Esso Australia Resources Pty Ltd (“Esso”)

SNAPPER ENVIRONMENT PLAN

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Abbreviations

Abbreviation	Description
AFMA	Australian Fisheries Management Authority
ALARP	As Low As Reasonably Practicable
AMOSC	Australian Marine Oil Spill Centre
AMSA	Australian Maritime Safety Authority
ANZECC	Australian and New Zealand Environment and Conservation Council
APASA	Asia Pacific Applied Science Association
AS/NZS	Australian Standards / New Zealand Standards
BBMT	Barry Beach Marine Terminal
BHPB	BHP Billiton Petroleum (Bass Strait) Pty Ltd
BOP	Blow Out Preventer
CDSP	Closed Drain Skimmer Pile
CFT	Critical Function Test
CHARM	Chemical Hazard and Risk Management Model
CO_2	Carbon dioxide
COMI	Crane Operation, Maintenance and Inspection
CS	Carbon Steel
DEPI	Department of Environment and Primary Industries (previously Department of Sustainability and the Environment or DSE and Department of Primary Industries or DPI)
DN	Nominal Diameter
DoE	Department of the Environment (formerly Department of Sustainability, Environment, Water, Population & Communities or SEWPaC)
DP	Dynamic Positioning
DPIC	Designated Person In Charge
EAPL	Esso Australia Pty Ltd
EARPL	Esso Australia Resources Pty Ltd
EP	Environment Plan
EPBC	Environment Protection and Biodiversity Conservation
ERA	Environmental Risk Assessment
ERW	Electrical Resistance Welded
FBE	Fusion Bonded Epoxy
FIMS	Facility Integrity Management System
FVO	First Valve On
GBJVOA	Gippsland Basin Joint Venture Operating Agreement
KPI	Key Performance Indicators
LEM	Lifting Equipment Manual
LVO	Last Valve Off
MAOP	Maximum Operating Pressure
MDRT	Measured Depth from Rotary Table
MLA	Marlin A
MLB	Marlin B

Abbreviation	Description
MSL	Mean Sea Level
MSV	Master Safety Valve
NM	Nautical Mile
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NSW	New South Wales
OCNS	Offshore Chemical Notification Scheme
OIMS	Operations Integrity Management System
OPEP	Oil Pollution Emergency Plan
OPGGS Act	Offshore Petroleum and Greenhouse Gas Storage Act 2006
OSTM	Oil Spill Trajectory Modelling
ODSP	Open Drain Skimmer Pile
PAV	Production Annulus Valve
PIC	Person In Charge
PSV	Pressure Safety Valves
PSZ	Petroleum Safety Zone
RAMSAR	Convention on Wetlands of International Importance
RC	Required Competencies
SAV	Surface Annulus Valve
SCSSV	Surface Controlled Surface Safety Valves
SC-SSSV	Surface Controlled Subsurface Safety Valves
SESSF	Southern and Eastern Scalefish and Shark Fishery
SETF	South Eastern Trawl Fishery
SHE&S	Safety, Health, Environment & Security
SIMAP	Spill Impact Mapping and Analysis Program
SNA	Snapper
SSD	Surface Shutdown
SSSD	Subsurface Shutdown
SSSV	Subsurface Safety Valve
SSV	Surface Safety Valve
TPS	Total Platform Shutdown
TUTA	Topsides Umbilical Termination Assembly
UHB	Ultra High Build
WCS	Worst Case Credible Spill
WMM	Waste Management Manual
WOMP	Well Operations Management Plan
WTA	Whiting
WTN	West Tuna
WWEM	Wellwork Execution Manual
ZPI	Zone of Potential Impact

1. Introduction

1.1. Overview

This Environment Plan has been prepared in accordance with the requirements of the *Offshore Petroleum and Greenhouse Gas Storage (OPGGS) Act 2006* and the *OPGGS (Environment) Regulations 2009*, per the amended Act and Regulations as at 28 February 2014. A concordance table is provided in Appendix C. The Environment Plan's development has been guided by N04750-GN1344 Environment Plan Content Requirements (NOPSEMA 2014).

This Environment Plan demonstrates that Esso Australia Resources Pty Ltd ("Esso") has a sound understanding of how its operations interact with the environment and demonstrates the implementation of controls to reduce environmental risks to as low as reasonably practicable (ALARP) and acceptable levels. It also sets appropriate environmental performance outcomes, standards, and measurement criteria for these controls.

The scope of the Environment Plan encompasses all activities relating to the operation of the following facilities and petroleum pipelines:

- Snapper platform (Production Licence VIC/L10);
- SNA-Shore600 Gas (Licensed Pipeline VIC/PL13); and
- SNA-MLA250 Oil (Licensed Pipeline VIC/PL19).

Reference to information previously provided to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) in the West Tuna Environment Plan (AUGO-PO-EMP-030, Rev 2, 27 June 2014, and subsequent Requests for Further Written Information) and the Central Fields Environment Plan (AUGO-PO-EMP-034, Rev 0, 31 October 2014) has been made throughout this document, where applicable, as per Regulation 31 of the OPGGS (Environment) Regulations.

1.2. Background

The Snapper (SNA) platform was installed in 1979 and commenced production in 1981. The platform is located in a water depth of 55 m, 32 km from shore in Production Licence Area VIC/L10. It is a fixed installation consisting of an eight leg steel piled jacket with 45 conductor slots and supporting modules containing production facilities and living quarters.

The SNA platform is connected to the shore by the SNA-Shore600 gas pipeline and to the Marlin A (MLA) platform by the SNA-MLA250 oil pipeline.

Ongoing operational, maintenance, and construction (brownfields) activities will be conducted on this facility and pipelines over the next five years, as well as wellwork operations on the SNA platform.

1.3. Titleholder

Production Licence VIC/L10 is produced by Esso and BHP Billiton Petroleum (Bass Strait) Pty Ltd (BHPB) as 50:50 co-venturers in a joint venture for the exploration, development and production of oil and gas in the Bass Strait.

Esso is the designated operator under the Gippsland Basin Joint Venture Operating Agreement (the GBJVOA). Esso receives services, including personnel, from its wholly owned subsidiary, Esso Australia Pty Ltd (EAPL).

Esso is a titleholder of the production licence over the Snapper and Moonfish fields and associated pipeline licences (as above), as defined in the OPGGS (Environment) Regulations 2009, details as below:

Esso Australia Resources Pty Ltd (ACN 091 829 819)
12 Riverside Quay
Southbank VIC 3006
Telephone: +61 3 9270 3333

The environmental contact for this activity is:

Farrah Tan
Esso Australia Pty Ltd for and on behalf of Esso Australia Resources Pty Ltd
Environment and Regulatory Supervisor
Telephone: (03) 9622 7250
Email: farrah.sl.tan@exxonmobil.com

NOPSEMA (Submissions) will be notified via phone or email of a change in titleholder, a change in the environmental contact or a change in the contact details for either the titleholder or the environmental contact (Reg 15 (3) of the OPGGS (Environment) Regulations 2009).

1.4. Corporate Environment Policy

The ExxonMobil Environment Policy has been described in Section 1.4 of the West Tuna Environment Plan.

1.5. Consultation

Consultation undertaken for the operation of production facilities and pipelines in Bass Strait, including the SNA platform, between December 2012 to May 2013, and April to June 2014, is described in Section 1.5 of the West Tuna Environment Plan.

In addition, a further opportunity was provided to relevant stakeholders to engage or re-engage with Esso from September to October 2014 on the Zone of Potential Impact relevant to this Environment Plan. This included additional consultation with State agencies and fisheries organisations.

The Stakeholder Consultation Log, including the complete report of consultation records, is provided in Appendix E.

2. Environmental Legislation

Relevant Commonwealth, Victorian, New South Wales and Tasmanian legislation as it applies to the operation of facilities and petroleum pipelines has been described in Chapter 2 of the West Tuna Environment Plan.

3. Description of the Activity

3.1. Operational Area

The operational area applicable to the scope of this Environment Plan includes:

- The Snapper (SNA) platform in Production Licence VIC/L10 and the area within a 500 m exclusion zone around the platform;
- The gas pipeline connecting the SNA platform with the shore (SNA-Shore600), covered by Pipeline Licence VIC/PL13 in Commonwealth waters (waters >3nm from shore); and
- The oil pipeline connecting the SNA platform with the Marlin A (MLA) platform (SNA-MLA250), covered by Pipeline Licence VIC/PL19.

3.2. Location

SNA is located within Production Licence VIC/L10 approximately 32 km off the Gippsland coast in approximately 55 m of water depth (Figure 3-1).

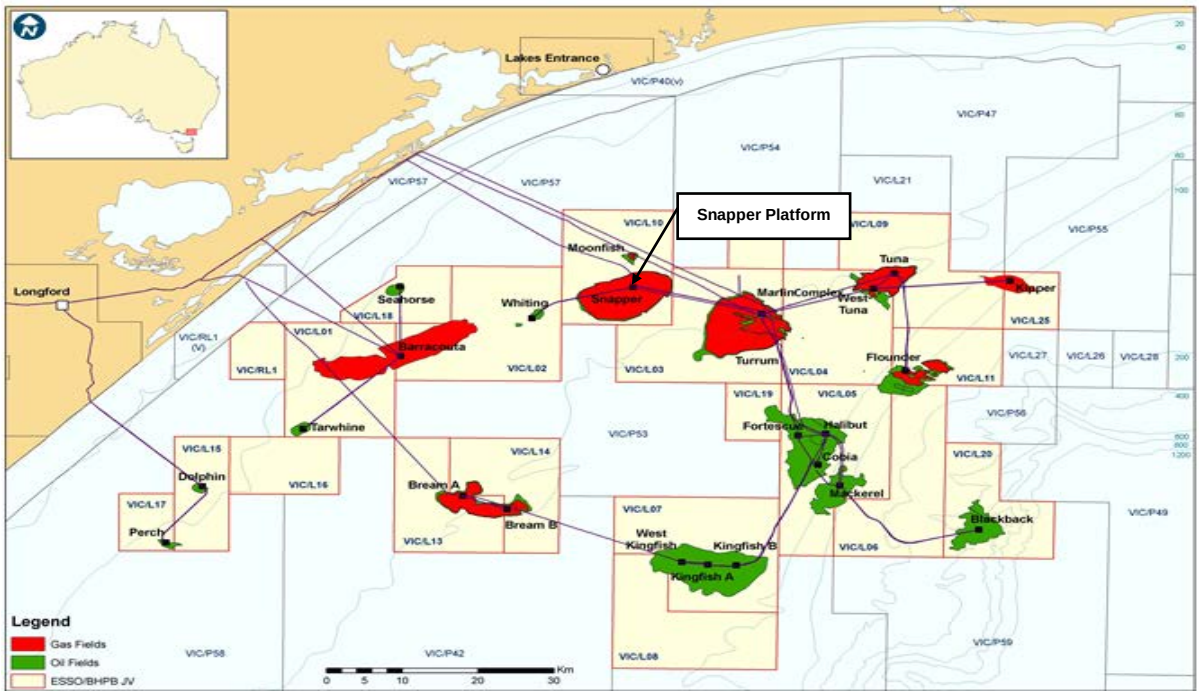


Figure 3-1 Esso production facilities in Bass Strait

The coordinates for the SNA platform are provided in Table 3-1.

Table 3-1 Facility locations

Production Licence No.	Facility Name	Code	Latitude	Longitude
VIC/L10	Snapper platform	SNA	38° 11’ 42” south	148° 01’ 26” east

There are two licenced pipelines originating at SNA platform (Table 3-2).

Table 3-2 Licenced pipelines

Licence No.	Name	Length (km)	DN (mm)	MAOP (kPa)	Approximate Flow Rate	Between	Product
VIC/PL13*	SNA-Shore600	31	600	11,030	17,000 Km^3/day	SNA and Shore	Wet gas
VIC/PL19	SNA-MLA250	18	250	12,100	0.43 ML/day	SNA and MLA	Crude oil

* Licence applies to section of pipeline in Commonwealth waters only.

3.3. General Layout

3.3.1. Snapper Platform

SNA is a fixed installation consisting of an eight leg steel piled jacket with 45 conductor slots. It supports seven modules containing production facilities and a living quarters module (Figure 3-2). The Main Deck area is 59 m x 29 m and is 24 m above MSL. The platform elevation is given in Figure 3-3.

The key equipment items within each of the deck modules (generally described from north to south) are detailed below.

Module 1 is situated at the northern end of the platform and supports the flare boom. At the Main Deck level it contains the radio tower and Whiting (WTA) oil and gas pig receivers on the west side, WTA production separator in the centre, and WTA gas compressor and MOL pump on the east side. The WTA oil and gas pipeline First Valves On (FVOs) are located below the south-west corner of Module 1. WTA does not receive flow from other platforms and the pipelines from WTA to SNA are currently disconnected from WTA at the LVOs on WTA and filled with inhibited water.

At Cellar Deck level, Module 1 contains the vessels comprising the flare, vent and drain system, diesel and glycol storage tanks and the glycol injection pumps. Glycol is also stored in Leg D1 below the south-east corner of Module 1.

The closed drain skimmer pile is located in Leg D2 below the south-west corner of Module 1 and the open drain skimmer pile is a separate caisson adjacent to Leg D2.

Module 2 is the wellbay module with mostly grated flooring at both the Cellar Deck and Main Deck levels. A splash wall running from east to west across the Cellar Deck level of Module 2 separates the wellbay from Module 3.

The riser from the MLB-SNA450 pipeline which transports gas from the Marlin B (MLB) platform is located on the west side of Module 2.

Module 3 contains the production manifolds and test separator at the Cellar Deck level. The chemical store is located on the west side across Modules 3 and 4 at the Main Deck level.

The FVO and pig receiver for the pipeline are located on a platform below Cellar Deck level, adjacent to L3. This imported gas from MLB combines with SNA produced gas downstream of the SNA isolation valves. The combined gas streams are then exported to Longford via the SNA-Shore600 gas pipeline.

The WTA oil and gas risers are located below the north-west corner of Module 3.

Module 4 contains the gas production separators and fuel gas system at the Cellar Deck level. The SNA gas compressor aftercoolers and the platform crane are located on the eastern edge of the module at the Main Deck level.

The pig launcher for the gas export pipeline passes through Module 4 and is accessed at the Main Deck level. The gas export pipeline LVO and riser are located below the west side of Module 4.

Module 5 contains the SNA oil production separator, SNA gas compressor and MOL pumps and the oil export pipeline pig launcher at the Cellar Deck level. The water handling facilities are also located here. The SNA-MLA250 oil export pipeline LVO and riser are located below the east side of Module 5. Module 5 is separated from Module 6 by a firewall running east-to-west across the Cellar Deck level.

Module 6 is a utilities module containing turbine generators, fire pumps, and air compressors at Cellar Deck level.

Figure 3-2 Snapper platform

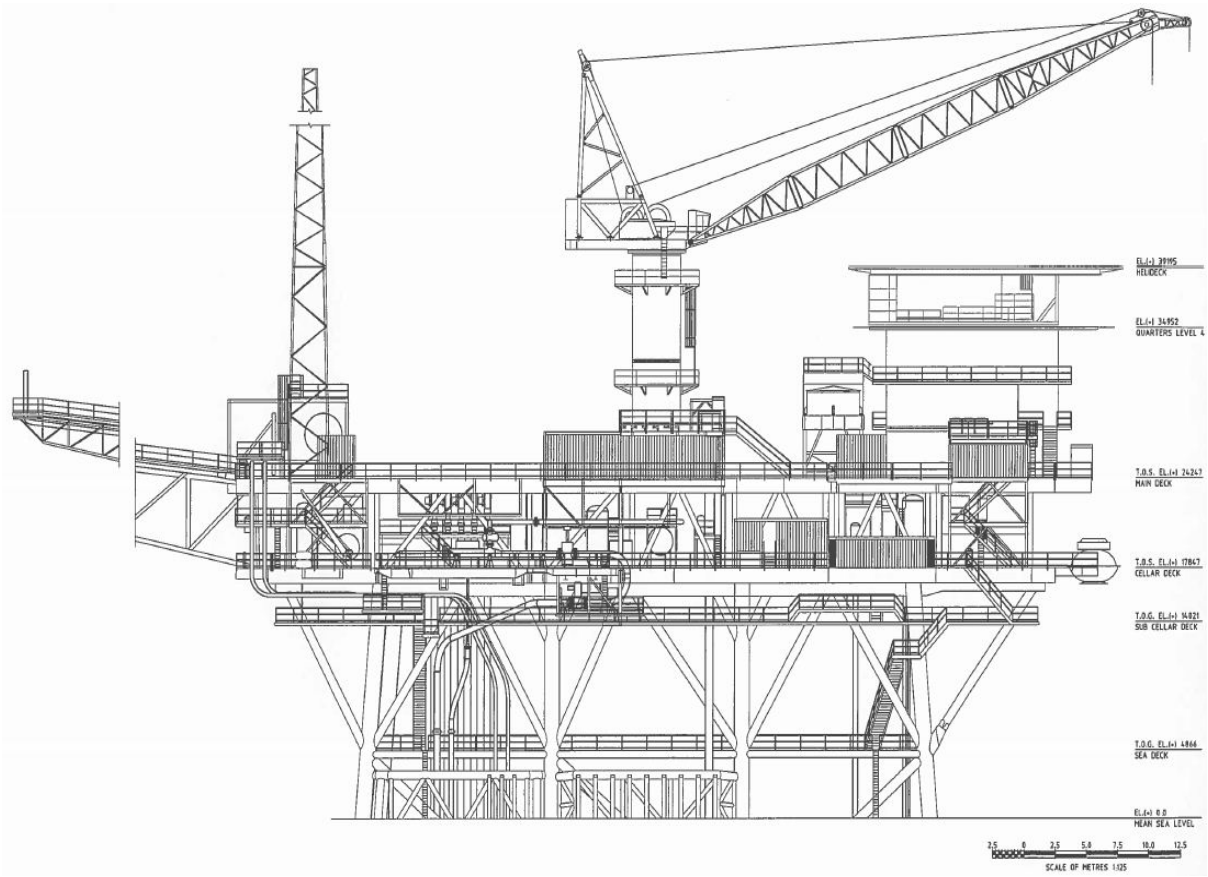


Figure 3-3 Snapper platform elevation

Module 7 is another utilities module at the Cellar Deck level. It contains the standby generator, switchgear room, battery room, ventilation systems, desalination unit, and workshops. The primary EAAs and brucker escape capsules are located south of Module 7.

An additional switchgear room and battery room for the WTA facilities is located in Module 7 at the Main Deck level. The Operator's laboratory is also located here. Legs A1 and A2 at the southern end of the jacket are used for water storage.

The **Living Quarters** is a separate module that connects directly to Modules 6 and 7 at the Main Deck level. The galley, laundry, dining and recreation areas are on Level 1 of the Quarters. The control room, radio and first aid room, day offices, gymnasium, and 4 bedrooms are on Level 2 of the Quarters. The remaining 12 bedrooms and most ablutions are on Level 3 of the Quarters. An additional level of quarters added initially to support drilling operations has been made permanent and includes an additional laundry, recreational room and kitchenette. The helideck is located above the Quarters.

The SNA platform layout is shown in Figure 3-4.

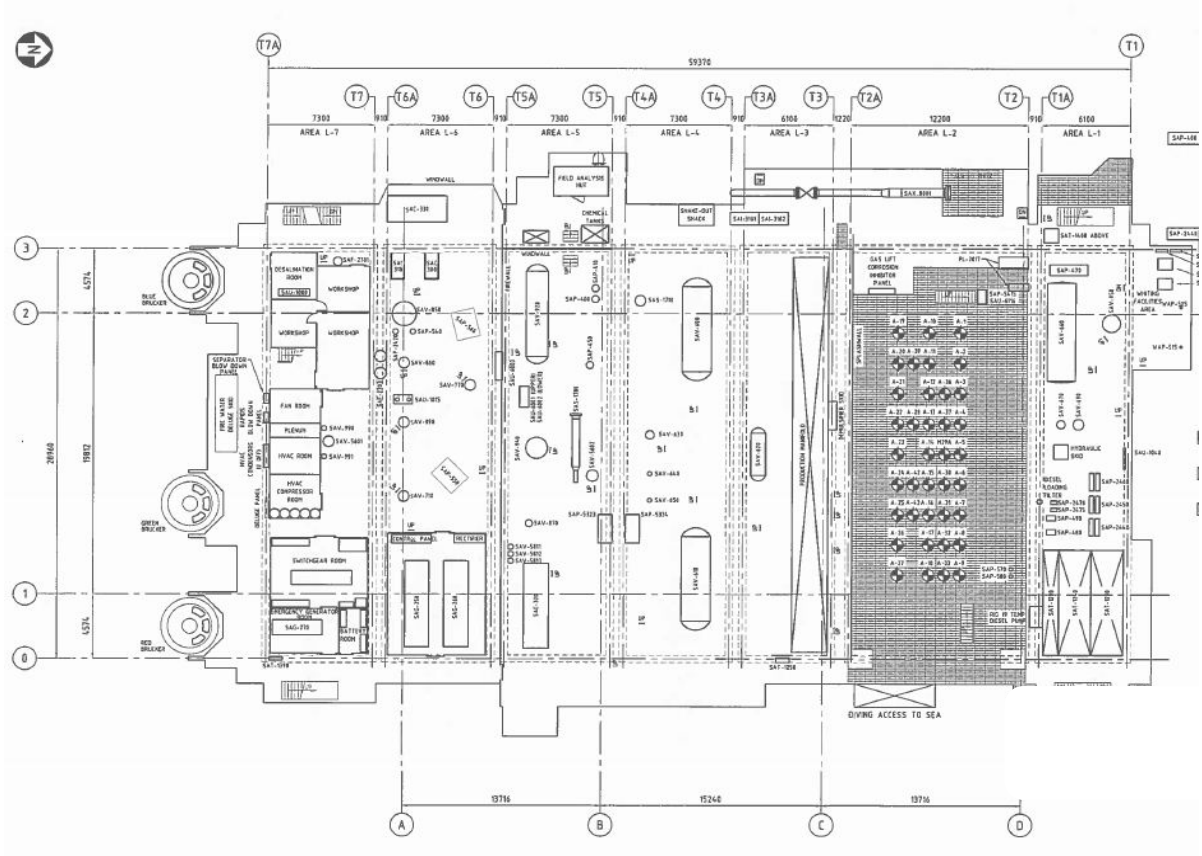


Figure 3-4 Snapper platform deck modules (Cellar Deck)

3.3.2. Platform Wells

The SNA platform has 45 slots, 39 conductors and 33 wells drilled. In general on SNA:

- There is a combination of 2-7/8" to 5-1/2" production tubing in the wells, which is inside 7-5/8" or 9-5/8" production casing. Some wells also contain either a 5-1/2" or 7" liner.
- The depth of the Subsurface Safety Valves (SSSV) is between 430 m and 490 m MDRT (Measured Depth from Rotary Table), approximately 340 m to 410 m below the mudline.
- The wellheads are all rated to either 3000 or 5000 psi.
- All wells are classified as oil or gas producers.

- All oil wells are equipped with either gas lift mandrels or sliding side doors. One well currently does not require gas lift for oil production; however it is anticipated this will be required within the next 5 years.

For platform wells, wellhead and tree valves provide barriers between the wellbore and facility during well operations, well entry, and in emergency situations. The surface and production annulus are accessed via the Surface Annulus Valve (SAV) And the Production Annulus Valve (PAV) respectively, and have been described further below:

- The surface casing provides a barrier between possible shallow formation zones and the wellbore. It is maintained full of corrosion inhibited fluid to resist ingress from shallow formations.
- The production casing prevents the escape of formation fluids from the wellbore if completion integrity is lost. Inhibited fluid in the production annulus protects casing/tubing from degradation.

At all times throughout the life of a well, there are at least two independent and tested barriers available. A barrier is any device that prevents uncontrolled flow from a well, mechanical or hydrostatic fluid, downhole or surface. Typical barriers during the production phase for the tubing are Xmas tree valves (specifically the Master Safety Valve (MSV); the primary actuated barrier in the event of an emergency and is therefore a critical valve) and SSSVs, while typical annulus barriers are hanger seals, corrosion inhibited fluid and the packer.

Automated systems are in place to initiate a surface and subsurface shutdown if there are abnormal operating conditions. SSSVs are installed in all offshore wells. The SSSV is a valve which is held open against a spring by hydraulic pressure via the SSSV hydraulic control line.

3.4. SNA-Shore600 pipeline

The SNA to Shore (SNA-Shore600) pipeline is a 600 mm nominal diameter, 31 km long gas transmission line running from the SNA platform to the Shore. This EP covers the portion of the pipeline to 3nm offshore where the pipeline enters State waters.

The SNA-Shore600 pipeline begins at the pig launcher on the SNA platform and terminates at the shore crossing at Loch Sport.

The route crosses the following existing pipelines:

- WTA-SNA250 (VIC/PL24).
- WTA-SNA200 (VIC/PL25).

The main pipeline segments are made from API-X52 SAW carbon steel (CS) line-pipe. On-bottom stability of the pipeline is achieved with concrete weight coating (CWC) of varying thickness along the length of the pipeline (between 16 mm and 140 mm). Primary external corrosion protection for the pipeline is provided by a 3.2 mm coal tar enamel (CTE) coating. Further protection is provided with the use of sacrificial zinc anode bracelets and anode sleds.

The export riser is made from API-X60 seamless CS line-pipe. In the splash zones, the risers are wrapped in a carbon steel sleeve and a 12 mm thick Monel sheath. Heat shrink sleeves are installed over the ends of the sleeve to seal out moisture. Below the splash zone, the riser is coated with a 6 mm thick Acalor coating in accordance with Esso specification for offshore structures.

3.5. SNA-MLA250 pipeline

The SNA to MLA (SNA-MLA250) pipeline is a 250 mm nominal diameter, 18 km long oil export line running from the SNA platform to the MLA platform.

The SNA-MLA250 pipeline begins at the pig launcher on the SNA platform and terminates at the pig receiver on the MLA platform.

The route crosses the following existing pipelines:

- MLA-Shore500 (VIC/PL2).
- MLB-SNA450 (VIC/PL41).
- MLA-KFB150 secondary line.

The main pipeline segments are made from API-X52 seamless CS line-pipe. On-bottom stability of the pipeline is achieved with 38 mm of CWC. Primary external corrosion protection for the pipeline is provided by a 4 mm CTE coating. Further protection is provided with the use of sacrificial zinc anodes and impressed current systems on the two platforms.

The tie-in spools and both export and import risers are made from API-X52 sour service seamless CS line-pipe. In the splash zones, the risers are wrapped in a 10 mm carbon steel sleeve and a 4.75 mm Monel sheath. Below the splash zone, the riser is coated with a 3 mm thick steel shield vinyl ester resin.

3.6. Snapper Platform Process Description

Gas wells on SNA flow through production flowlines into a gas production header. This header feeds both the east and west gas separators. The hydrocarbon liquid and water phases pass from the gas separator into the oil production header or export oil pipeline (SNA-MLA250), while the gas phase passes directly into the export gas pipeline (SNA-Shore600). The liquids can also be reinjected by free flow into the reservoir. In addition to the produced gas in the SNA-Shore600 export gas pipeline, sweet gas which flows in the MLB-SNA450 gas pipeline from the Marlin B (MLB) platform (gas produced from the MLA wells) is combined with SNA gas, downstream of the separator metering and isolation valves.

Oil wells on SNA from both the Snapper and Moonfish reservoirs flow through production flowlines into a 200 mm oil production header. This header feeds the oil separator. Produced fluids are separated into three phases and water is directed to the water handling system for treatment prior to disposal. The hydrocarbon liquid phase from the oil separator passes through one of two parallel electrically driven booster pumps and through a turbine driven MOL pump which boost the pressure to flow into the 250 mm oil export pipeline (SNA-MLA250). The gas phase from the SNA oil separator is compressed in the SNA gas compressor (C-320) and WTA gas compressor (C-2505) operating in series. Fin fans provide interstage and final discharge cooling.

The WTA production facilities on the SNA platform, apart from the gas compressor, (WAV-805), booster pumps (WAP-505 and WAP-515) and MOL pump (WAP-535) have been mothballed pending potential application for future WTA production.

Well testing of all wells is conducted through a common 150 mm test header feeding the test separator which returns all fluids to the production headers. Alternate headers are available for well testing.

Gas lift gas is supplied from the gas production separator (SAV-610) through a 100 mm gas lift header and 50 mm gas lift flowlines to lift the oil wells. The gas compressor discharge may also be used for this supply.

Fuel gas is drawn down from the gas separators to the fuel gas turbine drivers on the gas compressors, WTA MOL pump and generators. Fuel gas is also used for continuous purge of the flare system, to provide blanket gas to tanks and vessels and bubbler tube level indication.

3.6.1. Produced Water System

Produced water is separated from the crude in the production separator (WAV-805). The water (oily water) from the separator flows through the shutdown valve (UV-1315), mixes with clarifier chemical from clarifier pumps and then flows to the deoiler hydrocyclones (SAU-6001 and SAU-6002).

The hydrocyclones separate the oil from the produced water. The oily water from the hydrocyclones is sent to a degasser (SAV-5602) where further separation of oil from water occurs, before it is returned to the production header via MOL pump suction through oily water pumps (SAP-5323 and SAP-5324). The clean water from the deoiler hydocyclones goes to a DGF vessel (SAV-940).

The clean water from the DGF is discharged overboard via a flow meter, another control valve and the overboard shutdown valve. The oily water stream is transferred back to the degasser vessel via a control valve.

The quality of the water overboard is continuously monitored by an oil-in-water analyser.

3.6.2. Flare System

A relief header directs vapours vented from the Pressure Safety Valves (PSV) and blowdown valves via the two flare scrubbers to a flare mounted at the end of a cantilevered flare boom at the north end of the platform.

