# Otway Basin Exploration Drilling

# Environment Plan Summary

**CONTROLLED DOCUMENT**

**(VOB-EN-EMP-0002)**

Revision 1 – March 2019

**Table of Contents**

# List of Tables

# List of Figures



# Revision History

| Rev | Issue Date | Revision summary | Originator | Reviewer | Approver |
|---|---|---|---|---|---|
| 0 | 08 March 2019 | Issued to NOPSEMA | GLE | OGW | DC |
| 1 | 18 March 2019 | Reissued to NOPSEMA | GLE | OGW | DC |

# 1 Introduction

Cooper Energy Ltd (Cooper Energy) is Titleholder of production and exploration permits within both Otway and Gippsland basins off the Victorian Coastline. Acreage within the Otway Basin includes VIC/P44, VIC/L24 and VIC/L30.

## 1.1 Titleholder Details

In accordance with the Commonwealth Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009; Table 1-1 provides the details of titleholders and liaison person for the titles within which the petroleum activity will take place.

If the titleholder's nominated liaison person or contact details for the nominated liaison person changes, Cooper Energy will notify the Regulator in accordance with the Regulations.

**Table 1-1: Details of Titleholder and Stakeholder Liaison Person**

| Title(s) | Titleholder Details | Liaison Person |
|---|---|---|
| Production Licence VIC/L24<br><br>Exploration Permit VIC/P44 | Cooper Energy (CH) Pty. Ltd.<br>Address: Level 8/70 Franklin St, Adelaide SA 5000<br>Telephone Number: (08) 8100 4900<br>A.B.N.: 70 615 355 023 | For activities within all titles, the titleholder's nominated liaison person is:<br>Duncan Clegg<br>General Manager Developments<br>Cooper Energy Limited<br>level 8/70 Franklin St, Adelaide SA 5000<br>Phone: (08) 8100 4900<br>Email: stakeholder@cooperenergy.com.au |

# 2 Activity Location

This EP Summary provides for drilling activities for up to two (2) exploration wells (Annie-1 and Elanora-1) in the Otway Basin off Victoria's south-west coast, in an area where hydrocarbon exploration and production is well established (Figure 2-1).

Both proposed wells are located within Commonwealth waters ranging in depth from approximately 62m to 75m. Indicative co-ordinates for proposed well locations are provided in Table 2-1.

**Table 2-1 Otway Exploration Well Indicative Coordinates**

| Planned wells | Planned locations* | | Title Area | Approx. Water Depth (m) | Approx. distance from shore (nm) |
|---|---|---|---|---|---|
| | Longitude (E) | Latitude (S) | | | |
| Annie-1 | 142°49'39.10" | 38°40'56.22" | VIC/P44 | 62 | 5 |
| Elanora-1 | 142°36'4.28" | 38°46'42.49" | VIC/L24 | 75 | 15 |

**Final well locations expected to be within 500m of these coordinates*

### 2.1.1 Operational Area

The "operational area" for the drilling activities is defined as the area within 2km of the well location; this area is defined to encompass both the 500m safety exclusion area around the Mobile Offshore Drilling Unit (MODU) (when on location) and support activities such as anchoring and survey, which typically fall within 2km of the well location. This 2km radius aligns with the operational areas defined under accepted EP's for previous drilling campaigns completed by Cooper Energy (e.g. Casino-5 and Sole during 2018).

The transit of the MODU and support vessels outside of the operational area is outside the scope of this Plan. These activities are managed under the *Commonwealth Navigation Act 2012.*

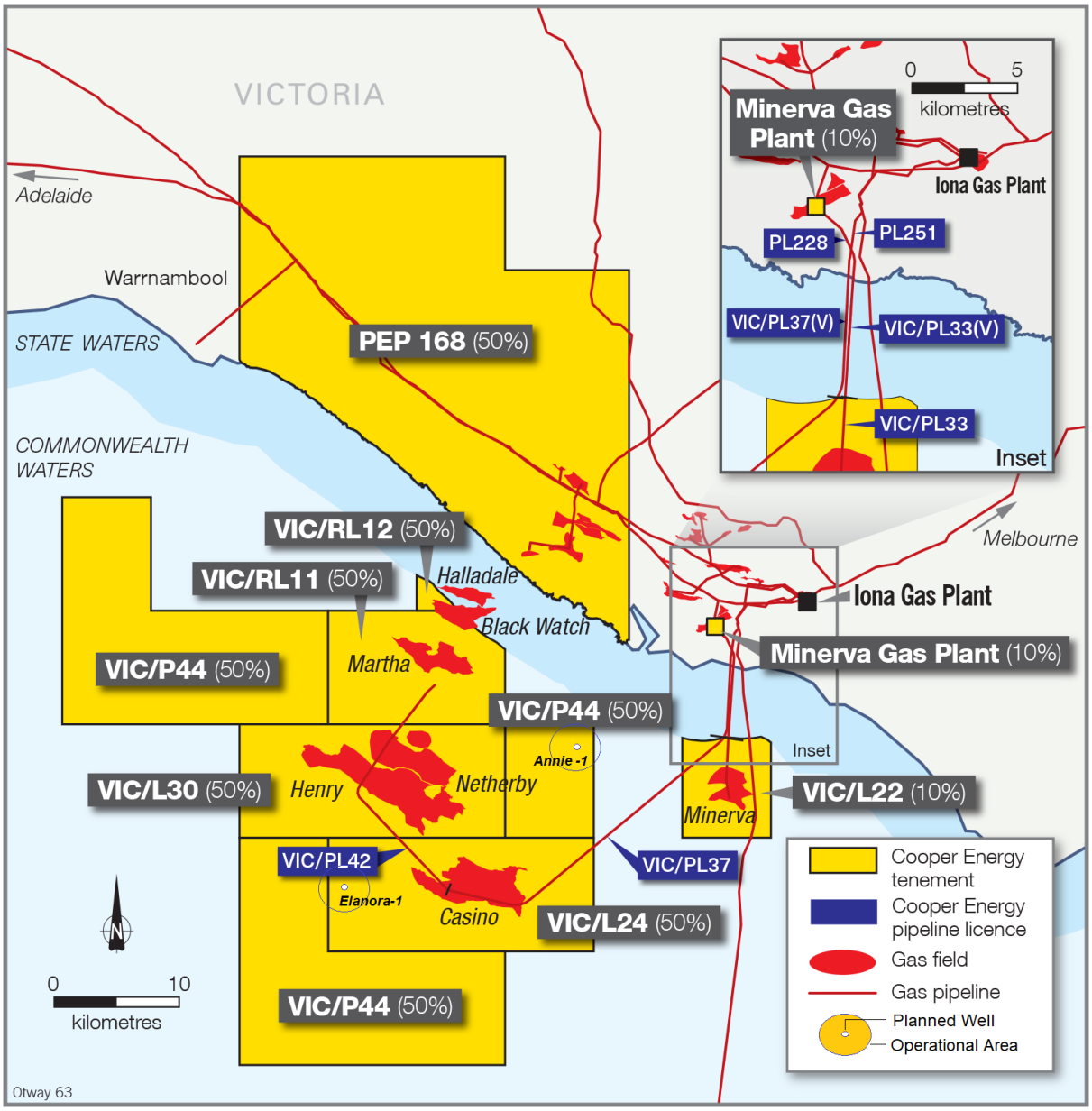


**Figure 2-1: Indicative Otway Well locations**

## 2.2 Prospective Field Characteristics

The Waarre reservoir is the source of hydrocarbons for Annie-1 and Elanora-1. Given this EP Summary covers exploration drilling activities, analogue reservoir data has been used for each of the proposed exploration wells. The hydrocarbon targeted within the Waarre reservoir, and therefore both wells covered under the EP, is gas-condensate.

Physical characteristics of the Waarre gas as represented by Netherby and Minerva condensate is provided in Table 2-2.

**Table 2-2: Physical Characteristics of Waarre Gas**

| Parameter | | Netherby Condensate | Minerva Condensate |
|---|---|---|---|
| API Gravity | | 51.2 | 48.23 |
| Density@25ºC g/ml | | 0.774 | 0.78260 |
| Dynamic Viscosity @ 25ºC (cP) | | 0.14 | 1.063 |
| Condensate Gas Ratio (bbl/Mmscf) | | 0.6 | 3.37 |
| Pour Point (ºC) | | -54 | -30 |
| Boiling Point Curve (% mass) | Volatiles (<180ºC) | 84 | 54.735 |
| | Semi-volatile (180-265ºC) | 14 | 32.675 |
| | Low Volatility (265-380ºC) | 2 | 11.79 |
| | Residual (>380ºC) | - | 0.8 |
| Group | | I | I |

## 2.3 Support Activities

### 2.3.1 Vessels

The MODU will be supported by two or three vessels, including anchor handling, tow and support (AHTS) vessels; the vessels will

- Tow the MODU to/from well locations;
- Support mooring and BOP tethering operations;
- Standby the MODU (one vessel on location at all times performing a number of duties such as vessel collision sentry and standby during helicopter take-off / landing);
- Transfer provisions (food, fuel, bulk materials, fuel), equipment and wastes to and from the MODU and shore base; and
- Facilitate site and equipment inspections / surveys before and after MODU arrival.

Vessels are part of the petroleum activity when:

- Undertaking activities such as laying anchors for the MODU, within the 2km Operational Area; or
- Undertaking support operations during implementation of project oil pollution emergency response and monitoring as required.

The transit of the MODU and support vessels outside the operational area is outside the scope of this EP Summary. These activities are managed under the Commonwealth *Navigation Act 2012*.

Depending on the water depth, and activity, support vessels may be required to anchor on location during the activity or will use dynamic positioning or similar station keeping systems to maintain their position while undertaking the activities.

### 2.3.2 Remotely Operated Vehicles (ROVs)

A ROV is a tethered underwater vehicle operated by a specialist crew aboard a vessel. They are linked by either a neutrally buoyant tether or often when working in rough conditions or in deeper water a load carrying umbilical cable is used along with a tether management system.

Most ROVs are equipped with a video camera and lights. Additional equipment may include sonars, a manipulator or cutting arm, wall thickness measurement equipment, mechanical cleaning equipment, water-jetting equipment, grout-bag installation equipment and cathodic potential measurement equipment.

ROVs may use electrics or hydraulics to control the manipulator or cutting arm. Where hydraulics are used to control the arm, a closed system is used where hydraulic fluid is circulated to move the arms and is designed not to release hydraulic fluid.

ROVs may be used prior to and during drilling operations, for activities such as:

- ROV Seabed Surveys;
- Subsea installation and placement assistance;
- Blowout preventer (BOP) land-out and recovery; and
- BOP well control contingency.

### 2.3.3 Helicopters

Personnel will access the MODU by helicopter, which is expected to operate out of Portland Airport or Warrnambool Airfield. Flights to the MODU are expected 5-7 days per week.

Helicopters utilised are expected to be Agusta Westland AW139 or similar type. Helicopter operations within the operational area are limited to landing and take-off on the helideck of the MODU.

There is no planned refuelling of helicopters offshore.

### 2.3.4 Surveys

Seabed surveys may be undertaken prior to MODU mobilisation and positioning, during and at the end of drilling activities surrounding both proposed well locations.

The purpose of pre-drill surveys is to obtain information on the surface and shallow sub-surface conditions, to inform well planning and design of MODU anchoring plans and confirm the geophysical data that has previously been obtained over the survey area. Pre-drill surveys may be undertaken 8-12 weeks prior to MODU arrival to allow for data processing and analysis.

These surveys may involve:

- Visual survey via ROV or drop camera;
- Hull mounted multi-beam echo sounder bathymetry system and peripheral sensors;
- Digital side scan sonar system and peripheral sensors;
- Sub-bottom profiling (SBP) undertaken with source tow sled, hydro-phone array; and/or
- Seabed sampling via gravitational drop corer (approximately 4-8 samples per well location).

During drilling activities ROVs are used to monitor progress and may also be used to operate subsea equipment.

Post-drill surveys record the condition of the well and seabed and can be used to locate and record or retrieve subsea equipment. Post-drill surveys are typically undertaken prior to MODU departure from the well location.

### 2.3.5 MODU positioning (Setting and Testing Anchors)

The MODU will be towed to location and moored prior to commencing activities. Anchors may be taken to location approximately 2-3 days ahead of MODU arrival to assist with the overall efficiency of the drilling activities.

Anchoring operations consist of running and setting of rig anchors, typically weighing 12-15 tn each and having a footprint of approximately 30 $m^2$ to 60 $m^2$ each depending on the use of third-party anchors. Anchors are attached to either wire, chain or a combination of both (typically 3 to 4" diameter) at around 1500m – 2000m from the drilling location. The anchor spread will be dependent on the rig selected and the preliminary mooring analysis conducted during the planning phase of each well.

The final mooring analysis will determine each mooring line's required length of chain and/or wire the anchor to the MODU. Transponders may be required to inform anchor positioning.

Where specialised (rental) anchors are required (subject to mooring analysis), the existing MODU anchors will need to be removed from the MODU and may be wet stored on location for the duration of the drilling campaign.

## 2.4 Exploration Drilling Activities

### 2.4.1 Well Design and Drilling Methodology

An indicative overview of the drilling design and process is described in this section. This process is subject to change, depending on individual well design requirements and the final location of the well. Well schematics are provided in the Well Operations Management Plan (WOMP) submitted to National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for assessment prior to drilling.

The drilling methodology proposes using a combination of seawater with high-viscosity mud sweeps and Water-Based Muds (WBM). The wells will be drilled in sections and casing cemented in place prior to moving on to the next section. For further details on cementing activities.

The conductor and surface hole well sections will be drilled without a riser; all cuttings and drilling fluids are discharged at the seabed. A riser and BOP are installed to drill the hole sections above and within the reservoir. Once the riser and BOP are installed, drill cuttings fluids and cuttings are circulated back to the MODU and discharged at the surface.

Drilling fluids (or muds) will be used during the drilling program to provide a range of functions, including:

- Control of formation pressures (i.e., providing a hydrostatic head by managing mud density maintains overbalance to the reservoir pressure and prevents a blowout);
- Wellbore stability through mud weight and chemical inhibition;
- Transport of drill cuttings out of the hole to seabed (riserless) and to surface via the MODU (riser installed);
- Maintenance of drill bit and assembly (i.e. lubrication, cooling and support); and
- Sealing of permeable formations to prevent formation invasion.

All chemicals will be selected in accordance with the Cooper Energy Offshore Environment Chemical Assessment Process (COE-MS-RCP-0042).

### 2.4.2 Drilling discharges

Up to approximately 150$m^3$ cuttings and 1200$m^3$ drilling fluids are discharged during drilling top-hole sections, for each well. The riser and BOP are installed for bottom-hole sections and provide a conduit for cuttings and drilling fluids to be brought back to the MODU. Solids control equipment removes solids from the drilling fluids; these solids are discharged overboard at surface. Drilling fluids are tested, reconditioned and re-used where possible, before ultimately being discharged overboard. Approximately 180$m^3$ cuttings and 1500$m^3$ of drilling fluids are

discharged at surface during and following drilling of bottom-hole sections, for each well including potential side-track.

Cuttings are expected to comprise predominantly carbonate sands with some clay, followed by calcarenites and marl from the upper sections of the wellbore, and marl with minor calcarenites then sandstone with some pyrite from the lower sections. The cuttings and associated drilling fluids are discharged continuously whilst drilling, which may occur for periods of around 24 hours at a time over the course of the activity. Drilling fluids are also discharged intermittently throughout drilling. Discharges occur in batches ranging from around 1 $m^3$ to 400 $m^3$ and depending on volume, may be discharged over a matter of minutes or several hours.

### 2.4.3 Cementing Operations

Cement is transported as dry bulk to the MODU by support vessels and pneumatically blown to the MODU storage tanks using compressed air. The dry bulk storage tanks on the MODU vent excess compressed air to atmosphere. This venting process carries small amounts of cement which is discharged below the MODU (maximum volume approximately 10 MT per well).

After a string of casing or a liner has been installed into the well, a cementing spacer is pumped to flush drilling fluids and filter cake to allow a good cement bond to be formed with the formation. When cementing top-hole sections (without a riser in place), the spacer is displaced by the cement slurry and discharged directly to the seabed at the mudline: approximately 12.7 $m^3$ per well. Once the riser is installed, spacers remain downhole.

Cement slurry is pumped down the inside of the casing (or liner) after the spacer. Drilling fluid is then pumped into the casing with a wiper plug to displace the cement out of the bottom of the casing and up into the annular space between the pipe and the borehole wall. Once the cement has cured, the casing and sealing elements are pressure tested.

Cementing is also undertaken for plug and abandonment activities.

Upon completion of each cementing activity, the cementing head and blending tanks are cleaned which results in a release of cement contaminated water to the ocean: approximately 3 $m^3$ per cement job, depending on the dead volume within the cement unit pipework.

### 2.4.4 Blow-Out Preventer (BOP) Installation and Function Testing

A blow-out preventer (BOP) will be used for the drilling and completion program to provide additional control of formation pressure and prevent release of formation fluids. BOPs consist of a series of hydraulically-operated valves and sealing mechanisms that are open to allow the mud to circulate during drilling and completion activities but can be quickly closed if excessive pressure is experienced. Whilst the configuration and size of the BOP varies between MODUs and well requirements, the BOP system will comprise ‘rams’ including annular rams designed to seal around the tubular components in the well; and blind-shear rams to cut through the drill pipe if necessary. To ensure redundancy within the system, valves can be operated from aboard the MODU, or via ROV.

Operating the BOP results in small volumes of water-based fluid (Transaqua HT or similar) being released to the environment (approximately 3L per 5-1/8” valve actuation; and 0.5 L per 2-1/16” valve actuation). A total of approximately 150 valve actuations are expected per well for testing and verification purposes. BOP test fluid is also used to pressure up against and verify seals on a regular basis during the campaign. Water-based products such as Stack Magic Eco-F (or similar) are used for pressure testing (approximately 1.5$m^3$ per week) during drilling activities.

### 2.4.5 Logging

During drilling, it is necessary to evaluate the formation to determine the presence, quantity and extent of hydrocarbon accumulations. Where possible this information is gathered real-time from Logging Whilst Drilling (LWD) tools.

Sonics logs are considered a primary formation evaluation objective in both wells. The sonic tool is a completely self-contained down-hole tool. There are no air-guns or any other noise sources on surface, and there will be no noise transmitted to the surface. The tool is run as part of a standard LWD (or wireline) suite and the data is transmitted to surface in the same way as the data from all the other LWD tools.

Additional down-hole logging sources may include, the density-neutron Am-Be & Gamma-Ray Cesium-137 (low activity). These sources may be required to acquire additional information that cannot be gathered during primary evaluation.

### 2.4.6 Well Plug and Abandonment

Following drilling, and in alignment with Section 572 of the OPGGS Act, both exploration wells will be plugged and abandoned (P&A).

P&A procedures are designed to isolate the well and mitigate the risk of a potential release of wellbore fluids to the marine environment.

P&A operations involve setting a series of cement and/or mechanical plugs within the wellbore, including plugs above and between any hydrocarbon bearing intervals, at appropriate barrier depths in the well and at the surface. These plugs are tested to confirm their integrity.

To remove surface equipment (wellhead), a mechanical cutting tool is landed onto the wellhead to sever the 9 5/8” (244mm), 13 3/8” (340mm) and 36” (916mm) casing just below the seabed (~1.5m below the seabed). The cutting tool is deployed inside the surface casing and uses seawater to operate a piston forcing abrasive cutters against and through the casing. The cutting activity generates metal shavings inside and outside of the casing.

The wellhead is then pulled free and recovered to surface either to the MODU or a support vessel.

# 3 Description of the Environment

## 3.1 Environment that may be affected (EMBA)

Given the nature and scale of the proposed drilling activity, Cooper Energy has based the description of the existing environment on the area that may be exposed to hydrocarbons during an oil pollution emergency. The evaluation has been informed by stochastic oil spill modelling of the maximum credible worst-case discharge (WCD) that might occur during petroleum activities for both spill scenarios: an accidental release of marine diesel oil (MDO) from a vessel collision; and a full-flow unrestricted loss of well control (LOWC).

The exposed area has been derived from the outputs of the oil spill model based upon highly conservative concentrations of hydrocarbons that may present on the sea surface, shorelines or within the water column, referred to hereafter as environmental screening concentrations (ESC).

The degree to which the environment may be affected within this broader area of potential hydrocarbon exposure will vary depending on the total concentration of hydrocarbons present at a given location. In general terms, there is likely to be a greater impact to receptors that are exposed to hydrocarbons closer to the source of the release and/or for a longer duration. The term EMBA has been adopted within this EP Summary to reflect any area where there may be an adverse impact on the environment, from hydrocarbon exposure or from other aspects of the drilling activity.

Figure 3-1 presents the area potentially exposed to hydrocarbons based upon the various spill scenarios and environmental screening concentrations described above.

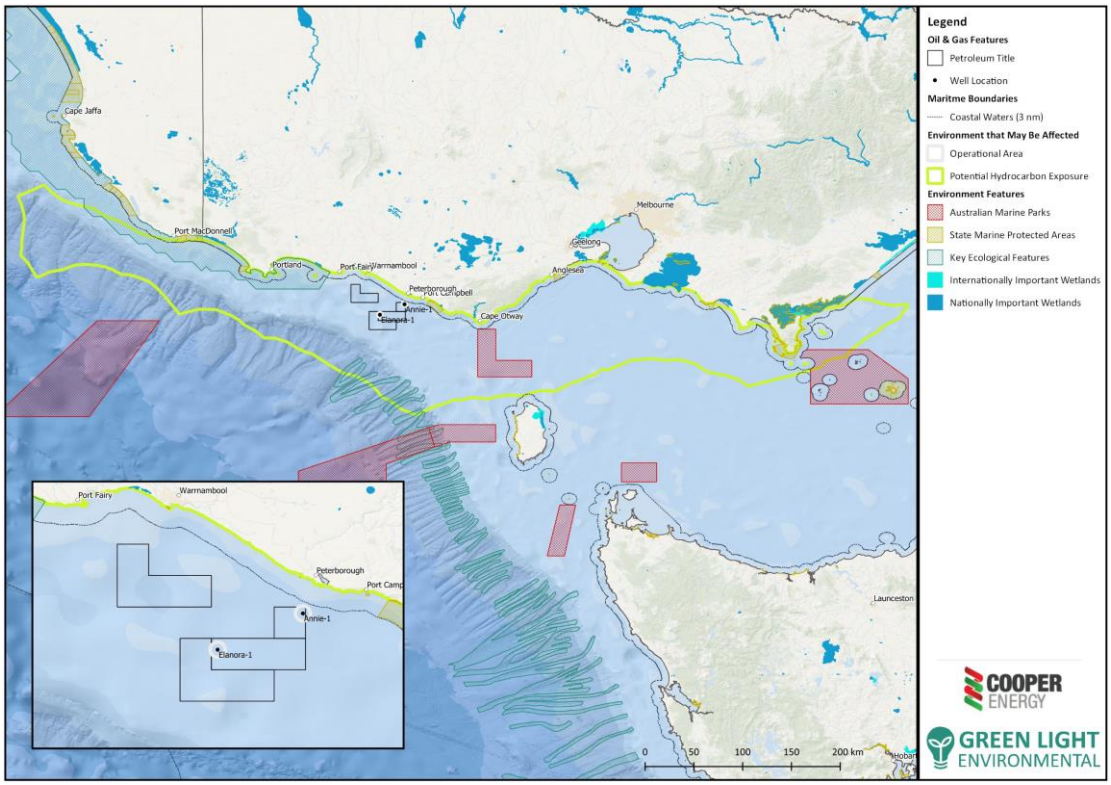


**Figure 3-1: Area potentially exposed to hydrocarbon based upon environmental screening concentrations**

## 3.2 Regional Setting

The petroleum titles are located in the Otway marine bioregion (NOO, 2002) as classified by the Interim Marine and Coastal Regionalisation for Australia (IMCRA). This bioregion extends from Cape Otway (Vic) to Cape Jaffa (South Australia) and includes the western islands of Bass Strait such as King Island. The characteristics of the Otway coastline and marine environment include very steep to moderate offshore gradients, high wave energy and cold temperate waters subject to upwelling events (i.e. the Bonney Upwelling) (IMCRA, 1998). Currents are generally slow, but moderately strong through the entrance to Bass Strait. Upwelling water is nutrient rich and corresponds with increases in the abundance of zooplankton, which attracts baleen whales and other species (including EPBC-listed species) that feed on the plankton swarms (krill). Shoreline habitats of the Otway coastline include penguin colonies, fur seal colonies and bird nesting sites.

## 3.3 Ecological and Social Receptors

The following tables show the presence of ecological (Table 3-1) and conservation & social (Table 3-2) receptors that may occur within the operational area the area potentially exposed to hydrocarbons. Examples of values and sensitivities associated with each of the ecological or social receptors (formally managed or otherwise) have been included in the tables. These values and sensitivities have been identified based on:

- Presence of listed threatened or migratory species, or threatened ecological communities;
- Presence of BIAs;
- Presence of important behaviours (e.g. foraging, roosting or breeding) by fauna, including those identified in the EPBC Protected Matter searches;
- Provides an important link to other receptors (e.g. nursery habitat, food source, commercial species); or
- Provides an important human benefit (e.g. community engagement, economic benefit).

**Table 3-1: Presence of Ecological Receptors within the Operational Area and the Area Potentially Exposed to Hydrocarbons**

| Receptor Group | Receptor Type | Receptor Description | Values and Sensitivities | Operational Area[1] | | Area Potentially Exposed to Hydrocarbons [2] | |
|---|---|---|---|---|---|---|---|
| **Habitat** | Shoreline | Rocky | • Foraging habitat (e.g. birds)<br>• Nesting or Breeding habitat (e.g. birds, pinnipeds)<br>• Haul-out sites (e.g. pinnipeds) | - | Not present<br>The Operational Area does not include the onshore environment. | ✓ | Present<br>The coastal environment in the Otway region is a mixture of sandy beaches and rocky coasts, including the well-known limestone and sandstone cliffs and rock formations of the Great Ocean Road. Each of these shoreline types has the potential to support different flora and fauna assemblage due to the different physical factors (e.g. waves, tides, light etc.) influencing the habitat; for example:<br>• Australian fur-seals are known to use rocky and sandy shores for haul-out and/breeding.<br>• Birds species may use sandy or rocky areas for roosting and breeding sites.<br>• Cliff & rocky coasts can provide a hard substrate for sessile invertebrate species (e.g. barnacles, sponges etc) to attach to. |
| | | Sandy | • Foraging habitat (e.g. birds)<br>• Nesting or Breeding habitat (e.g. birds, pinnipeds, turtles)<br>• Haul-out sites (e.g. pinnipeds) | - | | ✓ | |
| | | Tidal Flat | • Foraging habitat (e.g. birds)<br>• associated with saltmarsh environments. | - | | ✓ | |
| | Mangroves (Dominant Habitat)[1] | Intertidal/subtitle habitat, mangrove communities | • Nursery habitat (e.g. crustaceans, fish)<br>• Breeding habitat (e.g. fish) | - | Not present<br>The Operational Area does not include the onshore environment. | - | Present<br>Mangrove dominated habitat is identified in the area.<br>While mangroves are not a common habitat along the Otway coast, small patches are known to occur in estuarine habitats between Cape Otway and Port Philip Bay. Larger |

| Receptor Group | Receptor Type | Receptor Description | Values and Sensitivities | Operational Area[1] | | Area Potentially Exposed to Hydrocarbons [2] | |
|---|---|---|---|---|---|---|---|
| | | | | | | | areas are found further to the east around West Port Bay / French Island National Park and coast around Port Welshpool. |
| | Saltmarsh (Dominant Habitat) | • Upper intertidal zone, Saltmarsh habitat, habitat for fish and benthic communities | • Nursery habitat (e.g. crustaceans, fish)<br>• Breeding habitat (e.g. fish) | - | Not present<br>The Operational Area does not include the onshore environment. | ✓ | Present<br>Saltmarsh are identified in the area. Saltmarsh habitat are widespread along the Australian coast and mostly occur in the upper intertidal zone. Saltmarsh dominated habitat with greater than 10% coverage of saltmarsh occurs along most of the Victorian coastline potentially exposed to hydrocarbons.<br>In the broader region. Saltmarsh environments are much more common in northern Australia (e.g. Queensland), compared to the temperate and southern coasts (i.e. New South Wales, Victoria, Tasmania) (Boon *et al.* 2011). |
| | TEC: Subtropical and Temperate Coastal Saltmarsh | • Upper intertidal zone, Saltmarsh habitat, habitat for fish and benthic communities | • Nursery habitat (e.g. crustaceans, fish)<br>• Breeding habitat (e.g. fish) | - | Not present<br>The Operational Area does not include the onshore environment. | ✓ | Likely to occur.<br>The 'Subtropical and Temperate Coastal Saltmarsh' is listed as a vulnerable Threatened Ecological Community (TEC) under the EPBC Act, and it's known distribution includes the southern and eastern coasts of Australia.<br>Ecological community consists mainly of salt-tolerant vegetation (halophytes) including: grasses, herbs, sedges, rushes and shrubs (DSEWPaC 2013a). TEC environments are more |

| Receptor Group | Receptor Type | Receptor Description | Values and Sensitivities | Operational Area[1] | | Area Potentially Exposed to Hydrocarbons [2] | |
|---|---|---|---|---|---|---|---|
| | | | | | | | common in northern Australia (Queensland), compared to the temperate and southern coasts (New South Wales, Victoria, Tasmania) (Boon *et al.* 2011). |
| | Soft Sediment | Predominantly unvegetated soft sediment substrates | • Key habitat (e.g. benthic invertebrates) | ✓ | Present<br>Sediment is ubiquitous on the open ocean floor. The Otway Shelf is comprised of Miocene limestone beneath a thin veneer of sediments. The seabed within the operational area is expected to be typically soft sediment, with some outcropping of hard substrate, and a sparse coverage of epifauna (e.g. sponges or bryozoans). | ✓ | Present<br>Unvegetated soft sediments are a widespread habitat in both intertidal and subtidal areas, particularly in areas beyond the photic zone. The Otway Shelf is comprised of Miocene limestone beneath a thin veneer of sediments.<br>Shallow water (<20 m) water depth is typically open sand with intermittent patch reefs with algae coverage. Deeper water depths (>20 m) is dominated by open sandy habitat with sparse coverage of epifauna (e.g. sponges or bryozoans). Small, isolated patches of sponge reef may also occur. |
| | Seagrass | Seagrass meadows | • Nursery habitat (e.g. crustaceans, fish)<br>• Food source (e.g. fish, turtles) | - | Not present<br>The closest seagrass dominated habitat is present in nearshore waters (approximately 4nm from the Annie-1 well location) | ✓ | Present<br>Seagrass generally grows in soft sediments within intertidal and shallow subtidal waters where there is sufficient light. Known seagrass areas include offshore from Warrnambool, extending east from Port Campbell (including within the Twelve Apostles Marine Park). |
| | Algae | Benthic microalgae | • Food source (e.g. gastropods) | - | Not present. Unlikely at water depths within operational areas. | ✓ | Present |

| Receptor Group | Receptor Type | Receptor Description | Values and Sensitivities | Operational Area[1] | | Area Potentially Exposed to Hydrocarbons [2] | |
|---|---|---|---|---|---|---|---|
| | | | | | | | Benthic microalgae are ubiquitous in aquatic areas where sunlight reaches the sediment surface. Macroalgae communities are generally found on intertidal and shallow subtidal rocky substrates. Intermittent patch reefs dominated by the brown alga, Ecklonia sp., with red algae and coralline algae also present, have been recorded in shallow (<20 m) water depths). |
| | | Macroalgae | • Nursery habitat (e.g. crustaceans, fish)<br>• Food source (e.g. birds, fish) | - | Not present | ✓ | Present<br>Macroalgae communities are generally found on intertidal and shallow subtidal rocky substrates and can occur throughout the Australian coast. |
| | TEC: Giant kelp marine forests of SE Australia | Kelp | • Primary producer habitat<br>• Nursery habitat (e.g. crustaceans, fish)<br>• Food source (e.g. birds, fish) | - | Not present | ✓ | May occur<br>The 'Giant Kelp Marine Forests of South East Australia' is listed as an endangered TEC under the EPBC Act and may occur within the area. The ecological community is characterised by a closed to semi-closed surface or subsurface canopy of *Macrocystis pyrifera*. This ecological community occurs on rocky substrate; some patches may occur in Victoria or northern Tasmania. |
| | Coral | Hard and soft coral communities | • Nursery habitat (e.g. crustaceans, fish) | ✓ | Potentially present at water depths >50m. If present, likely to be soft coral with sparse distribution. | ✓ | Present<br>Soft corals can be found at most depths throughout the continental shelf, slope and off the slope regions, to well below the limit of light |

| Receptor Group | Receptor Type | Receptor Description | Values and Sensitivities | Operational Area[1] | | Area Potentially Exposed to Hydrocarbons [2] | |
|---|---|---|---|---|---|---|---|
| | | | • Breeding habitat (e.g. fish) | | | | penetration. Soft corals (e.g. sea fans, sea whips) occur as part of mixed reef environments in waters along the Otway coast. Soft corals can occur in a variety of water depths. |
| **Marine Fauna** | Plankton | Phytoplankton and zooplankton | • Food Source (e.g. fish, whales, turtles) | ✓ | Present<br>Phytoplankton and zooplankton are widespread throughout oceanic environments and is expected to occur in the Operational Area. No defined area of upwelling occurs within the operational area. | ✓ | Present<br>Phytoplankton and zooplankton are widespread throughout oceanic environments; however increased abundance and productivity can occur in areas of upwelling (e.g. Bonney Coast Upwelling). |
| | Seabirds and Shorebirds | Birds that live or frequent the coast or ocean | • Listed Marine Species | ✓ | Present<br>31 seabird and shorebird species (or species habitat) may occur within the operational area; with foraging behaviours identified for some albatross and tern species. The operational area intersects foraging BIAs for: Antipodean Albatross, Wandering Albatross, Buller's Albatross, Shy Albatross, Campbell Albatross, Black-browed Albatross, and the Common Diving-Petrel. | ✓ | Present<br>83 seabird and shorebird species (or species habitat) may occur within the area; with breeding, foraging and roosting behaviours identified for many species. The area intersects foraging BIAs for: Antipodean Albatross, Wandering Albatross, Buller's Albatross, Shy Albatross, Campbell Albatross, Black-browed Albatross, Common Diving-Petrel, White-faced Storm Petrel, Short-tailed Shearwater, Wedge-tailed Shearwater and the Australasian Gannet. There is also an aggregation BIA for the Australasian Gannet at the eastern end of the area, at Point Danger and Lawrence Rocks (south of Portland). A breeding BIA for the Common Diving-Petrel also exists for Lady Julia Percy Island; and a breeding BIA for the Wedge-tailed Shearwater within |
| | | | • Threatened Species | ✓ | | ✓ | |
| | | | • Migratory Species | ✓ | | ✓ | |
| | | | • BIA | ✓ | | ✓ | |

| Receptor Group | Receptor Type | Receptor Description | Values and Sensitivities | Operational Area[1] | | Area Potentially Exposed to Hydrocarbons [2] | |
|---|---|---|---|---|---|---|---|
| | | | | | | | the north-western boundary of the Twelve Apostles Marine Park |
| | Marine Invertebrates | Benthic and pelagic invertebrates | • Food Source (e.g. fish) | ✓ | Present<br>A variety of invertebrate species may occur within the operational, including sponges and bryozoans. Infauna may also be present within the sediment profile.<br>Given the limited extent of the operational area and even more limited extent of seabed disturbance within that area, the impact to possible habitat for commercially important species (e.g. rock lobster, Giant Crab) is expected to be minimal. | ✓ | Present<br>A variety of invertebrate species may occur within the area, including sponges, bryozoans and arthropods. Infauna studies along the Victorian coast showed high species diversity, that increased with water depth; crustacean were the dominant taxa in each depth class.<br>Commercially important species (e.g. abalone, rock lobster, and Giant Crab) may occur within the area. |
| | | | • Commercial Species | ✓ | | ✓ | |
| | Fish | Fish | • Commercial Species | ✓ | Present<br>Commercial fish species occur within the operational area. | ✓ | Present<br>Commercial fish species occur within the area. |
| | | | • Threatened Species | ✓ | Present<br>One threatened fish species (or species habitat) may occur within the operational area, the Australian Grayling. Note, this species is typically found in freshwater streams; however, may spend part of its lifecycle in coastal waters. | ✓ | Present<br>One threatened marine fish species (or species habitat) may occur within the area:<br>• Australian grayling |
| | | Sharks and Rays | • Threatened Species | ✓ | Present<br>Three shark species (or species habitat) may occur within the Operational Area:<br>• Great white shark<br>• Shortfin Mako shark | ✓ | Present<br>Three shark species (or species habitat) may occur within the area:<br>• Great white shark<br>• Shortfin Mako shark |
| | | | • Migratory Species | ✓ | | ✓ | |
| | | | • BIA | – | | ✓ | |

| Receptor Group | Receptor Type | Receptor Description | Values and Sensitivities | | Operational Area[1] | | Area Potentially Exposed to Hydrocarbons [2] |
|---|---|---|---|---|---|---|---|
| | | | | | • Porbeagle shark<br>The Operational Area is within a distribution BIA for the Great White Shark. No critical habitats or behaviours were identified. | | • Porbeagle shark<br>The area intersects the general distribution BIA for the Great White Shark; as well as smaller foraging BIAs (in the vicinity of Wilson's Promontory, Western Port Bay, and the Portland/Port Fairy areas) and a breeding BIA (located east of Wilson's Promontory). |
| | | Pipefish, seahorse, seadragons | • Listed Marine Species | ✓ | Present<br>27 syngnathid species (or species habitat) may occur within the Operational Area. No important behaviours or BIAs have been identified. | ✓ | Present<br>30 syngnathid species (or species habitat) may occur within the area. |
| | Marine Reptiles | Marine turtles | • Listed Marine Species | ✓ | Present<br>Three marine turtle species (or species habitat) may occur within the Operational Area<br>• Loggerhead turtle<br>• Green turtle<br>• Leatherback turtle<br>No BIAs or critical habitat were identified for marine turtles. | ✓ | Present<br>Three marine turtle species (or species habitat) may occur within the area. The area is recognised in the EPBC Protected Matters search, as a foraging habitat for:<br>• Loggerhead turtle<br>• Green turtle<br>• Leatherback turtle<br>No BIAs or critical habitat occur within the area. |
| | | | • Threatened Species | ✓ | | ✓ | |
| | | | • Migratory Species | ✓ | | ✓ | |
| | | | • BIA and critical habitat | – | | - | |
| | Marine Mammals | Seals and Sealions (Pinnipeds) | • Listed Marine Species | ✓ | Present<br>Two species of pinniped (or species habitat) may occur within the Operational | ✓ | Present<br>Three pinniped species (or species habitat) may occur within the area: the |

| Receptor Group | Receptor Type | Receptor Description | Values and Sensitivities | Operational Area[1] | | Area Potentially Exposed to Hydrocarbons [2] | |
|---|---|---|---|---|---|---|---|
| | | | • BIA | – | Area: the Long-nosed Fur-seal and the Australian Fur-seal.<br>No BIAs or critical habitat were identified for pinnipeds. | - | Long-nosed Fur-seal; the Australian Fur-seal; and the Australian Sealion.<br>No BIAs have been identified in the area; however, the area does intersect with known breeding colonies for the Long-nosed Fur-Seal and the Australian Fur-seal. |
| | | Whales | • Listed Marine Species | ✓ | Present<br>11 whale species (or species habitat) may occur within the Operational Area. Foraging behaviours were identified for some species (Sei, Fin and Pygmy Right Whale; Pygmy Blue Whale); no other important behaviours were identified.<br>The Operational Area is near to a BIA (aggregation area near Port Fairy) for the Southern Right Whale and a foraging BIA for the Pygmy Blue Whale. | ✓ | Present<br>22 whale species (or species habitat) may occur within the area. Within the PMST, foraging behaviours were identified for some species (Sie, Blue, Fin and Pygmy Right Whales); and breeding behaviour for the Southern Right Whale (noting however that no BIAs for breeding intersect with the area). No other important behaviours were identified for other species.<br>The area intersects distribution, migration and aggregation BIAs for the Southern Right Whale and a foraging BIA for the Pygmy Blue Whale. |
| | | | • Threatened Species | ✓ | | ✓ | |
| | | | • Migratory Species | ✓ | | ✓ | |
| | | | • BIA | ✓ | | ✓ | |
| | | Dolphins | • Listed Marine Species | ✓ | Present<br>Five dolphin species (or species habitat) may occur within the Operational Area.<br>No important behaviours or BIAs have been identified. | ✓ | Present<br>Eight dolphin species (or species habitat) may occur within the area. No important behaviours or BIAs have been identified. |
| | | | • Migratory Species | ✓ | | ✓ | |
| | Marine pests | | • Introduced marine species | ✓ | May be present<br>The National system for the prevention and management of marine pest incursions identifies several marine pests between Portland (east of Cape Otway) | ✓ | May be present<br>The National system for the prevention and management of marine pest incursions identifies several marine pests between |

| Receptor Group | Receptor Type | Receptor Description | Values and Sensitivities | Operational Area[1] | Area Potentially Exposed to Hydrocarbons [2] |
|---|---|---|---|---|---|
| | | | | and Port Phillip Bay (west of Cape Otway); based on species habitat preferences, the following may be present in the operational area:<br>• Northern Pacific seastar<br>• European green shore crab<br>• European or basket shell clam<br>• New Zealand screw shell<br>The introduced conical New Zealand Screw Shell (*Maoricolpus roseus*) has been identified east of Cape Otway in the Sole and Patricia Baleen offshore pipeline corridors, generally in water depths greater than 40 m. | Portland (east of Cape Otway) and Port Phillip Bay (west of Cape Otway); based on species habitat preferences, the following may be present in the area:<br>• European fan worm<br>• Japanese kelp<br>• Asian date/bag mussel<br>• Northern Pacific seastar<br>• European green shore crab<br>• European or basket shell clam<br>• New Zealand screw shell<br>The introduced conical New Zealand screw shell (*Maoricolpus roseus*) has been identified east of Cape Otway in the Sole and Patricia Baleen offshore pipeline corridors, generally in water depths greater than 40 m. |

