp-content/uploads/2018/09/Sonardyne-Data-Fusion-Engine.pdf.

—. 2021. "Datasheet ROVNav 6 LBL Transeiver and USBL Responder." Accessed December 2021. https://www.sonardyne.com/wp-content/uploads/2021/07/Sonardyne_8310_rovnav6.pdf.

Southall, B L, J J Finneran, C Reichmuth, P E Nachtigall, D R Ketten, A E Bowles, W T Ellison, D P Nowacek, and P L Tyack. 2019. "Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects." *Aquatic Mammals* 45 (2): 125-232.

Southall, B.L., A.E. Bowles, W.T. Ellison, J.J. Finneran, R.L. Gentry, C.R. Greene Jr, D Kastak, et al. 2007. "Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations." *Aquatic Mammals* 33 (4): 411–521.

Tritech. n.d. "Tritech Knowledge Base - Learn More about Side Scan Sonars." Accessed December 2021. https://www.tritech.co.uk/uploaded_files/Side%20Scan%20Sonars.pdf.

TSSC. 2014. *Approved Conservation Advice for Glyphis glyphis (speartooth shark).* Threatened Species Scientific Committee, Canberra, Australia: Australian Government.

TSSC. 2001. *Commonwealth Listing Advice on Rhincodon typus (Whale shark).* Threatened Species Scientific Committee, Canberra, Australia: Australian Government.

TSSC. 2015a. *Conservation Advice Balaenoptera borealis sei whale.* Threatened Species Scientific Committee, Canberra, Australia: Australian Government.

TSSC. 2015b. *Conservation Advice Balaenoptera physalus fin whale.* Threatened Species Scientific Committee, Canberra, Australia: Australian Government.

TSSC. 2015c. *Conservation Advice Rhincodon typus whale shark.* Threatened Species Scientific Committee, Canberra, Australia: Australian Government.

URS. 2001. *Review of Environmental Impacts of Petroleum Exploration and Appraisal Activities in Commonwealth Waters.* Prepared for Department of Industry, Science and Resources, Petroleum and Electricity Division, URS Australia.

Wardle, C.S., T.J. Carter, G.G. Urquhart, A.D.F. Johnstone, A.M. Ziolkowski, G Hampson, and D Mackie. 2001. "Effects of seismic air guns on marine fish, Continental Shelf Research 21 (2001)."

Webster, F J, B S Wise, W J Fletcher, and H Kemps. 2018. *Risk assessment of hte potentil impacts of seismic air gun surveys on marine finfish and invertebrates in Western Australia.* Perth, Western Australia: Department of Primary Industries and Regional Development.

WEL. 2014. *Browse FLNG Development, Draft Environmental Impact Statement. EPBC 2013/7079. November 2014.* Perth, Western Australia: Woodside Energy Limited.

Wiese, F.K., W.A. Montevecci, G.K. Davoren, F Huettmann, A.W. Diamond, and J Kinke. 2001. *Seabirds at risk around off shore oil platforms in the northwest Atlantic.* Marine Pollution Bulletin.

Appendix A: GEPL Environmental Policy

GULF ENERGY PTY LIMITED

ABN 58 094 620 176

ENVIRONMENT PROTECTION POLICY

Introduction

The Company recognises that through the nature and scale of its activities there is a fundamental requirement to conduct its operations in an environmentally responsible manner. It takes this responsibility very seriously.

To achieve our environmental objectives, the Company's Environment Management System will be implemented, and performance will be monitored through site inspection and formal audit protocols for projects 'in the field' which the Company undertakes.

Management Commitment and Responsibilities

Management makes the commitment to:

- Promote the prevention of pollution and comply with statutory environment protection legislation.
- Establish environment protection improvement programs based upon risk assessment processes that set and review environment protection targets and objectives, review the effectiveness of their implementation and outcomes, and if necessary, improve procedures and systems based on the results of the effectiveness reviews.
- Put in place sound management systems that meet or exceed Commonwealth, State, Territory and offshore jurisdictions' environmental targets and objectives for each project.
- Ensure that the views of all stakeholders are sought and considered when developing plans for projects which may impact them and the environment.
- Integrate environmental issues into site procedures, inductions, training and ongoing workplace communications with Company employees and contractors.
- Evaluate and regularly review employees, subcontractors, and suppliers regarding their environment protection performance.
- Promote continual improvement in environment protection performance through establishing appropriate planning, training, monitoring, inspection, evaluation, reporting and process improvement systems.
- Regularly review this policy to ensure that it is consistent with regulatory requirements, current community standards, industry best practice and the Company being a good corporate citizen.

Employee and Contractor Responsibilities

Employees and contractors share responsibility for environment protection by

- Working in compliance with a project's environment conditions as communicated through the site induction and ongoing communications from the Company's management.
- Supporting their respective managers, supervisors, and co-workers in the continual improvement of project environment protection performance.
- Promptly communicating any adverse environment incidents to management.

This Policy was adopted by the Gulf Energy Pty Limited Board on 14 February 2022.

Appendix B: Stakeholder Factsheet

Managed Risk. Extraordinary Potential.

Q23/P Site Survey Environment Plan

OVERVIEW

The Gulf of Carpentaria is comprised of a series of stacked sedimentary basins. The two shallower basins are the Karumba Basin and the Carpentaria Basin. Two-dimensional regional seismic data acquired in 2012, and a second infill seismic survey in 2014 confirmed the presence of the third, and deeper, Bamaga Basin. The relatively shallow water depths make the Bamaga Basin operationally attractive, and the location is strategically important as a potential natural gas supplier to northern and eastern Australia.

The Bamaga Basin occurs almost entirely within the Q23/P petroleum exploration permit. Gulf Energy Pty Limited (Gulf Energy) is the titleholder of the Q23/P exploration permit. Prior to undertaking exploration drilling activities to assess the viability of the Bamaga Basin as a source of natural gas, Gulf Energy is proposing to undertake a geophysical and geotechnical site survey within a 5 km x 5 km Operational Area within the Q23/P exploration permit. The purpose of this site survey is to ascertain the characteristics of the seabed within the area for future exploration drilling activities.

Gulf Energy's experienced management and team of very skilled and highly respected advisers and consultants has previously successfully conducted two seismic surveys in Q/23P without incident. The planned site survey will occur over a much smaller spatial area, and due to the types of surveys proposed is expected to have limited environmental impacts and risks.

LOCATION

All activities will occur within the 5 km x 5 km Operational Area in Commonwealth waters, more than 170 km west of the Queensland coast, and more than 350 km east of the Northern Territory coast. Water depths in the Operational Area are approximately 65–70 m. The location of the Operational Area is shown in the map below.

The actual survey area (within the Operational Area) will be refined prior to the commencement of onsite activities and will typically be approximately 2.5 km x 0.5 km.

TIMING

The site survey is scheduled to occur over a period of approximately four-weeks during Q3 2022 (pending environmental approval, safe operating conditions, and vessel availability). The site survey is likely to consist of two separate vessel mobilisations each of approximately two weeks duration; the geophysical survey will be completed first, followed by the geotechnical sampling survey.

SURVEY ACTIVITY

The geophysical survey may include the following types of data collection:

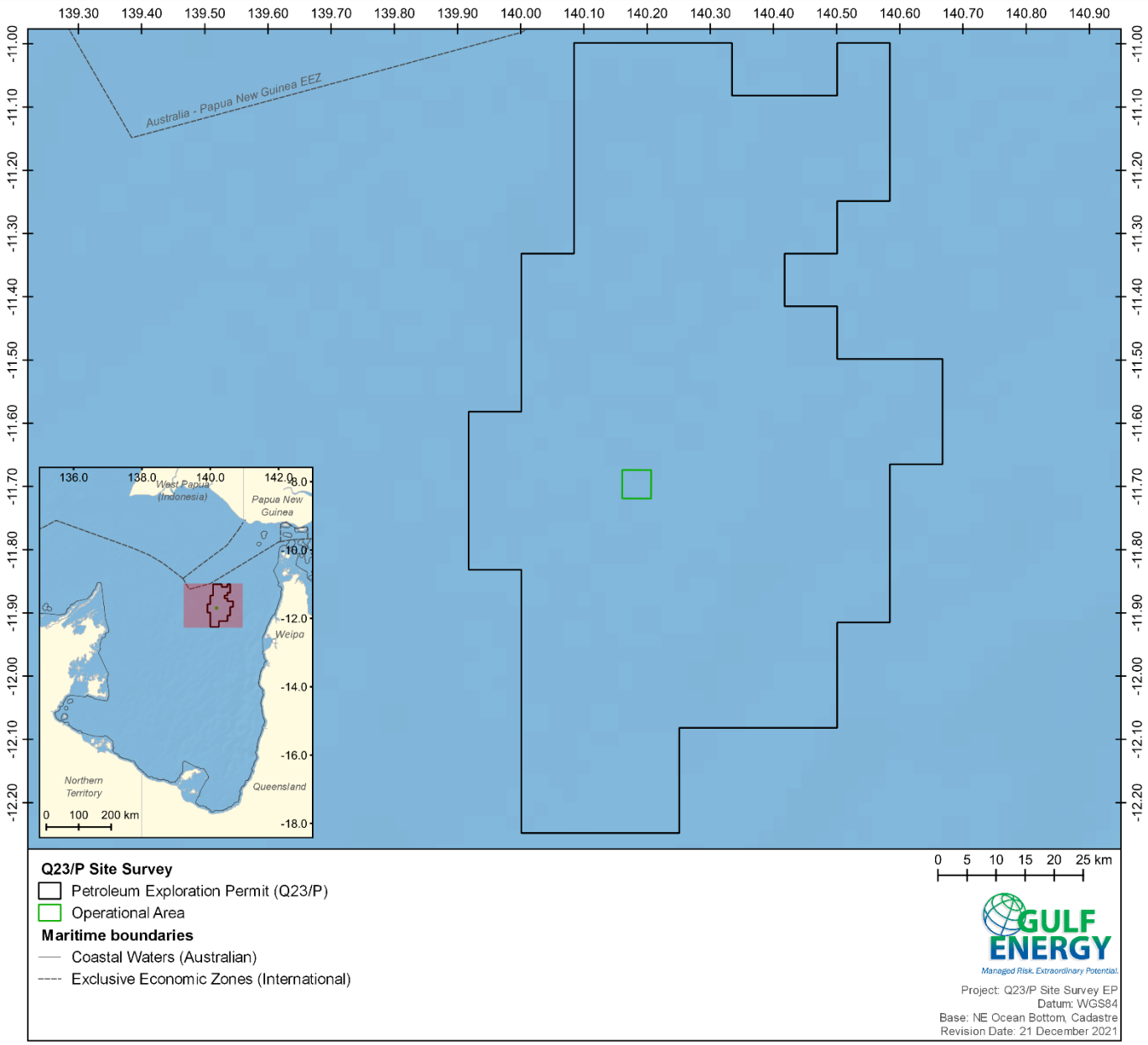
- multibeam echo sounder (used to assess water depths)
- side-scan sonar (used to detect presence of seabed hazards, including both natural features e.g., reefs or artificial structures e.g., marine debris)
- sub-bottom profiler (used to identify the structure and thickness of upper, near seabed, sedimentary layers)
- magnetometry (used to detect metallic objects at or below the seabed)
- high resolution reflective imaging (used to map near-surface geological hazards).

The geotechnical survey may include the following types of sampling or testing:

- core and borehole sampling (used to characterise the sediment profile below the seabed)
- grab sampling (used to characterise unconsolidated surface sediment on the seabed)
- penetrometer testing (used to determine seabed strength).

The geotechnical survey will require a vessel that has geotechnical coring capability, and therefore may be undertaken by a different vessel to that used during the geophysical survey.

An exclusion zone of 500 m around the survey vessels is proposed during site survey activities.



VALUES AND SENSITIVITIES

The Q23/P exploration permit occurs within the Gulf of Carpentaria, a shallow epicontinental sea between Australia, Papua New Guinea, and West Papua (Indonesia). The Operational Area occurs within the 'Gulf of Carpentaria Basin' key ecological feature, which has values including seasonally high primary productivity, and moderately abundant and diverse communities of infauna and mobile epifauna.

While a variety of marine fauna may be present within the Operational Area, this presence is expected to be of a transitory nature only with no significant aggregation expected (due to the lack of seabed or emergent features). No known biologically important areas, or critical habitat, for marine mammals, reptiles, fish, or birds are known to occur within the Operational Area.

Economic values within the Operational Area include commercial fishing and commercial shipping activity.

No social or cultural values were identified within the Operational Area.

ENVIRONMENTAL APPROVALS

The Bamaga Basin and the Q23/P exploration permit occur within Commonwealth waters, and as such any petroleum activities are subject to the regulatory requirements of the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* and Offshore Petroleum Greenhouse Gas Storage (Environment) Regulations 2009, as administered by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

Consequently, the *Q23/P Site Survey Environment Plan* is currently being prepared by Gulf Energy, ready for submission to NOPSEMA for assessment.

The Environment Plan describes the environment in which the petroleum activity takes place, provides an assessment of the impacts and risks arising from the activity, and identifies the control measures to manage the potential impacts and risks to levels that are acceptable and as low as reasonably practicable.

The Environment Plan is also required to outline how Gulf Energy has engaged with relevant stakeholders whose

interests, functions, and activities may be affected. The Environment Plan must include how stakeholder feedback has been considered and addressed.

PRELIMINARY CONTROL MEASURES

The draft *Q23/P Site Survey Environment Plan* has identified environmental aspects associated with the site survey, and proposed control measures to manage the impacts and risks associated with each of these aspects (see following table).

STAKEHOLDER CONSULTATION

Gulf Energy has identified you, or your organisation, department, or agency, as a 'relevant person' (as defined under the Offshore Petroleum and Greenhouse Gas (Environment) Regulations 2009) as someone whose functions, interests, or activities may be affected by this proposed petroleum activity.

This stakeholder consultation flyer has been prepared to provide sufficient information for 'relevant persons' to understand how the proposed activity (i.e., the geophysical and geotechnical site survey) may affect your own functions, interests, or activities, and provide you with the opportunity to submit feedback, identify concerns, or ask additional questions about the proposed activities to Gulf Energy.

Feedback from stakeholders on potential or perceived impacts associated with Gulf Energy's activities will be carefully considered and assessed.

Please note that stakeholder feedback and Gulf Energy's response will be included in the *Q23/P Site Survey Environment Plan*. If feedback is identified as sensitive by a stakeholder, Gulf Energy will make this known to NOPSEMA for the information to remain confidential.