The flare system is designed for a flow rate of 1,416 km^3/day. The flare is also configured with a reliable hydrocarbon gas purge for protection against flashback explosion, which could otherwise result from air ingress at zero to low flaring rates.

The flare scrubbers are located at the end of the relief header, at the north end of the platform, before the flare header rises up the flare boom. The primary function of the scrubbers is to remove liquid from the gas stream. Liquids removed from the flare scrubbers are directed to the Closed Drain Skimmer Pile (CDSP). Gas from the flare scrubbers is routed to a flare tip where it is ignited by a continuous pilot light.

3.7. Drain System

The SNA platform has a number of different drain systems:

- Open drain and deluge systems:
  - Open drain system that handles:
    - Chemicals, oils and waste from bunded areas or designated containment areas.
    - Rainwater or sea spray runoff on decks.
  - Deluge drains that dispose of excess deluge water directly overboard.
- Closed drain systems:
  - The closed drain system drains process equipment at higher than atmospheric pressure such as wellheads, separators and flowlines, process equipment and instrument bridles.

Skimmer piles are used to separate hydrocarbons from water in liquids directed to the open and closed drain. The open and closed drain systems each have their own skimmer pile caisson that interfaces with the sea via the pile window. Hydrocarbon vapours migrate to the top of the pile, hydrocarbon liquids settle out on top of the water in the pile, and water at the very bottom of the pile discharges to sea via the pile window.

3.8. Fuel Combustion Equipment

Fuel combustion equipment includes standby generators and compressors, and normally-operating turbines, compressors, generators and pumps, as well as other smaller equipment. Fuel combustion equipment on supply vessels includes generators, engines, turbines and pumps. The main fuel combustion equipment on the helicopters are the engines.

4. Description of activities that have the potential to impact the environment

This section outlines the aspects of the project that have the potential to impact the environment and it has been divided into two main groups of activities:

- Gippsland wide co-ordinated activities, including:
  - Support operations.
  - Inspection, maintenance and repair.
  - Wellwork.
- Facility specific activities, including:
  - Platform presence and operations.
  - Processing.
  - Unplanned events.

4.1. Gippsland Wide Co-ordinated Activities

The West Tuna Environment Plan describes a number of Gippsland wide co-ordinated activities that also apply to SNA operations. The hazards associated with these Gippsland wide co-ordinated activities are:

Support operations

- Sewage discharge from vessels (RA 1).
- Disposal of food wastes from vessels (RA 2).
- Disposal of general, solid or hazardous waste from platform (RA 3).
- Disposal of general, solid or hazardous waste from vessels (RA 4).
- Vessel deck drainage (RA 5).
- Vessel oily water (bilge) discharge (RA 6).
- Ballast water discharge (RA 7).
- Vessel biofouling (RA 8).
- Vessel and helicopter movements – collision with fauna (RA 9).
- Fuel combustion equipment on vessels (RA 10).

Inspection, maintenance and repair

- Surface structure maintenance, inspection and intervention (RA 11).
- Subsea structure maintenance, inspection and intervention (RA 12).
- Remotely operated vehicle (ROV) operations (RA 13).

Wellwork operations

- Discharge of wellwork fluids (RA 14).
- Discharge of cement or sand in wellwork operations (RA 15).
- Use and storage of radioactive sources (RA 16).

Note: 'RA' refers to the line item in the Risk Assessment in the West Tuna Environment Plan.

4.1.1. Support Operations

Support operations, including vessel and helicopter activities, are identical to, and have been described in, Section 4.1.1 of the West Tuna Environment Plan.

Supply vessel loading/unloading operations including bulk transfer of diesel and glycol, can take place on the east side of the platform. There is no bulk transfer of methanol.

4.1.2. Inspection, Maintenance and Repair

Inspection, maintenance and repair activities are identical to, and have been described in, Section 4.1.2 of the West Tuna Environment Plan.

4.1.3. Wellwork Operations

Wellwork operations include workover and wireline activities. Workover activities on the platform are expected to be in progress for approximately 6 months at a time every 4 years or similar over the remaining field life. Wireline activities on the platform are typically in progress for 5 weeks per year.

Wellwork operations have been described in Section 4.1.3 of the West Tuna Environment Plan.

4.2. Facility Specific Activities

The hazards that have been assessed from the risk assessment undertaken for SNA operations (RA, detailed in Section 8) that relate to operation of the platform and associated pipelines are:

Platform Presence and Operations

- Physical presence - Noise from platform, vessels and helicopters (RA 18).
- Physical presence - Interference with other marine users (RA 19).
- Operation and maintenance of platform (RA 20).
- Sewage discharge from platform (RA 21).
- Disposal of food wastes from platform (RA 22).
- Foam deluge system (RA 24).
- Chemicals and oils storage and handling (RA 25).
- Bulk transfer from vessel to platform via hose (RA 26).

Processing

The hazards associated with processing that are discussed in section 8 are:

- Pipeline hydrotest, flooding, dewatering and watering out discharges (RA 27).
- Produced water discharge (RA 29).
- Production drainage from open and closed pile systems (RA 30).
- Venting (RA 31).
- Flaring - Emissions to atmosphere (RA 32).
- Flaring - Carryover of liquid hydrocarbon (RA 33).
- Fuel combustion equipment on platform (RA 34).

Unplanned Events

- Vessel collision with another vessel or platform (RA 35).
- Loss of well control/well blowout from workover operations or well integrity failure (RA 36).
- Loss of containment from pipeline and topsides (RA 37).

Note: 'RA' numbers are not sequential.

4.2.1. Platform Presence and Operations

4.2.1.1. Physical Presence

The SNA platform is located within the Area to Be Avoided and a considerable distance from the shipping lanes which form part of the traffic separation scheme administered by AMSA.

SNA is usually continuously staffed and there is overnight accommodation for a maximum of 79 people. Routinely there are between 8 and 14 operations and maintenance personnel on board. This number may rise to between 25 and 65 during construction, wellwork or maintenance campaigns.

SNA is equipped with 2 x 800 kW gas turbine driven generators, both of which are equipped with air start and can run on diesel such that they can be started and run with the platform shutdown.

SNA is equipped with navigation lights, crane clearance lights, helipad lights and radio tower lights. Esso operational areas are remote from seabird and turtle nesting areas and therefore lighting from associated structures and vessels has a low potential for impacting marine fauna. The presence of platform lighting does not appear to disrupt or disorient fish or marine mammals such as seals or cetaceans. There are no environmental risks or impacts associated with lighting; therefore it will not be discussed further in this EP.

The Noise Map of SNA (Cellar Deck) indicates that there are small discrete high noise areas (turbine generators, fire water pumps, gas compressor, emergency generator) on the Cellar Deck, however the majority of noise generated on the platform is likely to be 80 to 85 dB or below. The main continuous noise generators on the platform are the gas compression turbines and the turbine power generators.

SNA obtains its potable water by reverse osmosis (RO) desalination of sea water. Supply vessels operating out of BBMT may supply potable water, if required. Potable water is used to supply the quarters, hot water heaters, radiator fill to the air compressors, crane and standby generator, turbine wash, eye wash stations and some safety showers. Reject RO water contains a brine fluid that remains after reverse osmosis, and as it is a salty brine which is similar to sea water, there are no environmental risks or impacts associated with the RO discharge; therefore it will not be discussed further in this EP.

4.2.1.2. Waste Generation and Disposal

Platform operations will generate both general wastes (solid inert materials including plastics, paper, glass and metal) and hazardous wastes (including waste oil and chemicals, laboratory wastes, separator sludge and sand, oily filters, oily rags and empty drums containing oil or chemical residues).

Waste discharges from SNA include sewage and grey water, cooling water, and putrescible food wastes. Solid general and hazardous wastes are temporarily stored on the platform, transported onshore and appropriately disposed.

It is estimated that 60 L/person/day of sewage and 140 L/person/day of grey water is produced on the platform. The sewage macerator on the platform has a design capacity of 40,000 L per hour, which is sufficient for above the maximum number of people on board.

4.2.1.3. Cranes and Lifting Equipment

A platform crane is located on the east side of the SNA platform. The crane is fuelled with diesel.

4.2.1.4. Fire Protection System

Two diesel driven seawater fire pumps supply water to deluge and sprinkler systems upon detection of fire. The production and the wellhead areas are protected by a deluge system. The living quarters and Modules L6 and L7 are protected by a pressurised sprinkler system.

Alcohol Type Concentrate (ATC) Aqueous Film Forming Foam (AFFF) can be applied via the deluge system or hose reels.

Operation of the foam deluge system occurs either:

- As part of testing of the system. This allows verification of the system functionality, and tests the ability of the system to aspirate a concentrated firefighting foam solution and deliver it to the correct dilution and flow rate at the foam application areas; or
- As demanded during an actual fire event.

Dry chemical portable extinguishers are located throughout the production and utility areas. Electrical equipment rooms and workshops are similarly equipped with portable extinguishers.

4.2.1.5. Storage and Handling of Oils and Chemicals

Oils and chemicals are used as part of the daily operation of the platform (e.g., cleaning decks, fuelling crane, includes paints and solvents etc.) and in the platform process (e.g., corrosion inhibition of pipelines, water handling chemicals, workover base fluid and chemical additives). Oils, including diesel, and chemicals are transferred via crane and stored as either packaged goods, in drums or in intermediate bulk containers (IBCs). Oil and chemicals are also transferred via hose by bulk into tanks on the SNA platform.

Glycol is also stored in the jacket leg D1 (approximately 170,000 L).

The chemical selection and approval for discharge process is identical to, and has been described in, Section 4.2.1.5 of the West Tuna Environment Plan.

4.2.2. Processing

4.2.2.1. Pipeline Processing

Pipeline processing activities have been described in Section 4.2.2.1 of the West Tuna Environment Plan, including batch inhibition and continuous corrosion inhibition, hydrate inhibition, pipeline hydrotesting, pipeline watering out and dewatering and pipeline valve operation.

4.2.2.2. Produced Water

The quality of produced water from the water handling system is continuously monitored by an oil-in-water (OIW) analyser using a side stream from the discharge line. For the purpose of produced water clean up, it is directed to the closed drain skimmer pile. In the event the produced water exceeds 30mg/L OIW, the water handling system automatically shuts down and the produced water is directed to the pipeline.

4.2.2.3. Open and Closed Drains and Piles

The SNA platform has two skimmer piles: SAT-6250 the Open Drain Skimmer Pile (ODSP) and SAT-6240 the Closed Drain Skimmer Pile (CDSP).

Drains connected to production facilities carry liquids to the CDSP. The CDSP is the larger of the two skimmer piles and is the D-2 jacket leg. The CDSP is vented at the end of the flare boom. Hydrocarbon liquid is recovered from the pile and pumped to the skimmer vessel (SAV-660) by the CDSP low head submersible pump (SAP-460) and then into the pipeline. Water passes out the bottom of the pile to sea at 49 m below MSL.

All open drains are routed to the ODSP. The ODSP has less capacity than the CDSP and is a skirt pile follower of 1219 mm diameter located east of the D-2 jacket leg. The ODSP separates any hydrocarbons from the water, and hydrocarbons are pumped to the CDSP. Any water soluble chemicals within the deck drainage system will exit the ODSP via the pile subsea window at 35.8 m below MSL. The ODSP is vented at the end of the flare boom.

Sets of bubble tubes are used to measure the volume of oil within the piles. Purge gas is used to operate the bubble tubes. Each skimmer pile has a submersible pump that pumps the hydrocarbon liquids out of the pile; the ODSP pump discharges to the CDSP and the CDSP pump discharges to the skimmer vessel and subsequently into a pipeline. Pumps are controlled automatically based on level measurement.

The skimmer vessel provides an additional stage of hydrocarbon separation before fluids from the closed drain system enter the closed pile. The skimmer vessel contents are drained periodically to the pile to manage levels and for maintenance of the inside of the vessel.

4.2.2.4. Flare and Vent Operation

Flaring is conducted from the platform for the safe disposal of hydrocarbons during process upset, maintenance, commissioning/startup or emergency conditions. A pilot light is maintained constantly with a small amount of gas such that the flare normally stays alight. Flaring rates on SNA do not usually exceed 10 km^3/day. In 2012, SNA flaring contributed 2,837 tonnes CO_2 equivalent greenhouse gas emissions.

Venting may also occur from process pipework, process equipment (such as compressor cases), and through some pipeline flexibles. There are no pipeline flexible sections on the Snapper pipelines.

4.2.2.5. Fuel Combustion Equipment

Fuel combustion equipment on the SNA platform is identical to, and has been described in, Section 4.2.2.7 of the West Tuna Environment Plan.

In 2012, SNA fuel combustion contributed 20,472 tonnes CO_2 equivalent greenhouse gas emissions.

4.2.3. Unplanned Events

The hazards associated with unplanned events that have been assessed and are described in detail in Sections 5 and 8.

5. Oil Spill Trajectory Modelling for Credible Spill Scenarios

5.1. Worst-case Credible Spill Scenario Identification

Based upon the proposed activities, an assessment of all potential unplanned hydrocarbon release scenarios which could occur was identified at the Environmental Risk Assessment (ERA). These scenarios included:

- Release of hazardous waste from the platform and from vessels (RA 3 and RA 4).
- Release of deck drain water, containing hydrocarbons, from vessels (RA 5).
- Release of vessel oily water (bilge) (RA 6).
- Release of oils and chemicals (RA 20, RA 25 and RA 26).
- Release of hydrocarbon-containing water from pipeline hydrotest, flooding, dewatering and watering out (RA 27).
- Release of hydrocarbons from the open and closed pile system (RA 30).
- Carryover of liquid hydrocarbons (RA 33).
- Release of diesel or other hazardous chemicals from a vessel to vessel collision or vessel to platform collision (RA 35).
- Release of hydrocarbon fluids (RA 36) from:
  - A short duration, four-day, loss of well integrity event.
  - A subsea equipment failure.
  - An extended duration loss of well control/well blowout from well integrity failure or workover operations.
- Release of hydrocarbon fluids (RA 37) from:
  - A pipeline pinhole release or through venting.
  - A topsides piping release.
  - A total failure of the topsides riser (surface).
  - A pipeline failure due to drag or rupture.

Of the above scenarios, the extended duration loss of well control/well blowout from well integrity failure or workover operations scenario (loss of containment of light crude at surface, RA 36) presented the worst case credible spill (WCS) and was taken forward to modelling (see Section 5.2.1). A release of waxy crude from wells on SNA (versus a representative light crude) was considered. A Snapper scenario (rate and volume) that would result in a worse consequence than the Gippsland maximum discharge case is not considered credible and was not taken forward to modelling.

Modelling was also undertaken for the unplanned release scenarios RA 35 and RA 37, as follows:

- RA 35: A vessel collision with another vessel or with the platform, resulting in a rupture of the hull and the loss of a fuel tank (280,000 L of diesel) over 6 hours was modelled. This modelling was undertaken at SNA.
- RA 37: A pipeline rupture from an anchor drag/dropped object resulting in the partial loss of inventory of the pipeline was modelled. The modelling was undertaken for a light crude pipeline (based on a subsea pipeline failure at the Marlin tee, located 1.7 km from MLA platform, where the release (695,000 L) is stopped in 95 hours) and a gas/condensate pipeline (based on a subsea pipeline failure of the MLA-Shore500 pipeline at 3nm from shore, where the release (9,871,000 L) is located approximately 28 km from the SNA platform and is stopped in 12 hours). The total loss of inventory from the SNA-MLA250 oil pipeline (867,000 L of light crude) and the SNA-Shore600 gas pipeline (9,599,000 L of gas and condensate) would involve a lesser volume being spilled than the modelled scenarios, since the leak would be stopped prior to a full release due to subsea pressure equilibrium.

Scenarios RA 35 and RA 37, in addition to the remaining scenarios listed above, have been determined to encounter a release volume less than the WCS and are considered to result in a smaller ZPI, therefore have not been discussed further in this chapter.

The OPEP contains information on proposed response actions to a Level 1, 2 or 3 spill event from any of these scenarios.

5.2. Assessment of Environmental Impact of Worst-case Credible Spill Scenario

This section discusses the outcomes of the Oil Spill Trajectory Modelling (OSTM) for the selected worst case credible spill scenario. It focuses on defining the likelihood of oil contact (surface, entrained and dissolved) with specific sensitive locations above the lowest threshold and shows the furthest possible extent from the release location that oil could reach, at the lowest threshold, if the spill scenario occurred. This is an extremely conservative worst case credible spill scenario.

5.2.1. Modelled Worst Case Credible Spill Scenario

The worst case credible spill (WCS) scenario for the loss of hydrocarbon is a surface release of light crude (loss of well control / well blowout event). A loss of well control / well blowout event can eventuate at the sea surface from a dropped object on a well with well integrity issues or during workover activities. This event can result in a failure unrecoverable with the well control skid pump, wireline unit pump or workover unit pump.

The modelled scenario was based on the following:

- Four release locations at the Snapper (SNA), Bream A (BMA), Kingfish A (KFA) and Flounder (FLA) platforms.
- A worst-case credible release duration of 98 days (14 weeks).
- A release at sea surface.
- A representative light crude with:
  - A density of 816 kg/m^3 and a dynamic viscosity of 4 cP @ 20°C.
  - 36% volatiles, 17% semi-volatiles, 22% low volatiles and 25% persistent compounds.
  - A Group II oil (light-persistent oil).

Calculations have indicated that the light crude discharge rate in such a worst-case blowout scenario will commence at 8,000 bbl/day and decline linearly to 2,000 bbl/day over the discharge period. A conservative estimate of 14 weeks (98 days) has been calculated to drill a relief well based on the time to mobilise a rig from Australia or South East Asia and factoring in the time taken to deploy a rig, resources and equipment. Arrangements to mobilise a suitable rig to drill the relief well would occur as soon as possible. This equates to a total discharge over the 14 weeks of 77,889 m^3 (77,889,000 L or 489,874 bbl).

It is estimated that it would take 11 weeks to drill a relief well with a jack-up rig or 14 weeks to drill a relief well using a semi-submersible rig mobilised from Australia or South East Asia to the platform. The modelling, therefore, is based on the more conservative 14 weeks release duration. Fourteen weeks assumes one week to secure a semi-submersible rig, eight weeks to mobilise the rig and four to five weeks to drill the relief well.

The modelled worst case credible scenario has been determined to result in a larger ZPI than a sea surface release of condensate at the SNA platform, or a subsea release of light crude and condensate at the SNA platform.

5.2.2. Modelling Methodology

Esso commissioned RPS APASA to undertake OSTM using a three-dimensional oil spill trajectory and weathering model, SIMAP (Spill Impact Mapping and Analysis Program) (APASA, 2014). SIMAP was run multiple times to simulate the defined spill scenarios using different samples of current and wind data based on randomly selected historic time-series of wind and current data (5 years duration) representative of the study area as follows:

- 50 simulations were completed per release location (total of 200 simulations) over a period of 112 days (16 weeks).
- The 0.5% probability contour is shown as the lowest resolution contour.

Results from the simulations were combined and statistically analysed to produce maps or tabulated results at sensitive locations showing multiple parameters including the probability of exposure above nominated shoreline, sea-surface and water column thresholds, and minimum time before sea-surface contact presented on an annualised basis.

One objective of the stochastic spill modelling is to establish a Zone of Potential Impact (ZPI) that may be exposed to surface or in-water hydrocarbons resulting from a marine hydrocarbon spill. Delineation of the ZPI is based on the furthest feasible extent from the release location (lowest exposure zone) of all modelled scenarios where hydrocarbon thresholds, including surface, entrained and dissolved aromatic hydrocarbons could be exceeded. Further details on the ZPI are given in Section 5.4 of this EP.

5.2.3. Environmental Assessment Thresholds

The potential for sensitive receptors to be exposed to surface, entrained and dissolved hydrocarbons is informed by the application of assessment thresholds. Assessment thresholds for hydrocarbon exposure (sea surface, shoreline, and water column dissolved aromatics and entrained hydrocarbons) have been described in Section 5.2.3 of the West Tuna Environment Plan.

5.3. Spill Modelling Outcomes

5.3.1. Loss of Containment of Light Crude Oil due to Blowout at Surface

This section discusses the outcomes of the OSTM for the worst case credible spill (WCS) scenario – the loss of containment of oil (light crude) at the sea surface. The potential impacts to sensitive environments and receptors from hydrocarbons are discussed in Section 6.11.

The sea surface well release has been modelled using assumptions presented in Section 5.2.1. In the event that this scenario was to occur, the trajectory of the spill will depend on prevailing wind and current conditions at the time.

5.3.1.1. Surface Hydrocarbon and Shoreline Loading

Modelling results have indicated that low (0.5 to 10 g/m^2, used to define the ZPI), moderate (10 to 25 g/m^2) and high (greater than 25 g/m^2) zones of sea-surface exposure may directly contact the Victorian coastline, New South Wales coastline and the north-eastern Tasmanian coastline (see Figure 5-1). Low sea-surface exposure levels stretched a maximum distance of 1,745 km east-northeast from the SNA release site, whilst moderate and high sea-surface exposure zones remained within 605 km east and 179 km east-northeast from the SNA release site, respectively.

The probability of sea-surface exposure for the moderate exposure threshold (10 g/m^2) is shown in Figure 5-2.

The maximum predicted length of shoreline exposed to oil above 100 g/m^2 (moderate exposure zones) and 1,000 g/m^2 (high exposure zones) was 438 km and 236 km, respectively. The average length of shoreline exposed to oil above 100 g/m^2 and 1,000 g/m^2 was 241 km and 107 km, respectively.

The probability of contact to the shoreline for the minimum reported threshold of 100 g/m^2 was predicted to be 100% and the absolute minimum time to shoreline contact was 36 hours. The maximum volume of oil to strand on the shoreline was 7,930 m^3. The protected areas with the highest

likelihood of shoreline contact (greater than 100 g/m^2) were Point Hicks National Park (99%), Ben Boyd National Park (85%), Gippsland Lakes Ramsar Site (80%), Cape Howe Marine National Park (77.5%) and Nadgee Nature Reserve (77.5%). The specific shorelines and islands with the highest probability of shoreline contact (greater than 100 g/m^2) were Point Hicks (100%), Cape Howe/Mallacoota (99.5%), Croajingolong (greater than 99%), Gabo Island (99.5%), Sydenham Inlet (97%) and Marlo (91%).

It is important to note that shoreline contact above the reported thickness threshold of 100 g/m^2 may be the result of very low concentrations of surface oil (less than 0.5 g/m^2) accumulating on shore over time and eventually triggering contact above the 100 g/m^2 threshold.

5.3.1.2. Entrained Hydrocarbon

The potential zones of entrained hydrocarbon exposure in the top layer (0 to 10 m) of the water column are presented in Figure 5-3, with the low zone (960 to 9,600 ppb.hrs) used to define the ZPI. Potential zones of low exposure to entrained hydrocarbons extended a maximum distance of 1,732 km east-northeast from the SNA release site.

The probability of contact with entrained hydrocarbons for the moderate exposure threshold (9,600 to 48,000 ppb.hrs) is shown in Figure 5-4. Potential moderate exposure zones extended a maximum distance of 607 km east-northeast from the SNA release site.

The modelling predicted potential exposure to high levels of entrained hydrocarbons (>48,000 ppb.hrs) in the 0 to 10 m depth layer in waters adjacent to the Victorian coastline, up to 274 km east-northeast of the SNA release site. High exposure zones were discontinuous and scattered east of the release sites and along the coastline from Cape Conran to Mallacoota.

5.3.1.3. Dissolved Aromatic Hydrocarbon

The potential zones of dissolved aromatic hydrocarbon exposure are presented in Figure 5-5, with the low zone used to define the ZPI. Potential low exposure zones extended along the Victorian coastline and southern New South Wales up to 561 km east-northeast from the SNA release site.

The probability of contact with dissolved aromatic hydrocarbons for the low exposure threshold (576 to 4800 ppb.hrs) is shown in Figure 5-6. Moderate exposure zones (4,800 to 38,400 ppb-hrs) were observed east of Point Hicks Marine Park, 181 km east-northeast from the SNA release site. No high exposure zones from dissolved aromatic hydrocarbons were predicted.

5.4. Definition of Zone of Potential Impact

The ZPI is shown in Figure 5-7. It extends along the Victorian and New South Wales coastlines and also comes into contact with the north-east coastline of Tasmania.

The ZPI was developed using 200 simulations (50 per release location), which were then combined into a single output map for sea-surface and in-water exposure to hydrocarbons. The green line shows the low exposure thresholds for surface, entrained and dissolved hydrocarbons (e.g., where light sheens may be visible and entrained hydrocarbons may be present).

5.4.1. Sensitive Environments that may be Impacted

The key environmental sensitivities within the ZPI that may be contacted at the moderate exposure levels for surface oil, entrained and dissolved aromatic hydrocarbons are listed below:

- Batemans Marine Park.
- Beagle Commonwealth Marine Reserve.
- Ben Boyd National Park.
- Beware Reef Marine Sanctuary.
- Cape Howe Marine National Park.
- Corner Inlet Ramsar Site.
- Croajingolong National Park.
- East Gippsland Commonwealth Marine Reserve.

- Flinders Commonwealth Marine Reserve.
- Gabo Island Harbour Special Management Area.
- Gippsland Lakes Ramsar Site.
- Jervis Commonwealth Marine Reserve
- Kent Island Group National Park.
- Mallacoota Inlet Special Management Area.
- Nadgee Nature Reserve.
- Ninety Mile Beach Marine National Park.
- Nooramunga Marine and Coastal Parks.
- Point Hicks Marine National Park.
- The Lakes National Park and Gipplsand Lakes Coastal Park.
- The Skerries Special Management Area.
- Wilsons Promontory Marine Reserve and National Park.

The key environmental sensitivities within the ZPI that may be contacted by moderate levels of shoreline loading are listed below:

- Batemans Marine Park.
- Bay of Fires Conservation Area.
- Ben Boyd National Park.
- Biamanga National Park.
- Bournda National Park.
- Cape Howe Marine National Park.
- Conjola National Park.
- Corner Inlet Marine and Coastal Parks, Ramsar Site and Marine National Park.
- Croajingolong National Park,
- East Coast Cape Barren Ramsar Site.
- Eurobodalla National Park.
- Freycinet National Park.
- Gippsland Lakes Ramsar Site.
- Jervis Bay Marine Park and National Park.
- Kent Island Group National Park.
- Limeburners Creek Nature Reserve.
- Logan Lagoon Ramsar Site.
- Mallacoota Inlet Special Management Area.
- Meroo National Park.
- Mimosa Rocks National Park.
- Mt William National Park.
- Murramarang National Park.
- Myall Lakes National Park and Ramsar Site.
- Nadgee Nature Reserve.
- Ninety Mile Beach Marine National Park.
- Nooramunga Marine and Coastal Parks.

- Point Hicks Marine National Park.
- Port Stephens – Great Lakes Marine Park.
- Royal National Park.
- Scamander Conservation Area.
- Shallow Inlet Marine and Coastal Park.
- Strzelecki National Park.
- The Lakes National Park and Gipplsand Lakes Coastal Park.
- The Skerries Special Management Area.
- Wilsons Promontory Marine National Park, Marine Reserve and National Park.

