BHP

Minerva Operation and Cessation Environment Plan

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Acronyms and Glossary

Term	Description
ADIOS	Automated Data Inquiry for Oil Spills
AEPR	Annually an Environmental Performance Review
AFMA	Australian Fisheries Management Authority
AHO	Australian Hydrographic Office
AHS	Australian Hydrographic Service
AHTS	Anchor handling tug supply vessels
AIS	Automatic identification system
ALARP	As low as reasonably practicable
AMBA	Area that may be affected
AMOSC	Australian Maritime Oil Spill Centre
AMOSPlan	Australian Marine Oil Spill Centre Plan
AMSA	Australian Maritime Safety Association
API	American Petroleum Institute
APPEA	Australian Petroleum Production and Exploration Association
APU	Australian Production Unit
ASBTIA	Australian Southern Bluefin Tuna Industry Association Ltd
AS (NZS)	Australian Standard (New Zealand Standard)
AUV	Autonomous underwater vehicle
AWO	Annulus Workover Valve
Bbl	Barrel
BHP	BHP Petroleum Pty Ltd
BIA	Biologically Important Areas
BOM	Bureau of Meteorology
BTEX	Benzene, Toluene, Ethylene and Xylene
BWM	Ballast Water Management
BWMP	Ballast Water Management Plan
BWMS	Ballast Water Management System
CAMBA	Agreement between the Government of Australia and the Government of the People's Republic of China for the protection of Migratory Birds and their Environment. (China Australia Migratory Birds Agreement)
CBTA	Competency based training an assessment
CEM	Crisis and emergency management
Cetacean	Whale and dolphin species
CGR	Condensate to gas

Term	Description
CHARM	Chemical Hazard and Risk Management
CO_2	Carbon Dioxide
CO_2-e	Carbon dioxide equivalent
CP	Cathodic
CRA	Corrosion Resistant Alloy
CRG	Community Reference Group
CWTS	Controlled waste tracking system
DAWR	Department of Agriculture and Water Resources
DELWP	Department of Environment. Land, Water and Planning
DEWHA	Department of the Environment, Water, Heritage and the Arts
DJPR	Department of Jobs, Precincts and regions
DNP	Director of National Parks
DNV	Det Norske Veritas
DoEE	Department of Environment and Energy (formerly DoE)
DOR	Dispersant to oil ratio
DoT	Department of Transport
DP	Dynamic positioning
DPIRD	Department of Primary Industries and Regional Development
EAG	Executive Advisory Group
ECC	Emergency and Crisis Centre
EES	Environmental effects statement
EFL	Electrical flying lead
EHU	Electro Hydraulic Control Umbilical
EIA	Environmental impact assessment
EIS	Environmental impact statement
EMT	Emergency Management Team
ENVID	Environment hazard identification
EP	Environment Plan, prepared in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
EPA	Environmental Protection Authority (Western Australia)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*. Commonwealth legislation designed to promote the conservation of biodiversity and protection of the environment.
EPG	Environment protection group
EPR	Environmental Performance Review
ERC	Environmental Review Committee
ERP	Emergency Response Plan

Term	Description
ESD	Ecologically Sustainable Development
FCP	Forward Command Post
FPSO	Floating Production Storage and Offloading Facility
FRT	Field response team
ft	feet
GDA	Geocentric Datum of Australia
GHG	Greenhouse gas
GIS	Geographic information system
GOWRS	Global Oiled Wildlife Response System
GPS	Global positioning system
HFL	Hydraulic Flying Lead
HQ	Hazard Quotient
HSE	Health, Safety and Environment
HSEC	Health, Safety, Environment and Community
IAP	Incident Action Plan
IAPP	International air pollution prevention
IBWMC	Approved ballast water management certificate
ICS	Incident command system
IMO	International Maritime Organisation
IMR	Inspections, maintenance and repairs
IMS	Introduced marine species
IMT	Incident Management Team
IOGP	International Association of Oil & Gas Producers
IOPP	International oil pollution prevention
IPIECA	International Petroleum Industry Environmental Conservation Association
ISPP	International sewage prevention pollution
ITOPF	International Tanker Owners Pollution Federation Limited.
IUCN	International Union for Conservation of Nature
JAMBA	Agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment. (Japan Australia Migratory Birds Agreement)
KEF	Key ecological feature
km	Kilometre
L	Litre
LEFCOL	Lakes Entrance Fisherman's Co-op

Term	Description
LEL	Lower Explosive Limit
LNG	Liquefied Natural Gas
LOWC	Loss of Well Control
LPG	Liquid petroleum gas
m^3	Cubic metre
m	Metre
mm	millimetre
MARPOL	International Convention for the Prevention of Pollution from Ships
MARS	Maritime Arrivals Reporting System
MBES	Multibeam echo sounder
MEG	Monoethylene Glycol (a hydrate inhibitor)
MEPS	Marine environmental protection services
MMscf	Million standard cubic feet per day
MNES	Matter of National Environmental Significance
MODU	Mobile Offshore Drilling Unit
MOSES	Marine oil spill equipment system
MoU	Memorandum of Understanding
MPa	Mega Pascal
MSI	Maritime Safety Information
MSIC	Maritime Safety Identification Card
NA	Not applicable
NATPLAN	National Plan for Maritime Environmental Emergencies
NCVA	National Conservation Values Atlas
NEBA	Net environmental benefit analysis
NES	Matters of National Environmental Significance, according to the EPBC Act
NGER	National Greenhouse and Energy Reporting
NGO	Non-governmental organisations
nm	Nautical mile (1,852 m) a unit of distance on the sea
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NOPTA	National Offshore Petroleum Titles Administrator
NOx	Nitric oxide
NPI	National Pollutant Inventory
NRST	National Response Team
OCNS	Offshore Chemical Notification Scheme
ODS	Ozone-depleting substance

Term	Description
OFL	Optical Flying Lead
OIW	Oil in water
OPEP	Oil Pollution Emergency Plan
OPGGS (E) Regulations	*Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009*
OPGGS Act	*Offshore Petroleum and Greenhouse Gas Storage Act 2006*
OSCP	Oil Spill Contingency Plan
OSMG	Oil Spill Monitoring Guideline
OSPAR	Oslo and Paris Commission for the Convention for the Protection of the Marine Environment of the North-East Atlantic
OSR	Oil Spill Response
OSRA	Oil Spill Response Agency
OSRL	Oil Spill Response Limited
OSTB	Oil spill tracking buoys
OSTM	Oil spill trajectory modelling
OVID	Offshore Vessel Inspection Database
OWR	Oiled Wildlife Response
PAH	Polycyclic aromatic hydrocarbons
PAM	Passive acoustic monitoring
PEC:NEC	Predicted Effect Concentration against No Effect Concentration
PFW	Produced formation water
PIC	Person in Charge
PINP	Phillip Island National Park
PLONOR	OSPAR definition of a substance Poses Little Or NO Risk to the environment
PMS	Preventative maintenance system
PMST	Protected Matters Search Tool
PMV	Production master valves
POLREP	Pollution Report
PPE	Personal protective equipment
ppm	Parts per million
PS	Performance Standard
psi	Pounds per square inch
PWV	Production wing valves
QA/QC	Quality assurance / quality control
RBI	Risk based inspection
RCC	Rescue Coordination Centre
RO	Reverse Osmosis
ROKAMBA	Agreement between the Republic of Korea and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment. (Republic of Korea-Australia Migratory Birds Agreement)

Term	Description
ROV	Remotely operated vehicle
RS	Response Strategy
SCAT	Shoreline clean-up and assessment technique
Scf/min	Standard cubic foot per minute
SCSSV	Surface controlled subsurface safety valves
SE	South east
SEL	Sound exposure level
SETFIA	South East Trawl Fishing Industry Association
SIV	Seafood Industry Victoria
SLDMB	Self-locating datum marker buoys
SMPEP	Shipboard Marine Pollution Emergency Plan
SOLAS	International Convention of the Safety of Life at Sea
SOPEP	Shipboard Oil Pollution Emergency Plan
SO_X	Sulphur Oxides
SSFA	Sustainable Shark Fishing Association
SSIA	Southern Shark Industry Alliance
SSS	Side scan sonar
SSW	South south-west
STB	Stock Tank Barrel
TBT	Tributyltin
TEC	Threatened ecological community
TJ/d	Tera Joules per day
TPH	Total petroleum hydrocarbons
UKOOA	United Kingdom Offshore Operators Association
UTA	Umbilical termination assembly
VEAWP	Victorian Emergency Animal Welfare Plan
VFA	Victorian Fishing Authority
VICPLAN	Victorian Plan Pollution Contingency Plan
VRFish	Victorian Recreation Fishing Peak Body
VSFA	Victorian Scallop Fisherman's Association
WA	Western Australia
WMP	Waste Management Plan
WOMP	Well Operations Management Plan

1 Introduction

1.1 Proposed Activity

BHP Billiton Petroleum (Victoria) Pty Ltd (BHP) proposes to continue ongoing operations activities and to commence cessation phase activities at end of field life for the offshore Minerva gas field located in graticular block (VIC/L22), which comprises the Minerva subsea pipeline which runs from the Minerva wells to the boundary of the Victorian State Waters. Production licence VIC/PL33 is located in Commonwealth waters, approximately 11 km south, south-west (SSW) of the township of Port Campbell, Victoria.

The Minerva Gas Field was discovered in March 1993. Production of the field is currently in decline. Production from the field will cease once production is no longer viable from Minerva-4, estimated to be late 2019 or 2020 with cessation activities to commence thereafter.

The Minerva offshore facilities produce hydrocarbon liquids from the Minerva reservoir via two subsea vertical wells. The hydrocarbon liquids are then transported onshore to the Minerva Gas Plant located on shore via a common pipeline for processing (Figure 3-3 and Figure 3-2).

BHP is acting as the operator on behalf of a joint venture comprising the titleholders:

- BHP; and
- Cooper Energy Limited.

1.2 Background

The Minerva Gas Plant development was assessed as a joint Commonwealth/State Environmental Impact Statement (EIS) – Victorian Environment Effects Statement (EES) under the Commonwealth *Environmental Protection (Impact of Proposals)* Act 1974 and the Victorian *Environment Effects* Act 1978. The Victorian Government approved the Environmental Impact Assessment (EIA) in March 2000 and approval from the Federal Government was received in March 2001.

The offshore wells were drilled in late 2002, and the offshore and onshore pipeline was laid in 2003. The construction of the onshore gas plant was completed in December 2004, and the facilities were commissioned and commenced production in January 2005.

1.3 Purpose of the Environment Plan

The overall purpose of this Minerva Operations Cessation EP (Commonwealth) is to ensure that all activities associated with the Minerva Operations are planned and conducted in line with BHP's Charter and Health, Safety, Environment and Community (HSEC) management system (refer to Section 10.1.1).

This EP has been prepared by BHP as a formal means of identifying the environmental risks associated with Minerva Operation and Cessation activities and ensuring that identified risks are managed in accordance with the BHP Environment and Climate Change – Our Requirements.

Petroleum activities in Commonwealth waters are regulated by NOPSEMA under the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGS Act) and associated *Offshore Petroleum Greenhouse Gas Storage (Environment)* (OPGGS (E)) Regulations. The content and structure of this EP has been developed to address the criteria for acceptance and the content requirements for EPs set out by the OPGGS (E) Regulations. The EP aims to demonstrate how environmental performance outcomes, environmental performance standards and measurement criteria will be applied to manage the environmental impacts and risks of the activity to *as low as reasonably practicable (ALARP)* and acceptable levels.

Table 1-1 provides a summary of the content of this EP and its concordance with the specific requirements of the OPGGS (E) Regulations. In brief, the EP includes:

- A description of the Minerva offshore infrastructure and activities;
- A description of the requirements, including applicable environmental legislation that apply to the activity;
- A description of the existing environment that may be affected by the activity;

- A description of consultation with relevant authorities, persons and organisations;
- An evaluation of the environmental impacts and risks;
- Appropriate environmental performance outcomes, environmental performance standards and measurement criteria;
- An implementation strategy for the activity that includes (amongst others) an Oil Pollution Emergency Plan (OPEP); and
- Monitoring, recording and reporting arrangements in relation to the proposed activity.

Table 1-1: Environment Plan Content Summary

Content	EP section	Environment Regulations Clause
Introduction, scope and purpose of the EP.	1	
BHP policies and approach to environmental management.	1	16(a)
Description of the Minerva operational offshore activities (location, timing, methods and equipment).	3	13(1)
Description of the environment (natural, cultural, socio-economic and values and sensitivities).	4	13(2)
Description of the environmental risks and impacts and risk assessment relevant to the activities.	5.5, 7, and 8	13(3)
Details the performance objectives, standards and measurement criteria established for each environmental risk and impact for the Minerva operational offshore activities.	5.5, 7, 8 and 9	11(1)(d), 13(4), 13(5)
Details the standards, environmental management and mitigation measures (commitments) to be implemented to meet standards and achieve performance objectives.	5.5, 7, 8 and 9	14(3)
Roles and responsibilities for management of environmental impacts and risks.	10	14(4), 14(5)
Details the reporting requirements (routine and non-routine).	10	15(1), 26, 26A, 26AA, 26B
Environment legislation applicable to the Minerva operational offshore activities.	2	13(5)
Analysis of control measures to assure that environmental impacts and risks have been reduced to ALARP.	5.5, 7, 8 and 9	11(1) (b)
Demonstration that environmental impacts and risks of the activity will be of an acceptable level.	5.5, 7, 8 and 9	11(1) (c)
Description of consultation with relevant authorities, persons and organisations.	5	11A, 16(b)
Oil Pollution Emergency Plan	Appendix F	14 (8), 14(8AA), 14(8A)

1.4 Environment Plan Summary

Under the new transparency arrangements an environment plan summary has been need to be included in as part of the Minerva Operations and Cessation EP. The EP Summary has been prepared from material provided and consists of the following as required by the OPGGS (E) Regulations 11(4).

Table 1-2: Environment Plan Summary

Content	EP Section
The location of the activity.	3.1
A description of the receiving environment.	4
A description of the activity.	
The details of environmental impacts and risks.	3
A summary of the control measures for the activity.	7 and 8
A summary of the arrangements for ongoing monitoring of the titleholder's environmental performance.	7 and 8
A summary of the response arrangements in the oil pollution emergency plan.	9
The details of consultation already undertaken, and plans for ongoing consultation.	5
The details of the titleholder's nominated liaison person for the activity.	1.8

1.5 Scope

This EP covers all offshore facilities and related operations and cessation activities including IMR at the:

- Minerva wells and subsea infrastructure (VIC/L22); and
- The Minerva subsea pipeline (VIC/PL33), which runs from the Minerva wells to the boundary of the Victorian State Waters (Figure 1-1).

This EP addresses the management of planned and unplanned events identified from various environmental hazard assessments undertaken for the Minerva Operations.

This EP will be revised and resubmitted to the regulatory authority, National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), for approval every 5 years from the date of acceptance of this plan or if a new or increased risk occurs that is not covered in the EP.

For the avoidance of doubt, the sections of this EP submitted to NOPSEMA for acceptance under s11 of the OPGGS (E) Regulations are the activities that are contained within Commonwealth waters only and covered under the OPGGS Act.

Those activities outside the scope of the EP (not being assessed) are:

- Vessel travel to/ from the permit areas (VIC/PL33 and VIC/L22);
- The plugging and abandoning of the Minerva wells. Separate approvals will be obtained for this phase of activities; and
- Separate approvals will be obtained for field decommissioning and abandonment of development infrastructure remaining in Permit Areas VIC/PL33 and VIC/L22.

1.5.1 Current Operations Phase

The current operation phase commenced in 2005 in Commonwealth waters includes:

- Production from two subsea vertical wells;
- Transport of gas from two subsea vertical wells via subsea pipeline (Figure 1-1);
- Inspections, maintenance and repairs (IMR) of subsea infrastructure (wellheads, flowlines, umbilical, manifold, pipeline); and
- Non-routine and accidental activities and incidents.

1.5.2 Cessation Phase

Cessation activities within the scope of this EP are as follows:

- Intervention activities to ‘‘shut in’’ existing infrastructure so that it is cleared of hydrocarbons, depressurised and purged/treated with water to reduce the remaining risks;
- Pigging (to remove hydrocarbons);
- Offshore activities including subsea flowline disconnection/cutting and plugging;
- IMR of subsea infrastructure (wellheads, flowlines, umbilical, manifold, pipeline); and
- Environmental monitoring.

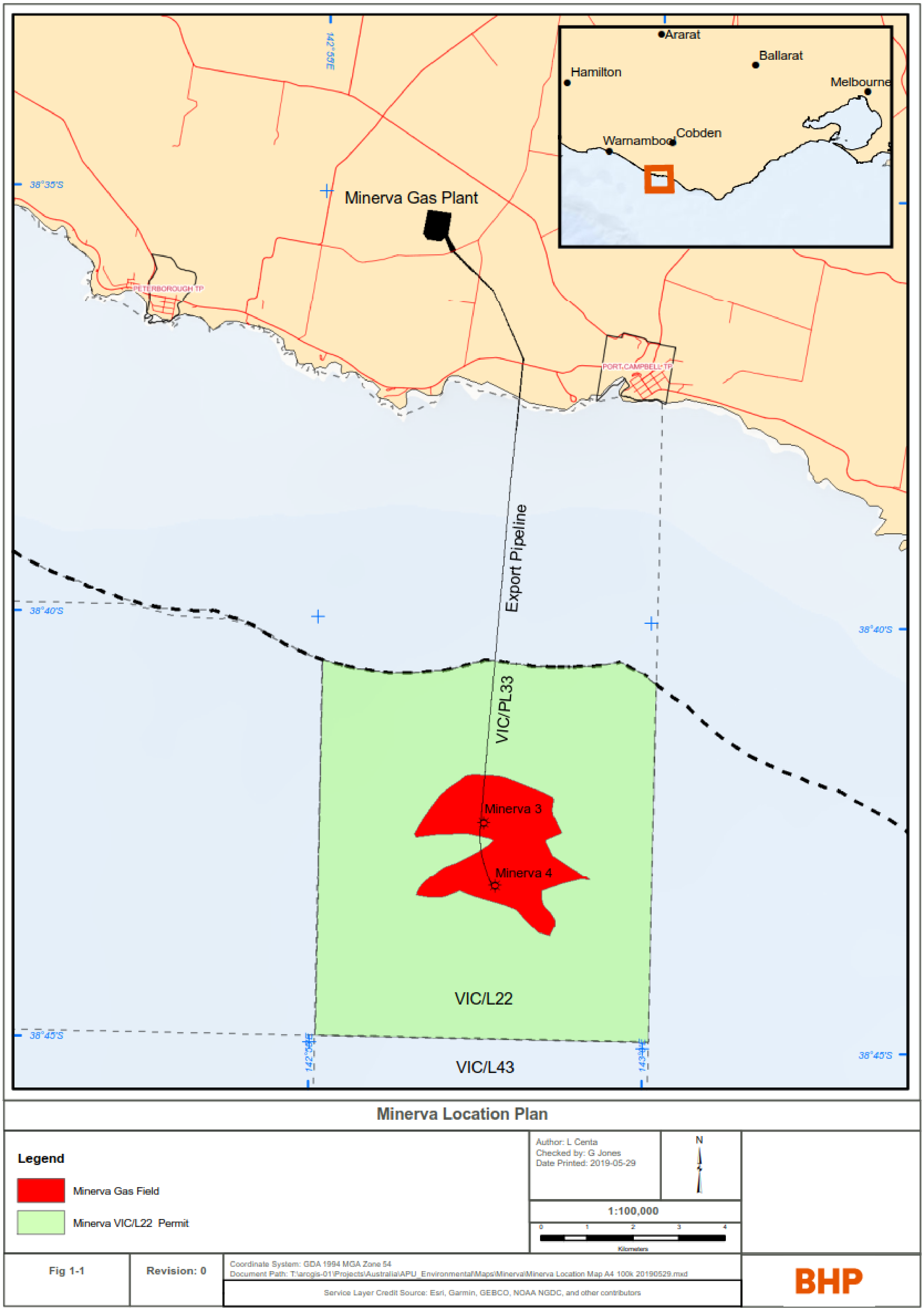

Figure 1-1: Minerva Location Plan

1.6 Description of Titleholder

The Titleholder for the Project is BHP, operating on behalf of the Minerva Joint Ventures which comprises:

- BHP Billiton Petroleum (Australia) Pty Ltd; and
- Cooper Energy Limited.

BHP has exploration, development, production and marketing activities in more than a dozen countries around the globe, including a significant deep-water position in the Gulf of Mexico, as well as operations in Australia, Trinidad and Tobago, Algeria and Pakistan. BHP's Australian assets include:

- Pyrenees Floating Production Storage and Offloading Facility (FPSO) – crude oil (operator);
- Macedon Gas Plant – natural gas (operator);
- Bass Strait – crude oil, condensate, liquefied petroleum gas (LPG) and natural gas (joint venture partner); and
- North West Shelf – crude oil, condensate and liquefied natural gas (LNG) (joint venture partner).

1.7 Overview of HSEC Management System

All BHP controlled activities associated with Minerva offshore activities will be conducted in line with:

- BHP Charter (Appendix A);
- BHP Our Requirements;
- BHP HSEC Management Standards;
- BHP Australian Production Unit Management System; and
- Any specific commitments laid out in this EP.

1.8 Titleholder and Contact Details

BHP is the titleholder for the Minerva Operations covered under this EP within Permit Areas VIC/L22. Titleholder details are as follows:

Name:	BHP Petroleum (Australia) Pty Ltd
Business address:	125 St Georges Terrace, Perth, Western Australia 6000
Telephone number:	1300 656 780
ACN:	39006923879

BHP's nominated liaison person for the Minerva Operations is:

Position:	Natalee Connor, Principal Corporate Affairs
Business address:	125 St Georges Terrace, Perth, Western Australia 6000
Phone:	1800 110 258
Email:	bhppetexternalaffairs@bhp.com

In the event of any change in the titleholder, a change in the titleholder's nominated liaison person or a change in the contact details for either the titleholder or the liaison person BHP will provide written notification to NOPSEMA through the online submissions website, referencing the EP document number and the NOPSEMA reference number.

2 Environmental Legislation

2.1 Relevant Environmental Legislation

Environmental aspects of petroleum activities in Commonwealth waters are controlled by two main statutes, these being the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and the OPGGS Act. Each of these is described in the following sections. There are a number of Commonwealth and Victorian statutes and regulations, International Agreements and Conventions and other applicable standards, guidelines and codes under which the Minerva offshore activities will be planned and carried out. The activity will be conducted in accordance with the relevant legislative requirements listed in Appendix B of this EP.

Prior to 28 February 2014, some petroleum activities in Commonwealth waters were regulated under two pieces of legislation: the EPBC Act and the OPGGS Act. From 28 February 2014, to simplify the content and streamline the environmental regulation of petroleum activities in Commonwealth waters, NOPSEMA became the sole designated regulator that relate to matters listed as 'protected' under the EPBC Act.

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act provides for the protection of the environment and conservation of biodiversity in Australia. The objectives of the EPBC Act that are relevant to the well abandonment activity are to:

- Provide for the protection of the environment, especially matters of national environmental significance;
- Conserve Australian biodiversity;
- Enhance the protection and management of important natural and cultural places; and
- Promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources.

The Minerva Gas Plant development was assessed as a joint Commonwealth / State EIS – Victorian EES under the Commonwealth Environmental Protection (Impact of Proposals) Act 1974 and the Victorian Environment Effects Act 1978. The Victorian Government approved the EIA in March 2000 and approval from the Federal Government was granted in March 2001.

Following amendments to the OPGGS (E) Regulations, that took effect 28 February 2014, the NOPSEMA assumed responsibility for administration of the EPBC Act from Department of the Environment and Energy (DoEE) (formerly the Department of Environment).

Under the 'streamlined' arrangements, impacts on the following matters protected under Part 3 of the EPBC Act are assessed solely through NOPSEMA:

- World Heritage values of a declared World Heritage property (sections 12 and 15A of the EPBC Act);
- National Heritage values of a declared National Heritage place (sections 15B and 15C of the EPBC Act);
- Wetlands of international importance (declared Ramsar sites) (sections 16 and 17B of the EPBC Act);
- Listed threatened species and ecological communities (sections 18 and 18A of the EPBC Act);
- Listed migratory species (sections 20 and 20A of the EPBC Act); and
- The environment in a Commonwealth marine area (sections 23 and 24A of the EPBC Act).

2.1.2 Offshore Petroleum and Greenhouse Gas Storage Act 2006

The OPGGS Act provides the regulatory framework for all offshore exploration and production activities in Commonwealth waters (those areas beyond three nautical miles from the Territorial sea baseline and with the Commonwealth Petroleum Jurisdiction Boundary). The OPGGS (E) Regulations have been made under the auspices of the OPGGS Act for the purposes of ensuring (as described in section 3) that any petroleum activity or greenhouse gas activity carried out in an offshore area is:

- carried out in a manner consistent with the principles of ecologically sustainable development set out in section 3A of the EPBC Act; and

- carried out in a manner by which the environmental impacts and risks of the activity will be reduced to as low as reasonably practicable; and
- carried out in a manner by which the environmental impacts and risks of the activity will be of an acceptable level".

This EP meets the requirements of the OPGGS (Environment) Regulations by providing a plan that:

- Is appropriate for the nature and scale of the activity;
- Demonstrates that the environmental impacts and risks of the activity will be reduced to ALARP;
- Demonstrates that the environmental impacts and risks of the activity will be of an acceptable level;
- Provides for appropriate environmental performance outcomes, environmental performance standards and measurement criteria;
- Includes an appropriate implementation strategy and monitoring, recording and reporting arrangements;
- Does not involve the activity or part of the activity, other than arrangements for environmental monitoring or for responding to an emergency, being undertaken in any part of a declared World Heritage property with the meaning of the EPBC Act; and
- Demonstrates that:
    - an appropriate level of consultation, as required by Division 2.2A, has been carried out;
    - the measures (if any) adopted, or proposed to adopt, because of the consultations are appropriate; and
    - complies with the OPGGS Act and the Environment Regulations.

3 Description of Activity

3.1 Location of the Activity

The Minerva Gas Field was discovered in March 1993 and is located approximately 11 km SSW of the township of Port Campbell, Victoria, Australia. The field lies entirely offshore in the Production Licence VIC/L 22 in the Otway Basin, in approximately 60 m of water (Figure 3-1). This EP also covers the pipeline in Commonwealth waters (VIC/PL33). The offshore wells were drilled in late 2002, and the offshore and onshore pipeline was laid in 2003. The construction of the onshore gas plant was completed in December 2004, and the facilities were commissioned and commenced production in January 2005.

The Minerva offshore facilities produce hydrocarbon liquids from the Minerva reservoir via two subsea vertical wells. The hydrocarbon liquids are then transported onshore to the Minerva Gas Plant via a common pipeline for processing (Figure 3-2 and Figure 3-3).