Feedback can be directed to:

Wolfgang Fischer (Managing Director)

contact@gulfenergy.com.au

Aspect	Proposed control
Physical presence (marine users)	• Prior to commencement of activities, AUSCOAST and/or Notice to Mariners will be issued as required
Physical presence (marine fauna)	• Vessels will implement caution and no approach zones in accordance with Commonwealth regulations (EPBC Regulations 2000 – Part 8 Division 8.1 – Interacting with cetaceans)
Seabed disturbance	• Geophysical data will be used to identify any areas of sensitive habitat prior to geotechnical sampling
Light emissions	• Vessel lighting during night activities is limited to that required for navigation and safe operations
Atmospheric and greenhouse gas emissions	• Vessels will comply with requirements of Marine Order 97 (MARPOL 73/78 Annex VI), including: - sulphur content of fuel oils - nitrous oxides emissions limits - having a valid International Air Pollution Prevention certificate - having a valid Ship Energy Efficiency Management Plan (appropriate to vessel class)
Underwater sound emissions	• Vessels will implement caution and no approach zones in accordance with Commonwealth regulations (EPBC Regulations 2000 – Part 8 Division 8.1 – Interacting with cetaceans) • During high resolution reflective imaging survey, vessels will implement precaution zones and standard management measures in accordance with Commonwealth policies (EPBC Act Policy Statement 2.1 – Interaction between offshore seismic exploration and whales)
Marine pests	• Any international vessel will comply with Commonwealth regulations (Biosecurity Act) and reporting requirements (Marine Arrivals Reporting System) • Vessels will comply with Commonwealth management requirements (Australian Ballast Water Management Requirements) • Vessels will comply with requirements of Marine Order 98 and anti-fouling certificates (as appropriate to vessel class)
Planned discharges (vessel operation)	• Vessels will comply with Marine Order 96 (MARPOL 73/78 Annex IV) in relation to offshore sewage discharges • Vessels will comply with Marine Order 95 (MARPOL 73/78 Annex V) in relation to food waste discharges • Vessels will comply with Marine Order 91 (MARPOL 73/78 Annex I) in relation to oily bilge water discharges
Accidental release (minor loss of containment)	• Vessels with comply with Marine Order 91 (MARPOL 73/78 Annex I) in relation to having an approved Ship Oil Pollution Emergency Plan or Shipboard Marine Pollution Emergency Plan (as appropriate to vessel class)
Accidental release (solid waste)	• Vessels will comply with Marine Order 95 (MARPOL 73/78 Annex V) in relation to garbage management (as appropriate to vessel class)
Accidental release (marine fuel oil)	• Prior to commencement of activities, AUSCOAST and/or Notice to Mariners will be issued as required • Vessels with comply with Marine Order 91 (MARPOL 73/78 Annex I) in relation to having an approved Ship Oil Pollution Emergency Plan or Shipboard Marine Pollution Emergency Plan (as appropriate to vessel class • Spill response implemented in accordance with the response arrangements and strategies detailed in Gulf Energy's Oil Pollution Emergency Plan • Environmental monitoring in the event of a spill implemented in accordance with Gulf Energy's Operational and Scientific Monitoring Plan

Appendix C: Oil Pollution Emergency Plan

Q23/P SITE SURVEY

OIL POLLUTION EMERGENCY PLAN

Document ID	GEPL-Q23P-002	Revision	0	Date	24/03/2022

DOCUMENT HISTORY

Revision	Date	Description	Author	Reviewer	Approver
0	24/03/22	Issue for use	TG	AF, MC	WF

CONTENTS

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

Term	Definition
ADIOS	Automated Data Inquiry for Oil Spills
AIIMS	Australasian Inter-service Incident Management System
ALARP	As low as reasonably practicable
AMOSC	Australian Industry Cooperative Oil Spill Response Arrangements
AMSA	Australian Maritime Safety Authority
CMT	Crisis Management Team
DES	(Queensland) Department of Environment and Science
EMBA	Environment that may be affected
EMT	Emergency Management Team
EP	Environmental Plan
EPO	Environmental Performance Outcome
ERT	Emergency Response Team
GEPL	Gulf Energy Pty Limited
HSE	Health, safety, and environment
IAP	Incident Action Planning
IMF	Impact Modification Factor
IPIECA	International Petroleum Industry Environmental Conservation Association
MDO	Marine Diesel Oil
MES	Monitoring, Evaluation, and Surveillance
MSQ	Maritime Safety Queensland
NATPLAN	National Plan for Maritime Environmental Emergencies
NOPSEMA	(Commonwealth) National Offshore Petroleum Safety and Environmental Management Authority
NOPTA	(Commonwealth) National Offshore Petroleum Titles Administrator
OPEP	Oil Pollution Emergency Plan
OPGGS Act	(Commonwealth) *Offshore Petroleum and Greenhouse Gas Storage Act 2006*
OPGGS(E)R	(Commonwealth) Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
OSC	On-Scene Commander
OSMP	Operational and Scientific Monitoring Plan
OSTM	Oil spill trajectory modelling
OWR	Oiled wildlife response
POLREP	Marine pollution report
PRI	Potential relative impacts
QCCAP	Queensland Coastal Contingency Action Plan
QLD	Queensland
RIMS	Relative impact mitigation score

Term	Definition
SIMA	Spill impact mitigation assessment
SOPEP	Shipboard Oil Pollution Emergency Plan
TRP	Tactical Response Plan

UNITS

Term	Definition
hr	Hour
km	Kilometres
m	Metres
m^3	Cubic metres
nm	Nautical miles

INITIAL (FIRST STRIKE) RESPONSE ACTION CHECKLIST

Responsibility	Task	Comment	Complete
Observer – first person at scene	Ensure their own safety and the safety of those nearby before taking any actions.		☐
	Raise the alarm (e.g., via radio, tetra, etc.) and provide specific details about the incident.		☐
	If qualified and if it is safe to do so, attempt to control the source of the spill.	Steps may include: • single-point control (righting overturned container, patching hole in ruptured container, move to secondary bunding, etc.) • transfer equipment control (shut down pumps, close valves, isolate source, etc.)	☐
	Remain in a safe location at the site of the incident and provide updates on the incident until relieved by the On-Scene Commander (OSC).		☐
On-Scene Commander (OSC) (e.g., Vessel Master for spills from vessels)	Before taking any actions, ensure their own safety and the safety of those nearby.		☐
	Take immediate actions to control the source of the spill. If source control is not possible, ensure vessel safety by clearing the immediate vicinity of the spill, if possible.	Take appropriate steps as described in the relevant Emergency Response Plan / Vessel Procedures / Shipboard Oil Pollution Emergency Plan (SOPEP) to stop, minimise, or control the escape of oil into the environment.	☐
	Identify as much information as possible about the spill incident, including but not limited to: • any injuries, other hazards • location and coordinates • oil type • source of oil • volume of spill • spill rate • if controlled or continuing to spill • weather, tide, and current details • any nearby habitat / shoreline type, proximity to inland waterways, etc. • apparent trajectory of the spill.	Information to help identify the oil type includes: • signs on nearby tanks or pipelines from which the substance could have originated • labelling on packaging • visible sheen or colouring on water surface • vessel's Oil Record Book (if relevant; contains information on volumes and content in each tank) • Safety Data Sheets.	☐
	For all vessel spills in Commonwealth Waters, regardless of whether the vessel is engaged in a petroleum activity or not, verbally notify Australian Maritime Safety Authority (AMSA), **as soon as practicable**, to inform them of the incident.	Refer to Appendix A for verbal and written reporting details and requirements, including links to POLREP forms.	☐

Responsibility	Task	Comment	Complete
	For all spills from facilities or vessels engaged in petroleum activities (see Section 2.1), verbally notify NOPSEMA **as soon as practicable and within 2 hours**, to inform them of the incident.	Refer to Appendix A for verbal and written reporting details and requirements.	☐
	For all spills in State Waters, or moving towards State Waters, verbally notify Maritime Safety Queensland (MSQ), **within 24 hours**, to inform them of the incident.	Refer to Appendix A for verbal and written reporting details and requirements.	☐
	Contact the EMT Leader (or delegate) and relay the incident details.		☐
	Communicate directly with Site Emergency Response Team (Site ERT) members upon deployment to the incident scene and confirm resource / equipment requirements.		☐
	If required, initiate emergency shutdown and depressurise or isolate (process, power, water, etc).	Initiate remotely activated systems (if required)	☐

1 INTRODUCTION

1.1 Purpose

This Oil Pollution Emergency Plan (OPEP) outlines specific emergency response options and tactics to respond effectively to an oil spill, should a spill occur where Gulf Energy Pty Limited (GEPL) is the nominated titleholder of a petroleum permit. This document supports the *Q23/P Site Survey Environmental Plan* (EP) (GEPL-Q23P-001) submitted to National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

The objectives of this OPEP are to:

- clearly define the oil spill emergency response arrangements and capabilities that are in place for GEPL activities
- guide the GEPL emergency management team (EMT) on emergency response option selection and implementation
- detail the arrangements and capabilities in place to monitor, evaluate, and survey oil pollution to inform response options
- outline the arrangements and capability that will be in place for monitoring the effectiveness of response options and ensuring that the environmental performance outcomes (EPOs) (detailed in Site Survey EP [GEPL-Q23P-001]) are met.

This document addresses the requirement for an OPEP under the Commonwealth legislation:

- *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGS Act)
- Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (OPGGS(E)R).

The following State and Commonwealth legislation has also informed the development of this OPEP:

- (Queensland) *Environmental Protection Act 1994*
- (Queensland) Environmental Protection Regulation 2019
- (Queensland) *Maritime Safety Queensland Act 2002*
- (Queensland) Coastal Protection and Management Regulation 2017
- (Queensland) *Transport Operations (Marine Pollution) Act 1995*
- (Queensland) Transport Operations (Marine Pollution) Regulation 2018
- (Queensland) *Petroleum and Gas (Production and safety) Act 2004*
- (Commonwealth) *Navigation Act 2012*.

1.2 Scope

This OPEP covers the response to Level 2 and Level 3 events (Section 3.1) to marine or coastal waters from assets or activities within the Gulf of Carpentaria in Queensland (QLD) that are under the operational control of GEPL (Figure 1-1). This document covers unplanned oil releases to the marine environment, where a coordinated response and support of the EMT may be required. This OPEP does not cover oil spills to the terrestrial environment.

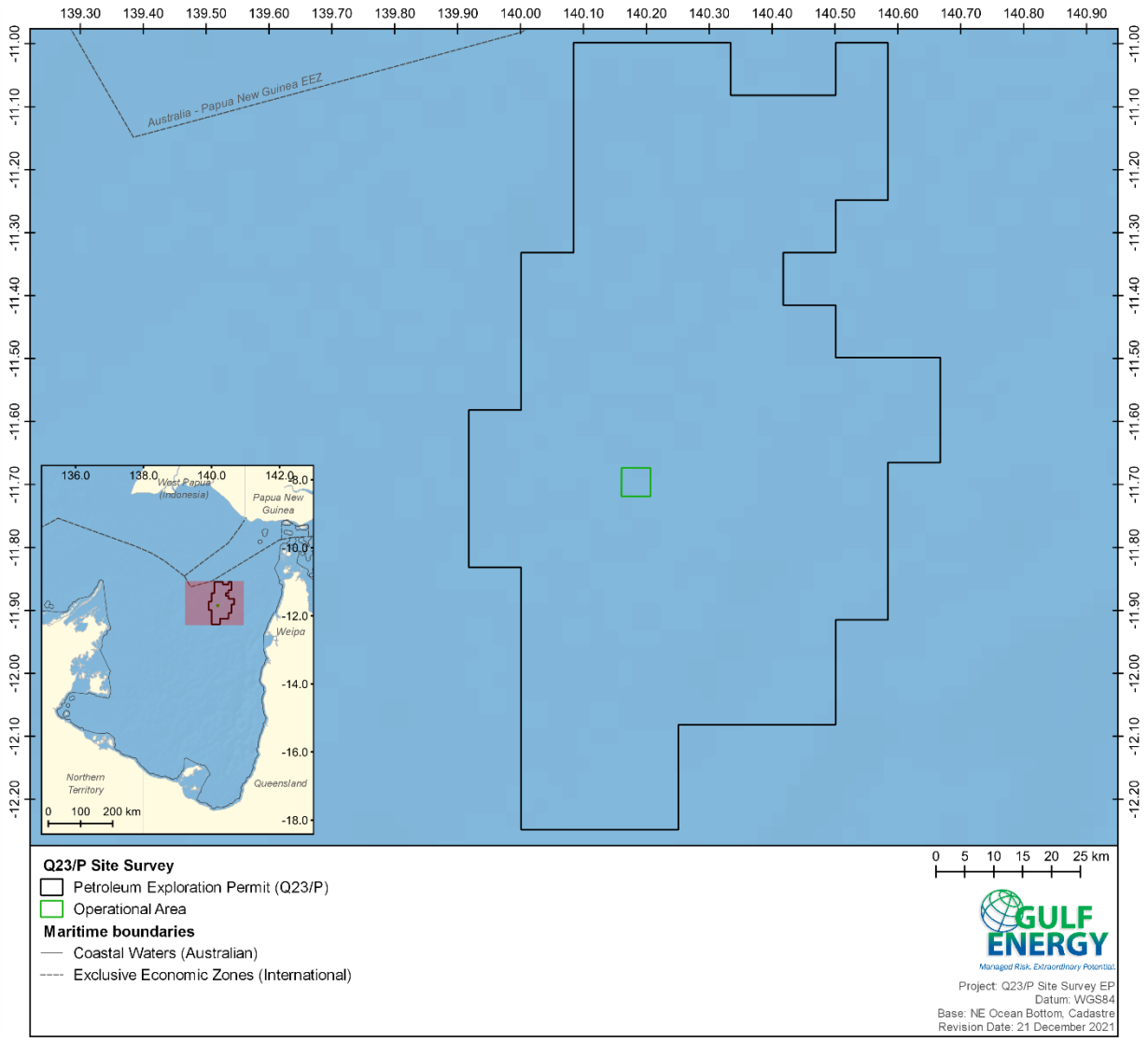


Figure 1-1: Gulf Energy activities within Gulf of Carpentaria

1.3 Response documentation interface

This OPEP interfaces with GEPL's Site Survey EP (GEPL-Q23P-001), which provides information regarding the existing environment and risks to ecological, social, economic, or cultural receptors. The EP also demonstrates that appropriate management controls are in place to reduce the potential for environmental impacts and risks to occur as a result of GEPL's activities to a level as low as reasonably practicable (ALARP) and acceptable. The EP also assesses response options that will reduce impacts and risks to ALARP and evaluate the potential impact and risks of implementing these response options.

This OPEP is consistent with, and supports, the procedures and resources provided in the GEPL, and external documents listed in Table 1-1.

Table 1-1: Documents and resources that interface with this OPEP

Reference	Summary of interface with this OPEP
GEPL documents / resources	
Operational and Scientific Monitoring Plan (OSMP)	The OSMP (Appendix D of the Site Survey EP [GEPL-Q23P-001]) describes the types of environmental monitoring that may be implemented in the event of an emergency condition that results in a Level 2 or Level 3 an oil spill to marine waters. The OSMP is the principal tool for determining the extent, severity, and persistence of environmental impacts from an oil spill.

Reference	Summary of interface with this OPEP
External documents / resources	
National Plan for Maritime Environmental Emergencies (NATPLAN) (AMSA 2020)	The NATPLAN sets out Australia's obligations under international conventions with respect to managing maritime environmental emergencies, including national arrangements, policies, and principles.
Queensland Coastal Contingency Action Plan (QCCAP) (MSQ 2021)	The QCCAP outlines the response arrangements to maritime environmental emergencies that impact on, or are likely to have an impact on, Queensland's coastal waters.
Port of Karumba. First-Strike Oil Spill Response Plan (Queensland Government 2018a)	These plans describe the spill response arrangements for an oil spill in either State or port authority waters. Following a first-strike response from GEPL, and once the Control Agency assumes incident command, the applicable Control Agency will either implement their own Plan or continue to implement Gulf Energy's OPEP.
Port of Skardon River. First-Strike Oil Spill Response Plan (Queensland Government 2018b)	
Port of Thursday Island (Port Kennedy). First-Strike Oil Spill Response Plan (Queensland Government 2018c)	
Marine Oil Spill Contingency Plan for Torres Strait (Queensland Government 2018d)	
Port of Weipa. First-Strike Oil Spill Response Plan (Queensland Government 2018e)	

2 SPILL MANAGEMENT ARRANGEMENTS

2.1 Control Agencies

The responsibility for an oil spill may vary depending on the location and origin of the spill. The NATPLAN (AMSA 2020) sets out the divisions of responsibility for an oil spill response, using these terms:

Control Agency: The organisation assigned by legislation, administrative arrangements, or within the relevant contingency plan, to control response activities to a maritime environmental emergency. Control Agencies have the operational responsibility for response and clean-up activities but may have arrangements in place with other parties to provide response assistance under their direction.