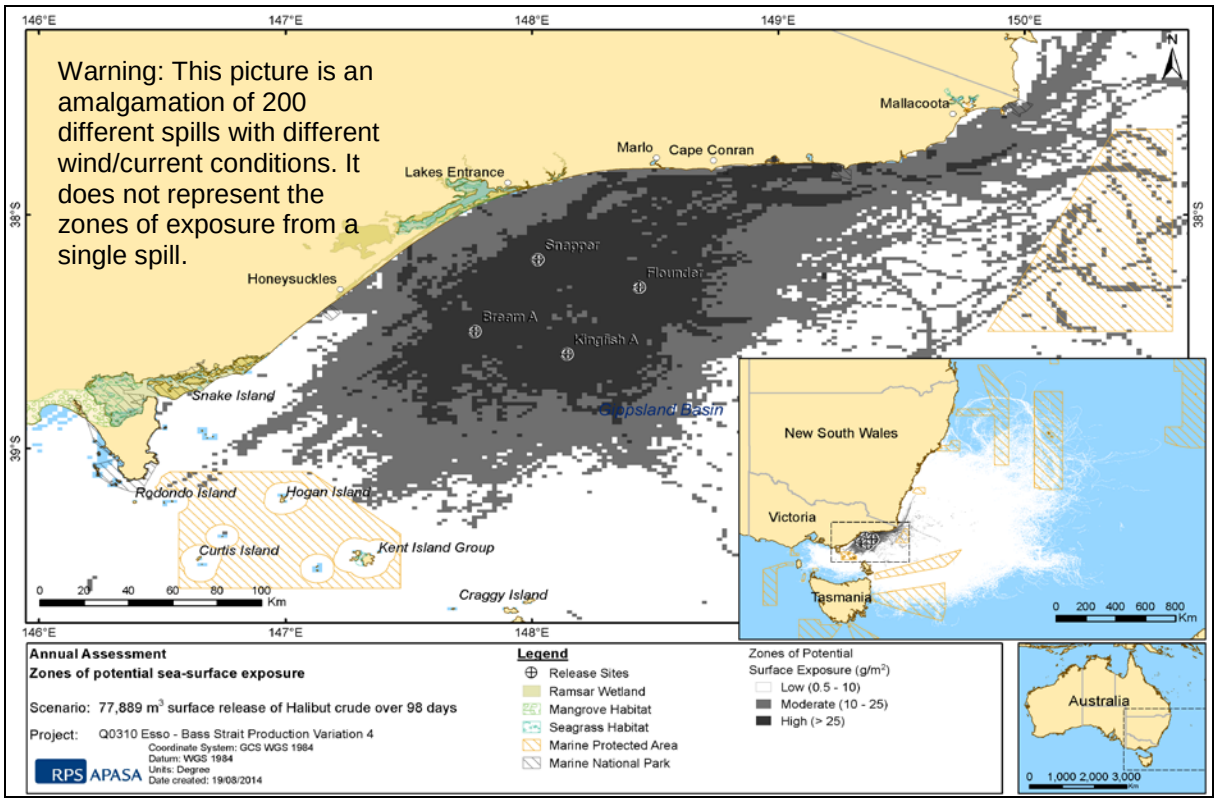


Figure 5-1 **Zones of potential sea-surface exposure, in the event of a 77,889 m^3 surface release of light crude over 98 days from a loss of well control, under annual wind and current conditions (APASA, 2014)**

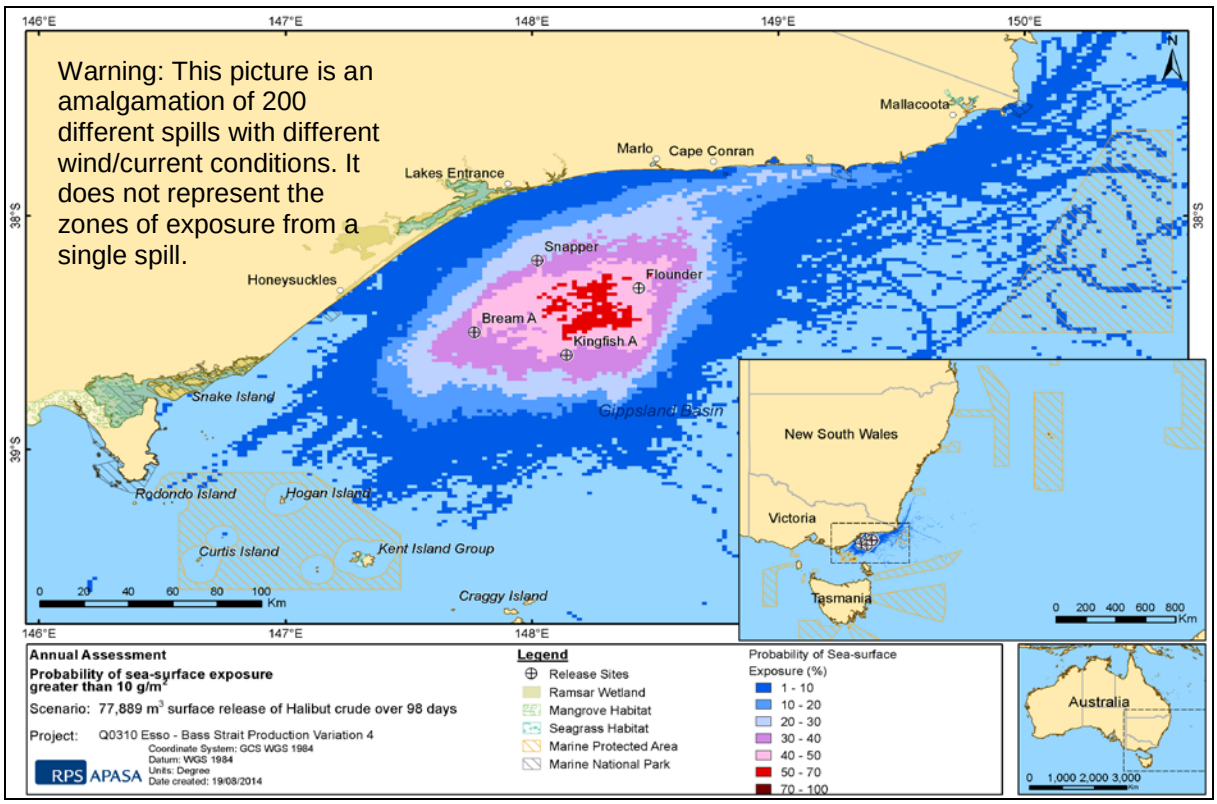


Figure 5-2 **Probability of sea-surface exposure (above 10 g/m^2 or moderate exposure), in the event of a 77,889 m^3 surface release of light crude over 98 days from a loss of well control, under annual wind and current conditions (APASA, 2014)**

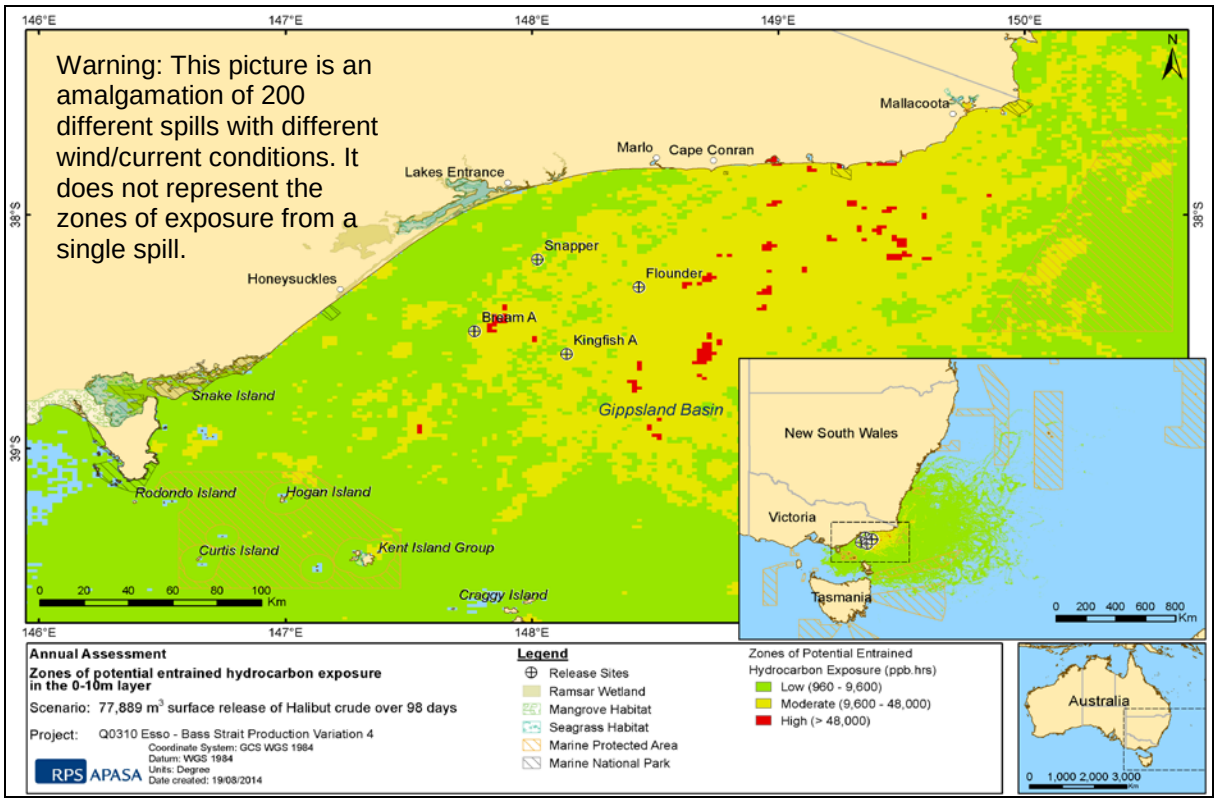


Figure 5-3 **Zones of potential entrained oil exposure, in the event of a 77,889 m^3 surface release of light crude over 98 days from loss of well control, under annual wind and current conditions (APASA, 2014)**

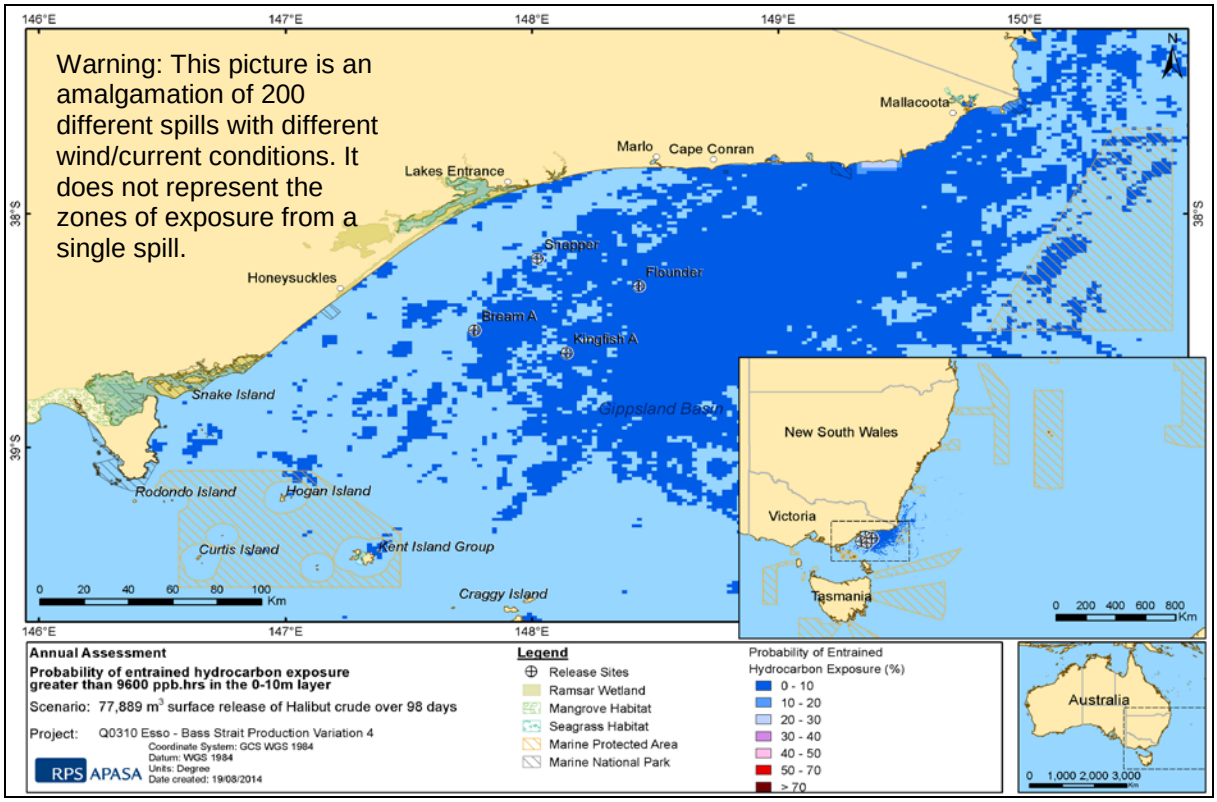


Figure 5-4 **Probability of entrained hydrocarbon (above 9600-48,000 ppb.hrs or moderate exposure) of a 77,889 m^3 surface release of light crude over 98 days from a loss of well, under annual wind and current conditions (APASA, 2014)**

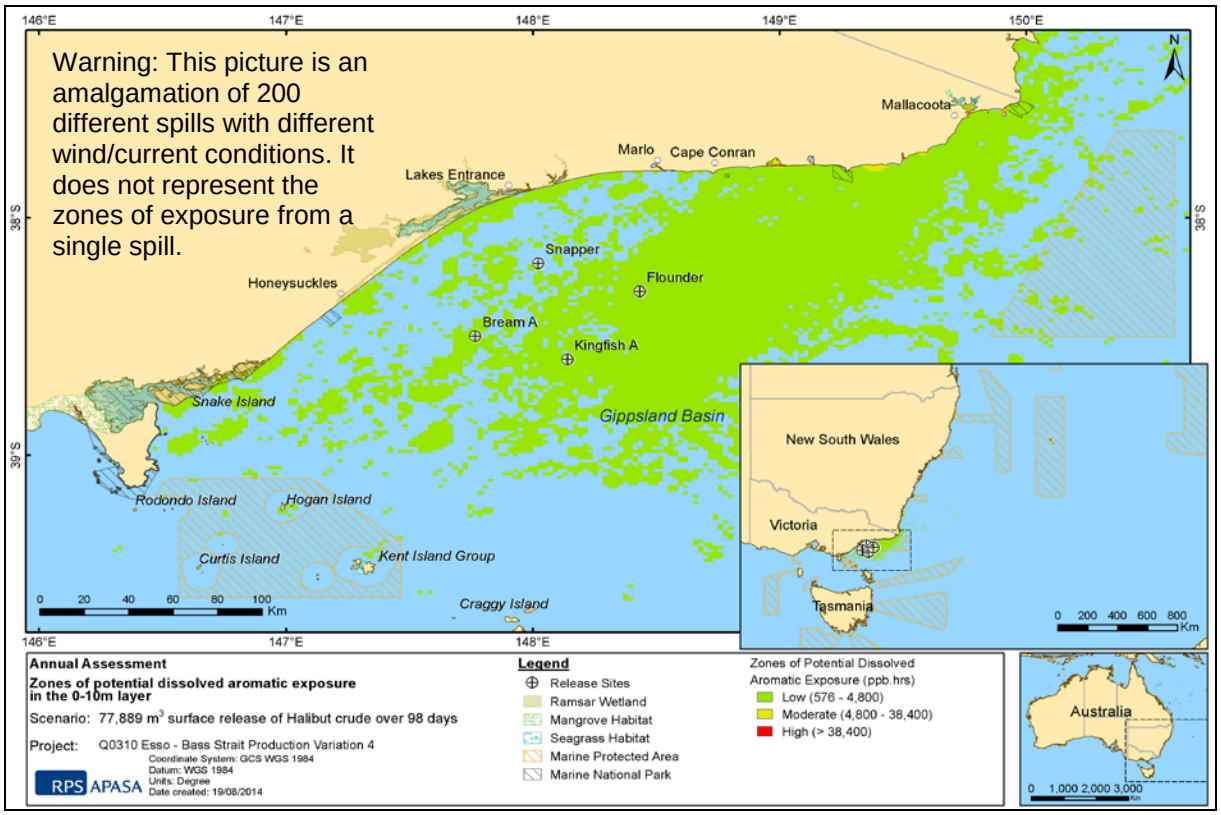


Figure 5-5 **Zones of potential dissolved aromatic hydrocarbon exposure, in the event of a 77,889 m^3 surface release of light crude over 98 days from a loss of well control, under annual wind and current conditions (APASA, 2014)**

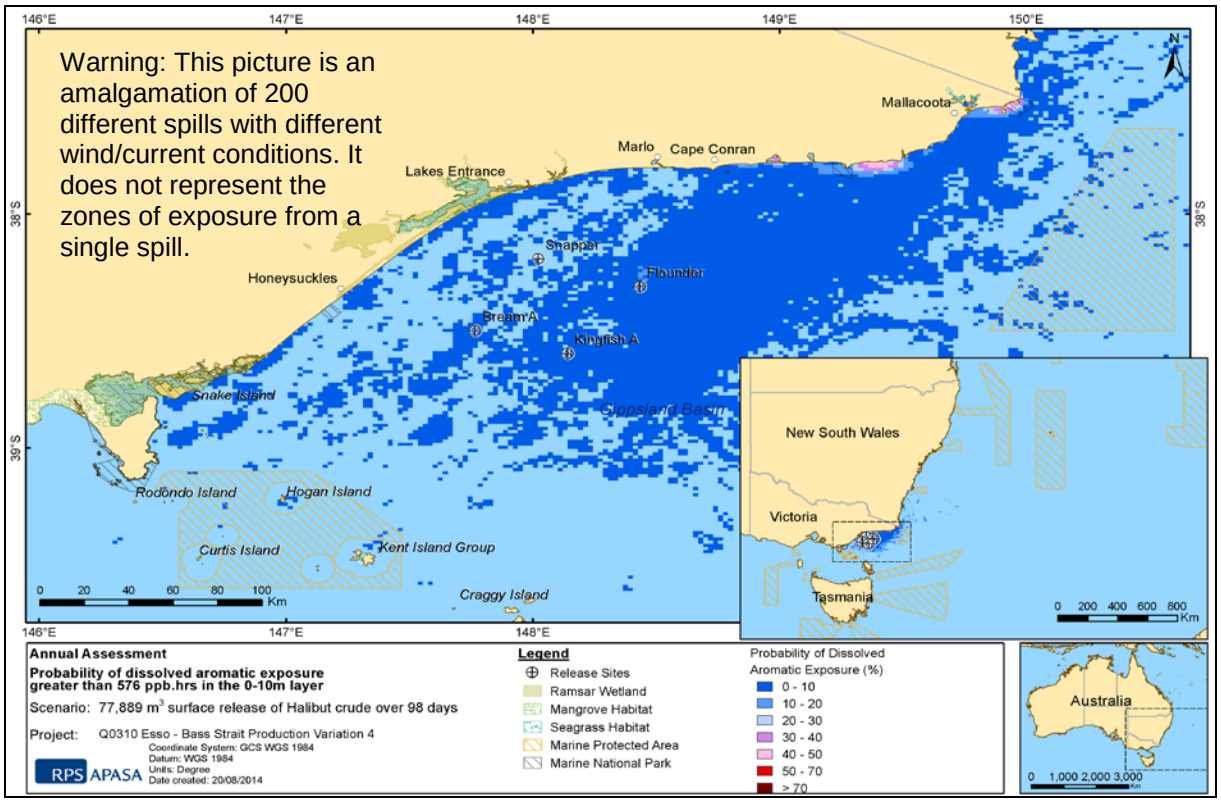


Figure 5-6 **Probability of dissolved aromatic hydrocarbon exposure (above 576 ppb.hrs or low exposure) of a 77,889 m^3 surface release of light crude over 98 days from a loss of well, under annual wind and current conditions (APASA, 2014)**

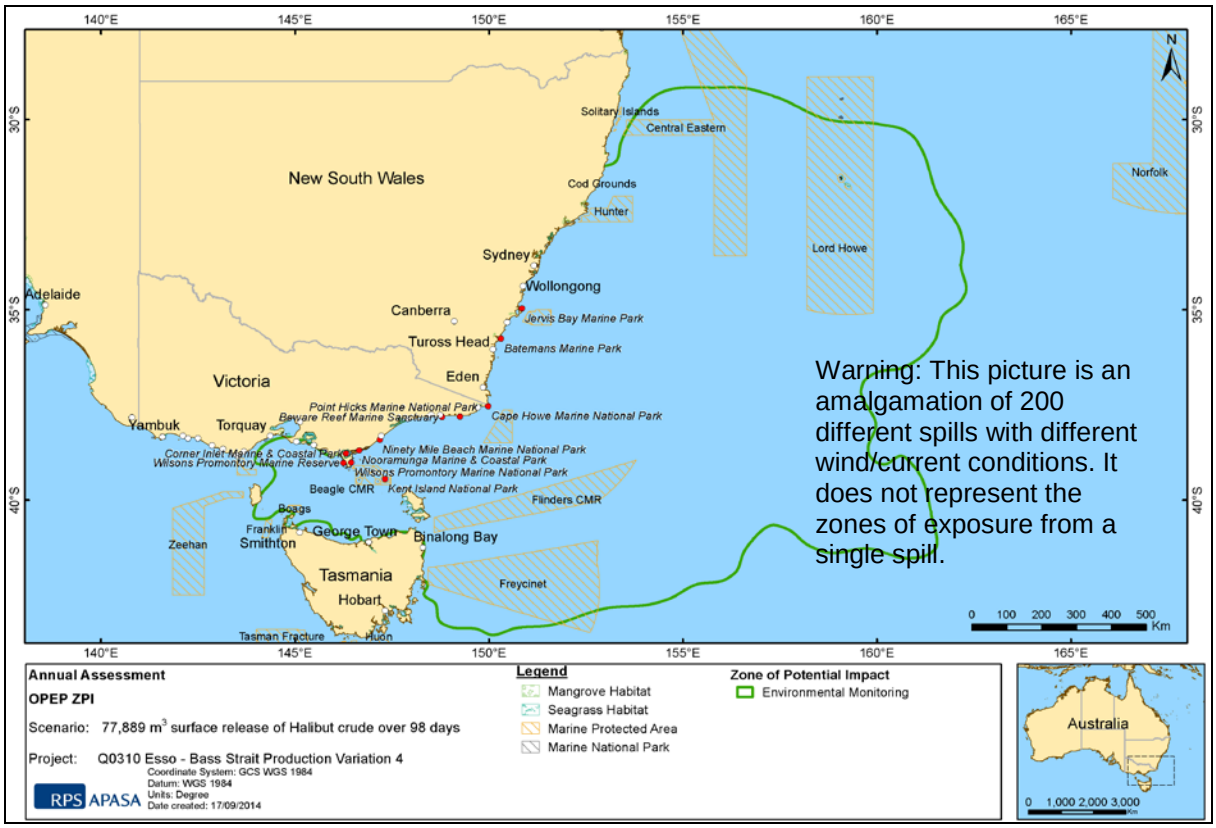


Figure 5-7 Zone of Potential Impact

6. Description of the Environment

6.1. Physical Environment

The SNA platform is located in Commonwealth waters within the Gippsland basin, in Production Licence VIC/L10 approximately 32 km off the Victorian coast in Bass Strait, in a water depth of 55 m MSL (see Figure 6-1).

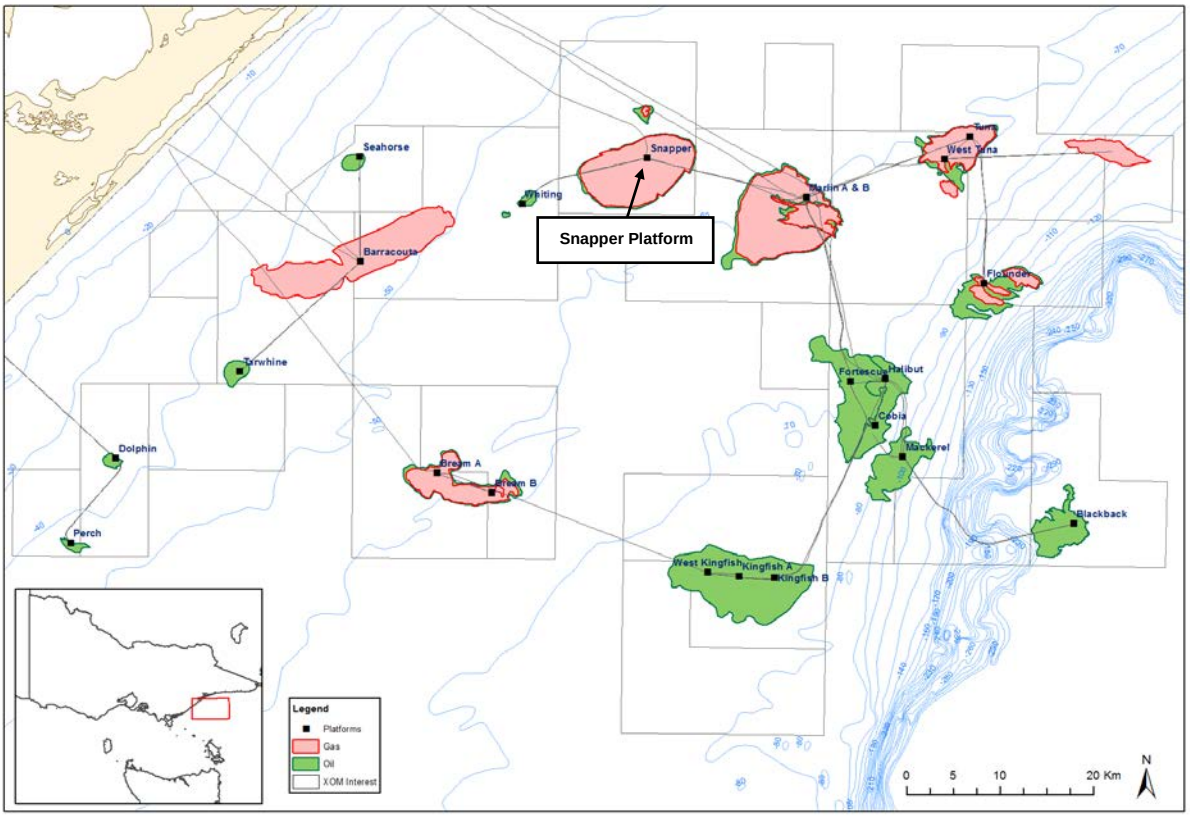


Figure 6-1 Bathymetry within the platform operating area and surrounds

The physical environment of the platform operating area and ZPI is identical to, and has been described in, Sections 6.2 and 6.3 of the West Tuna Environment Plan, including climate, meteorology and oceanography.

6.2. Biological Environment

The platform operating area and ZPI supports a range of diverse benthic invertebrate fauna as well as a variety of vertebrate species such as fish, birds, seals and whales, including listed endangered and vulnerable species. A description of these species has been provided in Section 6.4 of the West Tuna Environment Plan. Only Snapper facility-specific differences are described below.

6.2.1. Fish and Shellfish

Fish species listed under the EPBC Act that may occur in the operating area and ZPI are given in Table 6-1 of the West Tuna Environment Plan.

Additionally, the species listed in Table 6-1 below, also potentially occur within the ZPI.

Table 6-1 EPBC Act listed fish potentially occurring in the operating area and ZPI

Common Name	Scientific Name	Status	Likelihood of Occurrence	Identified in Operating Area	Identified in ZPI
Anderson's Pipefish	*Micrognathus andersonii*	L	MO		X
Blue-speckled Pipefish	*Hippichthys cyanospilos*	L	MO		X
Booth's Pipefish	*Halicampus boothae*	L	MO		X
Brown-banded Pipefish	*Corythoichthys amplexus*	L	MO		X
Duncker's Pipehorse	*Solegnathus spinosissimus*	L	MO		X
Flat-face Seahorse	*Hippocampus planifrons*	L	MO		X
Kellogg's Seahorse	*Hippocampus kelloggi*	L	MO		X
Madura Pipefish	*Hippichthys heptagonus*	L	MO		X
Manado Pipefish	*Microphis manadensis*	L	MO		X
Mud Pipefish	*Halicampus grayi*	L	MO		X
Orange-spotted Pipefish	*Corythoichthys ocellatus*	L	MO		X
Pallid Pipehorse	*Solegnathus hardwickii*	L	MO		X
Spotted Seahorse	*Hippocampus kuda*	L	MO		X
Thorn-tailed Pipefish	*Micrognathus brevirostris*	L	MO		X
Tryon's Pipefish	*Campichthys tryoni*	L	MO		X

Status Key: L–Listed marine species

Likelihood of Occurrence Key: MO–Species or species habitat may occur within area.

6.2.2. Sharks and Rays

Shark and ray species, including a reference list of EPBC Act listed sharks and rays potentially occurring in the operating area and ZPI, have been described in Section 6.4.2 of the West Tuna Environment Plan.

6.2.3. Reptiles

Reptiles, including a reference list of EPBC Act listed turtles potentially occurring in the operating area and ZPI, have been described in Section 6.4.3 of the West Tuna Environment Plan.

Additionally, the species of seasnake listed in Table 6.2 below, although more commonly found in the warmer waters of northern Australia, also potentially occur within the ZPI.

Table 6-2 EPBC Act listed reptiles potentially occurring in the operating area and ZPI

Common Name	Scientific Name	Status	Likelihood of Occurrence	Identified in Operating Area	Identified in ZPI
Elegant Seasnake	*Hydrophis elegans*	L	MO		X
Yellow-bellied Seasnake	*Pelamis platurus*	L	MO		X

Status Key: L–Listed marine species

Likelihood of Occurrence Key: MO–Species or species habitat may occur within area.

6.2.4. Birds

Bird species, including a reference list of EPBC Act listed birds potentially occurring in the operating area and ZPI, have been described in Section 6.4.4 of the West Tuna Environment Plan.

The Broad-billed Sandpiper and the Eastern Bristlebird do not occur within the platform operating area or ZPI.

Additionally, the species listed in Table 6.3 below, also potentially occur within the ZPI.

Table 6-3 EPBC Act listed birds potentially occurring in the operating area and ZPI

Common Name	Scientific Name	Status	Likelihood of Occurrence*	Identified in Operating Area	Identified in ZPI
Black-winged Petrel	*Pterodroma nigripennis*	L	BNO		X
Grey Ternlet	*Procelsterna cerulea*	L	BNO		X
Little Shearwater	*Puffinus assimillis*	L	BNO		X
Lord Howe Woodhen	*Gallirallus sylvestris*	V	BLO		X
Masked Booby	*Sula dactylatra*	MM, L	BNO		X
Masked Owl (Tasmanian)	*Tyto novaehollandiae castanops*	V	BNO		X
Pied Currawong (Lord Howe Island)	*Strepera graculina crissalis*	V	LO		X
Providence Petrel	*Pterodroma solandri*	MM, L	BNO		X
Red-tailed Tropicbird	*Phaethon rubricauda*	L	BNO		X
Wedge-tailed Shearwater	*Puffinus pacificus*	MM, L	BNO		X

Status Key:
V–Vulnerable (threatened)
L–Listed marine species
MM–Migratory marine species

Likelihood of Occurrence Key:
BNO–Breeding known to occur within area.
LO–Species or species habitat likely to occur within area.

6.2.5. Seals and Dugongs

Seal species, including a reference list of EPBC Act listed seals potentially occurring in the operating area and ZPI, have been described in Section 6.4.5 of the West Tuna Environment Plan.

Additionally, the species listed in Table 6.4 below, also potentially occurs within the ZPI.

Table 6-4 EPBC Act listed mammals potentially occurring in the operating area and ZPI

Common Name	Scientific Name	Status	Likelihood of Occurrence*	Identified in Operating Area	Identified in ZPI
Dugong	*Dugong dugon*	MM, L	MO		X

Status Key:
L–Listed marine species
MM–Migratory marine species

Likelihood of Occurrence Key:
MO–Species or species habitat may occur within area.

6.2.6. Cetaceans

Cetaceans, including a reference list of EPBC Act listed cetaceans potentially occurring in the operating area and ZPI, have been described in Section 6.4.6 of the West Tuna Environment Plan.

Additionally, the species listed in Table 6.5 below, also occur within the ZPI.