**Table 3-2: Presence of Conservation Values & Social Receptors within the Operational Area and the Area Potentially Exposed to Hydrocarbons**

| Receptor Group | Receptor Type | Receptor Description | Values and Sensitivities | Operational Area[1] | | Area Potentially Exposed to Hydrocarbons [2] | |
|---|---|---|---|---|---|---|---|
| **Natural System** | Commonwealth Marine Area | Key Ecological Features | • High productivity<br>• Aggregations of marine life | - | Present<br>A single KEF intersects with the operational area:<br>Shelf Rocky Reefs and Hard Substrates: On the continental shelf, rocky reefs and hard grounds provide attachment sites for macroalgae and sessile invertebrates, increasing the structural diversity of shelf ecosystems. The reefs provide habitat and shelter for fish and are important for aggregations of biodiversity and enhanced productivity. | ✓ | Present<br>Three KEFs intersect with the EMBA:<br>• Bonney Coast Upwelling: a predictable, seasonal upwelling bringing cold nutrient rich water to the sea surface and supporting regionally high productivity and high species diversity in an area where such sites are relatively rare and mostly of smaller scale.<br>• West Tasmania Canyons: located on the edge of the continental shelf offshore of the north-west corner of Tasmania and as far south as Macquarie Harbour. These canyons can influence currents, act as sinks for rich organic sediments and debris, and can trap waters or create upwellings that result in productivity and biodiversity hotspots.<br>• Shelf Rocky Reefs and Hard Substrates: On the continental shelf, rocky reefs and hard grounds provide attachment sites for macroalgae and sessile invertebrates, increasing the structural diversity of shelf ecosystems. The reefs provide habitat and shelter for fish and are important for aggregations of biodiversity and enhanced productivity |

| Receptor Group | Receptor Type | Receptor Description | Values and Sensitivities | Operational Area[1] | | Area Potentially Exposed to Hydrocarbons [2] | |
|---|---|---|---|---|---|---|---|
| | | Australian Marine Park | • Aggregations of marine life | - | Not present | ✓ | Present<br>The AMPs intersect with the outer boundaries of the area potentially exposed to hydrocarbons.<br>Apollo Marine Park:<br>• Ecosystems, habitats and communities associated with the Western Bass Strait Shelf Transition and the Bass Strait Shelf Province and associated with the sea-floor features: deep/hole/valley and shelf<br>• Important migration area for: Blue, Fin, Sei and humpback whales<br>• Important foraging area for: Black-browed and Shy albatross, Australasian Gannet, Short-tailed Shearwater, and Crested tern<br>• Cultural and heritage site: wreck of the MV City of Rayville<br>• Beagle Marine Park<br>• Ecosystems, habitats and communities associated with the Southeast Shelf Transition and associated with the sea-floor features: basin, plateau, shelf and sill<br>• Important migration and resting area for: southern right whale<br>• Important foraging area for: Australian fur seal, killer whale, white shark, shy albatross, Australasian gannet, short-tailed shearwater, pacific and silver gulls, crested tern, common diving petrel, fairy prion, |

| Receptor Group | Receptor Type | Receptor Description | Values and Sensitivities | Operational Area[1] | | Area Potentially Exposed to Hydrocarbons [2] | |
|---|---|---|---|---|---|---|---|
| | | | | | | | black-faced cormorant and little penguin<br>• Cultural and heritage sites: the wreck of the steamship SS Cambridge and the wreck of the ketch Eliza Davies. |
| | State Parks and Reserves | Marine Protected Areas | • Aggregations of marine life | - | Not present | ✓ | Present<br>Multiple State Marine Protected Areas intersect with the area. |
| | Wetlands of International Importance | Ramsar Wetlands | • Aggregation, foraging and nursery habitat for marine life | - | Not present | ✓ | Present<br>Five RAMSAR wetlands are located within (or adjacent to) the area:<br>• Corner Inlet<br>• Glenelg estuary and discovery bay wetlands<br>• Piccaninnie Ponds Karst Wetlands<br>• Port Philip Bay (western shore) and Bellarine Peninsula<br>• Western Port |
| | | Marine and Coastal Zone Wetlands of National Importance | • Aggregation, foraging and nursery habitat for marine life | - | Not present | ✓ | Present<br>Four wetlands of importance (with a coastal or marine connection) intersect with the area. These are:<br>• Corner Inlet<br>• Long Swamp<br>• Western Port<br>• Yambuck Wetlands |
| **Human System** | Commercial Fisheries | Commonwealth-managed | • Economic benefit | ✓ | Present | ✓ | Present |

| Receptor Group | Receptor Type | Receptor Description | Values and Sensitivities | Operational Area[1] | | Area Potentially Exposed to Hydrocarbons [2] | |
|---|---|---|---|---|---|---|---|
| | | | | | Five Commonwealth-managed fisheries have management areas that intersect the operational area:<br>• Eastern Tuna and Billfish Fishery<br>• Small Pelagic Fishery<br>• Southern & Eastern Scalefish & Shark Fishery<br>• Southern Squid Jig Fishery; and<br>• Southern Bluefin Tuna Fishery<br>Fishing intensity data suggests that the Southern and Eastern Scalefish and Shark Fishery and the Southern Squid Jig Fishery actively fish in the Operational Area. | | Six Commonwealth-managed fisheries have management areas that intersect with the area:<br>• Bass Strait Central Zone Scallop<br>• Eastern Tuna and Billfish Fishery<br>• Small Pelagic Fishery<br>• Southern & Eastern Scalefish & Shark Fishery<br>• Southern Squid Jig Fishery; and<br>• Southern Bluefin Tuna Fishery<br>Fishing intensity data suggests that the Southern and Eastern Scalefish and Shark Fishery and the Southern Squid Jig Fishery actively fish in the area. |
| | | State-managed | • Economic benefit | ✓ | Present<br>A number of State-managed fisheries have management areas that intersect with the Operational Area:<br>• Abalone fishery<br>• Eel fishery<br>• Giant crab fishery<br>• Rock lobster fishery<br>• Scallop fishery<br>• Wrasse fishery<br>• Sea Urchin fishery<br>Given the limited extent of the operational area, the impact to overall fishing effort across the region is expected to be minimal. | ✓ | Present<br>A number of State-managed fisheries have management areas that intersect with the area:<br>• Abalone fishery<br>• Eel fishery<br>• Giant crab fishery<br>• Pipi fishery<br>• Rock lobster fishery<br>• Scallop fishery<br>• Wrasse fishery<br>• Sea urchin and turban shell restricted fishery<br>• Bay and inlet fisheries<br>Fishing intensity data is not available; however, it is possible that the Giant |

| Receptor Group | Receptor Type | Receptor Description | Values and Sensitivities | Operational Area[1] | | Area Potentially Exposed to Hydrocarbons [2] | |
|---|---|---|---|---|---|---|---|
| | | | | | | | Crab, Rock Lobster, Scallop and Wrasse fisheries may be active within the area. |
| | Recreational Fisheries | State-managed | • Community<br>• Recreation | ✓ | Present<br>Recreational fishing may occur within the Operational Area. Most recreational fishing typically occurs in nearshore coastal waters (shore or inshore vessels) and within bays and estuaries. Recreational fishing activity is expected to be minimal in the Operational Area. | ✓ | Present<br>Most recreational fishing typically occurs in nearshore coastal waters, and within bays and estuaries; offshore (>5 km) fishing only accounts for approximately 4% of recreational fishing activity in Australia. |
| | Recreation and Tourism | Various human activities and interaction | • Community<br>• Recreation<br>• Economic benefit | ✓ | Present<br>Marine-based recreation and tourism may occur within the Operational Area, but activity is expected to be minimal given the water depths and distance from shore for both exploration well locations. | ✓ | Present<br>The Australian coast provides a diverse range of recreation and tourism opportunities, including scuba diving, charter boat cruises, and surfing. The area west of Great Otway National Park and Port Fairy is renowned for its nature-based tourism, recreational fishing and water sports. |
| | Industry | Shipping | • Community<br>• Economic benefit | ✓ | Present<br>The Operational Area for Annie-1 does not coincide with major shipping routes.<br>The Operational Area for Elanora-1 coincides with an area of increased vessel traffic between approximately 12nm and 30nm from shore. | ✓ | Present<br>The south-eastern coast is one of Australia's busiest in terms of shipping activity and volumes. Shipping routes typically occur only through the southern extent of the area. Commercial ports within the area include Port of Portland; the routes to from Port Phillip and Port of Melbourne also overlaps the area potentially exposed to hydrocarbons. |
| | | Oil and Gas (other) | • Economic benefit | - | Not present<br>Petroleum activity within the Operational Area is covered in this EP Summary. | ✓ | Present<br>The Otway Basin is an established gas producing region; however, most discoveries are confined to the onshore |

| Receptor Group | Receptor Type | Receptor Description | Values and Sensitivities | Operational Area[1] | | Area Potentially Exposed to Hydrocarbons [2] | |
|---|---|---|---|---|---|---|---|
| | | | | | | | and shallow water inboard parts of the basin. Current offshore production in the Otway Basin includes the Minerva, Thylacine, Geographe, Casino, Henry (including Netherby) fields, and the recent (late-2016) commencement of the Halladale/Speculant gas project. |
| | Heritage | Maritime | • Shipwrecks | – | Not present. | ✓ | Present<br>Several shipwrecks are within the area, including: *Falls of Halladale, Schomberg; and Newfield.* |
| | | Cultural | • World Heritage Properties<br>• Commonwealth Heritage Places<br>• National Heritage Places | – | Not present. | – | Not present. |
| | | Indigenous | • Indigenous use or connection | – | Not present | ✓ | Present<br>The coastal area of south-east Australia was amongst the most densely populated regions of pre-colonial Australia. Through cultural traditions, Aboriginal people maintain their connection to their ancestral lands and waters. The Gadubanud (Ktabanut) people have occupied the Otway region, including the estuaries and coastline for thousands of years. |

# 4 Environmental Impact and Risk Assessment Methodology

This section describes the environmental impact and risk assessment methodology employed for Otway Basin exploration drilling activities, adopting Cooper Energy's risk assessment framework and toolkit to evaluate the potential impacts and risks. Section 5 reflects the risk register and shows all identified risks and impacts to be closed out by addressing the required preventative and mitigative controls.

For the Cooper Energy offshore activities, environmental aspects, impacts and risks have been identified and assessed through the following steps:

- Establish the context for the assessment by defining the activity and associated environmental aspects;
- Identifying the impact or risk associated with the environmental aspects;
- Identifying the ecological and social receptors with the potential to be exposed to the hazard;
- Evaluate the potential impact or risk (consequence);
- Determine the ALARP decision context and identify control measures;
- Evaluate the likelihood of the impact or risk (consequence) occurring;
- Assigning residual risk rating (after control measures are implemented) utilizing the Cooper Energy qualitative risk matrix. In accordance with the Cooper Energy acceptance criteria, the impacts and risks continue to be reassessed until it is demonstrated the impact or risk is reduced to a level which is as low as reasonably practicable (ALARP) and is acceptable according to the Cooper Energy acceptance criteria; and
- Evaluate the acceptability of the potential impact or risk.


**Figure 4-1: AS/NZS ISO 31000 – Risk Management Methodology**

## 4.1 Impact and Risk Evaluation

### 4.1.1 Establish the context

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 aspect identification.

Based upon an understanding of the environmental interactions, relevant impacts or risks were defined. Ecological and social receptors identified with the potential to be exposed to an aspect and subsequent impacts or risks were then summarised enabling a systematic evaluation to be undertaken.

### 4.1.2 Evaluate the potential impact (consequence)

After identifying the potential impacts or risks; consequences were determined based on:

- The spatial scale or extent of potential impact or risk of the environmental aspect 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 environmental aspect within the receiving environment (e.g. persistence, toxicity, mobility, bioaccumulation potential);
- The duration and frequency of potential effects and time for recovery; and
- The potential degree of change relative to the existing environment or to criteria of acceptability.

Consequence definitions are provided in Table 4-1.

**Table 4-1: Definition of Consequence**

| Descriptor | Environment | Regulatory, reputation, community and media |
|---|---|---|
| 5. Critical | Severe long-term impact on highly-valued ecosystems, species populations or habitats.<br>Significant remedial/recovery work to land/water systems over decades (if possible at all). | Critical impact on business reputation &/or international media exposure.<br>High-level regulatory intervention.<br>Potential revocation of License/Permit.<br>Operations ceased. |
| 4. Major | Extensive medium to long-term impact on highly-valued ecosystems, species populations or habitats.<br>Remedial, recovery work to land or water systems over years (~5-10 years). | Significant impact on business reputation and/or national media exposure.<br>Significant regulatory intervention.<br>Operations ceased. |
| 3. Moderate | Localised medium-term impacts to species or habitats of recognized conservation value or to local ecosystem function.<br>Remedial, recovery work to land/water systems over months/year. | Moderate to small impact on business reputation.<br>Potential for state media exposure.<br>Significant breach of regulations, attracting regulatory intervention. |

| Descriptor | Environment | Regulatory, reputation, community and media |
|---|---|---|
| 2. Minor | Localised short-term impacts to species/habitats of recognised conservation value but not affecting local ecosystem functioning.<br>Remedial, recovery work to land, or water systems over days/weeks.<br>No significant impacts to third parties. | Some impact on business reputation and/or industry media exposure.<br>Breach of regulations - event reportable to authorities. |
| 1. Negligible | Temporary localised impacts or disturbance to plants/animals.<br>Nil to negligible remedial/recovery works on land/water systems. | Minimal impact on business reputation.<br>Negligible media involvement.<br>No regulatory breaches or reporting. |

### 4.1.3 Determine the ALARP decision context and identify control measures

In alignment with NOPSEMA's ALARP Guidance Note (N-04300-GN0166, Rev 6, June 2015), Cooper Energy have adapted the approach developed by Oil and Gas UK (OGUK) (formerly UKOOA; OGUK, 2014) for use in an environmental context to determine the assessment technique required to demonstrate that potential impacts and risks are ALARP (Figure 4-2). Specifically, the framework considers impact severity and several guiding factors:

- Activity type;
- Risk and uncertainty; and
- Stakeholder influence.

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

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

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

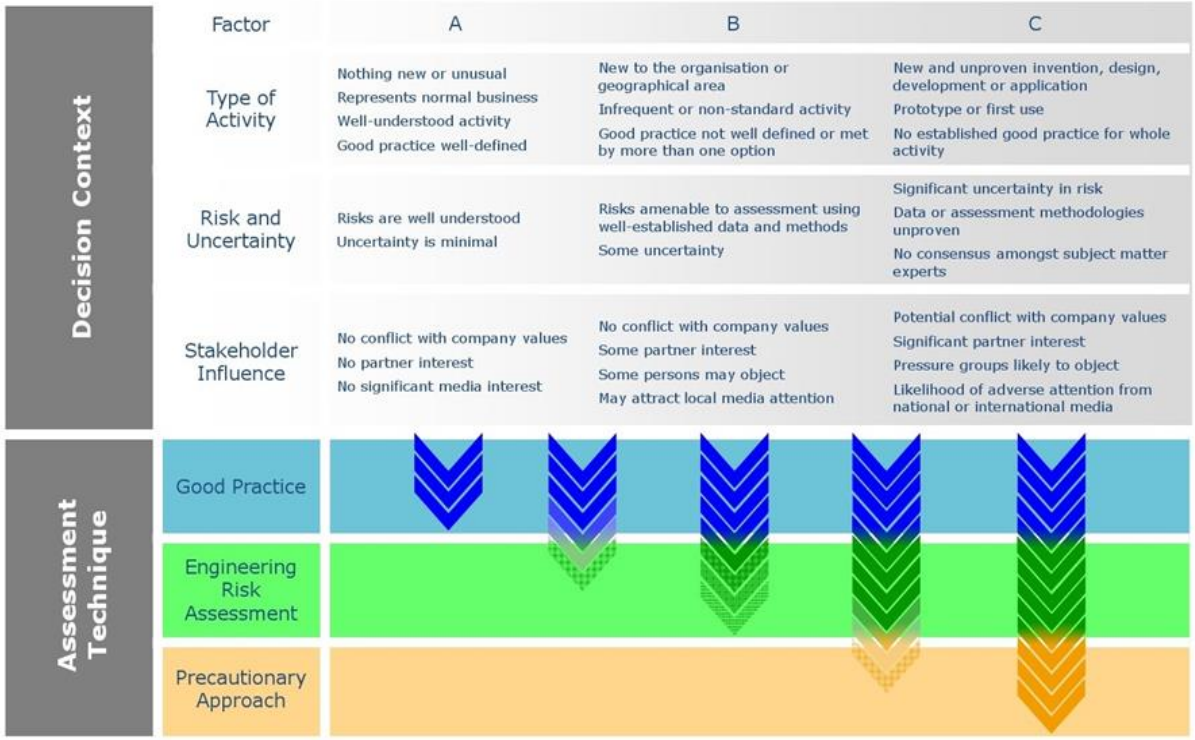


**Figure 4-2: ALARP Decision Support Framework**

(NOPSEMA EP decision-making GL1721, Rev 5, June 2018 – Criterion 10A(c) Acceptable level.)

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

- Good practice;
- Engineering risk assessment; and
- Precautionary approach.

### 4.1.4 Evaluating the likelihood of the impact (consequence) occurring

The likelihood of a defined consequence occurring was determined, considering the control measures that have been previously identified. Likelihood definitions are provided in Table 4-2 Likelihood levels are determined according to the Cooper Energy qualitative risk matrix (Table 4-3).

**Table 4-2: Definition of Likelihood**

| Descriptor | Description |
|---|---|
| A. Almost certain | Common event expected to occur in most circumstances within Cooper Energy operations (i.e. several times a year). |
| B. Likely | Event likely to occur once or more during a campaign, ongoing operations or equipment design life. |
| C. Possible | Infrequent event that may occur during a campaign, ongoing operations or equipment design life. |

| Descriptor | Description |
|---|---|
| D. Unlikely | Unlikely event but could occur at sometime within Cooper Energy operations (has occurred previously in similar industry). |
| E. Remote | Rare event. May occur in exceptional circumstances of Cooper Energy operations (not heard of in recent similar industry history). |

### 4.1.5 Assigning residual risk rating

Based upon the identified consequence and likelihood levels, Cooper Energy use the qualitative risk matrix (Table 4-3) to rate the residual risk level.

**Table 4-3: Cooper Energy Qualitative Risk Matrix**

| | | CONSEQUENCE | | | | |
|---|---|---|---|---|---|---|
| | | 1.Negligible | 2.Minor | 3.Moderate | 4.Major | 5.Critical |
| LIKELIHOOD | Almost Certain | M | M | H | H | H |
| | Likely | M | M | M | H | H |
| | Possible | L | M | M | H | H |
| | Unlikely | L | L | M | M | H |
| | Remote | L | L | L | M | M |

### 4.1.6 Evaluate the acceptability of the potential impact and risk

Cooper Energy considers a range of factors when evaluating the acceptability of environmental impacts or risks associated with its activities. This evaluation works at several levels, as outlined in Table 4-4 and is based on NOPSEMA's Guidance Notes for EP Content Requirements (N04750-GN1344, Rev 3, April 2016) and guidance issued in Decision-making – Criterion 10A(c) Acceptable Level (GL1721, Rev 5, June 2018).

The acceptability evaluation for each aspect associated with this activity is undertaken in accordance with Table 4-4.

**Table 4-4: Cooper Energy Acceptability Evaluation**

| Factor | Criteria / Test |
|---|---|
| Cooper Energy Risk Process – Acceptable Risk | Is the level of risk High? (if so, it is considered unacceptable) |
| Principles of Ecologically Sustainable Development (ESD) [See below] | Is there the potential to affect biological diversity and ecological integrity? (Consequence Level Major [4] and Critical [5])<br>Do activities have the potential to result in serious or irreversible environmental damage?<br>If yes: Is there significant scientific uncertainty associated with aspect?<br>If yes: Has the precautionary principle been applied to the aspect? |
| Legislative and Other Requirements | Confirm that all good practice control measures have been identified for the aspect including those identified in relevant EPBC listed species recovery plans or approved conservation advices |
| Internal Context | Confirm that all Cooper Energy HSEC MS Standards and Risk Control Processes have been identified for this aspect |
| External Context | What objections and claims regarding this aspect have been made, and how have they been considered / addressed? |

ESD Principles are:

A. Decision making processes should effectively integrate both long term and short term economic, environmental, social and equitable considerations

   This principle is inherently met through the EP assessment process. This principal is not considered separately for each acceptability 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. If there is, the project shall assess whether there is significant uncertainty in the evaluation, and if so, whether the precautionary approach should be applied

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 EP assessment methodology ensures that potential impacts and risks are ALARP, where the potential impacts and risk are determined to be serious or irreversible the precautionary principle is implemented to ensure the environment is maintained for the benefit of future generations. Consequently, this principal is not considered separately for each acceptability evaluation)

D. The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making

   Project to consider if there is the potential to affect biological diversity and ecological integrity)

E. Improved valuation, pricing and incentive mechanisms should be promoted

   (Not relevant to this EP summary).

## 4.2 Monitor and Review

Monitoring and review activities are incorporated into the impact and risk management process to ensure that controls are effective and efficient in both design and operation. This is achieved through the environmental performance outcomes, standards and measurement criteria that are described for each environmental hazard in Section 6.0 of the EP. Additional aspects of monitoring and review are described in the Implementation Strategy in Section 8.0 of the EP include:

- Analysing and lessons learnt from events (including near-misses), changes, trends, successes and failures;
- Detecting changes in the external and internal context (e.g. new conservation plans issued); and
- Identifying emerging risks.

# 5 Risk and Impact Evaluation

To meet the requirements of the Regulations, the impacts and risks associated with the petroleum activity appropriate to the nature and scale of each impact and risk and details the control measures that are used to reduce the risks to ALARP and an acceptable level are summarised in this section.

## 5.1 Physical Interaction (Collision with Marine Fauna)

Table 5-1 provides a summary of the environmental impact assessment (EIA) / environmental risk assessment (ERA) for Physical Interaction (Collision with Marine Fauna).

**Table 5-1: Physical Interaction (Collision with Marine Fauna) EIA / ERA**

| | |
|---|---|
| **Cause of Aspect** | The movement of vessels within the operational area and the physical presence of the vessel has the potential to result in collision with marine fauna. |
| **Summary of impact(s)** | Interaction with fauna has the potential to result in:<br>• injury or death of marine fauna. |
| **Consequence Evaluation** | |
| **Receptor(s)** | **Description of Potential Environmental Impact** |
| Megafauna | Megafauna are the species most at risk from this hazard and thus are the focus of this evaluation. Several marine mammals (whale, dolphin) and turtle species, including those listed as either threatened and/or migratory under the EPBC Act have the potential to occur within the operational area. The Operational Area is near to a BIA (aggregation area near Port Fairy) for the Southern Right Whale and a foraging BIA for the Pygmy Blue Whale.<br>For the Southern Right Whale, while the operational area is within a distribution BIA, it does not intersect with known aggregation areas. Similarly, for the Great White Shark, known aggregation areas (foraging, breeding), while in eastern Victoria, occur beyond the vicinity of the operational area. Both the Southern Right Whale and Great White Shark migrate north along the east coast of Australia, typically beginning in autumn; and return in spring (Great White Shark) or early-summer (Southern Right Whale). The Great White Shark has been recorded in higher numbers during November/December in Victorian waters (coinciding with seal pupping season); this is outside of the anticipated timing of works for the drilling activities outlined under this EP Summary.<br>The south-eastern coast is one of Australia's busiest in terms of shipping activity and volumes. However, the proposed well locations do not coincide with major commercial shipping routes.<br>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 in the vicinity of a vessel, while others are curious and often approach ships that have stopped or are slow moving, although they generally do not approach, and sometimes avoid, faster-moving ships (Richardson et al. 1995).<br>Collisions between larger vessels with reduced manoeuvrability and large, slow-moving cetaceans occur more frequently where high vessel traffic and cetacean habitat occurs (Whale and Dolphin Conservation Society, 2006). Laist et al. (2001) identified that |

| | |
|---|---|
| | larger vessels with reduced manoeuvrability moving in excess of 10 knots may cause fatal or severe injuries to cetaceans, with the most severe injuries caused by vessels travelling faster than 14 knots. Vessels typically used to support these activities do not have the same limitations on manoeuvrability and would not be moving at these speeds when conducting activities within the scope of the EP, inside the operational area.<br>The duration of fauna exposure to vessel strike is limited to the duration of works described in this EP Summary expected to be approximately 60 days. If a fauna strike occurred and resulted in death, it is not expected that it would have a detrimental effect on the overall population. Consequently, the potential impacts and risks from fauna strike are considered to be Minor (2) as this type of event may result in a localised short-term impact to species of recognised conservation value but is not expected to affect the population or local ecosystem function. |
| **ALARP Decision Context** | **A** |
| **Summary of Control Measures** | |
| **Vessel Master**<br>Vessel masters will be briefed on caution and 'no approach zones' and interaction management actions as defined in the EPBC Regulations 2000 – Part 8 Division 8.1 | |
| **Vessel Master**<br>A vessel master (or delegate) will be on duty at all times | |
| **Fauna interaction management actions**<br>Vessels adhere to the distances and vessel management practices of EPBC Regulations (Part 8) and Wildlife (Marine Mammals) Regulations 2009:<br>• Vessels will travel at less than 5 knots within the caution zone of a cetacean and minimise noise (Caution Zone is 150m radius for dolphins, 300 m for whales and 50 m for pinnipeds).<br>• The vessel must not drift closer than 50 m (dolphins and pinnipeds) and 100 m (whale);<br>• If whale comes within above limits, the vessel master must disengage gears and let the whale approach or reduce the speed of the vessel and continue on a course away from the whale;<br>• The vessel must not restrict the path of a marine mammal.<br>• The vessel must not separate any individual from a group of marine mammals or come between a mother whale and calf or a seal and pup;<br>• If the vessel is within the caution zone of a marine mammal the vessel must move at a constant speed that does not exceed 5 knots, avoids sudden changes in speed or direction and manoeuvres the vessel to outside the caution zone if the marine mammal shows any sign of disturbance;<br>Additionally, if a vessel is within the cautio00n zone of a marine mammal, the vessel shall not approach a marine mammal from head on, from the rear or be in the path ahead of a marine mammal at an angle closer than 30° to its observed direction of travel. | |
| **Environmental Induction**<br>All vessel crew have completed an environmental induction covering the requirements for marine mammal/vessel interaction consistent with EPBC Regulations 2000 (Chapter 8) and Victorian Wildlife (Marine Mammals) Regulations 2009 (Part 2/Part 3) and are familiar with the requirements. This includes a requirement to notify the bridge if marine mammals are sighted in the caution zone. | |

| | | | |
|---|---|---|---|
| **Fauna observation actions**<br>Trained crew members on active duty will report observations of megafauna located within the cautionary zone (as defined in The Australian Guidelines for Whale and Dolphin Watching) to the vessel master (or their delegate), as soon as it is safe to do so | | | |
| **Incident reporting**<br>Any injury to, or mortality of, an EPBC Act Listed Threatened or Migratory Species (including those from a vessel strike) will be recorded on the National Ship Strike database within 72 hours. | | | |
| **Likelihood** | **Unlikely (D)** | **Residual Risk** | **Low** |

## 5.2 Physical Interaction (Other Marine Users)

Table 5-2 provides a summary of the EIA / ERA for Physical Interaction (Other Marine Users).

**Table 5-2: Physical Interaction (Other Marine Users) EIA / ERA**

| | |
|---|---|
| **Cause of Aspect** | The movement of vessels within the operational area, and the physical presence of the MODU, vessels and equipment have the potential to result in interactions with other marine users.<br>Several fisheries also overlap both Annie-1 and Elanora-1 well locations and may therefore be excluded from these locations for the duration of the drilling activities. |
| **Summary of impact(s)** | Interaction with other marine users has the potential to result in:<br>• disruption to commercial activities. |
| **Consequence Evaluation** | |
| **Receptor(s)** | **Description of Potential Environmental Impact** |
| Fisheries | Several commercial fisheries have management areas that overlap the operational area described under this EP Summary.<br>Fisheries which may have an active presence in the operational area include the Victorian wrasse and snapper fishery; the Commonwealth trawl sector and squid jig fisheries. Fishing intensity plots for the other Commonwealth fisheries indicate low or no active presence in the operational area. Fishing intensity for state fisheries could not be obtained.<br>For previous drilling activities within a similar region, two stakeholders have indicated concern over possible cumulative impacts from multiple wells and associated exclusion zones, which may impact on the total area available for fishing. During drilling activities covered under this EP Summary, the 500m exclusion zone to be placed around the MODU will only be temporary. Once drilled, the proposed exploration wells will be plugged and abandoned and will therefore not present a potential cumulative impact due to exclusion zones. For safety reasons, in particular to avoid interaction between the subsea facilities and other marine users, establishing a temporary exclusion zone is considered necessary and will be exclusive.<br>The potential for temporal and geographical overlap with rock lobster and wrasse fisheries was also noted during consultation with SIV, although no concerns have been raised by those fisheries during consultation. Based on annual fishing records and the size of the fishing grounds, the proposed activities within the operational area and use of a temporary exclusion zone are not expected to result in a significant impact to commercial operations (via loss of catches, temporary loss of fishing grounds or potential damage to fishing equipment).<br>The south-eastern coast is one of Australia's busiest in terms of shipping activity and volumes.<br>Whilst Annie-1 is outside of established shipping routes through the Otway Region, Elanora-1 is at the northern edge of an area of heavy traffic. Given the width of this nearby shipping route (12-30nm) compared to the exclusion area for the MODU (500m radius), the most credible impact to other marine users would be the minor deviation of commercial vessels around the MODU exclusion zone with negligible impact on travel times or fuel use of these vessels. |

| | |
|---|---|
| | Based on the above assessments, any impacts to other marine users would be Negligible (1), with little to no potential impacts to external stakeholders. |
| **ALARP Decision Context** | **A** |
| **Summary of Control Measures** | |
| **Pre-start notifications**<br>The AHS will be notified no less than four working weeks before operations commence to enable Notices to Mariners to be published | |
| **Pre-start notifications**<br>AMSA's JRCC will be notified 24–48 hours before operations commence to enable AMSA to distribute an AUSCOAST warning | |
| **AIS Transceiver**<br>The MODU is fitted with an AIS transceiver enabling the MODU to receive the data broadcasted by surrounding vessels, such as Maritime Mobile Service Identity (MMSI) number, IMO number, VHF call sign, speed, heading and course over ground.<br>AIS is monitored 24 hours per day. | |
| **Aid to Navigation**<br>Additional navigational aid fitted (AtoN) increasing the range of traditional AIS. | |
| **Standby vessel**<br>One vessel is always on standby for the MODU. | |
| **Pre-start notifications**<br>Relevant stakeholders will be notified of activities a minimum 4 weeks prior to operations commencing. | |
| **Ongoing communications**<br>Relevant marine users will be notified of the cessation of activities | |
| **Stakeholder Feedback Channels**<br>Cooper Energy monitors stakeholder engagement channels including the Stakeholder email inbox and Stakeholder Telephone hotline | |

| | | | |
|---|---|---|---|
| **Likelihood** | **Unlikely (D)** | **Residual Risk** | **Low** |

## 5.3 Light Emissions

Table 5-3 provides a summary of the EIA / ERA for Light Emissions.

**Table 5-3: Light Emissions EIA / ERA**

| | |
|---|---|
| **Cause of Aspect** | During the activity, the MODU and support vessels will generate light while in the operational area. Lighting is used for marine safety to ensure clear identification of vessels to other marine users and to allow activities to be undertaken safely 24 hours a day. Lighting will typically consist of bright white (i.e., metal halide, halogen, fluorescent) lights, and are not dissimilar to other offshore activities in the region, including fishing and shipping.<br>No flaring is planned for the proposed drilling activities. |
| **Summary of impact(s)** | A change in ambient light levels has the potential to result in:<br>• Attraction of light-sensitive species such as seabirds, squid and zooplankton in turn affecting predator-prey dynamics; and<br>• Alteration of behaviour that may affect species during breeding periods (e.g. shearwaters, turtle hatchlings). |
| **Consequence Evaluation** | |
| **Receptor(s)** | **Description of Potential Environmental Impact** |
| Seabirds, fish, squid and plankton | Localised light glow that may act as an attractant to light sensitive species<br>High levels of marine lighting can attract and disorient seabird species resulting in species behavioural changes (e.g. circling light sources leading to exhaustion or disrupted foraging), injury or mortality near the light source.<br>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 (Marquenie et al. 2008) and that lighting can attract birds from large catchment areas (Weise et al. 2001). These studies indicate that migratory birds are attracted to lights on offshore platforms when travelling within a radius of 5 km from the light source, but their migratory paths are unaffected outside this zone (Shell, 2010).<br>Although the operational area overlaps several foraging BIAs for seabirds, it is not expected that light emissions acting as an attractant to a small number of individual seabirds would result in any impact to the individual or to the greater population.<br>There is no evidence to suggest that artificial light sources adversely affect the migratory, feeding or breeding behaviours of cetaceans. Cetaceans predominantly utilise acoustic senses to monitor their environment rather than visual sources (Simmonds et al. 2004), so light is not considered to be a significant factor in cetacean behaviour or survival.<br>Other marine life may also be attracted to the MODU or support vessels (e.g. fish, squid and plankton) that can aggregate directly under downward facing lights. These are prey species to many species of marine fauna and given the nature of the activity, any impacts arising from light emissions will be localised and temporary.<br>Consequently, the potential impacts and risks from light emissions are considered to be Negligible (1) as this type of event may result in temporary localised impacts or |

| | |
|---|---|
| | disturbance to animals but is not expected to affect the population or local ecosystem function. |
| Turtles, seabirds | **Alteration of behaviour from light-sensitive species during breeding periods**<br>Turtles<br>Light pollution can be an issue along, or adjacent to, turtle nesting beaches where emerging hatchlings orient to, and head towards, the low light of the horizon unless distracted by other lights which disorient and affect their passage from the beach to the sea (EA, 2003). Given the absence of turtle nesting in Victoria, impacts to nesting adults and turtle hatchlings are not expected.<br>Seabirds<br>Artificial light can cause significant impacts on burrow-nesting petrels and shearwaters. Fledglings often become disoriented and grounded because of artificial light adjacent to rookeries as they attempt to make their first flights to sea, a phenomenon known as 'fallout' (Birdlife International, 2012). Rodriguez at al. (2014) investigated the effects of artificial lighting from road lighting on short-tailed shearwater fledglings. The study established by removing the light source from nesting areas, there was a decrease in grounded fledglings and a corresponding reduction in bird fatalities.<br>The operational area (Annie-1) is approximately 9 km from the closest shoreline. Given the distance offshore, changes to ambient light levels in seabird breeding areas are not expected to occur, thus impacts to breeding seabirds from light emissions are not expected. |
| **ALARP Decision Context** | **A** |
| **Summary of Control Measures** | |
| Lighting will be limited to that required for safe work/navigation. | |

| | | | |
|---|---|---|---|
| **Likelihood** | **Possible (C)** | **Residual Risk** | **Low** |

## 5.4 Underwater Sound Emissions

Table 5-4 provides a summary of the environmental impact assessment (EIA) for Underwater Sound Emissions.