Jurisdictional Authority: The agency responsible for verifying that an adequate spill response plan is prepared and, in the event of an incident, that a satisfactory response is implemented. The Jurisdictional Authority is also responsible for initiating prosecutions and the recovery of clean-up costs on behalf of all participating agencies.

Table 2-1 summarises the designated Control Agency and Jurisdictional Authority for Commonwealth and State waters and for vessel and petroleum activity spills.

Table 2-1: Jurisdiction Authority and Control Agency arrangements

Jurisdictional boundary	Spill source	Jurisdictional Authority	Control Agency	
			Level 1	Level 2/3
Commonwealth waters (3–200 nm from territorial / state sea baseline)	Oil spill from offshore petroleum activity	NOPSEMA	Petroleum titleholder	Petroleum titleholder
	Vessel marine pollution	AMSA	AMSA	AMSA
State waters (waters to 3 nm from the mainland and some areas around offshore atolls and islands)	Oil spill from offshore petroleum activity	Maritime Safety Queensland (MSQ)	Petroleum titleholder, MSQ	MSQ
	Vessel marine pollution	MSQ	MSQ	MSQ
Port Authority waters (gazetted port boundary)	Oil spill from offshore petroleum activity	MSQ	Petroleum titleholder, MSQ	MSQ
	Vessel marine pollution	MSQ	MSQ	MSQ

2.1.1 Commonwealth waters

The following arrangements apply in Commonwealth Waters:

- **Petroleum titleholders** are the Control Agency for all spills (Level 1 to Level 3) from offshore petroleum activities or facilities in Commonwealth waters. Petroleum activity spills include those from fixed platforms, floating storage and offloading systems, mobile offshore drilling units, and subsea infrastructure. It also includes vessels undertaking construction, decommissioning, and pipelaying activities in the titleholder's operational area, which are considered facilities (Australian Government 2006). A 'facility' is defined by Schedule 3, Part 1, Clause 4 of the Commonwealth OPGGS Act.
- The **Australian Maritime Safety Authority (AMSA)** is the Control Agency for vessel (shipping) spills in Commonwealth waters from vessels not undertaking offshore petroleum activities, such as vessels undertaking seismic activities, supply vessels, or support vessels. As the petroleum titleholder, GEPL will carry out first-strike response activities (e.g., surveillance operations) until AMSA or a nominated NATPLAN agency arrives to assume incident command (as the Control Agency). GEPL will continue to implement the monitoring, evaluation, and surveillance (MES) activities outlined in this OPEP as deemed necessary by the Control Agency.

2.1.2 State, or Port Authority waters

The following arrangements apply in Queensland:

- **Maritime Safety Queensland (MSQ)** is responsible for the management of oil spills within Queensland's coastal and internal waters
- **Petroleum titleholders** are the first strike Control Agency for Level 1 spills in State waters, unless otherwise agreed with MSQ
- **MSQ** is the Control Agency for Level 2 and Level 3 spills in State waters resulting from an offshore petroleum activity or vessel (in accordance with the QCCAP (MSQ 2021))
- Local Disaster Management Groups can be activated to support marine pollution response operations and/or manage the clean-up of pollutants from impacted shorelines
- as the petroleum titleholder, GEPL will conduct the first-strike response for all marine pollution incidents in State or Port Authority waters until MSQ or a nominated NATPLAN agency arrives to assume incident command. GEPL will continue to implement the MES activities outlined in this OPEP as deemed necessary by the Control Agency.

In the event of an oil spill or ship-sourced pollution incident from GEPL's petroleum activities:

- the GEPL EMT Leader will report the incident as part of the 'activation of teams' process to MSQ, should the incident occur in QLD State waters or a QLD's Port Authority waters
- MSQ will provide a liaison officer to the GEPL EMT who will guide and support GEPL. This deployment may include additional personnel (with various technical or subject matter expertise) to form a liaison team, as agreed between MSQ and GEPL
- Shipboard Oil Pollution Emergency Plan (SOPEP) will be activated if a vessel is involved in an incident which results in the discharge of oil.

2.2 Multi-jurisdictional incident coordination

Multi-jurisdictional incidents (i.e., a Commonwealth and State Waters oil spill's emergency resulting from the same incident) will be managed in accordance with the NATPLAN (AMSA 2020) and the QCCAP (MSQ 2021).

The coordination arrangements for multi-jurisdictional incident response will depend on the risk, severity, and impact of the incident for each jurisdictional and Control Agency area. The following measures, based on the NATPLAN and QCCAP, may be considered as part of an agreed incident management framework:

- GEPL (and/or their contractors) will provide first-strike response and all necessary resources (including personnel and equipment) as a supporting agency
- the Control Agency appoints a lead Jurisdictional Authority, Control Agency, or EMT for particular response management functions
- the Control Agency establishes a Joint Strategic Coordination Committee to direct and prioritise activities, and resolve conflicts
- the Control Agency transitions incident control between jurisdictions
- the Control Agency uses a coordination plan to formalise the arrangements.

3 TEAM ACTIVATION

3.1 Spill level classification

The incident level will determine where the resources will be drawn from to respond to the spill and the level of incident management needed to manage the response effort. If a spill occurs where effective response is considered beyond the capabilities within a level, the response will be escalated immediately to the next level.

The decision to escalate a response to a higher level (as defined in Table 3-1) will be made by the responsible Control Agency (Table 2-1). If the response level is undetermined, then a worst-case scenario should be assumed when activating resources, as it is always possible to scale down the response effort. Section 3.2 describes the links between oil spill classification and GEPL EMT activation.

Table 3-1: Oil Spill Severity and Response

Characteristic	Level 1 Minor or Simple	Level 2 Moderate or Complex	Level 3 Major, Complex / Compound
GEPL emergency classification			
Team activated	Site Emergency Response Team (Site ERT)	Site ERT EMT	Site ERT EMT CMT
Team informed	EMT	Crisis Management Team (CMT)	N/A
Type of emergency			
Type of response	First-strike	Escalated	Campaign
Duration of response	Single shift	Multiple shifts Days to weeks	Extended response Weeks to months
Resources required	Requires on-site resources	Requires intra-state resources	Requires national or international resources
Consequence of emergency			
People	Potential for serious injuries	Potential for loss of life	Potential for multiple loss of life
Environment	Isolated impacts or with natural recovery expected within weeks	Significant impacts and recovery may take months. Monitoring and remediation may be required.	Significant area and recovery may take months or years. Monitoring and remediation will be required.
Asset	Minor site or building damage; Negligible damage	Localised substantial damage. Partial to major site shut down	Total loss of production; Total site shutdown
Reputation	Local and regional media coverage	National media coverage	International media coverage

3.2 Response team activation

GEPL's emergency management structure is scalable according to the level of incident. In general, incident response is managed by the GEPL's response teams. The relationship between these teams is provided in Figure 3-1 and Figure 3-2. This structure is consistent with the Australasian Inter-service Incident Management System (AIIMS) structure, adopted by NATPLAN and QCCAP, where the CMT Leader holds overall management responsibility for activities to control the incident. Use of this structure provides consistency in role definition between GEPL, and regulator or industry plans and allows external trained

resources to fit seamlessly into the EMT structure in a surge capacity. Figure 3-3 shows the EMT activation process and its interaction with AMSA or MSQ during response operations.

GEPL will comply with legislative requirements regarding cost recovery for oil pollution incidents that may occur as a result of the petroleum activities covered by the Site Survey EP (GEPL-Q23P-001).

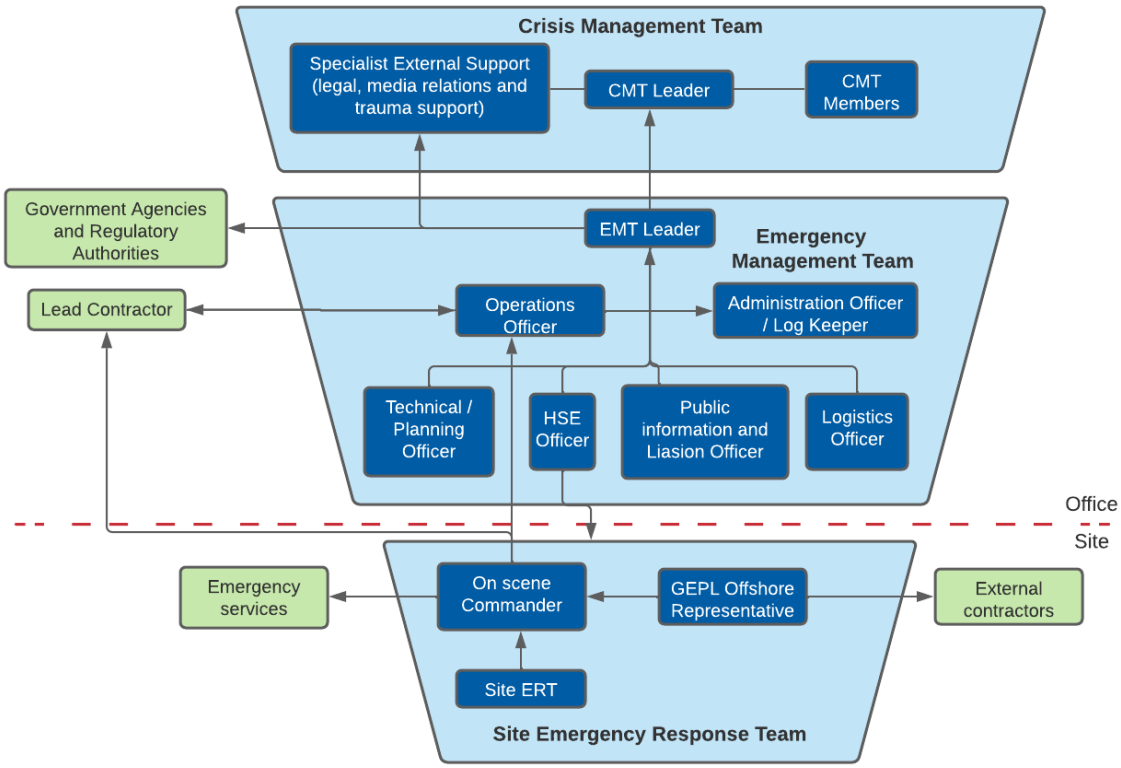


Figure 3-1: Emergency Response Organisation

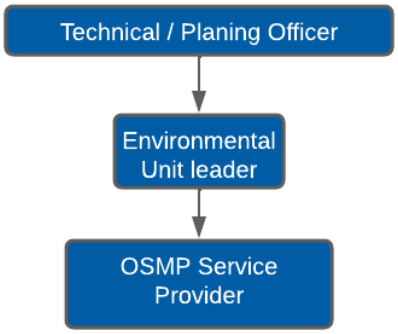


Figure 3-2: Planning Response Organisation

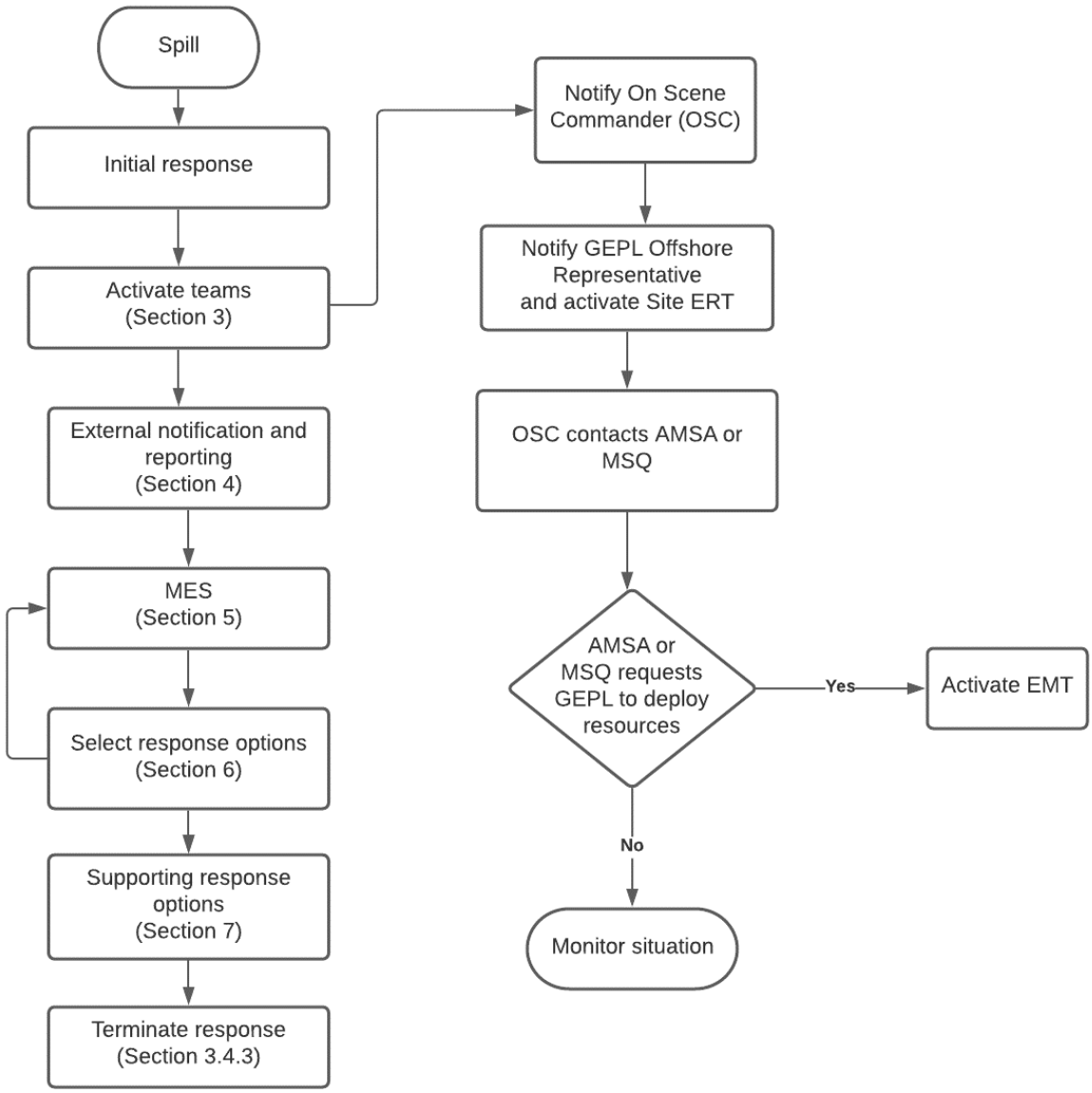


Figure 3-3: EMT activation process for vessel spills

3.3 Activation of internal and external resources

Internal and external support will be activated should additional assistance is required to respond to an emergency event. Response resources will be activated either in sequence or simultaneously, depending on the severity of the spill.

3.3.1 Internal roles and responsibilities

Table 3-2 provides an overview of GEPL emergency team roles and responsibilities in responding to an oil spill incident.