Table 6-5 EPBC Act listed cetaceans potentially occurring in the operating area and ZPI

Common Name	Scientific Name	Status	Likelihood of Occurrence	Identified in Operating Area	Identified in ZPI
Dolphins					
Fraser's Dolphin	*Lagenodelphis hosei*	L	MO		X
Indo-Pacific Humpback Dolphin	*Sousa chinensis*	MM, L	MO		X

Status Key:
L–Listed marine species
MM–Migratory marine species

Likelihood of Occurrence Key:
MO–Species or species habitat may occur within area.

6.3. Offshore Marine Environments

Marine environments that occur in the offshore operating area and ZPI include:

- Open Marine Environment.
- Seabed.
- Subtidal rocky reefs.
- Estuaries.

These offshore marine environments have been described in Section 6.5 of the West Tuna Environment Plan.

6.4. Nearshore Environments

Nearshore environments within the ZPI include:

- Intertidal rocky shores.
- Intertidal, emergent, sub tidal aquatic vegetation.
- Sheltered intertidal flats and bare sediment (mudflats).
- Marshes.
- Mangroves.
- Sandy beaches and dunes.
- Cliffs/exposed rocky headlands.
- International, national, state, regional or coastal sites of significance or sensitivity (see Section 6.5).

These nearshore environments have been described in Section 6.6 of the West Tuna Environment Plan.

6.5. International, National and State Sites of Significance or Sensitivity in the ZPI

Whilst no areas of high conservation significance are present in the platform operating area itself, there are sensitive habitats in the ZPI.

The international, national and state sites of significance or sensitivity that occur within the ZPI include:

International

- Gippsland Lakes Ramsar Site.
- Corner Inlet Ramsar Site.

- Logan Lagoon Ramsar Site.
- East Coast Cape Barren Island Lagoons Ramsar Site.
- Elizabeth and Middleton Reefs Marine National Nature Reserve Ramsar Site.*
- Myall Lakes Ramsar Site.*
- Croajingolong National Park and Biosphere Reserve (including Nadgee Nature Reserve).

National

- The Australian Whale Sanctuary.
- Beagle Commonwealth Marine Reserve.
- Boags Commonwealth Marine Reserve.*
- Central Eastern Commonwealth Marine Reserve.
- Cod Grounds Commonwealth Marine Reserve.*
- East Gippsland Commonwealth Marine Reserve.
- Flinders Commonwealth Marine Reserve.
- Franklin Commonwealth Marine Reserve.*
- Freycinet Commonwealth Marine Reserve.
- Hunter Commonwealth Marine Reserve.*
- Jervis Commonwealth Marine Reserve.
- Lord Howe Commonwealth Marine Reserve (including the former Lord Howe Island Marine Park (Commonwealth waters) and Elizabeth and Middleton Reefs Marine National Nature Reserve).
- Ben Boyd National Park.
- Biamanga National Park.
- Booti Booti National Park.*
- Bouddi National Park.*
- Bournda National Park.
- Cape Howe Marine National Park.
- Conjola National Park.
- Corner Inlet Marine National Park.
- Crowdy Bay National Park.*
- Eurobodalla National Park.
- Freycinet National Park.*
- Jervis Bay National Park and Booderee National Park.
- Kamay Botany Bay National Park.
- Khappinghat Nature Reserve and Saltwater National Park.*
- Kent Group National Park and Kent Group Marine Nature Reserve.
- Limeburners Creek National Park and Nature Reserve.*
- Meroo National Park.
- Mimosa Rocks National Park.
- Mt William National Park.

- Murramarang National Park.
- Myall Lakes National Park.*
- Ninety Mile Beach Marine National Park.
- Point Hicks Marine National Park.
- Royal National Park.
- Sea Acres National Park and Nature Reserve.*
- Seven Mile Beach National Park.
- Strzelecki National Park.
- Sydney Harbour National Park.
- The Lakes National Park and Gippsland Lakes Coastal Park.
- Tomaree National Park.*
- Wallarah National Park.*
- Wilsons Promontory Marine National Park, Wilson's Promontory Marine Park, Wilsons Promontory Marine Reserve and Wilsons Promontory National Park.
- Worimi National Park.*
- Wyrrabalong National Park.*

State (NSW)

- Batemans Marine Park including:
  - Brou Beach Sanctuary Zone; Brush Island Sanctuary Zone; Bullengella Lake – Corunna Lake Sanctuary Zone; Burrewarra Point Sanctuary Zone; Montague Island Nature Reserve, Habitat Protection Zone and Sanctuary Zone; Mullimburra Habitat Protection Zone and Sanctuary Zone; Murramarang Sanctuary Zone; North Head Sanctuary Zone; Tollgate Islands Sanctuary Zone; and Tuross Lake Habitat Protection Zone.
- Jervis Bay Marine Park including:
  - Hammer Head Sanctuary Zone; Huskisson Sanctuary Zone; Hyams Beach Sanctuary Zone; Point Perpendicular – Crocodile Head Sanctuary Zone; and St Georges – Steamer Head Sanctuary Zone.
- Port Stephens Great Lakes Marine Park including:
  - Broughton Island Sanctuary Zone; Cape Hawke Sanctuary Zone; Fingal Island Sanctuary Zone; Seal Rocks Sanctuary Zone; and Submarine Beach Sanctuary Zone.
- Nature Reserves including:
  - Awabakal Nature Reserve; Bournda Nature Reserve; Comerong Island Nature Reserve; Cullendulla Creek Nature Reserve; Darawank Nature Reserve; Kattang Nature Reserve; Lake Innes Nature Reserve; and Narrawalle Creek Nature Reserve.
- State Conservation Areas including:
  - Glenrock State Conservation Area; Gurrawarra State Conservation Area; and Munmorah State Conservation Area.

State (Victorian)

- Beware Reef Marine Sanctuary.
- Cape Conran Coastal Park.
- Corner Inlet and Nooramunga Marine and Coastal Parks.
- Gabo Island Harbour Special Management Area and Gabo Island Light Station Reserve.

- Mallacoota Inlet Special Management Area.
- Shallow Inlet Marine and Coastal Park.*
- The Skerries Special Management Area.
- Coastal Parks and Reserves including:
  - Cape Liptrap Coastal Park; Ewing Morass Wildlife Reserve; Kilcunda – Hamers Haven Coastal Reserve; Lakes Entrance – Lake Tyers Coastal Reserve; Marlo Coastal Reserve; McLoughlins Beach – Seaspray Coastal Reserve; and Punchbowl Coastal Reserve.
- Bass Strait and Victorian Islands and Nature Reserves.

State (Tasmanian)

- Bass Strait and Tasmanian Islands, Nature Reserves and Conservation Areas.

The sites of significance or sensitivity denoted with a * are described below. All other sites of significance or sensitivity have been described in Section 6.7 of the West Tuna Environment Plan.

6.5.1. International Sites of Significance

6.5.1.1. Elizabeth and Middleton Reefs Marine National Nature Reserve Ramsar Site

The Elizabeth and Middleton Reefs Marine National Nature Reserve Ramsar Site is located in the northern Tasman Sea, approximately 630 km east of Coffs Harbour in NSW. Elizabeth and Middleton Reefs are remote coral reef atolls that occur on top of isolated, oceanic sea mounts, 50 km apart from each other. The nature reserve is 187,726 hectares in size, with the area of the two reefs comprising approximately 8,000 hectares (DoE, 2014l).

The Elizabeth and Middleton Reefs Marine National Nature Reserve Ramsar Site meets the following Ramsar Criteria:

- Criterion 1: Contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region
- Criterion 2: Supports vulnerable, endangered, or critically endangered species or threatened ecological communities.
- Criterion 3: Supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.
- Criterion 4: Supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.
- Criterion 7: Supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.
- Criterion 8: Is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.

Elizabeth and Middleton Reefs are considered as both rare and representative examples of coral reef wetland in the Lord Howe Province marine bioregion as they are among the few, and largest, present. These reefs are distinctive in occurring on top of oceanic sea mounts, and are the southernmost open ocean platform coral reefs in the world. They represent an environment which is not present anywhere else in waters associated with the Australian continent, and support unique coral reef and fish communities (DoE, 2014l).

Fifteen species known or considered to occur at the site are listed as threatened under the EPBC Act. These include cetaceans, marine turtles, seabirds and fish. At least 322 fish species are known to occur at these Reefs, along with 122 species of corals, 122 crustaceans, 240 molluscs and 74 echinoderms (DoE, 2014l).

A small population of Green Turtle use the reefs primarily for food and shelter. At least 12 species of migratory waterbirds use the Reefs as resting places. These are mostly terns such as Sooty Tern and boobies such as Masked Booby. The reefs also provide shelter and feeding areas for juvenile stages of marine species which have more open water adult stages, and also provide rare shelter for other species during severe storms (DoE, 2014l).

The fish species recorded at the Reefs are highly diverse and include a range of sizes, shapes, reproductive types and life strategies. These fish communities in turn support a diverse and complex range of other ecosystem components and processes. Although fish species larvae may at times recruit to this remote location from other areas, it appears that most reef fish populations within the Elizabeth and Middleton Reefs must complete their entire life cycle on these reefs (DoE, 2014l).

6.5.1.2. Myall Lakes Ramsar Site

The Myall Lakes Ramsar Site is located within the Myall Lakes National Park, approximately 75 kilometres north of Newcastle on the central coast of New South Wales. The site is 44,612 hectares in size, is relatively unmodified and incorporates a number of distinct wetlands associated with the waterways and dune systems (DoE, 2014m).

The Myall Lakes Ramsar Site meets three of the Ramsar Criteria: 1, 2 and 3 (as described above).

The Myall Lakes are significant because they represent a unique association of at least 18 Ramsar wetland types, ranging from fresh to marine waters, with the entire association covering an extensive area, with minimal structural and hydrological disturbance and supporting ecosystems and processes in near-natural condition. They are one of the two largest brackish-freshwater barrier estuaries in the South East Coast Drainage Division, and are an excellent, representative example of this wetland type within the bioregion. They contain a unique co-existence of deep and shallow water macrophytes and the organic lake-floor muds known as gyttja (DoE, 2014m).

The Myall Lakes Ramsar Site supports five wetland dependent species which are listed as nationally threatened under the EPBC Act, or listed as internationally threatened in the IUCN Red List including the Australasian bittern, Freycinet's frog, Green and gold bell frog, Green thighed frog and Stuttering frog (DoE, 2014m).

The site is important for providing habitat for migratory birds, with 22 species listed in agreements between Australia and Japan (JAMBA), China (CAMBA) and the Republic of South Korea (ROKAMBA) recorded from the site. Migratory species listed under international agreements which breed in the Ramsar site include little tern (*Sterna albifrons*), sooty shearwater (*Puffinus griseus*), short-tailed shearwater (*Puffinus tenuirostris*) and wedge-tailed shearwater (*Puffinus pacificus*).

The site's vegetation is particularly diverse, with 946 species of terrestrial flora, two mangrove species and 10 species of submerged aquatic flora. The terrestrial species occur in a wide range of vegetation communities, from rainforest and wet sclerophyll vegetation to heathland and sand dune vegetation. There is also a high diversity of animal species, with 298 birds, 58 mammals, 44 fish species, 37 reptiles and 29 amphibians recorded from the Ramsar site (NSW Wildlife Atlas). Many of the site's animals are found in a wide range of wetland types, including estuarine waters; intertidal forested wetlands; coastal freshwater lagoons; permanent rivers, streams or creeks; freshwater tree dominated wetlands; and shrub dominated wetlands (DoE, 2014m).

6.5.2. National Sites of Significance

6.5.2.1. Boags Commonwealth Marine Reserve

The Boags Commonwealth Marine Reserve covers an area of 537 km^2 with a depth range from approximately 40 to 80 m. The reserve contains a rich array of life, particularly bottom-dwelling animals and those animals living in the sea-floor sediments and muds, such as crustaceans, polychaete worms and molluscs. The reserve is an important foraging area for a variety of seabirds including the Shy Albatross, Australasian Gannet, Short-tailed Shearwater, Fairy Prion, Black-faced Cormorant, Common Diving Petrel and the Little Penguin. White sharks also forage in the reserve (DoE, 2014k).

6.5.2.2. Cod Grounds Commonwealth Marine Reserve

The new Cod Grounds Commonwealth Marine Reserve covers an area of 4 km^2, has a depth range from approximately 15 to 70 m, and encompasses the former Cod Grounds Commonwealth Marine Reserve. The reserve was established in May 2007 in Commonwealth waters just south of Port Macquarie in NSW, to protect a significant aggregation site for the critically endangered east coast population of grey nurse sharks. The reserve is a biologically important area for the protected humpback whale, vulnerable white shark and a number of migratory seabirds. The area is a series of underwater pinnacles and a representation of the shelf seafloor feature (DoE, 2014k).

6.5.2.3. Franklin Commonwealth Marine Reserve

The Franklin Commonwealth Marine Reserve covers an area of 671 km^2 with a depth range of 40 m (at its northern end) to 150 m (at its southern end). The reserve is an important foraging area for a variety of seabirds including the Shy Albatross, Short-tailed Shearwater, Australasian Gannet, Fairy Prion, Little Penguin, Common Diving Petrel, Black-faced Cormorant and Silver Gull. Black Pyramid Rock, 6 km north of the reserve supports the largest breeding colony of the Australasian Gannet in Tasmania, and one of only eight breeding sites for this species in Australia. White sharks also forage in the reserve (DoE, 2014k).

6.5.2.4. Hunter Commonwealth Marine Reserve

The Hunter Commonwealth Marine Reserve covers an area of more than 6200 km^2 with a depth range from approximately 15 to 6000 m. The reserve provides important habitat for the east coast population of grey nurse shark, the humpback whale, great white sharks and a number of migratory seabirds. Seafloor features represented in the reserve include abyssal plain/deep ocean floor, canyons, shelf, slope and terrace geomorphic features. The reserve includes the key ecological feature of: shelf rocky reefs (unique sea floor feature with ecological properties of regional significance) (DoE, 2014k).

6.5.2.5. Booti Booti National Park

The Booti Booti National Park covers an area of 1,566 hectares and is made up of an 8 km peninsula between the Pacific Ocean and Wallis Lake in NSW. The park has a diversity of landforms, wildlife and vegetation and includes beaches, rainforest and an estuarine foreshore (OEH, 2014).

6.5.2.6. Bouddi National Park

The Bouddi National Park is located on the central coast near Gosford, north of Sydney in NSW. The park contains beaches, steep cliffs, rainforest and heathland. Additionally, the park contains one of Australia's first marine protected areas, significant Aboriginal sites, animals and plant life, and a paddle steamer wreck (OEH, 2014).

6.5.2.7. Crowdy Bay National Park

The Crowdy Bay National Park is located along the coast, near port Macquarie and Taree in NSW. The park contains a diversity of wildlife, beaches, dunes and rainforests, and has been a significant site for Aboriginal people for over 6000 years (OEH, 2014).

6.5.2.8. Freycinet National Park

The Freycinet National Park is located on Tasmania's east coast and consists of granite mountains, azure bays and beaches. The park is effectively two eroded blocks of granite - the Hazards and the Mt Graham/Mt Freycinet sections of the peninsula - joined by a sand isthmus. The park has a diversity of wildlife and a number of bays and lagoons (Parks and Wildlife Service Tasmania, 2014).

6.5.2.9. Khappinghat Nature Reserve and Saltwater National Park

The Khappinghat Nature Reserve and Saltwater National Park are located on the NSW mid-north coast, approximately 7 km south-east of Taree. The Khappinghat Nature Reserve covers an area of 3,547 hectares and the Saltwater National Park covers an area of 33 hectares. The sites have a diversity of landscapes and associated plant and animal communities and are of cultural importance to the Biripi and Worimi Aboriginal people (OEH, 2014).

6.5.2.10. Limeburners Creek National Park and Nature Reserve

The Limeburners Creek National Park and Nature Reserve is located between Crescent Head and Port Macquarie on the NSW mid-north coast. The site contains a wide range of landforms, supports a diverse range of wildlife communities and contains a wide range of coastal vegetation communities including wet and dry heathland, littoral rainforest, eucalypt forest and woodland, as well as fresh water and estuarine wetlands. Additionally, the site contains a high concentration of Aboriginal relics, including burial sites, shell middens, campsites and stone quarries (OEH, 2014).

6.5.2.11. Myall Lakes National Park

The Myall Lakes National Park is located near Newcastle in NSW and features one of the state's largest coastal lake systems. The park contains coastal forests, rainforests, sand dunes, cultural heritage sites, the state's tallest tree (the Grandis - a giant flooded gum) and the heritage-listed Sugarloaf Point Lighthouse at Seal Rocks (OEH, 2014).

6.5.2.12. Sea Acres National Park and Nature Reserve

The Sea Acres National Park is a beach adjoining rainforest and is located on the east coast of NSW. The park protects the largest remaining coastal rainforest on the Australian east coast. The park also has a long Aboriginal history (OEH, 2014).

6.5.2.13. Tomaree National Park

The Tomaree National Park is located on the coast of NSW and includes a number of beaches, coastal forests and the historic gun emplacements, part of Fort Tomaree and built in 1941 as part of Australia's World War II east coast defence system (OEH, 2014).

6.5.2.14. Wallarah National Park

The Wallarah National Park is located east of Lake Macquarie and 30 km south of Newcastle in NSW. The park contains aboriginal sites and places, native plants and animals, rock formations and heaths and forests (OEH, 2014).

6.5.2.1. Worimi National Park

The Worimi National Park, together with the Worimi State Conservation Area and the Worimi Regional Park, is part of the Worimi Conservation Lands and is located near Newcastle in NSW. The park contains a number of Aboriginal and historic sites of importance to the local Worimi Aboriginal community and also contains the largest dunes (Stockton dunes) in the southern hemisphere (OEH, 2014).

6.5.2.2. Wyrrabalong National Park

The Wyrrabalong National Park is located along the central coast of NSW and is divided into two sections. The northern section contains rainforest, wetlands and Red Gum Forest and the southern section contains abundant wildflowers during spring (OEH, 2014).

6.5.3. State (Victorian) Sites of Significance

6.5.3.1. Shallow Inlet Marine and Coastal Park

The Shallow Inlet Marine and Coastal Park is located between Waratah Bay and Wilsons Promontory in Victoria. The sheltered waters of Shallow Inlet provide an ideal setting for a range of water based activities, such as fishing and boating. The Boon Wurrung, Bunurong and Gunai/Kurnai people identify the Shallow Inlet Marine and Coastal Park as their traditional country (Parks Victoria, 2014).

6.6. Cultural Heritage

Cultural heritage areas within the ZPI are described in Section 6.8 of the West Tuna Environment Plan.

6.6.1. Summerland Peninsula

Additionally, the Summerland Peninsula (on the southwest coast of Phillip Island, approximately 280 km west of the SNA platform) has been nominated for inclusion on the National Heritage List as it provides valuable habitat for the little penguin and other species. This nomination either will be, or has been, referred to the Australian Heritage Council for assessment. No determination has been made as at September 2014.

6.6.2. Aboriginal Heritage

Native title areas within the ZPI are described in Section 6.8.1 of the West Tuna Environment Plan.

Some aboriginal sites of cultural importance include Shallow Inlet Marine and Coastal Park (identified by the Boon Wurrung, Bunurong and Gunai/Kurnai people as their traditional country), Khappinghat Nature Reserve and Saltwater National Park (of cultural importance to the Biripi and Worimi people) and Worimi National Park (of cultural importance to the Worimi people).

6.6.3. Shipwrecks

A search of the National Shipwrecks Database identified a number of shipwrecks within the ZPI (380 in Victorian waters, 254 in NSW waters and 375 in Tasmanian waters) with none in the platform operating area (DoE, 2014; see Figure 6-2).

6.7. Commercial Fishing

Commercial fisheries within the ZPI have been described in Section 6.9 of the West Tuna Environment Plan. Additionally, the Victorian Wrasse Fishery may also occur within the ZPI.

6.7.1. Victorian Wrasse Fishery

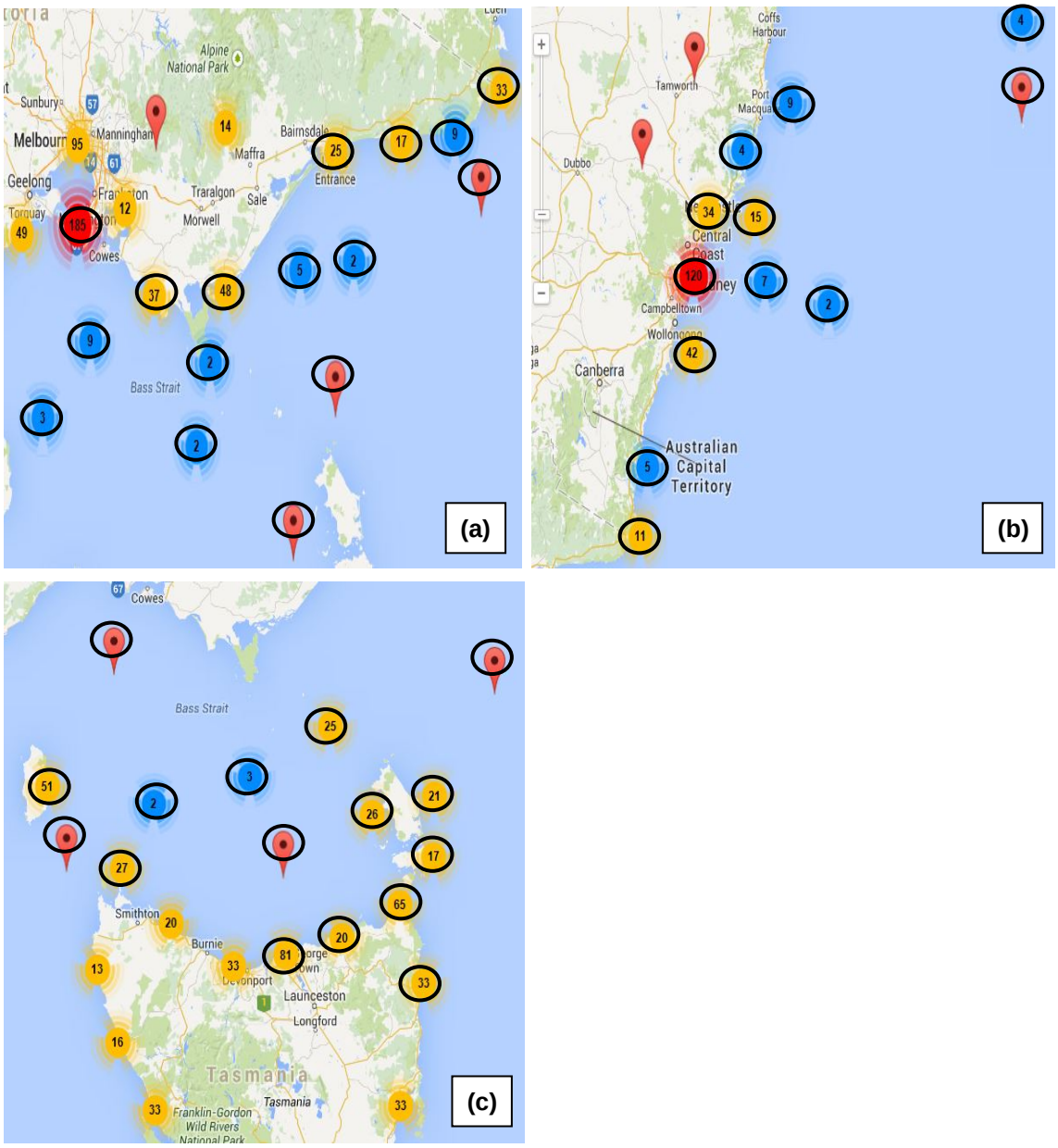
The wrasse fishery extends the entire length of the Victorian coastline and out to 20 nautical miles (with the exception of marine reserves). The fishery primarily targets the Blue-throat wrasse, the Saddled (or purple) wrasse and the Orange-spotted wrasse. While wrasse are fished along the entire Victorian coast, in recent years catches have been the highest off the central coast (Port Phillip Heads, Western Port, and Wilsons's Promontory) and west coast of Victoria (Portland) (DEPI, 2014).

6.8. Recreational Fishing, Boating and Tourism

Recreational fishing, boating and tourism activities within the ZPI, specifically within the coastal areas of Victoria and New South Wales, have been described in Section 6.10 of the West Tuna Environment Plan.

Similar to the coastal areas of Victoria and New South Wales, the coastal areas of north-eastern Tasmania also offer fishing, boating, diving, surfing and other activities in their bays, beaches and rivers. Popular activities include (Discover Tasmania, 2014):

- Walking along the beach, fishing, diving, camping and fossicking for ‘Killiecrankie diamonds’ at Flinders Island.
- Swimming and surfing at Scamander Beach.
- Exploring the mountain ranges at the Strzelecki National Park.
- Exploring the rocky gullies, beaches, forests and orange lichen-coloured boulders at the Bay of Fires Conservation Area.
- Diving, kayaking or travelling via a glass-bottomed boat through the Governor Island Marine Reserve to explore the kelp-covered reefs and sponge gardens.



Source: DoE, 2014.

Markers indicate the number of shipwrecks in that location. Red markers indicate on shipwreck in that location.

Figure 6-2 Shipwreck sites in the ZPI – (a) Victoria and (b) New South Wales (c) Tasmania

6.9. Commercial Shipping

Commercial shipping in Bass Strait has been described in Section 6.11 of the West Tuna Environment Plan.

Additional ports and waterways within the ZPI include: Shallow Inlet Waterway and Port of Anderson Inlet (Victoria); Boat Harbour, Port Macquarie, Port of Newcastle, North Harbour and Port Stephens (NSW); Port of Bell Bay and King Island (Grassy) (Tasmania).

6.10. Oil and Gas Industry

The oil and gas industry has been described in Section 6.12 of the West Tuna Environment Plan.

6.11. Potential Environments that may be affected by an Oil Spill

In the unlikely event of a worst case credible spill event (i.e., loss of well control at the sea surface), the ZPI could include sensitive marine environments with shoreline contact expected along the Victorian coast, New South Wales coast and north-eastern coast of Tasmania at the 100g/m^2 threshold. The potential impacts to offshore (potentially occurring within the platform operating area) and nearshore (potentially occurring within the ZPI) environments from oil are discussed in Section 6.13 of the West Tuna Environment Plan and have been summarised in Appendix F in this document.

7. Environmental Risk Assessment and Management

The approach and methodology used within this Environment Plan are consistent with AS/NZS ISO 31000 Risk management – Principles and Guidelines and AS/NZS ISO14001 Environmental Management Systems – Requirements with Guidance for Use.

The risk assessment methodology used to evaluate risks has been described in Section 7.1 of the West Tuna Environment Plan, including:

- Determination of consequence severity.
- Determination of probability.
- Demonstration of ALARP.
- Demonstration of acceptable level.

An Environmental Risk Assessment (ERA) workshop specific to this Environment Plan was undertaken 16 January 2014, using the ERA table from the West Tuna Environment Plan as a basis for discussion. The workshop reviewed the results of the West Tuna ERA and focussed on identifying any additional, or differences in, potential impacts and risks from activities on the SNA platform or associated pipelines. The workshop also focussed on determining measures to reduce the impacts and risks to ALARP and acceptable levels. Workshop participants were chosen based on their familiarity with, knowledge of, and expertise in Esso's operations at the SNA location.

A summary of the results of the risk assessment, including risks from Gippsland wide co-ordinated activities that also apply to the SNA platform, is provided in Appendix A (Risk Register).

8. Environmental Risk and Impact Assessment, Controls, Demonstration of ALARP and Acceptability

The risk assessment process undertaken as part of the preparation of this environment plan assessed the environmental impacts and risks associated with Gippsland wide co-ordinated activities and activities specific to the SNA platform and associated pipelines (see Environmental Risk Register in Appendix A).

This section outlines:

- A brief description of the hazards.
- The potential impact on the environment.
- A description of the controls in place to eliminate the risk where possible or reduce the risk of these events occurring to as low as reasonably practicable (ALARP).
- A demonstration of ALARP; this outlines any other measures that were considered or actions taken to reduce the risks to ALARP.
- A demonstration of acceptability.

Nineteen risks relating to facility-specific activities have been identified and assessed (RA 18, 19, 20, 21, 22, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37), and follow in Section 8.1.

As noted in Section 4.1, hazards, impacts and risks from Gippsland wide co-ordinated activities (RA 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16) that also apply to SNA have been described in Section 8.1 of the West Tuna Environment Plan and are not repeated herein.

8.1. Facility Specific Activities

8.1.1. Platform Presence and Operations

8.1.1.1. Physical presence – Noise from platform, vessels and helicopters (RA 18)

This risk has been assessed as RA 18 in the West Tuna Environment Plan.

8.1.1.2. Physical presence – Interference with other marine users (RA 19)

This risk has been assessed as RA 19 in the West Tuna Environment Plan.

8.1.1.3. Operation and maintenance of platform (RA 20)

This risk has been assessed as RA 20 in the West Tuna Environment Plan.

8.1.1.4. Sewage discharge from platform (RA 21)

This risk has been assessed as RA 21 in the West Tuna Environment Plan.

8.1.1.5. Disposal of food wastes from platform (RA 22)

This risk has been assessed as RA 22 in the West Tuna Environment Plan.

8.1.1.6. Foam Deluge System (RA 24)

This risk has been assessed as RA 24 in the West Tuna Environment Plan.

8.1.1.7. Chemicals and oils storage and handling (RA 25)

This risk has been assessed as RA 25 in the West Tuna Environment Plan.

8.1.1.8. Bulk Transfer from Vessel to Platform via Hose (RA 26)

This risk has been assessed as RA 26 in the West Tuna Environment Plan.

8.1.2. Processing

8.1.2.1. Pipeline hydrotest, flooding, dewatering and watering out discharges (RA 27)

This risk has been assessed as RA 27 in the West Tuna Environment Plan.