3.2 Timing of Activity

Production life of the field is currently in decline, and in 2013, the Minerva-4 well was shut-in due the occurrence of a PFW breakthrough, resulting in plant process difficulties. Minerva-4 has remained available for gas production service, subject to facility water handling provisions being available, and sufficient remaining reservoir pressure. In 2018, Minerva-4 well was re-opened and successfully flowed. Installation of new water handling equipment and reuse of existing equipment for injection of PFW down the chemical injection line to the depleted Minerva-3 well and the suspension of MEG injection offshore, will enable the additional recovery of gas from the Minerva-4 well, extending the plant life in 2019. Production from the field will cease once production is no longer viable from Minerva-4, estimated to be late 2019 or 2020.

The cessation phase is expected to commence within 18 months of production cessation, with the flushing of the flowline and cutting and plugging expected to take approximately 1 month. The cessation phase will continue for the remaining acceptability period of the EP (5 Years) during which time BHP will commence planning for the well abandonment and final decommissioning of the field (Table 3-1).

Table 3-1: Projected key activities for the Minerva development (indicative timing)

Activity	1993	2005	2005-2020	2019-2020	2022	2023
Field discovery	■					
Minerva Gas Plant commissioned		■				
Production (~ 15 yr)			■			
Field cessation – this EP				■		
Well abandonment planning (plug and abandon) (activities excluded from this EP)					■	
Field decommissioning planning (activities excluded from this EP)						■

3.3 Operations Area

The Operations Area defines the geographical boundary of the activity. The Minerva wells and pipeline are protected from third party vessels, and shipping and fishing activities, by a restricted area. Gazetted cautionary zones are marked on nautical charts under the OPGGS (Part 6.6 “safety zones and the area to be avoided”). Fishing vessels are instructed on the charts to avoid navigating, anchoring or fishing within this area.

The Operations Area is shown on Figure 3 1 and includes the safety exclusion area which extends to a distance of 500 metres (m), measured from each point of the outer edge of each of the wells and subsea equipment in the field, and a 100 m wide corridor extending either side of the outermost asset along the pipeline route to the Commonwealth-State waters boundary.

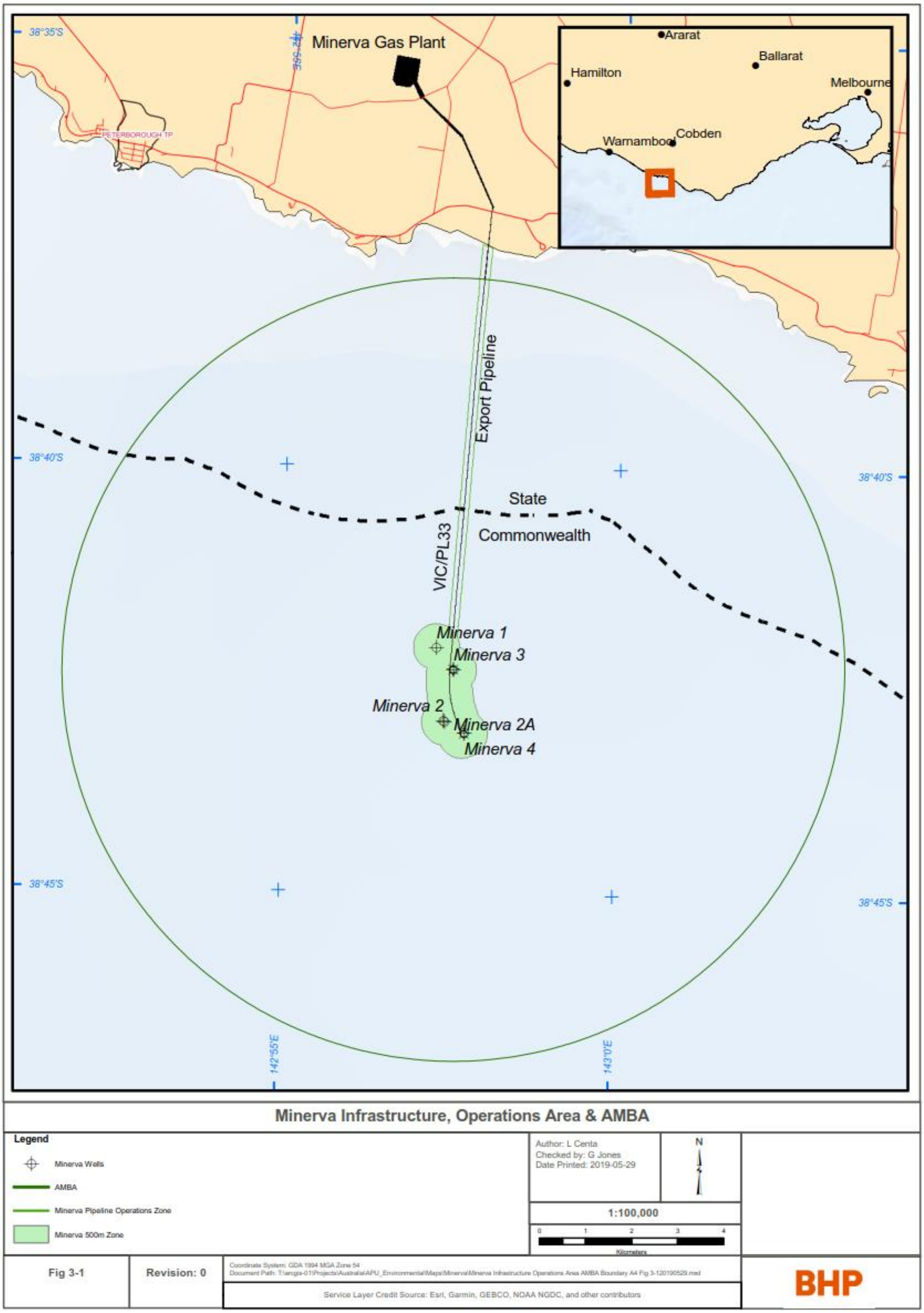

Figure 3-1: Infrastructure layout, Operations Area and AMBA boundary

3.4 Infrastructure Layout

The field has been developed with two subsea vertical wells Minerva-3 and Minerva-4 that were completed with 7-inch production tubing and tied to horizontal subsea production trees. The wells were designed to flow individually or simultaneously depending on gas demand and reservoir depletion. At commissioning, each well was capable of supplying the maximum gas plant throughput of 150 TJ/d. Minerva gas has a relatively low condensate yield (3.3 bbl/MMscf). Both wells are identically designed, with slight differences primarily due to minor depth changes.

Both development wells are drilled into the top 70 m of the Minerva reservoir, and are completed with expandable sand screens. As the Minerva gas reservoir is in communication with an extensive saline aquifer, reservoir pressure has been partially maintained by aquifer expansion and encroachment that has led to an increase in the water-gas ratio, which will lead to the upcoming cessation of production.

A single 10- inch gas production flowline has transported gas from the field to the onshore gas plant. In addition, two small diameter chemical injection lines has transported a mix of hydrate and corrosion inhibitor chemicals from the gas plant out to each of the two wells, and an electro-hydraulic umbilical provides services for well control.

The Minerva offshore facility wells and pipeline coordinates are provided in Table 3-2.

Table 3-2: Minerva Producing Infrastructure Coordinates

Name	Date Drilled	Description	Latitude (GDA 94)	Longitude (GDA 94)
Minerva-3	25-Nov-02	Vertical producing well	38 42 22.718 S	142 57 32.997 E
Minerva-4	19-Dec-02	Vertical producing well	38 43 07.368 S	142 57 44.023 E
Flowline crossing point from Commonwealth into State Waters			38 40 29.10 S	142 57 39.4 E

3.4.1 Wells

The subsea tree system of Minerva-3 and Minerva-4 is a horizontal type SpoolTree™ supplied by Cooper Cameron (Singapore) Pty Ltd.

Each well is completed with a 7 inch tubing string, fitted with a surface controlled subsurface safety valve (SCSSV) at around 250 m depth. The SCSSV is held open via hydraulic control line pressure from surface, which auto closes upon loss of control line pressure. The reservoir section is completed using expandable sand screens across the open hole section for sand control at depths of about 1700 m to 1800 m below sea level. Each well has a horizontal subsea tree which houses a master valve and wing valve in series which are similarly hydraulically functioned and both auto close upon loss on control line pressure.

Well Design and well integrity management requirements dictate that a primary barrier envelope and a secondary barrier envelope is maintained at all times. The establishment and maintenance of a barrier envelope is essential to prevent the unplanned escape of fluid from the well. The presence of additional barrier elements and barrier envelopes beyond the primary and secondary provide improved redundancy.

In operation, the Minerva Subsea Tree critical valves and subsurface safety valves are function tested at 12 month intervals and leak off tested at 24 month intervals. The performance standard acceptance criteria for routine tests are adopted from API RP14C/H and API STD 6AV1. The acceptable rate of leakage is 15 scf/min leak rate as defined by pressure build up. All Minerva tree barrier Valves passed this Criteria in December 2017 and March 2018.

Minerva-4 remains at higher pressure than Minerva-3 due to significant less offtake over recent years as a water management strategy. Minerva-4 has a current shut in tubing pressure of around 96 Bar, whilst Minerva-3 has a shut in tubing pressure of only 31 Bar. Remaining production life from Minerva-3 is expected to be under 3 months.

Recent water handling upgrades at the plant allow Minerva-4 to be brought back online for continuous production. Current water production levels have no significant impact on flow rate, however has an impact on MEG and integrity management within the plant. When Minerva-3 has finished producing, it will be used as a water disposal well for separated PFW until the limit of plant’s water handling capacity is reached.

Each subsea tree is tied into the export 10-inch flowline via a barred reducing tee with a double block and bleed valving arrangement and tie-in spool. Each subsea tree has a dedicated chemical injection line and a crossover chemical line connecting the chemical injection systems for each well.

3.4.2 Other Wells

Two vertical exploration wells targeting the Minerva Formation were drilled for data gathering, appraisal and development planning. Both wells remain plugged and suspended. Table 3-3 depicts the status of all non-producing wells within VIC-L22 as per Well Completion and Final Drilling Reports. These wells are also shown diagrammatically in Figure 3-2. The wells are described by the Minerva Well Operations Management Plan (WOMP).

Table 3-3: Minerva Non-Producing Infrastructure Coordinates

Name	Date Drilled	Description	Latitude (GDA 94)	Longitude (GDA 94)
Minerva-1	8-Mar-93	Suspended	-38° 42' 06.885"	142° 57' 17.278"
Minerva 2	18-Sep-93	Abandoned	-38° 42' 58.821"	142° 57' 24.419"
Minerva-2A	22-Sep-93	Suspended	-38° 42' 59.190"	142° 57' 25.742"

Figure 3-2: Minerva Pipeline and Producing Wells

3.4.3 10-Inch Flowline

The wells are connected to the land based gas plant near Port Campbell via a 10-inch common flowline. The flowline is laid on the surface of the seabed from the subsea wells to the shoreline and has a total length of approximately 15 km, of which approximately 4 km is onshore. The flowline crosses underneath a rock platform at the shoreline through a 1,600 m horizontal directionally drilled crossing. The flowline has been designed so that the 10-inch diameter and wall thickness selected are suitable for the flowrates, pressures and temperatures expected during operation (Figure 3-3).

An internal and external corrosion protection system has been provided on the flowline and tie-in spools. The internal system consists of corrosion inhibitor and wall thickness corrosion allowance. The external system consists of anti-corrosion coating and sacrificial anodes. Flowline field joints are protected by heat shrink sleeves offshore.

Upstream of the Minerva-3 branch connection all the flowline components are comprised of duplex stainless steel material. This material was selected to mitigate against the potential risk associated with ineffective internal corrosion inhibition in this section of the flowline during “dead leg” flowing scenarios. Flowline sections subject to such flowing scenarios are:

- The section of flowline between Minerva-4 branch connection and subsea pig launcher assembly will be a continuous “dead leg” and will therefore not be continually flushed with corrosion inhibitor;
- The section of flowline between Minerva-3 and Minerva-4 also has the potential to be a “dead leg” when Minerva-3 well is producing and Minerva-4 well is isolated;
- Expansion/tie-in spools are fabricated with duplex stainless steel since injection of corrosion inhibitor takes place at the wellhead and will take time to mix before it becomes effective;
- Expansion/tie-in spools used to connect the wellheads to the flowline are fabricated in two sections for handling and installation purposes.

The total length of the tie-in spool at Minerva-3 is approximately 87 m while at Minerva-4 the total length is approximately 82 m. The length of tie-in spools at both locations is such that the lateral distance between the 10-inch flowline and the wellhead is sufficient to avoid impact from dropped objects onto the main 10-inch flowline. The expansion/tie-in spools also allow the pipeline to expand and contract as the temperature in the flowline varies during operation without transferring significant loads into the wellheads.

Concrete weight coating has been provided for on-bottom stability of the flowline bundle and tie-in spools. The concrete weight coat increases the submerged weight of the 10-inch pipeline to the point where the flowline bundle is stable for the design 1 in 100 year return period wave and current conditions.

Branch connections from the 10-inch flowline to Minerva-3 and Minerva-4 wells include a 10 x 8-inch reducing tree with 8-inch double block and bleed valve assembly. The purpose of the double block and bleed valve assembly is to isolate a particular well to allow intervention while continuing to produce from the other well. All valves on the branch connections are flanged and are operable via a remotely operated vehicle (ROV).

The Minerva-3 and Minerva-4 branch connections, including the double block and bleed assembly are all housed in open steel protection frames. These frames protect against snagging by vessel mooring lines.

Key design parameters of the flowline are provided in Table 3-4.

Table 3-4: Minerva Flowline Design Parameters

Parameter	Value
Design life	20 years
Maximum flow rate	230 TJ/day
Normal maximum flow rate	150 TJ/day
Maximum allowable operating pressure	18.0 MPa
Normal operating pressure	15.9 Mpa start of field life
End of field life pressure	1.5 MPa
Shut-in tubing head pressure	16.8 Minerva pipeline

Parameter	Value
Maximum design temperature	78 °C

3.4.4 Umbilicals

There are two 2-inch chemical injection flowlines that service each wellhead. One 2-inch chemical injection pipeline is sized to provide a mix of hydrate and corrosion inhibitor at required flow rates to suit the production rate of the 10-inch flowline. The mix is injected under high pressure through ¾-inch hydraulically actuated chemical injection valves into the wellheads. These valves are located upstream of the production wing valves on the Minerva-3 and Minerva-4 wellheads.

The second 2-inch chemical injection pipeline will be utilised to handle low volumes of PFW (2000 bbl/day) and inject down the tubing outlet of the subsea tree at Minerva-3 and the suspension of MEG for late life field extension. The subsea tree with its integrated gate valves and SCSSV provide the principle means of isolation.

There are 2-inch tie-in spools used to connect the 2-inch chemical injection pipelines in the flowline bundle to each wellhead.

An external corrosion protection system has been provided on the 2-inch chemical injection pipelines and tie-in spools. Field joints on the chemical injection pipelines on the offshore section field joints are protected by heat shrink sleeves. Since the offshore section was laid using coiled tubing there are minimal field joints offshore.

The Electro Hydraulic Control Umbilical (EHU) is used for wellhead control. The EHU contains hydraulic and power cores used to control valve actuators on the wellheads.

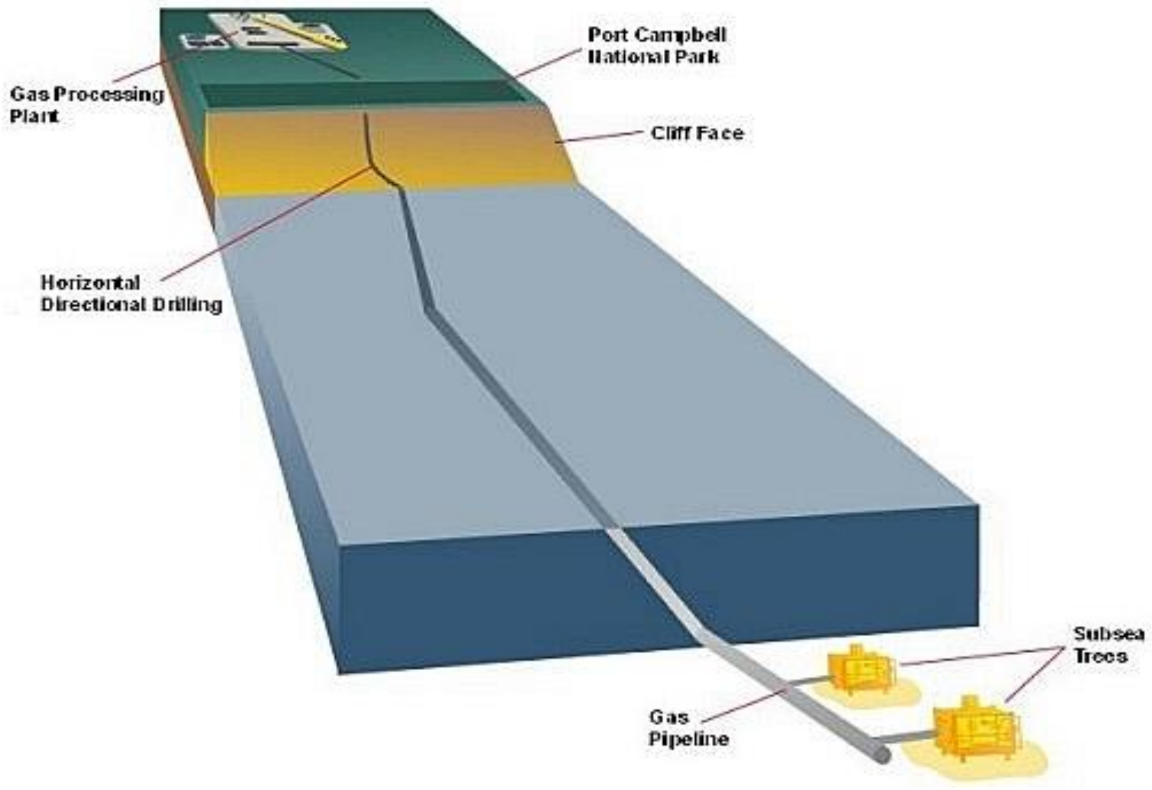

Figure 3-3: Schematic of Minerva Operations

3.5 Characterisation of Hydrocarbon

The hydrocarbons that are produced from the Minerva reservoir were gas comprised almost entirely of methane (93.5 %) and approximately 5.5 % of other small chained gaseous form hydrocarbons, with any hydrocarbons (0.05 %) that could form a condensate remaining in the vapour phase upon interaction with cooler ambient temperatures.

Typically, this dry gas flowed from the Minerva reservoir into the well bores. Due to the decreasing pressure and temperature encountered by the gas as it flows up the well bores into the flow line and to the onshore gas plant, there is a gradual retrograde condensation of heavier molecules to form a condensate liquid. This liquid first appears at some point within the well bore as a fine mist, but as the pressure and temperature continue to drop along the flow path, more liquid condenses and some of the mist particles may eventually coagulate to form droplets. These may ultimately coagulate to form larger drops and even slugs of liquid.

The composition of the condensate that may form is comprised of small chained hydrocarbons ranging from the C5 to C9 alkanes. The density of the Minerva condensate at 15°C was measured as 0.7854 g/ml with the American Petroleum Institute (API) gravity being 48.6. Based on the International Tanker Owners Pollution Federation Limited (ITOPF) classification system, condensate that may be formed from the Minerva reservoir can be classified as a Group I oil (non-persistent). Group I oils tend to dissipate completely through evaporation within a few hours and do not normally form emulsions. Additionally, Group 1 oils are defined as those with an API of >45, with those with a higher ºAPI number becoming less persistent in the environment.

3.6 Produced Formation Water Injection System

Produced formation water (PFW) is a by-product of oil and gas extraction. As the plant transitions towards the end of field life, an increase in PFW will be experienced. The produced gas is fully saturated with water at reservoir conditions.

Production of PFW was not expected to coincide with late-life production from the field, however in late 2012 / early 2013 the Minerva-4 well operated with PFW production before being shut-in due to limited water handling capacity in the onshore gas plant.

Towards the end of field life, PFW production from Minerva-3 is also expected. PFW from Minerva-3 has been encountered in 2019. The second 2-inch chemical injection pipeline will be utilised to handle low volumes of PFW (2,000 bbl/day) to be injected down the tubing outlet of the subsea tree at Minerva-3 and the suspension of MEG for late life field extension.

Production from the Minerva wells will cease when the water handling limit of the onshore plant and / or associated increase in chloride levels within the MEG circuit are reached as identified in the risk assessment. Setting a limit for the pipeline was not required to manage the risk ALARP, as such there is no limit on the pipeline.

3.7 Normal Operations

3.7.1 Well Operations Management Plan

The Minerva WOMP covers continuous well production activities leading to production cessation at end of economic field life in accordance with Part 5 of the OPGGS (Resource Management and Administration) Regulations 2011. End of economic production is expected during the period of validity of the WOMP. Production cessation activities including disconnection and isolation of wells from flow lines is anticipated to be undertaken within 2 months of last economic production, subject to mobilisation of identified subsea contractor and vessels.

Following subsea isolation, periodic inspections will be undertaken at frequencies dictated by the Australian Production Unit (APU) Subsea Integrity Management Plan, which calls for inspection frequency no greater than 5 yearly.

Timing for well abandonments is not prescribed by this WOMP, and will be driven by ongoing risk based inputs following inspection, and assessment of execution efficiencies presented by availability of specialist contractors, resources and equipment, such as Mobile Offshore Drilling Unit’s (MODU). Detailed well abandonment activities will be submitted in an updated WOMP for acceptance to the Regulator.

There are no planned Well Re-entry or new Drilling Activities planned under this WOMP.

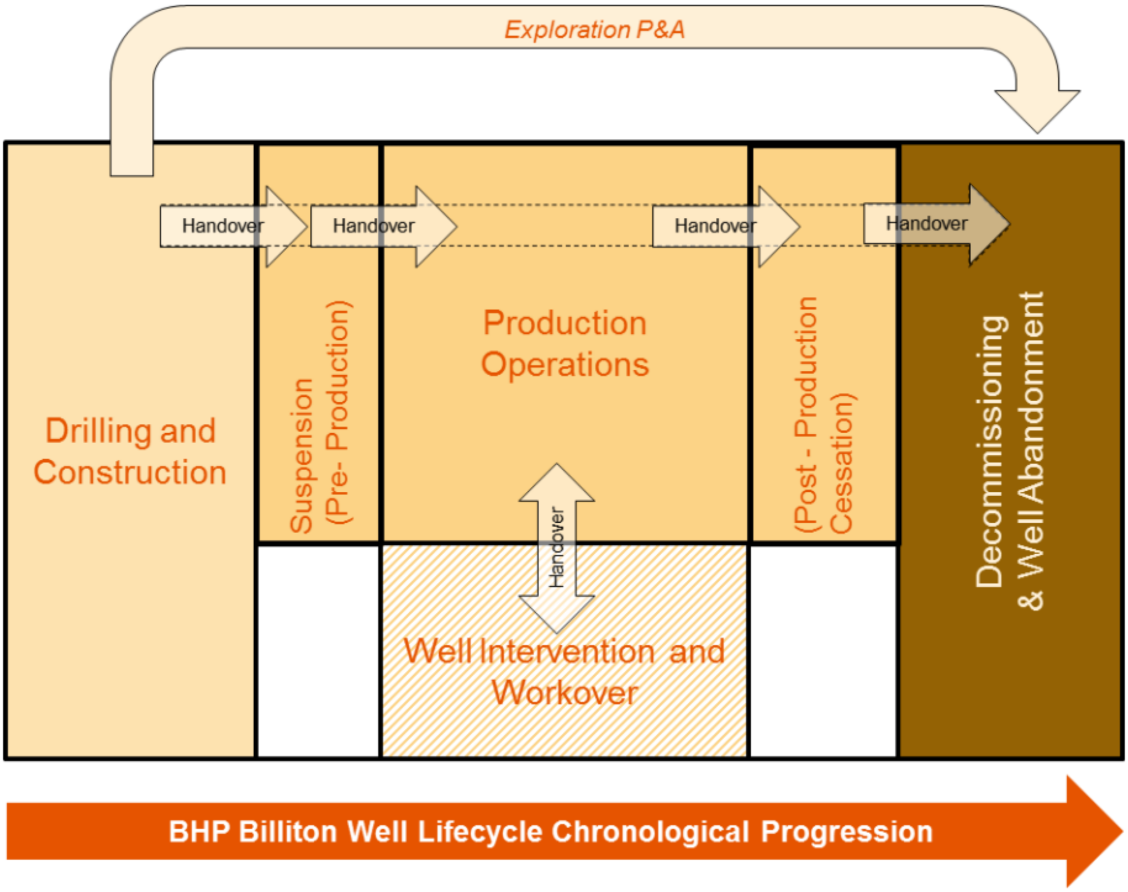

Figure 3-4: Well Lifecycle Management Philosophy

3.7.2 Well control

The Minerva subsea trees are connected in parallel, allowing the wells to be flowed either singularly or concurrently. An individual well can be shut in without interruption to the total production.

The wellhead system provides the structural foundation for the wells and an 18-¾-inch mechanical connector forms the structural and pressure connection between the subsea tree and the wellhead system.

The subsea wells are operated using a direct hydraulic control system. The subsea trees have hydraulically actuated spring return close valves with ROV override and a number of ROV operated only valves. The ROV operated only valves are used for well workover purposes and not for normal production operations. Variable flow control of the production rate is not possible at the subsea tree. A single SCSSV is also hydraulically actuated with spring return close valve.

In addition to the valves, each subsea tree has a pressure transmitter to constantly monitor the production pressure. The pressure transmitter is powered and monitored via a cable included in the production umbilical and jumper umbilicals.

The control of the subsea wells is from the Process Control System interfaced via the Well Control System. The Well Control System allows the operation of the wells to be performed remotely. The Well Control System operates the hydraulically actuated tree valves with water based hydraulic fluid. The fluid is water based so is environmentally friendly and so has a low viscosity for improved valve response time performance. The fluid is delivered at various hydraulic pressures to each of the valves though the umbilical. To aid the closure of some of the tree valves a hydraulic assist Boost pressure is provided on the closing (spring) side of the actuator.

The umbilical is routed from the gas plant Well Control Panel ultimately to umbilical termination assemblies (UTAs), which are located adjacent to each well. If the subsea connection is inadvertently broken due to a snagging incident the hydraulic couplers used at subsea connections will vent to sea, resulting in closure of all subsea hydraulically actuated valves.

The Well Control System also permits the corrosion inhibitor to be injected at the subsea trees as well as operating the production and monitoring valves. The hydraulic fluid used to operate the valves is provided by the Hydraulic Power Unit and Accumulator Rack and passes through a Well Control Panel for each subsea well.

A designated formal exclusion zone extending 500 m around each wellhead has been established to achieve a further measure of safety. This is intended to prevent accidental interference with subsea production equipment, and reduces the chance of accidental tree removal to as close as possible to zero.

3.8 Inspection, Maintenance and Repair (IMR) Activities

IMR activities are undertaken on a planned and as-required basis. Inspection is based on the Risk Based Inspection (RBI) principal to ensure integrity of the production system is maintained.

The subsea facilities will be capable of largely maintenance-free operation, with the exception of ROV work and minor subsea intervention. Inspection and monitoring activities will be performed to provide assurance of integrity, as well as to proactively identify maintenance or repair requirements. Inspections may be routine, or may be triggered by specific events (such as cyclones) that could affect the infrastructure. Maintenance and repair requirements are determined based on the results of inspections and monitoring.