Table 3-2: Emergency response teams roles and responsibilities

Role	Responsibilities
Site ERT	
On Scene Commander	• Management of the site emergency in order to mitigate its effects on personnel, assets and the environment • Contact the Control Agency (AMSA or MSQ) and NOPSEMA to report the situation (refer to Appendix A for verbal and written reporting details and requirements)

Role	Responsibilities
	• Contact EMT Leader and keep EMT informed (as required) • Control access to the site • Ensure incident area is kept secure until an investigation (if required by Control Agency) has been conducted.
Site ERT	• Command the onsite response, including oil spills, using onsite resources • Direct all media and external affairs inquiries, if any, to the EMT
EMT	
EMT Leader	• If required, activate the EMT and establish an action plan • Contact the CMT Leader, and keep CMT informed (as required) • Establish incident response objectives and strategies to be followed • Establish immediate priorities • Initiate, maintain and control the communication process within the organisation • Assess the status of the response • Approve, implement, and evaluate the Incident Action Plan (IAP) • Approve requests for additional resources or for the release of resources • Authorise the release of information through the Public Information Officer • Ensure completion of incident after-action reports • Ensure submission and completion of all written reports to regulatory entities (refer to Appendix A for verbal and written reporting details and requirements)
Operations Officer	• Provide the primary communications interface between the Site ERT and the EMT • Assist in the management of the emergency response • Advise on tactical response operations to achieve key priorities such as safety of people, protection of the environment and adequate source control activities • Supervise the execution of the IAP • Provide progress situation reports to the EMT Leader
Admin Officer / Log Keeper	• Maintain accurate, up-to-date incident documents • Record information about the incident (either electronic and/or hard copy)
Technical / Planning Officer	• Collect, evaluate, and communicate to the EMT the tactical information related to the incident • Prepare and document the IAP • Maintain a register of resources allocated or requested • Develop a recovery plan and strategy • Provide support services such as radio, document distribution and electronic devices to the Site ERT and/or EMT as required • Implement a shift, changeover and demobilisation plan if required • Collect, review, and store incident records to identify lessons learned and determine an action plan, if required.
Health, Safety and Environment (HSE) Officer	• Monitor on-scene safety conditions and develop measures to ensure the safety of all response personnel • Ensure internal policies are implemented/carried out (e.g., fatigue management, training programs) • Ensure all relevant information is collected and stored/preserved for subsequent incident investigation • Support the EMT with the emergency response process
Public Information and Liaison Officer	• Responsible for all interaction between EMT, and the news media and the public • Primary contact person for representatives of stakeholder organisations

Role	Responsibilities
	• Develop and coordinate the release of information on the situation and response efforts • Establish and coordinate inter-organisational contacts • Maintain updated a list of assisting organisations and corresponding representatives
Logistics Officer	• Provide facilities, services, and materials for the incident response • Estimate future service and support requirements • Provide progress situation reports to the EMT Leader
CMT	
CMT Leader	• Manage overall crisis response to any Level 3 incident • Provide incident briefing and ongoing updates to CMT Members
CMT Members	• Identify reputational issues and relevant local stakeholders • Track and document all costs and expenditures of the crisis response • Coordinate with insurance on claims
Specialist External Support	• Advise CMT Leader on on-going legal and reputational aspects • Advise CMT Leader of financial commitments in the response • Liaise with Public Information and Public Information Officer regarding to overall media strategy

3.3.2 External resource activation

The EMT is responsible for activating external resources. Table 3-3 outline organisations that can support GEPL in the event of a Level 2 or Level 3 incident.

Table 3-3: External Oil Spill Response Agency, Support Services and Activation

Support agency	Support services
AMSA	AMSA Activation Procedure: Initial request to the Environment Protection Duty Officer via the 24-hour emergency response centre on **1800 641 792**. This verbal request must be followed by **written confirmation within three hours**. Resources: • AMSA maintains strategic equipment stockpiles (six in QLD [Horn Island, Cairns, Townsville, Mackay, Gladstone, and Brisbane] and one in Northern Territory [Darwin]) (AMSA 2020). • Resources includes advisory services, personnel, and oiled wildlife response equipment (OWR) available in QLD and NT.
MSQ	MSQ Activation Procedure: Initial request to the Maritime Safety Queensland via the 24-hour emergency response centre on **1300 551 889**. Resources: • State Response Team, Regional Response Team, and National Response Team for rapid deployment to support GEPL's EMTs. • there are four MSQ spill response equipment stockpiles close to the Operational Areal (Weipa, Karumba, Skardon River and Thursday Island).
AMOSC^	AMOSC Activation Procedure: Initial call (**as early as possible**) to **0438 379 328** must be channelled via AMSA to require AMOSC's support (AMOSC 2021a). Equipment:

Support agency	Support services
	AMOSC's stockpiles of equipment include dispersant, containment, recovery, cleaning, absorbent, and communications equipment. Equipment is located in Geelong, Fremantle, Exmouth and Broome. Oiled wildlife equipment is also available in these locations.

^ Support from AMOSC is unlikely to be required for the activities within scope of the Site Survey EP (GEPL-Q23P-001).

3.4 Spill response processes

3.4.1 Incident Action Planning (IAP) process

An Incident Action Plan (IAP) will be prepared at the time of the spill, outlining the short-term operational objectives and activities for the response. The IAP will detail the response mechanisms and priority areas for protection based on the actual circumstances of the event, considering the spill trajectory and weather conditions, but also importantly safety considerations. The IAP will provide details of the operational activities and objectives to be achieved over a specified, short-term period. Initially this may be for the subsequent first strike few hours only, but once the operation is underway it is likely to address the activities required over each of the following 24-hour periods or longer.

The key steps in planning the response and preparing the IAP are:

- understanding the situation – identify emergency priorities (people, environment, business continuity and reputation)
- setting incident objectives – what are we trying to do and what are we trying to protect?
- describing the strategies – for example, deployment of vessels for containment and recovery
- developing the tactics – detail how the GEPL EMT will undertake these strategies, including responsibilities, logistics, etc.

The GEPL EMT will implement and monitor the effectiveness of the IAP process ensuring regular updates to the plan are made as appropriate.

To ensure that the IAP is appropriate for the nature of the spill, GEPL will seek the advisory support of technical experts or liaison officers from MSQ and/or AMSA.

3.4.2 Spill Impact Mitigation Assessment (SIMA)

The SIMA process is used to compare response effectiveness as well as the possible impacts arising from implementing various response options (IPIECA 2017). SIMA helps determine the most appropriate strategy to respond adequately to an oil spill event. GEPL has completed a SIMA to inform the response preparedness and capability assessment for activities covered under the Site Survey EP (GEPL-Q23P-001) to identify which response options would likely be selected to enable an effective and efficient first-strike response to a spill event covered under the EP. The outcomes of the SIMA are provided in Section 6.4.

In the event of a spill, GEPL will use SIMA to review the effectiveness of response techniques. These "operational SIMAs" will support response decision making and confirm whether the assumptions made in the planning process are valid and effective. A SIMA will feed into the IAP and will be conducted / reviewed on the same frequency as the IAP.

3.4.3 Termination of response and demobilisation

The termination of a spill response includes ceasing response operations, post-incident reporting, reviewing, and updating plans, restoring and recovering injured environments.

In accordance with the NATPLAN (AMSA 2020), the decision to terminate response operations is made in conjunction with relevant government authorities, which may include MSQ for State waters and AMSA and NOPSEMA for Commonwealth waters. The response termination process may require days to complete, depending on the scope and scale of the response. Figure 3-4 summarises the process for terminating an oil spill response and the associated activities.

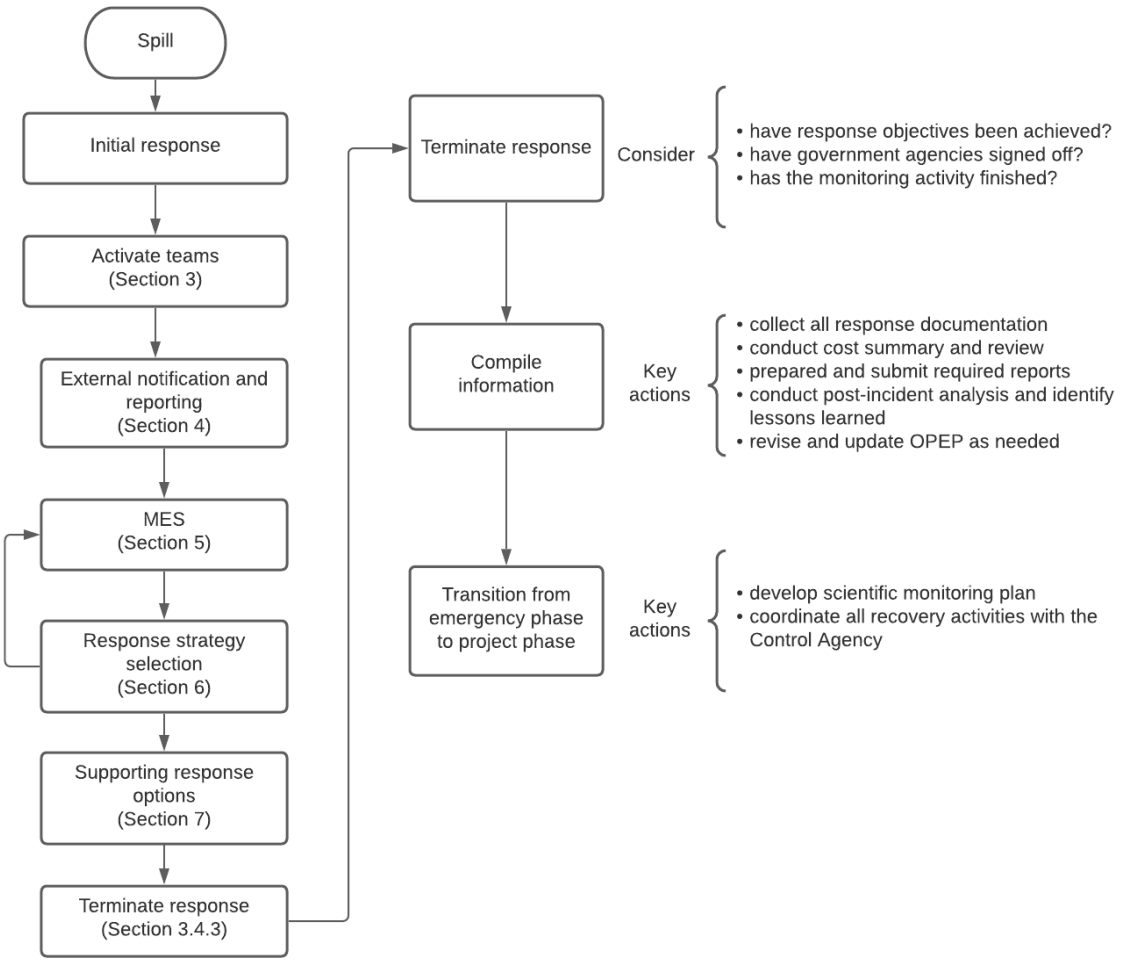


Figure 3-4: Response termination process

4 EXTERNAL NOTIFICATION AND REPORTING

The Public Information and Liaison Officer is responsible for coordinating all external notifications and reporting. This task may be delegated to other appropriate members of the EMT, at the discretion of the Public Information and Liaison Officer or EMT Leader.

Figure 4-1 shows the process for determining the appropriate external notification and reporting requirements for this OPEP. Appendix A provides additional external notification and reporting information, including relevant legislation, responsible parties and links to spill notification and reporting forms.

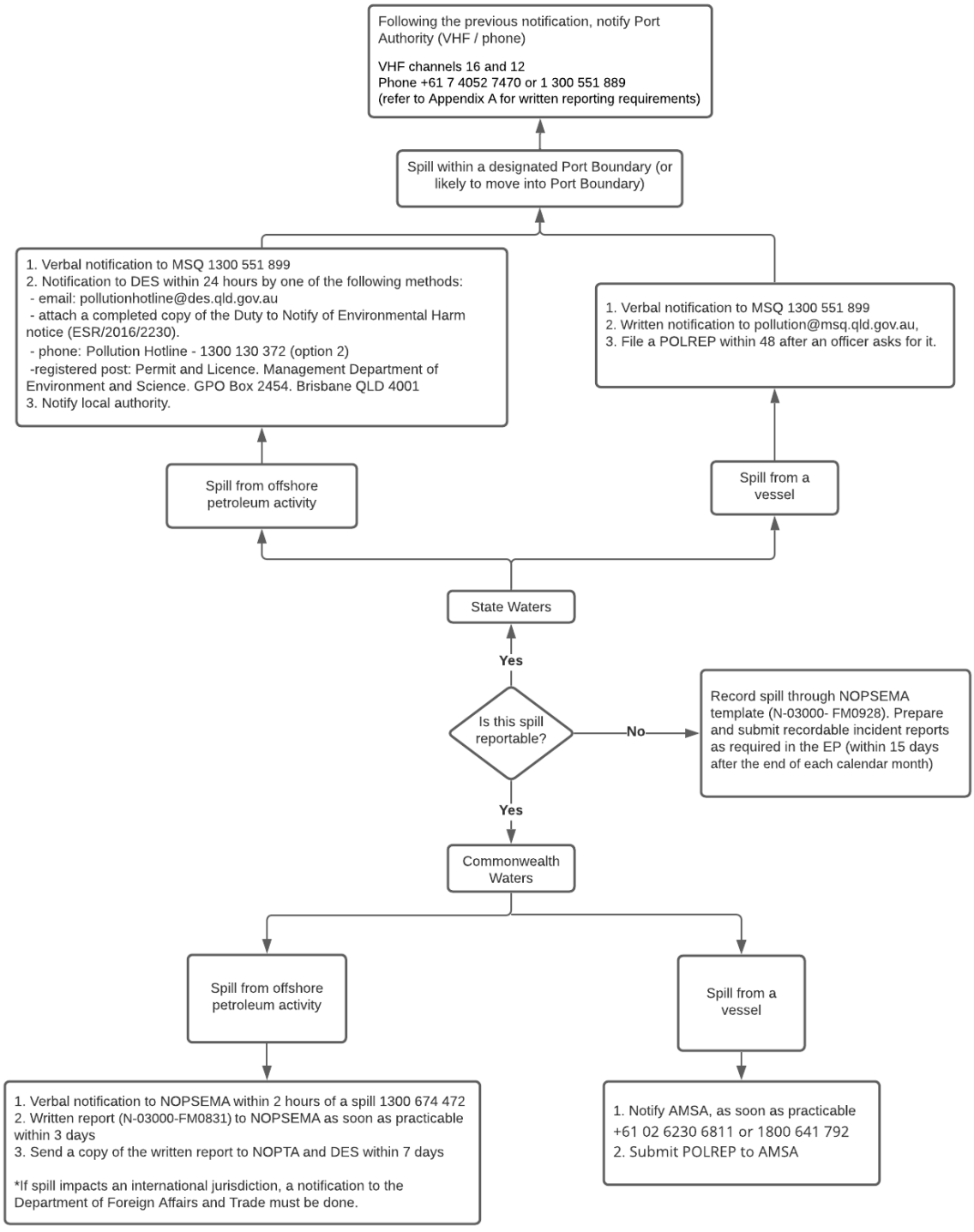


Figure 4-1: External notification guide

5 MONITORING, EVALUATION, AND SURVEILLANCE

Objective	To acquire and maintain situational awareness and assess the effectiveness of response options during a spill event to inform EMT decision-making. This strategy will be implemented continuously during the period of the incident response.
Initiation criteria	MES will be initiated for every spill to water as soon as the spill is identified. This may range from visual observation only, through to more involved monitor and evaluate tactics.
Termination criteria	MES will be terminated when the following criteria have been met: • the spill is no longer visible to surveillance personnel. Specifically, a 'silvery / grey' sheen, as defined by the Bonn Agreement Oil Appearance Code, is no longer observable • a subsurface plume is no longer detected using fluorometry • agreement is reached with Jurisdictional Authorities (i.e., AMSA and / or MQS) and stakeholders to terminate the incident response.

5.1 Overview

Oil spill monitoring, evaluation, and surveillance (MES) is important for anticipating resources at risk of exposure, directing response resources, and evaluating the effectiveness of response techniques. Accurate, timely, and ongoing information about a spill's location, extent, and movement is critical to spill response decision-making and provides ground-truthing of spill trajectory modelling.

MES should be conducted throughout the response duration, as determined by the process outlined in Section 6. MES of an oil spill helps determine whether further action is required and helps inform the decision-making for prioritising the protection of sensitive receptors. MES also provides valuable information to feed into SIMA, coordinating other response options and continually assessing the effectiveness of those spill response options.