8.1.2.2. Produced water discharge (RA 29)

Hazard

Produced Formation Water (PFW) is continuously discharged from the platform and has the potential to cause impacts to marine organisms and temporary changes to water quality. Potential smothering impacts may also result due to the discharge of sand.

Impact Assessment

The environmental risk and impact assessment of the effects of PFW discharges to the marine environment considers:

- Discharge regime;
- Composition and chemical additives;
- Fate of PFW constituents;
- Whole effluent ecotoxicity;
- Oceanographic conditions, as inputs to plume tracking and dispersion modelling;
- Plume tracking using volatile hydrocarbon profiling;
- Dispersion modelling; and
- Multiple substance potentially affected fraction (msPAF) calculation.

In consideration of each available data on these elements as detailed below, the impacts on water and sediment organisms posed by the discharge of PFW on Snapper are assessed as low. A summary of Snapper PFW contaminant data and resulting dilution is provided below in in Table 8-1. Note: Additional field monitoring of Bass Strait seawater and sediment is proposed to address the potential deposition of PFW contaminants in sediment and further support the risk conclusion for potential effects on seawater. As volumes of PFW discharged overboard from SNA in 2014 are around 40ML/month or 1.4ML/d, which is less than one-eighth of the highest rate of discharge modelled and the highest rate of discharge during in-field plume tracking, higher dilution ratios than shown in Table 8-1 are expected.

Table 8-1 Summary of impacts of Snapper PFW on water column and sediment

Fate	Contaminant Group	Contaminant	Distance from discharge	Dilution factor (minimum)	From
Water column	**Whole effluent**	Whole effluent	N/A	6.0 62.5	Ecotoxicology, potential lethal effect Ecotoxicology, potential chronic effect
	BTEX	Benzene Benzene, dissolved Benzene, dispersed	<20m 20m 20m	9.6 53,000 320,000	ANZECC water quality 95% species protection standard, composition Field plume tracking measurement Field plume tracking measurement
		Toluene, dissolved Toluene, dispersed	20m 20m	17,000 >3,000,000	Field plume tracking measurement Field plume tracking measurement
	PAH	Naphthalene	<20m 100m 4000m 10000m	21.4 6000 <55350 165000	ANZECC water quality 95% species protection standard, composition Field plume tracking measurement Field plume tracking measurement Field plume tracking measurement
		Phenanthrene	100m 6000m	4250 >20,000	Field plume tracking measurement Field plume tracking measurement
	Phenols	Phenol	N/A	6	ANZECC water quality 95% species protection standard, composition
	Nutrients	Ammonia	N/A	29.7	ANZECC water quality 95% species protection standard, composition
	Cyanide	Cyanide	N/A	5.5	ANZECC water quality 95% species protection standard, composition
	Suspended Hydrocarbons	Oil and grease, suspended	20m 32m 1000m 6000m	80 252 1750 13000	1997 model 1997 model 1997 model 1997 model
	Dissolved Hydrocarbons	Oil and grease, dissolved	4m 20m 28m, 36m depth 32m 51m 68m 100m 1000m 6000m	16 80 100 100 185 277 200 1750 18000	2002 model 1997 model 2002 model, summer 1997 model 2002 model, summer 2002 model, transitional 1997 model 1997 model 1997 model
	Temperature	Temperature	4m	To 2-3 degrees above ambient seawater	2002 model
Sediment	**Metals**	Metals	-	-	No sediment data available.
	PAH	High molecular weight PAH	-	-	No sediment data available.

Discharge regime

The average PFW discharge volume and oil in water (OIW) concentration for the Snapper platform was 1.4ML/d and 11.6mg/L over 2013.

PFW discharge commenced in 2010 on Snapper and OIW concentrations have stayed relatively constant (Figure 8-1).

Discharge volumes are expected to stay relatively constant or decrease over the next five years, due to a reduction in the total number of wells online and a reduction in the total liquid rate in the wells, despite the expected higher water percentage in production fluids.

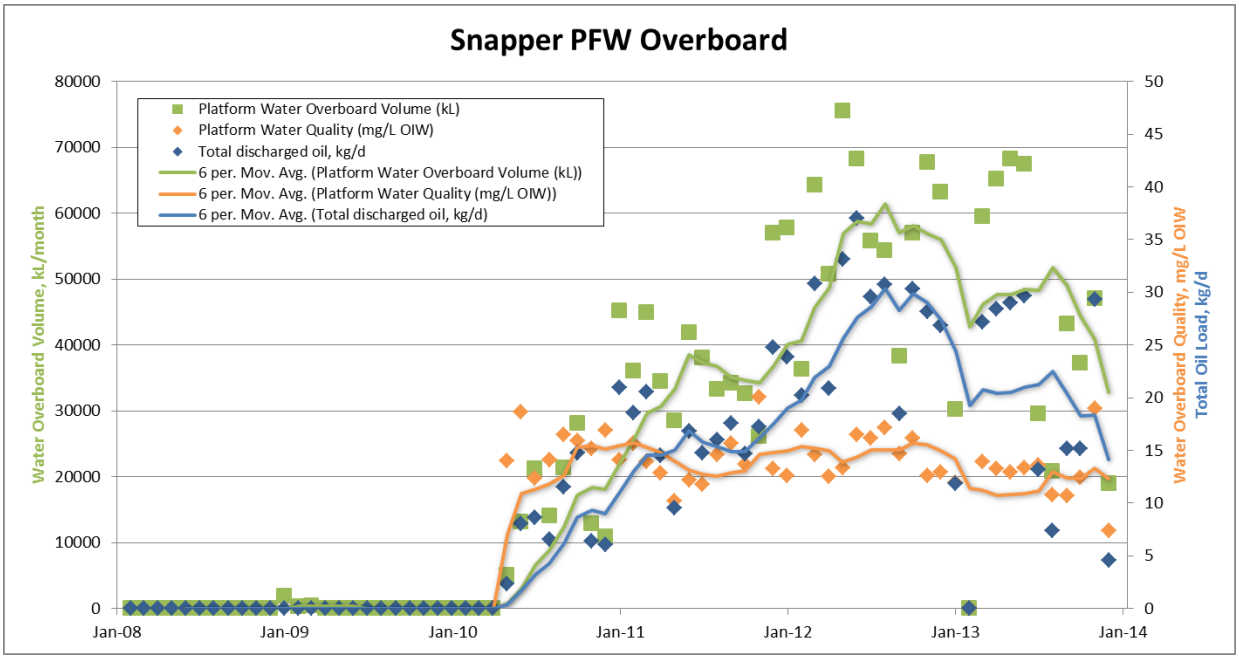


Figure 8-1 Snapper PFW discharge load, volume discharged and OIW concentration

Composition and chemical additives

PFW has been analysed for water soluble organic acids (represented by Total Organic Carbon, or TOC), mono-aromatic hydrocarbons (represented by benzene, toluene, ethylbenzene and xylene, or BTEX), poly-aromatic hydrocarbons (PAHs), phenols, and metals, among other constituents. The chemical composition of SNA PFW is shown in Table 8-2.

The Snapper sample has significant concentrations of benzene, naphthalene, phenol, cyanide, and ammonia in comparison with ANZECC marine water limits.

Chemicals are typically added to the process to prevent adverse effects such as hydrate formation, corrosion or scale formation, or to assist with process stability. Those soluble in water exit via the produced water stream and those not soluble in water travel onshore via product export pipelines.

Use of chemical and biological corrosion treatment chemicals is common to both oil and gas production operations where their use is necessary to prevent topsides and pipeline loss of containment from corrosion. Hydrate inhibitor and dehydration chemicals are almost exclusively used in gas production. Emulsion breakers, coagulants, flocculants, defoamers, paraffin inhibitors and solvents are most commonly used in liquid (crude oil, condensate, water) production. Generally, chemicals are used at concentrations that allow for consumption of the compound as it travels through the process, and very low residuals remain at the point of discharge (Ayres and Parker, 2004).

Chemicals added to the Snapper process as at October 2014 are Baker Hughes SCW24050 Scale inhibitor (CHARM Gold equivalent rating) and Baker Hughes DMO24586 Demulsifier (CHARM Gold equivalent rating).

Table 8-2 Chemical composition of PFW

Contaminant Group	mg/L	SNA 10/2014	ANZECC 99% / 95% species protection
BTEX and other VOCs	Benzene*	6.7	0.5 / 0.7
	Toluene*	13	-
	Ethylbenzene*	<0.5	-
	Total Xylenes*	5.5	-
	1.2.4-Trimethylbenzene	<0.5	
	1.3.5-Trimethylbenzene	0.15	
	2-Butanone (MEK)	0.15	
	2-Propanone (Acetone)	<2.5	
Polycyclic Aromatic Hydrocarbons (PAH)	Naphthalene*	1.5	0.05 / 0.07
	Flourene	0.037	
	Phenanthrene	0.037	
	Pyrene	<0.001	
	Flouranthene	<0.001	
	Acenapthene	<0.001	
	2-Methylnaphthalene	1.2	
Phenols	m & p Cresols	3.1	
	4-Chloro-3-methylphenol	<0.01	
	2-Chlorophenol	<0.003	
	o-Cresol	2.4	
	2,4-Dichlorophenol	<0.003	
	2,6-Dichlorophenol	<0.003	
	2,4-Dimethylphenol	1.5	
	2-Nitrophenol	<0.01	
	Pentachlorophenol*	<0.01	0.011/0.022
	Phenol*	2.4	0.27 / 0.4
	2,4,6-Trichlorophenol	<0.01	
	2,4,5-Trichlorophenol	<0.01	
	2,3,4,6-Tetrachlorophenol	<0.01	
Metals (Total unfiltered)	Arsenic	<0.001	
	Cadmium*	<0.0002	0.0007 / 0.0055
	Calcium	130	
	Chromium*	<0.0001	0.00014 / 0.0044
	Cobalt*	<0.0001	0.000005 / 0.001
	Copper*	<0.0001	0.0003 / 0.0013
	Iron	1.4	
	Lead*	<0.001	0.022 / 0.044
	Manganese	0.066	
	Mercury*	<0.0001	0.0001 / 0.0004
	Nickel*	<0.001	0.007 / 0.070
	Selenium	<0.001	
	Silver*	<0.0005	0.0008 / 0.0014
	Vanadium*	<0.001	0.005 / 0.010
	Zinc*	0.002	0.007 / 0.015
Nutrients	Ammonia (as N)*	27	0.5 / 0.91
	Total Nitrogen as N	22	None
	Phosphate	1.1	
pH	pH	7.3	
Physical	Temperature (degrees Celcius)	80	
	Total Dissolved Solids (TDS)*	18000	
	Suspended Solids (SS)*	12	
	Conductivity* (EC), µS/cm	29000	
Others	Total Organic Carbon as carbon*	260	
	Biochemical Oxygen Demand*	470	
	Carbonate	<10	
	Sulphides	5.2	
	Chloride (as Cl)	10000	
	Cyanide (total)	0.022	0.002 / 0.004
	Flouride (Waters)	8.8	None
	Methanol	<5	
	Glycols (MEG & TEG)	<20	
	Sulphur (Water)	128.1	
	Surfactants (MBAS)	<0.5	

Critical analytes are highlighted with *, these are chosen due to their potential to be higher than corresponding ANZECC criteria.

Fate of PFW constituents

- **Hydrocarbons**

There are dissolved, dispersed, suspended and settling particulate hydrocarbons in PFW.

- **Dissolved hydrocarbons**

Dissolved phase hydrocarbons are typically the constituents of primary interest when evaluating toxicity of PFW to test organisms (Terrens and Tait, 1994).

In general aromatic hydrocarbons have high water solubility and low partitioning affinity to suspended solids so most are distributed between both dissolved and particulate forms with only a small portion in suspended form. The ratio of naphthalene to phenanthrene is a guide to the ratio of suspended to dissolved aromatic hydrocarbons. For Snapper this ratio is 40 (almost halfway between 100 than 0) so there is likely a mix between dissolved and suspended forms.

Naphthalene and other poly-aromatic hydrocarbons (PAHs) can be bio-accumulated in lower trophic level organisms but are effectively bio-transformed in higher organisms which limits transfer through the foodweb (Wan et al. 2007; Takeuchi et al. 2009). Given the low concentrations in PFW and high dilution rates it is expected that PAHs pose a very low environmental risk to marine organisms.

Mono-aromatic hydrocarbons (including BTEX) have a higher water solubility than PAHs, and therefore concentrations in PFW are higher than PAHs. Where discharge plumes rise, volatile compounds like BTEX evaporate, reducing their concentration and possible harmful effects in the sea. The bioaccumulation factors of mono-aromatic hydrocarbons (BTEX) are low, and along with high dilution and biodegradation rates, suggest that the environmental risks of the discharge of PFW containing BTEX are low (Greenwood 2002).

- **Dispersed hydrocarbons**

Produced water contains small concentrations of dispersed hydrocarbons in the form of oil droplets. Dispersed oil dilutes more rapidly in a buoyant plume than dissolved oil due to its lower density and therefore any dispersed oil present may migrate directly to the sea surface micro-layer where it is subject to evaporative and natural abiotic and biotic degradation processes (Terrens 1994).

- **Suspended and settling particulate hydrocarbons**

Particulate higher molecular weight PAHs are a primary contaminant of concern in sediment due to partitioning affinity to suspended solids. Petroleum hydrocarbons adsorbed to suspended organic and inorganic solids in the water column are much less bioavailable to marine organisms than hydrocarbons in solution or dispersed in the water column (Anderson, 1983; Neff and Breteler, 1983). Because of the low bioavailability of sediment-adsorbed hydrocarbons, most benthic marine animals are able to tolerate relatively high concentrations of sediment hydrocarbons (Neff, 1989).

The possibility that precipitation will result in PFW-associated contaminants reaching the seabed has been accounted for by considering that precipitation from mixing PFW and seawater will likely result in very finely divided particles that will settle to the seafloor slowly if at all. The low settling velocities of these particles and the high energy environment of the Bass Strait will cause any accumulation in sediments to be at an extremely low loading thus posing minimal environmental risk. Therefore, it is very unlikely there are any impacts from particulate hydrocarbons in PFW to sediments. This hypothesis will be confirmed via collection of targeted sediment monitoring data for PAHs.

- **Metals**

Typical marine sediments (Robertson and Carpenter, 1976) exhibit ranges of metals concentrations higher than that of the Lakes Entrance and Latrobe formations that are perforated in wells across Bass Strait (Table 8-3).

Metals are a primary contaminant of concern in sediment due to their presence in particulate forms and resulting settling behaviour. Metals were essentially non-detected in recent composition analysis (see Table 8-2). Further, the suspended solids concentration in the PFW is quite low (12 mg/L). In addition, PFW plumes are highly buoyant. Therefore, the primary risk driver in PFW are water-soluble organic constituents that impact water column receptors and provided risks to the water column are managed,

this is considered adequate to protect benthos in sediment. This hypothesis will be confirmed via collection of targeted sediment monitoring data for PAHs.

Table 8-3 Metals concentrations in Bass Strait formations and Typical Marine Sediments

Metal, mg/kg	Lakes Entrance Formations (1069 – 1614m TVD)	Latrobe Formation (1809m TVD)	Typical Marine Sediments (Source: Robertson and Carpenter, 1976)
Arsenic	5-30	10	2-20
Cadmium	<1	<1	0.3-1
Chromium	16-19	120	10-200
Copper	11-15	65	8-700
Lead	8	<3	6-200
Mercury	<0.05	<0.05	0.05-3
Nickel	19-26	80	2-1000
Vanadium	20-70	80	10-500
Zinc	36-42	-	5-4000

- **Sand**

Sand from the reservoir collects in the separators and a small amount can overflow into water outlets from separators and be discharged in the PFW stream. Sand is unlikely to accumulate on the sea floor and pose a smothering impact, given the high energy environment. Studies under Snapper in 2009 monitored the sandy sea floor and drill cuttings piles and did not observe any sand piles from PFW discharge. This hypothesis will be confirmed via collection of targeted sediment monitoring.

- **Total Organic Carbon**

TOC from Bass Strait platform PFW is likely attributed to the presence of low molecular weight organic acids within PFW. Water soluble organic acids have low persistence (high biodegradation rate) and do not cause oxygen depletion in the water column. The expected environmental impact due to water soluble organic acids is low.

- **Nutrients**

Nutrients in water assist with biodegradation of hydrocarbon constituents, as they are a limiting factor to phytoplankton breakdown of organic particles. However, if nutrient levels are too high, the oxygen uptake in the water by bacteria degrading the hydrocarbons increase, and oxygen levels deplete (anoxia). Elevated levels of ammonia can also contribute to observed PFW toxicity. Due to the high amount of mixing the operating area, the potential for anoxic layers to form due to the discharge of nutrients in PFW is low.

- **Temperature**

Warmer water typically assists microbial biodegradation of PFW organic constituents in the water column but can also affect whether chemicals are desorbed and adsorbed from suspended particles. Due to the very short amount of time the PFW is expected to be at temperatures higher than the surrounding sea water, the expected effect of temperature on the fate of PFW constituents is expected to be minor.

- **Phenols**

Soluble organics, particularly phenols, can have an important role in determining acute toxicity of produced water. The vast majority of phenols are biodegraded (e.g. 99% reported in S. A. Flynn et al., 1996). Alkylated phenols, on the other hand, have low degradation rates and have potential for bioaccumulation. Previous tests with exposure of fish larvae to phenols in a continuous flow system indicated that effects were only present for concentrations of 25-100 ppb over several days of exposure (Smith 1993, in R. Farestveit et aI., 1996), and no lethal effects to newly hatched cod larvae were caused by exposure doses of produced water phenols in the range 3-1000 ppb – hours (R. Farestveit et aI., 1996). Due to high dilution factors, the environmental risks of the discharge of PFW containing phenol are likely to be low.

- **pH neutralisation**

Dilution and regulation of pH by the carbon dioxide equilibrium system restore the pH of the PFW to within seawater pH (7.5 – 8.4) within a few minutes after discharge. Due to these effects of rapid dilution and chemical neutralisation, PFW discharges with hydrogen ion concentrations exceeding seawater

values can only exist for a short time near the point of discharge and are not expected to cause any significant adverse environmental impacts.

Whole effluent ecotoxicity

Table 8-4 (below) presents ecotoxicity test data for Snapper PFW. Data was collected according to methods, species and taxa selection in accordance with ANZECC guidelines (ANZECC, 2000).

The data shows that *Allorchestes compressa* (a marine crustacean) experiences (acute) lethal effects at 16.8% effluent concentration or at the point where PFW is diluted 6 times.

The data shows that the no-effect concentration (NOEC) for chronic exposure for the most sensitive receptor is 1.6% effluent concentration for *Hormosira banksii* (a seaweed), indicating that the predicted no-effect concentration (PNEC) occurs at the point where PFW is diluted 62.5 times. *Hormosira banksii* is only abundant on shorelines, most commonly found in the littoral zone, exposed rock platforms or in rock pools between tide marks, more than 40km away from the operating area. Chronic effects for other species (sea urchin, marine crustacean, mussel, another algae and fish) range between 6.3 and 17.7% effluent concentration.

Table 8-4 Ecological toxicity of PFW

Platform **Month of test**	**Snapper** **10/2014**
***Specimen* (Ecotoxicity test)**	**% of effluent**
Hormosira banksii (seaweed) (macroalgal germination test 72 h NOEC **– Chronic endpoint**)	1.6
Hormosira banksii (seaweed) (macroalgal germination test 72 h EC50 **– Chronic endpoint**)	3.0
Heliocidaris tuberculata (sea urchin larval development 72 hr. EC50 – **Chronic endpoint**)	6.6
Mytilus galloprovincialis (mussel larval development 72 hr. EC50 – **Chronic endpoint**)	11.9
Nitschia closterium (algal growth 72 hr. NOEC – **Chronic endpoint**)	12.5
Allorchestes compressa (marine crustacean 96 hr. EC_{50} **– Acute endpoint**)	16.8
Lates calcarifer (fish, barramundi) 7 day NOEC biomass (7-day imbalance and biomass toxicity – **Chronic endpoint**) 7 day EC50 survival (7-day survival – **Acute endpoint**)	 6.3 17.7

Oceanographic conditions, as inputs to plume tracking and dispersion modelling

Oceanographic conditions, including wave height and period, tide levels, wind speed and direction, air temperature and humidity and barometric pressure have been collected at the Kingfish B platform and inform dispersion modelling. Wind data from Kingfish B station is loaded into the CSFR database and used in analysis below. In addition, databases such as HYCOM ocean data, HYDROMAP high resolution tidal data have been used to determine currents.

- **Currents and tides**

Predominant ocean plus tidal current average and maximum speed and direction are 0.37m/s and 1.38m/s north-east and southwest in summer (January to March), 0.38m/s and 1.57m/s north-east in spring (October-December) and 0.43m/s and 2.03m/s east-northeast in autumn and winter (April to September) (APASA, 2014, data from 2008-2012 inclusive). There is a continual tidal sweep around the platform area in a semi-diurnal (approximately 12 hour) tidal cycle. As a result, exposure to the plume in any given direction at any given time is very short-lived and the average concentration experienced by any exposed organism will be much lower than the in-plume concentrations. The limited nature of the PFW discharge in space and time also limits the potential toxicity effects to a thin buoyant plume.

- **Winds**

Winds across the region are relatively strong (on average from 13.6 to 15.9 knots and maximum from 35.2 to 54.8 knots). In general, winds were predominantly from the west-southwest and east-northeast year-round (APASA, 2014, data from 2008-2012 inclusive).

- **Bulk movement**

Frequent large scale flushing of water and sediment in Bass Strait due to winds and storms, typically eastward through westward, mitigates the localised accumulation of discharged PFW in close vicinity to the platform (ASA, 2002).

Plume tracking using volatile hydrocarbon profiling

Continuous geochemical tracer analysis (to measure a variety of light aromatic hydrocarbons) was selected to monitor the dispersion of discharged PFW in the water column. Benzene and toluene, in particular, have been shown to be excellent tracers of PFW discharge in sea water (Burns et al, 1999).

A study looking at near-field dispersion (20m around PFW discharge point) showed that benzene and toluene are diluted to approximately 53,000 and 17,000 times at 20m from the discharge (dissolved) and 320,000 and 3,000,000 times (dispersed) (Terrens and Tait, 1996) (Table 8-5). Suspended oil was not detected.

Table 8-5 Comparison of PFW Effluent and Ocean concentrations of PFW dissolved and dispersed aromatics

	PFW discharge µg/L	Ocean concentration (20m) Dissolved, ng/L	Dilution factor at 20m, dissolved	Ocean concentration (20m) Dispersed, ng/L	Dilution factor at 20m, dispersed
Naphthalene	440	37	11,890	<0.2	>2,200,000
Acenapthylene	2	0.2	10,000	<0.2	>10,000
Acenapthene	4	0.4	10,000	<0.2	>20,000
Flourene	10	2	5,000	<0.2	>50,000
Phenanthrene	18	3	6,000	<0.2	>90,000
Anthracene	0.7	<0.2	>3,500	<0.2	>3,500
Fluoranthene	0.8	0.2	4,000	<0.2	>4,000
Pyrene	0.4	0.2	2,000	<0.2	>2,000
Benzo(a)anthracene	<0.2	<0.2	N/A	<0.2	N/A
Chrysene	0.4	<0.2	>2,000	<0.2	>2,000
Benzene	320	6	53,000	<1	>320,000
Toluene	3000	180	16,667	<1	>3,000,000
Ethylbenzene	490	24	20,417	<1	>490,000
Total Xylenes	2600	220	11,818	<1	>2,600,000

A study looking at far-field dispersion (100m-10000m from the PFW discharge point) in 1996 showed that naphthalene is diluted between 6000 to 160,000 times at 100m from the discharge point and at background levels at more than 4000m from the discharge point, and phenanthrene is even further diluted (Table 8-6). Predominant current at the time of survey was south to south-south-east. PFW was found to be mostly confined to the upper 20m of the water column.

Table 8-6 Ocean concentrations of PFW aromatics in Bass Strait (N/D: non-detect)

Station and position in reference to PFW discharge	**100m**				**4000m+**			**Background**
(Results in ng/L) ND: Non-detect	**G, 100m SSE**	**H, 100m S**	**J, 100m SSE**	**K, 100m NNE**	**I, 4000m SW**	**F, 6000m SE**	**D, 10000m S**	**Stations A, E and L Background**
Naphthalene	58	15	5	8	6	5.6	2	7
Dilution ratio of Naphthalene to closest discharge in line of current	6000	18700	160000	41250	133000	55350	165000	N/A
Phenanthrene	4	ND	ND	ND	ND	<0.5	ND	ND
Dilution ratio of Phenanthrene to closest discharge in line of current	4250	N/A	N/A	N/A	N/A	>20,000	N/A	N/A

The overall conclusion from these ocean samples is that very low concentrations of dissolved aromatic hydrocarbons were detected, indicating that the PFW is highly dispersive in sea water.

Dispersion modelling

Two dispersion models have been run to model the behaviour of a discharged plume of contaminants in Bass Strait sea water. Calibration, verification and comparison of horizontal and vertical diffusion parameters of the OOC models were conducted using the plume tracking data above.

A study (1997) using the Offshore Operators Committee (OOC) model (discharge at 14ML/d and 15mg/L dissolved and 15mg/L suspended oil) showed that at 32m from the discharge point where the effluent plume reaches the sea surface it is diluted 100 (dissolved) to 252 times (suspended). At 20m suspended and dissolved oil are diluted approximately 80 times, at 100m approximately 200 times, and at 1000m approximately 1750 times. At 6 km, after dispersion by prevailing currents, hydrocarbons are diluted approximately 13,000 (suspended oil) and 18,000 times (dissolved). Reduction of temperature of the discharge occurs from 0.1 to 0.5°C above ambient seawater temperature within 32m.

A study (2002) using the OOC model (21.14 ML/d and 18.0mg/L oil-in-water content) showed that oil dilutes 16 times over 30 seconds in winter at 4m from the discharge point, and reduction of temperature of the discharge occurred from 85°C to 2-3°C above ambient temperature. In summer and transitional seasons respectively the model found the oil dilutes between 185 times at 51m (over 6.2 minutes) to 277 times at 68m from the discharge point (over 7.45 minutes). The PFW plume was sufficiently buoyant to rise through the water column. A 100 times dilution was realised at 28m from the discharge and at 36m water depth over 3.7 minutes (summer).

The conclusion of these models are that year-round oceanic dispersion effects are expected to rapidly dilute PFW discharges in the water column to extremely low concentrations.

Dispersion models give a conservative estimate of real concentration of discharged chemicals in the ocean within the discharge plume (Smith et al. 1993; Terrens & Tait 1996; Greenwood 2002). The data used in dispersion models are maximum plume concentrations and no account is taken of evaporation or degradation of the chemical components in the PFW (e.g. the light aromatic components are known to biodegrade rapidly within days) or the bulk ocean concentrations outside the plume.

Multiple substance potentially affected fraction (msPAF)

The collective risk posed by multiple contaminants in PFW is evaluated using two complimentary approaches: whole effluent toxicity data (Table 8-4) and PFW contaminant characterization data (Table 8-2). In both cases an initial assumption of near-field PFW exposure is required. To provide a conservative estimate of exposure a 1000 fold dilution within 1000 m based on plume tracking data discussed above is used for risk screening,

To assess risks using whole effluent toxicity data, the percent dilution of PFW corresponding to no effects is compared to the conservative near field exposure estimate (0.1%). If observed toxicity is greater than the near field dilution, chronic risk is considered ALARP.

To assess risks using PFW chemistry data, the msPAF calculation is used to assess the collective impact of multiple chemical stressors present in PFW on marine organisms (Schafer et al., 2013).

To apply the msPAF approach, ecotoxicity data for PFW constituents in Table 8-2 are used to define the species sensitivity distribution that describes the relationship between the percent of species impacted and concentration of the stressor, i.e. contaminant. The predicted near-field exposure concentration for each stressor is estimated by dividing the measured PFW contaminant concentrations by the conservative 1000 fold dilution factor. The predicted exposure concentrations (PECs) of each PFW contaminant is then used as input to compute the PAF of each contaminants which is then summed (depending on mode of action considerations) to compute the msPAF. If the calculated msPAF is less than 5%, chronic effects are considered ALARP.

Based on the October 2014 Snapper PFW chemistry data (Table 8-2), a preliminary analysis indicates that the msPAF confirms < 5% of species affected, consistent with observed toxicity results (Table 8-4). The component with most potential to cause toxic effects in marine organisms in Snapper PFW was found to be sulphides. The ammonia is expected to come partly from chemical additives (around one-third) and the remainder from naturally-occurring nutrients in the oil and gas reservoirs. Chemical additives based on amino compounds (of which <50% typically make up the chemical, and which may protonate to form ammonia) such as corrosion inhibitors are required in the process to prevent potential corrosion of wellbore tubulars, piping and pipelines.

Further use and evaluation of the msPAF approach will be performed and documented as future monitoring data sets become available (see Routine Monitoring section).