IMR activities will generally comprise a single campaign every year, with the precise frequency and timing dependent on monitoring and previous results. Typically, total vessel days on-site are expected to be no more than one to two weeks per year, depending on work task requirements.

Specific IMR activities that may occur over the duration of this EP include:

Inspections

- Visual inspections of subsea components, looking for damage, degradation, debris etc. - may involve ROVs, or Autonomous underwater vehicles (AUVs);
- Cathodic Potential readings, to confirm corrosion protection is working - involves ROVs taking Cathodic Potential field measurements;
- Multi-beam Echo Sounder (MBES) survey – involves high frequency, vessel-mounted or towed multi-beamed echo sounder along the pipeline and/or umbilical;
- Side Scan Sonar (SSS) surveys – involves the use of high frequency, directional sonar towed along the pipeline route by a vessel; and
- ROV / Pigging operations; internal inspection of pipeline - pigs launched via subsea infrastructure in Commonwealth Waters will pass through the production pipeline to the onshore gas pipeline. Received fluids or wastes will be captured onshore.

Maintenance

- Cathodic protection (CP) maintenance - replacement/new cathodic protection sacrificial anodes may be installed on or adjacent (within the operations area) to infrastructure using a vessel and ROV or divers;
- Burial / deburial of pipeline and / or umbilicals;
- Removal/relocation of foreign objects that may threaten the pipeline – such as boulders, large debris;
- Valve / choke replacement (e.g. on subsea trees) using environmentally approved AquaGlyco ~2.9 L valve swept volume/yr (all valves main valves operated twice and others once);
- Control lead replacement installation (e.g. Hydraulic Flying Lead (HFL) / Electrical flying lead (EFL's) / Optical Flying lead (OFL));
- Pipe spool replacement;
- Stabilisation/ span correction - may involve activities such as installation of grout bags or concrete mattresses, or burial/de-burial via jetting or suction techniques, using a vessel and ROV; and
- Marine growth/ scale removal from subsea wellheads/trees using ROVs to water blast and/ or acid chemical wash (if required to facilitate removal).

Repair

- Removal / replacement of manifold (control and production);
- Removal/ replacement of anode assembly skid(s);
- Removal / replacement of umbilical – typically ‘like for like’ replacement undertaken using ROV from a vessel. No discharge to the environment as the junction plates include self-sealing end fittings; and
- Pipeline / umbilical repairs - could involve the installation of structural clamps or high-pressure repair clamps. These activities are generally undertaken from a single vessel using ROV spread and possibly requiring lifting equipment.

The scheduling of periodic visits for maintenance activities is expected to occur coincident with inspection works wherever practicable and to involve one to two weeks annually, although this is dependent on weather conditions, operational specifics and/or downtime.

3.9 Cessation Phase Activities

3.9.1 Flowline Cutting and Plugging

At the commencement of cessation activities the 10-inch production line and 2-inch Chemical/MEG supply lines will be flushed to <30 ppm hydrocarbon measured in return flushing fluids. After flushing the subsea tree valves and flowline isolation valves will be closed. As a way to permanently isolate the flowline system from hydrocarbons the flowline spools and chemical/MEG supply lines will be cut at the subsea tree and the flowline side will be plugged with environmental plugs. The subsea tree side will be plugged with a pressure retaining plug which will add an extra barrier to the subsea tree system.

No fluids >30 ppm hydrocarbon will be discharged to the environment from the pipe spool and flowlines as the lines have been flushed with water prior to disconnect. The Hydraulic Flying Leads (HFL’s) will be disconnected from the subsea trees however the Electrical flying lead’ (EFL’s) will be kept attached so that the subsea trees can be monitored from the beach.

3.9.2 Subsea Inspections and Interventions

The Minerva Subsea Inspection Monitoring and Maintenance Plan sets out the frequency of subsea inspections. A routine (5 yearly) inspection of, and if required maintenance and repair of, all infrastructure (but not limited to, subsea trees, manifolds, static flowlines/umbilicals, jumpers and subsea distribution units) will be undertaken to inspect the current state of infrastructure. Routine inspections are generally undertaken by visual ROV inspection, Side Scan Sonar (SSS) surveys, probing of marine growth and ultrasonic wall measurements.

It is not intended during the cessation phase to require intervention to the subsea wells and infrastructure. However this EP allows for these activities to occur should they be required. Activities that may be required are cycling of valves, pressure testing or the replacement of any damaged component.

During the cessation phase a number of monitoring activities may be undertaken in preparation for the final decommissioning of the field. This may include sediment or seabed sampling, marine fauna sampling, water samples or removal of some sections of the subsea infrastructure for testing. For example, a section of flowline may be cut and removed.

Marine growth removal may be necessary on subsea infrastructure. Removal is typically by water jetting or by mechanical brushing but can also involve sandblasting or chemical cleaning.

3.10 Typical Vessel Types

Vessels used to support IMR and cessation activities may range in length from 35 m to 120 m, and include multi-purpose support vessels. Typically, only a single vessel would be required to implement offshore activities. Infrequently, there may be a requirement (e.g. a minor repair) for more than one vessel.

Vessels operate 24-hours a day. It is anticipated that vessel time for routine inspection activities along the pipeline will involve no more than one to two weeks per year, depending upon operational requirements.

Maintenance and repair activities may result in additional vessel time, depending on the scale and complexity of the work scope, but such activities are expected to be infrequent.

For the cutting and plugging of flowlines or intervention activities will likely be conducted from a Construction Support Vessel (CSV). The typical requirements for the CSV required for cessation activities are:

- <100 m dynamic positioning 2 (DP2) with a working class ROV; and
- Sufficient deck space for equipment required.

The fuel type used by these vessels is typically marine grade oil (diesel). The location of the main fuel tanks on new-build CSV's (from about the mid-2000's onwards) are generally situated inboard of water ballast tanks, which reduces the likelihood of a main fuel tank being ruptured during a vessel collision.

Inspection activities may require smaller type vessels (Offshore Support Vessels (OSV)) with reduced requirements but will likely be DP2 vessels.

3.11 Chemical Assessment Process

BHP has adopted a risk-based approach for the selection of chemicals with the least potential for environmental impacts. Where a product may be discharged to the environment (directly or through abandonment activities/ discharges) an environmental assessment is completed before the product is approved for use. BHP's Hazardous Materials Management procedure details the chemical selection procedures to be followed. The assessment must be demonstrated through completion of the New Material Request and Approval Form. The assessment includes a review of the product's ecotoxicity, biodegradation and bioaccumulation.

Central to the chemical selection process is the use of the OCNS. The OCNS conducts hazard assessments on chemical products, and lists/ranks all chemicals used in the exploration, exploitation, and associated offshore processing of petroleum on the UK Continental shelf. The OCNS promotes the substitution of hazardous substances by less hazardous, or preferably, non-hazardous alternatives.

The CHARM model calculates the ratio of Predicted Effect Concentration against No Effect Concentration (PEC:NEC). This is expressed as a Hazard Quotient (HQ), which is then used to rank the product. Data used in the CHARM assessment includes ecotoxicity, biodegradation and bioaccumulation. Using the CHARM model, chemicals ranked Gold have the lowest environmental hazard followed by the Silver ranking. Products not applicable to the CHARM model (i.e. inorganic substances, hydraulic fluids or chemicals used only in pipelines) are assigned an OCNS grouping, A - E. Group A includes products considered to have the greatest potential environmental hazard and Group E the least.

The following chemicals will be automatically approved for use:

- With reference to the UK's OCNS CHARM Model Algorithm Definitive Ranked List of Approved Products, chemicals with a HQ of Gold or Silver or Group E or D (CEFAS, 2017); and
- Substances listed on the Oslo and Paris Commission for the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) List of Substances Used and Discharged Offshore, which are considered to Pose Little or No Risk to the Environment (PLONAR).

The following products will be automatically rejected and require further assessment and/ or technical justification prior to approval for use:

- Those with substitution warnings under the OCNS system; and
- Products where the OCNS rating is not available.

Where further assessment is required, a review of available ecotoxicity, biodegradability and bioaccumulation information will be conducted. Chemicals will be approved if they fall within the following toxicity criteria and at least one other criteria can be determined:

- Low or very low toxicity ($LC50/EC50$ >100 to >1,000 mg/L);
- Biodegradability of >20 %; and
- Non-bioaccumulative to Log PoW <3.

Chemicals that do not meet the above criteria may only be approved for use following sufficient economic, safety and operational justification.

Consistent with the requirements of APU Hazardous Materials Procedure, preference in the chemical selection for Minerva offshore activities will be given to CHARM products that are listed as Silver and Gold category chemicals, or D or E, on the OCNS Definitive Ranked List of Approved Products, which indicates the lowest potential for environmental hazard. If chemicals are not rated on the OCNS list, but there is a technical justification, a chemical selection environmental assessment process will be conducted to determine if the impacts and risks are ALARP and acceptable.

4 Description of Environment

The purpose of this section is to address the requirements of Regulation 13(2) by describing the area that may be affected by the activity, including the area that could potentially be affected by potential emergency conditions.

4.1 Determination of the Area that May Be Affected

To describe the existing environment or the area may be affected (hereafter referred to as 'AMBA'), it is necessary to consider the spatial extent of all the identified potential hazards and risks associated with activity, either planned events (impacts) or unplanned events (risks).

For planned events the AMBA has been conservatively set to 500 m around the Minerva wells and 100 m around the pipeline. All impacts from planned activities are considered to be contained within this area.

The AMBA for unplanned events was determined by a weathering study for a diesel spill (100 m^3) associated with vessel operations as described in Section 2.2 of the OPEP. The output of the modelling showed that the maximum distance that a 100 m^3 spill of diesel was 8.2 km in any direction (BHP, 2014). The unplanned risk AMBA and all unplanned events are considered to be contained within this area.

For planned activities, the safety exclusion zone around field infrastructure and/or a buffer infrastructure, as described in Section 3.1, was adopted as the Operations Area.

- Physical presence;
- Seabed disturbance;
- Noise emissions;
- Atmospheric emissions;
- Marine discharges; and
- Waste management.

The following unplanned hydrocarbon release events were considered credible as a result of the proposed activities:

- an unplanned hydrocarbon release from subsea infrastructure; and
- an unplanned diesel spill as a result of vessel collision.

The AMBA was determined from stochastic modelling using 99 % probability contours of a 100 m^3 of diesel due to a vessel collision as is the worst case credible spill scenario.

Note that this AMBA is a worst-case scenario as it combines the spatial extent of a surface spill and shoreline accumulated oil.

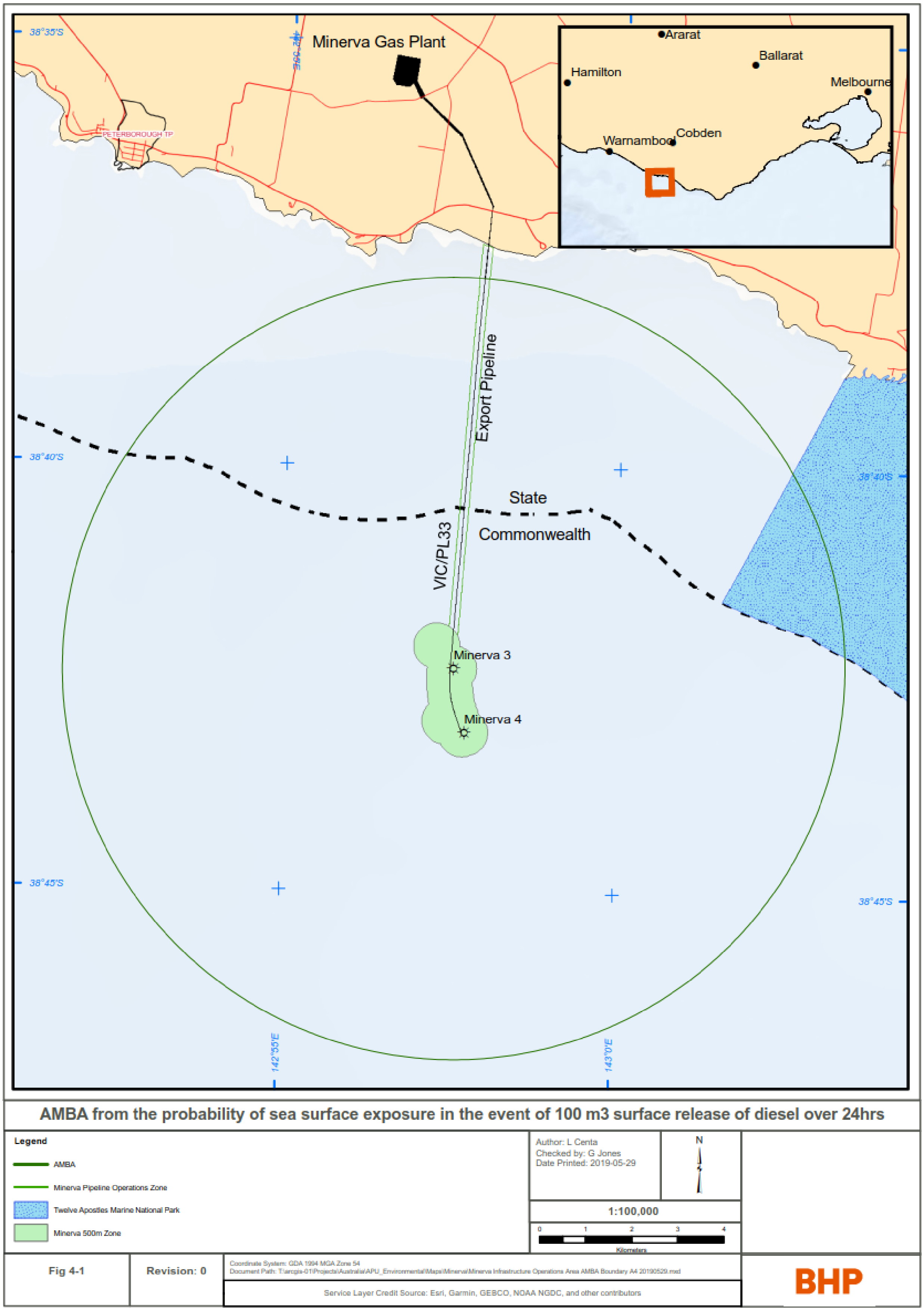

Figure 4-1: AMBA from the probability of sea surface exposure in the event of a 100 m^3 surface release of diesel over 24 hours

4.2 Particular Relevant Values and Sensitivities of the Environment

Regulation 13(2) of OPGGS ((E) Regulations states that *"the environment plan must:*

13(2)(a) Describe the existing environment that may be affected by the activity; and

13(2)(b) Include details of the particular relevant values and sensitivities (if any) of that environment".

Regulation 13(3) of the OPGGS (E) Regulations states that *"Without limiting paragraph 13(2)(b), particular relevant values and sensitivities may include any of the following:*

13(3)(f) Any values and sensitivities that exist in, or in relation to, part or all of:

(i) A Commonwealth marine area within the meaning of that Act; or

(ii) Commonwealth land within the meaning of that Act".

This section identifies the particular relevant values and sensitivities of the environment within the AMBAs for each of the impacts (planned activities) and risks (unplanned events). The environmental values in each AMBA were reviewed, including searches via the DoEE's Protected Matters Search Tool (PMST) to identify any EPBC Act listed species. The National Conservation Values Atlas (NCVA) (DoEE website) was also interrogated to identify biologically important areas for the region's protected species. A full description of these values and sensitivities is provided in Appendix D. The PMST Search Reports are provided in Appendix E.

4.2.1 Values and Sensitivities occurring within the AMBAs

Table 4-1 provides an overview of the values and sensitivities within the Operations Area and AMBA. Further information follows below, with detailed descriptions of these sensitivities and values provided within Appendix D.

Table 4-1: Values and sensitivities occurring within the AMBAs

Value / Sensitivity	Operations Area	AMBA
Marine (Pelagic) Fauna Receptors		
Whales	✓	✓
Dolphins	x	x
Fish and Sharks	✓	✓
Marine Reptiles	✓	✓
Seabirds and Shorebirds	✓	✓
Benthic Habitats / Receptors		
Soft Sediment	✓	✓
Seagrass Beds	x	x
Coral Reef Communities	x	x
Macroalgal Beds	x	✓
Dominant Shoreline Habitats / Receptors		
Rocky Shorelines	x	x
Sandy Beaches	x	x
Mangroves	x	x
Socio-Economic Receptors		
Tourism and Recreation	x	✓
Commercial Fisheries	x	✓
Recreational Fisheries	x	✓
Petroleum Exploration and Production	✓	✓

Value / Sensitivity	Operations Area	AMBA
Commercial Shipping	✓	✓
Cultural Heritage	x	x
Maritime Heritage (shipwrecks)	x	✓
Protected / Significant Areas		
World Heritage Areas	x	x
National Heritage Places	x	x
Marine Parks	x	✓
Wetlands of International Importance	x	x
Key Ecological Features	x	x
Biologically Important Areas	✓	✓

4.2.2 Fisheries

The Commonwealth and State Managed Fisheries expected to be active within the AMBAs are provided in Table 4-2 with detailed information on these fisheries provided in Appendix D.

Table 4-2: Commonwealth and State managed fisheries within the AMBAs

Value / Sensitivity	Operations Area	AMBA
Commonwealth Managed Fisheries		
Bass Strait Central Zone Scallop Fishery	✓	✓
Eastern Tuna and Billfish Fishery	✓	✓
Skipjack Tuna Fishery	✓	✓
Small Pelagic Fishery (Western Sub-Area)	✓	✓
Southern and Eastern Scalefish and Shark Fishery	✓	✓
Southern Bluefin Tuna Fishery	✓	✓
Southern Squid Jig Fishery	✓	✓
State Managed Fisheries (Whole of State)		
Rock Lobster Fishery	x	x
Abalone Fishery	x	x
Giant Crab Fishery	x	x

4.2.3 World Heritage Areas

Regulation 13(3) of OPGGS (E) Regulations states:

> *"Without limiting paragraph (2)(b), particular relevant values and sensitivities may include:*
>
> *13(3)(a) The world heritage values of a declared World Heritage property within the meaning of the EPBC Act".*

There are no marine World Heritage Areas within the Operations Area or AMBA (Table 4-3). The nearest marine World Heritage Area is over 1,000 km from the AMBA, whilst the nearest terrestrial World Heritage Property is approximately 200 km from the AMBA. No World Heritage Property Areas the Operations Area or spill AMBA, and therefore will not be impacted by planned or unplanned events from the Minerva offshore activities.

Table 4-3: World Heritage Areas within the AMBAs

Value / Sensitivity	Operations Area	AMBA
World heritage Areas	x	x

4.2.4 National Heritage Places

Regulation 13(3) of OPGGS (E) Regulations states:

"Without limiting paragraph (2)(b), particular relevant values and sensitivities may include:

13(3)(b) The national heritage values of a National Heritage place within the meaning of that Act".

There are no National Heritage Places within the vicinity of the Operations Area or AMBA. The nearest National Heritage Places is over 150 km inland from the AMBA. Therefore National Heritage Places will not be impacted by planned or unplanned events from the Minerva offshore activities.

4.2.5 Marine Parks and Marine Management Areas

Regulation 13(3) of OPGGS (E) Regulations states:

"Without limiting paragraph (2)(b), particular relevant values and sensitivities may include:

13(3)(f) Any values and sensitivities that exist in, or in relation to, part or all of:

(i) a Commonwealth marine area within the meaning of that Act".

The Apollo Australian Marine Park is located approximately 40 km from the hydrocarbon spill AMBA. The Apollo Commonwealth Marine Park does not intersects the Operations Area or spill AMBA and therefore will not be impacted by planned or unplanned events from the Minerva offshore activities.

The Operations Area and AMBA for planned events does not intersect any State Marine Park or Management Area. The AMBA for worst case credible hydrocarbon intersects both The Arches Marine Sanctuary and the Twelve Apostles Marine National Park Figure 4-2).

4.2.6 Wetlands of International Importance

Regulation 13(3) of OPGGS (E) Regulations states:

"Without limiting paragraph (2)(b), particular relevant values and sensitivities may include:

13(3)(c) The ecological character of a declared Ramsar wetland within the meaning of that Act".

There are no Wetlands of International Importance under the Convention on Wetlands of International Importance (the Ramsar Convention) in Victoria. The nearest Ramsar Wetland is over 50 km inland from the Activity area No Ramsar Wetlands intersect the Operations Area or spill AMBA and therefore will not be impacted by planned or unplanned events from the Minerva offshore activities.

4.2.7 Key Ecological Features

Key ecological features (KEFs) are of areas of regional importance for either biodiversity or ecosystem function and integrity within the Commonwealth marine environment and have been identified through the marine bioregional planning process (Department of the Environment and Energy, unknown date).

There are no KEFs within the vicinity of the Operations Area or AMBA. The nearest KEF is over 70 km from the Operations Area. No KEFs would therefore be impacted by planned or unplanned events from the Minerva offshore activities.

4.2.8 Listed Threatened Species

Regulation 13(3) of OPGGS (E) Regulations states:

"Without limiting paragraph (2)(b), particular relevant values and sensitivities may include:

13(3)(d) The presence of a listed threatened species or listed threatened ecological community within the meaning of that Act".

A search of the EPBC Act Protected Matters database (February 2019) identified 34 listed threatened (22 of which are also listed migratory species) that may occur or have habitat within the Operations Area, and 37 listed threatened (23 of which are also listed migratory species) that may occur or have habitat within the wider AMBA. No threatened ecological communities were identified. The threatened species are shown in Table 4-4.

Table 4-4: Listed threatened species that may occur within the AMBAs

Common Name	Species	EPBC Act Status	Operations Area	AMBA
Birds				
Australasian Bittern	*Botaurus poiciloptilus*	E	x	✓
Red knot	*Calidris canutus*	E	✓	✓
Curlew sandpiper	*Calidris ferruginea*	CE	✓	✓
Antipodean albatross	*Diomedea antipodensis*	V, M	✓	✓
Southern royal albatross	*Diomedea epomophora*	V, M	✓	✓
Wandering albatross	*Diomedea exulans*	V, M	✓	✓
Northern royal albatross	*Diomedea sanfordi*	E, M	✓	✓
Blue petrel	*Halobaena caerulea*	V	✓	✓
Bar-tailed Godwit	*Limosa lapponica baueri*	V, M	x	✓
Northern Siberian Bar-tailed Godwit	*Limosa lapponica menzbieri*	CE	x	✓
Southern giant petrel	*Macronectes giganteus*	E, M	✓	✓
Northern giant petrel	*Macronectes halli*	V, M	✓	✓
Orange-bellied parrot	*Neophema chrysogaster*	CE	✓	✓
Eastern curlew	*Numenius madagascariensis*	CE	✓	✓
Fairy prion	*Pachyptila turtur subantarctica*	V	✓	✓
Sooty albatross	*Phoebetria fusca*	V, M	✓	✓
Gould's petrel	*Pterodroma leucoptera leucoptera*	E	✓	✓
Soft-plumaged petrel	*Pterodroma mollis*	V	✓	✓
Australian Fairy Tern	*Sternula nereis nereis*	V	✓	✓
Buller's albatross	*Thalassarche bulleri*	V, M	✓	✓
Northern Buller's albatross	*Thalassarche bulleri platei*	V	✓	✓
Shy albatross	*Thalassarche cauta cauta*	V, M	✓	✓
White-capped albatross	*Thalassarche cauta steadi*	V, M	✓	✓
Grey-headed albatross	*Thalassarche chrysostoma*	E, M	✓	✓
Campbell albatross	*Thalassarche impavida*	V, M	✓	✓
Black-browed albatross	*Thalassarche melanophris*	V, M	✓	✓
Salvin's albatross	*Thalassarche salvini*	V	✓	✓
Marine Mammals				
Sei whale	*Balaenoptera borealis*	V, M	✓	✓
Blue whale	*Balaenoptera musculus*	E, M	✓	✓
Fin whale	*Balaenoptera physalus*	V, M	✓	✓
Southern right whale	*Eubalaena australis*	E, M	✓	✓
Humpback whale	*Megaptera novaeangliae*	V, M	✓	✓
Marine Reptiles				
Loggerhead turtle	*Caretta caretta*	E, M	✓	✓
Green turtle	*Chelonia mydas*	V, M	✓	✓

Common Name	Species	EPBC Act Status	Operations Area	AMBA
Leatherback turtle	*Dermochelys coriacea*	E, M	✓	✓
Fish				
Australian Grayling	*Prototroctes maraena*	V	✓	✓
White shark	*Carcharodon carcharias*	V, M	✓	✓

4.2.9 Listed Migratory Species

Regulation 13(3) of OPGGS (E) Regulations states:

> *"Without limiting paragraph (2)(b), particular relevant values and sensitivities may include:*
>
> *13(3)(e) The presence of a listed migratory species within the meaning of that Act".*

For each AMBA, an EPBC Act Protected Matters Report was generated (Appendix E). The listed migratory species under the EPBC Act and the following bilateral migratory bird agreements between the Government of Australia and the Government of Japan (JAMBA) and/or China (CAMBA) and/or Republic of Korea (ROKAMBA) that may occur within the AMBAs are presented in Table 4-5. Appendix D also contains a complete list of Listed Marine Species, and Whales and Other Cetaceans.

Table 4-5: Listed migratory species that may occur within the AMBA

Common Name	Species	Operations Area	AMBA
Common sandpiper	*Actitis hypoleucos*	✓	✓
Fork-tailed Swift	*Apus pacificus*	✓	✓
Flesh-footed shearwater	*Ardenna carneipes*	✓	✓
Little Tern	*Sternula albifrons*	x	✓
Sharp-tailed sandpiper	*Calidris acuminata*	✓	✓
Pectoral sandpiper	*Calidris melanotos*	✓	✓
Osprey	*Pandion haliaetus*	✓	✓
Pygmy Right Whale	*Caperea marginata*	✓	✓
Dusky Dolphin	*Lagenorhynchus obscurus*	✓	✓
Orca, killer whale	*Orcinus orca*	✓	✓
Porbeagle, Mackerel shark	*Lamna nasus*	✓	✓

4.2.10 Biologically Important Areas

Regulation 13(3) of OPGGS (E) Regulations states:

> *"Without limiting paragraph (2)(b), particular relevant values and sensitivities may include:*
>
> *13(3)(f) Any values and sensitivities that exist in, or in relation to, part or all of:*
>
> *(i) a Commonwealth marine area within the meaning of that Act".*

The South East Marine Region[1] identifies biologically important areas (BIAs) for some of the region's protected species. These are areas that are considered to be particularly important for the conservation of protected species and where aggregations of individuals display biologically important behaviour such as breeding, foraging, resting or migration. The Bioregion Plan provides advice on rating potential risk to BIAs while noting that "Biologically important areas are not protected matters and should not be confused with 'critical habitat' as defined in the EPBC Act."