5.2 Tactics

This OPEP includes MES tactics that may be used to evaluate the parameters and potential trajectory of the spill. GEPL has utilised the SIMA process (Section 6.4) to evaluate the efficiency of each tactic against environmental compartments according to EP's worst-case scenario using the following criteria:

- 0: No or Insignificant efficacy and suitability
- 1: Minor efficacy and suitability
- 2: Moderate efficacy and suitability
- 3: Major efficacy and suitability

The outcome of the assessment is provided in Table 5-1.

Table 5-1: Tactics efficacy and suitability

Resources at risk	Trajectory Modelling	Tracking Buoy Deployment	Visual Observation^	Remote Sensing
Lower water column	0	0	0	0
Upper water column	2	1	0	1
Water surface	1	3	1	1
Total	3	4	1	2

^ Visual observations from aircraft and / or vessels

Based upon the response tactic effectiveness for the spill scenarios covered in this OPEP, GEPL identified the following tactics as the most effective for monitoring a surface release of light marine fuel in offshore Commonwealth waters:

- **Trajectory Modelling** – uses computer models and computational techniques to estimate the speed and direction of movement, weathering spread patterns, and impacts of an oil spill
- **Tracking Buoy Deployment** – uses a buoy deployed to the water surface to track an oil slick's movement.

An operational monitoring program (Appendix D of the Site Survey EP [GEPL-Q23P-001]) is triggered when initiation criteria for the various assessment components are met. Given the nature and scale of the worst-case credible spill event under the EP, operational monitoring includes marine fauna surveillance. Initiation and termination triggers for those tactics are detailed in the Appendix D of the Site Survey EP [GEPL-Q23P-001]).

5.3 Implementation

Appendix B guides the Site ERT and EMT on tasks and responsibilities considered when implementing MES. Depending on the circumstances of the spill, they may determine that some tasks be varied, should not be undertaken, or should be reassigned.

6 RESPONSE STRATEGY SELECTION

This OPEP incorporates all response options and tactics that may be appropriate for the credible spill scenarios presented in the Site Survey EP (GEPL-Q23P-001).

6.1 Response objectives

For spills where GEPL is the Control Agency, the response objectives are to develop and implement appropriate and effective response strategies commensurate to the spill's scale, nature, and risk. The receptors (described within the EP) that the response strategy is designed to protect are:

- biologically important areas and species
- key ecological features
- socioeconomic receptors.

6.2 Implementation timing

Implementation times are based on these assumptions:

- implementation is defined as when mobilisation (of people, equipment, or third-party contractors) has commenced for the core activity described
- if an emergency occurs where human safety is at risk, minimum implementation times may vary
- for safety and efficiency reasons, GEPL will not conduct oil spill response operations at night; therefore, implementation times are considered paused during night-time hours (e.g., if an incident is reported at 1700 hours and the sun sets at 1800, only one hour of 'implementation time' is considered to have elapsed until sunrise the following day).

Factors outside GEPL's control, such as weather, may affect activation, mobilisation, and implementation times.

6.3 Identification of resources at risk (protection priorities)

Effective planning and implementation of the strategic objectives requires that sensitive environmental receptors are identified and then prioritised for protection. Prioritising the importance of receptors helps determine response needs for an oil spill. Understanding the presence of these receptors, how they are affected by oil, why they are important, and how to effectively protect them is a crucial step in oil spill preparedness. Identifying and prioritising resources at risk also assists with developing other oil spill planning tools, such as spill assessment and tactical response plans.

6.3.1 Shoreline sensitivity analysis

Shoreline sensitivity analysis was undertaken to support protection prioritisation and subsequent identification of priority response planning areas. The analysis was completed following IPIECA principles and was informed by the regional description of the environment and understanding of receptor presence in the region. Shoreline types and habitats within this region have been ranked based upon sensitivity to oil exposures in accordance with the criteria detailed within Table 6-1.

Table 6-1: Sensitivity to oil exposure criteria

Sensitivity	Criteria
High	Region of known sensitive habitat (mangrove, salt marshes, and sheltered tidal flats) which if impacted may have significant impacts and long recovery periods.
	Presence of known threatened species feeding, breeding, nesting or congregation areas.
	Areas of national significance or biological processes for species of national significance (e.g., breeding sites and National and State Parks, Commonwealth Heritage listed areas).

Sensitivity	Criteria
	Identified marine sanctuary or reserve.
Moderate	Region of known moderately sensitive habitats (sheltered rocky rubble coasts, exposed tidal flats, gravel beaches, mixed sand, and gravel beaches) which have a medium recovery period (~2-5 years).
	Presence of known threatened species or cultural heritage impacted.
	Region of significant commercial activity (e.g., fishing, tourism).
	Places of public interest such as beaches.
Low	Region of known low sensitivity habitat (fine grained beaches, exposed wave-cut platform and exposed rocky shores) which have a rapid recovery period (~ 1 year).
	Minimal impact to marine life, business, public areas, or cultural heritage items.

6.3.2 Priority response planning areas

Spill scenarios and associated modelling were utilised to define the environment that may be affected (EMBA) (refer to the Site Survey EP (GEPL-Q23P-001), and further analysed to determine the priority response planning areas for the spill events documented within this plan.

Based upon the understanding that it takes approximately 5 days to properly develop and ground-truth a tactical response plan (and 24–48 hours to mobilise equipment and personnel to site), highly sensitive areas with the potential to be exposed to oil within 7 days were identified as the priority response planning sites for this OPEP.

Table 6-2: Estimated time to develop a task

Task	Estimated Time (days)
Oil Spill Trajectory Modelling (OSTM) to identify potentially affected areas	1
Drafting of Tactical Response Plan (TRP)	1
Consultation with key stakeholders	2
Ground-truthing of TRP (Site Visit)	1
Mobilisation of equipment and resources	1-2
Total	**7 Days**

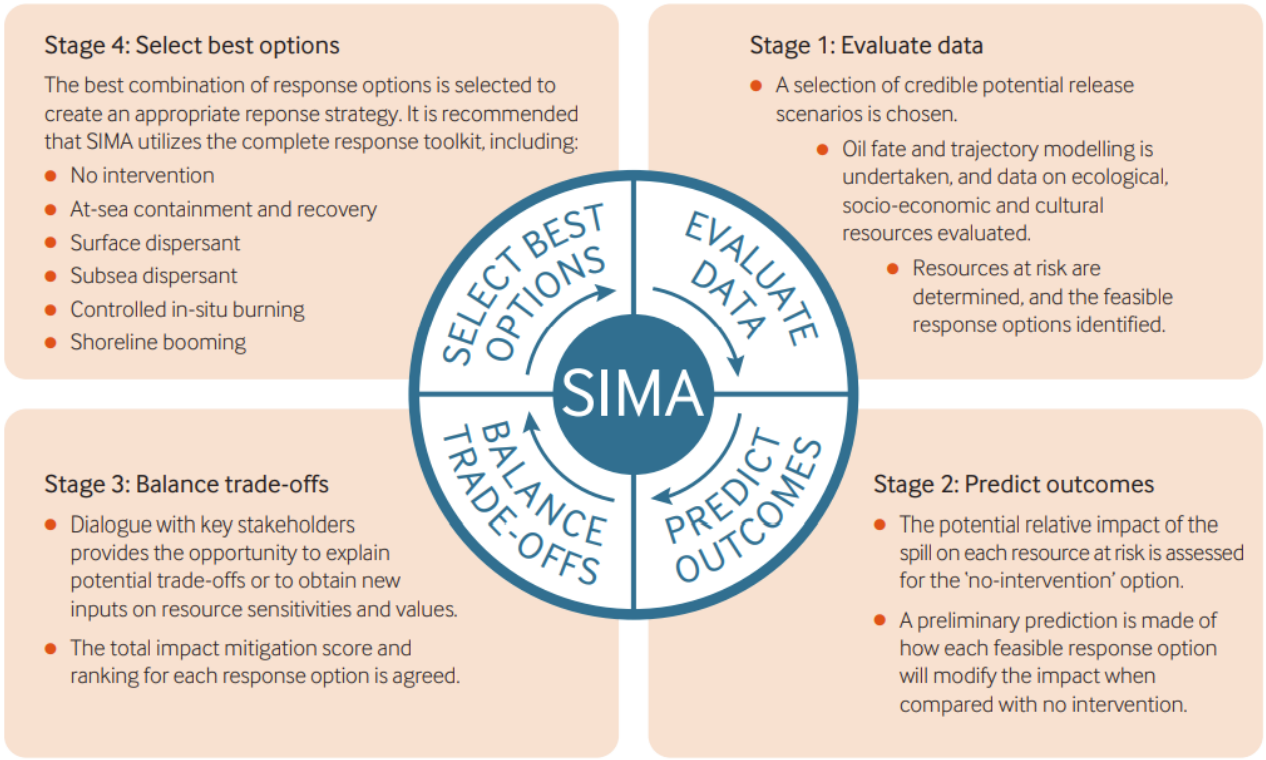
6.3.3 Tactical Response Plans

Based upon the nature of the spill event, the behaviour of oil when released to the environment, no priority response areas were identified for this spill event.

Consequently, no TRPs or pre activity, location specific response planning has been completed.

6.4 Spill Impact Mitigation Assessment

The SIMA process can identify and compare the effectiveness and possible impacts of response options selected (IPIECA 2017). SIMA helps determine the most appropriate strategy to respond adequately to an oil spill scenario. SIMA is undertaken throughout a four-stage process, summarised in Figure 6-1.



Source: (IPIECA 2017)

Figure 6-1: Summary of the SIMA methodology

6.4.1 Stage 1

Evaluation of potential release scenarios is based upon risks associated with the petroleum activity and environmental resources identified in the Site Survey EP (GEPL-Q23P-001), thus have not been duplicated here. However, in summary, the spill event detailed in the EP is:

- a 200 m^3 surface release of a light marine fuel (i.e., marine diesel oil [MDO])
- ADIOS modelling indicates no surface oil is present after ~72 hours
- no shoreline exposure is expected
- after ~12 hours, approximately 25% (50 m^3 of the 200 m^3) of the oil has evaporated, and ~30% (60 m^3 of the 200 m^3) has been dispersed into the water column.

The scenario was evaluated against each potential response option (Table 6-3) to determine their deployment feasibility.

Table 6-3: Potential Response Option Definition

Potential Response Option	Description	Feasibility
No intervention	Natural attenuation of a spill	Feasible
On-water containment and recovery	Barrier that traps oil in a thick layer on the water's surface	Feasible
Subsea dispersant injection	Deployment of a subsea dispersant manifold to inject dispersant directly into the oil plume	No subsurface oil release is included within the EP. Therefore, subsea dispersant injection is not considered to be a feasible response technique for this spill scenario
Surface dispersant application	Deployment of a surface dispersant that helps break up an oil slick	Feasible

Potential Response Option	Description	Feasibility
Controlled in-situ burning	Controlled combustion or burning of oil vapors from spilled oil.	As MDO is highly volatile and will readily evaporate, and / or readily entrain into the water column under wind / wave action, controlled in-situ burning is not considered to be a feasible response technique for this spill scenario
Shoreline booming	Physical barriers which slow the spread of oil and keep it contained protecting sensitive habitats and minimising the consequences of an oil spill reaching shore.	As spill events associated with the petroleum activity will not impact shoreline habitats, these response options are not considered suitable
Shoreline protection and deflection	Physical barriers to protect sensitive receptors from oil, or to deflect oil to other strategic areas.	

6.4.2 Stage 2

Once the spill scenario and the feasible response options were identified, GEPL then identified the resource compartments for the impact mitigation assessment to be completed. Based upon the location of the activity, the following compartments were considered appropriate:

- seabed
- water surface
- water column
- air
- shorelines
- high value resources
- socioeconomic
- cultural.

Based upon the risk assessment (and more specifically the consequence evaluation completed within the Site Survey EP (GEPL-Q23P-001), GEPL assigned a potential impact level to each of the compartments on the assumption that no intervention or response was implemented. GEPL's potential relative impacts (PRI) are classified according to Table 6-4.

Table 6-4: Potential relative impact level classification

Impact	Classification
None	0
Low	1
Medium	2
High	3

6.4.3 Stage 3

GEPL reviewed each feasible response option and assigned an impact modification factor (IMF). The IMF shows how each potential response option would alter the 'no intervention' scenario. The level of impact was identified using one of the modification factors shown in Table 6-5.

Table 6-5: Impact modification factor definition

Impact modification factor	Description
+3	Major mitigation of impact
+2	Moderate mitigation of impact
+1	Minor mitigation of impact
0	No or insignificant alteration of impact
-1	Minor additional impact
-2	Moderate additional impact
-3	Major additional impact

After evaluating the impact modification of potential responses, a relative impact mitigation score (RIMS) was calculated. RIMS represents the relative change that each response option is likely to have on each resource compartment. GEPL ranked the response options to determine which would provide the highest environmental mitigation. The outcome of this assessment is provided in Table 6-6.

Table 6-6: SIMA assessment

Resource Compartments	No intervention		Containment and recovery		Surface dispersant	
	PRI		IMF	RIMS	IMF	RIMS
	Impact	A	B1	A x B1	B2	A x B2
Seabed[1]	None	0	0	0	0	0
Lower water column (>20 m)	None	0	0	0	-1	0
Upper water column (<20 m)	Low	1	1	1	-2	-2
Water surface Limited sensitivity (offshore) with more sensitivities close to shore	Low	1	1	1	-2	-2
Air	Not applicable					
Shorelines[2]	Not applicable					
High value resources[3]	Not applicable					
Socio-economic[4] Shipping	None	0	1	0	-1	0
Socio-economic Commercial fisheries	Medium	2	1	2	-2	-4
Cultural	Not applicable					
Total:		4		4		-8
Ranking:		1st		1st		3rd

[1] Activities will be conducted in Commonwealth waters depths ranging between ~60–70 m.
[2] The closest land is >100 km from the project's activities.
[3] There are no identified BIAs within the operational area.
[4] There are no identified Commonwealth commercial fisheries within the operational area. There is one active state commercial fishery identified within the operational area. The project has identified proximity to shipping lanes.

6.4.4 Stage 4

The assessment indicates two feasible options:

- natural recovery and monitoring (no intervention)
- containment and recovery.

Although containment and recovery is a feasible response technique to implement in a surface vessel spill, it is not practicable to mobilise all the equipment, vessels and people out to the spill location within 48 hours. Further to this, as MDO is known to readily entrain, the SIMA indicates limited benefit for implementing this type of response. GEPL would closely monitor the situation through MES tactics and be available to activate and escalate additional responses in the improbable event that they were required.

6.5 Preliminary response option identification

Based upon the outcomes of the SIMA, GEPL would only plan to implement MES for the vessel spill scenario identified within the Site Survey EP (GEPL-Q23P-001), and not any other response option.

7 SUPPORTING RESPONSE FUNCTIONS

7.1 Oiled wildlife

Objective	Implement tactics to reduce impact and damage to fauna threatened by a spill
Initiation criteria	Oiled wildlife response (OWR) will be initiated when MES activities and / or operational monitoring activities indicate wildlife are at risk of contact, or have been contacted by the spill
Termination criteria	OWR will be terminated when the following criteria have been met: • agreement is reached with jurisdictional authorities and stakeholders to terminate the response • no wildlife has been observed in the trajectory of the spill • oiled wildlife has been successfully rehabilitated.

7.1.1 Overview

OWR is a support function that is implemented alongside other response options if applicable and commensurate to the scale and nature of the spill. The response includes wildlife hazing, pre-emptive capture, and capturing, cleaning, treating, and rehabilitating animals that have been oiled. OWR also includes collecting dead animals, performing post-mortem examinations, and disposing of dead animals that have succumbed to the effects of oiling.

The responsibility for an OWR depends on location and spill origin. These arrangements will apply for GEPL operations:

- if the OWR is required in State waters, the Queensland Department of Environment and Science (DES) will be the Jurisdictional Authority and will support MSQ, the Control Agency
- GEPL is the Control Agency for OWR in Commonwealth waters.