Routine monitoring

Esso will undertake the following routine monitoring of PFW to ensure potential risks and impacts from PFW are well understood:

- Oil-in water concentration monitoring is conducted daily.
- Performance of the online oil-in-water monitor is measured monthly.
- Esso will repeat the composition analysis at least six-monthly for two years so that the variability in produced formation water composition can be better characterized as a baseline. Composition is tested further at least annually for three years, on a reduced suite of critical and detected analytes (and at least those highlighted with * on Tables 8-2). On receipt of composition results, the multiple substance potentially affected fraction (msPAF) is calculated, following Schafer et al., 2013. This calculation addresses potential cumulative risks of multiple chemical stressors present in PFW to marine organisms. Dilution ratios in the msPAF calculation will be updated with results from dispersion modelling and/or in-situ monitoring as they become available.
- An ecotoxicity assessment of PFW is undertaken on a 5-yearly basis.
- A one-off dispersion model for each platform's PFW discharge will be created by end 2015. The dispersion model will consider oceanographic conditions, near-field trajectory and dilution of PFW, seabed sand and particulate loading, and tidal cycling.
- A targeted in-situ water and sediment monitoring program will be undertaken:
    - Objective: Establish that the concentrations of contaminants in water and sediment from PFW discharged across Esso's Bass Strait platforms is being managed to ALARP and acceptable levels, i.e.,
        - Understand spatial distribution and extent of PFW and drilling discharges,
        - Understand spatial distribution and extent of potential biological effects from PFW and drilling discharges, and
        - Ensure PFW is being degraded in the environment in an acceptable manner, i.e.
            - Compare water and sediment contamination with ecotoxicity literature and environmental quality standards (e.g. ANZECC/ARMCANZ), and/or field-specific stations with background levels
            - Compare results with modelling predictions
                - monitor the consistency of field measurements with PFW dispersion models,
                - understand changes occurring at field-specific environments due to PFW; and,
            - Support the risk assessment conclusion.
    - Scope:
        - (1) Interrogation of existing data sets
            - Examine existing datasets: including volumetric discharges across all platforms, age of facility (duration of PFW discharge), oil in water quality, discharge composition, duration since last drilling program, distance to other PFW discharges, oceanographic conditions (including seasonal variation and potential effect on sampling), water depth, PFW composition, and outfall configurations in order to select representative (regional and field-specific) sites for monitoring and select analytes of concern.
        - (2) Determine sample stations
            - Field-specific and regional station/s cover major seabed types/sediment particle size, oceanographic conditions including water depth

- Station/s to be decided based on the expected influence area based on dispersion modelling results
- Field-specific station/s to be located in transects around an outfall with most downstream of the predominant current direction
- Reference station/s (i.e. no field impact expected) may also be considered for each field-specific station network.

- (3) Conduct water program
  - Physical and chemical composition of the water column from various water depths
- (4) Conduct sediment program
  - Grab samples or similar, for physico-chemical composition analysis, (e.g. Total Organic Matter, grain size distribution, THC, aromatic hydrocarbons, PAH, decalins, esters, parrafins, barite, metals)
  - Identification of benthic infauna species.
  - Sediment profile imaging techniques may also be considered to assess changes in sediment appearance and biological activity with depth.

- Timing:
  - (1) Sampling design finalised prior to end February 2015.
  - (2) Conduct water and sediment program prior to end 2016.

Adaptive management regime

Esso will undertake the following adaptive management regime to ensure risks from PFW remain at ALARP and acceptable levels:

- Oil-in water changes
  - A 'Total Maximum Environmental Load' assessment is proposed. Daily measurements for oil in water (OIW) are collected so use of this parameter is a pragmatic "first tier" for risk screening. Earlier studies in 1990's suggested impacts from historical oil loadings associated with the 11ML/d PFW flow were acceptable. Therefore this flow provides a reasonable benchmark for judging current discharges, recognizing that higher dilution will be afforded at the lower current discharge rates. Any time the total amount of daily contaminant load (i.e. rate multiplied by contaminant concentration) oil discharged into the environment increases to above 1990's levels (i.e. 11ML/d multiplied by 30mg/L OIW = 330kg/d) further chemical composition sampling is arranged and the msPAF calculated in order to build a consistent, repeated assessment of cumulative risks.
- Chemical additive changes
  - There must be a demonstrable need (e.g. to ensure safe and stable operation of the platform or to prevent loss of containment from corrosion) for any additional chemicals to be added to the process that will impact on the PFW stream. These must be assessed according to the Chemical Assessment procedure, and only low-impact chemicals may be discharged.
  - Additive effects, chemical speciation, and bioavailability of a chemical additive are not defined by its OCNS/CHARM grouping. Therefore, any time a new chemical additive is used that has a different overall grouping, the multiple substance potentially affected fraction (msPAF) is re-calculated, using a corresponding conservative toxicity rating based on the chemical's rating.

    A 'non-detect' result in composition analysis may also be used to support a conclusion of no change in environmental risk from the additive if the chemical additive constituents are known.

- Potential environmental changes
  - Any time the msPAF calculation shows a significant increase in risk to marine organisms (i.e. > 5% of species predicted to be affected) beyond 1000 m from the discharge, further whole effluent toxicity testing to refine risk estimation or targeted field sampling is undertaken.
  - If the updated dispersion model or in-situ monitoring program shows a significant increase in risk to marine organisms (i.e. water or sediment levels >95% ANZECC species triggers or statistically higher than background levels beyond 1000 m from the discharge), we will need to carefully assess options/steps to meet environmental protection levels. If we encounter that situation, we will consider alternatives including additional separation or filtration methods, other disposal methods or reduction in water overboard discharge rate to meet acceptable environmental protection levels.

In addition to routine monitoring and adaptive management, Esso's OIMS Framework, as described in Section 10, establishes expectations for addressing risks inherent in the business and ensuring hazards are safely controlled. OIMS System 6-6 (Facility Integrity Management) contributes to the control of this risk.

Controls

- PFW is separated from crude oil and then treated by dissolved gas flotation and/or hydrocyclones to remove oil to below 30mg/L before discharge to the ocean.
- Performance of the online oil-in-water monitor is measured regularly.
- OIMS System 6-6 (Facility Integrity Management) ensures the separator low oil-water interface level instrumentation, oil phase detectors and on-line OIW monitors are appropriately maintained.
- Composition testing and ecotoxicity assessments are conducted routinely.
- Dispersion modelling and targeted in-situ sampling is conducted.
- An adaptive management regime is in place.

Risk Ranking

Likelihood	Consequence	Risk Ranking
B	IV	4

Demonstration of ALARP

Esso's OIMS System 6-6 is considered a sufficient control measure to reduce the impacts and risks associated with this hazard to ALARP, in accordance with Section 7.1.5 of the West Tuna Environment Plan, as the nature of this risk is well understood, the activity is a well-established practice and the residual risk resulting from this activity is considered to be low (Category 4). The performance of OIMS System 6-6 is appropriate for managing the day to day risk of this activity.

Managing the risk at a system level enables Esso to address multiple risks, relevant to facility integrity management, under the one system. Managing the risk at a procedural level is not considered appropriate given that the system currently manages hazards through procedural manuals, and the inefficiencies in measurement and reporting that would be required of the business are grossly disproportionate to the reduction in risk.

Other controls and alternatives were considered, in accordance with Section 7.1.5 of the West Tuna Environment Plan, including onshore disposal by temporary storage and subsequent transport, however this is not deemed practicable due to the high volumes of PFW. Retrospective implementation of equipment and processes that would allow direct transport of PFW to shore (i.e., by installation of dedicated PFW pipelines) is not considered viable due to weight and space constraints on the existing platforms.

The use of existing pipelines to transport PFW to shore introduces potential risks to pipeline integrity as PFW promotes internal corrosion. Material selection and inspection and maintenance strategies are

such that water inside these existing pipelines are minimised to reduce the rate of internal corrosion. There is limited capacity for PFW processing onshore (limited by pipeline and plant processing capacity).

PFW reinjection into productive or disused wells has been trialled but was unsuccessful on a number of platforms due to technical difficulties, such as insufficient reservoir drink rate and blockages across the reservoir perforations due to sand. Across Bass Strait, PFW is currently being re-injected on Kingfish B, which has spare unused wellbores and the reservoir characteristics have proven to be suitable for injection.

PFW re-injection into existing wells on the platform would involve addition of new wells to the platform, workover costs and acquiring additional pumping facilities, moreover technical feasibility is limited due to reservoir characteristics (e.g. reservoir drink rate).

Reduction in the amount of oil discharged offshore (for example, by implementing additional filtration equipment) is considered impractical due to reliability issues (membrane fouling resulting in water handling and platform shutdown) and availability of space on the platform, and poses additional environmental impact resulting from the high energy requirements to run the equipment, as well as imposing additional environmental impact and risks to personnel resulting from waste disposal requirements (concentrated oily waste from the filtration operation and filter membrane waste) and potential fuel spills to the marine environment).

Further monitoring other than described above (e.g. more frequent monitoring, or biological monitoring) is not warranted for the grossly disproportionate costs and reduction in risk.

Including a daily loading limit for constituents other than oil is not justified since in principle this constituent would be covered in the msPAF approach and further, daily frequency measurement of other constituents as a screening parameter is impractical.

On this basis Esso considers the risk to be ALARP.

Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 4 low risk. The OOC PFW model has been used extensively for similar modelling in the Gulf of Mexico and the North Sea, was developed for single point offshore discharges and was verified in the field, and hence is an industry-standardised method for determining environmental concentrations resulting from PFW discharges.

The requirement for PFW to have less than 30mg/L OIW is an accepted Australian industry practice, due to previous regulatory requirements.

OSPAR recommends twice-annual chemical composition sampling (OSPAR, 2012). OSPAR (the Oslo and Paris Commission) is the executive body that manages work carried out under the Convention [Treaty] for the Protection of the Marine Environment of the North-East Atlantic which is otherwise known as the OSPAR Convention, which is an international convention.

There were no valid claims or objections to this risk from relevant persons. Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 7.1.6 of the West Tuna Environment Plan.

The environmental performance outcomes and environmental performance standards for the controls above are given in Section 9, Table 9-1.

8.1.2.3. Production drainage from open and closed pile systems (RA 30)

This risk has been assessed as RA 30 in the West Tuna Environment Plan. The discharge of mercury-containing fluids does not apply to this Environment Plan.

8.1.2.4. Venting (RA 31)

This risk has been assessed as RA 31 in the West Tuna Environment Plan.

8.1.2.5. Flaring - Emissions to atmosphere (RA 32)

This risk has been assessed as RA 32 in the West Tuna Environment Plan.

8.1.2.6. Flaring - Carryover of liquid hydrocarbons (RA 33)

This risk has been assessed as RA 33 in the West Tuna Environment Plan.

8.1.2.7. Fuel combustion equipment on platform (RA 34)

This risk has been assessed as RA 34 in the West Tuna Environment Plan.

8.1.3. Unplanned Events

8.1.3.1. Vessel collision with another vessel or platform (RA 35)

This risk has been assessed as RA 35 in the West Tuna Environment Plan.

8.1.3.2. Loss of well control/well blowout from workover operations or well integrity failure (RA 36)

This risk has been assessed as RA 36 in the West Tuna Environment Plan.

The residual risk remains at an ALARP and acceptable level due to the additional oil spill response capabilities identified and stakeholder consultation undertaken, as described in this EP.

8.1.3.3. Loss of containment from pipeline or topsides (RA 37)

Hazard

A pinhole release or acute release from the pipeline or topsides piping or equipment may develop during normal operations due to corrosion (internal/external), fabrication/installation error, damage or from a dropped object which could result in an uncontrolled loss of hydrocarbons. Loss of hydrocarbon liquids into the marine environment can lead to changes in water column biochemistry, and impacts on seabirds, marine mammals and reptiles, fish and other marine organisms.

Uncontrolled loss of containment of hydrocarbons may occur through a number of mechanisms including, but not limited to:

- Overstressing of piping.
- Corrosion (internal and external).
- Low temperature embrittlement.
- Thermal cycling.
- Vibration damage.
- Accidental loads (e.g. dropped objects, mechanical impacts).

A release of glycol from the jacket leg D1, due to corrosion of the leg or damage from a vessel, can lead to changes in water column biochemistry, and impacts on seabirds, marine mammals and reptiles, fish and other marine organisms.

Impact Assessment

Design and commissioning

The design of pipelines and topsides piping and equipment was as follows:

- Material selection and associated corrosion management systems are such that they are compatible with the temperatures, pressures and compositions expected in the process. Where this is not practicable, procedures address operational arrangements to keep the system within safe / acceptable operating envelopes (critical operating procedures) for example temperature limits, pressure limits (PSVs adjusted). During the design process, quality assurance checks, audits, peer reviews and risk assessments inform further design enhancements to prevent loss of containment.
- A balance is achieved between flow velocities and piping diameters / schedules to achieve the required mass throughput without promoting excessive flow induced erosion and vibrations.

Where required, additional pipeline bracing and support to minimise spans are installed to further mitigate the risk of vibration damage.

- Piping routes and equipment placements (especially for hydrocarbon bearing systems) are such that they are protected from potential accidental loads (e.g. through shielding, specifically installed protective structures etc.). Where this is not practicable, critical operating restrictions are placed on specific activities to minimise the risk of a loss of containment.

The design and material selection for piping and pipelines and appropriate pre-installation checks and commissioning in early-life stages, combined with corrosion control, monitoring and inspection in later-life stages are implemented to maintain integrity throughout the full life cycle.

The LVO and FVO valves are function tested by a combination of a CFT (to confirm that the shutdown signal vents the hydraulic pressure), which is managed under OIMS System 6-6.

Integrity Management

Integrity management is covered under OIMS System 6-6, Facility Integrity Management System (FIMS) and includes the application of risk based processes for equipment criticality assessment and equipment strategy development. For pressure equipment (such as piping and pipelines) the following FIMS tasks are broken down to a number of elements that define the tasks required to maintain integrity including corrosion control and injection; pressure equipment integrity and pipelines integrity.

Specifically, each piece of integrity-critical topsides equipment and pipelines have an appropriate Equipment Strategy commensurate with the nature of their service. The Equipment Strategy lists the type and frequency of inspection and monitoring activities that are required to check that the FIMS integrity controls are functioning as intended for the equipment in question. Key focus is on the controls e.g., corrosion inhibition, coatings, cathodic protection, corrosion monitoring and inspection performed to ensure controls are functioning.

Pipelines, and structures such as the platform's legs, are subjected to external corrosion from the sea-water environment. The external corrosion is controlled by cathodic protection and coatings. Cathodic Protection is used to control corrosion, including the platform structure, and is checked periodically according to a risk-based frequency detailed in the Cathodic Protection Program. The Offshore Piping Inspection Program (OPIP) is a key inspection program to detect and monitor corrosion in offshore facilities. The In-line inspection (ILI) program is for detecting wall loss in pipelines and data obtained from these surveys are used to determine continued fit for purpose of the pressure equipment. Internal corrosion e.g., caused by CO2, H2S or the action of sulphate reducing bacteria (SRBs) could lead to a loss of containment. The design and implementation of the above integrity management systems minimise the risk of internal corrosion and chemical inhibition programs are also in place, that reduce the likelihood of corrosion-induced loss of containment. Program requirements are scheduled via the maintenance system and if the latest acceptable completion dates (LACD) are not met, then the programs are placed on an exception list with management sign-off.

The Coatings Integrity Management Program is a key program to monitor coating integrity. The Underwater Pipeline Inspection Program is a key inspection program to detect external corrosion of pipelines and the Pressure Vessel Inspection Program is a key inspection program to detect and monitor the corrosion/erosion of pressure vessels.

Damage prevention

Passing boats/ships have the potential to drop objects of various sizes onto the pipelines, however the possibility of such an object originating from a shipping vessel is considered highly unlikely due to the designated ATBA and distance from commercial shipping lanes.

Smaller dropped objects may also originate from fishing vessels, however it is also considered highly unlikely for the dropped object to hit a pipeline and cause damage that could lead to a loss of containment.

Shutdown systems

Automated systems are in place to initiate:

- Total Platform Shutdown (TPS);
- Subsurface Shutdown (SSSD);

- Surface Shutdown (SSD); and
- Process Shutdown.

These shutdowns are put in effect by a number of initiators that indicate abnormal operating conditions (e.g. low temperatures, excessive vibration, high pressures etc. that could bring the process to an unsafe state) or an actual loss of containment of hydrocarbons (e.g. triggering gas detectors on the topsides).

Emergency Response

Esso maintains spill response capability for responding in the event of a spill, which is outlined in the OPEP and considers timeframes to mobilise and stage a response. In accordance with OIMS System 10-2, emergency response procedures are activated when required, which includes bringing the facility back into a safe state where possible. All potential sightings of sheens or oil from the platform or a helicopter are recorded and responded to.

Esso's OIMS Framework, as described in Section 10, establishes expectations for addressing risks inherent in the business and ensuring hazards are safely controlled. OIMS Systems 6-6 (Facility Integrity Management) and 10-2 (Emergency Preparedness and Response) contribute to the control of this risk.

Controls

- OIMS System 6-6 (Facility Integrity Management) ensures critical inspection and maintenance programs are in place.
- OIMS System 6-6 (Facility Integrity Management) ensures corrosion control and monitoring programs are in place.
- OIMS System 6-6 (Facility Integrity Management) ensures cranes and lifting gear are appropriately maintained.
- OIMS System 6-6 (Facility Integrity Management) ensures shutdown and blowdown systems (pipeline high-low pressure, flowline high-low pressure, production/test header high-low pressure and export pipeline high-low pressure) are appropriately maintained.
- OIMS System 10-2 (Emergency Preparedness and Response) ensures effective emergency preparedness and response plans are in place, which provide for well-maintained equipment and trained personnel.
- OIMS System 6-6 (Facility Integrity Management) ensures oil spill equipment is appropriately maintained.

Risk Ranking

Likelihood	Consequence	Risk Ranking
D	II	3

Demonstration of ALARP

Esso's OIMS Systems 6-6 and 10-2 are considered a sufficient control measure to reduce the impacts and risks associated with this hazard to ALARP, in accordance with Section 7.1.5 of the West Tuna Environment Plan, as the nature of this risk is well understood, the activity is a well-established practice and the residual risk resulting from this activity is considered to be medium (Category 3). The performance of OIMS Systems 6-6 and 10-2 is appropriate for managing the day to day risk of this activity.

Managing the risk at a system level enables Esso to address multiple risks under the one system. Managing the risk at a procedural level is not considered appropriate given that the system currently manages hazards through procedural manuals, and the inefficiencies in measurement and reporting that would be required of the business are grossly disproportionate to the reduction in risk.

Other controls and alternatives were considered, in accordance with Section 7.1.5 of the West Tuna Environment Plan, including retrofitting alternative materials (e.g. duplex, stainless steel) for pipelines in place of carbon steel to mitigate against corrosion. This was considered to be cost-prohibitive and grossly disproportionate to the reduction in risk.

A further control to minimise the impact of pipelines is their retrospective burial. This was rejected on the basis that retrospective burial is costly and grossly disproportionate to the reduction in risk, and pipelines are likely to require visual inspection as part of the pipeline inspection and maintenance program.

In the unlikely event of a spill, Esso's well-practiced oil spill response systems would be activated (per the OPEP) and the impacts minimised.

No additional controls were identified in minimising the environmental impact from an uncontrolled loss of containment of hydrocarbons from pipelines, topsides piping and equipment.

On this basis Esso considers the risk to be ALARP.

Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 3 medium risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 7.1.6 of the West Tuna Environment Plan.

The environmental performance outcomes and environmental performance standards for the controls above are given in Section 9, Table 9-1.

8.2. Response Strategies

The hazards, impact identification and controls relevant to the response strategies are provided in Appendix B of the Central Fields Environment Plan. The demonstration of ALARP and acceptability of the response strategies is provided in Section 8.3 of the West Tuna Environment Plan.

In addition, to support a larger ZPI than described in the West Tuna Environment Plan, the following was considered:

- Access to global resources, including Regional Response Teams and global OSRO resources.

  Esso has access to additional personnel and technical expertise through the three ExxonMobil Regional Response Teams in Asia Pacific, North America and Europe/Africa/Middle East.

  As a wholly owned subsidiary of ExxonMobil Corporation, Esso also has access to oil spill response organisations (OSROs) such as AMOSC and OSRL, which provide both personnel with technical expertise and access to Tier 3 stockpiles of equipment both within Australia and overseas in Singapore, UK, Bahrain, etc. Global ExxonMobil contractual agreements can also be utilized for spill response capabilities, such as wildlife response, spill monitoring, etc.

- Changing or adding locations for dedicated dispersant stockpiles, additional tracking buoys or other equipment; including having additional equipment stocks and supplies along the coastline and just-in-time manufacturing of dispersant.

  Modelling shows that in most cases, shoreline contact is not expected to occur for at least 24 hours after a spill, therefore any equipment necessary can be mobilised to pre-designated staging areas, based on the specific spill trajectory. The availability of personnel in a staged approach in support of State agencies is adequate, and locations of existing equipment (from within Victoria, Australia and from Singapore) are suitable for the nature and scale of the spill risk. Having dedicated dispersant stockpiles, additional tracking buoys or other equipment located along the Gippsland coast or islands (e.g. Gabo or Rodondo Island), southern and central NSW coast, or Bass Strait Islands is not practicable due to additional security and safety risks, the possibility of theft and tampering and the difficulty in maintaining these stocks if they are located outside Esso's sites.

- Additional stakeholder consultation.

  Esso has consulted with State response agencies (Victoria, NSW and Tasmania) to discuss the Zone of Potential Impact. Esso and the State agencies will work cooperatively to provide equipment and resources to respond to a spill.

Further detail on response strategies is provided in the OPEP.

9. Performance Outcomes, Performance Standards and Measurement Criteria

This section outlines;

- The environmental performance outcomes against which the performance in protecting the environment can be measured and set the overall goals for the project.
- The performance standards that are applied to ensure control measures are operating at a level of performance which will manage the identified environmental impacts and risks of the activity to ALARP and acceptable levels.
- The measurement criteria that will define how environmental performance is measured against performance outcomes and performance standards.

Table 9-1 provides the full list of performance outcomes, performance standards and measurement criteria that have been developed for Esso's SNA operations. The responsibility for each performance standard has been assigned and accepted by the person in the designated role.

Note each line item numbered refers to the environmental "RA" Number for each item listed in Section 8 and also corresponds to the full risk assessment line item in Appendix A.

Every control listed in Section 8 is listed again below with the corresponding Performance Outcomes, Standards and Measurement Criteria.

9.1. Performance Outcomes

Environmental performance outcomes have been developed for each environmental hazard in Section 8 as defined in the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009.

Performance outcomes are a measurable level of performance required for the management of the environmental impacts and risks to ALARP and to an acceptable level.

9.2. Performance Standards

Performance standards are a statement of performance required of a control measure. The Performance Standards have been set for every outcome and every control outlined in Section 8 in order to demonstrate how these controls will perform effectively to ensure that the risk of impacts to the environment are managed to ALARP and to an acceptable level.

9.3. Measurement Criteria

Measurement criteria have been outlined to demonstrate how the Outcomes and Standards are measured. This forms an auditable trail and can be used to continually measure and monitor the performance of all controls, to ensure they are working effectively to reduce the risk of impacts to the environment to ALARP and to an acceptable level.

Table 9-1 Outcomes, standards and measurement criteria

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
Gippsland Wide Co-ordinated Activities							
1	Sewage discharge from vessels	Discharge of sewage waste to the marine environment.	No discharge of untreated sewage.	Not applicable.	Not applicable.	Incident records show that there has been no discharge of untreated sewage into the marine environment.	OIM
				OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors treat sewage through a certified sewage treatment system prior to discharge.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) is implemented to reduce the risk of untreated sewage discharge to the marine environment. The following level of performance is required of OIMS System 8-1: • Esso meets quarterly with the vessel contractor to review their environmental performance (via current certification records for the sewage treatment system) and to correct any deficiencies in their systems. This is to ensure that sewage is treated through a MARPOL Annex IV (Sewage) certified treatment system prior to discharge.	Monthly KPI 8-1 201 database report confirms interface meetings have occurred according to schedule. Quarterly interface meeting minutes show that vessel contractors have met their environmental performance requirements and deficiencies have been corrected in relation to the certification of the vessel sewage treatment system.	Vessel Contract Administrator
2	Disposal of food wastes from vessels	Discharge of food wastes to the marine environment.	No discharge of non-macerated food waste.	Not applicable.	Not applicable.	Incident records show that there has been no discharge of non-macerated food waste into the marine environment.	OIM
				OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors macerate putrescible waste (< 25mm size) prior to discharge, or the waste will be taken ashore for disposal.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) is implemented to reduce the risk of non-macerated food waste discharge to the marine environment. The following level of performance is required of OIMS System 8-1: • Esso meets quarterly with the vessel contractor to review their environmental performance (via food	Monthly KPI 8-1 201 database report confirms interface meetings have occurred according to schedule. Quarterly interface meeting minutes show that vessel contractors have met their environmental performance requirements and deficiencies have been corrected in relation to the food maceration system.	Vessel Contract Administrator

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					waste maceration discharge records) and to correct any deficiencies in their systems. This is to ensure that putrescible waste is treated prior to discharge.		
3	Disposal of solid/general waste from the platform	Inappropriate disposal of solid, general, hazardous waste into the marine environment from the platform.	No discharge of solid general or hazardous waste to the marine environment.	Not applicable.	Not applicable.	Incident records show that there has been no discharge of solid general or hazardous waste into the marine environment.	OIM
				OIMS System 6-5 (Environmental Management) ensures a waste management manual is in place that establishes and maintains waste management procedures for each type of waste generated including documentation requirements for handling, storage, and disposal of hazardous materials.	OIMS System 6-5 (Environmental Management) is implemented to reduce the risk of inappropriate waste discharge to the marine environment. The following level of performance is required of OIMS System 6-5: • A process or procedure is in place for managing each type of waste generated at the site including documentation of requirements for handling, storage, and disposal of hazardous materials.	Incident records show that there has been solid general or hazardous waste managed in a way that is not in accordance with waste management procedures.	OIM
4	Disposal of solid/general waste from vessels	Inappropriate disposal of solid general/hazardous waste to marine environment from vessels.	No discharge of solid general or hazardous waste to the marine environment from vessels.	Not applicable.	Not applicable.	Incident records show that there has been no discharge of solid general or hazardous waste into the marine environment from vessels.	OIM
				OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors store general refuse, solid and hazardous waste appropriately on the vessels and transfer the waste onshore for disposal.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) is implemented to reduce the risk of waste discharge to the marine environment. The following level of performance is required of OIMS System 8-1: • Esso meets quarterly with the vessel contractor to review their environmental performance (via review of the Vessel Garbage Management Plan and garbage transfer records) and to correct any deficiencies in their systems. This is to ensure that solid wastes are returned to shore and	Monthly KPI 8-1 201 database report confirms interface meetings have occurred according to schedule. Quarterly interface meeting minutes show that vessel contractors have met their environmental performance requirements and deficiencies have been corrected in relation to the Vessel Garbage Management Plan.	Vessel Contract Administrator

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					disposed of in accordance with the Vessel Garbage Management Plan.		
5	Vessel deck drainage	Discharge of hydrocarbon and/or chemical contaminated deck drainage into marine environment.	No discharge of contaminated deck drainage to marine environment.	Not applicable.	Not applicable.	Incident records show that there has been no discharge of contaminated deck drainage into the marine environment from vessels.	OIM
				OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors have scupper plugs fitted for use in overboard drains.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) is implemented to reduce the risk of discharge of contaminated vessel deck drainage to the marine environment. The following level of performance is required of OIMS System 8-1: • Esso meets quarterly with the vessel contractor to review their environmental performance and to correct any deficiencies in their systems. This is to ensure that scupper plugs are fitted for use in overboard drains.	Monthly KPI 8-1 201 database report confirms interface meetings have occurred according to schedule. Quarterly interface meeting minutes show that vessel contractors have met their environmental performance requirements and deficiencies have been corrected in relation to scupper plugs fitted for use in overboard drains.	Vessel contract administrator
6	Vessel oily water (bilge) discharge	Discharge of bilge.	No discharge of untreated bilge to the marine environment.	Not applicable.	Not applicable.	Incident records show that there has been no discharge of untreated bilge into the marine environment from vessels.	OIM
				OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors treat bilge to an oil-in-water concentration of 15ppm prior to discharge.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) is implemented to reduce the risk of untreated bilge discharge to the marine environment. The following level of performance is required of OIMS System 8-1: • Esso meets quarterly with the vessel contractor to review their environmental performance (via bilge discharge, equipment certification and maintenance records) and to correct any deficiencies in their systems. This is to ensure that oily water from the	Monthly KPI 8-1 201 database report confirms interface meetings have occurred according to schedule. Quarterly interface meeting minutes show that vessel contractors have met their environmental performance requirements and deficiencies have been corrected in relation to vessel bilge discharges and bilge treatment system certification.	Vessel Contract Administrator

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					vessel bilge system in managed in accordance with MARPOL 73/78 Annex I requirements, whereby the bilge treatment system is working to treat bilge to an oil-in-water concentration of 15ppm prior to discharge.		
7	Ballast water discharge	Unplanned introduction and transmission of invasive species.	No introduction of non-endemic marine species through ballast water.	Not applicable.	Not applicable.	Incident records show that there has been no introduction of non-endemic marine species through ballast water.	OIM
				OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors comply with the requirements of AQIS's Australian Ballast Water Management 2008 which includes exchange at sea outside of Australian territorial waters for 'high risk' ballast water from port or coastal waters.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) is implemented to reduce the risk of ballast water discharge to the marine environment resulting in the introduction of non-endemic marine species. The following level of performance is required of OIMS System 8-1: • Esso meets quarterly with the vessel contractor to review their environmental performance (via review of the Vessel Ballast Water Management Plan and ballast water discharge records) and to correct any deficiencies in their systems. This is to ensure that ballast, in accordance with the requirements of AQIS's Australian Ballast Water Management 2008, is exchanged at sea outside of Australian territorial waters for 'high risk' ballast water from port or coastal waters, and that the AQIS Ballast Water Management Summary is available with details about ballast water uptake ports, ocean exchanges and intended Australia discharge locations.	Monthly KPI 8-1 201 database report confirms interface meetings have occurred according to schedule. Quarterly interface meeting minutes show that vessel contractors have met their environmental performance requirements and deficiencies have been corrected in relation to vessel ballast water discharge.	Vessel Contract Administrator
8	Vessel biofouling	Unplanned introduction and transmission of invasive species.	No introduction of non-endemic marine species through hull fouling.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors undertake marine pest inspection and hull anti-fouling	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) is implemented to reduce the risk of the introduction of non-endemic marine species through hull fouling.	Monthly KPI 8-1 201 database report confirms interface meetings have occurred according to schedule.	Vessel Contract Administrator