**Table 5-4: Underwater Sound Emissions EIA**

| | |
|---|---|
| **Cause of Aspect** | Underwater sound emissions will be generated from:<br>• Side scan sonar survey<br>• Sub-bottom profiling survey<br>• Multibeam bathymetry<br>• Drilling operations (mechanical operation of the drill string and other machinery)<br>• Support operations (vessel/helicopter operations/acoustic transponders)<br>Underwater sound emissions can be impulsive (i.e. pulsed) or continuous (i.e. non-pulsed). The Sound Pressure Level (SPL) associated with underwater sound is typically reported as dB with a reference level of 1 micro-Pascal (dB re 1 µPa). However, the dB number can represent multiple types of measurements, including zero-to-peak pressure (0-pk, or PK), peak-to-peak pressure (pk-pk), root-mean-square (RMS). For environmental impact thresholds, Sound Exposure Level (SEL) can also be used, which can be the exposure over 1 second (SEL) or cumulative (SELcum), which is typically over 24 hours. Sound source level and frequency of sound generated varies considerably between different sources.<br>Helicopters generate airborne sound, which may penetrate into the marine environment. The intensity of the received sound depends upon the source level, altitude, and depth of the receiver. Richardson et al. (1995) reports figures for a Bell 214 helicopter (stated to be one of the noisiest) being audible in air for four minutes before it passed over underwater hydrophones, but detectable underwater for only 38 seconds at 3 m depth and 11 seconds at 18 m depth. The maximum received level was 109 dB RMS. As the received levels are below the source levels for vessels and MODU sound, which will be continuous throughout operations, no further assessment of helicopter sound has been made. |
| **Summary of impact(s)** | The potential impacts of underwater sound emissions in the marine environment are:<br>• Behavioural; and<br>• Auditory impairment, permanent threshold shift (PTS) and temporary threshold shift (TTS). |
| **Consequence Evaluation** | |
| **Receptor(s)** | **Description of Potential Environmental Impact** |
| Marine Mammals<br>Marine Turtles<br>Fish and Sharks<br>Commercial Fisheries | **Continuous Sound – Vessel and MODU**<br><u>Marine Mammals</u><br>The National Marine Fisheries Service (NMFS) guidance for behavioural disturbance for continuous sounds, such as those from vessel and drilling operations, is 120 dB SPL (NFMS 2013). Richardson et al. (1995) and Southall et al. (2007) indicate that behavioural avoidance by baleen whales may onset from 140 to 160 dB SPL or possibly higher.<br>McCauley (1998; 2004) indicates that continuous sound sources from MODU and vessel operations are expected to fall below 120 dB SPL within 4 km of the |

| | |
|---|---|
| | MODU/vessel. Hearing damage in marine mammals from shipping sounds has not been widely reported (Gotz et al. 2009).<br><br>Twenty-three whale species (or species habitat) may occur within the Operational Area and EMBA. Foraging behaviours were identified for some species (Sei, Fin and Pygmy Right Whale; Pygmy Blue Whale); no other important behaviours were identified. The Operational Area and EMBA intersects a distribution and a migration and resting on migration BIA for the Southern Right Whale and a foraging BIA for the Pygmy Blue Whale both species typically occur as individuals or in small (2–3 individuals) groups. Therefore, within the open water environment of the operational area, it is anticipated that cetacean numbers would be low, and so it is not expected that exposure to these sound levels would result in a significant change to foraging behaviours or natural movement that would result in further impact at either the individual or local population levels.<br><br>The Conservation Management Plan for the Blue Whale and for the Southern Right Whale and Conservation Advice for the Sei Whale, Fin Whale and Humpback Whale identify noise interference as a threat. However, continuous vessel sound from this activity is not expected to be any higher than that generated by existing shipping traffic within the region. Temporary behavioural impacts to these species are not expected to result in a significant change to foraging behaviours or natural movement that would result in further impact to individuals or local population levels.<br><br>Consequently, the potential impacts and risks from sound emissions are considered to be Minor (2) as this type of event may result in localised short-term impacts to species of recognised conservation value but is not expected to affect local ecosystem functions.<br><br><u>Marine Turtles</u><br><br>There is limited information on sea turtle hearing. Electro-physical studies have indicated that the best hearing range for marine turtles is in the range of 100-700 Hz.<br><br>There are currently no quantitative exposure guideline/criteria for marine turtles for shipping and continuous sound as Popper et al. (2014) found that there was insufficient data available to establish sound level thresholds and instead suggested general distances to assess potential impacts. Using semi-quantitative analysis, Popper et al. (2014) suggests that there is a low risk to marine turtles from shipping and continuous sound with the exception of TTS near (10s of metres) to the sound source, and masking at near, intermediate (hundreds of metres) and far (thousands of metres) distances and behaviour at near and intermediate distances from the sound source.<br><br>Based on the limited data regarding sound levels that illicit a behavioural response in turtles, the level of 166 dB SPL, derived from NSF (2011), is typically applied. Sound generated by MODU operations will be below this level, whilst sound generated by supply vessels are likely to fall below the behavioural response threshold within the near field (10s of metres) based on a source level of 165-180 dB SPL.<br><br>Three marine turtle species may occur within the Operational Area and EMBA though no BIAs or critical habitat to the survival of the species were identified. Within the open water environment of the operational area and EMBA, it is anticipated that turtle numbers would be low, and so it is not expected that exposure to these sound levels would result in a significant change to behaviours or natural movement that would result in further impact at either the individual or local population levels. |

| | |
|---|---|
| | The Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017) identified sound or noise interference as a threat, however, impacts on turtles at a population level are not predicted.<br>Consequently, the potential impacts and risks from sound emissions are considered to be Minor (2) as this type of event may result in localised short-term impacts to species of recognised conservation value but is not expected to affect local ecosystem functions.<br><u>Fish and Sharks</u><br>There are limited quantitative exposure guideline/criteria for fish for shipping and continuous sound as Popper et al. (2014) found that there was insufficient data available to establish sound level thresholds and instead suggested general distances to assess potential impacts. Popper et al. (2014) suggests that there is a low risk to fish from shipping and continuous sound noise with the exception of TTS near (10s of metres) to the sound source, and masking at near, intermediate (hundreds of metres) and far (thousands of metres) distances and behaviour at near and intermediate distances from the sound source. Popper et al. (2014) does provided a quantitative criteria for recoverable injury to fish with a swim bladder involved in hearing (170 dB RMS for 48 hrs) and TTS to fish with a swim bladder involved in hearing (158 dB RMS for 12 hrs). As there are no features within the area where fish are likely to be site-attached or congregate they are unlikely to be near the vessel/MODU for this period of time.<br>Limited research has been conducted on shark responses to sound. Myberg (2001) stated that sharks differ from bony fish in that they have no accessory organs of hearing such as a swim bladder and therefore are unlikely to respond to acoustical pressure. Klimley and Myrberg (1979) established that an individual shark will suddenly turn and withdraw from a sound source of high intensity (more than 20 dB above broadband ambient SPL) when approaching within 10 m of the sound source. Thus, any potential impacts are likely to be within 10s of metres of the MODU and vessel operations.<br>White sharks are likely to occur within the Operational Area and EMBA, however, no habitat critical to the survival of the species is present within the Operational Area and sound is not identified as a threat in the White Shark Recovery Plan (DSEWPaC, 2013b).<br>Consequently, the potential impacts and risks from sound emissions are Minor (2) as this type of event may result in localised short-term impacts to species of recognised conservation value but is not expected to affect local ecosystem functions.<br><u>Commercial Fisheries</u><br>The Operational Area and EMBA are located within a number of commercial fishing areas. Localised and temporary behaviour changes in fish have the potential to adversely affect commercial fishing operations.<br>As potential impacts and risks from sound emissions to fish and sharks is determined to have a minor consequence, thus impacts and risks to commercial fisheries from sound emissions are also considered to be Minor (2). |
| Marine Mammals<br>Marine Turtles<br>Fish and Sharks | **Pulse Sound – Seabed Surveys**<br><u>Marine Mammals</u><br>The criteria set by Southall et al. (2007) suggests that to cause an instantaneous injury to NFMS (2018) criteria incorporate the best available science to inform the assessment |

| | |
|---|---|
| | of PTS and TTS from impulsive noise sources. These criteria have been used to assess potential impacts to marine mammals that may be present within the areas where seabed surveys may occur.<br>The criteria for PTS and TTS for low frequency cetaceans such as the Sei, Fin, Pygmy Right, Pygmy Blue and Southern Right Whales are estimated to be reached within 40 m and 80 m respectively.<br>Southall et al. (2007) extensively reviewed marine mammal behavioural responses to sounds. Their review found that most marine mammals exhibited varying responses between 140 and 180 dB re 1 µPa SPL, but inconsistent results between studies makes choosing a single behavioural threshold difficult. Typically, the NMFS (2013) criteria of 160 dB re 1 µPa SPL is applied and it is estimated to be reached within ~ 6 km. Based on this it is unlikely that PTS and TTS impacts would occur at the shorter distances as it is more likely that a behavioural response would occur prior to a whale coming close to the vessel while undertaking a seabed survey. As seabed surveys will only be undertaken over a number of days behavioural impacts to migrating or foraging whales would be temporary and unlikely to have a significant impact on individuals or at a population level and therefore predicted to be Minor (2).<br>Two species of pinniped may occur within the Operational Area and EMBA; the Long-nosed Fur-seal and the Australian Fur-seal. No BIAs or habitat critical to the survival of the species were identified for pinnipeds. The nearest haul out site is at Beware Reef which is greater than 6 km from the Gippsland permit area where a seabed survey mat be undertaken. As seabed surveys will only be undertaken over a number of days behavioural impacts to pinnipeds would be temporary and unlikely to have a significant impact on individuals or at a population level and therefore predicted to be Minor (2).<br><u>Marine Turtles</u><br>Popper et al. (2014) provided exposure guidelines for marine turtles exposed to seismic airgun noise, with an impact threshold criterion >207 dB PK (~ 191 dB RMS) or >210 dB SELcum for mortality and potential mortal injury to turtles. This criterion is estimated to be reached within ~ 150 m of the sound source.<br>Based on the limited data regarding noise levels that illicit a behavioural response in turtles, the NSF (2011) level of 166 dB SPL is typically applied. This is estimated to be reached within 3 km. Based on this it is unlikely that mortality or mortal injury to turtles would occur at the shorter distance as it is more likely that a behavioural response would occur prior to a turtle coming close to the vessel while undertaking a seabed survey.<br>Four marine turtle species (or species habitat) may occur within the Operational Area or EMBA. No BIAs or habitat critical to the survival of the species occur within the Operational Area or EMBA. As seabed surveys will only be undertaken over a number of days behavioural impacts to turtles would be temporary and unlikely to have a significant impact on individuals or at a population level and therefore predicted to be Minor (2).<br><u>Fish and Sharks</u><br>Potential impacts to fish depend on the presence of a swim bladder. Typically, site-attached and demersal fish have a swim bladder, whereas pelagic fish do not. As noise criteria for sharks does not currently exist, they are assessed as fish without swim bladders. |

| | |
|---|---|
| | Popper et al. (2014) determined that mortality, potential mortal injury and recoverable injury could occur in fish without swim bladders above 213 dB PK (~ 197 dB SPL) and fish with swim bladders above 207 dB PK (~ 191 dB SPL). These levels are estimated to be reached within 80 m and 150 m, respectively.<br>Popper et al. (2014) also provides a quantitative criteria for TTS for fish with and without a swim bladder (186 dB SELcum). Popper et al. (2014) does state that a guideline based on the closest peak level or SEL single strike is may be more useful than one based on SELcum which assesses sound exposure over a period of time. As there are no features within the area where fish are likely to be site-attached or congregate they are unlikely to be near the vessel while it is undertaking a seabed survey for a set duration.<br>There are no criteria for behavioural responses to fish with Popper et al. (2014) providing a qualitative criteria with a high risk near (10s of metres) near the sound source. Seismic source discharges have been reported to elicit varying degrees of startle and alarm response in caged fish, however, studies on unrestrained fish are scarce (Carroll et al. 2017). Wardle et al. (2001) exposed free ranging marine fish inhabiting an inshore reef to sounds from a seismic source (195-218 dB re 1 µPa PK (~ 179-202 dB SPL) found fish exhibited a startle response but no avoidance behaviour was observed. This is estimated to be within ~ 50 – 560 m from the source<br>In relation to potential impact to fish from impulsive noise, studies to date have not shown mortality though prolonged or extreme exposure to high-intensity, low-frequency sound, may lead to physical damage such as threshold shifts in hearing or barotraumatic ruptures (Carroll et al. 2017). Behavioural impacts such as startle responses and avoidance behaviour may occur but as there are no features in the Operational Area where site-attached fish or fish congregations would occur. As seabed surveys will only be undertaken over a number of days impacts to fish would be temporary and unlikely to have a significant impact on individuals or at a population level and therefore predicted to be Minor (2). |
| **ALARP Decision Context** | **A** |
| **Summary of Control Measures** | |
| **Dedicated Marine Fauna Observer & shut down procedure during site surveys**<br>During seabed surveys a dedicated person trained in marine fauna observation and mitigation measures will be on duty aboard the survey vessel.<br>Seabed survey source will be shutdown if marine mammals are sighted with 500 m of the survey vessel. | |
| **Vessel Master**<br>Vessel masters will be briefed on caution and ‘no approach zones’ and interaction management actions as defined in the EPBC Regulations 2000 – Part 8 Division 8.1 | |
| **Vessel Master**<br>A vessel master (or delegate) will be on duty at all times | |
| **Fauna interaction management actions**<br>Vessel masters will implement interaction management actions in accordance with the EPBC Regulations 2000 – Part 8 Division 8.1 | |

| | | | |
|---|---|---|---|
| **Marine Fauna Observer**<br>At least one member of the support vessel crew will be trained in MFO and mitigation measures | | | |
| **Fauna observation actions**<br>Trained crew members on active duty will report observations of at-risk megafauna to the vessel master (or their delegate), as soon as it is safe to do so | | | |
| **Vessel Maintenance**<br>Noise radiated from vessels is reduced to as low as possible by ensuring engines and propulsion systems are maintained in accordance with manufacturer's specifications. | | | |
| **Likelihood** | **Possible (C)** | **Residual Risk** | **Low** |

## 5.5 Physical Presence – Seabed Disturbance

Table 5-5 provides a summary of the EIA / ERA for physical presence – seabed disturbance.

**Table 5-5 Physical Presence – Seabed Disturbance EIA**

| | |
|---|---|
| **Cause of Aspect** | During the activity, the MODU will be anchored to the seabed to enable drilling to be undertaken. There are two proposed anchoring locations surrounding both the Annie-1 and Elanora-1 well sites. Where specialised (rental) anchors are required (subject to mooring analysis), the existing MODU anchors will need to be removed from the MODU and may be wet stored on location for the duration of the drilling campaign.<br>Pre-drill site surveys may require seabed sampling and are expected to result in a disturbance footprint of approximately 1m$^2$. The majority of this would be associated with the temporary placement of the coring device / deployment frame.<br>Drilling activities will directly disturb the seabed through presence of the wellbore – each wellhead, assuming a 42" (1,067 mm) surface hole and 36" (914 mm) conductor casing, will occupy an area of 0.9 m$^2$ for each well, or 1.8 m$^2$ in total for both wells. |
| **Summary of impact(s)** | Seabed disturbance has the potential to impact on receptors, including benthic habitats and assemblages and demersal fish, through:<br>• Smothering and alteration of benthic habitats<br>• Localised and temporary increase in turbidity near the seabed |
| **Consequence Evaluation** | |
| **Receptor(s)** | **Description of Potential Environmental Impact** |
| Benthic Habitats and Fauna | **Smothering and Alteration**<br>The area of benthic habitat expected to be disturbed by planned activities is approximately 30 - 60m$^2$ per anchor (including 8 anchors at each location) and limited disturbance from drilling and possible pre-drill survey activities. Where rental anchors are used, the existing (8) MODU anchors may be wet stored in field. This may add approximately 30m$^2$ disturbance for each anchor, although is likely to be less given the anchors would not need to be set into the seabed. Total disturbance area is therefore expected to be very small.<br>Any impact will be limited to the immediate vicinity of the well locations, and thus the extent of potential impact is considered to be localised.<br>The benthic habitat within the operational area is characterised by a mix of soft sediment and shell/rubble seabed with some rocky reef and hard substrates supporting infauna communities, and sparse epibiotic communities (typically sponges).<br>The type of damage that could be sustained by smothering may include destruction of habitat. However, due to the similarity of surrounding habitat, and lack of sensitive benthic habitats, it is expected that recovery is likely. There are minimal pressures on this value and the damage would only occur within a small area. It is expected that any localised impacts from anchoring would rapidly recolonise and recover following any disturbance, therefore the potential impact has been determined as Negligible (1).<br>**Localised and temporary increase in turbidity near the seabed**<br>Benthic habitat may be disturbed through the temporary increase in turbidity near the seafloor because of seabed disturbance. Processes which may cause sediment to suspend in the water column are when the anchor and chains are laid down, or picked |

| | |
|---|---|
| | up, from the seabed; plus, any subsequent movement of the anchor chain over the seabed.<br><br>The mechanical impact from anchoring is too small to create suspension on a hard substrate; and for sandy substrate, the high settling velocity ensures the particles do not remain in suspension for an extended period of time (Ramboll Danmark, 2008). Estimates of the volume of sediment suspended from 25 tonne anchor lay down or retrieval in soft (i.e. clay/silt) material is 5–80 kg (Ramboll Danmark, 2008). Note, that anchoring activities may cause aggregations of the clay/silt particles to form, thus increasing a subsequent settling velocity (Ramboll Danmark, 2008). Anchor lay down or retrieval activities are not constant throughout the duration of activities for this EP; once the anchors are laid, set and tested they remain in place until they are retrieved. Deployment and retrieval will create some localised turbidity. Given the mixed sandy and rocky substrate within the operational area, the area of increased turbidity is likely to temporally and spatially be a very small area and localised around the disturbance points where anchors or equipment are placed or retrieved from the seabed.<br><br>While anchored, the MODU will remain stationary, and therefore no significant sweep (i.e. movement of anchor chain over seabed surface) is expected to occur. Small movements in anchor chain due to environmental conditions (e.g. currents) may occur and cause localised sediment resuspension. The anchor chain is 84 mm; therefore, the upper 5-10 cm of the sediment profile may be impacted by movement. Given the predominantly sandy nature of the substrate within the operational area, and the slow movement of an anchor chain, this material is likely to just be moved (i.e. not suspended) by the anchor chain; however, some of the silt material may go into suspension. Movement of anchor chains can occur throughout the period of activities; however, the area of increased turbidity is still expected to be very localised around the area of disturbance.<br><br>No significant benthic communities, including fishery stocks are expected to be impacted from anchoring activities. Whilst there is overlap between the activities and areas available for commercial fishing, no concerns have been raised by the fishing industry in relation to the planned activities at Annie and Elanora locations. Available fishing grounds cover extensive areas offshore Victoria; localised seabed disturbance from the drilling activities is unlikely to have any appreciable impact on the overall availability of fishing grounds or habitat for commercial species. The location of the wells within a seabed mix of sand and rock reef (typical of the SE marine region), and lack of sensitive benthic features, means that turbidity resulting from the described activities is expected to result in only temporary and localised impacts or disturbance, therefore the potential impact has been determined as Negligible (1). |
| **ALARP Decision Context** | **A** |
| **Summary of Control Measures** | |
| **Mooring analysis**<br>Mooring analysis will be undertaken before anchoring, as required API RP 2SK | |
| **Monitoring mooring line tensions**<br>Anchor slipping / tension monitoring will be undertaken while the MODU is anchored, as required by ISO 19901-7:2013, ensuring significant seabed scour does not occur | |

| | | | |
|---|---|---|---|
| **Mooring analysis**<br>Records indicate mooring/ anchoring undertaken as per the mooring analysis | | | |
| Anchors and chain will extend a maximum of 2 km (horizontal distance) from the MODU | | | |
| **Recovery of wellhead**<br>Wellheads will be recovered from the seabed during the plug and abandonment of both exploration wells. | | | |
| **Likelihood** | **Unlikely (D)** | **Residual Risk** | **Low** |

## 5.6 Atmospheric Emissions

Table 5-6 provides a summary of the EIA / ERA for Atmospheric Emissions.

**Table 5-6 Atmospheric Emissions EIA / ERA**

| | |
|---|---|
| **Cause of Aspect** | The following activities are identified as having the potential to result in air emissions:<br>• Use of fuel (MODU, support vessels and helicopters) |
| **Summary of impact(s)** | Generation of atmospheric emissions has the potential to result in:<br>• chronic effects to sensitive receptors from localised and temporary decrease in air quality;<br>• contribution to the global greenhouse gas (GHG) effect. |
| **Consequence Evaluation** | |
| **Receptor(s)** | **Description of Potential Environmental Impact** |
| Seabirds<br>Megafauna | **Localised and temporary decrease in air quality**<br>The use of fuel (e.g. marine-grade diesel and aviation fuel) to power engines, generators and mobile and fixed plant (e.g., ROV, back-deck crane, generator) will result in gaseous emissions of greenhouse gases (GHG) such as carbon dioxide ($CO_2$), methane ($CH_4$) and nitrous oxide ($N_2O$), along with non-GHG such as sulphur oxides (SOX) and nitrous oxides (NOX).<br>The quantities of atmospheric emissions generated by fuel consumption, and related impacts, will be similar to other vessels and helicopters operating in the South-east Marine Region for both petroleum and non-petroleum activities. Emissions from engines, generators and deck equipment may be toxic, odoriferous or aesthetically unpleasing, and will result in a localised, temporary reduction in air quality. Modelling was undertaken for nitrogen dioxide ($NO_2$) emissions from MODU power generation for an offshore project (BP, 2013), to quantify the area of which air quality reduction may occur. $NO_2$ was the focus of the modelling as it is considered the main (non-greenhouse) atmospheric pollutant of concern, with larger predicted emission volumes compared to other pollutants.$NO_2$ can also be used as a proxy for environmental receptors due to its potential to impact human health. The modelling results indicated 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 source and an increase of less than 0.1 µg/$m^3$ (0.00005 ppm) in ambient $NO_2$ concentrations more than 40 km away.<br>The Australian Ambient Air Quality National Environmental Protection (Air Quality) Measures (NEPM) recommends that hourly exposure to $NO_2$ is <0.12 ppm and annual average exposure is <0.03 ppm.<br>Given modelling indicated that even the highest hourly averages (0.03 ppm or 30µg/$m^3$ during flaring) were restricted to a distance ~5 km from the MODU (BP, 2013), any exposure to atmospheric emission from power generation would be expected to be below NEPM standards.<br>Potential receptors above the sea surface within 5 km of the activity that may be exposed to reduced air quality include seabirds and marine megafauna that surface for air (e.g. cetaceans and marine turtles). The operational area is within known foraging BIAs for the Pygmy Blue Whale, and some seabird (albatross and petrel) species. Emissions will be small in quantity and will dissipate quickly into the surrounding |

| | |
|---|---|
| | atmosphere, therefore any reduction in air quality will be localised and impacts would be limited.<br>Consequently, the potential impacts and risks from atmospheric emissions are considered to be Minor (2) as this type of event may result in localised short-term impacts to species of recognised conservation value but is not expected to affect local ecosystem functions.<br>**Contribution to the global GHG effect**<br>While these emissions add to the GHG load in the atmosphere, which adds to global warming potential, they are relatively small on a global scale, and temporary, representing an insignificant contribution to overall GHG emissions (DoEE, 2017a).<br>Any exposure from these operations would be expected to be insignificant, therefore no further evaluation of this aspect has been undertaken. |
| **ALARP Decision Context** | **A** |

| **Summary of Control Measures** | | | |
|---|---|---|---|
| Only low-sulphur (<3.5% m/m) marine-grade diesel will be used in order to minimise SOx emissions. | | | |
| All combustion equipment is maintained in accordance with the PMS (or equivalent). | | | |
| Vessels with diesel engines>130 kW must be certified to emission standards (e.g. IAPP, EIAPP). | | | |
| Vessels implement their Ship Energy Efficiency Management Plan (SEEMP) to monitor and reduce air emissions (as appropriate to vessel class). | | | |
| Fuel consumption is monitored on vessels (and portable back-deck equipment) and abnormally high consumption investigated. | | | |
| **Likelihood** | **Remote (E)** | **Residual Risk** | **Low** |

## 5.7 Planned Discharge – Drilling Cuttings and Fluid

Table 5-7 provides a summary of the environmental impact assessment (EIA) for Planned Discharge – Drilling Cuttings and Fluid.

**Table 5-7 Planned Discharge – Drilling Cuttings and Fluid EIA**

| | |
|---|---|
| **Cause of Aspect** | Drilling activities will result in planned discharges of drill cuttings and adhered drilling fluids.<br>Approximately 150m$^3$ cuttings and 1200m$^3$ drilling fluids are discharged during drilling top-hole sections, for each well. The riser and BOP are installed for bottom-hole sections and provide a conduit for cuttings and drilling fluids to be brought back to the MODU. Solids control equipment removes solids from the drilling fluids; these solids are discharged overboard at surface. Drilling fluids are tested, reconditioned and re-used where possible, before ultimately being discharged overboard. Approximately 180m$^3$ cuttings and 1500m$^3$ of drilling fluids are discharged at surface during and following drilling of bottom-hole sections, for each well including potential side-track.<br>The cuttings and associated drilling fluids are discharged continuously whilst drilling, which may occur for periods of around 24 hours at a time over the course of drilling activities. Drilling fluids are also discharged intermittently throughout drilling. Discharges occur in batches ranging from around 1 m$^3$ to 400 m$^3$ and depending on volume, may be discharged over a matter of minutes or several hours. |
| **Summary of impact(s)** | A planned discharge of drill cuttings and fluids has the potential to result in effects to ecological and social receptors through:<br>• Increased turbidity of the water column;<br>• Smothering of seabed habitat, flora and fauna resulting in the alteration of seabed substrate; and<br>• Potential chemical toxicity and oxygen depletion impacts to flora and fauna in the water column and sediment. |
| **Consequence Evaluation** | |
| **Receptor(s)** | **Description of Potential Environmental Impact** |
| Water Quality<br>Fish and Sharks<br>Plankton | **Increased turbidity in the water column**<br>Planned discharge of cuttings and adhered fluids from the surface will occur intermittently during drilling. Neff (2005) states that although the total volumes of muds and cuttings discharged to the ocean during drilling a well are large, the impacts in the water column environment are minimal, because discharges of small amounts of materials are intermittent.<br>When cuttings are discharged to the ocean, the larger particles, representing about 90% of the mass of the mud solids, form a plume that settles quickly to the bottom (or until the plume entrains enough seawater to reach neutral buoyancy). About 10% of the mass of the mud solids form another plume in the upper water column that drifts with prevailing currents away from the discharge point and is diluted rapidly in the receiving waters (Neff, 2005; 2010).<br>Environmental receptors with the potential to be exposed and most at risk of impact to an increase in turbidity levels include pelagic fish species and plankton found in the area around the well locations. Given the lack of suitable benthic habitat features within the operational area, any fish species in the area are expected to be of a transient |

| | |
|---|---|
| | nature only. In addition, while commercial fisheries have management areas that overlap with the operational area, active fishing effort within this area is expected to be minimal.<br>Jenkins and McKinnon (2006) reported that levels of suspended sediments greater than 500 mg/L are likely to produce a measurable impact upon larvae of most fish species, and that levels of 100 mg/L will affect the larvae of some species if exposed for periods greater than 96 hours. Jenkins and McKinnon (2006) also indicated that levels of 100 mg/L may affect the larvae of several marine invertebrate species, and that fish eggs and larvae are more vulnerable to suspended sediments than older life stages. Note, any impact to fish larvae is also expected to be limited due to high natural mortality rates (McGurk, 1986), intermittent exposure, and the dispersive characteristics of the open water in the operational area.<br>The operational area is also located within a Pygmy Blue Whale foraging BIA, and seabird foraging BIAs. However, cetaceans and avifauna are expected to be less sensitive to any potential impact from turbidity than fish larvae (described above), and therefore the evaluation of potential impacts to fish larvae provides a conservative evaluation of the level of potential impacts to marine fauna for this discharge.<br>Based upon dilutions identified by Hinwood et al. (1994) and Neff (2005), turbidity in the water column is expected to be reduced to below 10 mg/L (9 ppm) within 100 m of release.<br>Therefore, as previous dilution estimates (e.g. Hinwood et al., 1994; Neff, 2005) suggest suspended sediment concentrations caused by the discharge of drill cuttings will be well below the levels required to cause an effect on fish or invertebrate larvae (i.e. predicted levels are well below a 96-hr exposure at 100 mg/L, or instantaneous 500 mg/L exposure), minimal impact to larvae, or other marine fauna (pelagic fish, cetaceans, seabirds), is expected from the discharge of drill cuttings from activities discgussed under this EP Summary.<br>Considering the relatively short-lived nature of the intermittent plumes, and that concentrations of suspended solids rapidly dissipate with the prevailing currents, the potential impacts on larvae, or other marine fauna (pelagic fish, cetaceans, seabirds), is expected to be minimal. Thus, there is the potential for localised, short-term impact on species resulting in a Negligible (1) consequence. |
| Soft sediment<br>Marine invertebrates | **Smothering and alteration of seabed substrate**<br>The seabed within the operational area is predominantly sands with shell/rubble patches, some reef and hard substrate with sparse epibiotic (e.g. sponges) coverage. Note, there has been extensive demersal fishing activity in the general area, and therefore seabed biota is likely to be modified from the associated trawling and netting activities.<br>Hinwood et al. (1994) explain that the main environmental disturbance from discharging drilling cuttings and fluids is associated with the smothering and burial of sessile benthic and epibenthic fauna. Neff (2005) suggests that synthetic-based mud-coated cuttings tend to clump and settle rapidly as large particles over a small area near the discharge point and tend not to disperse rapidly, indicating that when drilling with WBMs, extent of dispersion is expected to increase when compared to synthetic based muds, however thickness of cuttings piles is expected to decrease. WMB will be used for the activities covered under this EP Summary. |

| | |
|---|---|
| | Many studies have shown that the effects on seabed fauna and flora from the discharge of drilling cuttings with water based muds are subtle, although the presence of drill-fluids in the seabed close to the drilling location (<500 m) can usually be detected chemically (e.g. Cranmer 1988, Neff et al. 1989, Hyland et al. 1994, Daan & Mulder 1996, Currie & Isaacs 2005, OSPAR 2009, Bakke et al. 2013).<br>Jones et al. (2006, 2012) compared pre and post-drilling ROV surveys and documented physical smothering effects from WBM cuttings within 100 m of the well. Outside the area of smothering, fine sediment was visible on the seafloor up to at least 250 m from the well. After three years, there was significant removal of cuttings particularly in the areas with relatively low initial deposition (Jones et al. 2012). The area impacted by complete cuttings cover had reduced from 90 m to 40 m from the drilling location, and faunal density within 100 m of the well had increased considerably and was no longer significantly different from conditions further away.<br>The presence of hard substrate can result in elevated negative response to smothering. Hyland et al. (1994) studied the effect of WBM cuttings discharges on hard bottom taxa, and found that coral and sponges could be particularly vulnerable as the smothering could disrupt feeding or respiration. While the operational area is within the Shelf Rocky Reefs and Hard Substrates KEF, hard substrate is expected to be intersperses with sandy and shell/rubble benthos, therefore the area is not expected to be exclusively hard substrate.<br>In general, research suggests that any smothering impacts within the operational area will be limited to 500 m from the well site, and full recovery is expected. Given the inert nature of the drill cuttings and the limited volume being discharged from riserless drilling, the impacts to benthic habitats are expected to be limited. Consequently, the potential impacts and risks from smothering and alteration of seabed substrate are considered to be Minor (2) as this type of event may result in localised short-term impacts to species of recognised conservation value, but is not expected to affect local ecosystem functions. |
| Fish and Sharks<br>Plankton<br>Marine Invertebrates<br>Soft Sediment | **Potential chemical toxicity**<br>Neff (2005) discusses that, in well-mixed ocean waters, drilling muds and cuttings are diluted by 100-fold within 10 m of the discharge and by 1000-fold after a transport time of about 10 minutes at a distance of about 100 m from discharge. Because of the rapid dilution of the drilling mud and cuttings plume in the water column, “harm to communities of water column plants and animals is unlikely and has never been demonstrated” (Neff, 2005).<br>The environmental receptors which may be impacted by elevated chemical toxicity in the surface waters include pelagic fish and plankton; and in the lower water column and benthos include demersal fish species, plankton, marine invertebrates and soft sediments.<br>The Cooper Energy Offshore Environmental Chemical Selection Process (COE-MS-RCP-0042) defines the process for assessment of the offshore operational use and discharge of chemicals from Cooper Energy facilities. All chemicals planned for use and discharge must be assessed prior to use. Where a chemical is initially assessed as PLONOR or OCNS Gold, Silver, E or D ranking, no further assessment is required, and chemicals are approved for use. For any chemicals with a higher ranking, steps for assessment are provided in the process. |

| | |
|---|---|
| | Due to the inert / PLONOR nature of its components, WBM have been shown to have little or no toxicity to marine organisms (Jones et al., 1996). Barite (a major insoluble component of water-based mud discharges) has been widely shown to accumulate in sediments following drilling (reviewed by Hartley 1996). Barium sulphate is of low bioavailability and toxicity to benthic organisms. Other metals present mainly as salts, in drilling wastes may originate from formation cuttings, or from impurities in barite and other mud components, however do not contribute to mud toxicity due to their low bioavailability (Schaanning et al., 2002).<br>Neff (2010) explains that the lack of toxicity and low bioaccumulation potential of the drilling muds means that the effects of the discharges are highly localised and are not expected to spread through the food web. Consequently, the potential impacts and risks from chemical toxicity are considered to be Minor (2) as this type of event may result in localised short-term impacts to species of recognised conservation value, but is not expected to affect local ecosystem functions. |
| **ALARP Decision Context** | **A** |
| **Summary of Control Measures** | |
| **Chemical selection process**<br>All planned chemical discharges shall be assessed and deemed acceptable before use, in accordance with Cooper Energy's Offshore Environment Chemical Assessment Process (COE-MS-RCP-0042) which uses the CHARM OCNS ranking in conjunction with toxicity, biodegradation and bioaccumulation data to determine potential impacts to the environment and acceptability of planned discharges. | |
| Inventory and appropriate Safety Data Sheets of chemicals selected in accordance Cooper Energy Offshore Environment Chemical Assessment Process will be available to Rig Personnel. | |
| **SCE Maintenance**<br>SCE will be maintained in accordance with manufacturer specifications. | |
| **Drilling Fluids Reuse Assessment**<br>Cooper Energy will undertake an assessment on the suitability of drilling fluids from Annie-1 to be reused for Elanora-1. Where deemed suitable, drilling fluids will be reused. | |
| **Barite Quality Standard**<br>Cooper Energy will request suppliers ensure stock barite contains no more than 1 mg/kg of Hg (dry weight) and no more than 3 mg/kg of Cd (dry weight). | |
| **Excess Chemical management**<br>Upon completion of the activity, excess bulks and unused drilling fluid additives will be returned to shore. | |

| | | | |
|---|---|---|---|
| **Likelihood** | **Unlikely (D)** | **Residual Risk** | **Low** |

## 5.8 Planned Discharge – Cement

Table 5-8 provides a summary of the environmental impact assessment (EIA) for Planned Discharge – Cement.

**Table 5-8 Planned Discharge – Cement EIA/ERA**

| | |
|---|---|
| **Cause of Aspect** | Drilling activities use cement and will result in planned discharges of cement.<br>The estimated volumes of cement discharged to the environment includes:<br>• A small proportion of dry cement from the pneumatic transfer process may be blown overboard during transfer operations (estimated to be in the order of 10MT per well);<br>• Washing the cementing head and blending tanks with seawater to prevent curing, resulting in a release of cement / water mix (surface discharge of approximately 3 $m^3$ per cement job;<br>• Cement overspill at the seabed during cementing of well structural casing jobs (approx. 12.7 $m^3$) per well), which will only occur during the top-hole (42”) cement job. Once good cement returns are observed around the wellhead, the mixing of cement will cease, and displacement will commence. |
| **Summary of impact(s)** | Planned discharge of cement has the potential to result in effects to marine fauna through:<br>• Increased turbidity of the water column from surface discharges;<br>• Smothering of benthic habitat and fauna by seabed discharges resulting in the alteration of benthic substrate; and<br>• Potential toxicity impacts to fauna. |
| **Consequence Evaluation** | |
| **Receptor(s)** | **Description of Potential Environmental Impact** |
| Fish and Sharks<br>Plankton | **Increased turbidity of the water column from surface discharges**<br>Cementing fluids are not routinely discharged to the marine environment; however, volumes of a cement/water mix of up to approximately 26 $m^3$ per well, may be released in surface waters during equipment washing. This total volume is discharged over multiple separate discharge events (approximately 6 per well) as smaller batch discharges. The discharge is a combination of cement slurry and mix or wash water. The cement particles will disperse under action of waves and currents, and eventually settle out of the water column; the initial discharge will generate a downwards plume, increasing the initial mixing of receiving waters.<br>The environmental receptors with the potential to be exposed to an increase in turbidity include pelagic fish species and plankton found in the area around the well locations. While commercial fisheries have management areas that intersect with the operational area, active fishing effort within this area is expected to be minimal given the lack of suitable benthic habitat features; therefore, any species in the area are expected to be of a transient nature only.<br>Jenkins and McKinnon (2006) reported that levels of suspended sediments greater than 500 mg/L are likely to produce a measurable impact upon larvae of most fish species, and that levels of 100 mg/L will affect the larvae of some species if exposed for periods greater than 96 hours. Jenkins and McKinnon (2006) also indicated that levels of 100 mg/L may affect the larvae of several marine invertebrate species and that fish eggs and larvae are more vulnerable to suspended sediments than older life stages.<br>Modelling of the release of 18 $m^3$ of cement wash water by de Campos et al. (2017) indicate an ultimate average deposition of 0.05 mg/$m^2$ of material on the seabed; with |

| | |
|---|---|
| | particulate matter deposited within the three-day simulation period. Given the low concentration of the deposition of the material, it is therefore expected that the in-water suspended solids (i.e. turbidity) created by the discharge is not likely to be high for an extended period of time, or over a wide area; even when scaling this volume up to the expected discharge (26 $m^3$) for activities under this EP Summary.<br>Modelling of larger cement discharges (approximately 78 $m^3$ over a one-hour period) has also previously been undertaken for BP (2013). Results of this modelling showed that within two hours suspended solid concentrations ranged between 5-50 mg/L within the extent of the plume (approximately 150 m horizontal and 10 m vertical); and by four hours post-discharge, that concentrations were <5 mg/L. Given the estimated rate of discharge for activities under this EP Summaryare one-third of the volume estimated by BP, it is therefore expected that the concentration of suspended sediments would be lower than predicted in the above modelling.<br>Neither the modelling by de Campos et al (2017) or BP (2013) suggest that suspended solids concentrations from a discharge of the cement washing will be at or near levels required to cause an effect on fish or invertebrate larvae, i.e. predicted levels were well below a 96-hr exposure at 100 mg/L, or instantaneous 500 mg/L exposure.<br>Based upon the estimated discharge volumes identified for this program, and the potential impact thresholds as identified by McKinnon (2006), a discharge of cement from the surface is expected to result in a very short exposure of increased turbidity such that potential impacts would be expected to be localised (i.e. within 150m) and short-term (a few hours), and consequences are considered to be Negligible (1). |
| Marine Invertebrates<br>Soft Sediment | **Smothering and Alteration of Benthic Substrate from seabed discharges**<br>Studies indicate that cement from upper hole sections displaced to the seabed may affect the seabed around the well to a radius of approximately 10 m to 50 m of the well resulting in the potential for disturbance of 0.007 $km^2$ per well.<br>The benthic habitat within the operational area is characterised by a soft sediment and shell/rubble seabed, infauna communities, and sparse epibiotic communities (typically sponges). Benthic invertebrate communities within Victoria, and particularly East Gippsland, show high species diversity (Heislers and Parry, 2007). The abundance of invertebrate species increased with depth (Heislers and Parry, 2007). There has been extensive demersal fishing activity throughout the area so seabed condition and biota is expected to be modified from trawling and netting activities (CEE Consultants, 2003).<br>Once cement overspill from cementing activities hardens, the area directly adjacent to the well (10-50m) will be altered, resulting in the destruction of seabed habitat within the footprint of the discharge. This impact on soft sediment communities is not expected to affect the diversity or ecosystem function in this area and thus is only considered a localised impact.<br>It is expected that cement discharges may result in a localised alteration of seabed substrate within a habitat that is considered to homogenous and not overly sensitive. Given the relatively small footprint associated with the subsea release of cement, this impact is considered to result in localised impact to habitat with a Negligible (1) consequence. |
| Fish<br>Plankton<br>Infauna | **Potential Toxicity**<br>The potential for toxicity is associated with chemicals that are added to the dry cement mix and as such, toxicity associated with the discharge of cement is limited to the subsea release of cement (not surface discharge of dry cement). Terrens et al. (1998) suggests that once cement has hardened, the chemical constituents are locked into the |

| | |
|---|---|
| | hardened cement. As such the extent of this hazard is limited to the waters directly adjacent to the displaced subsea cement (expected to be in the order of 10-50 m of the wellhead as discussed above).<br>The environmental receptors with the potential to be exposed and most at risk of impact to an increase in toxicity (in the lower water column and benthos), include demersal fish species and plankton and benthic habitats and associated benthic infauna.<br>Given that it is expected that cement will harden within a couple of hours, and exposure to in water concentrations are expected to be limited due to the rapid dispersion and dilution (as shown in previous discharge modelling [BP, 2013]), the potential for acute or chronic effects although possible will be limited such that potential impacts will result in a limited local degradation of the environment with a Negligible (1) consequence. |
| **ALARP Decision Context** | **A** |

| **Summary of Control Measures** | | | |
|---|---|---|---|
| **Chemical selection process**<br>All planned chemical discharges shall be assessed and deemed acceptable before use, in accordance with Cooper Energy's Offshore Environment Chemical Assessment Process (COE-MS-RCP-0042) | | | |
| **Drilling and cementing procedures**<br>Detailed cementing procedures will be developed and implemented before cementing activities commence | | | |
| **Monitoring cementing operations**<br>Actual cement use and discharge will be reconciled against planned quantities throughout the campaign. | | | |
| **Excess bulk cement management**<br>Upon completion of the activity, excess bulks will be returned to shore. | | | |
| **Likelihood** | **Unlikely (D)** | **Residual Risk** | **Low** |

## 5.9 Planned Discharge – Cooling Water and Brine

Table 5-9 provides a summary of the EIA / ERA for Planned Discharge – Cooling Water and Brine.