The arrangements for OWR in QLD are outlined in the Wildlife Response Plan for Maritime Environmental Emergencies Procedure (DES 2021). DES has developed the Procedure to define the minimum standards for OWR in QLD as part of its responsibilities outlined in the QLD State Disaster Management Plan. The Procedure can also guide OWR in Commonwealth waters; however, the OWR requirements in State waters are typically greater.

7.1.2 Tactics

OWR tactics and techniques are intended to mitigate adverse wildlife impacts by reducing the number of animals that come into contact with spilt oil, capturing and rehabilitating oiled fauna, and removing oiled carcasses to reduce secondary impacts.

The tactics implemented for an OWR are outlined in this document and consider the three response actions defined in the QLD's Wildlife Response Plan. If an OWR is initiated, implementation will follow the stages described in Table 7-1, a as appropriate to the nature and scale of the incident.

Table 7-1: Oiled wildlife response stages

Stage	Description
Stage 1: Oiled Wildlife Plan activation / First Strike	Gather situational awareness on whether an OWR impact has occurred or is imminent and complete notifications to jurisdictional authorities and external support agencies.
Stage 2: Mobilisation of wildlife resources	Mobilise initial preventive measures and / or resources to manage the incident in the early stages of its development.
Stage 3: Wildlife reconnaissance	Wildlife reconnaissance for the OWR should occur as part of the surveys for the fauna related OMPs undertaken to aid planning and decision-making for executing spill

Stage	Description
	response or clean-up operations. Wildlife reconnaissance will be required for the duration of the OWR operations.
Stage 4: IAP wildlife plan development	The Wildlife Response plan should include these operational components (relevant to the scale of the OWR): • wildlife impact assessment • reconnaissance and monitoring • search and collection • carcass collection and necropsy storage • field stabilisation • wildlife transport • wildlife processing / admission • wildlife intake and triage • wildlife cleaning • wildlife rehabilitation / conditioning • wildlife release • post-release monitoring of wildlife • OWR termination and demobilisation. (Note: Separate strategies and protocols may be required for different species groups).
Stage 5: Wildlife rescue and staging	This includes starting actions such as hazing, pre-emptive capture, establishing short-term wildlife staging areas, and transporting wildlife to a wildlife treatment facility.
Stage 6: Establish an oiled wildlife facility	Treatment facilities are required for cleaning and rehabilitating affected animals.
Stage 7: Wildlife rehabilitation	Considerations include a suitable rehabilitation centre and personnel, wildlife housing, record keeping, release and post-release monitoring.
Stage 8: OWR termination	Demobilising the OWR should be undertaken in accordance with parameters or endpoints established in the IAP and supplementary Wildlife Response plan. This decision will be made in consultation with the relevant jurisdictional authorities and support agencies.

7.1.3 Implementation

OWR activities can be resource intensive and require additional personnel to be positioned within the EMT. The OWR team will be managed according to the typical EMT command structure; specifically, there will be wildlife roles within the planning, finance / administration, and logistics sections (as relevant to the nature and scale of the spill and the potential size and complexity of the OWR). The Wildlife Response, as outlined in Table 7-1, will form the key management system that will provide control and oversight over the OWR.

Based upon the magnitude of the spill event and the oils behaviour when released to the environment, no shoreline wildlife is expected to be affected by the spill event, and limited marine species are expected to be exposed to the oil plume. Thus, no wildlife team would likely be involved.

7.2 Waste management

Based on the SIMA assessment and the selected response technique, GEPL would not expect to generate waste in an oil spill event. GEPL would provide all resources available and engage a certified waste disposal operator in the improbable event such action is required.

8 REVIEW AND UPDATE

This OPEP is required to be reviewed, and if applicable updated, to ensure maintenance of the response capability and confirm that all relevant information is accurate. This document shall be reviewed, updated (if required) and submitted to NOPSEMA every 5 years from date of acceptance.

The document may also be reviewed and revised more frequently, if required, as outlined in the activity specific EP. This could include changes required in response to one or more of the following:

- changes to the activity, described in the EP that affect oil spill response coordination or capabilities
- identification of a significant new or increased spill risk that affect oil spill response coordination or capabilities
- new information or improved technology is used to improve the management of spills
- following testing of the OPEP (under regulation 14(8) of the OPGGS(E)R) if improvements are identified
- after a Level 2 or Level 3 spill incident.

Significant modification to this OPEP and GEPL's oil pollution response arrangements that materially alters the basis upon which an activity-specific EP (that this OPEP supports) was accepted may require that EP be revised and submitted to NOPSEMA under regulation 17 of the OPGGS (E) Regulations.

9 SPILL RESPONSE ARRANGEMENT CAPABILITY IDENTIFICAITION

The following tables show the critical components and number of people required in each response to define GEPL's capability and required arrangements to respond to a worst-case credible spill scenario (described in the Site Survey EP (GEPL-Q23P-001).

9.1 Identification of critical components

Table 9-1 defines response packages for each response technique (the type and quantity of equipment). Critical components for each response package are identified. Critical components are defined as equipment or personnel that are limited in number and cannot be purchased or accessed readily.

Table 9-1: Response technique packages and critical components

Response Technique	Response Package definition	Source of package definition	Critical Components
Monitoring Evaluation and Surveillance	OSTM requires: • contract access to Trajectory Modelling service provider	(IPIECA 2019)	OSTM service provider
	A single electronic surface tracking buoy package includes: • a single electronic surface tracking buoy • monitoring equipment.		Electronic surface tracking buoy

9.2 Critical equipment availability

Table 9-2 lists the number of critical components of equipment (identified in Table 9-1) available to GEPL. This was determined by reviewing GEPL equipment availability and include equipment available through State and Commonwealth agencies, such as the National Plan stockpile.

Table 9-2: Response technique critical equipment availability

Response Technique	Critical component	GEPL	State / National Plan	Other	Total number of Critical Components	Comments
Monitoring Evaluation and Surveillance	Oil spill Trajectory Modelling service provider	0	1	0	1	GEPL EMT has access to OILMAP through the Control Agency (AMSA or MSQ). OILMAP provides predictions of the behaviour and of the movement of spilled oil.
	Electronic surface tracking buoy	1	0	0	1	GEPL will have a tracking buoy available onboard the Site Survey vessel for the duration of activities

10 REFERENCES

AMOSC. 2021a. *AMOSPlan Section III - Australian industry cooperative oil spill response arrangements.* Victoria: AMOSC. Accessed 2022. https://amosc.com.au/wp-content/uploads/2021/10/amosplan-2021.pdf.

AMOSC. 2021b. *Standard Operating Procedure. BOOMS – Offshore RO-BOOM / Lamor HD boom.* Australian Marine Oil Spill Centre.

AMSA. 2020. *National Plan for Marine Environmental Emergencies.* Canberra, Australia: Australian Maritime Safety Authority, Australian Government.

Australian Government. 2006. *Offshore Petroleum and Greenhouse Gas Storage Act.* Federal Register of Legislation.

Darwin Port. 2020. *Oil Spill Contingency Plan (OSCP).* SOP_OPS/13, Darwin Port Operations Pty Ltd. Accessed 2022. https://www.darwinport.com.au/sites/default/files/uploads/2020/SOP%20-%20SOP_OPS13%20-%20Oil%20Spill%20Contingency%20Plan%20%28OSCP%29%20V8%20-%202020-01-15_0.pdf#:~:text=This%20Darwin%20Port%20Oil%20Spill,potential%20to%20enter%20port%20waters.

DES. 2021. *Wildlife Response Plan for Maritime Environmental Emergencies Procedure.* Version 1.03, Department of Environment and Science. Accessed 2022. https://www.publications.qld.gov.au/ckan-publications-attachments-prod/resources/5a32692a-c3f0-47e6-9e8e-4d19ca1984fd/wildlife-response-plan-for-maritime-environmental-emergencies-1.03-9-july-2021.pdf?ETag=%22ba8e94067cede8a990ffda16f38c5bdf%22.

IPIECA. 2017. *Guidelines on implementing spill impact mitigation assessment (SIMA).* Report 593, IPIECA-API-IOGP. https://www.ipieca.org/media/4867/guidelines_on_implementing_spill_impact_mitigation_assessment_sima_2017.pdf.

IPIECA. 2019. *Oil spill preparedness and response: An introduction.* Report 520, IPIECA-IOGP.

IPIECA. 2014. *Wildlife response preparedness.* Report 516, International Association of Oil & Gas Producers.

MSQ. 2021. *Queensland Coastal Contingency Action Plan.* Department of Transport and Main Roads. Queensland Government. Accessed 2022. https://www.publications.qld.gov.au/ckan-publications-attachments-prod/resources/ed2d7b05-2a34-4662-b9b0-b27fa0ca7328/qccap-2021.pdf?ETag=%22009ca21b99fc70baac309f57c17b4fd9%22.

OSRL. 2021. *Offshore Boom and Skimmer Packages.* Accessed 2021. https://www.oilspillresponse.com/services/preparedness-services/equipment-hire/offshore-containment-and-recovery/.

Queensland Government. 2018d. *Marine Oil Spill Contingency Plan for Torres Strait.* Brisbane: Maritime Safety Queensland.

Queensland Government. 2018a. *Port of Karumba - First-Strike Oil Spill Response Plan.* Brisbane: Maritime Safety Queensland.

Queensland Government. 2018b. *Port of Skardon River - First-Strike Oil Spill Response Plan.* Brisbane: Maritime Safety Queensland.

Queensland Government. 2018c. *Port of Thursday Island (Port Kennedy) - First-Strike Oil Spill Response Plan.* Brisbane: Maritime Safety Queensland.

Queensland Government. 2018e. *Port of Weipa - First-Strike Oil Spill Response Plan.* Brisbane: Maritime Safety Queensland.

Appendix A: External Notification Thresholds and Reporting Responsibilities

Agency or Authority	Type of notification / Timing	Legislation / Guide	Reporting requirement	Responsible	Reporting and Contact Information
All Marine Spills (Commonwealth and State Waters)					
AMSA	• **immediate** verbal notification by the Vessel Master to AMSA: (02) 6230 6811 • written Marine Pollution Report (POLREP) form **within 24 hours** of the request of AMSA.	• Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (Commonwealth) • Navigation Act 2012 (Commonwealth). Marine Order 91 (Marine pollution prevention — oil) 2014	• all discharges / spills or probable discharges / spills to the marine environment of oil or oily mixtures or noxious liquid substances in the marine environment originating from a vessel/ship. This includes platform supply vessels and accommodation vessels • all spills where NATPLAN equipment is used in a response.	Vessel Master (for vessel spills) or EMT Leader (or delegate) for all other spills	If the ship is at sea, reports are to be made without delay to AMSA: • (02) 6230 6811 or 1800 641 792 • rccaus@amsa.gov.au • Fax: (02) 6230 6868 AMSA POLREP: • https://amsa-forms.nogginoca.com/public/ • Incident reporting requirements: • https://www.amsa.gov.au/marine-environment/marine-pollution/mandatory-marpol-pollution-reporting
Commonwealth Waters					
NOPSEMA	• initial verbal to NOPSEMA, **within 2 hours** after GEPL becomes aware on incident. • written report as soon as possible, **within 3 days**.	• Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Commonwealth) • Offshore Petroleum Greenhouse Gas Storage (Environment) Regulations 2009 (as amended 2014).	A spill associated with the activity that has caused, or has the potential to cause, moderate to significant environmental damage, such as a release of oil from a vessel engaged in a petroleum activity into the marine environment.	EMT Leader (or delegate)	Verbal notification: 1300 674 472 Written notification • submissions@nopsema.gov.au or via https://securefile.nopsema.gov.au/filedrop/ Incident reporting requirements: • https://www.nopsema.gov.au/sites/default/files/documents/2021-03/A198752.pdf
NOPTA	Written report (as above) to NOPTA **within 7 days** of the initial report being submitted to NOPSEMA	• Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Commonwealth) • Offshore Petroleum Greenhouse Gas Storage (Environment)	Regulation 26(6) requires the titleholder to give a written record of the notification to NOPSEMA, the NOPTA as soon as practicable after the oral notification.	EMT Leader (or delegate)	Provide same written report as provided to NOPSEMA: • resources@nopta.gov.au Incident reporting requirements:

Agency or Authority	Type of notification / Timing	Legislation / Guide	Reporting requirement	Responsible	Reporting and Contact Information
		Regulations 2009 (as amended 2014).			https://www.nopsema.gov.au/concerns-and-complaints/report-incident/notifications-and-reporting-environment-incidents
State Waters					
MQS	• verbal notification **as soon practicable** 1300 551 889 • written notification **within 48 hours** after an authorised officer asks for a report	• Transport Operations (Marine Pollution) Act 1995 (TOMPA) • Transport Operations (Marine Pollution) Regulation 2018 (TOMPR)	A reportable incident in relation to a ship may be notified to an authorised officer by communicating the reportable incident to a relevant person.	Immediate notification and POLREP by Vessel Master (for vessel spills) or EMT Leader (or delegate) for all other spills	POLREP Report must be made to: • pollution@msq.qld.gov.au MSQ POLREP • https://www.msq.qld.gov.au/Marine-pollution/POLREP Incident reporting requirements: • https://www.msq.qld.gov.au/Marine-pollution/Pollution-prevention-documents-required-by-ships
DES	Notification **within 24 hours** by email, phone, or registered post.	Environmental Protection Act 1994	A person is obligated to notify of pollution incidents and activities (not authorised under the Act) that cause or threaten to cause serious environmental harm or material environmental harm.	EMT Leader (or delegate)	Report must be made to: • pollutionhotline@des.qld.gov.au (include "Duty to notify of environmental harm" in the subject line) • 7 Pollution Hotline - 1300 130 372 (option 2) • Registered post: Permit and Licence Management. Department of Environment and Science. GPO Box 2454. Brisbane QLD 4001 ESR/2016/2230 • https://environment.des.qld.gov.au/__data/assets/word_doc/0036/89595/era-no-duty-notify-environmental-harm.docx Incident reporting requirements: • https://environment.des.qld.gov.au/__data/assets/pdf_file/0027/90666/cm-gl-duty-notify-environmental-harm.pdf

Agency or Authority	Type of notification / Timing	Legislation / Guide	Reporting requirement	Responsible	Reporting and Contact Information
QLD Ports	Verbal notification **as soon as possible**	• Transport Operations (Marine Pollution) Act 1995 (TOMPA) • Transport Operations (Marine Pollution) Regulation 2018 (TOMPR)	A reportable incident in relation to a ship may be notified to an authorised officer by communicating the reportable incident to a relevant person.	Immediate notification by Vessel Master (for vessel spills) or EMT Leader (or delegate) for all other spills	Notification through: • VHF channels 16 and 12 • +61 7 4052 7470 or 1300 551 889

Appendix B: MES Implementation guide

Responsibility		Task	Consideration	Complete
Tracking buoy (if selected); most suitable for Level 2–3 spills				
Initial Actions	Site ERT	Direct personnel to deploy buoy from the facility or vessel as close as possible to the leading edge of the spill (personnel and vessel safety is priority)	OSC should coordinate tracking buoy deployment Note and report the serial number of the deployed tracking buoy Tracking buoy login details are available from equipment supplier	☐
	OSC	Inform EMT Leader that buoy has been deployed and provide EMT Leader with current weather conditions	Note tracking buoy deployment details in incident log	☐
	EMT Leader (or delegate)	Verify deployment of tracking buoy using tracking buoy instructions	Tracking buoy login details are available from equipment supplier	☐
Ongoing Actions	EMT Leader (or delegate)	Use tracking buoy data to maintain a common operating picture	Tracking buoy data is tracked online and fed into spill trajectory models and common operating picture	☐
	EMT Leader (or delegate)	Use the IAP to guide any additional tracking buoys deployments		☐
Trajectory and fate/weathering modelling (if selected); *most suitable for Level 2–3 spills*				
Initial Actions	OSC / EMT Leader (or delegate)	Contact the Control Agency (AMSA or MSQ) and request to conduct an oil spill trajectory modelling	Refer to Appendix A for contact details	☐
Ongoing Actions	EMT Leader (or delegate)	Download modelling results and compare fate curves against Site Survey EP (GEPL-Q23P-001)		☐
	EMT Leader (or delegate)	Use results from monitor and evaluate activities, and/or data derived from oil assays of the source oil to improve model accuracy		☐
Satellite imagery (if selected); most suitable for Level 2–3 spills				
Initial Actions	EMT Leader (or delegate)	Contact the Control Agency (AMSA or MSQ) and request available satellite imagery	AMOSC provides satellite imagery. GEPL can access to this service through the Control Agency	☐

Responsibility		Task	Consideration	Complete
	EMT Leader (or delegate)	Integrate satellite imagery into common operating picture and provide to trajectory modelling provider for model validation		☐
Ongoing Actions	EMT Leader (or delegate)	Monitor and evaluate data to periodically reassess the spill and modify the response (through the IAP), as required		☐
Operational and Scientific Monitoring Plan (if required); *required for Level 2–3 spills*				
Initial Actions	EMT Leader (or delegate)	Activate the operational monitoring programs and identify relevant components to initiate, and then consult HSE Officer as subject matter experts		☐
SIMA (if required); required for Level 2–3 spills				
Initial Actions	OSC	Review SIMA using MES and operational monitoring programs data to confirm sensitive environmental and social receptors and protection prioritisation. Commence operational SIMA to support response decision making. Consult with EMT Leader to understand timing requirements for when the operational SIMA will be required (e.g., before the Preparation for Tactics Meeting, Tactics Meeting)		☐

Appendix D: Operational and Scientific Monitoring Plan

1 INTRODUCTION

This Operational and Scientific Monitoring Plan (OSMP) has been developed to satisfy the requirements of Regulation 14(8AA) and 14(8D) of the OPGGS(E)R.