[1] http://www.environment.gov.au/system/files/resources/7a110303-f9c7-44e4-b337-00cb2e4b9fbf/files/south-east-marine-region-profile.pdf

The National Conservation Values Atlas (NCVA) was reviewed and the BIAs for protected species that will or may occur within the AMBA are listed in Table 4-6. Eight BIAs intercept the Operations Area and AMBA. The identified protected species and the relevant BIAs are discussed shown in Table 4-6 and Appendix D.

Table 4-6: Biologically Important Areas within the AMBAs

Common Name	Value / Sensitivity	Operations Area	AMBA
Southern Right Whale	Key areas of aggregation include the Bonney Upwelling and adjacent waters off Victoria.	✓	✓
White Shark	Area used by White sharks as they move between nursery areas, opportunistic feeding.	✓	✓
Antipodean albatross	Foraging various locations along coastline.	✓	✓
Wandering albatross	Foraging various locations along coastline.	✓	✓
Buller's albatross	Foraging various locations along coastline.	✓	✓
Shy albatross	Foraging various locations along coastline.	✓	✓
Campbell albatross	Foraging various locations along coastline.	✓	✓
Black-browed albatross	Foraging various locations along coastline.	✓	✓

4.2.11 Threatened Ecological Communities

The EPBC Act Protected Matters database showed that the Giant Kelp Marine Forests of South East Australia may occur within hydrocarbon spill AMBA (Figure 4-2). This threatened ecological community (TEC) is listed as endangered. This TEC is discussed in detail in Appendix D.

4.2.12 Habitat Critical to the Survival of Species

'Habitat critical to the survival of a species' is defined within the EPBC Act Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (DoE, 2013) as areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal;
- For the long-term maintenance of the species (including the maintenance of species essential to the survival of the species);
- To maintain genetic diversity and long-term evolutionary development; or
- For the reintroduction of populations or recovery of the species.

The Recovery Plan for Marine Turtles in Australia (DoEE, 2017a) provides details of habitat critical to the survival of several species of marine turtle genetic stock (summarised in Table 4-7). The AMBA's do not intercept any habitat critical to the survival of species.

4.2.13 Species Recovery Plans, Conservation Advice and Threat Abatement Plans

BHP considered recent updates to Recovery Plans, Conservation Management Plans, Threat Abatement Plans or approved Conservation Advice in place (or in draft) for those EPBC Act listed threatened and migratory species that may occur within the AMBA's (Table 4-7).

Recovery Plans set out the research and management actions necessary to stop the decline of, and support the recovery of listed threatened species. In addition, Threat Abatement Plans provide for the research, management, and any other actions necessary to reduce the impact of a listed key threatening process on native species and ecological communities. The Minister decides whether a threat abatement plan is required for key threatening processes listed under Section 183 of the EPBC Act. Table 4-7 provides information on the specific requirements of the relevant conservation advice, species recovery plans and threat abatement plans that are applicable to the Activity, and demonstrates how current management requirements have been taken into account during the preparation of the EP. Through the implementation of relevant control measures, performance outcomes and performance standards, potential risks and impacts of the Activity are managed to ALARP and acceptable levels.

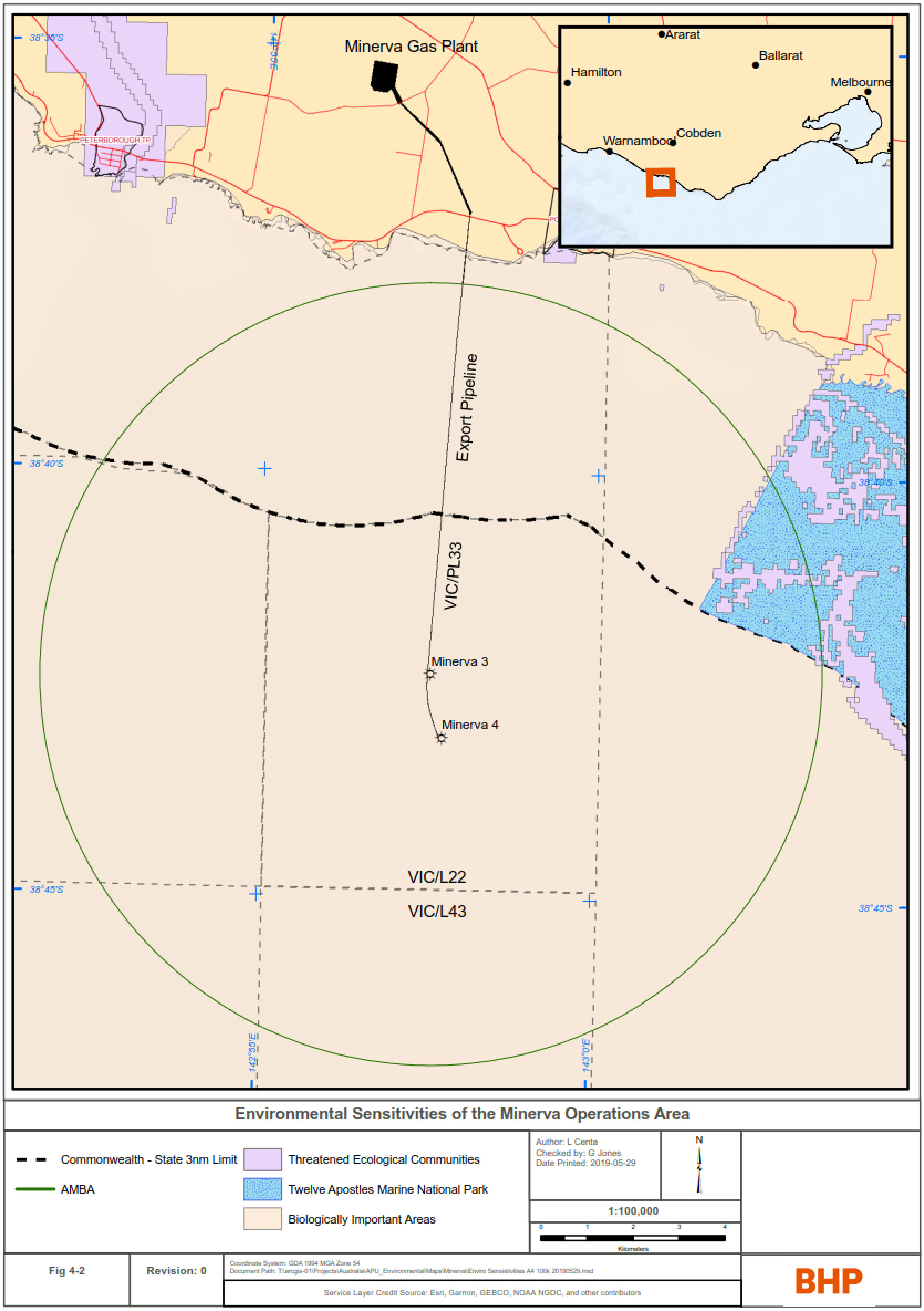

Figure 4-2: Environmentally sensitive areas for Minerva Operations Area

Table 4-7: Summary of relevant Species Recovery Plans, approved Conservation Plans and Threat Abatement Plans

Species or Group	Relevant Plan/Conservation Advice	Threats and or Management Strategies Relevant to the Activity	Addressed in EP Section
Threatened Ecological Communities			
Giant kelp marine forests of south east Australia	Approved Conservation Plan (TSSC, 2012)	Marine pollution	8.6
Birds			
EPBC Act listed seabirds in the AMBA's: • Antipodean albatross • Southern royal albatross • Northern royal albatross • Wandering albatross • Blue petrel • Northern giant petrel • Southern giant-petrel • Sooty albatross • Soft-plumaged petrel • Buller's albatross • Northern buller's albatross • Shy albatross • Grey-headed albatross • White-capped albatross • Campbell albatross • Salvin's albatross • Black-browed albatross	National Recovery Plan- Albatrosses and Giant Petrels (DSEWPaC, 2011a) Background Paper, Population Status and Threats to Albatrosses and Giant Petrels Listed as Threatened under the EPBC Act 1999 (DSEWPaC, 2011b) Approved Conservation Advice for the Soft-plumaged petrel and Blue petrel (TSSC, 2015c) Threat Abatement Plan for Impact of Marine Debris on Vertebrate Life (DoEE, 2018)	• Marine pollution • Marine debris	7.9 8.6
Red knot	Approved Conservation Plan (TSSC, 2016a)	• Habitat loss and degradation • Pollution/ contamination impacts	7.9 8.6
Curlew sandpiper	Approved Conservation Advice (TSSC, 2015a)	Habitat loss and degradation from pollution	8.6
Bar-tailed godwit	Approved Conservation Advice (TSSC, 2016b)	Habitat loss and degradation from pollution	8.6
Northern Siberian bar-tailed godwit	Approved Conservation Advice (TSSC, 2016b)	Habitat loss and degradation from pollution	8.6
Eastern curlew	Approved Conservation Advice (TSSC, 2015b)	Habitat loss and degradation from pollution	8.6
Orange-bellied parrot	National Recovery Plan (DPIW, 2006)	Pollution/ contamination impacts	8.6
Flesh-footed shearwater	Threat Abatement Plan for Impact of Marine Debris on Vertebrate Life (DoEE, 2018)	Habitat loss and degradation from pollution	8.6

Species or Group	Relevant Plan/Conservation Advice	Threats and or Management Strategies Relevant to the Activity	Addressed in EP Section
	Approved Conservation Advice (TSSC, 2014a)		
Little tern	Approved Conservation Advice (TSSC, 2014b)	Habitat loss and degradation from pollution	8.6
Marine Mammals			
EPBC Act listed marine mammals in the AMBAs at risk of being adversely impacted by marine debris	Threat Abatement Plan for Impact of Marine Debris on Vertebrate Life (DoEE, 2018)	Ship-sourced marine debris as a risk to vertebrate marine life through entanglement or ingestion	7.9
Sei whale	Approved Conservation Advice for the Sei Whale (TSSC, 2015d)	• Noise interference • Habitat degradation including pollution • Vessel strike	7.5 8.6 8.2
Blue whale	Conservation Management Plan for the Blue Whale (DOE, 2015)	• Noise interference • Habitat degradation including pollution • Vessel strike	7.5 8.6 8.2
Fin whale	Approved Conservation Advice for the Fin Whale (TSSC, 2015e)	• Noise interference • Habitat degradation including pollution • Vessel strike	7.5 8.6 8.2
Southern right whale	Conservation Management Plan for the Southern Right Whale (DSEWPaC, 2012)	• Noise interference • Habitat modification • Marine debris • Vessel disturbance/ strike	7.5 8.6 7.9 8.2
Humpback whale	Approved Conservation Advice for the Humpback Whale (TSSC, 2015f)	• Noise interference • Habitat degration • Marine debris • Vessel strike	7.5 8.6 7.9 8.2
Marine Reptiles			
EPBC Act listed marine turtles in the AMBAs: • **Loggerhead turtle** • **Green turtle** • **Leatherback turtle**	Recovery Plan for Marine Turtles (DoEE, 2017a); Commonwealth Conservation Advice for Leatherback turtle	• Noise interference • Marine debris • Habitat loss/ modification • Vessel disturbance/ strike	7.5 7.9 8.6 8.2

Species or Group	Relevant Plan/Conservation Advice	Threats and or Management Strategies Relevant to the Activity	Addressed in EP Section
EPBC Act listed marine turtles in the AMBAs at risk of being adversely impacted by marine debris: • **Loggerhead turtle** • **Green turtle** • **Hawksbill turtle**	Draft Threat Abatement Plan for Impact of Marine Debris on Vertebrate Life (DoEE, 2017b)	Marine debris	7.9
Fish, Sharks and Rays			
White shark	National Recovery Plan for the White Shark (DSEWPaC, 2013)	Habitat modification	8.6
Australian Grayling	Australia National Recovery Plan for the Grayling (DSE, 2008)	Habitat modification	8.6

5 Stakeholder Engagement

5.1 Stakeholder Engagement Approach

BHP's approach to stakeholder consultation aims to demonstrate to relevant persons and the general public that the environmental impacts and risks of an activity are being appropriately managed. BHP is committed to ongoing engagement and consultation with stakeholders during all project stages.

BHP has consulted broadly with relevant stakeholders regarding this Activity, including sharing information with stakeholders and responding directly to enquiries. No objections or significant concerns were raised by stakeholders during consultation in the preparation of this EP.

BHP has a process for ongoing stakeholder engagement and any concerns raised by stakeholders subsequent to EP submission will be duly considered and addressed.

5.2 Community Consultation History

An active community consultation program, which established the Environmental Review Committee (ERC), was first initiated by BHP during the initial Minerva project phase. The ERC is the key body for consultation with the community, local government and regulators. The ERC was Chaired and run by the Corangamite Shire. In 2013 the ERC was modified to become a Community Reference Group (CRG) to reflect the change in focus of the community during the Minerva Operations. The CRG forum aims for proactive and regular interaction to promote open and inclusive communication with relevant stakeholders including business owners, landowners and community groups. Meetings are held regularly and participants are invited to raise any concerns or issues.

Meeting agendas are prepared and circulated in advance of meetings, notes are recorded and feedback sought from stakeholders. In addition, a toll-free 1800 number and email address are made available to stakeholders through which they can raise any queries or concerns related to BHP's operations at any time.

5.2.1 Stakeholder Identification

Relevant persons have been identified based on BHP's existing relationships and relevant persons identified in previous EP consultations for the permit area, together with desktop stakeholder identification and analysis, as well as advice sought from selected stakeholders (notably Australian Fisheries Management Authority [AFMA], Department of Jobs, Precincts and regions [DJPR] and Victorian Fishing Authority [VFA]).

Key stakeholders that have been engaged through the EP revision include:

- Commonwealth and State departments and agencies;
- Local Government;
- Other petroleum operators;
- Commercial fisheries, including representative associations and individual licence holders/operators within both Commonwealth and State managed fisheries that overlap AMBAs identified in this EP (using contact details provided by AFMA and VFA);
- Local businesses; and
- Non-governmental organisations (NGOs).

As part of BHP's general stakeholder identification process, Victorian State and Commonwealth managed fisheries based on Operations Area and catch effort was consulted and advised of BHP Petroleum Minerva activities.

Fisheries stakeholders and individual licence holders who accepted the consultation invitation for the previous EPs for the permit area were re-consulted as part of the development of this EP. In addition, using contact details provided by AFMA and VFA, broad consultation has been initiated with all individual licence holders/operators within both Commonwealth and State managed fisheries that overlap AMBAs identified in this EP.

5.2.2 Stakeholder Consultation Outcomes

All stakeholder engagement records are maintained by BHP Corporate Affairs.

A summary of the consultation undertaken, responses received and a statement of BHP's response and actions, including assessment of any claims or objections made, as per regulation 16(b), is provided in Table 5-1 below.

No objections or significant concerns were raised by stakeholders during consultation in the preparation of this EP.

5.3 Stakeholder Consultation 2014

BHP contacted a subset of regional commercial fishermen and charter operators on 10 June 2014. This subset included representatives from the Apollo Bay Fisherman's Cooperative, Port Campbell Professional Fisherman's Association, Port Campbell Boating Club and the Port Campbell Boat Charters. BHP asked the representatives if they had any concerns, comments or issues regarding BHP's offshore operations at Minerva. BHP canvased their views on the need for ongoing consultation. The response from each representative was consistently that they had no concerns, that the operations did not impact their activities, and they did not see any requirement for ongoing consultation for the routine operations.

BHP invites fishing operators to our regular CRG meetings for regular consultation regarding the implementation of the Minerva Operations EP including for any proposed amendments to Safety Zones for Minerva. BHP also notes:

- A very comprehensive consultation process was undertaken during the development phase, with no significant issues raised by commercial fisherman or charter operators for the operations phase;
- BHP's activities at Minerva have not changed since commencement of production;
- No activities are planned for the duration of the EP that would impact the functions, interests or activities of local commercial fisherman or charter operators;
- BHP have not been approached by commercial fishermen or charter operators since operations commenced, and no issues have been raised directly or indirectly; and
- From the points above, BHP conclude that local commercial fishermen and charter operators do not have any concerns related to the ongoing Minerva operations.

Recent consultation records are provided as part of the sensitive information in Appendix C.

Relevant consultation regarding the activities associated with this EP are listed in Table 5-1.

Table 5-1: Stakeholder Consultation 2014

Stakeholder	Relevance	Method	Stakeholder Feedback	BHP Response
Regulator				
Department of State Development, Business and Innovation	Interested party	Phone conversation	Acknowledged activity	No further action.
Industry Association				
ERC	Interested party	Participation in ERC meetings	Participation in ERC meetings	No comments raised relevant to this EP. No further action.
Australian Maritime Oil Spill Centre (AMOSC)	Response Agency	Email	Response times for mobilisation of equipment	Information incorporated in OSCP.
Community Stakeholder				
Commercial and recreational fishing representatives (Apollo Bay Fisherman's Cooperative,	Interested party	Telephone contact	Telephone contact	No comments raised relevant to this EP. Fishing operators will

Stakeholder	Relevance	Method	Stakeholder Feedback	BHP Response
Port Campbell Professional Fisherman's Association, Port Campbell Boating Club and the Port Campbell Boat Charters)				be invited to CRG meetings.
CRG	Interested party	Participation in CRG meetings	Participation in CRG meetings	No comments raised relevant to this EP. No further action.

5.4 Stakeholder Consultation 2019

For the 2019 revision to the Minerva Operations Cessation EP, relevant persons have been identified based on BHP's existing relationships and those identified in previous EP consultations for the permit area, together with desktop stakeholder identification and analysis.

In addition to ongoing CRG meetings, key stakeholders that have been engaged through the EP revision include:

- Commonwealth and State departments and agencies;
- Local Government;
- Other petroleum operators;
- Commercial fisheries, including representative associations and individual licence holders/operators within both Commonwealth and State managed fisheries that overlap AMBAs identified in this EP;
- Local businesses; and
- NGOs.

BHP's consultation included CRG meetings and the wide distribution of an Activity Summary fact sheet and follow up phone and email correspondence. The information provided included the timing and duration of the activity, the mitigation measures for relevant impacts and risks, BHP's policies and experience, and contact details to facilitate providing feedback to BHP.

Stakeholders who raise objections and claims during consultation in the preparation of an EP are responded to directly, and any concerns raised (if not already considered by BHP) are addressed in the EP in the same manner as all risks identified by BHP.

Stakeholder engagement and consultation activities informing this EP revision include:

- CRG meetings (2014-2019);
- Email communications to relevant stakeholders sent 16 April 2019 that detailed the operational activities expected over the next five years and invited comment (refer Covering Email and Activity Summary in);
- Consideration and assessment of all responses from stakeholders received prior to submission of the EP.

All stakeholder engagement records are maintained by BHP Corporate Affairs.

Table 5-2 presents a summary of the consultation undertaken, responses received and a statement of BHP's response and actions, including assessment of any claims or objections made, in support of the revision of the EP.

No objections or significant concerns were raised by stakeholders during consultation in the preparation of this EP revision.

In line with the NOPSEMA transparency guideline, full transcripts of the consultation are provided in sensitive information section (Appendix C).

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Table 5-2: Summary of Stakeholder Consultation Process and Outcomes for 2019 Revision

Stakeholder	Representative Body	Date Consultation Commenced	Consultation Method	Stakeholder Response / Requests / Claim	BHP Response	Assessment of Merits of Claims and Objections	BHP Action / Commitment
CRG	NA	2014	Regular CRG update.	No issues raised.	Meeting notes and actions recorded. No actions related to this EP. Information on EP conveyed in the CRG on 27 March 2019.	No claims or objections	Not applicable
Community Organisation							
Cape Otway Ecology Conservation Centre	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required	No claims or objections	Not applicable
Conservation Volunteers	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required	No claims or objections	Not applicable
Heytesbury District Landcare Network	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required	No claims or objections	Not applicable
People and Parks Foundation	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required	No claims or objections	Not applicable
Port Campbell Visitor Information Centre	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required	No claims or objections	Not applicable
Timboon Action Group	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required	No claims or objections	Not applicable
Environmental NGO							
Cape Conservation Group Inc.	NA	30/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required	No claims or objections	Not applicable
Government Commonwealth							
Australian Maritime Safety Authority	NA	30/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required	No claims or objections	Not applicable
Australian Fisheries Management Authority	NA	30/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required	No claims or objections	Not applicable
Australian Hydrographic Service	NA	30/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required	No claims or objections	Not applicable

Stakeholder	Representative Body	Date Consultation Commenced	Consultation Method	Stakeholder Response / Requests / Claim	BHP Response	Assessment of Merits of Claims and Objections	BHP Action / Commitment
Australian Customs and Border Protection	NA	30/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required	No claims or objections	Not applicable
Department of Defence	NA	30/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required	No claims or objections	Not applicable
Department of Environment and Energy	NA	30/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Department of Environment and Energy - Australian Marine Parks	NA	30/04/2019	Email, Activity Summary	DNP should be notified if details regarding the activity change and result in an overlap with a marine park or new impact, or for emergency responses.	Updated emergency response information to include DNP in Section 10.5.3 reporting	No claims or objections	Not applicable
Government State							
Department of Environment, Land, Water and Planning (DELWP)	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required	No claims or objections	Not applicable
Environment Protection Authority	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required	No claims or objections	Not applicable
Parks Victoria	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required	No claims or objections	Not applicable
Wildlife Victoria	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required	No claims or objections	Not applicable
Government – Local							
Shire of Corangamite	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Warrnambool City Council	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Country Fire Authority	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable

Stakeholder	Representative Body	Date Consultation Commenced	Consultation Method	Stakeholder Response / Requests / Claim	BHP Response	Assessment of Merits of Claims and Objections	BHP Action / Commitment
Timboon and District Health Care Service	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Timboon P-12 School	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Industry Associations							
Australian Marine Oil Spill Centre	NA	30/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Australian Petroleum Producers and Explorers Association	NA	30/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Australian Institute of Petroleum	NA	30/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Commonwealth Fisheries Association	NA	30/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Commonwealth Fisheries							
Victorian Scallop Fisherman's Association (VSFA)	Bass Strait Central Zone Scallop Fishery	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Eastern Tuna and Billfish Fishery	Tuna Australia	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Skipjack Tuna Fishery	Tuna Australia	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Southern Bluefin Tuna Fishery	Australian Southern Bluefin Tuna Industry Association LTD (ASBTIA)	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Southern Bluefin Tuna Fishery	Tuna Australia	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Southern and Eastern Scalefish and Shark	South East Trawl Fishing	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable

Stakeholder	Representative Body	Date Consultation Commenced	Consultation Method	Stakeholder Response / Requests / Claim	BHP Response	Assessment of Merits of Claims and Objections	BHP Action / Commitment
Fishery - Commonwealth Trawl Fishery	Industry Association (SETFIA)						
Southern and Eastern Scalefish and Shark Fishery - Shark Gillnet Hook and Trap	SETFIA and Southern Shark Industry Alliance (SSIA)	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Southern and Eastern Scalefish and Shark Fishery - Shark Gillnet Hook and Trap	Sustainable Shark Fishing Association (SSFA)	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Southern and Eastern Scalefish and Shark Fishery - Shark Gillnet Hook and Trap	Lakes Entrance Fishermans Co-op (LEFCOL)	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Southern and Eastern Scalefish and Shark Fishery - Scalefish Hook	SETFIA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Southern Squid Jig Fishery	No representative body	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Small Pelagic Fishery (Western Sub-Area)	Seafood Industry Victoria (SIV)	16/04/2019	Email, Activity Summary	Email response received requesting BHP to provide further information on the offshore activities to be able to provide to their members.	BHP provided further information via email as requested.	No claims or objections	Not applicable
Victorian Fisheries							
Abalone Fishery	Victorian Abalone Council Australia	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Abalone Fishery	Victorian Abalone Divers Association	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable

Stakeholder	Representative Body	Date Consultation Commenced	Consultation Method	Stakeholder Response / Requests / Claim	BHP Response	Assessment of Merits of Claims and Objections	BHP Action / Commitment
Abalone Fishery	SIV	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Giant Crab Fishery	SIV	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Rock Lobster Fishery	SIV	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Inshore Trawl Fishery	SIV	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Ocean (General) Fishery	SIV	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Purse seine (Ocean) Fishery	SIV	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Rock Lobster Fishery	Victorian Rock Lobster Association	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Rock Lobster Fishery	Southern Rock Lobster Limited	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Rock Lobster Fishery	SIV	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Scallop (Ocean) Fishery	VSFA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Scallop (Ocean) Fishery	SIV	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Charter operators	Victorian Recreation Fishing Peak Body (VRFish)	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Recreational fishers	VRFish	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Local Businesses							

Stakeholder	Representative Body	Date Consultation Commenced	Consultation Method	Stakeholder Response / Requests / Claim	BHP Response	Assessment of Merits of Claims and Objections	BHP Action / Commitment
Port Campbell Surf Lifesaving Club	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Heytesbury Regional Parish - Timboon Uniting Church	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Edelman	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Neighbours							
Withheld due to sensitive information	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Withheld due to sensitive information	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Withheld due to sensitive information	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Withheld due to sensitive information	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Withheld due to sensitive information	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Withheld due to sensitive information	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Withheld due to sensitive information	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Neighbours							
Name withheld	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Name withheld	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Name withheld	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Name withheld	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable

Stakeholder	Representative Body	Date Consultation Commenced	Consultation Method	Stakeholder Response / Requests / Claim	BHP Response	Assessment of Merits of Claims and Objections	BHP Action / Commitment
Name withheld	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Name withheld	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Name withheld	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable
Regional Operators							
Cooper Energy	NA	16/04/2019	Email, Activity Summary	No response at time of EP submission.	No response required.	No claims or objections	Not applicable

5.5 Ongoing Consultation

Stakeholder consultation will be ongoing and BHP will work with stakeholders to address any future concerns if they arise throughout the validity of this EP. Should any new stakeholders be identified, they will be added to the stakeholder database and included in all future correspondence as required.

BHPs commitments to ongoing consultation include:

- Responding in a timely manner to all stakeholder and community contact regarding Minerva activities;
- Stakeholders who raise objections and claims following EP submission will be responded to directly, and should any concerns raised have not already been addressed in the EP, these will be assessed in the same manner as all risks identified by BHP and an EP revision submitted to NOPSEMA if required; and
- Continued regular CRG meetings.

6 BHP Environmental Risk Management Framework

BHP has established a risk management governance framework with supporting processes and performance requirements that provide an overarching and consistent approach for the identification, assessment and management of risks. BHP Policies have been formulated to comply with the intent of the Risk Management Policy and is consistent with the AS/ISO 31000-2009 Risk Management Principles and Guidance.

An integrated risk assessment and impact process was utilised to identify the most appropriate management strategy and relevant controls for each source of risk to ensure the impact (planned activities) or risk (unplanned event) is acceptable to BHP and reduced to ALARP (Figure 6-1). This process includes the incorporation of historic stakeholder, and legal and environmental monitoring data on the relevant environmental impacts.

6.1 Evaluation of Impacts and Risks

A formal impact and risk assessment was completed for each environmental aspect and source of risk identified in Section 7 and 8 with the Environment hazard identification (ENVID) process. The primary objective of the assessment was to develop an understanding of the impact and/or risk, to demonstrate its reduction to ALARP and to demonstrate its acceptability to BHP. The assessment is based on informed deliberations during the ENVID process that took into account the detailed risk/impact assessment of the sources of hazard, the controls selected to reduce or to prevent the risk/impact, and the rationale for the selected controls. This also involved consideration of the sources of risk, their positive and negative consequences and the likelihood that those consequences may occur.