**Table 5-9 Planned Discharge – Cooling Water and Brine EIA / ERA**

| | |
|---|---|
| **Cause of Aspect** | The vessels and MODU use seawater as a heat exchange medium for cooling engines and machinery, and also for the generation of potable water through reverse osmosis (RO) units. Seawater is drawn up from the ocean and distributed to cooling water or RO systems, before ultimately being discharged back to the ocean. Whilst the MODU cooling water system which is predominantly closed loop, some components (e.g. rig top drive) are cooled via an open loop heat exchange system, which results in seawater discharge.<br>Cooling water discharges: seawater is circulated as coolant for various equipment through the heat exchangers (in the process transferring heat from the machinery) and is then discharged to the ocean. Upon discharge, it will be warmer than the surrounding ambient water and may contain low concentrations of residual chemical depending on the method of water treatment used by the facility.<br>RO system discharges: concentrated brine is a waste stream created through the vessels desalination equipment for potable water generation. Potable water is generated through reverse osmosis (RO) or distillation resulting in the continuous surface discharge of seawater with elevated salinity. |
| **Summary of impact(s)** | Planned discharge of cooling and brine waters has the potential to result in chronic effects to fauna through:<br>• increased water temperature;<br>• increased water salinity;<br>• potential chemical toxicity in the water column. |
| **Consequence Evaluation** | |
| **Receptor(s)** | **Description of Potential Environmental Impact** |
| Cetaceans<br>Fish and Sharks<br>Marine Reptiles | **Increased Temperature**<br>Modelling 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). More recent modelling studies for the planned Barossa FPSO also indicated cooling water discharges generally returned to background levels within 3°C of ambient temperature within 100m (horizontally) of the discharge point (RPS, 2017). The cooling water discharges described within the Barossa study were > 360 000 $m^3$ / day. The campaign vessels and MODU are far smaller facilities by comparison, and cooling water discharges are expected to be well within this discharge rate (at least 1-2 orders of magnitude below) where seawater cooling systems are operating in accordance with normal operating parameters.<br>The environmental receptors with the potential to be exposed to an increase in temperature are transient marine fauna, including whales, sharks, fish, and reptiles. Marine mammals and fish passing through the area will be able to actively avoid entrainment in any heated plume (Langford, 1990), and reptiles and sharks would be |

| | |
|---|---|
| | expected to behave similarly. Acclimation of test organisms at 15, 20 and 25oC allowed them to tolerate temperature increments of 8-9oC without damage (UNEP, 1985).<br>Given the open nature of the receiving environment, the short duration of the activity, and the lack of sensitive environmental receptors, the impact of increased temperature is expected to be Negligible (1). |
| Fish and Sharks<br>Plankton | **Increased Salinity**<br>The brine water discharge stream generated through RO systems is elevated in salinity typically by ~10-30% when compared to seawater, assuming RO systems are operating in accordance with normal operating parameters. The greater salinity adds density and brine will sink through the water column where it will be rapidly mixed with receiving waters and dispersed by ocean currents. As such, any potential impacts are expected to be limited to the source of the discharge where concentrations are highest. This is confirmed by studies that indicate effects from increased salinity on planktonic communities in areas of high mixing and dispersion are generally limited to the point of discharge only (Azis et al., 2003).<br>The receptors with the potential to be exposed to an increase in salinity include pelagic fish species and plankton found in surface waters within the operational area.<br>Changes in salinity can affect the ecophysiology of marine organisms Most marine species are able to tolerate short-term fluctuations in salinity in the order of 20% to 30% (Walker and McComb, 1990). However, larval stages, which are crucial transition periods for marine species, are known to be more susceptible to impacts of increased salinity (Neuparth, Costa & Costa 2002). Pelagic species are mobile; it is expected that at worst, they would be subjected to slightly elevated salinity levels (~10-15% higher than seawater) for a very short period which they are expected to be able to tolerate. As such, transient species are not expected to experience chronic or acute effects.<br>Given the open nature of the receiving environment, the short duration of the activity, and the lack of sensitive environmental receptors, the impact of increased salinity is expected to be Negligible (1) |
| Water Quality<br>Cetaceans<br>Fish and Sharks<br>Marine Reptiles | **Potential Chemical Toxicity**<br>Scale inhibitors are typically low molecular weight phosphorous compounds that are water-soluble, and only have acute toxicity to marine organisms about two orders of magnitude higher than typically used in the water phase (Black et al., 1994). The biocides typically used in the industry are highly reactive and degrade rapidly (Black et al., 1994) and mostly consumed within the system prior to discharge. Modern vessel marine growth prevention systems typically generate chemicals in-situ (e.g. sodium hypochlorite and/or copper ions). These in-situ generated chemicals are categorised under the UK Offshore Chemical Notification Scheme (OCNS) as E category products meaning their discharge is considered to present the least hazard potential in accordance with OCNS criteria (Cefas, 2019a, b).<br>Scale inhibitors and biocide used in the heat exchange and desalination process to avoid fouling of pipework are inherently safe at the low dosages used; they are usually consumed in the inhibition process, so there is little or no residual chemical concentration remaining upon discharge.<br>The receptors with the potential to be exposed to changes in water quality resulting in toxic effects from chemicals are transient marine fauna, including whales, sharks, fish, and reptiles found in surface waters within the operational area. |

| | |
|---|---|
| | Larger pelagic species are mobile; at worst, it is expected that they would be subjected to very low levels of chemicals for a very short time as they swim near the discharge plume. As transient species, they are not expected to experience any chronic or acute effects.<br>Any impacts from chemical discharge will be localised and short-term. Given the open nature of the receiving environment, the intermittent nature of the activity, and the lack of sensitive environmental receptors, the impact of potential chemical toxicity is expected to be Minor (2). |
| **ALARP Decision Context** | **A** |

| **Summary of Control Measures** |
|---|
| Cooling water and RO systems are maintained in accordance with the facility PMS so that they are operating within accepted parameters. |
| **Chemical selection process**<br>All planned chemical discharges shall be assessed and deemed acceptable before use, in accordance with Cooper Energy's Offshore Environment Chemical Assessment Process (COE-MS-RCP-0042) which uses the CHARM OCNS ranking in conjunction with toxicity, biodegradation and bioaccumulation data to determine potential impacts to the environment and acceptability of planned discharges. |

| | | | |
|---|---|---|---|
| **Likelihood** | **Remote (E)** | **Residual Risk** | **Low** |

## 5.10 Planned Discharge - Treated Bilge

Table 5-10 provides a summary of the EIA / ERA for Planned Discharge - Treated Bilge.

**Table 5-10 Planned Discharge - Treated Bilge EIA / ERA**

| | |
|---|---|
| **Cause of Aspect** | Bilge water consists of water, oily fluids, lubricants, cleaning fluids, and other similar wastes that have accumulated in the lowest part of the vessel / MODU typically from closed deck drainage and machinery spaces.<br>Bilge water is treated onboard the vessel or MODU using the oil water separator (OWS) to reduce any oily residue to below regulated level, before being discharged at surface. |
| **Summary of impact(s)** | A discharge of this material has the potential to result in chronic effects to plankton through:<br>• potential toxicity in the water column. |
| **Consequence Evaluation** | |
| **Receptor(s)** | **Description of Potential Environmental Impact** |
| Plankton | OSPAR (2014) indicates that the predicted no effect concentration (PNEC) for marine organisms exposed to dispersed oil is 70.5 ppb. It should be noted that this PNEC is based upon no observed effect concentrations (NOEC) after exposure to certain concentrations for an extended period that was greater than 7 days (OSPAR 2014).<br>A discharge of treated bilge is non-continuous and infrequent. Modelling by Shell (2009) indicates that upon discharge, hydrocarbon and other chemical concentrations are rapidly diluted and expected to be below PNEC within a relatively short period of time. Given the nature of this discharge, marine fauna most susceptible to toxic impacts are mainly limited to less mobile fish embryo, larvae, and other plankton.<br>There is potential for short-term impacts to species that rely on plankton as a food source. Any impact to prey species would be temporary as the duration of exposure would be limited, and fish larvae and other plankton are expected to rapidly recover as they are known to have high levels of natural mortality and a rapid replacement rate (UNEP, 1985).<br>Consequently, the potential impacts and risks from planned discharge of treated bilge are considered to be localised and short-term and have been rated as Minor (2). |
| **ALARP Decision Context** | **A** |
| **Summary of Control Measures** | |
| **Oily-water Separation Equipment**<br>For vessels > 400 tonnes, bilge water passes through a MARPOL approved Oily Water Separator (OWS). | |

| | | | |
|---|---|---|---|
| **Criteria for approved discharge**<br>For vessels > 400 tonnes, treated bilge water discharge occurs if:<br>• Treatment is via a MARPOL compliant oily water separator;<br>• The OIW content is less than 15 ppm; and<br>• Oil Detection Monitoring Equipment (ODME) and control equipment are operating.<br>For vessels < 400 tonnes treated bilge is discharged if:<br>• Vessel is proceeding en-route; and<br>• Approved treatment equipment ensures oil content less than 15 ppm.<br>• If the above is not met the oil residue must be retained in on-board storage tanks for onshore disposal or further treatment. | | | |
| **OWS System Reliability**<br>OWS and ODME (appropriate to vessel size) are routinely maintained and system elements calibrated to ensure reliable discharge concentrations are being met. | | | |
| The residual oil from the OWS is pumped to tote tanks and disposed of onshore. | | | |
| **Likelihood** | **Remote (E)** | **Residual Risk** | **Low** |

## 5.11 Planned Discharge - Sewage and Food Waste

Table 5-11 provides a summary of the EIA / ERA for Planned Discharge - Sewage and Food Waste.

**Table 5-11: Planned Discharge - Sewage and Food Waste EIA / ERA**

| | |
|---|---|
| **Cause of Aspect** | The use of ablution, laundry and galley facilities by personnel will result in the surface discharge of sewage and grey water. Vessels and MODUs typically generate around 5-15 $m^3$ of waste water (consisting of sewage and grey water) per day.<br>The generation of food waste from feeding personnel will result in the discharge of food waste from the galley. The average volume of putrescible (food) waste discharged overboard from the vessel will vary depending on the POB and the types of meals prepared but would 1-2 kg per person per day. |
| **Summary of impact(s)** | A discharge of food waste, sewage and greywater has the potential to result in impacts to marine fauna from:<br>• Temporary and localised reduction in water quality (nutrients and biological oxygen demand [BOD])<br>• Changing predator / prey dynamics from increased scavenging behaviours |
| **Consequence Evaluation** | |
| **Receptor(s)** | **Description of Potential Environmental Impact** |
| Cetaceans<br>Fish and Sharks<br>Marine Reptiles | **Temporary and localised reduction in water quality (nutrients and biological oxygen demand [BOD])**<br>Monitoring of sewage discharges for another offshore project (WEL, 2014), 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, 100, and 200 m downstream of the platform 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.<br>The ecological receptors with the potential to be exposed to changes in surface water quality are transient marine fauna, including whales, sharks, fish and marine reptiles. Specifically, the operational area lies within a foraging BIA for the Pygmy Blue Whale.<br>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. In addition, regardless of receptor sensitivity to BOD (Black et al., 1994) state that BOD of treated effluent is not expected to lead to oxygen depletion in the receiving waters.<br>Consequently, the potential impacts and risks from the planned discharge of sewage and greywater have been evaluated as Minor (2), given this type of event may result in localised short-term impacts to a species of conservation value (seabirds; Pygmy Blue Whale) through impacting their foraging habitat. |
| Plankton<br>Cetaceans<br>Fish | **Changing predator / prey dynamics increased scavenging behaviours** 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. |

| | | | |
|---|---|---|---|
| Seabirds | The ecological receptors with the potential to be affected by changes in predator–prey dynamics include plankton and large pelagic fauna (e.g. marine mammals, fish and seabirds), found in the surface waters of the operational area. Specifically, the operational area lies within a foraging BIA for the Pygmy Blue Whale.<br>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 receptors that may potentially be in the water column are not impacted.<br>As described previously, plankton communities are not affected by sewage discharges, and thus impacts to the Pygmy Blue Whale (or other fauna) food source and any predator-prey dynamics is not expected to occur.<br>Although the operational area is quite a distance from shore, several species of seabirds are known to have a large foraging range, and consequently may be exposed to these discharges. However, as previous industry modelling indicates these discharges are only expected to result in a localised change in water quality within close proximity to the release location, any potential change to scavenging behaviours from seabirds is expected to be incidental.<br>Consequently, the potential impacts and risks from the planned discharge of sewage and greywater have been evaluated as Minor (2), given this type of event may result in localised short-term impacts to a species of conservation value (seabirds; Pygmy Blue Whale) through impacting their foraging habitat. | | |
| **ALARP Decision Context** | **A** | | |
| **Summary of Control Measures** | | | |
| **Food waste macerated**<br>Discharge of food waste shall be controlled by macerating galley waste to ≤25 mm (using an on-board food macerator) before discharge | | | |
| **Food waste Discharges**<br>Macerated putrescible waste is only discharged overboard when the vessel is greater than 3 nm from the coastline and while proceeding en-route or from a platform when it is >12nm from the coastline.<br>Un-macerated putrescible waste is only discharged overboard from vessels when the vessel is more than 12 nm from the coastline and while proceeding en-route. | | | |
| All crew are aware of the garbage management arrangements through the information provided in the induction | | | |
| **Planned maintenance system**<br>The macerator will be maintained in accordance with the PMS | | | |
| **MARPOL-approved STP**<br>A MARPOL-approved sewage system will be fitted to the MODU and support vessels | | | |
| **Planned maintenance system**<br>The sewage system will be maintained in accordance with the PMS | | | |
| **Likelihood** | **Unlikely (D)** | **Residual Risk** | **Low** |

## 5.12 Planned Discharge - Ballast water and Biofouling

Table 5-12 provides a summary of the EIA / ERA for Planned Discharge - Ballast water and Biofouling.

**Table 5-12 Planned Discharge - Ballast water and Biofouling EIA / ERA**

| | |
|---|---|
| **Cause of Aspect** | The operation of the MODU and vessels requires the uptake and discharge of ballast water within the operational area. The adjustment of ballast is critical for the stabilisation of the MODU during drilling activities, and to ensure stability of vessels and MODU during weather and the transferring of loads. The MODU and vessels are also subject to biofouling and will have some level of biofouling ranging from primary to tertiary levels (see DAFF 2009 for definitions). |
| **Summary of impact(s)** | The known and potential impacts of IMPs introduction (assuming their survival, colonisation and spread) include:<br>• Reduction in native marine species diversity and abundance;<br>• Displacement of native marine species;<br>• Socio-economic impacts on commercial fisheries; and<br>• Changes to conservation values of protected areas. |
| **Consequence Evaluation** | |
| **Receptor(s)** | **Description of Potential Environmental Impact** |
| Benthic Habitat | IMS are likely to have little or no natural competition or predators, thus potentially outcompeting native species for food or space, preying on native species, or changing the nature of the environment. It is estimated that Australia has more than 250 established marine pests, and that approximately one in six introduced marine species becomes pests (Department of the Environment, 2015).<br>Marine pest species can also deplete fishing grounds and aquaculture stock, with between 10% and 40% of Australia's fishing industry being potentially vulnerable to marine pest incursion. For example, the introduction of the Northern Pacific Seastar (Asterias amurensis) in Victorian and Tasmanian waters was linked to a decline in scallop fisheries (DSE, 2004). Marine pests can also damage marine and industrial infrastructure, such as encrusting jetties and marinas or blocking industrial water intake pipes. By building up on vessel hulls, they can slow the vessels down and increase fuel consumption.<br>The benthic habitat within the operational area is characterised by a soft sediment and shell/rubble seabed with some reef patches, infauna communities, and sparse epibiotic communities (typically sponges). Areas of higher value or sensitivity are located further afield: for example, it is approximately 15km from Annie-1 to the Twelve Apostles Marine National Park on the Victorian coast. Areas suitable for commercial scallop fishing are not expected near the well locations; commercially suitable scallop aggregations occur over 200km away in the waters of eastern Victoria (Koopman et al. 2018).<br>Once established, some pests can be difficult to eradicate (Hewitt et al., 2002) and therefore there is the potential for a long-term or persistent change in habitat structure. It has been found that highly disturbed environments (such as marinas) are more susceptible to colonisation than open-water environments, where the number of dilutions and the degree of dispersal are high (Paulay et al., 2002).<br>The chances of successful colonisation in the Otway region are considered small given: |

| | |
|---|---|
| | • The nature of the benthic habitats near the operational area where seabed contact is made (i.e. predominantly bare sands with patchy occurrences of hard substrate, and outside of coastal waters where the risk of IMS establishment is considered greatest (BRS, 2007).<br>• The well locations are geographically isolated from other subsea or surface infrastructure which might be suitable for colonisation.<br>If an IMS was introduced, and if it did colonise an area, it is expected that any colony would remain fragmented and isolated, and only within the vicinity of the wells (i.e. it would not be able to propagate to nearshore environments, and protected marine areas present in the wider region). Therefore, there is the potential for a localised, but irreversible, impact to habitat resulting in a Moderate (4) consequence. |
| **ALARP Decision Context** | **B** |
| **Summary of Control Measures** | |
| **Contractor Pre-mobilisation EP Compliance and Readiness Review, including IMS Risk Assessment**<br>Cooper Energy undertakes a MODU / vessel contractor pre-mobilisation compliance and readiness review using an EP checklist. This includes an Offshore Biofouling Risk Assessment Register (VIC-EN-REG-0002) which considers biofouling and ballast water related risks.<br>For vessels less than 500 gross tonnes and/or less than 50 m in length Cooper Energy will also require an assessment against the IMCA Marine Inspection for Small Workboats Inspection Template (IMCA, 2016) as part of pre-qualification. | |
| **MARS**<br>Commonwealth Department of Agriculture, Water and Resources (DAWR) clearance is obtained to enter Australian waters through pre-arrival information reported through MARS | |
| **Ballast Water Management Plan**<br>All domestic vessels have an approved Ballast Water Management Plan. | |
| **Ballast Water Management Certificate**<br>International vessels entering Australian waters have a Ballast Water Management Certificate. | |
| **Exchange of ballast water**<br>All ballast water exchange is undertaken in accordance with the requirements of the Australian Ballast Water Management Requirements (2017). | |
| **Report ballast water discharges**<br>All ballast water discharges will be reported | |
| **Maintain a ballast water record system**<br>A ballast water record system will be maintained. | |
| **Anti-fouling certificate**<br>Anti-fouling system certification is current in accordance with AMSA Marine Order Part 98 (Anti-fouling systems). | |
| **Submersible Equipment Cleaning**<br>All in-field equipment has been removed from the water, inspected and cleaned (where required) prior to deployment in the operational area. | |

| | | | |
|---|---|---|---|
| **Biofouling management plan**<br>A biofouling management plan (or equivalent information) will be available for the MODU and each support vessel. | | | |
| **Biofouling record book**<br>A biofouling record book (or equivalent records) will be maintained separately for the MODU and each support vessel. | | | |
| **Management of Vessel Movements**<br>No layup of MODU or vessels or MODU in Port Phillip Bay for a period >21 days prior to or during the campaign. | | | |
| **Vessel Anchoring**<br>Vessels will not anchor in the operational area | | | |
| **Rental Anchors**<br>If used, rental anchors will be clean prior to mobilisation for the campaign | | | |
| **Likelihood** | **Possible (C)** | **Residual Risk** | **Medium** |

## 5.13 Operational Discharges - Subsea

Table 5-13 provides a summary of the EIA / ERA for Operational Discharges - Subsea.

**Table 5-13 Operational Discharges - Subsea EIA / ERA**

| | |
|---|---|
| **Cause of Aspect** | The following activities have been identified as resulting in subsea discharges:<br>• BOP Installation and Function Testing;<br>• Severe and remove surface casing and wellhead. |
| **Summary of impact(s)** | A planned discharge of various fluids during drilling and well abandonment activities has the potential result in chronic and acute impacts to marine fauna via:<br>• Localised and temporary decrease in water quality |
| **Consequence Evaluation** | |
| **Receptor(s)** | **Description of Potential Environmental Impact** |
| Soft Sediment<br>Infauna communities<br>Epibiotic communities<br>Cetaceans<br>Fish and Sharks<br>Marine Reptiles | **Chemical Discharge**<br>Chemicals used and discharged during planned operations include control and hydraulic fluids such as Transaqua HT, Stack Magic Eco-F (or similar).<br>All chemicals used and discharged will be assessed using the Cooper Energy Offshore Environmental Chemical Assessment Process (COE-MS-RCP-0042) which uses the CHARM OCNS ranking in conjunction with toxicity, biodegradation and bioaccumulation data to determine potential impacts to the environment and acceptability of planned discharges.<br>Little to no impact is expected on benthic fauna at the release location given the low toxicity, low bioaccumulation and biodegradability characteristics of the proposed chemical discharges, and the dispersion characteristics of the release. For seabed invertebrates present near the wellhead, it is possible that low-level concentrations of chemical may be present on a short-term and episodic basis, however given the low toxicity of the chemicals, the low frequency and short-term nature of the exposure, Negligible (1) impacts are expected.<br>For mobile demersal and pelagic species which may be present at the wellheads during the activity, given the localised and short-term nature of the discharge, the low toxicity and low-frequency nature of the discharge and the species mobility which limits exposure, the environmental impact is expected to have a Negligible (1) impact to these species.<br>**Metal Shavings**<br>The wellheads will be cut with a rotating abrasive cutter. This tool has knives dressed with sintered tungsten carbide to form a cutting structure. The drill string is rotated and, whilst rotating, seawater is pumped down the drill string. The fluid applies pressure to a piston that moves pushing the knives out into contact with the casing. The abrasive knives are rotated against the casing to for a cut. The cutting process generates metal shavings. |
| **ALARP Decision Context** | **A** |
| **Summary of Control Measures** | |

| | | | |
|---|---|---|---|
| **Chemical selection process**<br>All planned chemical discharges shall be assessed and deemed acceptable before use, in accordance with the Cooper Energy Offshore Environment Chemical Assessment Process (COE-MS-RCP-0042) | | | |
| **Likelihood** | **Unlikely (D)** | **Residual Risk** | **Low** |

## 5.14 Accidental Release - Waste

Table 5-14 provides a summary of the EIA / ERA for Accidental Release - Waste.

**Table 5-14 Accidental Release - Waste EIA / ERA**

| | |
|---|---|
| **Cause of Aspect** | The handling and storage of materials and waste on board MODUs and vessels has the potential for accidental over-boarding of hazardous/non-hazardous materials and waste.<br>Small quantities of hazardous/non-hazardous materials (solids and liquids) will be used and wastes created, and then handled and stored on board until transferred to port facilities for disposal at licensed onshore facilities. However, accidental releases to sea are a possibility, such as in rough ocean conditions when items may roll off or be blown off the deck.<br>The following non-hazardous materials and wastes will be disposed of to shore, but have the potential to be accidentally dropped or disposed overboard due to overfull bins or crane operator error:<br>• Paper and cardboard;<br>• Wooden pallets;<br>• Scrap steel, metal, aluminium, cans;<br>• Glass; and<br>• Plastics.<br>The following hazardous materials may be used and waste generated through the use of consumable products and will be disposed to shore, but may be accidentally dropped or disposed overboard:<br>• Hydrocarbon-contaminated materials (e.g., oily rags, pipe dope, oil filters);<br>• Batteries, empty paint cans, aerosol cans, fluorescent tubes, printer cartridges;<br>• Contaminated personal protective equipment (PPE); and<br>• Acids and solvents (laboratory wastes). |
| **Summary of impact(s)** | The potential environmental impacts associated with the accidental release of waste are:<br>• Marine pollution (litter and a temporary and localised reduction in water quality);<br>• Injury and entanglement of marine fauna and seabirds; and<br>• Smothering or pollution of benthic habitats. |
| **Consequence Evaluation** | |
| **Receptor(s)** | **Description of Potential Environmental Impact** |
| Plankton<br>Megafauna<br>Seabirds | <u>Hazardous Materials and Waste</u><br>Hazardous materials and wastes are defined as a substance or object that exhibits hazardous characteristics and are no longer fit for its intended use and requires disposal. Some of these hazardous characteristics (as outlined in Annex III to the Basel Convention) include being toxic, flammable, explosive and poisonous.<br>Hazardous materials and wastes released to the sea cause pollution and contamination, with either direct or indirect effects on marine organisms. For example, chemical spills can impact on marine life from plankton to pelagic fish communities, causing physiological damage through ingestion or absorption through the skin. Impacts from an accidental release would be limited to the immediate area surrounding the release, prior to the dilution of the chemical with the surrounding seawater. In an |

| | |
|---|---|
| | open ocean environment such as the operational area, it is expected that any Minor (2) release would be rapidly diluted and dispersed, and thus temporary and localised.<br>Solid hazardous materials, such as paint cans containing paint residue, batteries and so forth, would settle on the seabed if dropped overboard. Over time, this may result in the leaching of hazardous materials to the seabed, which is likely to result in a small area of substrate becoming toxic and unsuitable for colonisation by benthic fauna. Given the size of materials release it is expected that only very localised impacts to benthic habitats within the operational area would be affected and unlikely to contribute to a significant loss of benthic habitat or species diversity.<br>All hazardous waste will be disposed of at appropriately licensed facilities, by licenced contractors, therefore impacts such as illegal dumping or disposal to an unauthorised onshore landfill that is not properly lined are unlikely to result from the project.<br><u>Non-hazardous Materials and Waste</u><br>Discharged overboard, non-hazardous wastes can cause smothering of benthic habitats as well as injury or death to marine fauna or seabirds through ingestion or entanglement (e.g., plastics caught around the necks of seals or ingested by seabirds and fish). For example, DSEWPaC (2015) reported that there had been 104 records of cetaceans in Australian waters impacted by plastic debris through entanglement or ingestion since 1998 (humpback whales being the main species).<br>If dropped objects such as bins are not retrievable by ROV, these items may permanently alter very small areas of seabed, resulting in the loss of benthic habitat. However, as with most subsea infrastructure, the items themselves are likely to become colonised by benthic fauna over time (e.g., sponges) and become a focal area for sea life, so the net environmental impact is likely to be neutral. This would affect extremely localised areas of seabed and would be unlikely to contribute to the loss of benthic habitat or species diversity.<br>Given the restricted exposures and limited quantity of marine pollution expected from this program, it is expected that any impacts from marine pollution may have a Minor (2) impact resulting from a localised short-term impact to species/habitats of recognised conservation value but not affecting local ecosystem functioning. |
| **ALARP Decision Context** | **A** |
| **Summary of Control Measures** | |
| **Garbage / waste management plan**<br>A Garbage Management Plan will be in place and implemented by the MODU and support vessels | |
| **Garbage record book**<br>A garbage record book /log will be in place and maintained for the MODU and support vessels | |
| **Waste management training / induction**<br>All crew undertake site inductions, which include a component on storing and handling hazardous materials and wastes | |

**Waste Handling and Disposal**

Handling of solid and hazardous wastes on-board the MODU and support vessels will comply with the requirements of Protection of the Seas (Prevention of Pollution from Ships) Act 1983, Marine Order – Part 95 – Garbage. This may include measures such as:

- No discharge of general operational or maintenance wastes or plastics or plastic products of any kind.
- Waste containers covered with tightly fitting, secure lids to prevent any solid wastes from blowing overboard.
- All solid, liquid and hazardous wastes (other than bilge water, sewage and food wastes) are incinerated or compacted (if possible) and stored in designated areas before being sent ashore for recycling, disposal or treatment.
- Any liquid waste storage on deck must have at least one barrier (i.e., bunding) to prevent deck spills entering the marine environment. This can include containment lips on deck (primary bunding) and/or secondary containment measures (bunding, containment pallet, transport packs, absorbent pad barriers) in place;
- Correct segregation of solid and hazardous wastes.

| | | | |
|---|---|---|---|
| **Likelihood** | **Unlikely (D)** | **Residual Risk** | **Low** |

## 5.15 Accidental Release (Minor)

Table 5-15 provides a summary of the EIA / ERA for Accidental Release (Minor)

**Table 5-15 Minor Loss of Containment EIA / ERA**

| | |
|---|---|
| **Cause of Aspect** | The operation of the MODU and support vessels includes handling, use and transfer of hazardous materials, and consequently the following pathways were identified as potentially leading to a loss of containment event:<br>• Use, handling and transfer of hazardous materials and chemicals on board;<br>• Hydraulic line failure from equipment;<br>• Transfer of hazardous materials between the MODU and Vessel (refuelling).<br>An evaluation of these types of events was completed to determined indicative volumes associated with each type of event. Both hydraulic line failure and use of hazardous materials onboard were associated with small volume spill events – with the maximum volume based upon the loss of an intermediate bulk container ~1 $m^3$.<br>AMSA (2015) suggests the maximum credible spill volume from a refuelling incident with continuous supervision is approximately the transfer rate over 15 minutes. Assuming failure of dry-break couplings and an assumed ~200 $m^3$/h transfer rate (based on previous operations), this equates to an instantaneous spill of ~50 $m^3$.<br>Given the volume associated with this type of incident is much larger, it has been used to conduct the risk consequence evaluation for this event. |
| **Summary of impact(s)** | A minor loss of containment (LOC) has the potential to result in chronic and acute impacts to marine fauna via:<br>• Potential toxicity. |
| **Consequence Evaluation** | |
| **Receptor(s)** | **Description of Potential Environmental Impact** |
| Plankton<br>Megafauna<br>Seabirds | A loss of 50 $m^3$ of diesel or chemicals upon release would be expected to result in changes to water quality in both surface waters and the pelagic environment. As evaluated in the potential impacts associated with a larger loss of diesel fuel were determined to be Minor (2), thus impacts from these types of events are not expected to be any larger (and thus have not been considered further). |
| **ALARP Decision Context** | **A** |
| **Summary of Control Measures** | |
| **Bulk fluid transfer process**<br>MODU will have a bulk fluid transfer process in place before commencing operations.<br>The process will include:<br>MODU-to-vessel communication protocols<br>transfer hose pressure testing<br>continuous visual monitoring<br>tank volume monitoring | |

| | | | |
|---|---|---|---|
| **Hoses and connections**<br>Transfer hoses shall comprise sufficient floating devices and self-sealing weak-link couplings in the mid-section of the hose string, in accordance with GOMO 0611-1401 | | | |
| **Planned Maintenance System**<br>Prevent transfer spills by maintaining bulk fluid transfer hoses, in accordance with the MODU maintenance system | | | |
| **Accidental release / waste management training / induction**<br>Prevent overboard discharge of hazardous liquid spills by storing hydrocarbons and hazardous liquids within secondary containment or purpose-built bulk tanks aboard the MODU or vessel | | | |
| **SMPEP (or equivalent)**<br>Prevent overboard discharge of hazardous liquid spills by maintaining chemical spill kits aboard the MODU or vessel, in accordance with the AMSA-approved SMPEP | | | |
| **SMPEP (or equivalent)**<br>Prevent overboard discharge of hazardous liquid spills by undertaking oil spill training exercises, in accordance with the MODU or vessel Operator's emergency response exercise program | | | |
| **Likelihood** | **Unlikely (D)** | **Residual Risk** | **Low** |

## 5.16 Accidental Release (Vessel Collision)

Table 5-16 provides a summary of the EIA / ERA for Accidental Release – LOC (Vessel Collision).