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
				undertaken for all vessels within 7 days prior to entering Australian Waters, in accordance with the National Biofouling Management Guidance for the Petroleum Production and Exploration Industry (DAFF 2009).	The following level of performance is required of OIMS System 8-1: • Esso meets quarterly with the vessel contractor to review their environmental performance (via hull antifouling and marine pest inspection records and anti-fouling certification records for all vessels that have travelled outside Australian waters) and to correct any deficiencies in their systems. This is to ensure that AQIS Australian Biofouling Management Requirements are met, including hull antifouling and marine pest inspections.	Quarterly interface meeting minutes show that vessel contractors have met their environmental performance requirements and deficiencies have been corrected in relation to vessel marine pest inspection, anti-fouling and current international anti-fouling system certification for all vessels that have travelled outside Australian waters.	
9	Vessel movements	Unplanned collision with marine fauna within the 500m PSZ.	Maintain separation distance between vessels and cetaceans and safe vessel speeds as far as is practicable within safe operating limits in order avoid collisions with marine fauna within the 500m PSZ.	Not applicable.	Not applicable.	Incident records show that there has been no collision with marine fauna within the 500m PSZ.	OIM
				OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors; maintain a 300 m standoff distance from cetaceans (where possible and safe to do so) as they move into and out of the 500 m exclusion zone, and employ avoidance measures such as reducing speed within the 500 m exclusion zone (where possible and safe to do so) should listed marine species (such as cetaceans or seals) be sighted.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) is implemented to reduce the risk of a collision with marine fauna. The following level of performance is required of OIMS System 8-1: • Esso meets quarterly with the vessel contractor to review their environmental performance (via logbook records of cetacean or seal sightings, and actions taken to reduce speeds and maintain separation distances) and to correct any deficiencies in their systems. This is to ensure adherence to the National Guidelines for Whale and Dolphin Watching (2005) for mobile vessels, including the implementation of avoidance measures, has occurred.	Monthly KPI 8-1 201 database report confirms interface meetings have occurred according to schedule. Quarterly interface meeting minutes show that vessel contractors have met their environmental performance requirements and deficiencies have been corrected in relation to the maintenance of a standoff distance to cetaceans and avoidance measures to listed marine species.	Vessel Contract Administrator
10	Fuel combustion equipment on	Emissions to atmosphere.	Fuel-combustion equipment operate to MARPOL 73/78 Annex VI	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) is implemented to reduce the risk of	Monthly KPI 8-1 201 database report confirms interface meetings have occurred according to schedule.	Vessel Contract Administrator

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
	vessels		requirements to minimise air quality impacts.	contractors have certified fuel-combustion equipment and operate in accordance with a current Air Pollution Prevention Certificate, where applicable.	atmospheric emissions. The following level of performance is required of OIMS System 8-1: • Esso meets quarterly with the vessel contractor to review their environmental performance (via certification records) and to correct any deficiencies in their systems. This is to ensure fuel-combustion equipment is certified to MARPOL 73/78 Annex VI (Air Emissions) & Marine Order 97 (Marine Pollution Prevention – Air Pollution) (Equipment Certification) standards.	Quarterly interface meeting minutes show that vessel contractors have met their environmental performance requirements and deficiencies have been corrected in relation to appropriate certification of fuel-combustion equipment.	
11	Surface structure maintenance, inspection and intervention	Incidental discharge of paint, coating and grit to the marine environment.	No discharge of paint, coating or grit to the marine environment.	Not applicable.	Not applicable.	Incident records show that there has been no discharge of paint, coating or grit to the marine environment.	OIM
				OIMS System 6-4 (Work Management) ensures guidelines are provided for specific work activities, i.e. abrasive blasting, includes the containment of paint, coating or grit.	OIMS System 6-4 (Work Management) is implemented to reduce the risk of discharge of paint, coating or grit to the marine environment. The following level of performance is required of OIMS System 6-4: • A general work permit is in place for abrasive blasting that manages and controls the risks related to the work, including discharge of paint, coating or grit to the marine environment.	Incident records show that there has been no abrasive blasting work that has taken place in a way that is not in accordance with specific work management guidelines.	OIM
12	Subsea structure maintenance, inspection and intervention	Release of materials (cement, paint, metals) or potential release of hydrocarbon to the marine environment.	No release of hydrocarbon liquid to the marine environment.	Not applicable.	Not applicable.	Incident records show that there has been no release of hydrocarbon liquid to the marine environment.	OIM
				OIMS System 6-1 (Operations and Maintenance Procedures) ensures correctly categorised and approved procedures are developed for subsea	OIMS System 6-1 (Operations and Maintenance Procedures) is implemented to reduce the risk of hydrocarbon liquid release during subsea intervention.	Every time a subsea intervention is performed, a procedure is referenced that was used in performing the task, and the procedure was correctly classified and approved for use prior	Offshore Operations Superintendent

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
				interventions.	The following level of performance is required of OIMS System 6-1: • A procedure is in place for subsea interventions and it is correctly classified (as either a critical or normal procedure or work aid) • The procedure contains requirements to manage and control risks related to the work tasks, including potential for release of hydrocarbon liquids to the marine environment; and • The procedure is approved for use by the correct level of management.	to the task being performed, and it contains requirements to manage and control risks related to the work tasks, including potential for release of hydrocarbon liquids to the marine environment.	
13	ROV operations	Release of hydraulic fluid to marine environment.	Only approved low impact hydraulic fluid to be used.	The hydraulic fluid used is a low environmental impact fluid.	Only CHARM gold / silver or OCNS E / D rated or equivalent hydraulic fluids are approved for use where discharge may occur.	Chemicals approved for use and discharge list confirms the fluids are CHARM gold / silver or OCNS E / D rated or equivalent.	OIM
14	Wellwork – Discharge of wellwork fluids	Discharge of wellwork fluids to the marine environment.	No hydrocarbon liquids discharged to marine environment.	Not applicable.	Not applicable.	Incident records show that there has been no release of hydrocarbon liquids to the marine environment.	OIM
			Only approved low impact chemicals to be used in workover fluids.	Low impact chemicals used.	Only CHARM gold / silver or OCNS E / D rated chemicals or equivalent are approved for use where discharge may occur.	Chemicals approved for use and discharge list confirms the fluids are CHARM gold / silver or OCNS E / D rated or equivalent.	OIM
15	Wellwork – Discharge of cement or sand in wellwork operations	Discharge of low amounts of cement or sand to the marine environment.	Only use approved low impact cement slurry and additives.	Use of low impact cement and cement additives.	Only CHARM gold / silver or OCNS E / D rated chemicals or equivalent are approved for use where discharge may occur.	Chemicals approved for use and discharge list confirms the fluids are CHARM gold / silver or OCNS E / D rated or equivalent.	OIM
16	Use and storage of radioactive sources	Unplanned loss of radioactive source to the marine environment.	No loss of radioactive sources to the marine environment.	Not applicable.	Not applicable.	Incident records show that there has been no loss of a radioactive source to the marine environment.	OIM
				OIMS System 6-4 (Work Management) ensures guidelines are provided for radiography, that includes storage and handling requirements to prevent loss to the	OIMS System 6-4 (Work Management) is implemented to reduce the risk of loss of a radioactive source to the marine environment.	Incident records show that there has been no radiography that has taken place in a way that is not in accordance with specific work management guidelines.	OIM

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
				marine environment.	The following level of performance is required of OIMS System 6-4: • A general work permit is in place for radiography that manages and controls the risks related to the work, including potential loss of the source to the marine environment.		
Facility Specific Activities							
18	Physical presence - Noise from platform / vessels and helicopters	Noise affecting marine fauna or cetacean behaviour.	Thrusters on vessels are maintained to run efficiently to reduce noise affecting marine fauna or cetacean behaviour.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors maintain vessel thrusters.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) is implemented to reduce the risk of noise affecting marine fauna or cetaceans from vessel thrusters. The following level of performance is required of OIMS System 8-1: • Esso meets quarterly with the vessel contractor to review their environmental performance (via maintenance records) and to correct any deficiencies in their systems. This is to ensure that vessel thrusters are maintained and running efficiently.	Monthly KPI 8-1 201 database report confirms interface meetings have occurred according to schedule. Quarterly interface meeting minutes show that vessel contractors have met their environmental performance requirements and deficiencies have been corrected in relation to the maintenance of vessel thrusters.	Vessel Contract Administrator
			Maintain separation distance between vessels and cetaceans as far as is practicable within the safe operating limits in order to limit disturbance to marine life from noise.	Not applicable.	Not applicable.	Incident records show that no environmental incidents have occurred involving cetaceans.	OIM
				OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures that vessel contractors maintain a 300 m standoff distance from cetaceans (where possible and safe to do so as they move into and out of the 500 m exclusion zone).	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) is implemented to reduce the risk of noise affecting marine fauna or cetaceans from vessel thrusters. The following level of performance is required of OIMS System 8-1: • Esso meets quarterly with the vessel contractor to review their environmental performance (via logbook records of cetacean sightings which also describe where actions are	Monthly KPI 8-1 201 database report confirms interface meetings have occurred according to schedule. Quarterly interface meeting minutes show that vessel contractors have met their environmental performance requirements and deficiencies have been corrected in relation to the maintenance of a standoff distance to cetaceans.	Vessel Contract Administrator

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					taken to avoid disturbance and maintain separation distances) and to corrects deficiencies in their systems. This is to ensure adherence to the National Guidelines for Whale and Dolphin Watching (2005), whereby vessels maintain a 300 m standoff distance from cetaceans (where possible and safe to do so, as they move into and out of the 500 m exclusion zone).		
19	Physical presence of platform, subsea equipment, and pipelines	Interference with commercial/ recreational fishing or shipping activities.	Confine area of operational interference to the 500m PSZ around platform / subsea facilities and pipeline corridors.	Not applicable.	Not applicable.	Incident records show that there have been no complaints of operational interference outside the PSZ, or any complaints made are recorded, assessed for validity and are responded to.	OIM
				A 500m Petroleum Safety Zone (PSZ) is in place around the facility.	A 500m PSZ is in place around the facility.	Navigation chart Aus-357 shows a 500m PSZ around the facility.	Offshore Environment Advisor
20	Operation and maintenance of platform	Dropped objects to the marine environment from the platform, or release of oils or chemicals to the marine environment.	No dropped objects from platforms that are dislodged in storms.	Not applicable.	Not applicable.	Incident records show that there have been no dropped objects from platforms that have been dislodged in storms.	OIM
				OIMS System 6-6 (Facility Integrity Management) ensures grating, appurtenances and other caissons are appropriately maintained.	OIMS System 6-6 (Facility Integrity Management) is implemented to reduce the risk of dropped objects from platforms to the marine environment. The following level of performance is required of OIMS System 6-6: • Grating, appurtenances and other caissons are maintained in accordance with the equipment strategy, which defines criticality of the equipment, and the corrective and preventative maintenance program. • The corrective and preventative maintenance program is loaded into a computer-based maintenance system, which generates a monthly exception	Monthly exception report shows any overdue maintenance, inspection, and/or testing tasks and is signed-off by the appropriate level of Operations Management.	Offshore Operations Superintendent

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					report.		
			No accidental dropped objects or release of oils or chemicals into the marine environment during lifting.	Not applicable.	Not applicable.	Incident records show that there have been no dropped objects from platforms and no release of oils or chemicals into the marine environment during lifting.	OIM
				OIMS System 6-6 (Facility Integrity Management) ensures cranes and lifting gear are appropriately maintained.	OIMS System 6-6 (Facility Integrity Management) is implemented to reduce the risk of dropped objects from platforms to the marine environment. The following level of performance is required of OIMS System 6-6: • Cranes and lifting gear are maintained in accordance with the equipment strategy, which defines criticality of the equipment, and the corrective and preventative maintenance program. • The corrective and preventative maintenance program is loaded into a computer-based maintenance system, which generates a monthly exception report.	Monthly exception report shows any overdue maintenance, inspection, and/or testing tasks and is signed-off by the appropriate level of Operations Management.	Offshore Operations Superintendent
21	Sewage discharge from platform	Discharge of sewage waste to the marine environment.	Sewage macerator is appropriately maintained.	OIMS System 6-6 (Facility Integrity Management) ensures the sewage macerator is appropriately maintained.	OIMS System 6-6 (Facility Integrity Management) is implemented to reduce the risk of sewage discharge to the marine environment. The following level of performance is required of OIMS System 6-6: • Sewage macerators are maintained in accordance with the equipment strategy, which defines criticality of the equipment, and the corrective and preventative maintenance program. • The corrective and preventative maintenance program is loaded into a computer-based maintenance system, which generates a monthly exception report.	Monthly exception report shows any overdue maintenance, inspection, and/or testing tasks and is signed-off by the appropriate level of Operations Management.	Offshore Operations Superintendent
22	Disposal of	Discharge of food	Food waste macerator is	OIMS System 6-6 (Facility Integrity	OIMS System 6-6 (Facility Integrity	Monthly exception report shows any	Offshore

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
	food wastes from platform	wastes to the marine environment.	appropriately maintained.	Management) ensures the food waste macerator is appropriately maintained.	Management) is implemented to reduce the risk of food waste discharge to the marine environment. The following level of performance is required of OIMS System 6-6: • Food waste macerators are maintained in accordance with the equipment strategy, which defines criticality of the equipment, and the corrective and preventative maintenance program. • The corrective and preventative maintenance program is loaded into a computer-based maintenance system, which generates a monthly exception report.	overdue maintenance, inspection, and/or testing tasks and is signed-off by the appropriate level of Operations Management.	Operations Superintendent
24	Foam deluge system	Release of foam into the marine environment.	Only approved PFOS-free foams to be used in firefighting system.	Use of PFOS-free AFFF foams.	All AFFF Foams to be PFOS-free.	MSDS of foams show no PFOS chemicals in foams.	OIM
25	Chemical and oils storage and handling	Unplanned release of chemicals or oils into the marine environment.	No unplanned release of oils or non-approved chemicals into the marine environment.	Not applicable.	Not applicable.	Incident records show that there has been no release of oil to the marine environment.	OIM
				OIMS System 6-6 (Facility Integrity Management) ensures oil and chemical store bunds are appropriately maintained.	OIMS System 6-6 (Facility Integrity Management) is implemented to reduce the risk of chemicals and oils discharge to the marine environment from stores. The following level of performance is required of OIMS System 6-6: • Oil and chemical store bunds are maintained in accordance with the equipment strategy, which defines criticality of the equipment, and the corrective and preventative maintenance program. For stores, as a minimum this requires that oil and chemical stores are located within a deck bund, and water-soluble chemicals not approved for discharge	Monthly exception report shows any overdue maintenance, inspection, and/or testing tasks and is signed-off by the appropriate level of Operations Management	Offshore Operations Superintendent

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					are stored in a bund that is isolated from drain/pile. • The corrective and preventative maintenance program is loaded into a computer-based maintenance system, which generates a monthly exception report.		
		Planned release of chemicals via drain/pile.	Only approved chemicals to be released.	The water-soluble chemicals discharged to drain are low environmental impact.	Only CHARM gold / silver or OCNS E / D rated or equivalent chemicals are approved for use where discharge may occur.	Chemicals approved for use and discharge list confirms the fluids are CHARM gold / silver or OCNS E / D rated or equivalent.	OIM
26	Bulk transfer from vessel to platform via hose	Unplanned release of diesel, or other chemicals (e.g., glycol, methanol, brine) to the marine environment.	No release of diesel or other chemicals into the marine environment.	Not applicable.	Not applicable.	Incident records show that there has been no release of diesel or other chemicals to the marine environment.	OIM
				OIMS System 6-6 (Facility Integrity Management) ensures transfer hoses are appropriately maintained.	OIMS System 6-6 (Facility Integrity Management) is implemented to reduce the risk of release of diesel or other chemicals to the marine environment. The following level of performance is required of OIMS System 6-6: • Transfer hoses are maintained in accordance with the equipment strategy, which defines criticality of the equipment, and the corrective and preventative maintenance program. • The corrective and preventative maintenance program is loaded into a computer-based maintenance system, which generates a monthly exception report.	Monthly exception report shows any overdue maintenance, inspection, and/or testing tasks and is signed-off by the appropriate level of Operations Management.	Offshore Operations Superintendent
			Mitigate impact on the environment from a transfer spill.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors have a SOPEP in place.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) is implemented to mitigate the impact of a transfer spill to the marine environment. The following level of performance is required of OIMS System 8-1: • Esso meets quarterly with the vessel contractor to review their	Monthly KPI 8-1 201 database report confirms interface meetings have occurred according to schedule. Quarterly interface meeting minutes show that vessel contractors have met their environmental performance requirements and deficiencies have been corrected in relation to the	Vessel Contract Administrator

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					environmental performance (via participation in periodic SOPEP drills or review of drill records) and to correct any deficiencies in their systems. This is to ensure that adequate procedures and plans (vessel SOPEP) are in place to respond to a transfer spill.	maintenance of an adequate SOPEP and the participation in periodic SOPEP drills (or equivalent).	
				OIMS System 10-2 (Emergency Preparedness and Response) ensures effective emergency preparedness and response plans are in place, which provide for well-maintained equipment and trained personnel.	OIMS System 10-2 (Emergency Preparedness and Response) is implemented to mitigate the impact of a transfer spill to the marine environment. The following level of performance is required of OIMS System 10-2: • Procedures and plans (an OPEP) are in place to respond to a spill during transfer activities. • The OPEP is resourced, accessible, current, and clearly communicated. • Exercises, simulations, and/or drills are conducted per schedule to determine the adequacy of the OPEP.	Emergency Response Exercises show the processes of the OPEP have been practised, are adequate and have been undertaken according to schedule. If an incident occurs, the emergency response log of events demonstrates that the OPEP was followed.	Offshore Operations Superintendent
				OIMS System 6-6 (Facility Integrity Management) ensures oil spill equipment is appropriately maintained.	OIMS System 6-6 (Facility Integrity Management) is implemented to reduce the risk of release of diesel or other chemicals to the marine environment. The following level of performance is required of OIMS System 6-6: • Oil spill equipment is maintained in accordance with the equipment strategy, which defines criticality of the equipment, and the corrective and preventative maintenance program. • The corrective and preventative maintenance program is loaded into a computer-based maintenance system, which generates a monthly exception report.	Monthly exception report shows any overdue maintenance, inspection, and/or testing tasks on oil spill equipment and is signed-off by the appropriate level of Operations Management.	Offshore Operations Superintendent
27	Pipeline	Discharge of	No oil in water discharge	In the event that water is to be	Overboard discharge of hydrotesting /	Records showing the daily average	OIM

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
	hydrotest, flooding, dewatering and watering out discharges	chemicals or hydrocarbons into the marine environment.	prior to treatment to below 30mg/L per day.	discharged overboard, it is firstly treated before being discharged into the marine environment such that the oil-in-water content is below 30mg/L.	dewatering fluids is via oily water treatment system, in accordance with specific developed procedures for pipeline hydrotesting/dewatering, and is treated to below 30mg/L.	oil in water confirm concentration equal to, or less than, 30mg/L.	
			Only approved low environmental impact chemicals will be used.	The chemicals used are low environmental impact.	Only CHARM gold / silver or OCNS E / D rated or equivalent chemicals are approved for use where discharge may occur.	Chemicals approved for use and discharge list confirms the fluids are CHARM gold / silver or OCNS E / D rated or equivalent.	OIM
29	Produced water discharge	Discharge of Produced Formation Water (PFW)	No oil in water discharge prior to treatment to below 30mg/L per day.	PFW is separated from crude oil and then treated by dissolved gas flotation and/or hydrocyclones to remove oil to below 30mg/L before discharge to the ocean.	Oily water treatment system operational to ensure oil has been removed to below 30mg/L oil-in-water content before discharge to the sea.	Records showing the daily average oil in PFW, as measured by the online monitor, confirm concentration equal to, or less than, 30mg/L.	OIM
				Performance of the online oil-in-water monitor is measured regularly.	A stand-alone accredited test is undertaken monthly to assess the performance of the online oil-in-water monitor. The online oil-in-water monitor is re-calibrated if its performance does not pass the test.	Test result records confirm that a stand-alone accredited test has been undertaken and has passed the test, and if not, re-calibration of the monitor has occurred.	OIM
				OIMS System 6-6 (Facility Integrity Management) ensures the separator low oil-water interface level instrumentation, oil phase detectors and on-line OIW monitors are appropriately maintained.	OIMS System 6-6 (Facility Integrity Management) is implemented to reduce the risk of PFW discharge to the marine environment. The following level of performance is required of OIMS System 6-6: • Separator low oil-water interface level instrumentation, oil phase detectors and online OIW monitors are maintained in accordance with the equipment strategy, which defines criticality of the equipment, and the corrective and preventative maintenance program • The corrective and preventative maintenance program is loaded into a computer-based maintenance system, which generates a monthly exception report.	Monthly exception report shows any overdue maintenance, inspection, and/or testing tasks on oil spill equipment and is signed-off by the appropriate level of Operations Management.	Offshore Operations Superintendent

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
			PFW to be managed in accordance with the routine monitoring and adaptive management regimes.	Composition testing and ecotoxicity assessments are conducted routinely.	Composition analysis is conducted at least six-monthly for two years and further at least annually for three years, at least on a reduced suite of critical and detected analytes. On receipt of composition results, the multiple substance potentially affected fraction (msPAF) is calculated. An ecotoxicity assessment of PFW is undertaken on a 5-yearly basis.	Composition analysis reports, msPAF calculation reports, and ecotoxicity reports show they are completed according to the scope and schedule as intended.	Offshore Environment Advisor
				Dispersion modelling and targeted in-situ sampling is conducted.	A one-off dispersion model for the platform's PFW discharge will be created by end 2015. A one-off in-situ water and sediment monitoring program will be undertaken to assess multiple Bass Strait PFW discharge risks by end 2016.	The dispersion model report and in-situ water and sediment monitoring program report show they are completed according to the scope and schedule as intended.	Offshore Environment Advisor
				An adaptive management regime is in place.	The adaptive management regime is implemented to manage changes to PFW. It consists of: • A 'Total Maximum Environmental Load' assessment based on daily oil in water concentration, • msPAF assessment any time a new chemical additive is used that has a different overall grouping, • Triggered testing, sampling, or other actions if the msPAF calculation, dispersion model or in-situ monitoring shows significant impacts to marine organisms as defined in Section 8.	Assessment reports show any time a change was recorded there is a corresponding assessment and further triggered testing, sampling, or other actions were carried out as defined in Section 8.	Offshore Environment Advisor
30	Production drainage – open and closed pile systems	Discharge of water from open or closed pile system containing hydrocarbons or biocide.	No discharge from pile systems containing hydrocarbons or chemicals.	Not applicable.	Not applicable.	Incident records show that there have been no discharges from pile systems containing hydrocarbons or chemicals.	OIM
				OIMS System 6-6 (Facility Integrity Management) ensures closed pile level instrumentation is appropriately maintained.	OIMS System 6-6 (Facility Integrity Management) is implemented to reduce the risk of hydrocarbon or chemical discharge from pile systems.	Monthly exception report shows any overdue maintenance, inspection, and/or testing tasks and is signed-off by the appropriate level of Operations	Offshore Operations Superintendent

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					The following level of performance is required of OIMS System 6-6: • Continuous level monitoring equipment on the closed pile is maintained in accordance with the equipment strategy, which defines criticality of the equipment, and the corrective and preventative maintenance program. • The corrective and preventative maintenance program is loaded into a computer-based maintenance system, which generates a monthly exception report.	Management.	
31	Venting	Emissions to atmosphere.	Equipment that are designed to vent, are operating per design.	OIMS System 6-6 (Facility Integrity Management) ensures pipeline flexible sections (where applicable) and vents (where applicable) are appropriately maintained.	OIMS System 6-6 (Facility Integrity Management) is implemented to reduce the risk of emissions in excess of design conditions from designed venting equipment. The following level of performance is required of OIMS System 6-6: • Equipment that are designed to vent, (i.e. pipeline flexibles and vents) are maintained in accordance with the equipment strategy, which defines criticality of the equipment, and the corrective and preventative maintenance program. • The corrective and preventative maintenance program is loaded into a computer-based maintenance system, which generates a monthly exception report.	Monthly exception report shows any overdue maintenance, inspection, and/or testing tasks and is signed-off by the appropriate level of Operations Management.	Offshore Operations Superintendent
32	Flaring	Emissions to atmosphere.	Flaring only occurs during equipment malfunction, emergency situations, commissioning/ startup and for maintenance reasons.	Flaring only occurs during equipment malfunction, emergency situations, commissioning/startup and for maintenance reasons.	Flaring only during equipment malfunction, emergency situations, commissioning/startup and for maintenance reasons.	Incident records show that there have been no flaring outside of these situations.	OIM

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
33	Flaring	Unplanned carryover (release) of liquid hydrocarbon.	No carryover (release) of liquid hydrocarbons to the marine environment from the flare.	Not applicable.	Not applicable.	Incident records show that there has been no carryover of liquid hydrocarbons to the flare.	OIM
				OIMS System 6-6 (Facility Integrity Management) ensures high level shutdowns on the flare scrubber are maintained.	OIMS System 6-6 (Facility Integrity Management) is implemented to reduce the risk of liquid carryover to the marine environment. The following level of performance is required of OIMS System 6-6: • High level shutdowns on the flare scrubber are maintained in accordance with the equipment strategy, which defines criticality of the equipment, and the corrective and preventative maintenance program. • The corrective and preventative maintenance program is loaded into a computer-based maintenance system, which generates a monthly exception report.	Monthly exception report shows any overdue maintenance, inspection, and/or testing tasks and is signed-off by the appropriate level of Operations Management.	Offshore Operations Superintendent
34	Fuel combustion equipment on platform	Emissions to atmosphere.	Pumps and compressors are operating per design to reduce emissions to atmosphere.	OIMS System 6-6 (Facility Integrity Management) ensures pumps and compressors are maintained appropriately.	OIMS System 6-6 (Facility Integrity Management) is implemented to reduce the risk of emissions in excess of design conditions to the marine environment. The following level of performance is required of OIMS System 6-6: • Pumps and compressors are maintained in accordance with the equipment strategy, which defines criticality of the equipment, and the corrective and preventative maintenance program. • The corrective and preventative maintenance program is loaded into a computer-based maintenance system, which generates a monthly exception report.	Monthly exception report shows any overdue maintenance, inspection, and/or testing tasks and is signed-off by the appropriate level of Operations Management.	Offshore Operations Superintendent
35	Vessel collision (with platform or	Unplanned loss of containment of diesel/brine/glycol/	No release of diesel or other chemicals to the marine environment due to	Not applicable.	Not applicable.	Incident records show that there has been no loss of containment to the marine environment from vessel	OIM

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
	another vessel)	methanol/drilling fluid from vessel tanks to the marine environment.	vessel collision.			collision.	
				OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors have trained and qualified Vessel Masters.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) is implemented to reduce the risk of loss of containment from vessel collision. The following level of performance is required of OIMS System 8-1: • Esso meets quarterly with the vessel contractor to review their environmental performance (via training records) and to correct any deficiencies in their systems. This is to ensure Vessel Masters are able to manoeuvre the vessels in position without incident.	Monthly KPI 8-1 201 database report confirms interface meetings have occurred according to schedule. Quarterly interface meeting minutes show that vessel contractors have met their environmental performance requirements and deficiencies have been corrected in relation to the appropriate training of Vessel Masters.	Vessel contract administrator
			Mitigate impact on the environment from uncontrolled spill.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors have a SOPEP in place.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) is implemented to mitigate the impact of loss of containment to the marine environment due to a vessel collision. The following level of performance is required of OIMS System 8-1: • Esso meets quarterly with the vessel contractor to review their environmental performance (via participation in periodic SOPEP drills or review of drill records) and to correct any deficiencies in their systems. This is to ensure that adequate procedures and plans (vessel SOPEP) are in place to respond to a loss of containment due to a vessel collision.	Monthly KPI 8-1 201 database report confirms interface meetings have occurred according to schedule. Quarterly interface meeting minutes show that vessel contractors have met their environmental performance requirements and deficiencies have been corrected in relation to the maintenance of an adequate SOPEP and the participation in periodic SOPEP drills (or equivalent).	Vessel contract administrator
				OIMS System 10-2 (Emergency Preparedness and Response) ensures effective emergency preparedness and response plans are in place, which provide for well-maintained equipment and	OIMS System 10-2 (Emergency Preparedness and Response) is implemented to mitigate the impact of a spill to the marine environment. The following level of performance is	Emergency Response Exercises show the processes of the OPEP have been practised, are adequate and have been undertaken according to schedule.	Offshore Operations Superintendent