The ENVID process considered both planned impacts and unplanned risks with a methodological variation in the manner these impacts or risks were assessed through to ALARP and acceptability.

The ENVID assessment was conducted as a workshop with a range of personnel from different disciplines including Operations, Projects and HSE. Decisions made within the ENVID included:

- Confirmation of the sources of hazard identified;
- A protection objective developed based on the source of hazard and potential impact (later used for the Performance Outcome);
- Identification of all potential controls and their acceptance through an ALARP process;
- Allocation of likelihood rating for an unplanned source of hazard;
- Severity rating for all sources of hazard; and
- Final acceptability of the risk and impact to BHP using the acceptability criteria.

The outcome of the assessment process illustrated in Figure 6-1 is described in Sections 7 and 8 with a series of summary tables, detailed impact descriptions, and impact/risk conclusions. All environmental aspects and their respective sources of hazard are structured as follows:

- Overview of the Source of Risk;
- Environmental Impact Assessment;
- Demonstration of ALARP;
- Demonstration of Acceptability; and
- Environmental Performance Outcomes, Performance Standards and Measurement Criteria.

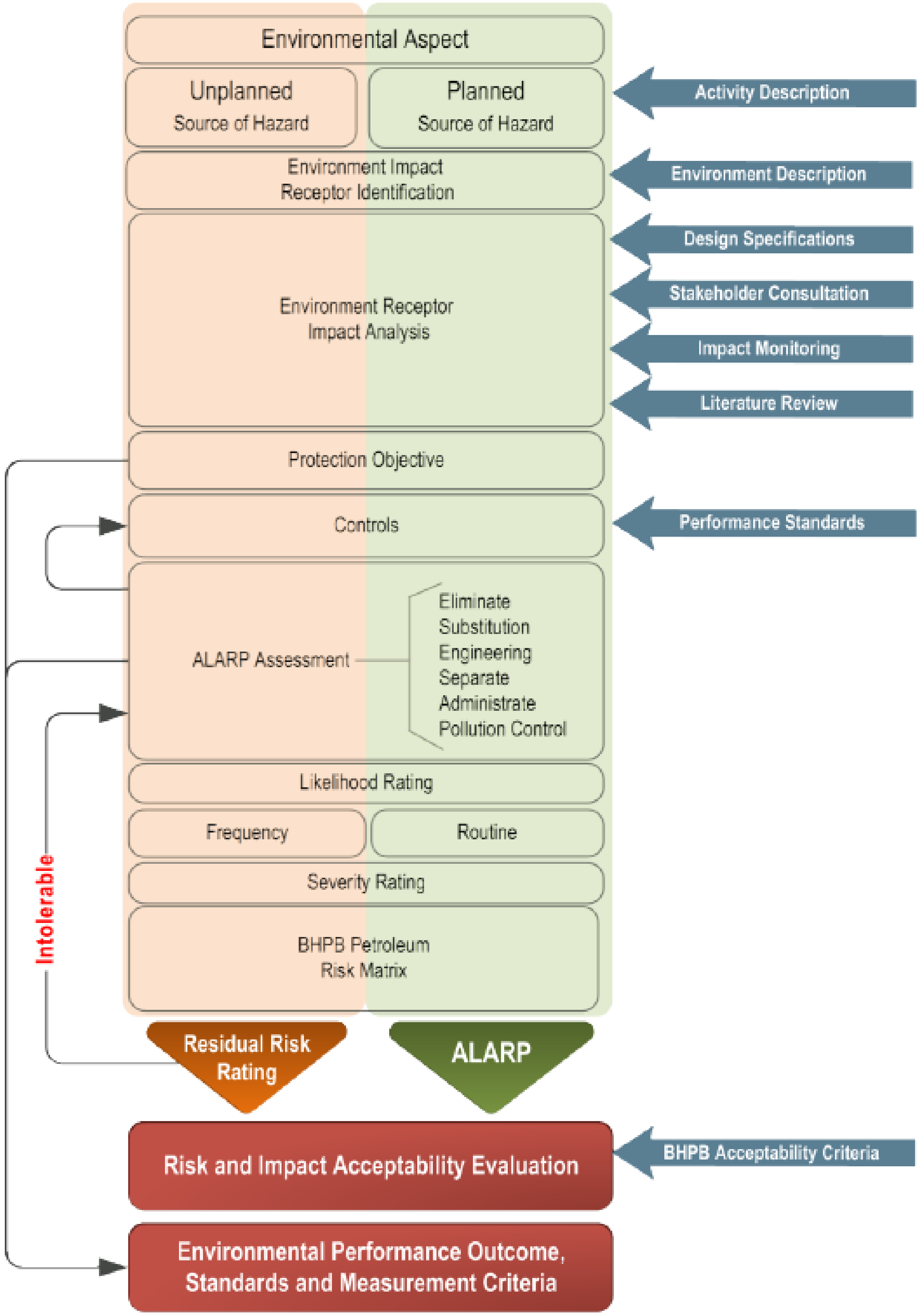

Figure 6-1: Environment plan integrated impact and risk assessment

6.1.1 Environmental Impact Assessment

The environmental impacts were based on the environmental receptors identified in Section 4 with the impact descriptions developed in an initial screening process that identified the specific receptor that may be impacted. Further quantitative or qualitative definition of the impact was then completed to ensure an understanding of the impact (routine or unplanned) to confirm that the severity of the risk and impact was correctly assigned during the evaluation process.

6.1.2 Demonstration of ALARP

Regulation 10A(b) of the OPGGS (E) Regulations 2009 requires demonstration that the environmental impacts and risks of the activity will be reduced to ALARP.

Determining whether risks have been reduced to ALARP requires an understanding of the nature and cause of the risk to be avoided and the sacrifice (in terms of safety, time, effort and cost) involved in avoiding that risk. The hierarchy of decision tools (from lowest risk to highest risk) has been adapted from the UK Offshore Operators Association (UKOOA) *Framework for Risk Related Decision Support*[2] is:

- Codes and standards;
- Good oilfield practice;
- Professional judgement;
- Risk-based analysis;
- BHP values; and
- Societal values.

A summary of the application of these decision tools and protocols in relation to the different categories of risk (Table 6-3) is presented in Table 6-1.

Table 6-1: Summary of risk ratings, decision-making tools and decision-making protocols

Risk Rating	Decision-Making Tool	Decision Making Protocol
Tolerable	Comparison to codes and standards, good oilfield practice and professional judgement are used to determine risk acceptability.	If the environmental risk was, found to fall within the "Tolerable" zone and the control measures are consistent with applicable standards and 'good oilfield practice' then no further action is required to reduce the risk further. However, if a control measure that would further reduce the impact or risk is readily available, and the cost of implementation is not disproportionate to the benefit gained, then it is considered 'reasonably practicable" and should be implemented.
ALARP Zone	In addition to comparisons with codes and standards, good oilfield practice and professional judgement, risk-based analyses are used to determine risk acceptability.	If the environmental risk of the hazard has been found to fall within the "ALARP Zone" then an iterative process to identify alternative/additional control mechanisms will be conducted to reduce the risk to the "Tolerable" zone. However, if the risk associated with a hazard cannot be reasonably reduced to the "Tolerable" zone without grossly disproportionate sacrifice (e.g. cost, time, resources and safety); then the mitigated environmental risk is considered to be ALARP.
Intolerable	All of the above decision making tools apply combined with consideration of BHP corporate values and societal values.	If the environmental risk of the hazard has been found to fall within the "Intolerable Zone" then the source of hazard will need additional barriers and is not acceptable to BHP in the current condition. Work to reduce the level of risk should be assessed against the precautionary principle with the burden of proof requiring demonstration that the risk has been reduced to the ALARP Zone before the activity can commence.

[2] UKOOA. (2014). Guidance on Risk Related Decision Making. Issue 2. Oil & Gas UK, London.

The ALARP assessment process primarily considers good engineering plus industry practice and legal requirements as key factors affecting the acceptability of a risk. Other factors such as physical constraints, stakeholder perceptions, asset protection and the interaction between environmental and safety risk is also considered as part of the overall decision-making process.

The risk assessment approach described above implies a level of proportionality wherein the principles of decision-making applied to each particular hazard are proportionate to acceptability of environmental risk of that hazard. The decision-making principles for each level of risk are based on the precautionary principle (as defined in the EPBC Act) and provide assurance that the environmental impacts and risks are reduced to ALARP and of an acceptable level.

All environmental risks and associated sources of hazard in this EP have been assessed through a tailored ALARP assessment that presents all identified controls in a hierarchal framework. All of the risks associated with the Minerva offshore activities correspond to Type A Decisions according to the UKOOA Guidance (UKOOA, 2014)[3]. The assessment of risks indicates they do not represent anything new or unusual, the risks are well understood, the adopted control measures represent established good oilfield practice and there is no conflict with BHP corporate values or major stakeholder implications.

The ALARP process undertaken considers all possible controls for both planned activity impacts and unplanned event risks, analysis of their impact/risk reduction (prevent or mitigate) proportional to the benefit gained and their final acceptance as a control or rejection and reasoning as to why.

The hierarchy of controls applied in this EP are defined below and are in order of preference as illustrated in Figure 6-2:

- Eliminate – Remove the source preventing the impact, i.e. eliminate the hazard;
- Substitution – Replace the source preventing the impact;
- Engineering – Introduce engineering controls to prevent or control the source having an impact;
- Separate – Separate the source from the receptor preventing impact;
- Administrate – Procedures, competency and training implemented to minimise the source causing an impact;
- Pollution Control – Implement a pollution control system to reduce the impact;
- Contingency Planning – Mitigate control reducing the impact; and
- Monitoring – Program or system used to monitor the impact over time.

The general preference is to accept controls that are ranked in the Tier 1 categories of Eliminate, Substitute, Engineering and Separate as these controls provide a preventive means of reducing the likelihood of the hazard occurring. Tier 2 categories reduce the potential consequence of the impact or risk. This ranking of controls was considered during the determination of ALARP and the impact and risk acceptance process.

[3] UKOOA (2014). Guidance on risk related decision making. Oil & Gas UK, London. 25 pp.

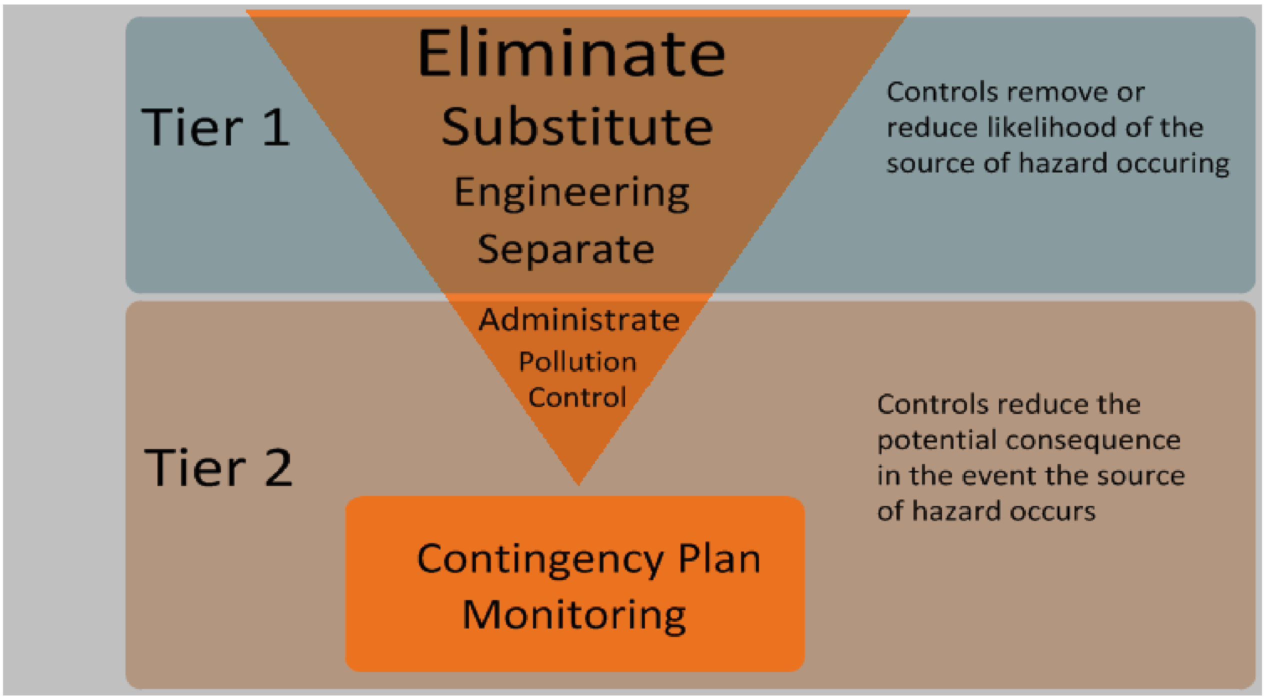

Figure 6-2: Hierarchy of control framework

The controls associated with each of the risks for planned and unplanned events of the activity, along with those for the response strategies proposed in the unlikely event of an oil spill, were assessed taking into consideration the potential environmental benefit gained if the control was implemented compared with the practicability of its implementation. If the control had high effectiveness (Availability, Functionality, Reliability, Survivability, Independence/Compatibility) and was practicable to implement (i.e. there was no disproportionate cost/time/safety/effort sacrifice), then the control was adopted. Similarly, if the control was not practicable (i.e. the cost, time and effort to implement the control were grossly disproportionate to the benefit gained), then the control was rejected.

6.1.2.1 Planned Activity Assessment

All planned activities were assessed as being a routine impact and defined as such in the ENVID. The description and degree of impact formed the basis for the severity rating applied with a quantitative assessment of impact conducted where possible to ensure the impact was well understood and clearly categorised on the severity table. Where this was not possible, a robust qualitative assessment was completed and the severity rating assigned during the ENVID process in accordance with the BHP HSEC Risk Matrix. This matrix is consistent with the BHP Our Requirements Risk Management Severity Table (Table 6-3) taking into account any of the mitigative controls assigned. All planned events do not have an allocated residual risk rating and are treated and reduced to ALARP.

6.1.2.2 Unplanned Event Risk Assessment

Risk ranking of an unplanned event is the product of the consequence of an event (severity) and the likelihood of that event occurring. Risk analysis involved an assessment of the predicted impacts that would occur taking into account existing mitigative control measures.

Likelihood and potential severity ratings were assigned in accordance with the BHP HSEC Risk Matrix (Table 6-3 to Table 6-5), which allowed the risk of individual events to be categorised in a methodical and structured process. This was completed based upon judgement by the ENVID assessment team with detailed potential impact descriptions used to ensure a robust and comprehensive decision.

The likelihood rating was based on the frequency of the source of hazard actually occurring with all preventative controls taken into consideration.

The potential severity rating was determined based on the potential impact that may occur once the source of hazard had occurred taking into account any mitigative controls in place to reduce the impact.

6.1.3 Demonstration of Acceptability

Regulation 10A(c) of the OPGGS (E) Regulations 2009 requires demonstration that the environmental impacts and risks of the activity will be of an acceptable level.

The criteria used to assess the acceptability of an environmental impact or risk to BHP are listed in Table 6-2.

Table 6-2: Environmental risk acceptability criteria

Criteria	Question	Demonstration
Codes and Standards	Is the impact or risk being managed in accordance with relevant legislation, Ministerial Conditions or standards?	Controls based on legislative requirements, standards or Ministerial Conditions must be accepted.
Ecologically Sustainable Development (ESD)	Is the proposed impact consistent with the principles of ESD?	BHP undertakes petroleum activities in a manner that is consistent with its Charter values and Code of Business Conduct. Guided by the Charter value of Sustainability, the BHP approach to environmental management is based on the identification, assessment and control of risk across all phases of a petroleum activity to minimise environmental impacts. BHP considers that adherence to these principles is consistent with the principles of ESD.
Internal Context		
BHP Charter and HSEC Management System Compliance	Is the proposed impact consistent with the requirements of BHP Our Requirements, Petroleum Standard and HSEC Management Systems?	The impact or risk must be in compliance with the BHP Charter and HSEC Management systems.
Professional Judgement	Is the impact or risk being managed in accordance with industry best practice?	The impact or risk must be managed through implementation of controls that are considered to be industry best practice.
ALARP	Are there any further reasonable and practicable controls that can be implemented to further reduce the impact or risk?	The residual risk must be demonstrated to be ALARP. ALARP of key controls will be continually re-evaluated throughout the life of the activity and not only during EP development.
External Context		
Environmental Best Practice	Are controls in place to manage the impacts and risk to the environment that are commensurate with the nature and scale of any environmental sensitivities of the receiving environment?	The environmental performance outcomes, performance standards and measurement criteria that determine whether the outcomes and standards have been achieved are commensurate with the environmental significance of the receiving environment.
Stakeholder Views	Do stakeholders have any concerns, if so, have controls been implemented to manage them?	Stakeholder consultation must be completed prior to commencement of activity and any concerns to be addressed.

Table 6-3: BHP risk matrix used for rating planned and unplanned activities

Likelihood	Severity Level				
	1	2	3	4	5
Highly Likely	30	90	300	900	3000
Likely	10	30	100	300	1000
Probable	3	9	30	90	300
Unlikely	1	3	10	30	100
Highly Unlikely	0.3	0.9	3	9	30

Table 6-4: BHP Severity Level Table Definitions

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Severity	Descriptor	Severity Factor
5	6 or more fatalities or 6 or more life shortening illnesses; or Severe impact to the environment and where recovery of ecosystem function takes 10 years or more; or Severe impact on community lasting more than 12 months or a substantiated human rights violation impacting 6 or more people; or Severe impact on company reputation, investment attractiveness, legal rights or compliance, social value proposition or ability to access opportunities at a global level; or US$2 billion or more[2].	1000
4	1-5 fatalities or 1-5 life shortening illnesses; or Serious impact to the environment, where recovery of ecosystem function takes between 3 and up to 10 years; or Serious impact on community lasting 6-12 months or a substantiated human rights violation impacting 1-5 persons; or Serious impact on company reputation, investment attractiveness, legal rights or compliance, social value proposition or ability to access opportunities at a national level; or Between US$250 million and up to US$2 billion[2].	300
3	Life altering or long term/permanent disabling injury or illness to one or more persons; or Substantial impact to the environment, where recovery of ecosystem function takes between 1 and up to 3 years; or Substantial impact on community lasting 2-6 months; or Substantial impact on company reputation, legal rights or compliance, social value proposition, or ability to access opportunities at a sub national level (state, territory, province); or Between US$50 million and up to US$250 million[2].	100
2	Non-life altering or short-term disabling injury or illness to one or more persons; or Measureable but limited impact to the environment, where recovery of ecosystem function takes less than 1 year; or Measureable but limited community impact lasting less than one month; or Measureable but limited impact on company reputation, legal rights or compliance, or social value proposition at a local level (region, city, town); or Between US$2 million and up to US$50 million[2].	30
1	Low level impact resulting in first aid only; or Minor, temporary impact to the environment, where the ecosystem recovers with little intervention; or Minor, temporary community impact that recovers with little intervention; or Minor, temporary impact on company reputation, legal rights or compliance, or social value proposition; or Less than US$2 million[2].	10

Table 6-5: BHP Likelihood Table Definitions

Uncertainty	Frequency	Likelihood factor
Highly Likely	Likely to occur within a 1 year period.	**3**
Likely	Likely to occur within a 1 - 5 year period.	**1**
Probable	Likely to occur within a 5 - 20 year period.	**0.3**
Unlikely	Likely to occur within a 20 - 50 year period.	**0.1**
Highly Unlikely	Not likely to occur within a 50 year period.	**0.03**

6.2 Environmental Performance Outcomes, Environmental Performance Standards and Measurement Criteria

Regulation 10A(d) of the OPGGS (E) Regulations 2009 requires the EP provides appropriate environmental performance outcomes, environmental performance standards and measurement criteria.

An objective of the EP is to ensure that all activities are carried out in accordance with appropriate environmental performance outcomes and standards. This requires (among other things) that appropriate measurement criteria for demonstrating that the performance outcomes and performance standards have been met are defined within the EP. In determining the nature of the outcomes, standards and measurement criteria the following requirements have been considered:

- OPGGS (E) Regulations r.13(4) (a), (b) and (c);
- NOPSEMA Guidance Note N-04750-GN1344 Rev 4 on Environment Plan Content Requirements (s.3);
- ISO 14001:2004(E), s.3.9, s.3.12; and
- ISO 14001:2004 Requirements with Guidance for Use. s.4.3.3, s.4.5.1.

Establishing environmental performance outcomes and performance standards involves a process of taking into account legal requirements and the environmental risks (described in risk assessment presented in Sections 7 and 8), and considering available control options (Section 7 and 8), and the views of interested parties (Section 5). The resulting outcomes and standards must be measurable where practicable and consistent with BHP Charter.

6.2.1 Environmental Performance Outcomes

Environmental performance outcomes were developed during the ENVID process to ensure protection of the environment from the impact or risk and to ensure on-going performance and measurability of the controls. All environmental risks are required to have at least one associated environmental performance outcome. These were developed using the below criteria:

- Specific to the source of hazard;
- Indicate how the environmental impact will be managed (e.g. minimise or prevent);
- Contain a statement of measurable performance (where applicable);
- Contain a timeframe for action (where applicable); and
- Consistent with legislative and HSEC Charter requirements.

6.2.2 Environmental Performance Standards

An environmental performance standard is a statement of performance required of a system, an item of equipment, a procedure or functional responsibility, which is used as a basis for managing environmental risk, for the duration of the activity.

There is a specific link between the environmental standards, the environmental performance outcomes and control measures; each outcome has one or more standards defining the performance requirement that needs to be met to achieve the outcome and any control measure (identified during the risk assessment process) that is critical to reducing risks to ALARP will have a corresponding performance standard.

Performance standards can be broad ranging and can be taken from many sources, however, they have one fundamental similarity, namely the standard is specific and measurable and achievable. Example performance standard sources include:

- BHP Charter;
- BHP HSEC Framework;
- BHP HSEC Controls;
- BHP Engineering Standards and Procedures;

- BHP Critical Equipment or Non-Equipment Performance Standards;
- Legislation and Regulations; and
- Industry Guidelines and Standards.

6.2.3 Environmental Measurement Criteria

Measurement criteria have been developed for each environmental performance outcome and standard as a means of measuring assurance that the performance outcome and standard will be continually met during the operational phase of the activity.

The measurement criteria are focused on providing evidence of environmental performance against outcomes for all aspects that can have an impact on the environment and providing assurance of compliance with a standard, process or procedure identified as necessary for ensuring that environmental impacts and risks are reduced to an acceptable level and to ALARP.

7 Environmental Risk Assessment and Evaluation

This section of the EP outlines the risk assessment, risk evaluation, potential environmental impacts, environmental performance outcomes, environmental performance standards and measurement criteria of the Minerva offshore activities.

7.1 Risk Assessment and Evaluation

Regulation 13(5) and 13(6) of OPGGS (E) Regulations states that “the environment plan must include:

13(5)(a) Details of the environmental impacts and risks for the activity; and

13(5)(b) An evaluation of all the impacts and risks, appropriate to the nature and scale of each impact or risk; and

13(5)(c) Details of the control measures that will be used to reduce the impacts and risks of the activity to as low as reasonably practicable and an acceptable level.

13(6) To avoid doubt, the evaluation mentioned in paragraph (5)(b) must evaluate all the environmental impacts and risk arising directly or indirectly from:

13(6)(a) All operations of the activity; and

13(6)(b) Potential emergency conditions, whether resulting from accident or any other reason.

Further, Regulation 13 (7) of the OPGGS (E) Regulations states that “the environment plan must:

13(7)(a) Set environmental performance standards for the control measures identified under paragraph (5)(c); and

13(7)(b) Set out the environmental performance outcomes against which the performance of the titleholder in protecting the environment is to be measured; and

13(7)(c) Include measurement criteria that the titleholder will use to determine whether each environmental performance outcome and environmental performance standard is being met.

The purpose of this Section is to address the requirements of Regulations 13(5), 13(6), and 13(7) by providing an assessment and evaluation of all the impacts and risks for the Activity and associated control measures that will be applied to reduce impacts and risks to an acceptable level, demonstrating how the measures being taken will reduce the level of impact and risk to ALARP.

The environmental aspects and sources of risk identified during the ENVID process were separated into planned (i.e. routine operations) and unplanned (i.e. incidents) activities. A total of 12 activities were identified that had an associated potential hazard that may have an environmental impact that required risk assessment and evaluation. These comprised seven routine activities and five unplanned events, which had low residual risk ratings or were reduced to ALARP, and hence the level of acceptability was considered tolerable or accepted on the basis of being reduced to ALARP. Table 7-1 provides a summary of the activities, environmental aspects affected and the risk assessment and evaluation that are discussed in the following sections. The environmental risks considered for the planned activities have been assessed within the operational AMBA of 3 km around the Minerva-3 well, whereas for unplanned events the environmental risks were considered across the larger spill AMBA of 8.2 km around the Minerva-3 site.

Table 7-1: Summary of the planned activities, aspects potentially affected and the risk assessment and evaluation

Activity		Environmental								Socio-Economic				Risk Assessment & Evaluation			
		Marine Mammals	Marine Turtles	Fish	Seabirds/ Shorebirds	Seabed	Marine Biota	Marine Protected Areas	Key Ecological Features	Commercial Fisheries	Shipping Activities	Tourism and Recreation	Greenhouse Gas	Severity	Likelihood	Residual Risk	Acceptability
Planned Activities																	
7.3	**Physical Presence**																
	Presence of infrastructure / vessels – interference to 3rd parties									x	x	x		1	Unlikely	1	T
	Presence of subsea infrastructure - damage to/ lost fishing gear										x	x		1	Unlikely	1	T
7.4	**Seabed Disturbance**																
	Presence of subsea infrastructure					x				x	x			1	Highly Likely	30	T
	Presence of vessel and cessation activities					x				x	x			1	Highly Likely	30	T
	Dropped objects					x								1	Unlikely	1	T
7.5	**Light Emissions**																
	Artificial light from vessels and ROVs	x	x		x									1	Highly Likely	30	T
7.7	**Underwater Noise Emissions**																
	Vessel operation (engines, DP thrusters) and associated activities (e.g. ROVs, AUVs, SSS)	x	x	x										1	Highly Likely	30	T
7.8	**Atmospheric Emissions**																
	Vessel engines, generators and mobile/ fixed plant and equipment.												x	1	Highly Likely	30	T
7.9	**Marine Discharges**																

Activity		Environmental								Socio-Economic				Risk Assessment & Evaluation			
		Marine Mammals	Marine Turtles	Fish	Seabirds/ Shorebirds	Seabed	Marine Biota	Marine Protected Areas	Key Ecological Features	Commercial Fisheries	Shipping Activities	Tourism and Recreation	Greenhouse Gas	Severity	Likelihood	Residual Risk	Acceptability
	Sewage						x							1	Highly Likely	30	T
	Grey water						x							1	Highly Likely	30	T
	RO brine reject						x							1	Highly Likely	30	T
	Cooling water						x							1	Highly Likely	30	T
	Deck drainage						x							1	Unlikely	1	T
	Food waste						x							1	Highly Likely	30	T
7.10	**Waste Management**																
	Planned (hazardous and non-hazardous) waste disposal			x										1	Highly unlikely	30	T
	Loss of non-hazardous solid waste (rubbish) overboard	x	x	x										1	Unlikely	1	T
7.10	**Subsea Discharges**																
	Control fluid release from valve actuation						x							1	Highly unlikely	30	T
	Release of treated seawater, hydraulic fluid and/or hydrocarbon gas						x							2	Unlikely	3	T
	Marine growth/ scale removal						x							1	Highly unlikely	30	T

Note: “T” = tolerable acceptability.