**Table 5-16: Accidental Release – LOC (Vessel Collision) EIA**

| | |
|---|---|
| **Cause of Aspect** | The following activities have the potential to result in a spill of 250m$^3$ marine diesel oil (MDO):<br>• A collision between the support vessel and the MODU or a third-party vessel that results in tank rupture and MDO loss.<br>Vessel drift or powered grounding is not considered credible given the distance from shore of the operational area and the lack of emergent features in the operational area. |
| **Summary of impact(s)** | A vessel collision event has the potential to expose ecological and social receptors to different hydrocarbon expressions and concentrations. Hydrocarbon expressions include:<br>• Surface;<br>• Shoreline accumulation; and<br>• In water (entrained and dissolved).<br>These exposures have the potential to result in impacts directly via:<br>• toxicity effects / physical oiling<br>• Water quality degradation; and<br>• reduction in intrinsic values / visual aesthetics.<br>Or indirectly as a result of the potential impacts noted above, there is the potential to result in<br>• damage to commercial businesses. |
| **Consequence Evaluation** | |
| **Receptor(s)** | **Description of Potential Environmental Impact** |
| Seabirds and Shorebirds | <u>Surface Hydrocarbon Exposure</u><br>When first released, the MDO has higher toxicity due to the presence of volatile components. Individual birds making contact close to the spill source at the time of the spill (i.e. areas of concentrations >10g/m$^2$ out to 16 km) may suffer impacts however it is unlikely that a large number of birds will be affected. Seabirds rafting, resting, diving or feeding at sea have the potential to come into contact with localised areas of sheen >10 µm and may experience lethal surface thresholds, however the area of contact is localised and temporary (~36 hrs) due to the rapid weathering of the oil.<br>Seabirds have the potential to come into contact with oil below this threshold over a wider area of exposure (i.e. up to 193 km away from the release site). However, the presence of birds is expected to be of a transitory nature, with no known offshore aggregation areas present within the area potentially exposed to surface hydrocarbon concentration >10g/m$^2$.<br>As such, acute or chronic toxicity impacts (death or long-term poor health) to small numbers of birds are possible, however this is not considered significant at a population level.<br>Consequently, the potential impacts and risks to seabirds from surface hydrocarbon exposure event are considered to be Minor (2), as they could be expected to result in |

| | |
|---|---|
| | localised short-term impacts to species/habitats of recognised conservation value but not affecting local ecosystem functioning. |
| Marine turtles | Surface Hydrocarbon Exposure<br>Marine turtles are vulnerable to the effects of oil at all life stages. Marine turtles can be exposed to surface oil externally (i.e. swimming through oil slicks) or internally (i.e. swallowing the oil). Ingested oil can harm internal organs and digestive function. Oil on their bodies can cause skin irritation and affect breathing.<br>The number of marine turtles that may be exposed is expected to be low due to the location, and the localised and relatively short (~36 hrs) extent of exposure above the threshold.<br>Therefore, potential impact would be limited to individuals, with population impacts not anticipated.<br>Consequently, the potential impacts and risks to marine turtles are considered to be Negligible (1), as they could be expected to result in localised short-term impacts to species/habitats of recognised conservation value but not affecting local ecosystem functioning. |
| Pinnipeds | Surface Hydrocarbon Exposure<br>Exposure to surface oil can result in skin and eye irritations and disruptions to thermal regulation. Fur seals are particularly vulnerable to hypothermia from oiling of their fur – however the characteristics of MDO mean this is not likely.<br>The number of pinnipeds exposed is expected to be low, with population impacts not anticipated. Due to the rapid weathering of MDO, the potential exposure time is short.<br>Consequently, the potential impacts and risks to pinnipeds from a LOC event are considered to be Negligible (1), as they could be expected to result in localised short-term impacts to species/habitats of recognised conservation value but not affecting local ecosystem functioning. |
| Cetaceans | Surface Hydrocarbon Exposure<br>Physical contact by individual whales of MDO is unlikely to lead to any long-term impacts. Given the mobility of whales, only a small proportion of the population would surface in the affected areas, resulting in short-term and localised consequences, with no long-term population viability effects. Geraci (1988) found little evidence of cetacean mortality from hydrocarbon spills; however, some behaviour disturbance (including avoidance of the area) may occur. While this reduces the potential for physiological impacts from contact with hydrocarbons, active avoidance of an area may disrupt behaviours such as migration, or displace individuals from important habitat, such as foraging, resting or breeding.<br>If whales are foraging at the time of the spill, a greater number of individuals may be present in the plume, however due to the rapid weathering of MDO and the short duration of the surface exposures at higher concentrations (e.g. >10 $g/m^2$), this is not considered likely.<br>While avoidance of an area with a barely visible sheen (i.e. 0.1 $g/m^2$) is considered unlikely, it is acknowledged that this may occur within the aggregation area in waters offshore from Port Fairy/Warrnambool. However, given this is a small percentage of the total BIA and that surface MDO is expected to rapidly weather, the risk of displacement to whales is considered low. |

| | |
|---|---|
| | Consequently, the potential impacts and risks to cetaceans are considered to be Minor (2), as they could be expected to result in localised short-term impacts to species/habitats of recognised conservation value but not affecting local ecosystem functioning |
| Recreation and Tourism | Surface Hydrocarbon Exposure<br>Visible surface hydrocarbons (i.e. a rainbow sheen) have the potential to reduce the visual amenity of the area for tourism and discourage recreational activities. However, the relatively short duration, and distance from shore means there may be short-term and localised consequences, which are ranked as Minor (2).<br>Refer also to:<br>Cetaceans |
| Heritage | Surface Hydrocarbon Exposure<br>Visible surface hydrocarbons (i.e. a rainbow sheen) have the potential to reduce the visual amenity of known heritage sites. The relatively short duration, and distance from shore means there may be short-term and localised consequences, which are ranked as Minor (2). |
| Seabirds and Shorebirds | Shoreline Hydrocarbon Exposure<br>Shoreline species may suffer both direct oiling and potential displacement from foraging and/or nesting sites. Acute or chronic toxicity impacts (death or long-term poor health) to small numbers of birds are possible, however this is not considered significant at a population level.<br>Direct oiling of nesting sites is considered unlikely as hydrocarbons would typically accrue within the upper swash zone, and nests would occur above this level on a beach. However, oiled fauna may track oil into their nests, which may then have subsequent impacts on any eggs present. This would be more of a risk for fauna, such as the Little Penguin, that must traverse the intertidal area to reach nesting sites. There are no known breeding locations for penguins along the Otway mainland coast at risk of shoreline oil accumulation. In addition, given the volatility of the exposed oil, any impact to nests is expected to occur to individuals and not considered to pose a long-term risk at population level.<br>Consequently, the potential impacts and risks to seabirds from shoreline hydrocarbon exposure event are considered to be Minor (2), as they could be expected to result in localised short-term impacts to species/habitats of recognised conservation value but not affecting local ecosystem functioning. |
| Saltmarshes | Shoreline Hydrocarbon Exposure<br>Saltmarsh is considered to have a high sensitivity to hydrocarbon exposure. Saltmarsh vegetation offers a large surface area for oil absorption and tends to trap oil.<br>Evidence from case histories and experiments shows that the damage resulting from oiling, and recovery times of oiled marsh vegetation, are very variable. In areas of light to moderate oiling where oil is mainly on perennial vegetation with little penetration of sediment, the shoots of the plants may be killed but recovery can take place from the underground systems. Good recovery commonly occurs within one to two years (IPIECA, 1994). |

| | |
|---|---|
| | Consequently, the potential impacts and risks to saltmarsh are considered to be Moderate (3), as they could be expected to result in localised medium-term impacts to species or habitats of recognized conservation value or to local ecosystem function. |
| Recreation and Tourism | Shoreline Hydrocarbon Exposure<br>Visible hydrocarbons stranded on a shoreline have the potential to temporarily reduce the visual amenity of the area for tourism and discourage recreational activities. However, due to the volatility of MDO and the short sections of coastline (localised) potentially affected by peak shoreline loading, consequence has been ranked as Minor (2). |
| Heritage | Shoreline Hydrocarbon Exposure<br>Hydrocarbons stranded on a shoreline have the potential to temporarily reduce the Heritage value of the area. However, due to the volatility of MDO and the short sections of coastline (localised) potentially affected by peak shoreline loading, are ranked as Minor (2). |
| Coral | In-water Hydrocarbon Exposure<br>Exposure of entrained hydrocarbons to shallow subtidal corals has the potential to result in lethal or sublethal toxic effects, resulting in acute impacts or death at moderate to high exposure thresholds (Shigenaka, 2001). Contact with corals may lead to reduced growth rates, tissue decomposition, and poor resistance and mortality of sections of reef (NOAA, 2010).<br>However, given the lack of coral reef formations, and the sporadic cover of hard or soft corals in mixed nearshore reef communities along the Otway coast, such impacts are considered to be limited to isolated corals.<br>Consequently, the potential impacts to corals are considered to be Minor (2), as they could be expected to result in localised short-term impacts to species/habitats of recognised conservation value, but not affecting local ecosystem functioning. |
| Macroalgae | In-water Hydrocarbon Exposure<br>Reported toxic responses to oils have included a variety of physiological changes to enzyme systems, photosynthesis, respiration, and nucleic acid synthesis (Lewis & Pryor 2013). A review of field studies conducted after spill events by Connell et al (1981) indicated a high degree of variability in the level of impact, but in all instances, the algae appeared to be able to recover rapidly from even very heavy oiling.<br>Given the restricted range of exposure (shallow nearshore and intertidal waters only) and the predicted lower concentrations of hydrocarbons that could reach these waters, any impact to macroalgae is not expected to result in long-term or irreversible damage.<br>Consequently, the potential impacts to macroalgae are considered to be Minor (2), as they could be expected to result in localised short-term impacts to species/habitats of recognised conservation value, but not affecting local ecosystem functioning. |
| Seagrass | In-water Hydrocarbon Exposure<br>There is the potential that exposure could result in sub-lethal impacts, more so than lethal impacts, possibly because much of seagrasses' biomass is underground in their rhizomes (Zieman et al., 1984). |

| | |
|---|---|
| | Given the restricted range of exposure (shallow nearshore and intertidal waters only) and the predicted lower concentrations of hydrocarbons expected to be in these waters, any impact to seagrass is not expected to result in long-term or irreversible damage.<br>Consequently, the potential impacts to seagrass are considered to be Minor (2), as they could be expected to result in localised short-term impacts to species/habitats of recognised conservation value, but not affecting local ecosystem functioning. |
| Plankton | In-water Hydrocarbon Exposure<br>Relatively low concentrations of hydrocarbon are toxic to both plankton [including zooplankton and ichthyoplankton (fish eggs and larvae)]. Plankton risk exposure through ingestion, inhalation and dermal contact with in-water hydrocarbons.<br>Plankton are numerous and widespread but do act as the basis for the marine food web. However, any impact is expected to be localised and temporary, meaning that an oil spill in any one location is unlikely to have long-lasting impacts on plankton populations at a regional level. Once background water quality conditions have re-established, the plankton community may take weeks to months to recover (ITOPF, 2011), allowing for seasonal influences on the assemblage characteristics.<br>Consequently, the potential impacts to plankton are considered to be Minor (2), as they could be expected to cause short-term and localised impacts, but not affecting local ecosystem functioning. |
| Invertebrates | In-water Hydrocarbon Exposure<br>Acute or chronic exposure through contact and/or ingestion can result in toxicological risks. However, the presence of an exoskeleton (e.g. crustaceans) reduces the impact of hydrocarbon absorption through the surface membrane. Invertebrates with no exoskeleton and larval forms may be more prone to impacts. Localised impacts to larval stages may occur which could impact on population recruitment that year.<br>Tainting of recreation or commercial species is considered unlikely to occur, however if it did it is expected to be localised and low level with recovery expected.<br>Consequently, the potential impacts and risks to commercially-fished invertebrates from an MDO LOC are considered to be Minor (2), as they could be expected to result in localised short-term impacts to species/habitats of recognised conservation value but not affecting local ecosystem functioning. |
| Fish and Sharks | In-water Hydrocarbon Exposure<br>Pelagic free-swimming fish and sharks are unlikely to suffer long-term damage from oil spill exposure because dissolved/entrained hydrocarbons in water are not expected to be sufficient to cause harm (ITOPF, 2011). Subsurface hydrocarbons could potentially result in acute exposure to marine biota such as juvenile fish, larvae, and planktonic organisms, although impacts are not expected cause population-level impacts.<br>There is the potential for localised and short-term impacts to fish communities; the consequences are ranked as Minor (2).<br>Impacts on eggs and larvae entrained in the upper water column are not expected to be significant given the temporary period of water quality impairment, and the limited areal extent of the spill. As egg/larvae dispersal is widely distributed in the upper layers of the water column it is expected that current induced drift will rapidly replace any oil affected populations. Impact is assessed as temporary and localised and are considered Minor (2). |

| | |
|---|---|
| Pinnipeds | <u>In-water Hydrocarbon Exposure</u><br>Hydrocarbons in the water column or consumption of prey affected by the oil may cause sub-lethal impacts to pinnipeds, however given the temporary and localised nature of the spill, their widespread nature, and the rapid weathering of MDO, impacts at a population level are considered very unlikely. Impact is assessed as temporary and localised and are considered Minor (2). |
| Cetaceans | <u>In-water Hydrocarbon Exposure</u><br>Cetacean exposure to in-water hydrocarbons can occur via ingestion or physical coating (Geraci and St Aubin, 1988).<br>Toxicity impacts are more associated with 'fresh' hydrocarbon; the risk of impact declines rapidly as the MDO weathers.<br>The potential for environmental impacts would be limited to a relatively short period following the release and would need to coincide with a migration or aggregation event to result in exposure to a large number of individuals. However, such exposure is not anticipated to result in long-term population viability effects.<br>A proportion of the migrating population of whales could be affected for a single migration event, which could result in temporary and localised consequences, which are ranked as Negligible (1). |
| Commercial Fisheries and Recreational Fishing | <u>In-water Hydrocarbon Exposure</u><br>Any acute impacts are expected to be limited to small numbers of juvenile fish, larvae, and planktonic organisms, which are not expected to affect population viability or recruitment. Impacts from entrained exposure are unlikely to manifest at a fish population viability level.<br>Actual or potential contamination of seafood can affect commercial and recreational fishing and can impact seafood markets long after any actual risk to seafood from a spill has subsided (NOAA, 2002) which can have economic impacts to the industry.<br>Any exclusion zone established would be limited to the immediate vicinity of the release point, and due to the rapid weathering of MDO would only be in place 1-2 days after release, therefore physical displacement to vessels is unlikely to be a significant impact.<br>The consequence to commercial and recreational fisheries is assessed as localised and short-term and ranked as Minor (2).<br>Refer also to:<br>• Fish and Sharks<br>• Invertebrates. |
| Recreation and Tourism | <u>In-water Hydrocarbon Exposure</u><br>Any impact to receptors that provide nature-based tourism features (e.g. whales) may cause a subsequent negative impact to recreation and tourism activities. However, the relatively short duration, and distance from shore means there may be short-term and localised consequences, which are ranked as Minor (2).<br>Refer also to:<br>• Fish and Sharks<br>• Cetaceans<br>• Invertebrates<br>• Recreational Fishing |

| | |
|---|---|
| State Marine Protected Areas | <u>In-water Hydrocarbon Exposure</u><br>The consequence to protected marine areas is assessed as localised and short term, and ranked as Minor (2).<br>Refer to:<br>• Invertebrates<br>• Macroalgae<br>• Pinnipeds. |
| Australian Marine Parks | <u>In-water Hydrocarbon Exposure</u><br>The concentration at which the water column within AMPs may be exposed is below the ecological no-effect (low) time-based exposure threshold. Given the temporary (1 hour instantaneous) nature of the exposure, and the limited effect on water quality, the consequence is ranked as Negligible (1). |
| **ALARP Decision Context** | **A** |
| **Summary of Control Measures** | |
| **Vessel Crew and Navigational Equipment**<br>Vessels will meet the crew competency, navigation equipment, watchkeeping and radar requirements of the AMSA Marine Order Part 3 and Part 30 | |
| **Emergency Response Preparedness**<br>Emergency response capability will be maintained in accordance with EP, OPEP and related documentation. | |
| **SMPEP (or equivalent)**<br>Emergency response activities will be implemented in accordance with the vessel SMPEP | |
| **OPEP**<br>Emergency response activities will be implemented in accordance with the OPEP<br>The Offshore Victoria OPEP was developed to support all Cooper Energy offshore Victorian activities and includes activities described under this EP. | |
| **OSMP**<br>Operational and scientific monitoring will be implemented in accordance with the OSMP<br>Operational monitoring will allow adequate information to be provided to aid decision making to ensure response activities are timely, safe, and appropriate. Scientific monitoring will identify if potential longer-term remediation activities may be required and potential breaches of protected places management objectives, specifically those of Australian Marine Parks. | |
| **Pre-start notifications**<br>The AHS will be notified no less than four working weeks before operations commence to enable Notices to Mariners to be published | |
| **Pre-start notifications**<br>AMSA's JRCC will be notified 24–48 hours before operations commence to enable AMSA to distribute an AUSCOAST warning | |

| | | | |
|---|---|---|---|
| **Pre-start notifications**<br>Relevant Stakeholders will be notified of activities a minimum 4 weeks and 1 week prior to operations commencing | | | |
| **Likelihood** | **Unlikely (D)** | **Residual Risk** | **Low** |

## 5.17 Accidental Release (Loss of Well Control)

Table 5-17 provides a summary of the EIA / ERA for Accidental Release - LOC (Loss of Well Control Event).

**Table 5-17 Accidental Release - LOC (Loss of Well Control Event) EIA / ERA**

| | |
|---|---|
| **Cause of Aspect** | A loss of well control has the potential to be caused during emergency conditions when intersecting hydrocarbon bearing formation and may result in the release of gas and condensate. |
| **Summary of impact(s)** | A LOWC event has the potential to expose ecological and social receptors to both gas and liquid condensate:<br>• Surface;<br>• Shoreline accumulation; and<br>• In-water (dissolved and entrained).<br>These exposures have the potential to result in potential impacts directly to ecological and social receptors via:<br>• Potential for reduction in intrinsic values / visual aesthetics;<br>• Water quality degradation; and<br>• Potential toxicity effects / physical oiling.<br>Or indirectly as a result of the potential impacts noted above, there is the potential to result in<br>• Potential damage to commercial businesses. |
| **Consequence Evaluation** | |
| **Receptor(s)** | **Description of Potential Environmental Impact** |
| Seabirds and Shorebirds | <u>Surface Hydrocarbon Exposure</u><br>When first released, gas condensate has higher toxicity due to the presence of volatile components. Individual birds making contact close to the spill source at the time of the spill (i.e. areas of concentrations >10g/m$^2$ out to 1 km from the well site) may suffer impacts however it is unlikely that a large number of birds will be affected. Seabirds rafting, resting, diving or feeding at sea have the potential to come into contact with localised areas of sheen >10 µm and may experience lethal surface thresholds for the duration of the spill. Contact with areas of high hydrocarbon exposure is highly unlikely. As such, acute or chronic toxicity impacts (death or long-term poor health) to small numbers of birds are possible, however this is not considered significant at a population level.<br>Seabirds have the potential to come into contact with oil below this threshold over a wider area of exposure. However, the presence of birds is expected to be of a transitory nature, with no known offshore aggregation areas present within area potentially exposed to surface hydrocarbons at concentration >10g/m$^2$.<br>Consequently, the potential impacts and risks to seabirds from a LOWC event are considered to be Minor (2), as they could be expected to result in localised short-term impacts to species/habitats of recognised conservation value but not affecting local ecosystem functioning. |
| Marine Turtles | <u>Surface Hydrocarbon Exposure</u> |

| | |
|---|---|
| | Marine turtles are vulnerable to the effects of oil at all life stages. Marine turtles can be exposed to surface oil externally (i.e. swimming through oil slicks) or internally (i.e. swallowing the oil). Ingested oil can harm internal organs and digestive function. Oil on their bodies can cause skin irritation and affect breathing.<br>The number of marine turtles that may be exposed is expected to be low due to the location, and the localised (1km from well site) extent of exposure above the threshold.<br>Therefore, potential impact would be limited to individuals, with population impacts not anticipated.<br>Consequently, the potential impacts and risks to marine turtles are considered to be Negligible (1), as they could be expected to result in localised short-term impacts to species/habitats of recognised conservation value but not affecting local ecosystem functioning. |
| Pinnipeds | <u>Surface Hydrocarbon Exposure</u><br>Exposure to surface oil can result in skin and eye irritations and disruptions to thermal regulation. Fur seals are particularly vulnerable to hypothermia from oiling of their fur – however the characteristics of Minerva condensate mean this is not likely.<br>The number of pinnipeds exposed is expected to be low, with population impacts not anticipated. Due to the rapid weathering of condensate, the potential exposure time is short.<br>Consequently, the potential impacts and risks to pinnipeds from a LOWC event are considered to be Negligible (1), as they could be expected to result in localised short-term impacts to species/habitats of recognised conservation value but not affecting local ecosystem functioning. |
| Cetaceans | <u>Surface Hydrocarbon Exposure</u><br>Physical contact by individual whales to condensate is unlikely to lead to any long-term impacts. Given the mobility of whales, only a small proportion of the population would surface in the affected areas, resulting in short-term and localised consequences, with no long-term population viability effects. Geraci (1988) found little evidence of cetacean mortality from hydrocarbon spills; however, some behaviour disturbance (including avoidance of the area) may occur. While this reduces the potential for physiological impacts from contact with hydrocarbons, active avoidance of an area may disrupt behaviours such as migration, or displace individuals from important habitat, such as foraging, resting or breeding.<br>If whales are foraging at the time of the spill, a greater number of individuals may be present in the plume, however due to the small area of the surface exposure above the impact threshold (<1km from well site), this is not likely.<br>While avoidance of an area with a barely visible sheen (i.e. 0.1 g/m$^2$) is considered unlikely, it is acknowledged that this may occur within the aggregation area in waters offshore from Port Fairy/Warrnambool. However, given this is a relatively small area of the total BIA, the risk of displacement to whales is considered low.<br>Consequently, the potential impacts and risks to cetaceans are considered to be Minor (2) as they could be expected to result in localised short-term impacts to species/habitats of recognised conservation value but not affecting local ecosystem functioning. |

| | |
|---|---|
| Recreation and Tourism | Surface Hydrocarbon Exposure<br>Visible surface hydrocarbons (i.e. a rainbow sheen) have the potential to reduce the visual amenity of the area for tourism, and discourage recreational activities. However, the relatively short duration means there may be short-term and localised consequences, which are ranked as Minor (2).<br>Refer also to:<br>Cetaceans |
| Heritage | Surface Hydrocarbon Exposure<br>Visible surface hydrocarbons (i.e. a rainbow sheen) have the potential to reduce the visual amenity of known heritage sites. The relatively short duration means there may be short-term and localised consequences, which are ranked as Minor (2). |
| State Marine Protected Areas<br>Australian Marine Parks | Surface Hydrocarbon Exposure<br>Visible hydrocarbons at 0.1 g/m$^2$ represent a highly conservative impact to visual amenity i.e., are barely visible (if at all). Given the temporary nature of the exposure, and the surface threshold being below that of ecological impact, the consequence is ranked as Negligible (1). |
| Seabirds and Shorebirds | Shoreline Hydrocarbon Exposure<br>Shoreline species may suffer both direct oiling and potential displacement from foraging and nesting sites. Acute or chronic toxicity impacts (death or long-term poor health) to small numbers of birds are possible, however this is not considered significant at a population level.<br>Direct oiling of nesting sites is considered unlikely as hydrocarbon would typically accrue within the upper swash zone, and nests would occur above this level on a beach. However, oiled fauna may track oil into their nests, which may then have subsequent impacts on any eggs present. This would be more of a risk for fauna, such as the Little Penguin, that have to traverse the intertidal area to reach nesting sites. There are no known breeding locations for penguins along the Otway mainland coast at risk of shoreline oil accumulation. In addition, given the volatility of the exposed oil, any impact to nests is expected to occur to individuals and not considered to pose a long-term risk at population level.<br>Given the potential for sensitive shoreline habitat to be exposed to hydrocarbons above the actionable >100 g/m$^2$ shoreline exposure thresholds, the length of shoreline that has the potential to be exposed and the peak volume potentially accumulated ashore, the consequence has been ranked as Moderate (3). |
| Saltmarsh | Shoreline Hydrocarbon Exposure<br>Saltmarsh is considered to have a high sensitivity to hydrocarbon exposure. Saltmarsh vegetation offers a large surface area for oil absorption and tends to trap oil.<br>Evidence from case histories and experiments shows that the damage resulting from oiling, and recovery times of oiled marsh vegetation, are very variable. In areas of light to moderate oiling where oil is mainly on perennial vegetation with little penetration of sediment, the shoots of the plants may be killed but recovery can take place from the underground systems. Good recovery commonly occurs within one to two years (IPIECA, 1994). |

| | |
|---|---|
| | Consequently, the potential impacts and risks to saltmarsh are considered to be Moderate (3), as they could be expected to result in localised medium-term impacts to species or habitats of recognized conservation value or to local ecosystem function. |
| Recreation and Tourism | Shoreline Hydrocarbon Exposure<br>Visible hydrocarbons stranded on shorelines have the potential to reduce the visual amenity of the area for tourism and discourage recreational activities. However, the short sections of coastline (localised) potentially affected by peak shoreline loading, which are ranked as Minor (2). |
| Heritage | Shoreline Hydrocarbon Exposure<br>Hydrocarbons stranded on a shoreline have the potential to temporarily reduce the heritage value of the area. However, the short sections of coastline (localised) potentially affected by peak shoreline loading, are ranked as Minor (2). |
| Coral | In-water Hydrocarbon Exposure<br>Exposure of entrained hydrocarbons to shallow subtidal corals has the potential to result in lethal or sublethal toxic effects, resulting in acute impacts or death at moderate to high exposure thresholds (Shigenaka, 2001). Contact with corals may lead to reduced growth rates, tissue decomposition, and poor resistance and mortality of sections of reef (NOAA, 2010).<br>However, given the lack of coral reef formations, and the sporadic cover of hard or soft corals in mixed nearshore reef communities along the Otway coast, such impacts are considered to be limited to isolated corals.<br>Consequently, the potential impacts to corals are considered to be Minor (2), as they could be expected to result in localised short-term impacts to species/habitats of recognised conservation value, but not affecting local ecosystem functioning. |
| Macroalgae | In-water Hydrocarbon Exposure<br>Reported toxic responses to oils have included a variety of physiological changes to enzyme systems, photosynthesis, respiration, and nucleic acid synthesis (Lewis & Pryor 2013). A review of field studies conducted after spill events by Connell et al (1981) indicated a high degree of variability in the level of impact, but in all instances, the algae appeared to be able to recover rapidly from even very heavy oiling.<br>Given the restricted range of exposure (shallow nearshore and intertidal waters only) and the predicted lower concentrations of hydrocarbons expected to be in these waters, any impact to macroalgae is not expected to result in long-term or irreversible damage.<br>Consequently, the potential impacts to macroalgae are considered to be Minor (2), as they could be expected to result in localised short-term impacts to species/habitats of recognised conservation value, but not affecting local ecosystem functioning. |
| Seagrass | In-water Hydrocarbon Exposure<br>There is the potential that exposure could result in sub-lethal impacts, more so than lethal impacts, possibly because much of seagrasses' biomass is underground in their rhizomes (Zieman et al., 1984).<br>Given the restricted range of exposure (shallow nearshore and intertidal waters only) and the predicted lower concentrations of hydrocarbons expected to be in these waters, any impact to seagrass is not expected to result in long-term or irreversible damage. |

| | |
|---|---|
| | Consequently, the potential impacts to seagrass are considered to be Minor (2), as they could be expected to result in localised short-term impacts to species/habitats of recognised conservation value, but not affecting local ecosystem functioning. |
| Plankton | In-water Hydrocarbon Exposure<br>Relatively low concentrations of hydrocarbon are toxic to both plankton [including zooplankton and ichthyoplankton (fish eggs and larvae)]. Plankton risk exposure through ingestion, inhalation and dermal contact with in-water hydrocarbons.<br>Plankton are numerous and widespread but do act as the basis for the marine food web. However, any impact is expected to be localised and temporary, meaning that an oil spill in any one location is unlikely to have long-lasting impacts on plankton populations at a regional level. Once background water quality conditions have re-established, the plankton community may take weeks to months to recover (ITOPF, 2011), allowing for seasonal influences on the assemblage characteristics.<br>Consequently, the potential impacts to plankton are considered to be Minor (2), as they could be expected to cause short-term and localised impacts, but not affecting local ecosystem functioning. |
| Invertebrates | In-water Hydrocarbon Exposure<br>Acute or chronic exposure through contact and/or ingestion can result in toxicological risks. However, the presence of an exoskeleton (e.g. crustaceans) reduces the impact of hydrocarbon absorption through the surface membrane. Invertebrates with no exoskeleton and larval forms may be more prone to impacts. Localised impacts to larval stages may occur which could impact on population recruitment that year.<br>Tainting of recreation or commercial species is considered unlikely to occur, however if it did it is expected to be localised and low level with recovery expected.<br>Consequently, the potential impacts and risks to commercially-fished invertebrates from a LOWC event are considered to be Minor (2), as they could be expected to result in localised short-term impacts to species/habitats of recognised conservation value but not affecting local ecosystem functioning. |
| Fish and Sharks | In-water Hydrocarbon Exposure<br>Pelagic free-swimming fish and sharks are unlikely to suffer long-term damage from oil spill exposure because dissolved/entrained hydrocarbons in water are not expected to be sufficient to cause harm (ITOPF, 2010). Subsurface hydrocarbons could potentially result in acute exposure to marine biota such as juvenile fish, larvae, and planktonic organisms, although impacts are not expected cause population-level impacts.<br>There is the potential for localised and short-term impacts to fish communities; the consequences are ranked as Minor (2).<br>Impacts on eggs and larvae entrained in the upper water column are not expected to be significant given the temporary period of water quality impairment, and the limited geographical extent of the spill. As egg/larvae dispersal is extensive in the upper layers of the water column and it is expected that current induced drift will rapidly replace any oil affected populations. Impacts are assessed as temporary and localised, and therefore considered to be Minor (2). |
| Pinnipeds | In-water Hydrocarbon Exposure<br>Hydrocarbons in the water column or consumption of prey affected by the oil may cause sub-lethal impacts to pinnipeds, however given the localised nature of the spill, their |

| | |
|---|---|
| | widespread nature, no known breeding colony within the area of predicted ecological exposure (above time-based exposure concentrations), and the rapid loss of the volatile components of condensate in choppy and windy seas (such as that of the EMBA), impacts at a population level are considered very unlikely. Impact is assessed as temporary and localised and are considered Minor (2). |
| Cetaceans | In-water Hydrocarbon Exposure<br>Cetacean exposure to entrained hydrocarbons can result in physical coating as well as ingestion (Geraci and St Aubin, 1988). Such impacts are associated with 'fresh' hydrocarbon; the risk of impact declines rapidly as the condensate weathers.<br>The potential for environmental impacts would be limited to a relatively short period following the release and would need to coincide with a migration or aggregation event to result in exposure to a large number of individuals. However, such exposure is not anticipated to result in long-term population viability effects.<br>A proportion of the migrating population of whales could be affected for a single migration event, which could result in temporary and localised consequences, which are ranked as Negligible (1). |
| Commercial Fisheries and Recreational Fishing | In-water Hydrocarbon Exposure<br>In-water exposure to entrained hydrocarbons may result in a reduction in commercially targeted marine species, resulting in impacts to commercial fishing and aquaculture. Actual or potential contamination of seafood can affect commercial and recreational fishing and can impact seafood markets long after any actual risk to seafood from a spill has subsided (NOAA, 2002) which can have economic impacts to the industry.<br>Any acute impacts are expected to be limited to small numbers of juvenile fish, larvae, and planktonic organisms, which are not expected to affect population viability or recruitment. Impacts from entrained exposure are unlikely to manifest at a fish population viability level.<br>Any exclusion zone established would be limited to the safety exclusion zone around the vicinity of the release point, and due to the rapid weathering of hydrocarbons would only be in place whilst well-kill activities are enacted, therefore physical displacement to vessels is unlikely to be a significant impact.<br>The consequence to commercial and recreational fisheries is assessed as localised and short term and ranked as Minor (2).<br>Refer also to:<br>• Fish and Sharks |
| Recreation and Tourism | In-water Hydrocarbon Exposure<br>Any impact to receptors that provide nature-based tourism features (e.g. whales) may cause a subsequent negative impact to recreation and tourism activities. However, the relatively short duration, and distance from shore means there may be short-term and localised consequences, which are ranked as Minor (2).<br>Refer also to:<br>• Fish and Sharks<br>• Cetaceans<br>• Invertebrates<br>• Recreational Fishing |

| | |
|---|---|
| State Marine Protected Areas | In-water Hydrocarbon Exposure<br>The consequence to protected marine areas is assessed as localised and short term and ranked as Minor (2).<br>Refer to:<br>• Invertebrates<br>• Macroalgae |
| Australian Marine Parks | In-water Hydrocarbon Exposure<br>The concentration at which the water column within AMPs may be exposed is below the ecological no-effect (low) time-based exposure threshold. Given the temporary (1 hour instantaneous) nature of the exposure, and the limited effect on water quality, the consequence is ranked as Negligible (1). |
| **ALARP Decision Context** | **B** |
| **Summary of Control Measures** | |
| **Well proposal and formation evaluation**<br>Well proposal and formation evaluation program will be completed before finalising well locations | |
| **Well construction and abandonment processes**<br>Well construction and abandonment will be implemented in accordance with the Cooper Energy Well Engineering Standards (WMS-MS-STD-0002) | |
| **Well design and plan approval**<br>The Cooper Energy Well Engineering Standards (WMS-MS-STD-0002) and Cooper Energy Well Management System (WEMS-DC-STD-0001) ensure all aspects of risk profiling, well construction or abandonment design are peer reviewed and approved by management at each stage.<br>The Cooper Energy Well Engineering Standards (WMS-MS-STD-0002) is an assurance program used to ensure specified requirements have been met; this provides assurance that well control can be maintained at all times. Specifically, this process requires well design and plan approval for construction and abandonment programs.<br>The well abandonment and construction program will be approved under the Cooper Energy Well Management System (WEMS-DC-STD-0001) before operation | |
| **NOPSEMA accepted WOMP**<br>A NOPSEMA-accepted WOMP that describes well barriers and integrity testing will be in place before well intervention or drilling activities start.<br>The WOMP details well barriers and the integrity testing that will be in place for the program. Cooper Energy's NOPSEMA-accepted WOMP describes Cooper Energy's minimum requirements for well barriers during operations. | |
| **Well Program**<br>Before undertaking activities within the scope of this EP, a specific well program will be developed | |
| **Planned maintenance system**<br>The PMS will ensure safety critical equipment (specifically the BOP) will be maintained in accordance with the manufacturer specifications | |

| | | | |
|---|---|---|---|
| **Emergency Response Preparedness**<br>Emergency response capability will be maintained in accordance with EP, OPEP and related documentation. | | | |
| **OPEP**<br>Emergency response activities will be implemented in accordance with the OPEP (VIC-ER-EMP-0001) (Appendix 3), and performance standards therein<br>The Offshore Victoria OPEP was developed to support all Cooper Energy offshore Victorian activities and includes activities described under this EP. | | | |
| **Stakeholder Consultation**<br>In the event of a LOWC event, potential relevant stakeholders will be identified and notified. | | | |
| **OSMP**<br>Operational and scientific monitoring will be implemented in accordance with the OSMP (VIC-ER-EMP-0003).<br>Operational monitoring will allow adequate information to be provided to aid decision making to ensure response activities are timely, safe, and appropriate. Scientific monitoring will identify if potential longer-term remediation activities may be required and potential breaches of protected places management objectives, specifically those of Australian Marine Parks. | | | |
| **Likelihood** | **Unlikely (D)** | **Residual Risk** | **Medium** |

# 6 Emergency Response Overview

## 6.1 Oil Spill response strategies

For the purposes of selecting appropriate response options, hydrocarbons have been grouped into oil types as defined by the ITOPF classification system:

- Group I – Minerva gas condensate (LOWC) (refer to Section 5.17)
- Group II – 250 $m^3$ MDO (Vessel collision) (refer to Section 5.16).

By conducting an Operational and Net Benefit Assessment, Cooper Energy has identified the following response strategies as being appropriate for a response to these events (Table 6-1)

**Table 6-1: Suitability of Response Options for MDO, and Waarre Reservoir Dry Gas Condensate**

| Response Option | OPEP Section Reference | Description | Vessel Collision (MDO) | Viable Response? | Strategic Net Benefit? | LOWC (Minerva Condensate) | Viable Response? | Strategic Net Benefit? |
|---|---|---|---|---|---|---|---|---|
| Source Control | OPEP Section 6 | Limit flow of hydrocarbons to environment. | Achieved by vessel SMPEP/SOPEP. | ✓ | ✓ | <u>For wellhead issues:</u><br>In accordance with the Offshore Victoria Source Control Plan (VIC-DC-ERP-0001). This plan provides a response to release incidents from wellheads | ✓ | ✓ |
| Monitor & Evaluate | OPEP Section 7 | Direct observation – Aerial or marine; Vector Calculations; Oil Spill Trajectory Modelling; Satellite Tracking Buoys<br>To maintain situational awareness, all monitor and evaluate options suitable. | MDO spreads rapidly to thin layers.<br>Aerial surveillance is considered more effective than vessel to inform spill response and identify if oil has contacted shoreline or wildlife. Vessel surveillance limited in effectiveness in determining spread of oil.<br>Manual calculation based upon weather conditions will be used at the time to provide guidance to aerial observations.<br>Oil Spill trajectory modelling utilised to forecast impact areas.<br>Deployment of oil spill monitoring buoys at the time of vessel incident will assist in understanding the local | ✓ | ✓ | For a continuous significant spill event (well blowout) hydrocarbons will be present at the surface for the duration of the release.<br>To maintain situational awareness, all monitor and evaluate techniques will be considered during dry gas spill incidents to understand the possible impacts. | ✓ | ✓ |

| Response Option | OPEP Section Reference | Description | Vessel Collision (MDO) | Viable Response? | Strategic Net Benefit? | LOWC (Minerva Condensate) | Viable Response? | Strategic Net Benefit? |
|---|---|---|---|---|---|---|---|---|
| | | | current regime during the spill event. | | | | | |
| Dispersant Application | OPEP Section 6 | Breakdown surface spill & draw droplets into upper layers of water column.<br>Increases biodegradation and weathering and provides benefit to sea-surface /air breathing animals. | MDO, while having a small persistent fraction, spreads rapidly to thin layers. Insufficient time to respond while suitable surface thicknesses are present.<br>Dispersant application can result in punch-through where dispersant passes into the water column without breaking oil layer down if surface layers are too thin. Application can contribute to water quality degradation through chemical application without removing surface oil.<br>Considered not to add sufficient benefits. | X | X | The Waarre reservoir is 'dry gas' condensate.<br>Chemical dispersants are expected to have limited effectiveness on dry gas condensate spills.<br>Actionable surface thickness of 10g/$m^2$ is expected in the vicinity of the release location (<1 km) for both seasons and within a response exclusion zone in the event of a LOWC scenario.<br>Dispersant use may be considered to attempt to reduce 'Lower Explosive Limits' (LELs) at surface and allow close access to the well during response activities. | ✓ | ✓ |
| Contain & Recover | N/A | Booms and skimmers to contain surface oil where there is a potential threat to | MDO spreads rapidly to less than 10 µm and suitable thicknesses for recovery are only present for the first 36 hours for a large offshore spill, and there is insufficient mobilisation time to capture residues. | X | X | Actionable surface thickness of 10g/$m^2$ is expected in the vicinity of the release location (<1 km) for both seasons and within a response exclusion zone in the event of a LOWC scenario. | X | X |

| Response Option | OPEP Section Reference | Description | Vessel Collision (MDO) | Viable Response? | Strategic Net Benefit? | LOWC (Minerva Condensate) | Viable Response? | Strategic Net Benefit? |
|---|---|---|---|---|---|---|---|---|
| | | environmental sensitivities. | In general, this method only recovers approximately 10-15% of total spill residue, creates significant levels of waste, requires significant manpower and suitable weather conditions (calm) to be deployed. | | | | | |
| Protect & Deflect | OPEP Section 8 | Booms and skimmers deployed to protect environmental sensitivities. | MDO spreads rapidly to less than 10 µm and suitable thicknesses for recovery are only present for the first 36 hours for a large offshore spill. There may be insufficient mobilisation time to capture residues prior to hydrocarbons washing ashore. In addition to this, corralling of surface hydrocarbons close to shore may not be effective for MDO depending on sea surface conditions. However, if operational monitoring indicates shorelines are potentially exposed to actionable levels of levels of hydrocarbons and accessible to response personnel and equipment, protection and deflection may be an effective technique for reducing shoreline loadings. | ✓ | ✓ | The maximum length of actionable shoreline oil is approximately 35 km with initial shoreline contact predicted to occur within 71 hours of the release with approximately 200 $m^3$ predicted to remain on shorelines.<br>If operational monitoring indicates shorelines are potentially exposed to actionable levels of hydrocarbons and accessible to response personnel and equipment, protection and deflection may be an effective technique for reducing shoreline loadings. | ✓ | ✓ |

| Response Option | OPEP Section Reference | Description | Vessel Collision (MDO) | Viable Response? | Strategic Net Benefit? | LOWC (Minerva Condensate) | Viable Response? | Strategic Net Benefit? |
|---|---|---|---|---|---|---|---|---|
| Shoreline Clean-up | OPEP Section 9 | Shoreline clean-up is a last response strategy due to the potential environmental impact. | As shoreline exposure is possible depending on the spill location, and as there are various shoreline techniques that are appropriate for this type of hydrocarbon, a shoreline clean-up may be an effective technique for reducing shoreline loadings where access to shorelines is possible. | ✓ | ✓ | The maximum length of actionable shoreline oil is approximately 35 km with initial shoreline contact predicted to occur within 71 hours of the release with approximately 200 $m^3$ predicted to remain on shorelines.<br>As shoreline exposure is possible depending on location, and as there are various shoreline techniques that are appropriate for this type of hydrocarbon, a shoreline clean-up may be an effective technique for reducing shoreline loadings where access to shorelines is possible. | ✓ | ✓ |
| Oiled wildlife Response (OWR) | OPEP Section 10 | Consists of capture, cleaning and rehabilitation of oiled wildlife. May include hazing or pre-spill captive management. | Given limited size and rapid spreading of the MDO spill, large scale wildlife response is not expected. However, there is the potential that individual birds could become oiled in the vicinity of the spill.<br>OWR is both a viable and prudent response option for this spill type. | ✓ | ✓ | For the moderate [actionable] threshold (10 $g/m^2$) the impacts were limited to the vicinity of the release location (<1 km) for both seasons. No impacts at the high threshold (25 $g/m^2$) were predicted. It is unlikely that wildlife would be oiled within the offshore environment, however given the maximum length of | ✓ | ✓ |

| Response Option | OPEP Section Reference | Description | Vessel Collision (MDO) | Viable Response? | Strategic Net Benefit? | LOWC (Minerva Condensate) | Viable Response? | Strategic Net Benefit? |
|---|---|---|---|---|---|---|---|---|
| | | In Victoria, this is managed by DELWP. | | | | actionable shoreline oil is approximately 35 km, it is possible that shoreline species could be oiled.<br>OWR is both a viable and prudent response option for this spill type. | | |

## 6.2 Spill Response: Source Control

Well-related source control activities may range from:

- ROV intervention utilising specialist ROV tooling; and/or
- Well capping; and/or
- Relief well installation.

The potential impacts and risks associated with performing these activities is covered under the aspects evaluated in this EP Summary(Sections 5.1 to 5.17), and thus are not considered further.

Source control arrangements for LOC from vessel failures includes:

- Closing water tight doors;
- Checking bulkheads;
- Determining whether vessel separation will increase spillage;
- Isolating penetrated tanks; and
- Tank lightering, etc.

## 6.3 Spill Response: Monitor and Evaluate

Ongoing monitoring and evaluation of the oil spill is a key strategy and critical for maintaining situational awareness and to complement and support the success of other response activities. In some situations, monitoring and evaluation may be the primary response strategy where the spill volume/risk reduction through dispersion and weathering processes is considered the most appropriate response. Monitor and evaluate will apply to all marine spills. Higher levels of surveillance such as vessel/aerial surveillance, oil spill trajectory modelling and deployment of satellite tracking drifter buoys will only be undertaken for Level 2/3 spills given the nature and scale of the spill risk.

It is the responsibility of the Control Agency to undertake operational monitoring during the spill event to inform the operational response.