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
				trained personnel.	required of OIMS System 10-2: • Procedures and plans (an OPEP) are in place to respond to a spill. • The OPEP is resourced, accessible, current, and clearly communicated. • Exercises, simulations, and/or drills are conducted per schedule to determine the adequacy of the OPEP.	If an incident occurs, the emergency response log of events demonstrates that the OPEP was followed.	
				OIMS System 6-6 (Facility Integrity Management) ensures oil spill equipment is appropriately maintained.	OIMS System 6-6 (Facility Integrity Management) is implemented to reduce the risk of release of diesel or other chemicals to the marine environment. The following level of performance is required of OIMS System 6-6: • Oil spill equipment is maintained in accordance with the equipment strategy, which defines criticality of the equipment, and the corrective and preventative maintenance program • The corrective and preventative maintenance program is loaded into a computer-based maintenance system, which generates a monthly exception report.	Monthly exception report shows any overdue maintenance, inspection, and/or testing tasks on oil spill equipment and is signed-off by the appropriate level of Operations Management.	Offshore Operations Superintendent
36	Loss of well control/well blowout from workover operations or well integrity failure	Unplanned loss of containment of reservoir fluids.	No loss of containment of hydrocarbons to the marine environment.	Not applicable.	Not applicable.	Incident records show that there has been no loss of containment to the marine environment from loss of well control/well blowout, including from wellwork or well integrity failure.	OIM
				OIMS System 6-3 (Well Management) ensures wellwork programs are documented, understood, and effectively executed.	OIMS System 6-3 (Well Management) is implemented to reduce the risk of a loss of containment to the marine environment from wellwork and well integrity. The following level of performance is required of OIMS System 6-3: • Wellwork Procedure considers completion design, wellwork fluid selection, and formation pressures to	Wellwork procedure has been signed off by the appropriate level of management depending on the wellwork complexity.	Offshore Operations Superintendent – Wellwork and Operations Support

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					ensure that there are two barriers in the well at any time during wellwork. Depending on the wellwork level of complexity it is signed off by the appropriate level of management.		
				OIMS System 6-3 (Well Management) ensures that Wellwork Supervisors are trained and competent to perform their assigned tasks.	OIMS System 6-3 (Well Management) is implemented to reduce the risk of a loss of containment to the marine environment from wellwork and well integrity. The following level of performance is required of OIMS System 6-3: • Required Competencies (RC) for Wellwork Supervisors are met.	The OIMS System 6-3 verification measures report shows there are no non-procedural RC gaps for Wellwork Supervisors.	Offshore Operations Superintendent – Wellwork and Operations Support
				OIMS System 5-2 (Personnel Training) ensures that Operations Technicians are trained to perform their assigned tasks, including Operations integrity risks during well operations.	OIMS System 5-2 (Personnel Training) is implemented to reduce the risk of a loss of containment to the marine environment from wellwork and well integrity. The following level of performance is required of OIMS System 5-2: • Required Competencies (RC) for Operations Technicians are met.	Monthly KPI report shows there are no non-procedural RC gaps for Operations Technicians.	Offshore Operations Superintendent
				OIMS System 6-3 (Well Management) ensures well integrity activities are undertaken, including pressure monitoring, testing, preventive maintenance and downhole corrosion control.	OIMS System 6-3 (Well Management) is implemented to reduce the risk of a loss of containment to the marine environment from wellwork and well integrity. The following level of performance is required of OIMS System 6-3: • Periodic pressure monitoring, testing, preventative maintenance and downhole corrosion control is conducted in accordance with the Well Integrity Management System to ensure no loss of containment due to wellbore integrity failure. • The testing process involves an evaluation of any wellbore integrity exceptions, which are recorded in the Well Integrity Management System.	The Wellbore Integrity Testing Exception Report shows any overdue testing and potentially increased wellbore integrity risks, is prepared monthly and is signed-off by the appropriate level of management.	Offshore Operations Superintendent – Wellwork and Operations Support

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
			Mitigate impact on the environment from uncontrolled spill.	OIMS System 10-2 (Emergency Preparedness and Response) ensures effective emergency preparedness and response plans are in place, which provide for well-maintained equipment and trained personnel.	OIMS System 10-2 (Emergency Preparedness and Response) is implemented to mitigate the impact of a spill to the marine environment. The following level of performance is required of OIMS System 10-2: • Procedures and plans (an OPEP) are in place to respond to a spill. • The OPEP is resourced, accessible, current, and clearly communicated. • Exercises, simulations, and/or drills are conducted per schedule to determine the adequacy of the OPEP.	Emergency Response Exercises show the processes of the OPEP have been practised, are adequate and have been undertaken according to schedule. If an incident occurs, the emergency response log of events demonstrates that the OPEP was followed.	Offshore Operations Superintendent
				OIMS System 6-6 (Facility Integrity Management) ensures oil spill equipment is appropriately maintained.	OIMS System 6-6 (Facility Integrity Management) is implemented to reduce the risk of release of hydrocarbons to the marine environment. The following level of performance is required of OIMS System 6-6: • Oil spill equipment is maintained in accordance with the equipment strategy, which defines criticality of the equipment, and the corrective and preventative maintenance program • The corrective and preventative maintenance program is loaded into a computer-based maintenance system, which generates a monthly exception report.	Monthly exception report shows any overdue maintenance, inspection, and/or testing tasks on oil spill equipment and is signed-off by the appropriate level of Operations Management.	Offshore Operations Superintendent
37	Loss of containment from pipeline or topsides	Unplanned loss of containment of reservoir fluids due to topsides or equipment failure, chronic pinhole leak or acute failure due to corrosion, dropped	No release of hydrocarbons into the marine environment from pipelines or topsides.	Not applicable.	Not applicable.	Incident records show that there has been no release of hydrocarbons into the marine environment from pipelines or topsides.	OIM
				OIMS System 6-6 (Facility Integrity Management) ensures critical inspection and maintenance programs are in place.	OIMS System 6-6 (Facility Integrity Management) is implemented to reduce the risk of loss of containment from pipeline or topsides.	Monthly exception report shows any overdue maintenance, inspection, and/or testing tasks and is signed-off by the appropriate level of Operations Management.	Offshore Operations Superintendent

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
		object, 3rd party damage, fabrication or installation error.			The following level of performance is required of the System: • Pressure vessels, piping, and pipelines are maintained in accordance with the equipment strategy, which defines criticality of the equipment, and the corrective and preventative maintenance program. • The corrective and preventative maintenance program includes; a Coating Integrity Management Program, Pipeline Inspection Programs (including In-Line Inspection and Underwater Pipeline Inspections), an Offshore Piping Inspection Program (OPIP), a Cathodic Protection Program and a Pressure Vessel Inspection Program. • The corrective and preventative maintenance program is loaded into a computer-based maintenance system, which generates a monthly exception report.		
				OIMS System 6-6 (Facility Integrity Management) ensures corrosion control and monitoring programs are in place.	OIMS System 6-6 (Facility Integrity Management) is implemented to reduce the risk of loss of containment from pipeline or topsides. The following level of performance is required of the System: • A corrosion control and monitoring program is in place. • Exceptions to corrosion control and monitoring are reported and signed off that piping, vessels or pipelines is protected by other layers of corrosion protection.	Offshore Production Chemicals report shows any exceptions or anomalies to corrosion control and monitoring, is prepared monthly and is signed-off by the appropriate level of management.	Offshore Operations Superintendent
				OIMS System 6-6 (Facility Integrity Management) ensures cranes and lifting gear are appropriately maintained.	OIMS System 6-6 (Facility Integrity Management) is implemented to reduce the risk of dropped objects from platforms to the marine environment.	Monthly exception report shows any overdue maintenance, inspection, and/or testing tasks and is signed-off by the appropriate level of Operations Management.	Offshore Operations Superintendent

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					The following level of performance is required of OIMS System 6-6: • Cranes and lifting gear are maintained in accordance with the equipment strategy, which defines criticality of the equipment, and the corrective and preventative maintenance program. • The corrective and preventative maintenance program is loaded into a computer-based maintenance system, which generates a monthly exception report.		
				OIMS System 6-6 (Facility Integrity Management) ensures shutdown and blowdown systems (pipeline high-low pressure, flowline high-low pressure, production/test header high-low pressure and export pipeline high-low pressure) are appropriately maintained.	OIMS System 6-6 (Facility Integrity Management) is implemented to reduce the risk of a loss of containment from pipeline or topsides. The following level of performance is required of OIMS System 6-6: • Shutdown and blowdown systems (pipeline high-low pressure, flowline high-low pressure, production/test header high-low pressure and export pipeline high-low pressure) are maintained in accordance with the equipment strategy, which defines criticality of the equipment, and the corrective and preventative maintenance program. • The corrective and preventative maintenance program is loaded into a computer-based maintenance system, which generates a monthly exception report.	Monthly exception report shows any overdue maintenance, inspection, and/or testing tasks and is signed-off by the appropriate level of Operations Management.	Offshore Operations Superintendent
			Mitigate impact on the environment from a pipeline or topsides loss of containment.	OIMS System 10-2 (Emergency Preparedness and Response) ensures effective emergency preparedness and response plans are in place, which provide for well-maintained equipment and trained personnel.	OIMS System 10-2 (Emergency Preparedness and Response) is implemented to mitigate the impact of a spill to the marine environment. The following level of performance is required of OIMS System 10-2: • Procedures and plans (an OPEP) are	Emergency Response Exercises show the processes of the OPEP have been practised, are adequate and have been undertaken according to schedule. If an incident occurs, the emergency response log of events demonstrates	Offshore Operations Superintendent

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					in place to respond to a spill. • The OPEP is resourced, accessible, current, and clearly communicated. • Exercises, simulations, and/or drills are conducted per schedule to determine the adequacy of the OPEP.	that the OPEP was followed.	
				OIMS System 6-6 (Facility Integrity Management) ensures oil spill equipment is appropriately maintained.	OIMS System 6-6 (Facility Integrity Management) is implemented to reduce the risk of release of hydrocarbons to the marine environment. The following level of performance is required of OIMS System 6-6: • Oil spill equipment is maintained in accordance with the equipment strategy, which defines criticality of the equipment, and the corrective and preventative maintenance program • The corrective and preventative maintenance program is loaded into a computer-based maintenance system, which generates a monthly exception report.	Monthly exception report shows any overdue maintenance, inspection, and/or testing tasks on oil spill equipment and is signed-off by the appropriate level of Operations Management.	Offshore Operations Superintendent

10. Implementation Strategy

The Implementation Strategy identifies systems, practices and procedures to be used to ensure that the environmental impacts and risks of the activity are reduced to As Low As Reasonably Practicable and to acceptable levels, and that the environmental performance outcomes and standards in the Environment Plan are met.

10.1. Operations Integrity Management System (OIMS)

Esso's OIMS management system has been described in, and is identical to, Section 10.1 of the West Tuna Environment Plan.

10.2. Roles and Responsibilities

The production organisation structure and the positions relevant to the operation and maintenance of the SNA facility have been described in Section 10.2 of the West Tuna Environment Plan.

10.3. Training and Competency

Training and competency requirements, including platform inductions, vessel inductions and oil spill response training have been described in Section 10.3 of the West Tuna Environment Plan.

10.4. Reporting

Annual environmental performance reporting and incident notification and reporting have been described in Section 10.4 of the West Tuna Environment Plan.

10.5. Monitoring

Routine environmental monitoring and Esso's Operational and Scientific Monitoring Program has been described in, and is identical to, Section 10.5 of the West Tuna Environment Plan.

10.6. Auditing, Assessments, Investigations and Inspections

Auditing, assessments, investigations and inspections have been described in, and are identical to, Section 10.6 of the West Tuna Environment Plan.

10.7. Environmental Performance Review

Environmental performance review has been described in, and is identical to, Section 10.7 of the West Tuna Environment Plan.

10.8. Emergency and Oil Spill Preparedness and Response

Emergency and Oil Spill Preparedness and Response will be undertaken in accordance with Section 10.8 of the West Tuna Environment Plan.

10.9. Ongoing Consultation

Ongoing consultation will be undertaken in accordance with Section 10.9 of the West Tuna Environment Plan.

11. References

A complete list of references has been provided in Section 11 of the West Tuna Environment Plan.

Additionally, the following references are also applicable to this Environment Plan:

DoE, 2014l. Australian Wetlands Database – Ramsar wetlands, Elizabeth and Middleton Reefs Marine National Nature Reserve Ramsar Site. A WWW publication accessed September 2014 at http://www.environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=60

DoE, 2014m. Australian Wetlands Database – Ramsar wetlands, Myall Lakes Ramsar Site. A WWW publication accessed in September 2014 at http://www.environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=52

Office of Environment & Heritage (OEG) NSW National Parks & Wildlife Service, 2014. Reserve types in NSW – National Park. A WWW publication accessed in September 2014 at http://www.environment.nsw.gov.au/nationalparks/parktypes.aspx?type=nationalpark

Parks and Wildlife Service Tasmania, 2014. National Parks – Visitor's Guide to Tasmania's National Parks. A WWW publication accessed in September 2014 at http://www.parks.tas.gov.au /index.aspx?base=236

Parks Victoria, 2014. Shallow Inlet Marine & Coastal Park. A WWW publication accessed in September 2014 at http://parkweb.vic.gov.au/explore/parks/shallow-inlet-marine-and-coastal-park

Threatened Species Scientific Committee, 2013. *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (S266B) Conservation Advice for Subtropical and Temperate Coastal Saltmarsh.

Appendix A Risk Register

RA	Risk Identification			Risk Treatment	Residual Risk Analysis and Ranking		
	Activity	Hazard/Aspect	Potential Impact	Controls (Preventative and Mitigative)	Likelihood	Consequence	Risk Ranking
Gippsland Wide Co-ordinated Activities							
1	Sewage discharge from vessels	Discharge of sewage waste to the marine environment.	Sewage waste will be readily dispersed and degraded with little or no impact expected.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors treat sewage through a certified sewage treatment system prior to discharge.	D	Duration: L Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: M IV	4
2	Disposal of food wastes from vessels	Discharge of food wastes to the marine environment.	Food waste will be readily degraded and dispersed, little or no impact expected.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors macerate putrescible waste (< 25mm size) prior to discharge, or the waste will be taken ashore for disposal.	D	Duration: L Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: M IV	4
3	Disposal of solid/general waste from the platform	Inappropriate disposal of solid, general, hazardous waste into the marine environment from the platform.	Change in water quality. Littering of the marine environment. Death or injury of marine fauna (through ingestion, entanglement, suffocation).	OIMS System 6-5 (Environmental Management) ensures a waste management manual is in place that establishes and maintains waste management procedures for each type of waste generated including documentation requirements for handling, storage, and disposal of hazardous materials.	D	Duration: L Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: M IV	4

RA	Risk Identification			Risk Treatment	Residual Risk Analysis and Ranking		
	Activity	Hazard/Aspect	Potential Impact	Controls (Preventative and Mitigative)	Likelihood	Consequence	Risk Ranking
4	Disposal of solid/general waste from vessels.	Inappropriate disposal of solid, general/hazardous waste to marine environment from vessels.	Change in water quality. Littering of the marine environment. Death or injury of marine fauna (through ingestion, entanglement, suffocation).	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors store general refuse, solid and hazardous waste appropriately on the vessels and transfer the waste onshore for disposal.	D	Duration: L Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: M IV	4
5	Vessel deck drainage	Discharge of hydrocarbon and/or chemical contaminated deck drainage into marine environment.	Temporary changes to water column biochemistry. Acute or chronic impacts to marine organisms.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors have scupper plugs fitted for use in overboard drains.	D	Duration: L Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: M IV	4
6	Vessel oily water (bilge) discharge	Discharge of bilge.	Localised, temporary change in water quality.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors treat bilge to an oil-in-water concentration of 15ppm prior to discharge.	D	Duration: L Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: M IV	4
7	Ballast water discharge	Unplanned introduction and transmission of invasive species.	Introduced exotic species out-compete endemic species for local resources.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors comply with the requirements of AQIS's Australian Ballast Water Management 2008 which includes exchange at sea outside of Australian territorial waters for 'high risk' ballast water from port or coastal waters.	D	Duration: L Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: M IV	4

RA	Risk Identification			Risk Treatment	Residual Risk Analysis and Ranking		
	Activity	Hazard/Aspect	Potential Impact	Controls (Preventative and Mitigative)	Likelihood	Consequence	Risk Ranking
8	Vessel biofouling	Unplanned introduction and transmission of invasive species.	Introduced exotic species out-compete endemic species for local resources.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors undertake marine pest inspection and hull anti-fouling undertaken for all vessels within 7 days prior to entering Australian Waters, in accordance with the National Biofouling Management Guidance for the Petroleum Production and Exploration Industry (DAFF 2009).	D	Duration: L Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: M IV	4
9	Vessel movements	Unplanned collision with marine fauna within the 500m PSZ.	Death or injury of marine fauna.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors; maintain a 300 m standoff distance from cetaceans (where possible and safe to do so) as they move into and out of the 500 m exclusion zone, and employ avoidance measures such as reducing speed within the 500 m exclusion zone (where possible and safe to do so) should listed marine species (such as cetaceans or seals) be sighted.	B	Duration: L Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: M IV	4
10	Fuel combustion equipment on vessels	Emissions to atmosphere.	Decline in air quality / atmospheric pollution and contribution to greenhouse gases.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors have certified fuel-combustion equipment and operate in accordance with a current Air Pollution Prevention Certificate, where applicable.	A	Duration: M Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: L IV	3
11	Surface structure maintenance, inspection and intervention	Incidental discharge of paint, coating and grit to the marine environment.	Minimal impact to water quality from minor amounts of paint residue, sand blasting, coatings, grit.	OIMS System 6-4 (Work Management) ensures guidelines are provided for specific work activities, i.e. abrasive blasting, includes the containment of paint, coating or grit.	D	Duration: L Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: M IV	4

RA	Risk Identification			Risk Treatment	Residual Risk Analysis and Ranking		
	Activity	Hazard/Aspect	Potential Impact	Controls (Preventative and Mitigative)	Likelihood	Consequence	Risk Ranking
12	Subsea structure maintenance, inspection and intervention	Release of materials (cement, paint, metals) or potential release of hydrocarbon to the marine environment.	Changes to water column biochemistry. Disturbance/removal of marine growth, smothering or disturbance of benthic flora and fauna. Acute or chronic impacts or mortality of marine organisms.	OIMS System 6-1 (Operations and Maintenance Procedures) ensures correctly categorised and approved procedures are developed for subsea interventions.	D	Duration: M Scale: L Intensity: M Irreplaceability: L Vulnerability: L Influence: M III	4
13	ROV operations	Release of hydraulic fluid to marine environment.	Acute or chronic impacts on marine organisms. Changes to water column biochemistry.	The hydraulic fluid used is a low environmental impact fluid.	D	Duration: L Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: M IV	4
14	Wellwork – Discharge of wellwork fluids	Discharge of wellwork fluids to the marine environment.	Acute or chronic impacts on marine organisms. Temporary changes to water column biochemistry.	Low impact chemicals used.	D	Duration: L Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: M IV	4
15	Wellwork – Discharge of cement or sand in wellwork operations	Discharge of low amounts of cement or sand to the marine environment.	Temporary increase in turbidity in the water column. Temporary, localised increase in pH. Acute or chronic impacts on marine organisms. Smothering of benthic flora / fauna.	Use of low impact cement and cement additives.	D	Duration: L Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: M IV	4

RA	Risk Identification			Risk Treatment	Residual Risk Analysis and Ranking		
	Activity	Hazard/Aspect	Potential Impact	Controls (Preventative and Mitigative)	Likelihood	Consequence	Risk Ranking
16	Use and storage of radioactive sources	Unplanned loss of radioactive source to the marine environment.	Acute or chronic impacts on marine organisms.	OIMS System 6-4 (Work Management) ensures guidelines are provided for radiography, that includes storage and handling requirements to prevent loss to the marine environment.	E	Duration: L Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: M IV	4
Facility Specific Activities							
18	Physical presence - Noise from platform / vessels and helicopters	Noise affecting marine fauna or cetacean behaviour.	Behavioural change: disruption to migratory and/or movement patterns of seabirds / marine fauna. Hearing impairment of marine fauna. Increased stress in marine fauna. Disruption to marine fauna underwater cues.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors maintain vessel thrusters. OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures that vessel contractors maintain a 300 m standoff distance from cetaceans (where possible and safe to do so as they move into and out of the 500 m exclusion zone).	D	Duration: L Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: M IV	4
19	Physical presence of platform, subsea equipment, and pipelines	Interference with commercial/ recreational fishing or shipping activities.	Reduced area for fishing due to PSZ exclusion and interference with the migratory routes of cetaceans.	A 500m Petroleum Safety Zone (PSZ) is in place around the facility.	D	III	4 *(Risk assessed on social impact basis)*
20	Operation and maintenance of platform	Dropped objects to the marine environment from the platform, or release of oils or chemicals to the marine environment.	Localised impact to sessile benthic species. Acute or chronic impacts on marine organisms. Changes to water column biochemistry.	OIMS System 6-6 (Facility Integrity Management) ensures grating, appurtenances and other caissons are appropriately maintained. OIMS System 6-6 (Facility Integrity Management) ensures cranes and lifting gear are appropriately maintained.	D	Duration: L-M Scale: L-M Intensity: L Irreplaceability: L Vulnerability: L Influence: M III	4

RA	Risk Identification			Risk Treatment	Residual Risk Analysis and Ranking		
	Activity	Hazard/Aspect	Potential Impact	Controls (Preventative and Mitigative)	Likelihood	Consequence	Risk Ranking
21	Sewage discharge from platform	Discharge of sewage waste to the marine environment.	Sewage waste will be readily dispersed and degraded with little or no impact expected.	OIMS System 6-6 (Facility Integrity Management) ensures the sewage macerator is appropriately maintained.	D	Duration: L Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: M IV	4
22	Disposal of food wastes from platform	Discharge of food wastes to the marine environment.	Food waste will be readily degraded and dispersed, little or no impact expected.	OIMS System 6-6 (Facility Integrity Management) ensures the food waste macerator is appropriately maintained.	D	Duration: L Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: M IV	4
24	Foam deluge system	Release of foam into the marine environment.	Localised temporary changes to water column biochemistry.	Use of PFOS-free AFFF foams.	D	Duration: L Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: M IV	4
25	Chemical and oils storage and handling	Unplanned release of chemicals or oils into the marine environment and planned release of chemicals via drain/pile.	Acute or chronic impacts on marine organisms. Changes to water column biochemistry.	OIMS System 6-6 (Facility Integrity Management) ensures oil and chemical store bunds are appropriately maintained. The water-soluble chemicals discharged to drain are low environmental impact.	D	Duration: L-M Scale: L-M Intensity: M Irreplaceability: L Vulnerability: L Influence: M III	4

RA	Risk Identification			Risk Treatment	Residual Risk Analysis and Ranking		
	Activity	Hazard/Aspect	Potential Impact	Controls (Preventative and Mitigative)	Likelihood	Consequence	Risk Ranking
26	Bulk transfer from vessel to platform via hose	Unplanned release of diesel, or other chemicals (e.g., glycol, methanol, brine) to the marine environment.	Loss of inventory of hose approx. 300L – localised short term impact on water quality.	OIMS System 6-6 (Facility Integrity Management) ensures transfer hoses are appropriately maintained. OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors have a SOPEP in place. OIMS System 10-2 (Emergency Preparedness and Response) ensures effective emergency preparedness and response plans are in place, which provide for well-maintained equipment and trained personnel. OIMS System 6-6 (Facility Integrity Management) ensures oil spill equipment is appropriately maintained.	D	Duration: L Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: M IV	4
27	Pipeline hydrotest, flooding, dewatering and watering out discharges	Discharge of chemicals or hydrocarbons into the marine environment	Changes to water column biochemistry. Acute or chronic impacts on marine organisms.	In the event that water is to be discharged overboard, it is firstly treated before being discharged into the marine environment such that the oil-in-water content is below 30mg/L. The chemicals used are low environmental impact chemicals.	C	Duration: L Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: M IV	4
29	Produced water discharge	Discharge of Produced Formation Water (PFW)	Acute or chronic impacts on marine organisms. Temporary changes to water quality. Smothering impacts due to the discharge of sand.	PFW is separated from crude oil and then treated by dissolved gas flotation and/or hydrocyclones to remove oil to below 30mg/L before discharge to the ocean. Performance of the online oil-in-water monitor is measured regularly. OIMS System 6-6 (Facility Integrity Management) ensures the separator low oil-water interface level instrumentation, oil phase detectors and on-line OIW monitors are appropriately maintained. Composition testing and ecotoxicity assessments are conducted routinely. Dispersion modelling and targeted in-situ sampling is conducted. An adaptive management regime is in place.	B	Duration: L Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: M IV	4
30	Production drainage – open and closed pile systems	Discharge of water from open or closed pile system containing hydrocarbons or biocide.	Localised impact on water quality. Bioaccumulation in marine organisms.	OIMS System 6-6 (Facility Integrity Management) ensures closed pile level instrumentation is appropriately maintained.	D	Duration: M Scale: L Intensity: L-M Irreplaceability: L Vulnerability: L Influence: M III	4

RA	Risk Identification			Risk Treatment	Residual Risk Analysis and Ranking		
	Activity	Hazard/Aspect	Potential Impact	Controls (Preventative and Mitigative)	Likelihood	Consequence	Risk Ranking
31	Venting	Emissions to atmosphere.	Decline in air quality / atmospheric pollution and contribution to greenhouse gases.	OIMS System 6-6 (Facility Integrity Management) ensures pipeline flexible sections (where applicable) and vents (where applicable) are appropriately maintained.	A	Duration: M Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: L IV	3
32	Flaring	Emissions to atmosphere.	Decline in air quality / atmospheric pollution and contribution to greenhouse gases.	Flaring only occurs during equipment malfunction, emergency situations, commissioning/startup and for maintenance reasons.	D	Duration: H Scale: M Intensity: M Irreplaceability: L Vulnerability: L Influence: M III	4
33	Flaring	Unplanned carryover (release) of liquid hydrocarbon.	Acute or chronic impacts on marine organisms. Changes to water column biochemistry.	OIMS System 6-6 (Facility Integrity Management) ensures high level shutdowns on the flare scrubber are maintained.	D	Duration: L Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: M IV	4
34	Fuel combustion equipment on platform	Emissions to atmosphere.	Decline in air quality / atmospheric pollution and contribution to greenhouse gases.	OIMS System 6-6 (Facility Integrity Management) ensures pumps and compressors are maintained appropriately.	A	Duration: M Scale: L Intensity: L Irreplaceability: L Vulnerability: L Influence: L IV	3

RA	Risk Identification			Risk Treatment	Residual Risk Analysis and Ranking		
	Activity	Hazard/Aspect	Potential Impact	Controls (Preventative and Mitigative)	Likelihood	Consequence	Risk Ranking
35	Vessel collision (with platform or another vessel)	Unplanned loss of containment of diesel/brine/glycol/methanol/drilling fluid from vessel tanks to the marine environment.	Changes to water column biochemistry. Acute or chronic impacts on seabirds, marine mammals and reptiles, fish and other marine organisms.	OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors have trained and qualified Vessel Masters. OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors have a SOPEP in place. OIMS System 10-2 (Emergency Preparedness and Response) ensures effective emergency preparedness and response plans are in place, which provide for well-maintained equipment and trained personnel. OIMS System 6-6 (Facility Integrity Management) ensures oil spill equipment is appropriately maintained.	E	Duration: M Scale: M Intensity: M Irreplaceability: M Vulnerability: M Influence: M II	4
36	Loss of well control/well blowout from workover operations or well integrity failure	Unplanned loss of containment of reservoir fluids.	Changes to water column biochemistry. Acute or chronic impacts on seabirds, marine mammals and reptiles, fish and other marine organisms.	OIMS System 6-3 (Well Management) ensures wellwork programs are documented, understood, and effectively executed. OIMS System 6-3 (Well Management) ensures that Wellwork Supervisors are trained and competent to perform their assigned tasks. OIMS System 5-2 (Personnel Training) ensures that Operations Technicians are trained to perform their assigned tasks, including Operations integrity risks during well operations. OIMS System 6-3 (Well Management) ensures well integrity activities are undertaken, including pressure monitoring, testing, preventive maintenance and downhole corrosion control. OIMS System 10-2 (Emergency Preparedness and Response) ensures effective emergency preparedness and response plans are in place, which provide for well-maintained equipment and trained personnel. OIMS System 6-6 (Facility Integrity Management) ensures oil spill equipment is appropriately maintained.	E	Duration: H Scale: H Intensity: M Irreplaceability: M Vulnerability: M Influence: M I	3

RA	Risk Identification			Risk Treatment	Residual Risk Analysis and Ranking		
	Activity	Hazard/Aspect	Potential Impact	Controls (Preventative and Mitigative)	Likelihood	Consequence	Risk Ranking
37	Loss of containment from pipeline or topsides	Unplanned loss of containment of reservoir fluids due to topsides or equipment failure,chronic pinhole leak or acute failure due to corrosion, dropped object, 3rd party damage, fabrication or installation error.	Changes to water column biochemistry. Acute or chronic impacts in seabirds, marine mammals and reptiles, fish and other marine organisms.	OIMS System 6-6 (Facility Integrity Management) ensures critical inspection and maintenance programs are in place. Corrosion control and monitoring programs in place. OIMS System 6-6 (Facility Integrity Management) ensures cranes and lifting gear are appropriately maintained. OIMS System 6-6 (Facility Integrity Management) ensures shutdown and blowdown systems (pipeline high-low pressure, flowline high-low pressure, production/test header high-low pressure and export pipeline high-low pressure) are appropriately maintained. OIMS System 10-2 (Emergency Preparedness and Response) ensures effective emergency preparedness and response plans are in place, which provide for well-maintained equipment and trained personnel. OIMS System 6-6 (Facility Integrity Management) ensures oil spill equipment is appropriately maintained.	D	Duration: M Scale: M Intensity: M Irreplaceability: M Vulnerability: M Influence: M II	3

Appendix B Evaluation of Response Strategies

The evaluation of response strategies table provided in Appendix B of the Central Fields Environment Plan is applicable to this Environment Plan.

Appendix C Concordance Table

The concordance table provided in Appendix C of the West Tuna Environment Plan is applicable to this Environment Plan.

Appendix D Environmental Task Register

The Environmental Task Register provided in Appendix D of the West Tuna Environment Plan is applicable to this Environment Plan.

Appendix E Stakeholder Consultation

The consultation records and supporting documentation presented in Appendix E of the Central Fields Environment Plan is applicable to this Environment Plan.

Appendix F Environmental Impact Assessment

The Environmental Impact Assessment presented in Appendix F of the Central Fields Environment Plan is applicable to this Environment Plan.