7.2 Environmental Risks Excluded from the Scope of the Environment Plan

Several environmental risks were considered during the ENVID assessment as not applicable to the Minerva offshore activities and hence were not considered to be within the scope of this EP.

7.2.1 Physical Presence – Interference with Tourism and Recreational Activity

No tourism or recreational activities are expected in the Operations Area given its remote location, lack of natural subsea features and water depth. The wells and export pipeline are gazetted and marked with exclusion zones on marine charts. Impacts from the presence of the infrastructure to tourism or recreational activities were therefore considered non-credible.

7.2.2 Transit of Vessels

Vessels will travel to and from the Minerva Operation Area from their port of departure. During this transit, the vessels will be governed by the relevant marine legislation, outlined within vessel specific management plans which will be reviewed by BHP prior to mobilisation. This EP covers the risks associated with the offshore activities centred on the Minerva Operations area (i.e. the permit area).

7.2.3 Anchoring

Vessels will not anchor in the Operation Area. All vessels utilised for offshore activities will use DP systems to maintain position on location. Impacts from anchoring were therefore considered non-credible.

7.3 Physical Presence – Interference to Other Users

7.3.1 Summary of Impact and Risk Assessment and Evaluation

Aspect	Source of Risk	Potential Impact	Consequence	Severity	Likelihood	Residual Risk	Acceptability
Physical Presence	Presence of vessels inspections ROV surveys or cessation activities.	Interference with other commercial shipping, fishing and/ or other third party vessels.	Potential disruption to commercial & recreational fishing and shipping activities. Temporary loss of small part of fishing area.	1	Unlikely	1	Tolerable
	Presence of wells, flowlines and subsea infrastructure.	Damage to / loss of fishing gear.	Potential disruption to commercial & recreational fishing and shipping activities. Temporary loss of small part of fishing area.	1	Unlikely	1	Tolerable

7.3.2 Source of Risk

The presence of subsea development infrastructure (e.g. wells) is marked on hydrographic charts for the area, with a 500 m petroleum safety zone, measured from each point of the outer edge of the four wells. If other marine users heed these restrictions, shipping and fishing activity would be excluded from this area.

During offshore activities, one or more vessel will be on location at the well field or along the pipeline. The Minerva Operations may pose impact to fishing activities (e.g. longline fishing).

The subsea infrastructure (e.g. wells, pipeline, umbilical, flowlines) on the seafloor also has the potential to cause damage to or loss of fishing gear due to gear snagging on the infrastructure, if fishers ignore the exclusion zones and warnings on nautical charts. The presence of the subsea infrastructure also provides an artificial habitat for marine organisms.

7.3.3 Environmental Impact Assessment

The presence of subsea infrastructure provides an artificial habitat for marine organisms by providing a hard substrate and a structure for protection of marine organisms such as fish from predators. The subsea infrastructure is likely to increase the benthic community in the immediate vicinity, but due to the depth of the infrastructure is likely to have limited adverse effect and possibly a positive environmental impact.

The subsea infrastructure may result in damage/ snagging of fishing gear, although the area surrounding the Minerva wells and flowline are marked on nautical charts as a cautionary zone (refer Figure 3-1) and as such fishers are likely to already exercise precaution in the area due to the presence of known subsea infrastructure. The area affected represents only a very small proportion of the total area available for local fishing activity. No environmental impact is predicted to occur as a result of vessel activity from this relatively small area.

Primarily only low intensity recreational line fishing occurs in the area, mostly with rod and line from access points such as cliff-tops, beaches and rock.

Blacklip abalone is Victoria’s most valuable commercial fishery with 690 tonnes caught in total of which 69 tonnes caught in the Western Zone. The rock lobster fishery is the second most valuable commercial fishery in Victoria with 296,000 pot lifts in FY18. Neither of these fisheries overlap the AMBA. Both of these fisheries occur in primarily in shallower waters (Section 4.2.2) than the depth of the Minerva wells and most of the associated subsea infrastructure (60 m), therefore impacts are unlikely.

A number of Commonwealth-managed fisheries also operate in the area, as discussed in Section 4.2.2. The Southern Bluefin Tuna Fishery total allowable catch of 6165 tonnes Australia wide for FY18. The Skipjack Tuna Fishery is currently not in use. Bass Strait Central Zone Scallop Fishery was 3,000 tonnes in 2017 and lies between the Victorian and Tasmanian scallop fisheries that lie within 20 nm of their respective coasts. The presence of vessels may pose an obstacle and potential for displacement of commercial and recreational fishers during the period of the offshore activities.

The area affected represents only a very small proportion of the total area available for local fishing activity. No environmental impact is predicted to occur as a result of vessel activity from this relatively small area. The impact of obstacle is considered ‘Tolerable’ on the basis of negligible disturbance to other users.

7.3.4 Demonstration of ALARP

A summary of the ALARP process undertaken for the environmental aspect is presented in Table 7-2. This process was completed as outlined in Section 6.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was not considered suitable (refer Table 7-2). The result of this ALARP assessment contributes to the overall acceptability of the risk and impact. All routine activity impacts do not have an allocated residual risk rating and are treated and reduced to ALARP.

Table 7-2: Physical Presence - ALARP assessment summary

Function	Controls	Accept/ Reject	Reason	Performance Standard
Eliminate	N/A			
Substitute	N/A			
Engineer	Over-trawl protection on subsea infrastructure	R	**Environmental Benefit:** Sacrifice (including HSE risks and financial cost) grossly disproportionate to any environmental benefit. **Operability:** Retrofitting protection during the operations phase was not approved under EPBC Act assessment and would require a separate offshore campaign, introducing safety risks, environmental impacts and risks associated with increased vessel operations, and with placement of	

Function	Controls	Accept/ Reject	Reason	Performance Standard
			structures over operating infrastructure, or interruptions to production to reduce installation risks. Infrastructure is marked on charts and commercial fishers made aware of location through consultation. No complaints or claims regarding loss or damage to equipment received over previous 5yrs of operation. Residual risk is considered low (tolerable). **Cost:** High.	
Separate	Establish and maintain a smaller safety zone.	R	Potential for increase in gear snagging on infrastructure, therefore no benefit from a reduction in risk.	
Administrate	Maintain a 500 m exclusion zone around the wells. Wells and pipeline are gazette and marked on navigational charts.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with the Petroleum Safety Zone regulations. **Cost:** Low	**PS 7.3.1**
	Notification of details (e.g. location, duration of activities, etc.) of offshore activities to AMSA which triggers issue of Maritime Safety Information (MSI) notifications and to the Australian Hydrographic Service (AHS) which will issue a 'Notice to Mariners'.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with AMSA regulations. **Cost:** Low	**PS 7.3.2**
	Vessels contracted to comply with Marine Orders 21 & 30 as applicable to vessel size, type and class.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with AMSA regulations. **Cost:** Low	**PS 7.3.3**
	BHP consultation to ensure relevant stakeholders and marine users are aware of the offshore activities and to advise of presence of infrastructure.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with Stakeholders. **Cost:** Low	**PS 7.3.4**
	Record complaints from stakeholders and annual review of complaints register.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with Stakeholders. **Cost:** Low	**PS 7.3.4**
Pollution Control	N/A			
Monitoring	Bridge-watch on all vessels to be maintained 24-hours per day.			

ALARP Summary

The risk assessment and evaluation has identified a range of controls that when implemented are considered to manage the impacts and risks of the offshore activities on other marine users. Offshore activities cannot occur without the presence of a vessel in the Operations Area. The ongoing presence of subsea infrastructure until field decommissioning occurs is unavoidable and the offshore activities cannot occur without the use of vessels in the field. Consideration was given to reducing the exclusion zone; however this would reduce the disturbance by an immeasurably small fraction at the cost of a greatly increased risk of collision and snagging of fishing gear on infrastructure. No additional or alternative control measures were identified to reduce environmental impacts, therefore the impacts and risks to other users is considered to be reduced to ALARP.

7.3.5 Demonstration of Acceptability

BHP considers a range of factors when determining that a level of impact and risk to the environment is broadly acceptable, as summarised in Table 7-3.

Table 7-3: Demonstration of acceptability for physical presence

Criteria	Question	Demonstration
Codes and Standards	Is the impact or risk being managed in accordance with relevant Australian or International legislation, Ministerial Conditions or standards?	Impacts and risks associated with the physical presence of vessels will be managed in accordance with relevant legislation (e.g. Navigation Act 2012), and codes and standards (e.g. Marine Orders 21 and 30).
ESD	Is the proposed impact consistent with the principles of ESD?	BHP undertakes petroleum activities in a manner that is consistent with the Australian Petroleum Production and Exploration Association (APPEA) Principles of Conduct, which endorse the continuous improvement in health, safety and environmental performance in ways that protect people and the environment through the responsible management of petroleum activities and their impacts. BHP considers that adherence to these principles is consistent with the principles of ESD.
Internal Context		
BHP Charter and HSEC Management System Compliance	Is the proposed impact or risk consistent with the requirements of BHP Our Requirements, Petroleum Standard and HSEC Management Systems?	The physical presence of infrastructure and vessels will be in compliance with the BHP Charter and HSEC management systems, and will be consistent with offshore petroleum activities.
Professional Judgement	Is the impact or risk being managed in accordance with industry best practice?	Control measures identified in this plan are consistent with industry best practice and guidelines. Accepted control measures that will be implemented are provided in Table 7-2.
ALARP	Are there any further reasonable and practicable controls that can be implemented to further reduce the impact or risk?	All reasonable and practicable controls have been assessed (Table 7-2). No additional controls were identified in further reducing the impacts and risks of physical presence without a gross disproportionate sacrifice. BHP considers that the residual risk of physical presence has been demonstrated to be ALARP.
External Context		
Environmental Best Practice	Are controls in place to manage the impacts and risk to the environment that are commensurate with the nature and scale of any environmental sensitivities of the receiving environment?	The environmental performance outcome, performance standards and measurement criteria that determine whether the outcome and performance standards have been achieved are commensurate with the receiving environment.

Criteria	Question	Demonstration
Stakeholder Views	Do stakeholders have concerns / issues, and if so, have controls been implemented to manage their concerns / issues?	Stakeholders have been consulted about the Minerva Operations through a comprehensive and long-term consultation program. No concerns have been raised regarding physical presence. The proposed control measures are designed to reduce potential impacts and risks of the activity on environmental sensitivities in the offshore Operations area.

Acceptability Summary

BHP is satisfied that when the accepted controls are implemented that the impact and residual risk of physical presence is considered ALARP. Furthermore, the adopted controls are considered to be consistent with good oilfield practice/ professional judgement and environmental best practice. The physical presence of the vessels and infrastructure will comply with all relevant laws, codes and standards, as well as the BHP Charter and HSEC Management System. All relevant controls were considered as part of the ALARP assessment, and as no other reasonably practicable additional controls were identified that would further reduce the impacts and risks of physical presence without a grossly disproportionate sacrifice, the impacts and risks are considered ALARP.

BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct and hence the principles of ESD. Stakeholders have been consulted about the offshore activities and no concerns regarding this aspect have been raised. BHP undertakes regular consultation with relevant stakeholders about its offshore activities providing them with sufficient and reasonable opportunities to raise any new concerns or issues for the duration of this activity. On this basis, it is considered that adherence to the performance standards will manage the impacts and risks of physical presence to an acceptable level.

7.3.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Performance Outcome	Controls	Performance Standard	Measurement Criteria
No reports of interference with commercial fishing or shipping or recreational vessels during offshore activities.	Navigation, bridge and communication equipment will be compliant with appropriate marine navigation and vessel safety requirements.	**PS 7.3.1.** **BHP Petroleum HSEC Controls, EC 1 Marine Operations: Marine Control 3: Facility Safety Zones: 3.1 Establishment of Safety Zone: Establish and maintain a Facility Safety Zone for Offshore Facilities:** Maintain an exclusion zone around the wells with a minimum distance of 500 m.	Breaches of vessel access within the 500 m exclusion zone during offshore activities recorded in Marine Logbook and reported via incident report form and documented in Monthly Incident Report and Environmental Performance Report.
	Notification of details of offshore activities to AMSA which triggers 'Notice to Mariners'	**PS 7.3.2.** Notification of details (e.g. location, duration of activities, etc.) of offshore activities (>7 days duration) to AMSA which triggers issue of MSI notifications and to the AHS which will issue a 'Notice to Mariners'.	Documentation of notification to AMSA and AHS advising of the details of offshore activities >7 days.
	Vessels contracted to comply with Marine Orders 21 & 30.	**PS 7.3.3.** **Marine Orders 21 and 30** Vessels contracted to comply with Marine Orders as applicable to vessel size, type and class.	Records of contracted vessels complying with Marine Orders 21 & 30.
	Record and annual review of complaints from stakeholders.	**PS 7.3.4.** **APU Community Concerns, Inquiries and Complaints Procedure (WA) (AOEA-CR-0003):**	Records maintained of stakeholder feedback, including appropriate corrective action.

Performance Outcome	Controls	Performance Standard	Measurement Criteria
		Third-party (community) concerns, inquiries and complaints associated with HSEC issues are directed to the appropriate contact and dealt with appropriately and consistently.	

7.4 Seabed Disturbance

7.4.1 Summary of Impact and Risk Assessment and Evaluation

Aspect	Source of Risk	Potential Impact	Consequence	Severity	Likelihood	Residual Risk	Acceptability
Physical disturbance to seabed	Presence of subsea infrastructure on seabed.	Minor change/ damage to seabed habitat in/ adjacent to infrastructure/ anchor footprint	Small area of direct/ indirect disturbance to seabed and associated communities in/ adjacent to infrastructure/ anchor footprint. Potential positive impact as presence of pipeline/ flowlines provide substrate therefore increasing biological productivity and / or diversity.	1	Highly Likely	30	Tolerable
	Cessation activities including removal of small sections of pipe; environmental monitoring, plugging of pipelines, flowlines, umbilicals and jumpers	Damage to seabed habitat	Small area of direct damage to seabed and associated communities. Impact mitigated by widespread distribution of similar habitat in the region.	1	Highly Likely	30	Tolerable
	Dropped objects from vessels	Damage to seabed habitat	Small area of direct damage to seabed and associated communities. Temporary increase in local turbidity. Impact mitigated by ubiquitous distribution of similar habitat in the region.	1	Unlikely	1	Tolerable

7.4.2 Source of Risk

The physical presence of infrastructure on the seabed has resulted in alteration of the seabed habitat within the infrastructure footprint and may (where exposed) result in localised sediment accretion/ scouring over time. There may also be minor and localised seabed disturbance during the offshore activities. This could include ROV movements, placement of equipment on the seabed, such as mattress/ grout bag installation should span correction on the pipeline/ umbilicals be required, and/ or displacement of seabed sediments if necessary to access buried subsea infrastructure. Vessels will use DP systems to maintain position on location. There is also a risk of seabed disturbance in the Operations Area due to dropped objects (e.g. equipment). For solid objects accidentally dropped overboard that are heavy enough to sink to the seabed, seabed disturbance will be limited to the size of the object footprint.

During the cessation activities certain tasks may involve interaction with the seabed. Sections of pipe may be cut and removed on the seabed during the cessation phase, removal and relocation will be within the Operations Area. Placement of grab samplings and other environmental monitoring tasks may involve short term seabed impact.

7.4.3 Environmental Impact Assessment

The cumulative area of seabed that will be affected by the offshore activities is estimated to be less than approximately 1,000 m^2, which includes the subsea infrastructure. The severity of impact to benthic communities is dependent on density of biota, sensitivity of biota to disturbance and the recovery potential of benthic communities. ROV video surveys indicate that the seabed is comprised of sandy substrate with very sparse epifauna predominantly comprised of crustaceans and polychaetes (worms). These species are considered to have low sensitivity to physical disturbance (compared to, for example, sponges or octocorals) and generally display high recovery following physical disturbance. The area of similar plateau habitat within the bioregion is estimated to be 51,000 km^2. Therefore, the cumulative area of disturbance is an extremely small portion of similar habitat (approximately 0.00005 %) and the environmental impact is considered to be insignificant.

As the seabed infrastructure is likely to be a high contributor of hard substrate in the area, it has also provided a habitat for species that would otherwise not be able to use the area.

Vessels will use DP to undertake offshore activities. Vessels will not anchor in the Operations Area.

Dropped objects may occur during vessel operations associated with Minerva offshore activities from over the side operations. The area of seabed potentially affected in the event of a dropped object is likely to be less than 10 m^2. Some minor additional disturbance may result from subsea inspection and maintenance activities. Subsea offshore activities may also cause similar areas of disturbance from time-to-time.

7.4.4 Demonstration of ALARP

A summary of the ALARP process undertaken for the environmental aspect is presented in Table 7-4. This process was completed as outlined in Section 6.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was not considered suitable (refer Table 7-4). The result of this ALARP assessment contributes to the overall acceptability of the risk and impact. All routine impacts do not have an allocated residual risk rating and are treated and reduced to ALARP.

Table 7-4: Seabed Disturbance - ALARP assessment summary

Function	Controls	Accept/ Reject	Reason	Performance Standard
Eliminate	N/A			
Substitute	N/A			
Engineer	N/A			
Separate	Vessels will use DP to undertake offshore activities. Vessel will not anchor in the Operations Area.	A	**Environmental Benefit:** Reduces the risk of damage to the wellheads causing possible damage and spill risk. **Operability:** Vessels will use DP systems to maintain position on location. **Cost:** Low	**PS 7.4.1**
Administrate	Recovery of dropped objects where practical and safe to do so.	A	**Environmental Benefit:** Reduces the risk of damage to any emergent seabed habitats.	**PS 7.4.2**

Function	Controls	Accept/ Reject	Reason	Performance Standard
			Operability: Control measures are feasible and standard practise. **Cost:** Low	
Pollution Control	N/A			
Monitoring	N/A			

ALARP Summary

The seabed in the offshore Operations Area consists of predominately soft bottom sediments with sparse fauna mostly comprised of crustaceans and polychaetes (worms). When considered in the context of similar seabed habitat in the region, the proportion of habitat that will be affected by the Minerva offshore activities is extremely small and the predicted impact to seabed communities is considered to be low.

The risk assessment and evaluation has identified a range of control measures that when implemented are considered to manage the impacts and risks of seabed disturbance during the Minerva offshore activities. As the requirement for anchoring will be minimal, with vessels generally using DP to maintain position and with no reasonably practicable additional control measures identified, it is considered that the impacts and risk to the benthic environment have been reduced to ALARP.

7.4.5 Demonstration of Acceptability

BHP considers a range of factors when determining that a level of impact and risk to the environment is broadly acceptable, as summarised in Table 7-5.

Table 7-5: Demonstration of acceptability for seabed disturbance

Criteria	Question	Demonstration
Codes and Standards	Is the impact or risk being managed in accordance with relevant Australian or International legislation, Ministerial Conditions or standards?	Impacts and risks associated with the seabed disturbance will be managed in accordance with relevant approvals.
ESD	Is the proposed impact consistent with the principles of ESD?	BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct, which endorse the continuous improvement in health, safety and environmental performance in ways that protect people and the environment through the responsible management of petroleum activities and their impacts. BHP considers that adherence to these principles is consistent with the principles of ESD.
Internal Context		
BHP Charter and HSEC Management System Compliance	Is the proposed impact or risk consistent with the requirements of BHP Our Requirements, Petroleum Standard and HSEC Management Systems?	Seabed disturbance associated with the offshore activities will be in compliance with BHP charter values and HSEC management systems and will be consistent with offshore petroleum activities.
Professional Judgement	Is the impact or risk being managed in accordance with industry best practice?	Control measures identified in this plan are consistent with industry best practice and guidelines. Accepted control measures that will be implemented are provided in Table 7-4.
ALARP	Are there any further reasonable and practicable controls that can be implemented to further reduce the impact or risk?	All reasonable and practicable controls have been assessed (Table 7-4). BHP considers that the residual risk of seabed disturbance has been demonstrated to be ALARP.
External Context		

Criteria	Question	Demonstration
Environmental Best Practice	Are controls in place to manage the impacts and risk to the environment that are commensurate with the nature and scale of any environmental sensitivities of the receiving environment?	The environmental performance outcome, performance standards and measurement criteria that determine whether the outcome and standards have been achieved are commensurate with the environmental significance (of the receiving environment.
Stakeholder Views	Do stakeholders have concerns / issues, and if so, have controls been implemented to manage their concerns / issues?	Stakeholders have been consulted about the Minerva offshore activities through a comprehensive and long-term consultation program. No stakeholder concerns have been raised regarding this aspect. The proposed control measures are designed to reduce potential impacts and risks of the activity on environmental sensitivities in the offshore Operations Area.

Acceptability Summary

BHP is satisfied that when the accepted control measures are implemented that the impact and residual risk of seabed disturbance is considered ALARP. The activity will take place in an area that has previously been disturbed during production well drilling and pipeline construction, the extent and nature of impact has been considered not to be significant under the EPBC Act, and impacts will be managed consistent with commitments/conditions of referral. Therefore, the potential impacts are considered to be acceptable.

All relevant control measures were considered as part of the ALARP assessment and the adopted control measures are considered to be consistent with good oilfield practice/ professional judgement and environmental best practice. Seabed disturbance associated with Minerva offshore activities will comply with all relevant laws, codes and standards, as well as the BHP Charter and HSEC Management Systems. No other reasonably practicable additional control measures were identified that would further reduce the impacts and risks of seabed disturbance without a grossly disproportionate sacrifice, and BHP is satisfied that implementation of the accepted control measures will reduce the impact and residual risk of seabed disturbance to ALARP. BHP undertakes petroleum activities in a manner that is consistent with the principles of ESD. Stakeholders have been consulted about the Minerva offshore activities and no concerns regarding this aspect have been raised. BHP undertakes regular consultation with relevant stakeholders about its offshore activities providing them with sufficient and reasonable opportunities to raise any new concerns or issues for the duration of this activity. On this basis, it is considered that impacts and risks of seabed disturbance will be managed to an acceptable level.

7.4.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Performance Outcome	Controls	Performance Standard	Measurement Criteria
Disturbance to seabed is within 100 m of subsea infrastructure.	Vessels will use DP to undertake offshore activities.	**PS 7.4.1.** Vessels will use DP to undertake offshore activities.	Records demonstrate selection of DP vessels to undertake offshore activities.
	Recovery of dropped objects where practical to do so and when recovery will provide a net environmental benefit.	**PS 7.4.2.** Recovery of dropped objects where practicable to do so and where recovery will provide a net environmental benefit.	Documentation of dropped object retrieval.

7.5 Light Emissions

7.5.1 Summary of Risk Assessment and Evaluation

Aspect	Source of Risk	Potential Impact	Consequence	Severity	Likelihood	Residual Risk	Acceptability
Light emissions	Artificial light from vessels and ROVs	Light emissions (spill/ glow) causing alterations to normal marine fauna behaviour	Potential attraction and/ or disorientation of marine fauna	1	Highly Likely	30	Tolerable

7.5.2 Source of Risk

Artificial lighting will be used during offshore vessel activities for safe conduct of operations and for various safety requirements. Lighting will frequently be required on a 24-hours basis during the offshore vessel activities. In addition, spot lighting may also be used on an as needed basis such as during ROV deployment and retrieval.

Lighting on the vessels is designed to ensure adequate illumination for safe working conditions. Typical light intensity values are 5 to 10 lux for walkways, 50 lux for working areas and approximately 100 lux for high intensity light areas. Light intensity diminishes with inverse of distance squared (I received = I/r2). Figure 7-1 presents a simple calculation of diminishment of received light with distance assuming 100 lamps on the vessel of low, medium and high intensity each acting additively. It can be seen that light received is diminished to about the equivalent of light that would be received from a full moon within about 200 m from the vessel and to that of a moonless clear night within about 1,500 m for low intensity lights and 3,000 m for high intensity lights.

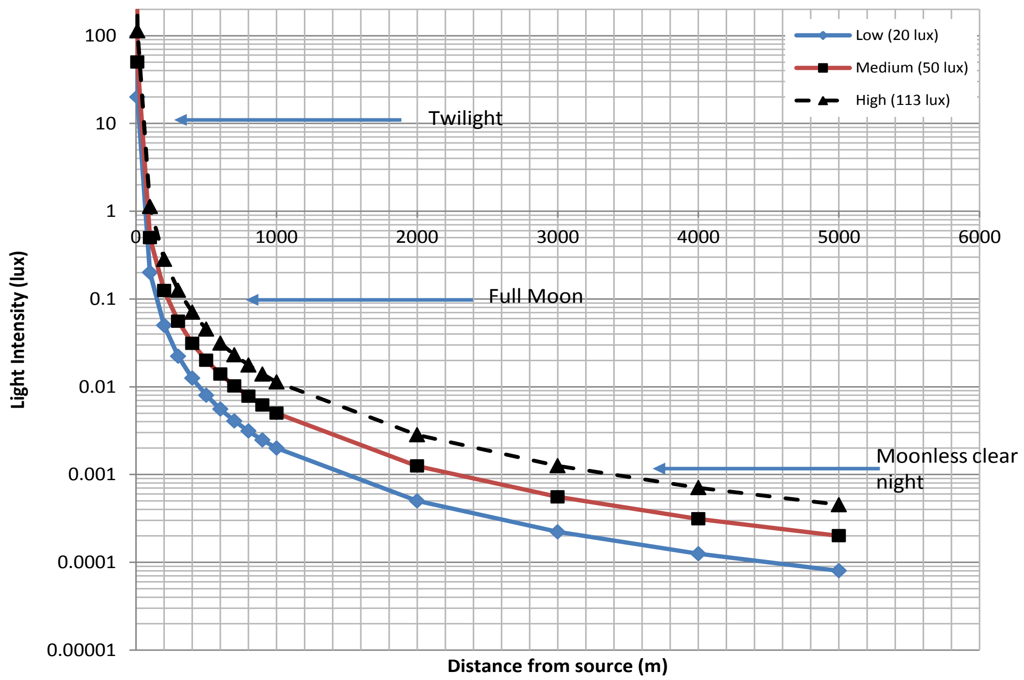


Figure 7-1: Diminishment of light with distance from source assuming 100 lamps of low, medium and high intensity

7.5.3 Environmental Impact Assessment

The environmental risk is the light spill/ glow causing alterations to normal marine fauna behaviour whereby they are attracted to and/ or disorientated by the light from the vessels. The species with greatest sensitivity to light are seabirds and turtles.