## 6.4 Dispersant Application

A loss of well control is predicted to result in a surface gas plume at the sea surface, resulting in high levels of VOCs near the plume. Additional volumes of condensate transported to the surface are predicted to spread out from the flowing well and contribute to increased levels of VOCs within the air surrounding the flowing well. Condensate spill modelling for Annie-1 indicates surface levels of condensate would not occur at high levels (>25g/$m^2$). However, moderate concentrations of between 10-25 g/$m^2$ are predicted at surface and provide an indication of where higher LELs may be encountered. These moderate surface concentrations are limited to within a 1km radius of the flowing well (APASA, 2019).

Dispersant application is included as a safety-related control measure where VOCs from surface oil may exceed lower explosive limits (10% LEL) around well control activities (i.e. drilling a relief well, or deployment of capping stack under a lower flow scenario). Without this safety measure achieving the proximity needed to drill a relief well (nominally within 2km of the flowing well, with closer access needed to run anchors), or capping stack (vertical access) may not be possible.

The methods of dispersant application which might provide benefit for the purposes of LEL reduction are:

- Subsea dispersant application. Relevant to a lower-flow / capping scenario. Noting dispersant application subsea is unlikely to be safe (proximity to wellsite) or effective given the shallow water depth, high volumes of gas (and low liquids) that would lift dispersant to surface at a high rate within the gas plume.
- Surface (vessel-based) dispersant application to suppress VOCs near the vessel. Relevant to both high and lower flow scenarios where surface VOCs lead to LELs >10%.

For Annie-1 and Elanora-1 locations, dispersant application would be limited to the near vicinity of the well control response operations only, and outside of state waters and state or national marine parks.

## 6.5 Spill Response: Protect and Deflect

Based upon sensitivity mapping, the following protection priority areas were identified and would be subject to protection and deflection response operations in the event that hydrocarbon exposure from an oil spill is predicted via operational monitoring:

- Curdies Inlet
- Warrnambool Bay & Hopkins River Mouth
- Princetown Wetlands & Gellibrand River Mouth
- Lower Aire River Wetland & Aire River Mouth

## 6.6 Spill Response: Shoreline Assessment and Clean-up

Any shoreline operations will be undertaken in consultation with, and under the control of DJPR EMB, the Control Agency for Victoria and the appropriate land managers of the shoreline affected.

Shoreline clean-up consists of different manual and mechanical recovery techniques to remove oil and contaminated debris from the shoreline to reduce ongoing environmental contamination and impact. It may include the following techniques:

- Natural recovery – allowing the shoreline to self-clean (no intervention undertaken);
- Manual collection of oil and debris – the use of people power to collect oil from the shoreline;
- Mechanical collection – use of machinery to collect and remove stranded oil and contaminated material;
- Sorbents – use of sorbent padding to absorb oil;
- Vacuum recovery, flushing, washing – the use of high volumes of low-pressure water, pumping and/or vacuuming to remove floating oil accumulated at the shoreline;
- Sediment reworking – move sediment to the surf to allow oil to be removed from the sediment and move sand by heavy machinery;
- Vegetation cutting – removing oiled vegetation; and
- Cleaning agents – application of chemicals such as dispersants to remove oil.

Shorelines within the EMBA are predominantly sandy beaches with numerous estuaries present along the Victorian Coastline.

Based upon this behaviour, the following methods may have environmental benefit:

- Manual clean-up;
- Closure of estuaries resulting in additional stranding on sandy beach; and
- Mechanical collection – use of machinery to collect and remove stranded oil and contaminated material.

Stochastic spill modelling undertaken at the Annie-1 well location, included a single deterministic trajectory chosen as the worst-case scenario based on the following combined criterion;

- Greatest volume ashore; and
- Longest length of shoreline contacted by the condensate at, or above, the shoreline actionable threshold (≥ 100 g/m$^2$).

## 6.7 Spill Response: Oiled Wildlife Response

In the event of a Level 2 or 3 hydrocarbon spill, the impacts on wildlife are determined by the types of fauna present, the type of oil spilled and the extent of exposure. A review of the species likely to be present within the EMBA identifies marine birds, shorebirds and fur-seals could be affected.

Oiled wildlife response consists of a three-tiered approach involving:

- Primary: Situational understanding of the species/populations potentially affected (ground-truth species presence and distribution by foot, boat or aerial observations);

- Secondary: Deterrence or displacement strategies (e.g., hazing by auditory bird scarers, visual flags or balloons, barricade fences; or pre-emptive capture); and
- Tertiary: Recovery, field stabilisation, transport, veterinary examination, triage, stabilisation, cleaning, rehabilitation, release.

## 6.8 Risk Assessment of Oil Spill Response Strategies

This section provides a risk assessment of the oil spill response options, based on two credible spill scenarios:

1. LOC - Vessel collision resulting in a ruptured tank and spill of MDO (MDO spill)
2. LOC - Loss of well control (LOWC)

### 6.8.1 Source Control

Source control in response to a LOWC event may include drilling a relief well and deploying a capping stack. The potential impacts and risks associated with performing these activities is covered underother sections of the EP, and thus are not considered further.

### 6.8.2 Monitor and Evaluate

Table 6-2 provides a summary of the EIA / ERA for Spill Response: Monitor and Evaluate

**Table 6-2: Spill Response: Monitor and Evaluate EIA / ERA**

<table>
<tr><td>Cause of Aspect</td><td colspan="3">The following hazards associated with operational monitoring have the potential to interfere with marine fauna:<br>• Aircraft use for aerial surveillance (fixed wing or helicopter).</td></tr>
<tr><td>Summary of impact(s)</td><td colspan="3">The potential impacts of underwater sound emissions in the marine environment are:<br>• Localised and temporary fauna behavioural disturbance that significantly affects migration or social behaviours; and<br>• Auditory impairment, Permanent Threshold Shift (PTS).</td></tr>
<tr><td colspan="4">Consequence Evaluation</td></tr>
<tr><td>Receptor(s)</td><td colspan="3">Description of Potential Environmental Impact</td></tr>
<tr><td>Marinemammals<br>Marine reptiles<br>Fish<br>Commercial fisheries</td><td colspan="3">The potential impacts associated with aircraft activities have been evaluated in Section 5 of this EP summary. Based upon the nature and scale of the activities, the evaluation is considered appropriate for any aerial or marine surveillance undertaken and thus has not been considered further.</td></tr>
<tr><td>ALARP Decision Context</td><td colspan="3">A</td></tr>
<tr><td colspan="4">Summary of Control Measures</td></tr>
<tr><td colspan="4">Consultation in the event of a spill will ensure that relevant government agencies support the monitor and evaluate strategy thus minimising potential impacts and risks to sensitivities.</td></tr>
<tr><td>Likelihood</td><td>Unlikley (D)</td><td>Residual Risk</td><td>Low</td></tr>
</table>

## 6.9 Dispersant Application

Table 6-3 provides a summary of the EIA / ERA for Spill Response: Dispersant Application

**Table 6-3: Spill Response: Dispersant Aplication EIA / ERA**

| | |
|---|---|
| **Cause of Aspect** | The following hazards associated with dispersant application have the potential to impact marine environment:<br>• Dispersant application within the marine environment (discharge to the water column);<br>• Vessel and ROV operations;<br>• Subsea dispersant package deployment to the seabed |
| **Summary of impact(s)** | The potential impacts and risks associated with vessel and ROV presence, and with the deployment of subsea dispersant package components to the seabed within the operational area are considered to be no different to the impacts and risks already provided for within this EP Sumary. These hazards are not therefore evaluated further.<br>The potential impacts associated with dispersant application and discharge into the marine environment are:<br>• Potential chemical toxicity impacts to flora and fauna in the water column. These impacts are evaluated further below. |
| **Consequence Evaluation** | |
| **Receptor(s)** | **Description of Potential Environmental Impact** |
| Coral | Given the lack of hard coral reef formations, and the sporadic cover of soft corals in mixed reef communities, toxic impacts are considered to be limited to isolated corals.<br>Consequently, the potential impacts to corals are considered to be Minor (2), as they could be expected to result in localised short-term impacts to species/habitats of recognised conservation value, but not affecting local ecosystem functioning. |
| Plankton | Planktonic organisms could be impacted by dispersant via a number of pathways; studies of impacts to diatoms showed that cell membranes can be damaged, impacting survivability (Hook & Osbourne 2012).<br>Plankton are numerous and widespread; they contain a myriad of species at various life stages and is a key component of the marine food web. Plankton distribution and composition is not uniform and is in a constant state of flux – it is influenced by natural variations in the oceans such as salinity, temperature, nutrient availability and currents. Given the short-term nature of possible exposure to dispersant, and the natural variations to plankton assemblages, recovery of both biomass and diversity would be expected within the days and weeks following the response.<br>Consequently, the potential impacts to plankton are considered to be Minor (2), as they could be expected to cause short-term and localised impacts, but not affecting local ecosystem functioning. |

| | |
|---|---|
| Invertebrates | Acute or chronic exposure through contact and/or ingestion can result in toxic impact, effecting survivability. However, given the limited extent of dispersant application, and short-term nature of response activities (which might require dispersant application), impacts would be limited to low numbers, and are unlikely to appreciably affect overall recruitment rates across the region<br>Consequently, the potential impacts to plankton are considered to be Minor (2), as they could be expected to cause short-term and localised impacts, but not affecting local ecosystem functioning. |
| Fish, sharks<br>Sygnathids | Pelagic free-swimming fish, sharks are unlikely to suffer long-term damage from dispersant exposure given dispersant use would be targeted and limited to response operations around the well. Syngnathids are less likely to be exposed to toxic levels of dispersant given they occupy demersal habitats, where elevated levels of dispersant are more likely in the upper water column.<br>Elevated concentrations of dispersant in the near vicinity of the discharge could result in acute toxicity to marine biota such as juvenile fish, larvae, and planktonic organisms, although impacts are not expected cause population-level impacts.<br>There is the potential for localised and short-term impacts to fish communities; the consequences are ranked as Minor (2).<br>Impacts on eggs and larvae are not expected to be significant given the temporary period of water quality impairment, and the limited areal extent of dispersant application relative to the abundance and natural variability recruitment within a given region. Impact is assessed as temporary and localised and are considered Minor (2). |
| Marine mammals<br>Marine turtles | Impacts to marine mammals and turtles are not expected in relation to exposure to dispersant; the transient nature of marine mammals in the region limits their potential to be exposed to dispersant; dispersants such as Dasic Slickgone are also not expected to persist, or accumulate up the food chain (Irving & Lee, 2015) Dasic, 2017, Dasic 2018); in their review of dispersant impacts, Hook & Lee (2015) noted they did not review of the effects on marine mammals given dispersant use is accepted as providing a net benefit by reducing the probability of their exposure to surface oil slicks.<br>Any consequences (e.g. behavioural change) would be temporary and localised, which are ranked as Negligible (1). |
| Commercial Fisheries<br>Recreational Fishing | Any acute impacts are expected to be limited to small numbers of juvenile fish, larvae, and planktonic organisms, which are not expected to affect population viability or recruitment. Impacts from entrained exposure are unlikely to manifest at a fish population viability level. The consequence to commercial and recreational fisheries is assessed as temporary and localised, and ranked as Negligible (1). Refer also to: Fish and Sharks, and Invertebrates. |
| Recreation and Tourism | Any impact to receptors that provide nature-based tourism features (e.g. whales) may cause a subsequent negative impact to recreation and tourism activities. However, the relatively short duration, and distance from shore means there may be temporary and localised consequences, which are ranked as Negligible (1).<br>Refer also to: Fish and Sharks, Cetaceans, Invertebrates and Recreational Fishing. |
| **ALARP Decision Context** | **A** |

| Summary of Control Measures | | | |
|---|---|---|---|
| Consultation in the event of a spill will ensure that relevant government agencies support the monitor and evaluate strategy thus minimising potential impacts and risks to sensitivities. | | | |
| Under the OPGGS(E) Regulations, NOPSEMA require that the petroleum activity have an accepted Oil Pollution Emergency Plan (OPEP) in place before the activity commences. In the event of a LOWC, the OPEP will be implemented.<br>The Offshore Victoria OPEP was developed to support all Cooper Energy offshore Victorian activities. | | | |
| Cooper Energy's OSMP details the arrangements and capability in place for:<br>operational monitoring of a hydrocarbon spill to inform response activities<br>scientific monitoring of environmental impacts of the spill and response activities.<br>Operational monitoring will allow adequate information to be provided to aid decision making to ensure response activities are timely, safe, and appropriate. Scientific monitoring will identify if potential longer-term remediation activities may be required. | | | |
| **Likelihood** | **Unlikley (D)** | **Residual Risk** | **Low** |

## 6.10 Protect and Deflect

Table 6-4 provides a summary of the EIA / ERA for Spill Response: Protect and Deflect

**Table 6-4: Spill Response: Protect and Deflect EIA / ERA**

| **Cause of Aspect** | The following hazards associated with protection and deflection have the potential to interfere with marine and shoreline fauna:<br>• Personnel and equipment access to beaches; nearshore waters and wetlands. |
|---|---|
| **Summary of impact(s)** | The potential impacts of physical disturbance to the environment are:<br>• Damage to or loss of vegetation;<br>• Disturbance to fauna habitat and fauna from noise, air and light emissions from response activities; and<br>• Temporary exclusion of the public from amenity beaches.<br>Sandy beaches are the focus for the consequence evaluation as they are considered to provide an indication of the worst-case consequences from implementing shoreline response due to presence of potential sensitivities and the invasive nature of techniques (such as mechanical collection). |
| **Consequence Evaluation** | |
| **Receptor(s)** | **Description of Potential Environmental Impact** |
| Nearshore habitats<br>Shoreline habitats | The potential impacts associated with protection and deflection activities vary depending on the method used and the nearshore / shoreline habitat. Particular values and sensitivities in the area that may be affected by the spill include nearshore habitats (such as seagrass) and shoreline habitats (sandy beaches).<br>The consequence of these shoreline activities may potentially result in medium-term and localised damage to, or alteration of, habitats and ecological communities and as such have been ranked as moderate (3). |

| | | | |
|---|---|---|---|
| **ALARP Decision Context** | **A** | | |
| **Summary of Control Measures** | | | |
| Maintaining the capability described in OPEP is key for ensuring that the any response is implemented effectively and quickly. | | | |
| Identify priority protection sites in accordance with Appendix 5 and apply tactical response planning measures as identified within the OPEP. | | | |
| Consultation In the event of a spill will ensure that relevant government agencies support the tactical response arrangements thus minimising potential impacts and risks to sensitivities. | | | |
| Utilising existing tracks and paths where possible will ensure the disturbance footprint associated with the implementation of this response technique is reduced to ALARP. | | | |
| **Likelihood** | **Remote (E)** | **Residual Risk** | **Low** |

## 6.11 Shoreline Assessment and Clean-up

Table 6-5 provides a summary of the EIA / ERA for Spill Response: Shoreline Assessment and Clean-up.

**Table 6-5: Spill Response: Shoreline Assessment and Clean-up EIA / ERA**

| | |
|---|---|
| **Cause of Aspect** | The following hazards are associated with shoreline clean-up activities and may interfere with environmental sensitivities:<br>• Personnel and equipment access to beaches;<br>• Shoreline clean-up; and<br>• Waste collection and disposal. |
| **Summary of impact(s)** | The known and potential impacts of these activities are:<br>• Damage to or loss of vegetation;<br>• Disturbance to fauna habitat and fauna from noise, air and light emissions from response activities; and<br>• Temporary exclusion of the public from amenity beaches.<br>Sandy beaches are the focus for the consequence evaluation as they are considered to provide an indication of the worst-case consequences from implementing shoreline response due to presence of potential sensitivities and the invasive nature of techniques (such as mechanical collection). |
| **Consequence Evaluation** | |
| **Receptor(s)** | **Description of Potential Environmental Impact** |

| | |
|---|---|
| Seabirds<br>Pinnipeds<br>Shoreline habitats<br>Socio-economic | The noise and general disturbance created by shoreline clean-up activities could potentially disturb the feeding, breeding, nesting or resting activities of resident and migratory fauna species that may be present (such as seabirds, penguins and fur-seals). Any erosion caused by responder access to sandy beaches, or the removal of sand, may also bury nests. In isolated instances, this is unlikely to have impacts at the population level.<br>Based upon the low viscosity, MDO is likely to infiltrate porous shorelines (such as sandy beaches) relatively. Consequently, clean-up efforts expected to result in more of a disturbance to the coastline as mechanical recovery could be required (resulting in excavation of shorelines).<br>If not done correctly, any excavation along the coast could increase beach erosion and limit longer term recovery. The very presence of stranded oil and clean-up operations will necessitate temporary beach closures (likely to be weeks but depends on the degree of oiling and nature of the shoreline). This means recreational activities (such as swimming, walking, fishing, boating) in affected areas will be excluded until access is again granted by local authorities. Given the prevalence of rocky shorelines in the EMBA, this is unlikely to represent a significant social or tourism drawback.<br>Consequently, the potential impacts and risks from these activities are considered to be Moderate (3). |
| **ALARP Decision Context** | **A** |
| **Summary of Control Measures** | |
| Maintaining the capability described in Table 9-2 of the OPEP is key for ensuring that the any response is implemented effectively and quickly. | |
| Consultation In the event of a spill will ensure that relevant government agencies support the shoreline assessment and clean up strategy thus minimising potential impacts and risks to sensitivities. | |
| Utilising existing tracks and paths where possible will ensure the disturbance footprint associated with the implementation of this response technique is reduced to ALARP. | |

| | | | |
|---|---|---|---|
| **Likelihood** | **Remote (E)** | **Residual Risk** | **Low** |

## 6.12 Oiled Wildlife Response

Table 6-6 provides a summary of the EIA / ERA for Spill Response: Oiled Wildlife Response

**Table 6-6: Spill Response: Oiled Wildlife Response EIA / ERA**

| | |
|---|---|
| **Cause of Aspect** | The hazards associated with OWR are:<br>• Hazing of target fauna may deter non-target species from their normal activities (resting, feeding, breeding, etc.);<br>• Distress, injury or death of target fauna from inappropriate handling and treatment; and<br>• Euthanasia of target individual animals that cannot be treated or have no chance of rehabilitation. |
| **Summary of impact(s)** | The potential impacts of this activity are disturbance, injury or death of fauna. |

| Consequence Evaluation | | | |
|---|---|---|---|
| **Receptor(s)** | **Description of Potential Environmental Impact** | | |
| Marine fauna | Untrained resources capturing and handling native fauna may cause distress, injury and death of the fauna. To prevent these impacts, only appropriately trained oiled wildlife responders will approach and handle fauna. This will eliminate any handling impacts to fauna from untrained personnel and reduce the potential for distress, injury or death of a species.<br>It is preferable to have oil-affected animals that have no prospect of surviving or being successfully rehabilitated and released to the environment humanely euthanized than to allow prolonged suffering. The removal of these individuals from the environment has additional benefits in so far as they are not consumed by predators/scavengers, avoiding secondary contamination of the food-web.<br>Hazing and exclusion of wildlife from known congregation, resting, feeding, breeding or nesting areas may have a short- or long-term impact on the survival of that group if cannot access preferred resources. These effects may be experienced by target and non-target species. For example, shoreline booming or ditches dug to contain oil may prevent penguins from reaching their burrows after they've excited the water and low helicopter passes flown regularly over a beach to deter coastal birds from feeding in an oil-affected area may also deter penguins from leaving their burrows to feed at sea, which may impact on their health.<br>Due to the potential for localised short-term impacts to species/habitats of recognised conservation value but not affecting local ecosystem functioning, the potential impacts form this activity have been identified as Minor (2). | | |
| **ALARP Decision Context** | **A** | | |
| **Summary of Control Measures** | | | |
| Maintaining the Oiled Wildlife Response capability as described in the OPEP is key for ensuring that the any response is implemented effectively and quickly. | | | |
| Consultation In the event of a spill will ensure that relevant government agencies support the OWR strategy thus minimising potential impacts and risks to sensitivities. | | | |
| Utilising existing tracks and paths where possible will ensure the disturbance footprint associated with the implementation of this response technique is reduced to ALARP. | | | |
| **Likelihood** | **Remote (E)** | **Residual Risk** | **Low** |

# 7 Implementation Strategy

Regulation 14 of the OPGGS(E) Regulations requires that an implementation strategy must be included in an EP. The implementation strategy described in this section provides a summary of the Cooper Energy Health Safety Environment and Community Management System (HSEC MS).

## 7.1 Cooper Energy Management System

The HSEC MS is Cooper Energy's corporate system which provides the framework for the delivery of Cooper Energy's values, policies, standards and practices related to health, safety, environment and community. The HSEC MS applies to all:

- Workplaces, sites and activities operated by Cooper Energy and under Cooper Energy's management or control;
- Exploration, construction and development activities under Cooper Energy management or control; and
- Cooper Energy employees, contractors and visitors on Cooper Energy sites, in offices and on activities such as offshore inspections, construction and development projects.

All personnel are expected to be familiar with, and comply with, the requirements of the HSEC MS.

### 7.1.1 Contractor Management System

The Contractor and Supplier Management Standard details Cooper Energy's contractor management system which provides a systematic approach for the selection and management of contractors to ensure any third party has the appropriate safety and environment management system and structures in place to achieve HSEC performance in accordance with Cooper Energy's expectations.

The Standard applies to sub-contractors, Third Party Contractors (TPCs) and suppliers conducting work at Cooper Energy sites or providing services to Cooper Energy.

The Standard addresses operational HSEC performance of all contractors while working under a Cooper Energy contract or in an area of Cooper Energy responsibility or which may be covered under the HSEC Management System. The key HSEC steps in the Cooper Energy contractor management system include:

- Planning - HSEC assessment of potential contractors, suppliers and/or TPCs.
- Selection - Submission and review of contractors and/or TPCs HSEC management data.
- Implementation - Onsite contractors and/or TPCs HSEC requirements including induction and training requirements.
- Monitoring, review and closeout - Ongoing review of contractors and/or TPCs HSEC performance including evaluation at work handover.

## 7.2 Emergency Response

Cooper Energy will manage emergencies from the Otway Basin exploration drilling activities in accordance with the Cooper Incident Management Plan (IMP). The purpose of the IMP is to provide the Cooper Energy Incident Management Team (IMT) with the necessary information to respond to an emergency affecting operations or business interruptions. Specifically, this plan:

- Describes the Emergency Management Process;
- Details the response process; and

- Lists the roles and responsibilities for the IMT members.

### 7.2.1 Emergency (Oil Spill) Response Arrangements

The Cooper Energy Offshore Victoria Oil Pollution Emergency Plan (the OPEP) (VIC-EPER-EMP-0001) and Offshore Victoria Operational and Scientific Monitoring Plan (the OSMP) (VIC-ER-EMP-0002) provide for oil spill response and monitoring arrangements for Cooper Energy's Offshore Victorian assets and provide for the activities covered under the EP. Details on the response capabilities of Cooper Energy during the Otway Basin Exploration Drilling program are outlined in Table 7-1.

**Table 7-1 Preparation Controls for Response Capabilities**

| Response Strategy | Preparedness Environmental Performance Standards |
|---|---|
| Source Control | Cooper Energy maintains the following agreements (or contractor pre-qualifications) to maintain source control capabilities:<br>• Well Control Specialist (including capping stack capability)<br>• ROV Contractors.<br>• Subsea Engineering Company.<br>• Well Engineering Contractor.<br>• Cooper Energy Relief Well Readiness Form (verified every 2 months whilst drilling and every 6 months for operations), including Capping Stack Resources. |
| | Cooper Energy conducts annual source control desktop exercise. |
| Monitor and evaluate | Cooper Energy maintains the following agreements (or contractor pre-qualifications) to maintain operational response capabilities:<br>• AMOSC membership (Aerial Observers, RPS-APASA Contract).<br>• AMSA MoU.<br>• Aviation support (pre-qualification assessment.)<br>• Marine support services. |
| | An oil spill tracking buoy and instructions for deployment will be located offshore at all times during drilling and IMR campaigns. |
| Dispersant Application | Cooper Energy maintains the following agreements (or contractor pre-qualifications) to maintain source control capabilities:<br>• Well Control Specialist (including capping stack capability).<br>• ROV Contractors.<br>• Subsea Engineering Company.<br>• Well Engineering Contractor.<br>• Cooper Energy Relief Well Readiness Form (verified every 2 months whilst drilling and every 6 months for operations), including Capping Stack Resources. |
| Protect and Deflect | Cooper Energy maintains the following agreements to maintain shoreline assessment/protect and deflect capabilities:<br>• AMOSC membership (equipment, personnel, CORE Group. Mutual aid).<br>• AMSA MoU (equipment, personnel).<br>• Scientific resource support agreement (GHD or equivalent).<br>• Waste management contract. |

| Response Strategy | Preparedness Environmental Performance Standards |
|---|---|
| Shoreline Clean-up | Cooper Energy maintains the following agreements to maintain shoreline assessment/clean-up response capabilities:<br>• AMOSC membership (equipment, personnel, CORE Group. Mutual aid).<br>• AMSA MoU (equipment, personnel).<br>• Scientific resource support agreement (GHD or equivalent).<br>• Waste management contract. |
| Oiled Wildlife Response | Cooper Energy maintains the following agreements to maintain OWR response capabilities:<br>• AMOSC membership (equipment, personnel).<br>• Waste management contract.<br>• Vessel of Opportunity listing |

Vessels will also operate under the vessel's Shipboard Marine Pollution Emergency Plan (SMPEP) (or equivalent appropriate to class) or spill clean-up procedures to ensure timely response and effective management of any vessel-sourced oil spills to the marine environment.

### 7.2.2 Oil Spill Response Competency & Training

Personnel will have the appropriate competencies and training to undertake their roles and responsibilities in emergency situations.

Oil spill response training and competency records are maintained internally in accordance with Documented Information Standard Instruction (COE-MS-STI-0008).

### 7.2.3 Testing Arrangements

In accordance with Regulation 14 (8A) & (8C) of the OPGGS(E) Regulations and HSEC MS Standard 16: Crisis and Emergency Preparedness and Response, the response arrangements will be tested:

- When they are introduced;
- When they are significantly amended;
- Not later than 12 months after the most recent test;
- If a new location for the activity is added to the EP after the response arrangements have been tested, and before the next test is conducted – testing the response arrangement in relation to the new location as soon as practicable after it is added to the plan; and
- If a facility becomes operational after the response arrangements have been tested and before the next test is conducted – testing the response arrangements in relation to the facility when it becomes operational.

### 7.2.4 Effectivenes Monitoring

During the incident response, the effectiveness of the response will be assessed using the NEBA process. This assessment must utilise predictive modelling results, received monitoring data in the context of the affected environment, the environmental conditions and the level of hydrocarbons released.

Initially this will be undertaken every 24 hours (as minimum) or when relevant new information is received, until the termination criteria have been met. The NEBA, in consultation with the DJPR EMB will be used to inform the decision to terminate the response.

## 7.3 Chemical Assessment and Selection

Cooper Energy's Offshore Environmental Chemical Assessment Procedure (COE-MS-RCP-0004) requires that chemicals that will be or have the potential to be discharged to the environment are assessed and approved prior to use. This process is used to ensure the lowest toxicity, most biodegradable and least accumulative chemicals are selected which meet the technical requirements.

## 7.4 Invasive Marine Species Risk Assessment

Cooper Energy's IMS Risk Assessment (VIC-EN-REG-0002) was developed to complement Australian IMS prevention efforts in the context of Cooper Energy's own operations offshore in the Bass Strait. The assessment is undertaken prior to the mobilisation of a vessel (inclusive of MODUs) or submersible equipment (e.g. ROVs) to a Cooper Energy Operational Area (as defined under the EP for the activity). The IMS Risk Assessment incorporates key considerations from other established risk assessment processes (e.g. WA Vessel Check, DoA 2009 and PPA 2017).

## 7.5 Management of Change

The Management of Change (MoC) Procedure (COE-MS-PCD-003) and MoC Standard Instruction (COE-MS-STI-0013) describes the requirements for dealing with managing change.

The objective of the MoC process is to ensure that changes do not increase the risk of harm to people, assets or the environment. This includes:

- Deviation from established corporate processes;
- Changes to offshore operations;
- Deviation from specified safe working practice or work instructions/procedures;
- Implementation of new systems; and
- Significant change of HSEC-critical personnel.

Environmentally relevant changes include:

- New activities, assets, equipment, processes or procedures proposed to be undertaken or implemented that have the potential to impact on the environment and have not been:
- Assessed for environmental impact previously, in accordance with the relevant standard; and
- Authorised in the existing management plans, procedures, work instructions or maintenance plans.
- Proposed changes to activities, assets, equipment, processes or procedures that have the potential to impact on the environment or interface with the environmental receptor;
- Changes to the existing environment including (but not limited to) fisheries, tourism and other commercial and recreational uses, and any changes to protective matter requirements;
- Changes to the requirements of an existing external approval (e.g. changes to conditions of environmental licences);
- New information or changes in information from research, stakeholders, legal and other requirements, and any other sources used to inform the EP;
- Changes or updates identified from incident investigations, emergency response activities or emergency response exercises.

For any MoC with identified environmental impacts or risks, an impact/risk assessment will be undertaken to ensure that impacts and risks from the change can be managed to meet the nominated EPOs set out in the accepted EP as well as be ALARP and of an acceptable level.

### 7.5.1 Revisions of the EP

If the proposed change introduces a significant new environmental impact or risk, results in a significant increase to an existing risk, or through a cumulative effect of a series of changes there is a significant increase in environmental impact or risk, the EP will be revised for re-submission to NOPSEMA.

Where a change results in the EP being updated, the change/s are to be logged in the EP Change Register.

In addition, the titleholder is obligated to ensure that all specific activities, tasks or actions required to complete the activity are provided for in the EP. Regulation 17(5) of the OPGGS(E) Regulations require that where there is a significant modification or new stage of the activity (that is, change to the spatial or temporal extent of the activity) a proposed revision of the EP will be submitted to NOPSEMA.

## 7.6 Incident Reporting

As per Cooper Energy's Incident Management Standard Instruction (COE-MS-STI-0020), Cooper Energy has a systematic method of incident reporting and investigation and a process for monitoring close out of preventative actions.

The incident reporting and investigation procedure defines the:

- Method to record, report, investigate and analyse accidents and incidents;
- Legal reporting requirements to the regulators within mandatory reporting timeframes;
- Process for escalating reports to Cooper Energy senior management and the Cooper Energy Board;
- Methodology for determining root cause;
- Responsible persons to undertake investigation; and
- Classification and analysis of incident.

## 7.7 Environmental Performance Monitoring and Reporting

### 7.7.1 Emissions and Discharges

Emissions and discharge monitoring and records required for MODU operations and vessel-based activities are detailed in Table 7-2.

Copies of emission and discharge records will be retained in accordance with the Documented Information Standard Instruction (COE-MS-STI-0008).

**Table 7-2: Discharge and Emissions Monitoring**

| Aspect | Monitoring | Requirement | Reporting Frequency |
|---|---|---|---|
| BOP Fluid Discharges | Chemical Name<br>Volume | All discharges | Weekly report |
| Drill Fluids Discharge | Chemical Name<br>Chemical quantity<br>Fluid type<br>Fluid volume | All discharges | Report weekly or by well section |

| Aspect | Monitoring | Requirement | Reporting Frequency |
|---|---|---|---|
| Cement Discharges | Chemical Name<br>Chemical Quantity<br>Volume of cement | All discharges | Report weekly or by cement job |
| Treated Bilge | Volume | All discharges | Weekly |
| Sewage | Volume | All discharges | Weekly |
| Food Waste | Volume | All discharges | Weekly |
| Accidental Releases | All material fact and circumstances concerning the incident;<br>Any action taken to avoid or mitigate the adverse environmental impact of the incident; and<br>The corrective action that has been taken or is proposed to be taken to stop control or remedy the reportable incident. | All releases | Weekly |
| Fuel Use | Volume | Daily | Daily report |
| Waste | Volume sent ashore | All waste loadouts | Weekly |

### 7.7.2 Reporting

As required by Regulation 26C OPGGS(E) Regulations Cooper Energy will submit an annual EP performance report to the regulator (NOPSEMA). This reports compliance against each of the EPOs and EPSs of the EP and provides the results of monitoring as outlined in Table 7-2.

Cetacean observation data will be submitted to the DoEE via the Australian Marine Mammal Centre Data Portal.

### 7.7.3 Audit and Inspection

Environmental performance of offshore activities will be audited and reviewed in several ways in accordance with Standard 18: Audit and Assessment. These reviews are undertaken to ensure that:

- Environmental performance standards to achieve the EPOs are being implemented, reviewed and where necessary amended;
- Potential non-compliances and opportunities for continuous improvement are identified; and
- Environmental monitoring requirements are being met.

The following arrangements review the environmental performance of the activity:

- A premobilisation inspection will be undertaken for offshore vessels and MODU to ensure it will meet the requirements of the EP.
- HSEC inspections will be conducted offshore (vessels and MODU) on a weekly basis throughout the drilling activity to ensure ongoing compliance with the EP requirements.
- Spill readiness (i.e. provision of drills and spill kits in accordance with facility SOPEP/SMPEP);

- Waste management is in accordance with EP EPOs and EPSs;
- Chemical Inventory checks to ensure campaign chemicals are accepted via the COE chemical assessment process;
- Maintenance checks for equipment identified within an EP EPS (e.g. OWS)

### 7.7.4 EP Compliance

Cooper Energy shall track compliance with the controls contained in the EP and assess the effectiveness of the implementation strategy.

Opportunities for improvement or non-compliances noted will be communicated to relevant personnel at the time of the inspection/audit to ensure adequate time to implement corrective actions. The findings and recommendations of inspections or audits will be documented and distributed to relevant personnel for comment, and any actions tracked until completion.

Results from the environmental compliance tracking will be summarised in the annual EP performance report submitted to NOPSEMA.

### 7.7.5 Management of Non-conformance

In response to any non-conformance, corrective actions will be implemented and tracked to completion as per the Incident Management, Non-Conformity and Corrective Action Standard Instruction (COE-MS-STI-0020).

Corrective actions will specify the remedial action required to fix the breach and prevent its reoccurrence and is delegated to the person deemed most appropriate to fulfil the action. The action is closed out only when verified by the appropriate Manager and signed off. This process is maintained through the Cooper Energy corrective action tracking system.

Where more immediacy is required, non-compliances will be communicated to relevant personnel and responded to as soon as possible. The results of these actions will be communicated to the offshore crew during daily toolbox meetings or at daily or weekly HSEC meetings.

Cooper Energy will carry forward any non-conformance items for consideration in future operations to assist with continuous improvement in environmental management controls and performance outcomes.

## 7.8 Records Management

In accordance with the Regulation 27 of the OPGGS(E) Regulations (Cwlth) and Regulation 32 of the OPGGS Regulations (Vic), Cooper Energy will store and maintain documents or records relevant to the EP in accordance with the Documented Information Standard Instruction (COE-MS-STI-0008).

# 8 Stakeholder Consultation

Determining the relevant stakeholders for the proposed Otway Basin exploration drilling activities involved the following:

- Reviewing the social receptors identified in the existing environment section;
- Reviewing existing stakeholders identified as relevant and contained within the Cooper Energy stakeholder register (Otway Basin);
- Reviewing previous drilling campaign consultation records;
- Conversing with existing stakeholders to identify potential new stakeholders or changes to stakeholder contacts or consultation preferences;
- Reviewing Commonwealth and State fisheries jurisdictions and fishing effort in the region;
- Reviewing the Australian Government Guidance Offshore Petroleum and Greenhouse Gas Activities: Consultation with Australian Government agencies with responsibilities in the Commonwealth Marine Area; and
- Screening nearby exploration permits and production licences for active Titleholders through the National Offshore Petroleum Titles Administrator (NOPTA) website and further web research.