The objectives of this OSMP are to:

- identify and describe the operational and scientific monitoring that may be implemented in the event of a Level 2 or Level 3 oil spill to the marine environment
- demonstrate an appropriate degree of readiness to implement this monitoring.

1.1 Scope

This OSMP covers the monitoring that may be implemented in response to Level 2 of Level 3 oil spill events to the marine environment from site survey activities within the Gulf of Carpentaria (refer to Section 3 of the Q23/P Site Survey Environment Plan (EP) [GEPL-Q23P-001]).

As such, given the site survey activities covered under this EP, this OSMP is limited to a vessel spill event within the OA, and the surface release of a ~200 m^3 of a light marine fuel (e.g., marine diesel oil [MDO] or marine gas oil [MGO]). GEPL note that the risks from this scale of vessel spill event, and the associated response activities are anticipated to be limited to Level 1 event (with potential to increase to Level 2 in extraordinary circumstances).

The geographical scope of the OSMP is the environment that may be affected (EMBA) (refer to Section 4 and Section 7.11 of the EP), which is wholly in Commonwealth waters. Due to the surface release, and rapid weathering of light marine fuels, no exposure to benthic habitats or shorelines is predicted to occur.

1.2 Control agency

The *National Plan for Maritime Environmental Emergencies* (NATPLAN) (AMSA 2020) sets out the divisions of responsibility for an oil spill response. For a vessel spill in Commonwealth waters, both the Jurisdictional Authority and the Control Agency is the Australian Maritime Safety Authority (AMSA) (refer to Section 2.1 of the Oil Pollution Emergency Plan [OPEP] (GEPL-Q23P-002); Appendix C of the EP).

As such, in the event of a spill from a vessel within Commonwealth waters, GEPL would be responsible for undertaking operational monitoring (unless AMSA as Control Agency directs otherwise), and GEPL would be responsible for undertaking scientific monitoring.

1.3 Types of monitoring

Oil spill monitoring is divided into two types, operational and scientific, which are undertaken for two distinct, but closely related, purposes (NOPSEMA 2020).

Operational monitoring (also known as Type I or response phase monitoring) which collects information about the spill and associated response activities to aid planning and decision making during the response or clean-up operations. Operational monitoring may include both initial response phase monitoring (i.e., rapid qualitative and observational data gathering for situational awareness) and advanced response phase monitoring (i.e., quantitative measurement) (Hook, et al. 2016). Operational monitoring typically finishes when the spill response is terminated.

Operational monitoring studies complement the Monitoring, Evaluation, and Surveillance (MES) response strategy described in Section 5 of the OPEP). The OPEP identifies that the most effective tactics for a 200 m^3 surface release of light marine fuel were trajectory modelling, and/or tracking buoy deployment.

Scientific monitoring (also known as Type II or recovery phase monitoring) which is focussed on non-response objectives and evaluating environmental impact and recovery from both the spill event itself as well as from any response activities. Results from scientific monitoring studies may also be used to identify and recommend remediation requirements where required. Scientific monitoring may continue for extended periods after a spill response is terminated.

Operational and scientific monitoring studies may occur simultaneously (i.e., scientific monitoring can start before a response operation is completed). There may also be an information flow between studies, for example data from operational monitoring may be used to trigger the initiation of scientific studies.

2 ENVIRONMENTAL VALUES AND SENSITIVITIES

2.1 Matters of national environmental significance

Table 2-1 lists MNES that are known to be present, or may occur, within the EMBA (refer to Section 4 of the EP).

Table 2-1: Matters of national environmental significance within the EMBA

Matter of national environmental significance	Present within the EMBA	Description
World Heritage areas	X	N/A
National Heritage places	X	N/A
Wetlands of international importance	X	N/A
Listed threatened ecological communities	X	N/A
Listed threated species	✓	• 17 listed threatened species or species habitat may occur within the EMBA (Section 4.2 of the EP) - 3 birds, 3 whales, 6 turtles, 3 sharks, 2 sawfish • No BIAs or critical habitat for listed threatened species intersects with the EMBA (Section 4.2 of the EP)
Listed migratory species	✓	• 29 listed threatened species or species habitat may occur within the EMBA (Section 4.2 of the EP) - 10 birds, 4 whales, 1 dolphin, 2 rays, 6 turtles, 3 sharks, 3 sawfish • One BIA for a listed migratory species (Lesser Frigatebird) intersects with the EMBA (Section 4.2 of the EP) • No critical habitat for listed migratory species intersects with the EMBA (Section 4.2 of the EP)
Commonwealth marine areas	✓	• The EMBA occurs within the Commonwealth North Marine Bioregion (Section 4.3.1 of the EP). • The EMBA does not intersect with any Australian Marine Parks (Section 4.3.1.1 of the EP) • The EMBA does overlap with the Gulf of Carpentaria Basin KEF (Section 4.3.1.2 of the EP)
Great Barrier Reef Marine Park	X	N/A
Nuclear actions	X	N/A
Water resources	X	N/A

2.2 Monitoring priorities

The EMBA has been defined as a 30 km buffer around the OA (refer to Section 4 and Section 7.11 of the EP). The EMBA is located entirely within Commonwealth waters, with no exposure to benthic habitats or shorelines predicted to occur.

GEPL has defined monitoring priorities for this OSMP as:

- species undertaking biologically important behaviours (e.g., breeding, foraging, etc.)

- biologically important areas or critical habitat for regionally significant marine fauna
- protected marine areas (e.g., Australian Marine Parks, heritage areas)
- key ecological features
- commercial fisheries.

These priorities were identified as being the key sensitive receptors with high conservation or economic value.

Table 2-2 provides a summary of monitoring priorities within the EMBA. As per the Description of the Environment (Section 4 of the EP), there are no protected marine areas within the EMBA, and no important behaviours for marine fauna were identified from the protected matters database searches.

Table 2-2: Monitoring priorities within the EMBA

Monitoring priority	Environmental values and sensitivities	Relevant operational or scientific monitoring studies
Biologically important areas or critical habitat for regionally significant marine fauna		
Lesser Frigatebird	• Listed migratory species • Foraging BIA	• O1: Marine fauna surveillance • S2: Marine fauna assessment
Key ecological features		
Gulf of Carpentaria Basin	• Regional importance for biodiversity, endemism, and aggregations of marine life (both benthic and pelagic habitats)	• O1: Marine fauna surveillance • S1: Water quality assessment • S2: Marine fauna assessment
Commercial fisheries		
Northern Prawn Fishery	• Commonwealth-managed commercial fishery targeting Banana, Tiger, and Endeavour prawns	• S1: Water quality assessment • S3: Fisheries assessment

2.3 Information sources

Table 2-3 provides environmental data sources that are relevant to key sensitive receptors with high conservation or economic value within the EMBA.

Table 2-3: Environmental databases

Data source	Description	Access
Geodatabases		
Australian Ocean Data Network (AODN)	The AODN is the primary access point for search, discovery, access and download of data collected by the Australian marine community. Data are presented as a regional view of all the data available from the AODN. Primary datasets are contributed to by Commonwealth government agencies, State government agencies, universities, the Integrated Marine Observing System an Australian Government Research Infrastructure project, and the Western Australia Marine Science Institution (WAMSI).	Publicly available: https://portal.aodn.org.au/search
The Atlas of Living Australia (ALA)	The ALA is a collaborative, online, open resource that contains information on all the known species in Australia aggregated from a wide range of data providers. It provides a searchable database when considering species	Publicly available: https://www.ala.org.au/

Data source	Description	Access
	within the EMBA. The ALA receives support from the Australian Government through the National Collaborative Research Infrastructure Strategy and is hosted by the CSIRO.	
Species Profile and Threats Database	The database is designed to provide information about species and ecological communities listed under the *Environment Protection and Biodiversity Conservation Act 1999*. It provides information on what the species looks like, its population and distribution, habitat, movements, feeding, reproduction and taxonomic comments.	Publicly available: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl
Species Profile and Threats Database: Key Ecological Features	This database provides information on key ecological features based on marine bioregional plans, scientific reports and other sources.	Publicly available: https://www.environment.gov.au/sprat-public/action/kef/search
Management Plans		
Marine bioregional plan for the North Marine Region	The bioregional plan describes the marine environment and conservation values (protected species, protected places and key ecological features) of the North Marine Region, sets out broad objectives for its biodiversity, identifies regional priorities, and outlines strategies and actions to achieve these.	Publicly available: https://www.awe.gov.au/environment/marine/marine-bioregional-plans/north
North Marine Bioregional Plan Bioregional Profile	The North Bioregional Profile focuses on the natural assets of the North Marine Region, describes its ecological characteristics, outlines its conservation values and explains how new marine reserves will be identified. Additionally, it provides a broad description of the human activities that take place in the region.	Publicly available: https://parksaustralia.gov.au/marine/management/resources/scientific-publications/north-marine-bioregional-plan-bioregional-profile-description-ecosystems-conservation/
Recovery Plan or Conservation Advice for Listed Threatened Fauna		
Curlew Sandpiper	Conservation Advice	Publicly available: http://www.environment.gov.au/biodiversity/threatened/species/pubs/856-conservation-advice.pdf
Eastern Curlew	Conservation Advice	Publicly available: http://www.environment.gov.au/biodiversity/threatened/species/pubs/847-conservation-advice.pdf
Red Knot	Conservation Advice	Publicly available: http://www.environment.gov.au/biodiversity/threatened/species/pubs/855-conservation-advice-05052016.pdf
Blue Whale	Recovery Plan (2015–2025)	Publicly available: https://www.awe.gov.au/sites/default/files/documents/blue-whale-conservation-management-plan.pdf

Data source	Description	Access
Fin Whale	Conservation Advice	Publicly available: http://www.environment.gov.au/biodiversity/threatened/species/pubs/37-conservation-advice-01102015.pdf
Sie Whale	Conservation Advice	Publicly available: http://www.environment.gov.au/biodiversity/threatened/species/pubs/34-conservation-advice-01102015.pdf
Flatback Turtle	Recovery Plan (2017–2027)	Publicly available: https://www.awe.gov.au/sites/default/files/documents/recovery-plan-marine-turtles-2017.pdf
Green Turtle		
Hawksbill Turtle		
Leatherback Turtle		
Loggerhead Turtle		
Olive Ridley Turtle		
Leatherback Turtle	Conservation Advice	Publicly available: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1768-conservation-advice.pdf
Commercial Fisheries		
Northern Prawn Fishery	Fishery Status report	Publicly available: https://www.awe.gov.au/abares/research-topics/fisheries/fishery-status
	Fishing effort spatial data	Publicly available: https://www.awe.gov.au/abares/research-topics/fisheries/fisheries-data

3 IMPLEMENTATION

3.1 Activation

GEPL's Environment Unit Leader (EUL) is responsible for activating the OSMP, subject to approval from the EMT Leader.

Within 4 hours of notification from the EMT Leader that a Level 2 (or higher) spill event has occurred, the EUL will:

- obtain approval from the EMT Leader to initiate the OSMP
- review initiation criteria for operational monitoring studies, and if met, activate the relevant studies
- review initiation criteria for scientific monitoring studies, and if met, activate the OSMP Service Provider.

3.2 Roles and responsibilities

The key roles and responsibilities for implementation of the OSMP are defined in Table 3-1.

Prior to activities commencing, GEPL will have a contract in place with a scientific monitoring consultant (OSMP Service Provider) with the expertise and resources to undertake this monitoring.

Personnel involved in implementing this OSMP may be sourced from both internal (i.e., GEPL) and external (e.g., Site Survey personnel, OSMP Service Provider) resources.

Table 3-1: Roles and Responsibilities

Role	Responsibilities
EMT Leader	The EMT Leader is ultimately accountable for the implementation of the OSMP. Specific responsibilities related to the OSMP include: • integrate operational and scientific monitoring with the spill response • ensure that the EUL is sufficiently resourced to oversee and guide implementation of OSMP activities.
Environment Unit Lead (EUL)	The EUL is the key position for implementing the OSMP and relaying information between the OSMP Service Provider and the EMT. Specific responsibilities related to the OSMP include: • ensure that operational and scientific monitoring studies are implemented according to their specific initiation criteria and within nominated response times • mobilise OSMP Service Provider for scientific monitoring • continued management of scientific monitoring studies once spill response operation is terminated • receive data from OSMP Service Provider and disseminate it to the relevant teams within the EMT.
Scientific Monitoring Coordinator (OSMP Service Provider)	The Scientific Monitoring Coordinator are the technical leads for scientific monitoring studies. Specific responsibilities related to the OSMP include: • finalise monitoring design for individual scientific monitoring studies • advise the EUL on data collection, logistical support required, and monitoring priorities if constraints (e.g., safety, time, logistics) are encountered • in consultation with the EUL, liaise with relevant stakeholders and regulators on monitoring design, monitoring priorities, and results • technically oversee data analyses, interpretation, and reporting preparation.
Field Teams (OSMP Service Provider)	A Field Team includes one Field Team Lead, who is the key contact point to the Scientific Monitoring Coordinator during a field deployment. Specific responsibilities related to the OSMP include: • ensure appropriate resources and equipment are available • ensure awareness and understanding of QA/QC procedures • implement monitoring study in the field • support with data analysis, interpretation, and report preparation.

3.3 Capability arrangements

Table 3-2 details the capability assessment for the implementation of the OSMP studies. It identifies the minimum number of personnel to manage and implement the OSMP studies and resources (e.g., vessel) required to perform the studies. The studies have been grouped where appropriate to ensure effective use of resources.

A capability assessment has not been presented for operational monitoring studies as these will be undertaken by vessel personnel on the survey vessel, and as such no additional capabilities are required.

Prior to activities commencing, GEPL will have a contract in place with a scientific monitoring consultant (OSMP Service Provider) with the expertise and resources to undertake this monitoring.