7.5.3.1 Turtles

The attraction of sea turtles to light has been well documented. Disturbance can occur to adults during nesting (limited to light in close proximity to nesting beaches and therefore not discussed further) or to newly emerged hatchlings. Hatchlings use light cues to find their way to the ocean. Once in the water, the exact methods of navigation are unknown, but it is known that hatchlings in the water are attracted to strong light sources. There are no nesting habitats in the Operations are or onshore. The potential effect is also mitigated as minimal light is directed outwards and (in the case of support vessels) and the movement of the vessel. The extent and nature of environmental impact associated with lighting was considered by DoEE not to be significant under the EPBC Act, provided certain measures were implemented. The controls proposed are consistent with these measures and the impacts are considered to be low.

7.5.3.2 Seabirds

Weise *et al.* (2001) presented a literature review discussing the effect of light from platforms in the North Sea to seabirds. They noted that seabirds are highly visually orientated and that large attractions of birds, and in some cases mortality of birds, have often been documented by lighthouses, communication towers, buildings and oil platforms. Injuries can occur through direct collisions, and the rate of collision is (they inferred from literature) related to the cross-sectional area of the obstacle, amount of light and number of birds present. Black (2005) reported on two cases of mass seabird mortalities from striking of ships in the Southern Ocean. In both cases, mortalities occurred when the vessel was at anchor near seabird colonies and conducting night deck operations during periods of reduced visibility. The nearest seabird breeding sites are located off Southern Tasmania a distance of at least 700 km from the Operations Area. The environmental impact associated with collision from seabirds attracted to the light is considered to be low.

It has been concluded that the likelihood of such light impacts on migrating birds at the Minerva Operations Area is low, as migrating birds in the region are at or near to the end of their migration. The environmental impact associated with the potential for seabirds to be diverted from normal migratory pathways is considered to be low.

As there are no safe alternatives to the use of artificial lighting on the vessels, and as lighting will be restricted to that required to provide safe working and navigational requirements, it is considered minimised to ALARP. In summary, BHP considers the proposed activity is not inconsistent with recovery plan for marine turtles, as impacts and risks associated with light emissions were considered in the Environmental Risk Assessment, and a range of control measures were identified and adopted during the ALARP assessments, as detailed below.

7.5.3.3 Species Recovery Plans, Approved Conservation Advice and Threat Abatement Plans

BHP has considered information contained in recovery plans, approved conservation advice and threat abatement plans published by the DoEE. This includes the Recovery Plan for Marine Turtles in Australia (DoEE, 2017a).

The overarching objective of the Recovery Plan for Marine Turtles in Australia is to reduce detrimental impacts on Australian populations of marine turtles and hence promote their recovery in the wild. All six species of marine turtle that occur in Australian waters are listed as threatened under the EPBC Act. Marine turtles are long-lived, slow to mature and are subject to a number of threats of which vessel strike is the most relevant to vessel activities as part of Pyrenees Operations. As discussed in the recovery plan, light pollution is highlighted as a significant threat to marine turtles for the potential to disrupt critical behaviours and cause disorientation of hatchlings following their emergence from nests, although breeding adult turtles may also be disorientated. Minimising light pollution such that artificial light within or adjacent to habitat critical to the survival of marine turtles is managed such that marine turtles are not displaced from these habitats (DoEE, 2017a). There are no nesting habitats in the Operations are or onshore.

As there are no safe alternatives to the use of artificial lighting on the Facility and associated vessels, and as lighting will be restricted to that required to provide safe working and navigational requirements, it is considered minimised to ALARP. In summary, BHP considers the proposed activity is not inconsistent with recovery plan for marine turtles, as impacts and risks associated with light emissions were considered in the Environmental Risk Assessment, and a range of control measures were identified and adopted during the ALARP assessments, as detailed below.

7.5.4 Demonstration of ALARP

A summary of the ALARP process undertaken for the environmental aspect is presented in Table 7-6. This process was completed as outlined in Section 6.1.2 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification why not considered suitable. The result of this ALARP assessment contributes to the overall acceptability of the risk and impact.

Table 7-6: Light emissions – ALARP assessment summary

Function	Controls	Accept/ Reject	Reason	Performance Standard
Eliminate	N/A			
Substitute	N/A			
Engineer	Reduction of underwater lighting associated with IMR and cessation activities	R	**Environmental Benefit:** The lighting on the ROV is highly directional and ROV operations will occur in close proximity to the subsea infrastructure locations. Any effects on fauna behaviour are likely to be localised and very short lived. **Operability:** ROVs undertaking IMR and cessation activities require lighting to adequately illuminate work areas during operation. Lighting requirements may vary according to task and/or prevailing underwater conditions and there are no documented minimum safe working guidelines. Inadequate lighting may introduce inefficiencies and/or operational risk due to reduced inspection, maintenance and repair quality. **Cost:** Low	
Separate	N/A			
Administrate	Marine Order 30: External lighting on all vessels will be minimised to that required for safety of navigation and safety of deck operations.	A	**Environmental Benefit:** The risk to all fauna cannot be reduced due to variability in timing of environmentally sensitive periods and the unpredictable presence of some species. **Operability:** External lighting on all vessels will be minimised to that required for safety of navigation and safety of deck operations. **Cost:** Low	**PS 7.5.1**
Pollution Control	N/A			
Monitoring	N/A			

ALARP Summary

The risk assessment and evaluation has identified a range of controls consistent with those conditions that when implemented are considered to manage the impacts and risks of light emissions during the offshore vessel activities. Other relevant considerations are comparison to good oilfield practice and professional judgement. Undertaking offshore vessel activities on subsea infrastructure is standard good oilfield practice and vessels are required for the offshore vessel activities. The illumination of work areas is normal maritime oilfield practice and necessary for safe operations. The offshore vessel activities will occur in an open ocean environment with the nearest shoreline approximately 10 km from the Macedon field. No sensitive receptors such as turtle nesting beaches or seabird roosting/foraging habitat are known from within the AMBA by light emissions. With no reasonable additional controls identified, other than not proceeding with the inspection/intervention activities, it is considered that the impacts and risk to marine fauna from light emissions have been reduced to ALARP.

7.5.5 Demonstration of Acceptability

BHP considers a range of factors when determining that a level of impact and risk to the environment is broadly acceptable, as summarised in Table 7-7.

Table 7-7: Demonstration of acceptability for light emissions

Criteria	Question	Demonstration
Codes and Standards	Is the impact or risk being managed in accordance with relevant Australian or International legislation, Ministerial Conditions or standards?	Impacts and risks associated with light emissions will be managed in accordance with approvals, including EPBC Act 1999 – Referral Decision December 2009 (EPBC 2008/4065) Conditions.
Ecologically Sustainable Development (ESD)	Is the proposed impact consistent with the principles of ESD?	BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct, which endorse the continuous improvement in health, safety and environmental performance in ways that protect people and the environment through the responsible management of petroleum activities and their impacts. BHP considers that adherence to these principles is consistent with the principles of ESD.
Internal Context		
BHP Charter and HSEC Management System Compliance	Is the proposed impact or risk consistent with the requirements of BHP Our Requirements, Petroleum Standard and HSEC Management Systems?	Light emissions will be in compliance with the BHP Charter and HSEC management systems and will be consistent with offshore petroleum activities.
Professional Judgement	Is the impact or risk being managed in accordance with industry best practice?	Controls identified in this plan are consistent with industry best practice and guidelines. Accepted controls that will be implemented are provided in Table 7-6.
ALARP	Are there any further reasonable and practicable controls that can be implemented to further reduce the impact or risk?	All reasonable and practicable control measures have been assessed (Table 7-6). No additional controls were identified to further reduce the impacts and risks of light emissions. BHP considers that the residual risk of light emissions has been demonstrated to be ALARP.
External Context		
Environmental Best Practice	Are control measures in place to manage the impacts and risk to the environment that are commensurate with the nature and scale of any environmental sensitivities of the receiving environment?	The environmental performance outcomes, performance standards and measurement criteria that determine whether the outcomes and standards have been achieved are commensurate with the environmental significance of the receiving environment.
Stakeholder Views	Do stakeholders have concerns / issues, and if so, have control measures been implemented to manage their concerns/ issues?	Stakeholders have been consulted about the Minerva Operations activities through a comprehensive and long-term consultation program. No stakeholder concerns have been raised regarding this aspect. The

Criteria	Question	Demonstration
		proposed control measures are designed to reduce potential impacts and risks of the activity on environmental sensitivities in the Operations Area.

Acceptability Summary

BHP is satisfied that when the accepted control measures are implemented that the impact and residual risk of light emissions is considered ALARP.

All relevant controls were considered as part of the ALARP assessment and the adopted control measures comply with EPBC Act 1999. Navigational lighting is required to satisfy Marine Order 30 - Prevention of Collisions requirements and illumination of working areas on vessels is necessary for safety working practices. External lights on vessels are not normally directed outwards except when necessary for safe operations outboard, such as transfer operations or deployment/ retrieval of equipment. Lighting management associated with vessel activities will comply with all relevant laws, codes and standards, as well as the BHP Charter and HSEC Management Systems. No other reasonably practicable additional controls were identified that would further reduce the impacts and risks of light emissions without a grossly disproportionate sacrifice, and BHP is satisfied that implementation of the accepted controls will reduce the impact and residual risk of light emissions to ALARP. BHP undertakes petroleum activities in a manner that is consistent with the principles of ESD. Stakeholders have been consulted about the offshore vessel activities and no concerns regarding this aspect have been raised. BHP undertakes regular consultation with relevant stakeholders about its operations / activities providing them with sufficient and reasonable opportunities to raise any new concerns or issues for the duration of this activity. On this basis, it is considered that impacts and risks of light emissions will be managed to an acceptable level.

7.5.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Performance Outcome	Performance Standard	Measurement Criteria
Light emission from vessels will be controlled to a level necessary for safe working conditions and navigation to minimise impacts to marine fauna.	**PS 7.5.1.** External lighting on all vessels will be minimised to levels necessary for safety of navigation and safety of deck operations.	Documentation of HSE audit, which includes review of external lighting.

7.6 Underwater Noise Emissions

7.6.1 Summary of Impact and Risk Assessment and Evaluation

Aspect	Source of Risk	Impact	Consequence	Severity	Likelihood	Residual Risk	Acceptability
Underwater noise emissions	Noise generated within the Operational Area from: • Vessels; • Subsea infrastructure; and • IMR and cessation activities.	Underwater sound emitted to marine environment causing interference to marine mammals	Potential to cause behaviour disturbance such as avoidance measure and/ or disruption to important behaviours (e.g. disruption to migratory movements).	1	Highly Likely	30	Tolerable

7.6.2 Source of Risk

Underwater noise has the potential to adversely affect marine fauna and in extreme cases cause physiological harm. Underwater noise[4] generated by anthropogenic activities may impact on marine fauna by:

- Causing behavioural changes including displacement from biologically important habitat areas (such as feeding, resting, breeding, calving and nursery sites);
- Masking or interference with other biologically important sounds such as communication or echolocation systems used by certain cetaceans for navigation and location of prey;
- Causing physical injury to hearing and other internal organs; and
- Indirectly impacting on predator or prey species.

The main potential sources of underwater noise[5] associated with Minerva Operations are from:

- Vessels;
- Subsea infrastructure; and
- IMR and cessation activities.

7.6.2.1 Noise Generated by Vessels

McCauley (1998) measured underwater broadband noise equivalent to approximately 182 dB re µPa at 1 m from a vessel holding station in the Timor Sea. Under normal operating conditions when the vessel is idling or moving between sites, vessel noise would be detectable only over a short distance. The noise from a vessel holding its position using bow thrusters and strong thrust from its main engines may be detectable above background noise levels during calm weather conditions, for 20 km or more from the vessel although this range of audibility will be reduced under noisier (windier) background conditions.

7.6.2.2 Noise Generated by Subsea Inspection Maintenance and Repair Activities

During offshore vessel activities, ROVs, AUVs, SSS and/or MBES may be used. The noise generated by these sources will typically be of considerably lower intensity than vessel noise, or, in the case of SSS, predominantly at frequencies (>180 kHz) that are outside the hearing thresholds of cetaceans and well above the hearing level of other mammals and fish (DECC, 2011[6]). SSS devices operate at frequencies similar to those used in 'fish finders' by commercial fishers. The technique involves high frequency sound pulses typically between 100-500 kHz with the higher frequencies providing a greater resolution (DECC, 2011[7]). SSS used for imaging the pipeline will be highly directional and at high frequencies which attenuate in the water column and do not propagate over long distances. MBES are another sonar device which typically operate at frequencies (200-400 kHz for high resolution in shallower waters) that fall outside the hearing range of most marine mammals and fish (DECC, 2011). Given the surveys will be undertake infrequently and typically last under five days, and the rapid attenuation and intermittent nature of high frequency sonar signals, the potential effects are expected to fall off rapidly with distance from the source and be unlikely to cause significant impacts to any marine fauna populations. As sound levels are dependent on the primary (noisiest) sound source rather than being strictly additive, and these activities all require vessel support, they will make little contribution to the overall noise emissions associated with the offshore vessel activities, which will be dominated by vessel noise.

4 Note that noise is propagated and measured differently in water than on land. The standard scientific approach is to describe underwater noise levels in terms of sound pressure. While a decibel (dB) is a relative measure of sound level, in order to make this measure meaningful for underwater noise, it is referenced to a standard 'reference intensity' of 1 mPa (dB re 1 µPa). Underwater noise is also measured over a specified frequency, usually either a 1 Hz bandwidth (expressed as dB re 1 µPa2/Hz), or over a broadband that has not been filtered. Where the frequency has not been expressed, it is assumed that the measurement is a broadband measurement.

5 Note that noise is propagated and measured differently in water than on land. The standard scientific approach is to describe underwater noise levels in terms of sound pressure. While a decibel (dB) is a relative measure of sound level, in order to make this measure meaningful for underwater noise, it is referenced to a standard 'reference intensity' of 1 mPa (dB re 1uPa). Underwater noise is also measured over a specified frequency, usually either a 1 Hz bandwidth (expressed as dB re 1uPa2/Hz), or over a broadband that has not been filtered. Where the frequency has not been expressed, it is assumed that the measurement is a broadband measurement.

6 Department of Energy and Climate Change (DECC). 2011. Review and Assessment of Underwater Sound Produced from Oil and Gas Sound Activities and Potential Reporting Requirements under the Marine Strategy Framework Directive. Genesis Oil and Gas Consultants report for DECC. J71656. Document No. J71656-Final Report-G2. July 2011. Downloaded from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/50017/finreport-sound.pdf

7 Ibid

Indicative source characteristics for typical acoustic survey equipment are provided in Table 7-8.

Table 7-8: Source Characteristics of Underwater Noise Generated by the Activity

Noise sources	Frequency Range (kHz)	Estimated SPL (dB re 1 µPa SPL) @1 m
Side Scan Sonar (SSS) (Impulsive)	9–675	200–234
Multibeam Echo Sounder (MBES) (Impulsive)	2–675	210–247
Support vessel using DP (Continuous)	0.3-3	165-180

7.6.3 Environmental Impact Assessment

7.6.3.1 Vessels

Theobald *et al*. (2009)[8] have calculated the cumulative sound exposure received by an animal approaching and swimming past a vessel with noise level of 182 dB re 1uPa @1m (analogous to noisiest vessel operations). The maximum exposure is calculated to be 185 dB re 1 uPa2.s (refer to Figure 7-2).

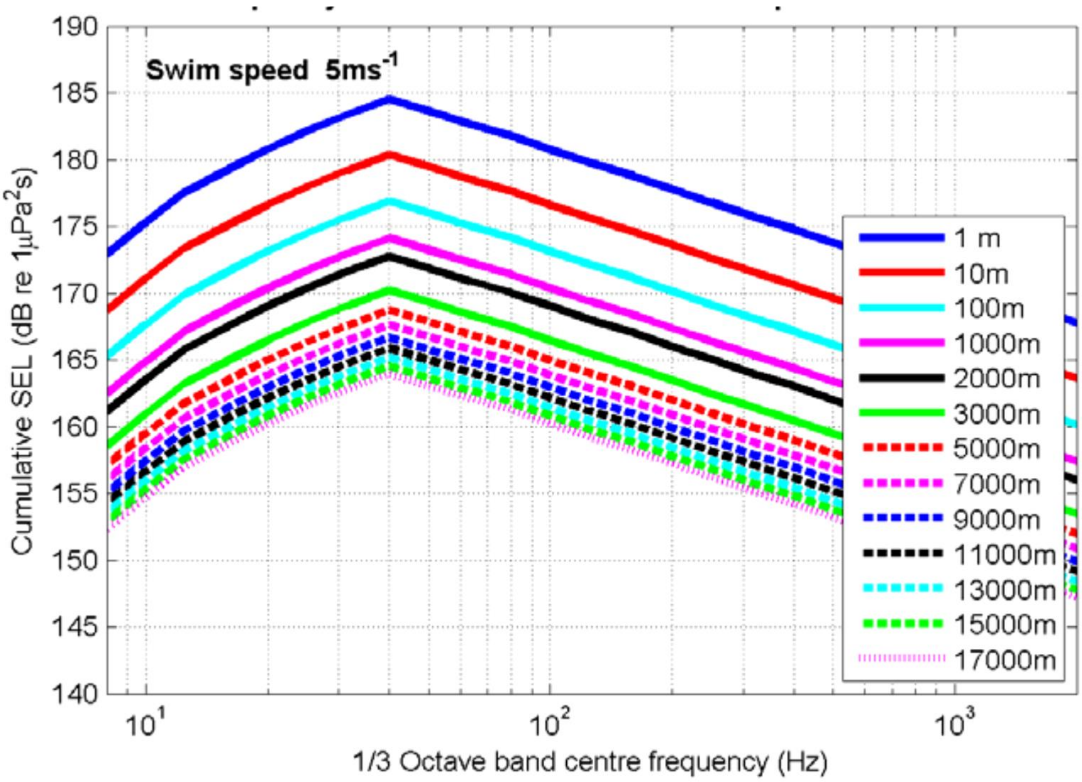


Figure 7-2: Calculated cumulative sound exposure Level received by animal swimming past vessel with source noise level of 185 dB re 1 uPa2.s

(Trajectory length 30 km, swim depth 10 m, legend refers to separation distance at closest point: sourced from Theobald *et al.,* 2009[9]).

The species with greatest sensitivity to underwater noise are whales, turtles and fish. Two pathways of effect are considered direct physical damage and behavioural effect.

8 Theobald, P., Lepper, P., Robinson, S. and Hazelwood ,D. (2009). Cumulative noise exposure assessment for marine mammals using sound exposure level as a metric. Report by National Physics laboratory, Middlesex, United Kingdom. Accessed May 2012 <http://promitheas.iacm.forth.gr/uam2009/lectures/pdf/27-3.pdf>

9 Ibid

7.6.3.2 Physical Damage

Whales

Calculations of the noise exposure level received by a whale swimming past a vessel with noise characteristics of a vessel (Theobold *et al.,* 2009) indicate that a whale would need to pass within a few meters to receive a cumulative SEL sufficient to cause physiological effect.

For baleen whales the threshold for physical injury (defined as the onset of permanent threshold shift) from pulse and non-pulse sources has been estimated by Southall *et al.* (2007) as occurring at the received sound exposure levels (SELs) of 198 and 215 dB re 1µPa2 s, respectively. The approach of Southall et al. (2007) recognises that even if the initial received levels are not great enough to cause injury, harmful effects can result from lower level sounds that last for a longer duration. The EPBC Seismic Interaction Guidelines Department of the Environment, Water, Heritage and Arts (DEWHA) (2008b) set the lower standard of 160 dB re 1µPa2 s from a single pulse at 1 km on the assumption that the whale would receive the multiple pulses for a 33 minute period (leading to a cumulative SEL of 186 dB re 1µPa2 s, the threshold for temporary threshold shift). This is not considered to be a credible scenario with the current control mechanisms in place. A whale swimming past a vessel would not receive cumulative SEL sufficient to cause physiological effect.

Turtles:

For turtles the only known data addressing threshold shift in turtles is from a study conducted by Eckart *et al*. (2006)[10] on leatherback turtles. This study demonstrated that turtles will suffer temporary threshold shift and eventually permanent threshold shift from seismic impulses with SEL greater than 185 dB re 1 uPa2.s. A turtle would need to approach within 100 m or remain at 1 km for a period of approximately 26 minutes for physiological impact to occur. Neither of these is considered to be a credible scenario with the current control mechanisms in place. A turtle swimming past the vessel would need to pass within 1 m to receive cumulative SEL sufficient to cause physiological effect.

Fish:

There is a wide range of susceptibility to noise pulses among fish. The primary factor likely to influence susceptibility is the presence or absence of a swim bladder. Generally fishes with a swim bladder will be more susceptible than those without this organ. Many adult fishes, including the elasmobranchs (sharks, rays and sawfish) do not possess a swim bladder and so are not susceptible to swim bladder-induced trauma. Using a similar approach to the DEWHA Policy Statement (DEWHA, 2008) and the derived relationship of Hastings and Popper (2005)[11] threshold criteria for physiological harm has been calculated[12] to be:

For a 0.1 kg fish: single exposure of 199 dB re 1 µPa2.s; and

For a 1 kg fish: single exposure of 200 dB re 1 µPa2.s.

7.6.3.3 Behavioural Effects

Whales:

Southall *et al.* (2007) conducted a comprehensive review of data published describing behaviour of marine mammals in response to sound. They defined the threshold for behaviour response as being, “Moderate changes in locomotion speed direction and/or dive profile but no avoidance of the sound source, brief minor shift in group distribution and moderate cessation or modification of vocal behaviour”. The review of published data suggests that threshold for behaviour response is highly variable between species, within species and even the same individual animal at different times. For baleen whales the threshold for behavioural response occurs at received sound level of between 120 to 160 dB re 1 uPa (Table 7 pg. 454).

Turtles:

Sea turtles have been recorded as demonstrating a startle response to sudden noises (Lenhardt *et al.,* 1983)[13.] However, few studies have investigated threshold level necessary for behavioural effects.

10 Eckert, S.A., Bowles, A. and Berg, E. (1998). The effect of seismic airgun surveys on leatherback sea turtles (*Dermochelys coriacea*) during the nesting season. Technical report to BHP (Petroleum) Trinidad Ltd.

11 Hastings, M.C. and Popper, A.N. (2005). Effects of sound on fish. Subconsultants to Jones & Stokes Under California Department of Transportation Contract No. 43A0139. Report. Pp 82. Accessed March 2011 <http://www.dot.ca.gov/hq/env/bio/files/Effects_of_Sound_on_Fish23Aug05.pdf>

12 Assumes 1 pulse every 8 seconds giving a total of 75 pulses over a ten minute period.

13 Lenhardt, M.L., Bellmund, S., Byles, R.A., Harkins, S.W. and Musick, J.A. (1983). Marine Turtle reception of bone conducted sound. Journal of Auditory Research, 23: 119-1125.

Fish:

Most pelagic fish are expected to exhibit avoidance behaviour and swim awayfrom acoustic noise sources. Available evidence suggests that behavioural change for some fish species may be no more than a nuisance factor. These behavioural changes are localised and temporary with displacement of pelagic or migratory fish populations having insignificant repercussions at a population level (McCauley, 1994[14]).

A whale swimming past a vessel holding station would not receive cumulative SEL sufficient to cause temporary threshold shift, however a turtle may if it approaches closer to within 1 m of the vessel. Temporary threshold shift is, by definition, a short-term temporary effect and does not represent long-term harm to the individual animal. The proximity at which behavioural effects may commence for whales, turtles and fish has been determined by reference to Figure 7-1 and summarised in Table 7-9.

7.6.3.4 Species Recovery Plans, Conservation Management Plans and Approved Conservation Advice

BHP has considered information contained in recovery plans, conservation management plans, approved conservation advice and threat abatement plans (refer to previous Table 4-7).

The Recovery Plan for Marine Turtles in Australia (DoEE, 2017) highlights noise interference from anthropogenic activities as a threat to turtles. The Recovery Plan refers to vessel noise and the operation of some oil and gas infrastructure as sources of chronic (continuous) noise in the marine environment, exposure of which may lead to avoidance of important turtle habitat. Five species of turtle may occur within the Operations Area, no BIAs intercept the Operations Area or AMBA.

The Operations Area intercepts the BIA for the Southern Right Whale for aggregations. The Conservation Management Plan for the Southern Right Whale (DSEWPaC, 2012), the Conservation Management Plan for the Blue Whale (DoE, 2015), Approved Conservation Advice for the Sei Whale (TSSC, 2015d), Conservation Advice for the Fin Whale (TSSC, 2015e) and the Conservation Advice for Humpback Whale (TSSC, 2015f) highlight anthropogenic noise as a threat. The Operations Area is not within a whale calving, foraging area, or a confined migratory pathway.

Based on the noise levels likely from the Activities, turtles and whales transiting or in the vicinity of the Operations Area, may avoid the immediate area around the vessels. However underwater noise levels are expected to be localised, with possible effects to turtles and whales limited to, at worst, short-term avoidance behaviour. Infrequent, localised and temporary avoidance of a small area within the Operations Area will not affect the conservation status of turtles or whales that transit the Operations Area, or compromise the objectives or recovery actions that form the basis of the Management Plans and Conservation Advice.

Noise emissions are considered to be as low as reasonably practicable whilst meeting vessel navigation/safety and activity requirements. With controls in place, the potential impacts of noise emissions were assessed as low, consistent with the relevant requirements of Conservation Management Plans/Approved Conservation Advice documents and acceptable.

Table 7-9: Predicted range within which behavioural effects (including avoidance) may commence for whales, turtles and fish

Function	Whale	Turtles	Fish
Vessel holding station	0 – 3,000 m	0 – 300 m	0 – 50 m

7.6.4 Demonstration of ALARP

A summary of the ALARP process undertaken for the environmental aspect is presented in Table 7-10. This process was completed as outlined in Section 6.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was not considered suitable (Table 7-10). The result of this ALARP assessment contributes to the overall acceptability of the risk and impact. All routine impacts do not have an allocated residual risk rating and are treated and reduced to ALARP.

14 McCauley, R.D. (1994). The environmental implications of offshore oil and gas development in Australia – seismic surveys. In: Swan, J.M., Neff, J.M. and Young, P.C. (eds.), Environmental Implications of Offshore Oil and Gas Development in Australia - The Findings of an Independent Scientific Review. pp. 19-122. Australian Petroleum Exploration Association, Sydney.