**Table 8-1: Stakeholders for the Otway Basin Exploration Drilling Activity**

| Stakeholder | Reasoning | Stakeholder Category* |
|---|---|---|
| **Department or agency of the Commonwealth to which the activities to be carried out under the EP may be relevant** | | |
| Australian Fisheries Management Authority (AFMA) | Activity is within a Commonwealth fishery area or will impact or potentially impact a Commonwealth fishery area or resource. Via previous consultation has recommended that engagement with CFA as the peak fishing industry body for commonwealth and that ABARES reports should be reviewed for fishery status. CFA is included in this table as a relevant stakeholder and the latest 2018 ABARES report was used to determine which Commonwealth fisheries have fishing effort within the activity area. | 1 |
| Australian Hydrographic Office (AHO) | Via previous consultation have request to provide information at least three weeks prior to commencement of any oil and gas activity to allow for publication of notices to mariners. | 2 |
| Australian Maritime Safety Authority (AMSA) | Via previous consultation have provided shipping activities within the area of the activity. Requested AMSA-JRCC contacted 24-48 hours before activity commences to promulgate AUSCOAST warning and AHS contacted 4 weeks prior to activities for notice to mariners. | 2 |
| Director of National Parks<br>Department of Environment and Energy (DoEE) | One Commonwealth Marine Reserve (Apollo Commonwealth Marine Reserve) intersects with the EMBA. | 1 |

| Stakeholder | Reasoning | Stakeholder Category* |
|---|---|---|
| **Each Department or agency of a State or the Northern Territory to which the activities to be carried out under the EP may be relevant** | | |
| DJPR – Victorian Fishery Authority | Activity is within a Victorian fishery area or will impact or potentially impact a Victorian fishery area or resource. | 1 |
| DJPR – Emergency Management Branch (EMB) | Responsible for Marine Pollution Response arrangements in Victoria. Previously consulted on VIC OPEP in 2017 and consulted again in 2019. | 1 |
| DJPR – Biosecurity and Agriculture Services | Responsible for Biosecurity / marine biosecurity notifications across State Jurisdictions. | 1 |
| DELWP - Marine National Parks and Marine Parks | State Marine Protected Areas (including the 12 Apostles Marine National Park) intersect with the EMBA. | 1 |
| DELWP – Wildlife Emergencies and Biodiversity Regulation | State agency involved in response to wildlife emergencies including oiled wildlife. | 1 |
| Transport Safety Victoria (Maritime Safety) | Manages safety of waterways in Victoria and prepare State Waters Notice to Mariners. Given the campaign activities are beyond the State water limit, campaign information has been provided for interest. | 1 |
| **The Department of the responsible State Minister, or the responsible Northern Territory Minister** | | |
| DJPR – Earth Resources Regulation (ERR) | Regulate petroleum activities in Victorian State waters. Frequently engaged and provided with Regular updates on Cooper Energy offshore activities. | 1 |
| **A person or organisation whose functions, interests or activities may be affected by the activities to be carried out under the EP** | | |
| ***Fisheries:*** | | |
| Abalone Victoria (Central Zone) [SIV] | Activity is within the Victorian Western / Central Abalone Zone. Based on water depths and habitat it is unlikely that abalone fishing occurs in the Operational Area. Stakeholder has been sent information regarding Cooper Energy offshore activities through 2017 and 2018. Only response has been to provide their generic email address. | 1 |
| Apollo Bay Fisherman's Cooperative [SIV] | Activity overlaps with State fisheries who maybe members of the association. Stakeholder has been sent information regarding Cooper Energy offshore activities through 2017 and 2018 with no response. | 1 |
| Australian Southern Bluefin Tuna Industry Association (Port Lincoln) | Activity is within the fishery management area but there is no fishing effort. Stakeholder requested to receive updates on Cooper Energy's activities during prior consultation. Provided information on Cooper Energy offshore activities through 2017 and 2018 without further response. | 3 |
| Commonwealth Fisheries Association | Peak body representing commonwealth commercial fisheries. Activity overlaps with Commonwealth fisheries. AFMA recommended that engagement with CFA be undertaken as the peak fishing industry body for | 1 |

| Stakeholder | Reasoning | Stakeholder Category* |
|---|---|---|
| | Commonwealth fisheries. Stakeholder has been sent information regarding Cooper Energy offshore activities through 2017 and 2018 with no response. | |
| Eastern Victoria Sea Urchin Divers Association SIV | Activity is within the Victorian western and central zones of the Sea Urchin Fishery. Based on water depths and habitat it is unlikely that sea urchin fishing occurs in the Operational Area. Stakeholder has been sent information regarding Cooper Energy offshore activities through 2017 and 2018 with no response. | 1 |
| Eastern Zone Abalone Industry Association SIV | Activity is within the Victorian Western and central Abalone Zones. Based on water depths and habitat it is unlikely that abalone fishing occurs in the Operational Area. Stakeholder has been sent information regarding Cooper Energy offshore activities through 2017 and 2018 with no response. | 1 |
| Lakes Entrance Fishermen's Society Co-operative Limited (LEFCOL) SIV | Activity overlaps with State fisheries who maybe members of the co-operative. Stakeholder has been sent information regarding Cooper Energy offshore activities through 2017 and 2018. LEFCOL and Cooper Energy have consulted Cooper Energy has previously meet with. Area of concern related to physical presence and restricting access to fishing areas. | 1 |
| Port Campbell Professional Fisherman's Association SIV | Activity overlaps with State fisheries who maybe members of the association. Stakeholder has been sent information regarding Cooper Energy offshore activities through 2017 and 2018. Confirmed would like to be kept informed and that all oil and that they were represented by Seafood Industry Victoria. | 1 |
| Port Franklin Fishermen's Association SIV | Activity overlaps with State fisheries who maybe members of the association. Stakeholder has been sent information regarding Cooper Energy offshore activities through 2017 and 2018 with no response. | 1 |
| Portland Professional Fishermans Association SIV | Activity overlaps with State fisheries who maybe members of the association. Stakeholder has been sent information regarding Cooper Energy offshore activities through 2017 and 2018 with no response. | 1 |
| San Remo Fishing Cooperative | Activity overlaps with State fisheries who maybe members of the cooperative. Stakeholder has been sent information regarding Cooper Energy offshore activities through 2017 and 2018 with no response. | 1 |
| Seafood Industry Victoria (SIV) | Activity overlaps with a number of State fisheries. SIV represents all State fisheries licence holders. Cooper Energy has previously met with SIV to discuss Cooper Energy's activities and ongoing engagement. | 1 |
| South-east Fishing Trawl Industry Association (SETFIA) | Activity overlaps with fisheries which SETFIA represent; these include the Southern and Eastern Scalefish and Shark Fishery, and Small Pelagic Fishery. SETFIA also represent Eastern Rock Lobster Fishery. Cooper Energy has ongoing engagement with SETFIA who provide a notification to fishers when activities being undertaken. | 1, 2 |
| Southern Rock Lobster Ltd | Responsible for the management and co-ordination of research, development and extension in the Southern Rock Lobster Fishery which overlies the activity. Based on habitat | 1 |

| Stakeholder | Reasoning | Stakeholder Category* |
|---|---|---|
| | it is unlikely that rock lobster fishing occurs in the Operational Area. Stakeholder has been sent information regarding Cooper Energy offshore activities through 2017 and 2018 with no response. | |
| Southern Shark Industry Alliance SETFIA | Activity is within the southern and eastern Scalefish and Shark Fishery management area. Stakeholder has been sent information regarding Cooper Energy offshore activities through 2017 and 2018 with engagement is via SETFIA. No objections or claims have been received from this fishery. | 1 |
| Sustainable Shark Fishing Inc. (SSF) | Activity is within the southern and eastern Scalefish and Shark Fishery management area where fishing could occur. Stakeholder has been sent information regarding Cooper Energy offshore activities through 2017 and 2018 with no response. | 1 |
| Southern Squid Jig Fishery (SSJF) | Activity is within an area where there may be low levels of squid fishing, depending on the transient nature of catch/fishery, although there are no specific fishing grounds. COE engaged SSJF representative in January 2019 who appreciated the opportunity to consult but indicated it was unlikely skippers would be interested (in planned 2019 activities). | 1 |
| Victorian Recreational Fishers Association (VRFish) | Activity is within an area where they maybe low levels of recreational fishing noting there are no significant features identified in the activity areas. Stakeholder has been sent information regarding Cooper Energy offshore activities through 2017 and 2018 with no response. | 1 |
| Victorian Rock Lobster Association (VRLA) SIV | Activity is within the western zone of the Rock Lobster Fishery. Based on habitat it is unlikely that rock lobster fishing occurs in the Operational Area. Stakeholder has been sent information regarding Cooper Energy offshore activities through 2017 and 2018. Requested that consultation be undertaken via SIV. | 1 |
| Victorian Scallop Fisherman's Association | Activity is within the Bass Strait Scallop Fishery. Via previous consultation are mainly concerned regarding seismic surveys. Stakeholder has been sent information regarding Cooper Energy offshore activities through 2017 and 2018 with no response. | 1 |
| Warnambool Professional Fishermans Association | Activity overlaps with State fisheries who maybe members of the association. Stakeholder has been sent information regarding Cooper Energy offshore activities through 2017 and 2018 with no response. | 1 |
| Western Abalone Divers Association | Activity is within the Victorian Western / Central Abalone Zone. Based on water depths and habitat it is unlikely that abalone fishing occurs in the Operational Area. Stakeholder has been sent information regarding Cooper Energy offshore activities through 2017 and 2018 with response to confirm point of contact. | 1 |
| **Any other person or organisation that the Titleholder considers relevant** | | |
| Abalone Council Australia | Activity is within the Victorian Western / Central Abalone Zone. Based on water depths and habitat it is unlikely that abalone fishing occurs in the Operational Area. Stakeholder | 1 |

| Stakeholder | Reasoning | Stakeholder Category* |
|---|---|---|
| | has been sent information regarding Cooper Energy offshore activities through 2017 and 2018 with no response. | |
| Australian Oceanographic Services Pty Ltd | Interested in work being undertaken in the area. Stakeholder has requested information on Cooper Energy's activities. Stakeholder has been sent information regarding Cooper Energy offshore activities through 2017 and 2018 and has had some queries but no objections or claims raised. | 3 |
| Port Campbell Tourism and Information Centre | Possibility of interest from visitors in relation to rig presence offshore Port Campbell. The Tourism and Information Centre has been provided updates on Cooper Energy activities through 2017 and 2018 with no response. | 1 |
| San Remo Fishing Cooperative SIV | Activity not expected to overlap with area of fishing. San Remo Fishing Co-op is based in between Cooper Energy titles in Otway and Gippsland and may be interested in activities. Stakeholder has been sent information regarding Cooper Energy offshore activities through 2017 and 2018 with no response. | 3 |
| Scuba Divers Federation of Victoria (SDFV) | Represent diving clubs in Victoria. Though unlikely diving occurs in the area of the activity stakeholder receives updates on Cooper Energy's activities. Stakeholder has been sent information regarding Cooper Energy offshore activities through 2017 and 2018 with no response. | 3 |

## 8.1 Provision of Sufficient Information

### 8.1.1 Cooper Energy Campaign Fact Sheet

Commencing in 2017, Cooper Energy has provided regular campaign fact sheets to relevant stakeholders. These fact sheets described Cooper Energy activity plans and progress in the Otway and Gippsland Basins including well construction activities planned for 2018 and development installation activities (Sole Project) planned for 2018/19.

The fact sheets provide information on the location, timing and nature of the proposed activities, potential risks and impacts and controls; stakeholders are also invited to contact Cooper Energy via either the phone number or email address provided (both are monitored daily) if stakeholders wish to seek further information or have an objection.

Recently (November 2018) a fact sheet was provided to relevant stakeholders describing Cooper Energy's plans in the Otway and Gippsland Basins for 2019, including exploration drilling nearby the CHN facilities (subject of this EP). A copy of the fact sheet is provided in.

## 8.2 Assessment of Claims and Feedback

Cooper Energy shall assess the merits of any new claims or objections made by a relevant stakeholder whereby they believe the activity may have adverse impacts upon their interest or activities. Cooper Energy shall finalise the assessment of merit of any claim or objection within 2 weeks of receipt of all pertinent information and undertake any resulting actions as soon as practicable.

If the claim has merit, where appropriate, Cooper Energy shall modify management of the activity. The assessment of merit and any resulting actions shall be shared with the stakeholder.

## 8.3 Ongoing Stakeholder Consultation

### 8.3.1 Ongoing Consultation and Notifications

From the stakeholder consultation undertaken and documented in Table 8-1 the notifications and ongoing consultation required is detailed in Table 8-2.

Cooper Energy updates local fishers' plotters or initiates other 'awareness' activities based upon the results of a regular SETFIA Fisheries ALARP Assessment, a methodology developed in conjunction with SETFIA, which establishes through an assessment of risk factors, any increases in commercial fishing risk. Mitigation strategies are developed in conjunction with SETFIA which includes the identifying new vessel masters, new fishing vessels, increases in fishing activities or fishery closures. Cooper maintains a register of fishing vessel and the currency of vessel 'plotter information' which is regularly maintained.

During offshore activities, the Otway fishing fleet are provided with SMS information via SETFIA to ensure they are aware of activities.

### 8.3.2 Ongoing Identification of Relevant Persons

Cooper Energy will continue to identify new or changes to relevant person(s) through ongoing consultation with established stakeholders including peak industry bodies.

Should new relevant person(s) be identified these stakeholders will be contacted, provided information about the activity and given the opportunity to comment.

New relevant persons may be identified during the course of ongoing consultation with existing relevant persons, or if new relevant person(s) make themselves known to Cooper Energy and express an interest in the activity.

Cooper Energy will review relevant stakeholders should new or increased environmental risks be identified, or if a new activity, or new stage of the existing activity be proposed.-. New stakeholders will be provided information as to the new or increased environmental risk of change to the activity.

**Table 8-2: Ongoing Stakeholder Requirements**

| Ongoing Stakeholder Requirement | Timing | Stakeholder |
|---|---|---|
| Consultation feedback channels to be maintained (Phone line and stakeholder email inbox) | Ongoing during and after activity | All relevant stakeholders |
| Victorian State government OPEP Review (See OPEP for review triggers)[1] | Prior to activity commencing, where new assets are introduced, or identification of a new spill scenario outside of the existing risk profile of the OPEP. | Victorian DJPR |
| Regulatory notification of start of activity. | 10 days prior to activity commencing. | NOPSEMA |
| Notification of start of activity for publication of AUSCOAST warning and notice to mariners. | 4 weeks prior to activity commencing. | AHS |
| | 24-48 hours prior to activity commencing. | AMSA-JRCC |

| Ongoing Stakeholder Requirement | Timing | Stakeholder |
|---|---|---|
| Notification to stakeholders of on-water activity. Notification to include:<br>• Location of activity: coordinates;<br>• Timing of activity: start and finish date and duration;<br>• Vessel(s), vessels details including call sign and contact, and<br>• Cooper Energy contact person. | 2 months prior to activity commencing. | SETFIA, who will provide SMS to fishing vessels in the area.<br>Texts updates will be provided by Cooper Energy to SETFIA approximately 2 months prior to the activity commencing and then closer to the time (nominally 1 month, 1 week, then 1 day) of the campaign commencing. |
| Notification to stakeholders of cessation of the activity. Notification to include:<br>Notice of activities completed. | Within 10 days of activity cessation. | |
| Regulatory notification of cessation of activity. | Within 10 days of activity completion. | NOPSEMA |
| Notification of cessation of activity to cease warnings for activity. | On vessel demobilisation from field. | AHS<br>AMSA-JRCC |

**Table 8-3: Stakeholder Feedback and Cooper Energy Assessment of Objections and Claims**

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| Australian Southern Bluefin Tuna Industry Association (Port Lincoln) | General activity updates provided in 2017 and 2018. Confirmed would like to receive general updates. | General Update November 2018 Flyer. | None | N/a | N/a | CF-ASBTIA-20181125-Email |
| Abalone Council Australia | General activity updates provided in 2017 and 2018. Confirmed email to send correspondence. | General Update November 2018 Flyer. | None | N/a | N/a | CF-ACA-20181112-Email. |
| Abalone Victoria (Central Zone) [SIV] | General activity updates provided in 2017 and 2018. | General Update November 2018 Flyer. | None | N/a | N/a | CF-ACA-20181112-Email. |
| Apollo Bay Fishermen's Cooperative [SIV] | General activity updates provided in 2017 and 2018. | General Update November 2018 Flyer. | None | N/a | N/a | CF-ABFC-20181112-Email. |
| Australian Fisheries Management Authority | General activity updates provided in 2017 and 2018. Confirmed consultation steps and email for correspondence. | General Update November 2018 Flyer. | None | N/a | N/a | CF-AFMA-20181112-Email. |
| Australian Hydrographic Office | General and specific activity updates and agreed notifications in 2017 and 2018. | To be notified: AHS to be sent activity notifications at previously agreed intervals: Four (4) | None | N/a | N/a | N/a |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| | | working weeks prior to activities commencing to enable AHS to promulgate NTM. Note, AMSA are provided general updates. | | | | |
| Australian Maritime Safety Authority | General and specific activity updates and consultation on marine traffic activity in 2017 and 2018. | General Update November 2018 Flyer. | AMSA confirmed ongoing notification requirements for AMSA, RCC and AHS. | No objection or claim. | COE thanked AMSA for confirming notification requirements. | GA-AMSA-20181109-Email.<br>GA-AMSA-20181115-Emails |
| | | N/a | AMSA provided Marine Traffic Maps for COE offshore activity locations. | No objection or claim. | COE thanked AMSA for Traffic Plots. | GA-AMSA-20181116a-Emails<br>GA-AMSA-20181116b-Otway Marine Traffic Map<br>GA-AMSA-20181116c-Emails<br>GA-AMSA-20181116d-Gippsland Marine Traffic Map<br>GA-AMSA-20181116e-Emails<br>GA-AMSA-20181116f-Emails |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| | | Emailed to enquire proximity of COE 2019 activities to designated shipping lanes. Also noted slight change to planned well locations since previous correspondence. | AMSA provided updated maps<br>AMSA confirmed the heavy vessel traffic routes in Otway are long established shipping patterns. | N/a | N/a | GA-AMSA-20181130-Email<br>GA-AMSA-20181203a-Email<br>GA-AMSA-20181203b-Email<br>GA-AMSA-20181203-Updated Otway Map 1-month AIS data cargo and tankers<br>GA-AMSA-20181203-Updated Otway Map 6-months AIS<br>GA-AMSA-20181203-Updated Otway Map 6-months AIS data cargo and tankers. |
| | | Emailed to enquire AIS signal intervals and to request additional maps to allow further interrogation of vessel movements in the Otway Region | AMSA confirmed the mapped blue dots represents a vessel's Automatic Identification System (AIS) position at a 15-minute interval.<br>Four additional maps were provided showing monthly traffic | N/a | COE thanks AMSA noting that between the April and June charts it provided us a good picture of traffic around Casino with and without Coopers project vessel (referencing to the previous COE | GA-AMSA-20190107-Email<br>GA-AMSA-20190108 - Otway Map - Cooper_Energy_wells - March 2018<br>GA-AMSA-20190108 - Otway Map - Cooper_Energy_wells - April 2018 |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| | | | near for COE wells between March and June 2018. | | Casino-5 well intervention and workover activities in Q1/Q2 2018. | GA-AMSA-20190108 - Otway Map - Cooper_Energy_wells - May 2018<br>GA-AMSA-20190108 - Otway Map - Cooper_Energy_wells - June 2018<br>GA-AMSA-20190108a-Email<br>GA-AMSA-20190108b-Email |
| Australian Maritime Safety Authority (Rescue Coordination Centre) | Specific activity notifications 24-48 hours prior to activity commencing by Vessel Master. | To be notified: RCC to be sent activity notifications at specific intervals: 24-48 hour prior to activity commencing by vessel master | None | N/a | N/a | N/a |
| Australian Maritime Safety Authority (Spill Response) | General activity updates provided in 2017 and 2018. No responses received. | To be notified of activity and copy of OPEP prior to activity commencing. | None | N/a | N/a | N/a |
| Australian Oceanographic Services Pty Ltd | General activity updates provided in 2017 and 2018. AOS have expressed general interest in COE offshore activities | General Update November 2018 Flyer. | None | N/a | N/a | OI-AOS-20181129-Email |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| | and have offered services of fishing vessels for offshore surveys. | | | | | |
| Commonwealth Fisheries Association | General activity updates and notices provided in 2017 and 2018. No responses received. | General Update November 2018 Flyer. | None | N/a | N/a | CF-CFA-20181113-Email. |
| Department of Economic Development, Jobs, Transport and Resources (Biosecurity and Agriculture Services)<br><br>*2019 Dept name change*<br>Department of Jobs, Precincts and Regions | First consulted November 2018 in relation to IMS processes.<br><br>Notes: COE is developing an IMS management procedure to complement the existing IMS Risk Assessment Tool (VIC-EN-REG-0002) | Provided overview of COE activities and provided COE General Update November 2018 flyer. Asked if the dept would be open to reviewing COE IMS procedure to ensure it aligns with best practice. | DEDJTR confirmed happy to review COE IMS procedure. Also welcomed establishing comms with offshore industry in regard to IMS. Notes Maritime Industry Australia Limited leading the development of a reference case to assist the offshore industry in managing its IMS risks. | No objection or claim. | COE thanked DEDJTR for their response, confirmed interest in the MIAL reference case. | GA-DJPR-BAS-20190109 Emails |
| | | 18/12/2018 - Emailed DEDJTR the draft COE IMS procedure and | 19/12/2018 - Agreed / anticipated response on | N/a | N/a | |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| | | existing IMS tool for review. | review of draft IMS procedure late January 2019. | | | |
| | | 09/01/2019 – DJPR provided comment on COEs draft IMS procedure and Risk Assessment Tool noting:<br>• Overall it looks quite thorough - only have a few comments and suggestions<br>• Using climatic conditions to inform risk was appropriate but may not account for all species, noting Didemnum perlucidum in particular; to manage this particular risk (i.e. of species that may thrive across different climatic conditions) the online WA vessel check was a useful tool and accepted by other states for IMS risk management of vessels coming to Australia from international waters<br>• The existing COE IMS tool is still appropriate for intrastate movements<br>Useful to apply the COE IMS tool just prior to mobilisation to ensure complete vessel history is captured, noting that layup of vessels in Port Phillip Bay (large number of IMS and well established) for | | No objection or claim<br>COE updating draft procedure and have accepted all comments provided by the DJPR and are looking at how the WA vessel check could fit within the draft IMS procedure.<br><br>In relation to the vessels and MODU planned for use during the Otway Drilling campaign, all have had WA vessel checks completed, or an inspection/assessment by independent IMS specialists allowing clearance to WA waters before joining the COE well construction campaign in 2018; the vessels and MODU have remained in Australian waters since then. In | COE thanked DJPR for their comments and will revert with any queries.<br><br>Dialogue ongoing | |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| | | >21 days could expose those vessels to fouling and increase the risk of transporting IMs to other coastal areas (e.g. Corner Inlet). | | addition, the COE IMS risk assessment is applied prior to mobilisation, accounting for complete vessel and MODU history (inclusive of domestic movements). Vessel history is reported to COE prior to the campaign via the COE IMS questionnaire and movements are monitored during the campaign via daily vessel reports. Vessel operator biofouling management plans complement these measures by including triggers for undertaking further IMS assessment or inspection (as necessary) if vessels operate outside of the established vessel operating profile. | | |
| Department of Economic Development, Jobs, Transport | General activity updates and notices provided in | General Update November 2018 Flyer. Emailed noting upcoming | None | N/a | N/a | GA-DEDJTR-VFA-20181113-Emails |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| and Resources (Victorian Fishery Authority)<br>*2019 Dept name change*<br>Department of Jobs, Precincts and Regions | 2017 and 2018. Contacts confirmed. | meetings and ongoing consultation with SETFIA and also COE attendance at the Seafood and Petroleum Industry Consultation Workshop in Melbourne on 16 November 2018. | | | | |
| Department of Economic Development, Jobs, Transport and Resources (Marine Pollution Team)<br>*2019 Dept name change*<br>Department of Jobs, Precincts and Regions (Emergency Management Branch) | Consulted in regard to reviewing OPEPs in 2017 and 2018. Provided review of VIC OPEP in 2017, and of BMG well abandonment OPEP in 2018.<br>General activity updates and notices provided in 2017 and 2018. | General Update November 2018 Flyer. Provided a summary activities and status of the OPEP. Provided opportunities to meet and discuss activities and response including at AMOSC Members form 10/12/2018 | DEDJTR emailed to introduce new point of contact and set up meeting to make introductions and confirm arrangements with the State. | No objection or claim | COE responded to set up meeting in Melbourne early December 2018 | GA-DEDJTR-MPT-20181129-Emails.<br>GA-DEDJTR-MPT-20181203-Emails. |
| | | Meeting 06/12/2018: DEDJTR and COE discussed and confirmed arrangements and contact details for State agencies and Ports in the event of a spill. | | No objections or claims | N/a | GA-DEDJTR-MPT-20181204a-Emails.<br>GA-DEDJTR-MPT-20181204b-Emails. |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| | | Confirmed process and triggers for Victorian Government reviews of the OPEP, in summary:<br>New OPEPs or significant modifications that require re-submission to NOPSEMA or DEDJTR ERR for approval: Cooper provide draft to EMD who will coordinate a State review and consolidate comments. Potential presentation of scenarios and Q&A with relevant people beforehand.<br>Vic OPEP updates where new assets are introduced (no significant changes to risk profile and not being resubmitted to NOPSEMA / ERR for approval): Cooper to provide updated OPEP for EMD review. EMD will involve other State departments as relevant to the scenario.<br>Vic OPEP administrative / minor updates: Not needed to go to EMD.<br>First Strike & Tactical Response Plans: Cooper to provide to EMD for awareness once completed.<br>DEDJTR also noted that the Marine Pollution Team would be moving to a new Department in January 2019, and that contact details would need to be updated in 2019. | | | | GA-DEDJTR-MPT-20181204c-Emails. |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| | | Cooper Energy responded to thank DEDJTR for their time and input, and to summarise the key points from the meeting. | DEDJTR responded to confirm key points and to note it was discussed it would be possible to collaborate on drills, and an additional point to suggest sharing information regarding personnel fulfilling particular roles | No objections and claims | N/a | GA-DEDJTR-MPT-20181206a-Email.<br>GA-DEDJTR-MPT-20181206b-Email. |
| | | COE emailed DJPR (formerly DEDJTR) Emergency Management Branch following phone conversation to discuss incorporation of a new spill scenario (gas well LOWC) and request for review of elements relevant to State arrangements, and to arrange a full | DJPR EMB responded to confirm look forward to receiving the OPEP, and happy to coordinate a review in February and will advise timing. | N/a | Dialogue ongoing | GA-DJPR-EMB - 20190115-Email.<br>GA-DJPR-EMB-20190116-Email. |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| | | State review in February 2019. | | | | |
| | | 25/01/2019: DJPR provided comments on COE Offshore Vic OPEP (REV 7). In summary:<br>a) Change of agency name to be reflected throughout the document.<br>b) Control agency – seeking update of working to clarify who is the control agency for a given scenario: COE is responsible for source control in relation to COE infrastructure regardless of jurisdiction; DJPR is the control agency for shoreline or at sea oil response in coastal waters.<br>c) NEBA – providing a number of suggestions:<br>• Diesel and condensate be treated separately for the NEBA provided in the OPEP<br>• Detail regarding volumes for each pollutant varies<br>• DJPR would like to understand the rationale for shoreline clean-up for | No objections or claims:<br>31/01/2019: COE responded to DPJR to thank them for their comments, and provided a response in relation to specific questions from the DJPR, in summary:<br>a & b) Recommendations and updates have been adopted throughout the OPEP.<br>c) NEBA:<br>• COE can provide within the next revision of the OPEP, for whole government review<br>• Worst case discharge volumes and duration are provided for these scenarios which relate to emergency conditions; spill of other chemicals or hydraulic fluids would not exceed a L1 spill event and would not be considered an emergency condition<br>• COE have revisited the rationale for shoreline clean-up for different shoreline types and have amended accordingly, taking on board DJPRs recommendations | | GA-DJPR-EMB-20190131- Emails |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| | | saltmarshes and wetland (for diesel/condensate), noting typically not considered to provide net benefit.<br>• Consultation with community or community experts regarding Aboriginal Cultural heritage in the EMBA's.<br>• For commercial fishing/aquaculture and recreational fishing/diving, clean-up and/or replacing impacted property/facilities should be considered a response option.<br>• Rationale behind non-selection of protection and deflection for some receptors; DJPRs is that all receptors (that are not submerged) have the potential to be protected by deflection.<br>• Oiled wildlife response to be considered for turtles and penguin colonies | | • Cooper Energy (and Santos previously) has operated within this Offshore and onshore Victorian region for several years; there has been historical consultation undertaken regarding Aboriginal cultural heritage. No specific consultation has been undertaken as part of the review of this Oil Pollution Emergency Plan, however, the need to appropriately consult with relevant community groups in the event of an oil pollution emergency is incorporated into the Cooper Energy ongoing stakeholder engagement process. Confirmed that experts in Aboriginal heritage would form part of State IMT where required.<br>• Consideration for clean-up of social / recreational values is provided for in the OPEP, however the potential replacement of property or facilities would be subject to separate and independent | | |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| | | | | consultation that sits outside the scope of the OPEP.<br>• Protection and deflection has been identified for priority sites, but also would not be ruled out for use in other areas.<br>• Commitments have been made within the OPEP to consult with DELWP, and at their direction implement oiled wildlife response; COE would welcome further advice from DELWP during the whole of government review of the OPEP.<br>Dialogue ongoing, further government review of OPEP being planned for February 2019. | | |
| Department of Environment, Land, Water and Planning (Marine National Parks and Marine Parks) | General activity updates and notices provided in 2017 and 2018. Only received notification of thanks. | General Update November 2018 Flyer. Also noted planned drilling campaign in Otway and unlikely spill scenarios with the possibility of reaching coastal Marine National Park. | None | N/a | N/a | GA-DEDJTR-NPMP-20181130-Email. |
| Department of Environment, | General activity updates and notices provided in | General Update November 2018 | DEDJTR confirmed happy | N/a | N/a | GA-DEDJTR-WEBR-20181130a-Email. |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| Land, Water and Planning (Wildlife Emergencies and Biodiversity Regulation) | 2017 and 2018. Confirmed would like to receive general updates. | Flyer. Also noted from previous meeting opportunity to review Sole Pipeline Onshore Operations EMP (for PL006238). | to review draft Sole Pipeline Onshore Operations EMP. | | | GA-DEDJTR-WEBR-20181130b-Email. |
| Director of National Parks | General activity updates and notices provided in 2017 and 2018. No response received. | 09/11/2018: COE sent General Update November 2018 Flyer and highlighted the potential for spill response activities in relation to Australian Marine Parks.<br>25/01/2019: DoNP thanked COE for update on planned / ongoing activities. Noted no overlap of planned activities with Marine Parks, and no authorisation requirements from the DNP. Noted EPs must:<br>a) identify and manage the impacts and risks on marine park values to an acceptable level and has considered all options to avoid them or reduce them to as low as reasonably practicable<br>b) clearly demonstrate that the activity will not be inconsistent with the management plan<br>DoNP also noted:<br>- they do not require further notification of progress made in relation to this activity unless details regarding the activity change and | | No Objections or Claims; how COE are addressing DoNP requirements:<br>a) marine parks have the potential to be exposed to low levels of hydrocarbons in the event of a LOC event. The impacts and risks to marine parks, including their values, have been evaluated within the EP. Controls to manage impacts and risks to ALARP and Acceptable levels have been considered and selected where practicable<br>b) the planned activities do not overlap marine parks; response | N/a | GA-DoNP-20181109-Email. |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| | | result in an overlap with a marine park or for emergency responses<br>- Oil pollution response, environmental monitoring and remediation activities are allowable in Multiple Use and Special Purpose Zones (IUCN Category VI) when undertaken in accordance with an EP accepted under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009<br>c) Emergency responses: The DNP should be made aware of oil/gas pollution incidences which occur within a marine park or are likely to impact on a marine park as soon as possible. Notification should be provided to the 24-hour Marine Compliance Duty Officer on 0419 293 465. The notification should include:<br>○ titleholder details<br>○ time and location of the incident (including name of marine park likely to be affected)<br>○ proposed response arrangements as per the Oil Pollution Emergency Plan (e.g. dispersant, containment, etc)<br>○ confirmation of providing access to relevant monitoring and evaluation reports when available; and<br>○ contact details for the response coordinator. | | activities (i.e. monitoring) have the potential to overlap marine parks, and are allowable in both multiple use and special purpose zones; further consultation would be undertaken with the DoNP in the event of an LOC.<br>c) Emergency response contact and notification requirements have been included within the EP Implementation Strategy) | | |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| Eastern Victorian Rock Lobster Industry Association [SETFIA] | General activity updates and notices provided in 2017 and 2018. | General Update November 2018 Flyer. | EVRLIA/SETFIA confirmed contact for EVRLIA | No objection or claim. | COE confirmed they would use agreed contact going forward. | CF-EVRLIA-20181108-Email<br>CF-SETFIA-20181029-Phone Log |
| Eastern Zone Abalone Industry Association and Eastern Victoria Sea Urchin Divers Association [SIV] | General activity updates and notices provided in 2017 and 2018. | General Update November 2018 Flyer. | None | N/a | N/a | CF-EZAIA-SUDA-20181112-Email |
| Lakes Entrance Fishermen's Society Cooperative Limited (LEFCOL) [SIV] | General activity updates and notices provided in 2017 and 2018. Previous concerns raised in relation to oil and gas activities including impacts from cumulative effect of oil and gas exclusion zones / infrastructure presence. Refer to SOL-EN-EMP-0007. Consultation has continued through 2018. Consultation includes periodic meetings and communications. | General Update November 2018 Flyer.<br>Meeting planned in December 2018 with LEFCOL and SETFIA for general discussion regarding COE 2019 activities and consultation approach.<br>Future fisheries tribunal meetings. | LEFCOL happy to meet with SETFIA and COE to discuss COE activities in December. | No objection or claim. | COE confirmed meeting location and timing. | CF-LEFCOL-20181108-Email<br>CF-LEFCOL-20181109-Emails<br>CF-LEFCOL-20181120-Emails |
| Parks Victoria | Engaged / general activity updates provided in 2017 | General Update November 2018 Flyer. | None | N/a | N/a | GA-PV-20181108-Email |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| | and 2018. No response received. | | | | | |
| Port Campbell Professional Fishermen's Association [SIV] | Engaged / general activity updates provided in 2017 and 2018. | General Update November 2018 Flyer. COE also asked if PCPFA would like to meet to discuss COE 2019 activities. | PCPFA confirmed they would like to be kept informed. Also noted their policy had changed whereby all oil and gas notifications should now go direct to VRLA and SIV. | No objection or claim. | COE confirmed they would also be contacting VRLA and SIV and would continue to keep all parties updated on COE activities. | CF-PCPFA-20181112-Emails<br>CF-PCPFA-20181113-Emails |
| Port Campbell Tourism and Information Centre | Engaged / general activity updates provided in 2017 and 2018. No response received. | 06/12/2018 COE Port Campbell Tourism and Information Centre and discussed 2019 planned activities. COE followed up on visit with an email providing the 2018 drilling campaign flyer to PCTIC | None | N/a | N/a | OI-PCTIC-20181206-Email |
| Port Franklin Fishermen's Association [SIV] | Engaged / general activity updates provided in 2017 and 2018. No response received. | General Update November 2018 Flyer. | None | N/a | N/a | CA-PFFA-20181112-Email |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| Portland Professional Fishermen's Association [SIV] | Engaged / general activity updates provided in 2017 and 2018. No response received. | General Update November 2018 Flyer. | None | N/a | N/a | CA-PPFA-20181112-Email |
| San Remo Fishing Cooperative [SIV] | Engaged / general activity updates provided in 2017 and 2018. No response received. | General Update November 2018 Flyer. | None | N/a | N/a | CF-SRFC-20181112-Email |
| Scuba Divers Federation of Victoria | Engaged / general activity updates provided in 2017 and 2018. No response received. | General Update November 2018 Flyer. | None | N/a | N/a | CF-SDFV-20181112-Email |
| Seafood Industry Victoria | General activity updates and notices provided in 2017 and 2018.<br>Periodic Meetings on COE activities. | General Update November 2018 Flyer. Emails and calls in relation to COE 2019 activities and consultation approach. | SIV confirmed keen to meet with COE. No indication that COE activities were a cause for any concern. SIV provided v1 of their consultation policy. SIV are working to reduce consultation burden on fisheries from oil and gas activities generally. | SIV consultation Policy v1 (April 2018) contains requests for how consultation should be conducted. COE notes that the language within the SIV Policy is particularly focussed on Seismic survey, for which SIV have previously expressed concern (e.g. DEDJTR 2018).<br>Subsequent to this Policy being received and reviewed by COE, | COE and SIV discussed general consultation approach over phone on 14 November 2018<br>COE set up face to face meeting with SIV 26 November 2018 at SIV office. | CF-SIV-20181108-Email<br>CF-SIV-20181114a-Emails<br>CF-SIV-20181114b-SIV Consultation Policy v1<br>CF-SIV-20181114c-Emails<br>CF-SIV-20181121-Emails |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| | | 26/11/2018 - Meeting with SIV at SIV HQ in Melbourne. SIV and Cooper discussed each other's activities and approaches to consultation. SIV and COE agreed notification is appropriate for operational activities and could be communicated by an update in the SIV PROFISH magazine, nominally in December 2018 issue. COE 2019 drilling plans were discussed including potential impacts and controls. Agreed the main impact (albeit minor) was the potential for (temporary) displacement due to Rig presence. SIV and COE agreed to collaborate on a joint letter to licence holders who may be in the area - notably the Western Rock Lobster fishers and wrasse which are 'site-attached' to reef and therefore fished at specific locations. This would be mailed out by SIV as holder of the fishery licences. SIV suggested high level letter showing location and timing and offering further information. Recognition during meeting that drilling is unlikely to impact fishers unless they happen to fish at that specific location. SIV also provided some additional information for COE existing environment. | | meetings have been held with SIV and an alternate consultation approach agreed, appropriate to the nature of COEs current and planned activities. During these meetings, no particular concerns were raised with the exception of possible overlap of the activities with some fishing activities (see below). This was to be addressed in the consultation approach agreed with SIV, which comprises the following:<br>• COE activities (general) to be communicated via SIV Profish Magazine, with financial contribution from COE<br>• COE activities (Otway Exploration Drilling); SIV | 28/11/2018 - COE Emailed SIV with a summary of key points for meeting on 2611/2018. COE also provided the letter for mail-out by SIV regarding drilling activities. | CF-SIV-20181126-Meeting Minutes<br>CF-SIV20181126-Fishery Updates<br>CF-SIV20181126-Meeting Slides<br>CF-SIV20181128-Email Mailout<br>CF-SIV20181128-Mailout |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| | | | | members to be engaged via a COE/SIV jointly authored fisheries mailout<br>• Any Claims or Objections received from SIV member by either SIV or COE will be assessed by COE.<br>It is also noted that the SIV Policy v1 has expectations around reporting of compliance. The language and examples provided are Seismic focussed and do not appear relevant to the planned Otway Drilling Campaign. Not-withstanding, COE do track EP compliance and will submit a performance report to NOPSEMA, such that information on Compliance with EP Performance Standards can be made available to stakeholders if | | |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| | | | | requested and where appropriate. | | |
| | | COE emailed Fisheries letter mailout to SIV for review / sending<br><br>COE emailed draft flyer for inclusion into PROFISH | SIV emailed to say letter and flyer for PROFISH magazine were perfect, and to provide Cooper with process and expenses for how they would mail out to fishers, and also for flyer / magazine production | No objections or claims | Cooper agreed on process and to meet expenses in relation to magazine production and letter mailout. | CF-SIV20181204 – PROFSH flyer<br>CF-SIV20181204 – Email PROFSH flyer<br>CF-SIV20181205a – Email PROFSH flyer<br>CF-SIV20181205a – Email PROFSH flyer |
| | | 11/01/2019: COE emailed SIV to update on expected timing of Otway Exploration well drilling campaign and to enquire whether there was any feedback from the fisheries letter mail-out and PROFISH flyer.<br>18/01/2019: COE and SIV Phone hook-up confirming<br>• mailout and flyer went out in December<br>• Positive feedback on the PROFISH magazine<br>No issues raised regarding COEs activity update or in response to mail out | | No objections or claims | N/a (ongoing dialogue) | CF-SIV-20190111 - Email<br>CF-SIV-20190118 – Phone Log |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| South-East Trawl Fishing Industry Association | General activity updates and notices provided in 2017 and 2018. Previous objections made in relation to oil and gas activities including impacts from noise (particularly from seismic) and cumulative effect of oil and gas exclusion zones. Refer to SOL-EN-EMP-0007. Consultation has continued through 2018; this has included periodic meetings/communications, agreement and implementation of regular TEXT updates for COE activities, and provision of quarterly advice from SETFIA on fisheries activity in the region. | Consultation on draft fisheries damages protocol October 2018.<br>Discussed approach for regular TEXT updates in October 2018.<br>General Update November 2018 Flyer.<br>Meeting planned in December 2018 with LEFCOL and SETFIA for general discussion regarding COE 2019 activities and consultation approach. | SETFIA requested fisheries damages protocol be extended to another fishery.<br>SETFIA requested advice on timing of activity update TEXTS.<br>COE to meet with SETFIA and LEFCOL to discuss COE activities in December. | No objection or claim. | COE confirmed compensation protocol could be extended to cover other fisheries noted in correspondence.<br>COE confirmed timing of regular TEXTs in the run-up to COE activities.<br>COE confirmed meeting location and timing. | CF-SETFIA-20181023a-Emails<br>CF-SETFIA-20181023b-Draft Fisheries Damages Protocol<br>CF-SETFIA-20181025-Emails<br>CF-SETFIA-20181029-Phone Log<br>CF-SETFIA-20181108-Email<br>CF-SETFIA-20181109-Emails<br>CF-SETFIA-20181112-Emails |
| | | 12/12/2018 - Meeting with SETFIA / LEFCOL. Key points: 1. Resolution to potential Sole pipeline pin-up, 2. Agreed approach for drilling / IMR notification, 3. Some challenges being experiences in relation to consultation with oil and gas industry (multi-client seismic).<br>N/a | | N/a | N/a | CF-SETFIA-20181112-Meeting Minutes |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| | | TEXT from COE to confirm representation / contacts for Southern and Eastern Scalefish and Shark Fishery and the Southern Squid Jig Fishery. | SETFIA confirmed they represented the Southern and Eastern Scalefish and Shark Fishery but not the Southern Squid Jig Fishery and provided a contact for the SSJF. | No objection or claim | COE thanked SETFIA and contacted SSJF (see CF-SJF for further details). | CF-SETFIA-20190117-Phone Log. |
| Southern Rock Lobster Ltd | Engaged / general activity updates provided in 2017 and 2018. No response received. | General Update November 2018 Flyer. | None | N/a | N/a | CF-SRL-20181112-Email |
| Southern Shark Industry Alliance SETFIA | General activity updates and notices provided in 2017 and 2018. | General Update November 2018 Flyer. | SSIA/SETFIA confirmed contact for EVRLIA | No objection or claim. | COE confirmed they would use agreed contact going forward. | CF-SETFIA-20181029-Phone Log<br>CF-SSIA-20181108-Email |
| Sustainable Shark Fishing Inc | Engaged / general activity updates provided in 2017 and 2018. No response received. | General Update November 2018 Flyer. | None | N/a | N/a | CF-SSFI-20181112-Email |
| Southern Squid Jig Fishery | Not directly engaged previously | Call and introduction to Cooper Energy and COE planned activities for 2019. General discussion between fishery contact (DW) and COE in relation to both parties' activities. Geographical overlap between activities possible although | | No objection or claim | COE offered to include SSJF on notifications as preferred by squid fisheries. | CF-SSJF-20190122 – Phone Log<br>CF-SSJF-20190122 - Email |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| | | fishery only has a small number of operators, and they do not have any specific fishing ground; they transient - following the squid. Skippers are not expected to be interested given the nature of planned activities (e.g. no seismic) but DW would coordinate sending licence holders information on COE activities. DW noted there was no formal industry association and appreciated being liaised with directly.<br>COE followed up with further information on the campaign including campaign flyer. | | | Continued dialogue / maintain channels for communications. | |
| Victorian Fish and Food Marketing Association [SIV] | Engaged / general activity updates provided in 2017 and 2018. No response received. | COE consulted with SIV who represent this organisation. | None | N/a | N/a | N/a |
| Victorian Recreational Fishers Association | Engaged / general activity updates provided in 2017 and 2018. No response received. | General Update November 2018 Flyer. | None | N/a | N/a | CF-VRFA-20181112-Email |
| Victorian Rock Lobster Association [SIV] | Engaged / general activity updates provided in 2017 and 2018. No response received. | General Update November 2018 Flyer. | VRLA responded confirmed receipt of update flyer and noted that they did not consider this general update to be consultation. Noted that | Objection to being emailed relates to broader frustration with the large amount of information from the oil and gas industry and associated burden. COE to engage further via | COE responded to confirm they were consulting with SIV in relation to COE activities and oil and gas consultation. COE provided the | CF-VRLA-20181112-Email<br>CF-VRLA-20181112-Emails<br>CF-VRLA-20181115-Emails |

| Stakeholder | Summary of historical consultation | Information Provided for 2019 Activities | Summary of Stakeholder response | Cooper Energy Assessment of Objection or Claim | Cooper Energy Response | Record # (Stakeholder ID-Date-Item) |
|---|---|---|---|---|---|---|
| | | | consultation should be conducted via their peak body SIV. Asked if Cooper Energy would be attending the Seafood and Petroleum Industry Regional Workshop in November 2018. | peak bodies and industry forums to help resolve the over-burden. | VRLA the option of being removed from COE General Update mailing list. COE also confirmed they would attend the Seafood and Petroleum Industry Regional Workshop in November 2018. | CF-VRLA-20181121-Emails |
| Victorian Scallop Fishermans Association | Engaged / general activity updates provided in 2017 and 2018. No response received. | General Update November 2018 Flyer. | None | N/a | N/a | CF-VTFA-20181112-Email |
| Warrnambool Professional Fishermen's Association | Engaged / general activity updates provided in 2017 and 2018. No response received. | General Update November 2018 Flyer. | None | N/a | N/a | CF-WPFA-20181112-Email |
| Western Abalone Divers Association SIV | Engaged / general activity updates provided in 2017 and 2018. No response received. | General Update November 2018 Flyer. | None | N/a | N/a | CF-WADA-20181112-Email |