Table 3-2: Capabilities needs assessment for Site Survey activities

OSMP study	Roles	Competencies	Resources
Operational monitoring			
O1: Marine fauna surveillance	Opportunistic Fauna Observer/s	N/A (existing site survey vessel crew)	N/A (existing site survey vessel)
Scientific monitoring			
All	1 x Scientific Monitoring Coordinator	• Bachelor's degree in environmental management/science from a recognised institution or equivalent tertiary study in technical area • >10 years' experience • Familiar OSMP	N/A
S1: Water quality assessment S2: Marine fauna assessment	1 x Field Lead	• Bachelor's degree in environmental management/science from a recognised institution or equivalent tertiary study in technical area • >5 years' experience • Familiar OSMP	1 x vessel
	Field Team (4 pax)	• Bachelor's degree in environmental management/science from a recognised institution or equivalent tertiary study in technical area • >5 years' experience • Experienced in the relevant sampling and/or recording techniques • Experienced in data analysis and reporting	
S3: Fisheries assessment	1 x Field Lead	• Bachelor's degree in environmental management/science from a recognised institution or equivalent tertiary study in technical area • >5 years' experience • Familiar OSMP	1 x vessel
	Field Team (2 pax)	• Bachelor's degree in environmental management/science from a recognised institution or equivalent tertiary study in technical area • >5 years' experience • Experienced in the relevant sampling and/or recording techniques • Trained and/or experienced olfactory analysts • Experienced in data analysis and reporting	

4 MONITORING STUDIES

Different oil types, spill locations, and volumes require different studies to form a fit–for–purpose OSMP that can determine the extent, severity, and persistence of environmental impacts from the oil spill. Given the nature and scale of the credible spill event under this EP (refer to Section 7.11 of the EP), and the weathering and fate characteristics of light marine fuel oils, the following studies have been identified as relevant:

- Operational monitoring
  - O1: Marine fauna surveillance
- Scientific monitoring
  - S1: Water quality assessment
  - S2: Marine fauna assessment
  - S3: Fisheries assessment.

The MES response strategy from the OPEP complements the operational monitoring studies. The MES strategy provides information on the location and trajectory of the spill via trajectory modelling and/or tracking buoy deployment (refer to Section 5 of the OPEP).

Baseline monitoring provides information on the condition of receptors prior to, or spatially independent of, a spill event. This is of importance for scientific monitoring where the ability to detect changes between pre-impact and post-impact conditions is necessary. However, given the nature of the oil being released (i.e., a light marine fuel) and the known weathering and fate characteristics, pre-impact baseline monitoring is not considered practicable. Where required, baseline (or control) sites for scientific monitoring will be located at spatially independent sites.

4.1 Operational monitoring

In the event of a Level 2 light marine fuel spill from a vessel within Commonwealth waters, GEPL would be responsible for undertaking operational monitoring (unless AMSA as Control Agency directs otherwise) as summarised in Table 4-1.

Table 4-1: Marine fauna surveillance

Objective	The objective of this operational monitoring study is to undertake visual surveillance to identify marine fauna at risk from the oil spill based on their presence in relation to the area observed or predicted to be affected by the oil slick, and to inform response options where relevant.
Initiation criteria	The initiation criteria for this operational monitoring study are: • the EMT Leader (or delegate) has determined that Level 2 (or higher) spill to marine waters has occurred, **and** • the EUL (or delegate) advises that either full or partial implementation of the study is to commence.
Survey techniques	The survey techniques may be implemented under this operational monitoring study: • opportunistic observations from survey vessel. Data for the following parameters may be collected under this operational monitoring study: • presence and identification (species group or species) of oiled fauna • state of oiled fauna (if possible).
Indicative timing	Indicative implementation schedule for this operational monitoring study is within 24 hours of the initiation criteria being met. As this operational monitoring study is based on opportunistic observations from the crew aboard the survey vessel, no mobilisation to site of additional personnel or resources is required.
Termination criteria	The termination criteria for this operational monitoring study are: • The EMT Leader (or delegate) considers that continuation of this operational monitoring study will not result in a change to the scale or location of active response options, **or** • The EMT Leader (or delegate) has advised that agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the response, **or** • The EUL (or delegate) considers that continuation of monitoring under this operational monitoring study is likely to increase overall environmental impact, **or** • Relevant scientific monitoring studies initiation triggers have been assessed.

4.2 Scientific monitoring

In the event of a Level 2 light marine fuel spill from a vessel within Commonwealth waters, GEPL would be responsible for undertaking scientific monitoring as summarised in Table 4-2, Table 4-3, and Table 4-4. The studies are presented separately below; however, in practice they may be undertaken simultaneously.

Table 4-2: Water quality assessment

Objective	The objective of this scientific monitoring study is to detect and monitor the presence, concentration, and persistence of hydrocarbons in marine waters following the spill and associated response activities.
Initiation criteria	The initiation criteria for this scientific monitoring study are: • the EMT Leader (or delegate) has determined that Level 2 (or higher) spill to marine waters has occurred, **and** • data from MES has indicated that contact of a monitoring priority is possible, and it is considered likely that ongoing (scientific) monitoring of impacts will be required, supported by scientifically rigorous water quality monitoring, **or** • the EUL (or delegate) advises that either full or partial implementation of the study is to commence.
Survey techniques	The survey techniques may be implemented under this scientific monitoring study: • surface water sample collection • sub-surface water sample collection • in-situ profiles • visual inspections. Data for the following parameters may be collected under this scientific monitoring study: • oil concentrations • physical characteristics.
Indicative timing	Indicative implementation schedule for this scientific monitoring study is: • EUL to activate OSMP Service Provider within 4 hours of initiation criteria being met • OSMP Service Provider to finalise monitoring design/sampling plan within 72 hours of being activated • Field Teams to mobilise to site within 7 days of being activated.
Termination criteria	The termination criteria for this scientific monitoring study are: • the relevant Jurisdictional Authority/Government Agency has been consulted and has agreed that monitoring can be ceased, **and** • oil concentrations in marine waters are below benchmark levels which can be defined as (whichever is applicable): - toxicant default guideline values for water quality in aquatic ecosystems - the relevant regulatory site-specific trigger level (where these exist) - below baseline levels - control site values.

Table 4-3: Marine fauna assessment

Objective	The objective of this scientific monitoring study is to identify and quantify the status and recovery of marine fauna related to an oil spill and response activities.
Initiation criteria	The initiation criteria for this scientific monitoring study are: • the EMT Leader (or delegate) has determined that Level 2 (or higher) spill to marine waters has occurred, **and** • data from O1 has indicated that oiled marine fauna have been observed within the area affected by the oil spill, **or**

	• the EUL (or delegate) advises that either full or partial implementation of the study is to commence.
Survey techniques	The survey techniques may be implemented under this operational monitoring study: • visual observations from vessel • carcass collection and tissue sampling. Data for the following parameters may be collected under this operational monitoring study: • presence and identification (species group / species) of oiled fauna • state of oiled fauna • presence and state of any carcass.
Indicative timing	Indicative implementation schedule for this scientific monitoring study is: • EUL to activate OSMP Service Provider within 4 hours of initiation criteria being met • OSMP Service Provider to finalise monitoring design/sampling plan within 72 hours of being activated • Field Teams to mobilise to site within 7 days of being activated.
Termination criteria	The termination criteria for this scientific monitoring study are: • the relevant Jurisdictional Authority/Government Agency has been consulted and has agreed that monitoring can be ceased, **and** • there has been no impact on marine fauna or their biologically important behaviours, **or** • the extent of damage of impacted marine fauna and/or their BIAs or critical habitat has been quantified, **and** • measured parameters of marine fauna populations impacted by the oil spill have returned to within the expected natural dynamics of baseline state and/or control sites.

Table 4-4: Fisheries assessment

Objective	The objective of this scientific monitoring study is to monitor potential contamination and tainting of important finfish and crustacean species from commercial fisheries to evaluate the likelihood that an oil spill will have an impact on the fishing industry.
Initiation criteria	The initiation criteria for this scientific monitoring study are: • the EMT Leader (or delegate) has determined that Level 2 (or higher) spill to marine waters has occurred, **and** • data from MES has indicated that contact of a high-use commercial fishing area is possible, **or** • advice has been provided to government to restrict, ban, or close a fishery, **or** • declarations of intent by commercial fisheries or government agencies to seek compensation for alleged or possible damage. • the EUL (or delegate) advises that either full or partial implementation of the study is to commence.
Survey techniques	The survey techniques may be implemented under this operational monitoring study: • indicator fish species sample collection • opportunistic carcass collection and tissue sampling. Data for the following parameters may be collected under this operational monitoring study: • olfactory evaluation • chemical analysis of biota (tissue) analysis • fish health indicators and biomarkers.
Indicative timing	Indicative implementation schedule for this scientific monitoring study is: • EUL to activate OSMP Service Provider within 4 hours of initiation criteria being met • OSMP Service Provider to finalise monitoring design/sampling plan within 72 hours of being activated • Field Teams to mobilise to site within 7 days of being activated.

Termination criteria	The termination criteria for this scientific monitoring study are: • the relevant Jurisdictional Authority/Government Agency has been consulted and has agreed that monitoring can be ceased, **and** • contamination in the edible portion or in the stomach/intestinal contents attributable to the oil spill is no longer detected, **or** • no differences are detected in commercial fisheries from control and impact sites, **or** • the physiological and biochemical parameters in the studied species have returned to baseline levels, **or** • evidence that catch rates, species composition, community abundance, distribution and age structure of commercial fisheries and their by-catches have returned to baseline levels.

5 REFERENCES

AMSA. 2020. *National Plan for Maritime Environmental Emergencies - 2020 Edition.* Canberra, Australia: Australian Maritime Safety Authority, Australian Government.

Hook, S, G Batley, M Holloway, P Irving, and A Ross. 2016. *Oil Spill Monitoring Handbook.* Clayton South, Australia: CSIRO Publishing.

NOPSEMA. 2020. *Information Paper: Operational and Scientific Monitoring Programs.* Perth, Australia: National Offshore Petroleum Safety and Environmental Management Authority, Australian Government.

Appendix E: Protected Matters Search Reports

Australian Government
Department of Agriculture, Water and the Environment

OPERATIONAL AREA

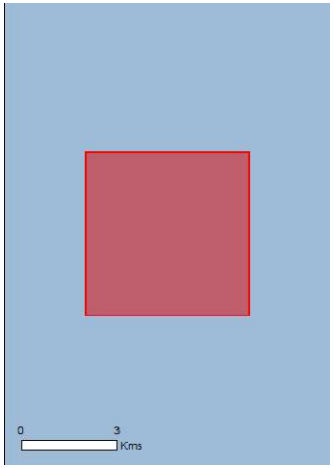
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 10/02/22 22:26:56



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

Coordinates
Buffer: 0.0Km

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	17
Listed Migratory Species:	29

Other Matters Protected by the EPBC Act

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

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

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	46
Whales and Other Cetaceans:	11
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

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

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

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

Name

EEZ and Territorial Sea

Marine Regions [Resource Information]

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

Name

North

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Mammals		
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
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat may occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat may occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Glyphis glyphis Speartooth Shark [82453]	Critically Endangered	Species or species habitat may 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

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
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 may occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat may 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

Name	Threatened	Type of Presence
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
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 may occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat may occur within area
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 may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may 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
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris 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
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 may occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Fish		

Name	Threatened	Type of Presence
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		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
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
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 spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		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
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
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 may occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat may occur within area
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 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 mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Hydrophis pacificus Large-headed Seasnake, Pacific Seasnake [1112]		Species or species habitat may occur within area
Lapemis hardwickii Spine-bellied Seasnake [1113]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	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]
Name	Status	Type of Presence
Mammals		
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
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
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 truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

Key Ecological Features (Marine)	[Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Gulf of Carpentaria basin	North

Caveat

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

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

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

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-11.673917 140.160817,-11.674048 140.206689,-11.719261 140.20656,-11.71913 140.160681,-11.673917 140.160817

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.

Department of Agriculture Water and the Environment
GPO Box 858
Canberra City ACT 2601 Australia
+61 2 6274 1111

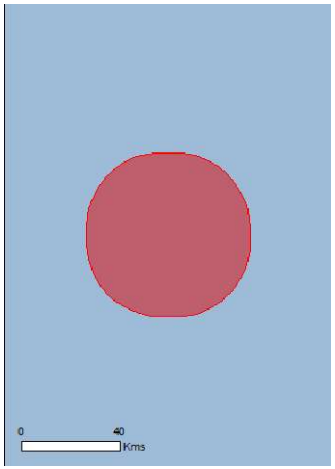
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 10/02/22 22:45:27



Coordinates
Buffer: 0.0Km

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	17
Listed Migratory Species:	29

Other Matters Protected by the EPBC Act

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

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

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	46
Whales and Other Cetaceans:	11
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

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

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

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

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

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

Name
North

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Mammals		
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
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat may occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat may occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Glyphis glyphis Speartooth Shark [82453]	Critically Endangered	Species or species habitat may 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

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
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 may occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat may 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

Name	Threatened	Type of Presence
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
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 may occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat may occur within area
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 may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may 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
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

Name	Threatened	Type of Presence
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris 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
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 may occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Fish		
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		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
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
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 spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		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
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
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 may occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat may occur within area
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 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 mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Hydrophis pacificus Large-headed Seasnake, Pacific Seasnake [1112]		Species or species habitat may occur within area
Lapemis hardwickii Spine-bellied Seasnake [1113]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	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]

Name	Status	Type of Presence
Mammals		
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
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
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 truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

Key Ecological Features (Marine) [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Gulf of Carpentaria basin	North

Caveat

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

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

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

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-11.756422 139.888011,-11.734374 139.885843,-11.713407 139.885512,-11.687951 139.885512,-11.663184 139.885818,-11.638147 139.888017,-11.620918 139.890926,-11.603085 139.895178,-11.585173 139.900782,-11.572013 139.9058,-11.559127 139.911502,-11.53909 139.922054,-11.52316 139.932071,-11.502611 139.947479,-11.485719 139.962666,-11.471258 139.977927,-11.459292 139.992556,-11.444863 140.013416,-11.43182 140.036694,-11.424114 140.053541,-11.417967 140.069652,-11.411814 140.089871,-11.407211 140.11051,-11.404097 140.132304,-11.402722 140.153849,-11.402767 140.208315,-11.404341 140.236332,-11.407623 140.258538,-11.413376 140.282894,-11.422387 140.309431,-11.432449 140.331832,-11.443542 140.351768,-11.45674 140.371395,-11.476449 140.395213,-11.498033 140.416068,-11.523864 140.435846,-11.551074 140.451975,-11.578747 140.464345,-11.608018 140.473622,-11.639824 140.479715,-11.674676 140.48193,-11.719892 140.481846,-11.746269 140.480492,-11.766528 140.477659,-11.786519 140.473285,-11.81256 140.465098,-11.831488 140.457237,-11.84753 140.449188,-11.864817 140.438928,-11.881994 140.426883,-11.898848 140.412959,-11.916608 140.395517,-11.929266 140.380894,-11.942583 140.362915,-11.956299 140.340502,-11.966977 140.318836,-11.975319 140.297526,-11.983219 140.270123,-11.988548 140.239888,-11.990512 140.210537,-11.990372 140.180101,-11.990215 140.150332,-11.987936 140.123608,-11.982093 140.093032,-11.971034 140.058484,-11.959455 140.032943,-11.947235 140.011635,-11.925927 139.982462,-11.905405 139.960504,-11.888356 139.945477,-11.870842 139.932425,-11.851612 139.920417,-11.830688 139.909719,-11.807323 139.900328,-11.781544 139.89277,-11.756422 139.888011

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.

Department of Agriculture Water and the Environment
GPO Box 858
Canberra City ACT 2601 Australia
+61 2 6274 1111