# 9 Acronyms and Abbreviations

| Acronym | Description |
|---|---|
| ADIOS | Automated Data Inquiry for Oil Spills |
| AFMA | Australian Fisheries Management Authority |
| AHO | Australasian Hydrographic Office |
| AHTS | Anchor Handling, Tow and Support |
| ALARP | As Low As Reasonably Practical |
| AMOSC | Australian Marine Oil Spill Centre |
| AMP | Australian Marine Park |
| AMSA | Australian Maritime Safety Authority |
| AOF | Absolute Open Flow |
| API | American Petroleum Institute |
| APPEA | Australian Petroleum Production & Exploration Association |
| AQIS | Australian Quarantine and Inspection Service |
| ASTM | American Society for Testing and Materials |
| BAOAC | Bonn Agreement Oil Appearance Code |
| BIA | Biologically Important Areas |
| BOD | Biological Oxygen Demand |
| BOM | Bureau of Meteorology |
| BOP | Blowout Preventer |
| CAMBA | Agreement between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment |
| CEE | Consulting Environmental Engineers |
| CFSR | Climate Forecast System Reanalysis |
| CHN | Casino Henry and Netherby |
| CITES | Convention on International Trade in Endangered Species of Wild Fauna and Flora |
| CMP | Commonwealth Marine Parks |
| CMA | Commonwealth Marine Area |
| CoEP | Code of Environmental Practice |
| DAFF | Department of Agriculture, Fisheries and Forestry |
| DDR | Daily Drilling Report |

| Acronym | Description |
|---|---|
| DAWR | Department of Agriculture, Water and Resources |
| DEDJTR | Department of Economic Development, Jobs, Transport and Resources (now DJPR) |
| DEE | Department of Environmental Engineering |
| DELWP | Department of Environment, Land, Water and Planning |
| DIIS | Department of Innovation, Industry and Science |
| DoEE | Department of Environment & Energy |
| DJPR | Department of Jobs, Precincts and Regions |
| DSEWPaC | Department of Sustainability, Environment, Water, Population and Communities Annual Report |
| DSV | Diving support vessel |
| EIA | Environmental Impact Assessment |
| EIAPP | Engine International Air Pollution Prevention |
| EMB | Emergency Management Branch (DJPR) |
| EMBA | Environment that May Be Affected |
| EP | Environment Plan |
| EPA | Environment Protection Authority |
| EPBC | Environmental Protection and Biodiversity Conservation |
| EPO | Environmental Performance Outcome |
| EPS | Environmental Performance Standard |
| ERA | Environmental Risk Assessment |
| ERR | Earth Resources Regulation |
| ESC | Environmental Screening Concentrations |
| ESD | Ecologically Sustainable Development |
| FFG | Flora and Fauna Guarantee |
| GEMS | Diamond's Global Excellence Management System |
| GHG | Global Greenhouse Gas |
| HCFC | Hydrochlorofluorocarbon |
| HSEC | Health, Safety, Environmental and Community |
| HSEC-MS | Health, Safety, Environmental and Community Management System Management System |
| IAP | Incident Action Plan |
| IAPP | International Air Pollution Prevention |

| Acronym | Description |
|---|---|
| IC | Incident Controller |
| ICC | Incident Control Centres |
| IEE | International Energy Efficiency |
| IMCRA | Integrated Marine and Costal Regionalisation of Australia |
| IMT | Incident Management Team |
| IOGP | International Association of Oil and Gas Producers |
| IOPP | International Oil Pollution Prevention |
| IPIECA | Global oil and gas industry association for environmental and social issues |
| IMS | Invasive Marine Species |
| ISO | International Organisation for Standardisation |
| ITOPF | International Tanker Owners Pollution Federation |
| IUCN | International Union for Conservation of Nature |
| IWCF | International Well Control Forum |
| JAMBA | Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment |
| JHA | Job Hazard Assessments |
| JRCC | Joint Rescue Coordination Centre |
| KEF | Key Ecological Features |
| LEL | Lower Explosive Limit |
| LOC | Loss of Containment |
| LOWC | Loss of Well Control |
| LWD | Logging Whilst Drilling |
| MARPOL | International Convention for the Prevention of Pollution from Ships |
| MARS | Maritime Arrivals Reporting System |
| MDO | Marine Diesel Oil |
| MFO | Marine Fauna Observation |
| MNES | Matters of National Environmental Significance |
| MO | Marine Orders |
| MoC | Management of Change |
| MODU | Mobile Offshore Drilling Unit |
| MoU | Memorandum of Understanding |

| Acronym | Description |
|---|---|
| NCEP | National Centre for Environmental Prediction |
| NEBA | Net Environmental Benefit Analysis |
| NEPM | National Environmental Protection (Air Quality) Measures |
| NES | National Ecological Significance |
| NMFS | National Marine Fisheries Service |
| NOAA | National Oceanic and Atmospheric Administration |
| NOEC | No observed effect concentrations |
| NOPSEMA | National Offshore Petroleum Safety and Environmental Management Authority |
| NOPTA | National Offshore Petroleum Titles Administrator |
| NP | National Park |
| OCNS | Offshore Chemical Notification System |
| ODME | Oil Detection Monitoring Equipment |
| OGUK (formally UKOOA) | Oil & Gas UK |
| OIM | Offshore Installation Manager |
| OPEP | Oil Pollution Emergency Plan |
| OPGGS | Offshore Petroleum and Greenhouse Gas Storage |
| OPGGS(E)R | Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 |
| OSCA | Oil Spill Control Agent |
| OSMP | Operational and Scientific Monitoring Program |
| OSTM | Oil Spill Trajectory Modelling |
| OWR | Oiled Wildlife Response |
| OWS | Oily Water Separator |
| PLONOR | Posing Little Or No Risk to the environment |
| PMS | Planned Maintenance System |
| PNEC | Predicted No Effect Concentration |
| POB | Persons on Board |
| POWBONS | Pollution of Waters by Oil and Noxious Substances Act |
| PPE | Personal Protective Equipment |
| PTS | Permanent Threshold Shift |
| RAMSAR | Convention on Wetlands of International Importance especially as Waterfowl Habitat |

| Acronym | Description |
|---|---|
| RCP | Risk Control Practices |
| RMS | Root Mean Squared |
| RO | Reverse Osmosis |
| ROV | Remotely Operated Vehicle |
| SCAT | Shoreline Clean-Up Assessment Technique |
| SDFV | Scuba Divers Federation of Victoria |
| SEEMP | Ship Energy Efficiency Management Plan |
| SEMS | Diamond's Safety and Environmental Management System |
| SETFIA | South-east Fishing Trawl Industry Association |
| SIMAP | Spill Impact Mapping Analysis Program |
| SIV | Seafood Industry Victoria |
| SMPEP | Shipboard Marine Pollution Emergency Plan |
| SOPEP | Shipboard Oil Pollution Emergency Plan |
| SPL | Sound Pressure Level |
| SSF | Sustainable Shark Fishing Inc. |
| STP | Sewage Treatment Plan |
| TEC | Threatened Ecological Communities |
| TPCs | Third Party Contractors |
| UAV | Unmanned Aerial Vehicles |
| UNEP | United Nations Environmental Programme |
| VADA | Victorian Abalone Divers Association |
| VRFish | Victorian Recreational Fishers Association |
| VRLA | Victorian Rock Lobster Association |
| VSCP | Offshore Victoria Source Control Plan |
| WADA | Western Abalone Divers Association |
| WBM | Water Based Muds |
| WOMP | Well Operations Management Plan |

# 10 Units

| Unit | Description |
|---|---|
| ‘ | Minutes |
| “ | Seconds |
| µg/$m^3$ | Micrograms per Cubic Metre |
| bbl | Barrel |
| cP | Centipoise |
| dB | Decibel |
| hrs | Hours |
| kg | Kilograms |
| kg/$m^3$ | Kilograms per Cubic Meter |
| kHz | Kilohertz |
| km | Kilometres |
| $km^2$ | Kilometres Squared |
| L | Litres |
| m | metres |
| mm | Millimetres |
| $m.s.^{-1}$ | Metres Per Second |
| $m^2$ | Metres Squared |
| $m^3$ | Metres Cubed |
| $m^3/h$ | Metres Cubed per Hour |
| MMscfd | Million standard cubic feet per day |
| $^o$ | Degrees |
| $^o$C | Degrees Celsius |
| ppb | Parts per Billion |
| ppm | Parts Per Million |
| µPa | Micro Pascals |

# 11 References

AMSA. 2015. Technical guideline for preparing contingency plans for marine and coastal facilities. Canberra, Australia

AMSA. 2016. Minimising the risk of collisions with cetaceans. Marine Notice 15/2016. Available online at: https://apps.amsa.gov.au/MOReview/MarineNotice/IssuedIndex [Accessed 01 February 2017]

ASMA. 2019. Australian Dispersant Stock Suitability. Online resource. Available at: https://www.amsa.gov.au/.

APASA. January 2019. Annie-1 Oil Spill Modelling (MAQ0748J).

AQIS. 2011. Offshore Installations Quarantine Guide. Australian Quarantine Inspection Service. Canberra.

Australian Government. 2019. Marine Pests. Online Resource available at: http://www.marinepests.gov.au/pests/. Accessed January 2019.

Australian Government. 2008. Marine Pest Fact Sheet: Northern Pacific Sea Star. August 2008.

Australian Government. 2002. Impacts: Identifying Disturbances. The South-East Regional Marine Plan. National Oceans Office. Australian Government.

Azis, P., Al-Tisan, I., Daili, M., Green, T., Dalvi, A. and Javeed, M. 2003. Chlorophyll and plankton of the Gulf coastal waters of Saudi Arabia bordering a desalination plant Desalination, 154 (2003), pp. 291–302

Bakke T, Klungsøyr J & Sanni S (2013). Environmental impacts of produced water and drilling waste discharges from the Norwegian offshore petroleum industry. Marine Environmental Research 92: 154-169.

BirdLife International. 2012. Light pollution has a negative impact on many seabirds including several globally threatened species. Presented as part of the BirdLife State of the world's birds website. Available online at: http://www.birdlife.org/datazone/sowb/casestudy/488 [Accessed 13 January 2017]

Biofouling Solutions 2018. Far Saracen Layup Biofouling Management Plan. Derwent Estuary 2018/19. BFS1562.

Biofouling Solutions 2019. Ocean Monarch ROV Inspection Report. BFS012b

Black, K.P., Brand, G.W., Grynberg, H., Gwyther, D., Hammond, L.S., Mourtikas, S., Richardson, B.J. and Wardrop, J.A. 1994. Production facilities. In: Environmental implications of offshore oil and gas development in Australia – the findings of an independent scientific review. Swan, J.M., Neff, J.M. and Young, P.C. (eds) Australian Petroleum Exploration Association. Sydney. pp 209–407

Boon, P.I., Allen, T., Brook, J., Carr, G., Frood, D., Hoye, J., Harty, A., Mcmahon, A., Mathews, S., Rosengren, N., Sinclair, S., White, M. and Yugovic, J. (2011) Mangroves and coastal saltmarsh of Victoria: distribution, condition, threats and management. Report to Department of Environment and Primary Industries, Bendigo. Available on-line at http://www.vu.edu.au/institute-for-sustainability-and-innovation-isi/publications.

BP. 2013. Shah Deniz 2 Project. Environmental & Socio-Economic Impact Assessment. BP Development Pty Ltd

Bureau of Rural Sciences (BRS) (2007) Designated Exchange Areas Project - Providing Informed Decision on the Discharge of Ballast Water in Australia (Phase 2). Commonwealth of Australia. Final Report. pp. 93.

Carroll AG, Przeslawski R, Duncan A, Gunning M and Bruce B (2017). A critical review of the potential impacts of marine seismic surveys on fish and invertebrates. Marine Pollution Bulletin 114: 9-24.

CEE. 2003. Sole Development (Patricia Baleen Extension) Technical Report, Marine Biological Issues. Consulting Environmental Engineers Pty Ltd.

Cefas. 2019a. Cefas Template: Sodium Hypochlorite Solution Generated in Situ. Available online at: https://www.cefas.co.uk.

Cefas. 2019b. Cefas Template: Sodium Hypochlorite with Copper Ions Generated in Situ. Available online at: https://www.cefas.co.uk.

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

Commonwealth of Australia. 2012. Conservation Management Plan for the Southern Right Whale. A Recovery Plan under the Environment Protection and Biodiversity Conservation Act 1999 2011 – 2021.

Commonwealth of Australia. 2015. Conservation Management Plan for the Blue Whale—A Recovery Plan under the Environment Protection and Biodiversity Conservation Act 1999.

Commonwealth of Australia. 2017. Recovery Plan for Marine Turtles in Australia.

Cooper Energy 2018a. Environment Plan Compliance and Readiness Inspection Report: MODU. VIC-EN-IRT-0001.

Cooper Energy 2018b. Environment Plan Compliance and Readiness Inspection Report: Vessels. VIC-EN-IRT-0002.

Cooper Energy 2018c. EP Performance Report. Sole-3 & 4 Drilling and Sole-2 Well Abandonment. SOL-EN-REP-0009.

Cooper Energy 2018d. EP Performance Report. Casion-5 Well Intervention and Workover. CHN-EN-REP-0001.

Cranmer G (1988). Environmental survey of the benthic sediments around three exploration well sites. Report No 88/02. Report to the United Kingdom Offshore Operators Association. Aberdeen University Marine Studies Ltd, Aberdeen, UK, 33pp.

Currie DR & Isaacs LR (2005). Impact of exploratory offshore drilling on benthic communities in the Minerva gas field, Port Campbell, Australia. Marine Environmental Research 59: 217-233.

Daan R & Mulder M (1996). On the short-term and long-term impact of drilling activities in the Dutch sector of the North Sea. ICES Journal of Marine Science 53: 1036-1044.

DAWR. 2017a. Biofouling Management Requirement (web page). Accessed at http://www.agriculture.gov.au/biosecurity/avm/vessels/biofouling/management-requirements.

DAWR. 2017b. Australian Ballast Water Management Requirements Version 7.

Dasic International. 2019. Oil Dispersants – Slickgone NS. Online Information. Available at: http://oil.dasicinter.com/oil-dispersants/slickgone-ns-1.

Dasic International. 2017. Dasic Slickgone EW Safety Data Sheet. Rev 10 (11/01/2018)

Dasic International. 2017. Dasic Slickgone NS Safety Data Sheet. Rev 13 (05/04/2017).

Department of Agriculture Forestry and Fisheries (DAFF). 2009. The National Biofouling Management Guidance for the Petroleum Production and Exploration Industry. Accessed at: www.marinepests.gov.au.

Department of Agriculture (DoA). 2015. Anti-fouling and In-water Cleaning Guidelines. Accessed at: http://www.agriculture.gov.au/biosecurity/avm/vessels/biofouling/anti-fouling-and-inwater-cleaning-guidelines

DCENR (2007) Impact of seismic surveys on marine life: Gausland, I (Statoil, Stavanger, Norway). Department of Communications, Climate Actions and Environment[Available at: https://www.dccae.gov.ie/en-ie/Pages/default.aspx]

Department of Primary Industries and Regional Development, WA (DPIRD WA). 2017. Guidance Statement. In-water cleaning of Vessels in WA.

Department of the Environment. 2015. The introduction of Marine Pests to the Australian Environment via Shipping. Available at: http://www.environment.gov.au/biodiversity/threatened/nominations/ineligible-ktp/introduction-marine-pests-via-shipping. Accessed 10 December 2018.

Department of Economic Development Job Transport and Resources (DEDJTR). 2018. The CarbonNet Project. 3D Marine Seismic Survey. Environment Plan Summary. 16 January 2018 (Rev 1). Available at: https://www.nopsema.gov.au/environmental-management/activity-status-and-summaries/

Dias, J., Rocha, R., Godwin, S., Tovar-Hernandez, M., Delahoz, M., McKirdy, S., de Lestang, P., McDonald, J., Snow, M. 2016. Investigating the cryptogenic status of the sea squirt *Didemnum perlucidum* (Tunicata, Ascidiacea) in Australia based on a molecular study of its global distribution. Aquatic Invasions. Vol 3, Issue 11: 239-245.

DoEE, 2017. Conservation Values Atlas. Search for Operational Areas Undertaken November 2018. Available at: http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf. Accessed November 2018.

DoF. 2009. A Review: Biosecurity Risks Posed by Vessels and Mitigation Options. Fisheries Occasional Publication No. 55. Department of Fisheries. Government of Western Australia.

DOTIS (2018) Discovery of Sound in the Sea. Determine if a sound affects a marine mammal. Discovery of Sound in the Sea. Accessed November 2018 < https://dosits.org/animals/effects-of-sound/determine-if-a-sound-affects-a-marine-animal/>

DSEWPaC. 2011. National recovery plan for threatened albatrosses and giant petrels 2011-16. Department of Sustainability, Environment, Water, Population and Communities. Hobart.

DSEWPaC. 2012. Marine Bioregional Plan for the Temperate East Marine Region. A WWW publication accessed at http://www.environment.gov.au/topics/marine/marine-bioregional-plans/temperate-east. Department of Sustainability, Environment, Water, Population and Communities

DSEWPaC. 2013a. Conservation Advice for SUBTROPICAL AND TEMPERATE COASTAL SALTMARSH. Canberra: Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/118-conservation-advice.pdf.

DSEWPaC 2013b. *Recovery Plan for the White Shark* (Carcharodon carcharias). Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/recovery-plans/recovery-plan-white-shark-carcharodon-carcharias.

DESEWPaC. 2015. Species group report card – cetaceans Supporting the marine bioregional plan for the North Marine Region. Department of Sustainability, Environment, Water, Population and Communities. Available from: https://www.environment.gov.au/system/files/pages/0fcb6106-b4e3-4f9f-8d06-f6f94bea196b/files/north-report-card-cetaceans.pdf

Environment Australia (EA). 2003. Recovery Plan for Marine Turtles in Australia, Prepared by the Marine Species Section Approvals and Wildlife Division, Environment Australian. Available online at: http://www.environment.gov.au/coasts/publications/turtle-recovery/pubs/marine-turtles.pdf [Accessed 21 February 2017]

Engelhardt, F. 1983. Petroleum effects on marine mammals. *Aquatic Toxicology*, 4: 199–217.

Franmarine Underwater Services. 2019. Envirocart Information. Website available at: http://franmarine.com.au. Accessed January 2019.

French-McCay, D.P, N. Whittier, D. Aurand, C. Dalton, J. J. Rowe, S. Sankaranarayanan, 2005. Modeling fates and impacts of hypothetical oil spills in Delaware, Florida, Texas, California, and Alaska waters, varying response options including use of dispersants. Proceedings, 2005 International Oil Spill Conference, Paper 399, Miami, Florida, American Petroleum Institute, Washington, DC.

*French-McCay, D.P. 2018. Aquatic Toxicity Thresholds for Oil Spill Risk Assessments.*

French, D.P. 2009. State-of-the-art and research needs for oil spill impact assessment modelling. In: Proceedings of 32nd Arctic and Marine Oil Spill Program (AMOP) Technical Seminar. Ottawa, Ontario, Canada. (pp. 601–653)

Geraci, J.R. and St. Aubin, D.J. 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. Ventura, California.

GOMO 2013. Guidelines for Offshore Marine Operations. Revision 0611-1401. Available online http://www.g-omo.info/wp-content/uploads/2016/06/201311-GOMOfinal.pdf Accessed 14 May 2017

Gotz, T., Hastie, G., Hatch, L., Raustein, O., Southall, B., Tasker, M., et al. 2009. Overview of the impacts of anthropogenic underwater sound in the marine environment. OPSAR commission.

Halliburton. 2018. Data sheet: Global Rapid Intervention Package (GRIP): Air-mobile equipment package for subsea well control response Available at: https://www.halliburton.com/

Hannay, D, MacGillivray, A, Laurinolli, M & Racca, R 2004, Source Level Measurements from 2004 Acoustics Programme, Sakhalin Energy, pp. 66.

Hartley, J.P. 1996. Environmental monitoring of offshore oil and gas drilling discharges – A caution on the use of barium as a tracer. Mar. Pollut. Bull. 32:727-733

Heislers, S. and Parry, G.D. 2007. Species diversity and composition of benthic infaunal communities found in Marine National Parks along the outer Victorian coast. Parks Victoria Technical Series No. 53. Parks Victoria.

Hewitt, C.L., Martin, R.B., Sliwa, C., McEnnulty, F.R., Murphy, N.E., Jones, T. and Cooper, S. (eds). 2002. National introduced marine pest information system. Available online http://www.marinepests.gov.au/Pages/default.aspx Accessed 04 May 2017

Hinwood, J.B., Potts, A.E., Dennis, L.R., Carey, J.M., Houridis, H., Bell, R.J., Thomson, J.R., Boudreau, P. and Ayling, A.M. 1994. 'Drilling Activities'. In: Environmental Implications of Offshore Oil and Gas Developments in Australia – the Findings of an Independent Scientific Review. Edited by Swan J.M., Neff J.M. and Young P.C. Australian Petroleum Exploration Association. Sydney

Hook, S. and Lee, K. 2015. A review of the ecotoxicological implications of oil dispersant use in Australian waters. CSIRO Oceans and Atmosphere Report, Lucas Heights, NSW, Australia.

Hook, S., Osborn, H. 2012. Comparison of toxicity and transcriptomic profiles in a diatom exposed to oil, dispersants, dispersed oil. Aquatic Toxicology 124-125:139-151.

Howard, R.K. and Edgar, G.J. 1994. Seagrass meadows. In: Hammond, L.S. and Synnot, R.N. (eds) Marine Biology. Longman Cheshire, Melbourne.

Hyland J, Hardin D, Steinhauer M, Coats D, Green R & Neff J (1994). Environmental impact of offshore oil development on the outer continental shelf and slope off Point Arguello, California. Marine Environmental Research 37: 195-229.

IMCRA Technical Group. 1998. Interim Marine and Coastal Regionalisation for Australia: an ecosystem-based classification for marine and coastal environments. Version 3.3. Environment Australia, Commonwealth Department of the Environment. Canberra.

IMO. 2011. Resolution mepc.207(62). 2011 guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species.

IPIECA. 2014. Wildlife response preparedness. Good practice guidelines for incident management and emergency response personnel.

IPIECA. 2017. Dispersants: subsea application: Good practice guidelines for incident management and emergency response personnel. Available at: http://www.oilspillresponseproject.org.

Irving, P. and K. Lee. 2015. Improving Australia's Dispersant Response Strategy, Proceedings of the Thirty-Eighth AMOP Technical Seminar, Environment Canada, Ottawa, ON, pp. 973-987, 2015.

International Tanker Owners Pollution Federation [ITOPF]. 2011. Effects of oil pollution on the Marine Environment. Technical Information Paper: No. 13. Viewed online.

International Tanker Owners Pollution Federation [ITOPF]. Handbook. 2014. Viewed online.

Jenssen, B.M. 1994. Effects of Oil Pollution, Chemically Treated Oil, and Cleaning on the Thermal Balance of Birds. Environmental Pollution, 86.

Jones DOB, Hudson IR & Bett BJ (2006). Effects of physical disturbance on the cold-water megafaunal communities of the Faroe-Shetland Channel. Marine Ecology Progress Series 319: 43-54.

Jones DOB, Gates AR & Lausen B (2012). Recovery of deep-water megafaunal assemblages from hydrocarbon drilling disturbance in the Faroe−Shetland Channel. Marine Ecology Progress Series 461: 71-82.

Jones, F.V., C. Hood, and G. Moiseychenko. 1996. International methods of evaluating the discharge of drilling fluids in marine environments. SPE 46825. In: 1998 SPE International Conference on Health, Safety and Environment in Oil and Gas Exploration and Production. Caracas, Venezuela, 7-10 June 1998. Society of Petroleum Engineers, Inc. Richardson, TX. 18 pp

Klimley AP and Myrberg Jr AA (1979). Acoustic stimuli underlying withdrawal from a sound source by adult lemon sharks, Negaprion brevirostris (Poey). Bulletin of Marine Science, 29: 447–458.

Koopman, M., Knuckey, I., Harris, M. and Hudson, R. (2018). Eastern Victorian Ocean Scallop Fishery – 2017-18 Abundance Survey. Report to the Victorian Fisheries Authority. Fishwell Consulting. 42pp

Laist, D.W., Knowlton, A.R., Mead, J.G., Collet, A.S., & Podesta, M. 2001. Collisions between Ships and Whales. Marine Mammal Science, Vol. 17, Issue 1, pp 35-75.

Langford, T.E.L. 1990. Ecological effects of thermal discharges, xi, 468p. Elsevier.

Lewis, M. and Pryor, R. 2013. Toxicities of oils, dispersants and dispersed oils to algae and aquatic plants: Review and database value to resource sustainability. Environmental Pollution 180:345–367.

Lin, Q. and Mendelssohn, I.A. 1996. A comparative investigation of the effect of South Louisiana crude oil on the vegetation of freshwater, brackish, and salt marshes. Marine Pollution Bulletin, 32: 202–209.

Marquenie, J., Donners, M., Poot, H., Steckel, W. and de Wit, B. (2008). Adapting the spectral composition of artificial lighting to safeguard the environment. Petroleum and Chemical Industry Conference Europe -Electrical and Instrumentation Applications, pp 1-6.

Marine Education Society of Australia (Mesa). 2019. Online resource: Marine Pests of Australia. Available at: http://www.mesa.edu.au/marine_pests/marine_pests13.asp

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

McCauley RD. 2002. Underwater Noise Generated by the Cossack Pioneer FPSO and Its Translation to the Proposed Vincent Petroleum Field, Report produced for Woodside Energy Limited, pp. 24.

McCauley RD. 2004. Underwater sea noise in the Otway Basin – drilling, seismic and blue whales. Report prepared by Centre for Marine Science and Technology, Curtin University, for Santos Ltd McIntyre, A.D. and Johnson, R. 1975. Effects of nutrient enrichment from sewage in the sea. In: ALH Gameson, ed. Discharge of sewage from sea outfalls. New York, Pergamon Press. pp.131–141.

McGurk, M.D. 1986. Natural mortality of marine pelagic fish eggs and larvas: role of spatial patchiness. Mar. Ecol. Prog. Ser. Vol. 34:227–242, 20985. Available from: http://hcrs.co/wp-content/uploads/Hay%20Egg%20Loss%20Folder/McGurk%201986.pdf

McIntyre, A.D. and Johnson, R. 1975. Effects of nutrient enrichment from sewage in the sea. In: ALH Gameson, ed. Discharge of sewage from sea outfalls. New York, Pergamon Press. pp. 131–141

Monniot, F. and C. Monniot 2001 Ascidians from the tropical western Pacific. Zoosystema 23(2):248-336.

Muñoz, J. and McDonald, J. 2014. Potential Eradication and Control Methods for the Management of the Ascidian Didemnum perlucidum in Western Australia. Fisheries Research Report No. 252. Department of Fisheries, Western Australia. 40pp.

Myrberg Jr AA. 2001. The acoustical biology of elasmobranchs. Environmental Biology of Fishes, 60: 31-45.

Neff J.M, Bothner M.H, Maciolek N.J & Grassle J.F. (1989). Impacts of exploratory drilling for oil and gas on the benthic environment of Georges Bank. Marine Environmental Research 27: 77-114.

Neff JM. 2005. Composition, environmental fates, and biological effect of water based drilling muds and cuttings discharged to the marine environment: A synthesis and annotated bibliography. Report prepared for the Petroleum Environmental Research Forum (PERF). Washington DC: American Petroleum Institute. 73 p.

Neff, J.M. 2010. Fates and Effects of Water Based Drilling Muds and Cuttings in Cold-Water Environments. Prepared by Neff & Associates LLC for Shell Exploration and Production Company. A WWW document accessed at https://s08.static-shell.com/content/dam/shell-new/local/country/usa/downloads/alaska/neff-final-draftgs072010.pdf.

Neuparth, T., Costa, F. O., & Costa, M. H. (2002). Effects of temperature and salinity on life history of the marine amphipod Gammarus locusta. Implications for ecotoxicological testing. Ecotoxicology, 11, 61–73.

NMFS 2013. *Marine Mammals: Interim Sound Threshold Guidance* (webpage). National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce. http://www.westcoast.fisheries.noaa.gov/protected_species/marine_mammals/threshold_guidance.html

[NMFS] National Marine Fisheries Service. 2018. 2018 Revision to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts. U.S.

Department of Commerce, NOAA. NOAA Technical Memorandum NMFS-OPR-59. 167 pp. https://www.fisheries.noaa.gov/webdam/download/75962998.

NOAA (National Oceanic and Atmospheric Administration). 2002. Final Restoration Plan and Environmental Assessment for the M/V Kuroshima Oil Spill, Summer Bay, Unalaska, Alaska.

NOAA. 2010. Oil spills in coral reefs: planning and response considerations, US Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service, Office of Response and Restoration.

National Research Council (NRC). 2005. Oil spill dispersants: efficacy and effects. The National Academies Press, Washington, D.C., USA

NSF 2011. Final Programmatic Environmental Impact Statement/Overseas. Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey. National Science Foundation, Arlington, VA.

New South Wales Department of Primary Industries. Marine Pests – Pacific oyster webpage. Online resource available at: https://www.dpi.nsw.gov.au/fishing/pests-diseases/marine-pests/found-in-nsw/pacific-oyster

OGUK. 2014. Guidance on Risk Related Decision Making. Available online at: http://oilandgasuk.co.uk/product/guidance-on-risk-related-decision-making-issue-2-july-2014/ [Accessed 7 January 2017]

OSPAR. 2014. Establishment of a list of Predicted No Effect Concentrations (PNECs) for naturally occurring substances in produced water. OSPAR Commission. OSPAR Agreement: 2014–05

OSPAR. 2009. Assessment of impacts of offshore oil and gas activities in the North-East Atlantic. OSPAR Commission, 40pp.

Oil Spill Response Ltd (OSRL). 2019. Technical Information Sheet / Subsea Well Information Service. Offset Installation Equipment.

Owens, E.H. and Sergy, G.A. 1994. Field guide to the documentation and description of oiled shorelines. Environment Canada, Edmonton, Alberta.

Parks Victoria. 2019. Marine Pests webpage. Online resource available at: https://parkweb.vic.gov.au/park-management/environment/weeds-and-pests/marine-pests

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

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

Popper AN, Hawkins AD, Fay RR, Mann D, Bartol S, Carlson T, Coombs S, Ellison WT, Gentry R, Halvorsen MB, Løkkeborg S, Rogers P, Southall BL, Zeddies D and Tavolga WN 2014. Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report, ASA S3/SC1.4 TR-201.4 prepared by ANSI Accredited Standards Committee Rationale and Background Information (Chapter 8).

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

Rodrıguez A, Burgan G, Dann P, Jessop R, Negro JJ, et al. (2014) Fatal Attraction of Short-Tailed Shearwaters to Artificial Lights. PLoS ONE 9(10): e110114. doi:10.1371/journal.pone.0110114

RPS 2017. Appendix 1: ConocoPhillips Barossa Project Cooling Water Dispersion Modelling. Prepared by RPS for Conocophillips Australia. Report Number: MAQ0540J.000, 7 March 2017.

Schaanning, M.T., K. Hylland, G.Ø. Eriksen, T.D. Bergan, J.S. Gunnarson, and J. Skei. 1996. Interactions between eutrophication and contaminants II. Mobilization and bioaccumulation of Hg and Cd from marine sediments. Mar. Pollut. Bull. 33:71-79.

Shell. 2010. Prelude Floating LNG Project EIS Supplement-Response to Submissions

Shigenaka, G. 2001. Toxicity of oil to reef building corals: a spill response perspective. National Oceanic and Atmospheric Administration (NOAA) Technical Memorandum, National Ocean Service, Office of Research and Restoration 8, Seattle, USA.Simmonds, M.P., Dolman, S.J. and Weilgart, L. (eds). 2004. Oceans of Noise. AWDCS Science Report Published by the Whale and Dolphin Conservation Society. Available online at: http://www.wdcs.org/submissions_bin/OceansofNoise.pdf [Accessed 22 February 2017]

Solstad. 2012. Ballast Water Management Plan AHTS Far Senator.

Southall, B.L., Bowles, A.E., Ellison, W.T., Finneran, J.J., Gentry, R.L., Greene Jr C.R., Kastak, D., Ketten, D.R., Miller, J.H., Nachtigall, P.E., Richardson, W.J., Thomas, J.A and Tyack, P.L. 2007. Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. Aquatic Mammals. 33 (4):411–414.

Terrens, G.W., Gwyther D., and Keogh M.J. (1998) Environmental Assessment of Synthetic-based Drilling Mud Discharges to Bass Strait, Australia. APPEA Journal. V38: Part 1. Proceedings of the APPEA Conference, Canberra, 8-11 March 1998.

Threatened Species Scientific Committee (TSSC). 2015a. Approved Conservation Advice for *Balaenoptera borealis* (Sei whale). Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/34-conservation-advice-01102015.pdf. In effect under the EPBC Act from 01-Oct-2015.

Threatened Species Scientific Committee (TSSC). 2015b. Approved Conservation Advice for Balaenoptera physalus (fin whale). Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/37-conservation-advice-01102015.pdf. In effect under the EPBC Act from 01-Oct-2015.

Threatened Species Scientific Committee (TSSC) 2015c. Approved Conservation Advice for *Megaptera novaeangliae* (Humpback whale). Available online at: http://www.environment.gov.au/biodiversity/threatened/species/pubs/38-conservation-advice-10102015.pdf [Accessed 02 February 2017]

United Nations Environment Programme, (UNEP). 1985. GESAMP: Thermal discharges in the marine environment. UNEP Regional Seas Reports and Studies No. 45.

Victorian Fisheries Authority (VFA). 2017a. Victorian Rock Lobster Fishery Management Plan. Available at: https://vfa.vic.gov.au/. Accessed January 2019.

Victorian Fisheries Authority (VFA). 2017b. Harvest Strategy for the Victorian Wrasse (Ocean) Fishery. Available at: https://vfa.vic.gov.au/. Accessed January 2019.

Walker, D.I. and McComb, A.J. 1990. Salinity response of the seagrass Amphibolis antarctica (Labill.) Sonder et Aschers: an experimental validation of field results. Aquat Bot. 36:359–366.

Wardle CS, Carter TJ, Urquhart, GG, Johnstone, ADF, Ziolkowski, AM, Hampson, G and Mackie, D (2001). Effects of seismic air guns on marine fish. Continental Shelf Research 21: 1005-1027.

Weise, F. K., Montevecci, W. A., Davoren, G. K., Huettmann, F., Diamond, A. W. and Linke, J. 2001. Seabirds at risk around off shore oil platforms in the northwest Atlantic. Marine Pollution Bulletin. 42:1285-1290.

WEL (Woodside Energy Ltd.). 2014. Browse FLNG Development, Draft Environmental Impact Statement. EPBC 2013/7079. November 2014. Woodside Energy, Perth WA

World Bank Group. 2015. Environmental, Health, and Safety Guidelines Offshore Oil and Gas Development. Available online at: http://www.ifc.org/wps/wcm/connect/f3a7f38048cb251ea609b76bcf395ce1/FINAL_Jun+2015_Offshore+Oil+and+Gas_EHS+Guideline.pdf?MOD=AJPERES [Accessed 26 November 2018].

Zieman, J.C., Orth, R., Phillips, R.C., Thayer, G.W. and Thorhaug, A. 1984. The effects of oil on seagrass ecosystems. In: Cairns J, J., Buikema J, A.L. (eds) Restoration of Habitats Impacted by Oil Spills. Butterworth, London.