Table 7-10: Noise Emissions - ALARP assessment summary

Function	Controls	Accept/ Reject	Reason	Performance Standard
Eliminate	N/A			
Substitute	Prevent or reduce offshore activities during peak cetacean migration periods.	R	**Environmental Benefit:** The risk to all fauna cannot be reduced due to variability in timing of environmentally sensitive periods and the unpredictable presence of some species. **Operability:** The use of vessels is essential to the Activity. Infrequency and short duration of offshore activities results in only low risk. Restricting timing or duration of vessel operations may have logistical implications or decrease the effectiveness of the integrity inspection/ intervention program. **Cost:** High. Restricting timing or duration of vessel operations may have high costs and/or decrease the effectiveness of the integrity inspection/ intervention program.	
	Use anchors on vessels instead of DP to hold station.	R	**Environmental Benefit:** Anchoring will cause an increase in seabed disturbance. Very limited environmental benefit can be gained by this method which is disproportionate to the cost and effort involved. **Operability:** Would complicate and increase risk of works in proximity to infrastructure. May limit the type of vessel due to water depth resulting in logistical implications or costs. **Cost:** Low	
Engineer	N/A			
Separate	N/A			
Administrate	Vessel Masters to operate vessels in accordance with the Part 8 of the OPGGS Act 2006 – (s. 280 (2) (c)); EPBC Regulations 2000 – Part 8 Division 8.1 (r. 8.05) Interacting with Cetaceans (modified to include turtles and whale sharks) to avoid interactions with whales, whale sharks, and marine turtles.	A	**Environmental Benefit:** Reduces interaction risk to Cetaceans (modified to include turtles and whale sharks). **Operability:** Legal obligation to comply with the OPGGS Act 2006 and EPBC Regulations 2000. **Cost:** Low	**PS 7.5.1**
	Environment awareness induction provided to all vessel crew to advise marine fauna interaction requirements.	A	**Environmental Benefit:** Providing training to personnel assists in understanding legal obligations. **Operability:** Inductions form part of any new employee process. **Cost:** Low	**PS 7.5.2**

Function	Controls	Accept/ Reject	Reason	Performance Standard
	Noise emitting machinery/ equipment will be appropriately maintained.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Machinery maintenance is part of normal operations to ensure operating in accordance with manufactures guidelines. **Cost:** Low	**PS 7.5.4**
	Record complaints from stakeholders and review of complaints register done annually.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with Stakeholders. **Cost:** Low	**PS 7.5.5**
Pollution Control	N/A			
Monitoring	Sightings of cetaceans, whale sharks and turtles to be conducted on the vessel/s operating in the Operations Area opportunistically and secondary to the primary responsibilities of core crew. Sightings are recorded and reported.			

ALARP Summary

The risk assessment and evaluation has identified a range of controls that when implemented are considered to manage the unplanned impacts and risks of the noise to marine fauna. With the appropriate controls outlined in Table 7-10, which are consistent with guidelines and represent international practice, the risk and impact of noise emitting activities and sources of noise affecting marine fauna is considered to be reduced to ALARP in order to allow offshore activities to proceed safely. With no reasonable additional controls identified, other than not proceeding with the activities, it is considered that the impacts and risk to noise emissions have been reduced to ALARP.

7.6.5 Demonstration of Acceptability

BHP considers a range of factors when determining that a level of impact and risk to the environment is broadly acceptable, as summarised in Table 7-11.

Table 7-11: Demonstration of acceptability for noise emissions

Criteria	Question	Demonstration
Codes and Standards	Is the impact or risk being managed in accordance with relevant Australian or International legislation, Ministerial Conditions or standards?	Impacts and risks associated with noise emissions will be managed in accordance with relevant codes and standards (e.g. EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans; including species described in recent updates to Recovery Plans, Conservation Management Plans, Threat Abatement Plans or approved Conservation Advice in place (or in draft) for those EPBC Act listed threatened and migratory species that may occur within the AMBA's as described in Table 4-4.
ESD	Is the proposed impact consistent with the principles of ESD?	BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct, which endorse the continuous improvement in health, safety and environmental performance in ways that protect people and the environment through the responsible management of petroleum activities and their impacts. BHP considers that adherence to these principles is consistent with the principles of ESD.

Criteria	Question	Demonstration
Internal Context		
BHP Charter and HSEC Management System Compliance	Is the proposed impact or risk consistent with the requirements of BHP Our Requirements, Petroleum Standard and HSEC Management Systems?	Noise emissions associated with the offshore activities will be in compliance with the BHP Charter and HSEC management systems and will be consistent with offshore petroleum activities.
Professional Judgement	Is the impact or risk being managed in accordance with industry best practice?	Noise sources are likely to occur when vessels are using DP thrusters to remain on location. Use of anchors would reduce the noise signature however vessels with sufficient anchor capabilities are likely to be larger (>noise) with increased effort involved. The use of controls described reduced the likely negative impacts of the activity.
ALARP	Are there any further reasonable and practicable controls that can be implemented to further reduce the impact or risk?	All reasonable and practicable controls have been assessed (Table 7-10), additional controls were considered but were found not to be justifiable in further reducing the impacts and risks of noise emissions without a gross disproportionate sacrifice. BHP considers that the residual risk of noise emissions has been demonstrated to be ALARP.
External Context		
Environmental Best Practice	Are controls in place to manage the impacts and risk to the environment that are commensurate with the nature and scale of any environmental sensitivities of the receiving environment?	The environmental performance outcomes, performance standards and measurement criteria that determine whether the performance outcomes and performance standards have been achieved are commensurate with the environmental significance of the receiving environment.
Stakeholder Views	Do stakeholders have concerns/ issues, and if so, have controls been implemented to manage their concerns/ issues?	Stakeholders have been consulted about the offshore activities through a comprehensive and long-term consultation program. Stakeholder concerns have been considered for noise emissions, and this is reflected in controls designed to mitigate impacts of the activity on environmental sensitivities in the offshore Operations area.

Acceptability Summary

BHP is satisfied that when the accepted control measures are implemented that the impact and residual risk of noise emissions is considered ALARP. Furthermore, the adopted control measures are considered to be consistent with good oilfield practice/ professional judgement and environmental best practice. Noise emissions will comply with all relevant laws, codes and standards, as well as the BHP Charter and HSEC Management Systems. All relevant controls were considered as part of the ALARP assessment, and as no other reasonably practicable additional control measures were identified that would further reduce the impacts and risks of noise emissions without a grossly disproportionate sacrifice, the impacts and risks are considered ALARP. BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct and hence the principles of ESD. Stakeholders have been consulted about the offshore activities no concerns regarding this aspect have been raised. BHP undertakes regular consultation with relevant stakeholders about its offshore activities providing them with sufficient and reasonable opportunities to raise any new concerns or issues for the duration of this activity. On this basis, it is considered that the impacts and risks of noise emissions will be managed to an acceptable level.

7.6.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Performance Outcome	Controls	Performance Standard	Measurement Criteria
Reduce noise impacts to marine fauna during the activity	Vessel Masters to operate vessels in accordance with the EPBC Regulations 2000 Part 8 Division 8.1 (Regulation 8.05) to avoid interactions with cetaceans and whale sharks.	**PS 7.6.1.** ***OPGGS Act 2006 – (s. 280 (2) (c)) - EPBC Regulations 2000* – Part 8 Division 8.1 Interacting with cetaceans (modified to include whale sharks and turtles) such that:** Vessels will not knowingly travel greater than 6 knots within 300 m of a cetacean, whale shark or turtle (caution zone) and minimise noise. Vessels will not knowingly approach closer than 100 m for a large whale or whale shark, or 50 m of a dolphin or turtle (with the exception of bow riding). If the cetacean/ whale shark show signs of being disturbed, the support vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots. Vessels must move at a constant slow speed and with minimal noise away from a cetacean that is approaching so that the vessel remains at least 300 m from the cetacean.	Records of breaches of vessel and cetacean/ whale shark/ turtle interaction requirements outlined in EPBC Regulations 2000 Part 8 Division 8.1 (Regulation 8.05) reported via incident report form and documented in Monthly Incident Report and Environmental Performance Report.
	Environmental awareness induction to advise marine fauna interaction requirements.	**PS 7.6.2.** Environmental awareness induction provided to vessel crew prior to activities to advise marine fauna interaction requirements.	Induction attendance records demonstrate that environmental awareness inductions have been conducted for vessel crew.
	Noise emitting machinery/ equipment will be appropriately maintained.	**PS 7.6.3.** Noise emitting machinery/ equipment will be appropriately maintained.	Noise emitting machinery/ equipment maintenance records current and scheduled on PMS.
	Record complaints from stakeholders, review of complaints register done annually.	**PS 7.6.4.** Third-party (community) concerns, inquiries and complaints associated with HSEC issues will be directed to the appropriate contact and dealt with appropriately and consistently.	Records maintained of stakeholder feedback including appropriate corrective action. Documented evidence of annual review of complaints conducted.

7.7 Atmospheric Emissions

7.7.1 Summary of Impact and Risk Assessment and Evaluation

Aspect	Source of risk	Impact	Consequence	Severity	Likelihood	Residual Risk	Acceptability
Atmospheric emissions	Emissions from vessel engines, generators and fixed/ mobile plant.	Greenhouse gas (GHG) emissions and non-GHG emissions such as nitrous oxides (NOx) and Sulphur oxides (SOx)	Increase in GHG effect. Localised decrease in air quality.	1	Highly Likely	30	Tolerable

7.7.2 Source of Risk

Vessel engines and associated machinery undertaking the offshore activities will be powered by internal combustion engines and will generate atmospheric emissions, principally Carbon Dioxide (CO_2). The average diesel fuel usage for a vessel is in the order of 1,000 L per day. Carbon dioxide equivalent (CO_2-e) emissions have been calculated in accordance with the National Greenhouse and Energy Reporting (NGER) (Measurement) Determination (Commonwealth of Australia, 2008[15]); NOx and SOx have been calculated in accordance with the National Pollutant Inventory (NPI) Emission Estimation Technique for Combustion Engines (DEWHA, 2008a[16]), results and are presented in (and assume one vessel in continuous use).

Table 7-12: Calculated atmospheric emissions from vessel

Parameter	Vessel (tonnes per day)
CO2-e	2.68
SOx	0.000017
NOx	0.072

7.7.3 Environmental Impact Assessment

Atmospheric emissions generated during the offshore activities will result in a localised, temporary reduction in air quality in the environment immediately surrounding the discharge point and contribute to the global greenhouse effect. Gaseous emissions under normal circumstances quickly dissipate into the surrounding atmosphere. The impact of atmospheric emissions from the offshore activities on marine environment of the region is insignificant.

7.7.4 Demonstration of ALARP

A summary of the ALARP process undertaken for the environmental aspect is presented in Table 7-13. This process was completed as outlined in Section 6.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was not considered suitable (Table 7-13). The result of this ALARP assessment contributes to the overall acceptability of the risk and impact. All routine impacts do not have an allocated residual risk rating and are treated and reduced to ALARP.

15 Commonwealth of Australia, Department of the Environment and Energy website – National Greenhouse and Energy Reporting (Measurement) Determination. Available at: http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/nger/determination

16 Department of the Environment, Water, Heritage and the Arts (DEWHA). 2008a. National Pollutant Inventory. Emission estimation technique manual for combustion engines. Version 3.0. June 2008. Available at: http://www.npi.gov.au/system/files/resources/afa15a7a-2554-c0d4-7d0e-d466b2fb5ead/files/combustion-engines.pdf

Table 7-13: Atmospheric Emissions - ALARP assessment summary

Function	Controls	Accept/ Reject	Reason	Performance Standard
Eliminate	Use renewable energy to power vessel	R	**Operability:** Not commercially proven for large vessels that require a reliable and steady fuel source. **Cost:** High	
Substitute	N/A			
Engineer	N/A			
Separate	N/A			
Administrate	Air emissions will be measured or estimated (using accepted industry estimation methodology), recorded and internally reported.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Machinery maintenance is part of normal operations to ensure operating on accordance with manufactures guidelines. **Cost:** Low	**PS 7.7.1**
	AMSA Marine Order – Part 97: Marine Pollution Prevention - Air Pollution: Vessels will comply with Marine Orders 97	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with MARPOL Annex VI. **Cost:** Low	**PS 7.7.2**
	If available and suitable, Det Norske Veritas (DNV) comfort class vessels will be favoured by BHP selection process. Vessel contractor choice influenced by vessel specifications in regards emission management.	A	**Environmental Benefit:** Required information to evaluate performance prior to hire. **Operability:** Part of the Marine Management Process for newly contracted vessels to complete prior to hire. **Cost:** Low	**PS 7.7.3**
	Vessel diesel engines and other machinery are maintained as per preventative maintenance system (PMS) to ensure equipment is operating efficiently.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Machinery maintenance is part of normal operations to ensure operating on accordance with manufactures guidelines. **Cost:** Low.	**PS 7.7.3**
Pollution Control	N/A			
Monitoring	Monitoring of energy consumption and emissions produced.			

ALARP Summary

The risk assessment and evaluation has identified a range of control measures that when implemented are considered to manage the impacts and risks of atmospheric emissions from offshore activities to a tolerable level. The offshore activities cannot occur without a vessel, and requires fuel to power the vessel, mobile plant and equipment. Fuel usage for the activities cannot be eliminated. Power generation through the combustion of fossil fuels is essential to power mobile plant, equipment and the vessels. The proposed control measures are consistent with relevant Australian and international maritime regulations, and are consistent with good oilfield practice. An alternative fuel source (solar, wind, biofuels) has not been commercially proven for use in large vessels. With no reasonably practicable additional control measures identified that would provide significant net environmental benefit without grossly disproportionate cost, it is considered that the impacts and risk of atmospheric emissions have been reduced to ALARP.

7.7.5 Demonstration of Acceptability

BHP considers a range of factors when determining that a level of impact and risk to the environment is broadly acceptable, as summarised in Table 7-14.

Table 7-14: Demonstration of acceptability for atmospheric emissions

Criteria	Question	Demonstration
Codes and Standards	Is the impact or risk being managed in accordance with relevant Australian or International legislation, Ministerial Conditions or standards?	Impacts and risks associated with atmospheric emissions will be managed in accordance with relevant legislation (e.g. Protection of the Sea (Prevention of Pollution from Ships) Act 1983), and codes and standards (e.g. MARPOL, Marine Orders).
ESD	Is the proposed impact consistent with the principles of ESD?	BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct, which endorse the continuous improvement in health, safety and environmental performance in ways that protect people and the environment through the responsible management of petroleum activities and their impacts. BHP considers that adherence to these principles is consistent with the principles of ESD.
Internal Context		
BHP Charter and HSEC Management System Compliance	Is the proposed impact or risk consistent with the requirements of BHP Our Requirements, Petroleum Standard and HSEC Management Systems?	Atmospheric emissions associated with vessel operations will be in compliance with the BHP Charter and HSEC management systems and will be consistent with offshore petroleum activities.
Professional Judgement	Is the impact or risk being managed in accordance with industry best practice?	Atmospheric emissions will be managed in accordance with BHP reporting requirements, relevant legislation and codes and standards to meet the performance outcome of reducing emissions to levels necessary for the reasonable conduct of the activities. Controls identified in this plan are consistent with industry best practice and guidelines. Accepted controls that will be implemented are provided in Table 7-13.
ALARP	Are there any further reasonable and practicable controls that can be implemented to further reduce the impact or risk?	All reasonable and practicable controls have been assessed (Table 7-13), additional controls were considered but were found not to be justifiable in further reducing the impacts and risks of atmospheric emissions without a gross disproportionate sacrifice. BHP considers that the residual risk of atmospheric emissions has been demonstrated to be ALARP.
External context		
Environmental Best Practice	Are controls in place to manage the impacts and risk to the environment that are commensurate with the nature and scale of any environmental sensitivities of the receiving environment?	The environmental performance outcomes, performance standards and measurement criteria that determine whether the performance outcomes and performance standards have been achieved are commensurate with the environmental significance of the receiving environment.
Stakeholder Views	Do stakeholders have concerns / issues, and if so, have controls	Stakeholders have been consulted about the activities through a comprehensive and long-

Criteria	Question	Demonstration
	been implemented to manage their concerns / issues?	term consultation program. Stakeholder concerns have been considered for atmospheric emissions, and this is reflected in controls designed to mitigate impacts of the activity on environmental sensitivities in the offshore Operations area.

Acceptability Summary

Atmospheric emissions from vessels are permissible under the Protection of the Sea (Prevention of Pollution from Ships) Act 1983, which reflect MARPOL Annex VI requirements. The proposed controls are consistent with relevant Australian and international maritime regulations. Other relevant considerations are comparison to good oilfield practice and professional judgement. The mechanisms for power generation are consistent with good oilfield practice. Alternative means of power generation (e.g. renewable energy) are considered unrealistic on the basis of reliability and therefore have not been considered. The offshore activities are located in an area where air emissions will disperse and rapidly assimilate with the surrounding environment. Given the controls and management measures in place, the distance from any sensitive habitats and the short duration of any vessel activity during the Minerva offshore activities, the predicted impact and risk associated with atmospheric emissions are considered to be acceptable.

BHP is satisfied that when the accepted controls are implemented that the impact and residual risk of atmospheric emissions to the environment is considered 'ALARP'. Furthermore, the adopted controls are considered to be consistent with good oilfield practice/ professional judgement and environmental best practice. The atmospheric emissions associated with vessels will comply with all relevant laws, codes and standards, as well as BHP Charter and HSEC Management Systems. All relevant controls were considered as part of the ALARP assessment, and as no other reasonable additional controls were identified that would further reduce the impacts and risks of atmospheric emissions without a gross disproportionate sacrifice, the impacts and risks are considered ALARP. BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct and hence the principles of ESD. Stakeholders have been consulted about the activities and appropriate control measures will be implemented to address any concerns that were raised. BHP undertakes regular consultation with relevant stakeholders about its offshore activities providing them with sufficient and reasonable opportunities to raise any new concerns or issues for the duration of this activity. On this basis, it is considered that adherence to the performance standards will manage the impacts and risks of atmospheric emissions of the vessels to an acceptable level.

7.7.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Performance Outcome	Controls	Performance Standard	Measurement Criteria
Atmospheric emissions will be managed to meet legislative emission standards.	Air emissions will be measured or estimated (using accepted industry estimation methodology), recorded and internally reported.	**PS 7.7.1.** **BHP Our Requirements HSEC Reporting:** Identify and document all data sources (for example invoice, instrument); measurement methods (including calculations and estimations); calibration and maintenance requirements for measurement equipment (including location details of the associated records); and data source exclusions.	Envirosys records indicate atmospheric emissions from vessels are monitored and reported, including greenhouse gas, ozone-depleting substances, fluoride, NOx, SOx and energy use.
	Vessels will comply with Marine Orders 97.	**PS 7.7.2.** **AMSA Marine Order – Part 97: Marine Pollution Prevention - Air Pollution:** Vessels will comply with Marine Orders 97.	Records show that vessels comply with Marine Orders 97.

Performance Outcome	Controls	Performance Standard	Measurement Criteria
	Vessel contractor choice influenced by vessel specifications in regards emission management.	**PS 7.7.3.** **BHP HSEC Controls: Vessel Engagement and Authorisation and Marine Management Procedure** If available and suitable, DNV comfort class vessels will be favoured by BHP selection process. Vessel contractor choice influenced by vessel specifications in regards emission management. Vessel diesel engines and another machinery are maintained as per PMS to ensure equipment is operating efficiently.	Records show compliance with Vessel Engagement and Authorisation and Marine Management Procedure during contractor selection process. BHP vessel audit shows vessel diesel engines and other machinery are maintained as per PMS to ensure equipment is operating efficiently.

7.8 Vessel Discharges

7.8.1 Summary of Impact and Risk Assessment and Evaluation

Aspect	Source of Risk	Impact	Consequence	Severity	Likelihood	Residual Risk	Acceptability
Vessel Discharges	Sewage	Localised nutrient increase.	Localised increase in marine productivity surrounding discharge point.	1	Highly Likely	30	Tolerable
	Grey water	Minor localised nutrient increase, addition of surfactants (soaps and detergents) and chemicals to water column.	Localised and temporary reduction in water quality adjacent to discharge point.	1	Highly Likely	30	Tolerable
	Reverse Osmosis (RO) brine reject	Minor increase in salinity.	No observable effect on flora or fauna.	1	Highly Likely	30	Tolerable
	Cooling water	Potential for contamination with residual biocide chemicals. Minor increase in water temperature.	Localised and temporary elevated water temperature adjacent to discharge point.	1	Highly Likely	30	Tolerable
	Rainfall/ washdown water	Detergent, oil and grease discharge to marine environment during rainfall or wash-down activities.	Potential localised decrease in water quality at discharge location	1	Highly Likely	1	Tolerable
	Food waste	Localised nutrient increase from food waste discharge.	Localised increase in marine productivity	1	Highly Likely	30	Tolerable

Aspect	Source of Risk	Impact	Consequence	Severity	Likelihood	Residual Risk	Acceptability
			surrounding discharge point.				

7.8.2 Source of Risk

Sewage, Grey Water and Food Waste

The vessels used for offshore activities will generate a range of planned discharges, including sewage, grey water, putrescible (food) wastes and possibly brine from RO (if used for potable water generation) and/ or cooling water (if used by onboard machinery engines). The volumes and types of discharges will vary among vessels and depending on the duration on site and the number of people onboard.

The volume of sewage, grey water and food wastes generated by a vessel is directly proportional to the number of persons onboard the vessel. The largest vessel likely to be used for offshore activities can accommodate approximately 100 persons. The total volume of sewage and grey water generated by this size vessel (if fully manned) is estimated to be in the order of 4.5 m^3 per day. Food waste generated is typically 1 L per person per day. This scale of discharge falls within the scope of the Environment Plan Reference Case – Planned Discharge of Sewage, Putrescible Waste and Grey Water (National Energy Resources Australia, 2017[17]).

Brine Reject from Reverse Osmosis

Potable water is produced onboard the vessels using RO machinery. RO is a membrane-technology filtration method that removes salt molecules and ions from seawater by applying pressure to the solution when it is on one side of a selective membrane. The result is that a brine solution with salinity elevated by approximately 10 % is retained on the pressurised side of the membrane and the potable water is allowed to pass to the other side.

Cooling Water

Seawater is used as a heat exchange medium for the cooling of machinery engines on some vessels; others use air cooling. Seawater is pumped on board the vessel, passes through heat exchangers and is subsequently discharged from the vessel to the sea surface with temperature elevation in the order of 2 to 5°C. Seawater used for cooling is dosed with chlorine following intake and discharged with low residual chlorine concentrations that are rapidly diluted by prevailing water currents.

Deck Drainage

No wastes contaminated with hydrocarbons or chemicals will be routinely discharged from the vessel deck drains. Drainage from areas of a high risk of hydrocarbon or chemical contamination will be managed to ensure that it has an oil content of less than 15 ppm prior to overboard discharge or sent to shore for disposal. Rainfall and wash down of the decks may result in minor quantities of chemical residues, such as detergent, oil and grease entering the deck drainage system and being possibly discharged overboard.

7.8.3 Environmental Impact Assessment

Sewage, Grey Water and Food Waste

The potential impacts associated with sewage, grey water and food waste discharges from vessels are discussed in detail in the Environment Plan Reference Case (National Energy Resources Australia, 2017[18]). The impacts from discharges during the offshore activities are considered to fall within the scope of this description since:

The volume and types of discharge are consistent with the Reference Case limitations;

The discharges will not affect a (State or Commonwealth) marine reserve or occur within 3 nm of a World Heritage Property, National Heritage Place, Wetland of International Importance or the Great Barrier Reef Marine Park; and

17 National Energy Resources Australia (2017). Environment Plan Reference Case – Planned Discharge of Sewage, Putrescible Waste and Grey Water.

18 Ibid

The discharges are not inconsistent with management documentation for any EPBC Act listed threatened or migratory species.

Studies of moving vessels have shown very high dispersion rates for effluents (Loerh *et al.,* 2006[19]). Given the low numbers and relatively small size of vessels (and hence discharge volumes) that will be involved in offshore activities, the short duration of activities in the offshore Operations Area and the open water location of the area, the potential environmental impact discharges during offshore activities is considered to be low. These discharges will be quickly dispersed and diluted such that any temporary change in water quality will be limited to the vicinity of the discharge point for a very short time.

Brine Reject from Reverse Osmosis

The brine solution will be quickly dispersed and diluted to undetectable levels within a few metres of the discharge point. Given the relatively low volume of discharge, the relatively low increase in salinity and the open ocean environment, the discharge of RO brine stream is considered to have an insignificant environmental effect.

Cooling Water

When discharged to sea the cooling water will be subject to turbulent mixing and loss of heat to the surrounding waters. The area of detectable increase in seawater temperature is likely to be less than 10 m radius. The impact of cooling water discharge is considered to be insignificant.

Deck Drainage

Due to the small volumes of deck drainage, the very low levels of contaminants likely to be entrained in the discharge and the rapid dilution and dispersal that will result in the open ocean, the environmental effects will be temporary and localised. The discharge of deck drainage is considered to have a negligible environmental effect.

7.8.4 Demonstration of ALARP

A summary of the ALARP process undertaken for the environmental aspect is presented in Table 7-15. This process was completed as outlined in Section 6.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was not considered suitable (Table 7-15). The result of this ALARP assessment contributes to the overall acceptability of the risk and impact. All routine impacts do not have an allocated residual risk rating and are treated and reduced to ALARP.

Table 7-15: Liquid Waste - ALARP assessment summary

Function	Controls	Accept/ Reject	Reason	Performance Standard
Eliminate	Store food waste onboard vessel/s and ship to shore.	R	**Environmental Benefit:** This option would be to contain food wastes offshore and ship them to shore for disposal While this option avoids the discharge of food wastes to sea it merely moves the environmental impact to another location rather than reducing it. No net environmental benefit would accrue from this option. The financial cost and HSE risks associated with storing food waste on board and shipping the food waste offshore is disproportionate to any environmental benefit gained. **Operability:** HSE risk to personnel with storing food waste on board for extended periods of time. **Cost:** Low	
Substitute	N/A			

19 Loehr, L. C., Beegle-Krause, C.-J., George, K., McGee, C. D., Mearns, A. J.and Atkinson, M. J. (2006). The significance of dilution in evaluating possible impacts of wastewater discharges from large cruise ships. Marine Pollution Bulletin, Vol 52, pp 681–688

Function	Controls	Accept/ Reject	Reason	Performance Standard
Engineer	Sewage treatment and discharge equipment onboard to treat sewage and reduce impact to the environment and maintained in good working order.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with MARPOL. **Cost:** Low	**PS 7.8.1**
Separate	N/A			
Administrate	Vessels will comply with the following marine orders: Marine Order 91 (Oil) Marine Order 95 (Pollution prevention – garbage) Marine Order 96 (Pollution prevention – sewage).	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with Marine Orders. **Cost:** Low	**PS 7.8.1**
	Environment awareness induction provided to all vessel crew to advise waste management requirements.	A	**Environmental Benefit:** Providing training to personnel assists in understanding legal obligations. **Operability:** Inductions form part of any new employee process. **Cost:** Low.	**PS 7.8.2**
	Where Offshore Chemical Notification Scheme (OCNS) rating of D or E or a Chemical Hazard and Risk Management (CHARM) rating of Silver or Gold rated chemicals are used, no further control required.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with BHP internal procedure. **Cost:** Low	**PS 7.8.4**
	If other non-rated chemicals are required and may be discharged to sea, chemical selection procedures described in APU Hazardous Materials Acquisition Supplement Procedure will be followed.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with BHP internal procedure. **Cost:** Low	**PS 7.8.4**
Pollution Control	Fuels, oils and hazardous chemicals stored with secondary containment at least 110 % of largest single waste container.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with MARPOL. **Cost:** Low	**PS 7.8.3**
	Scupper plugs or equivalent deck drainage control measures available where chemicals and hydrocarbons are stored and frequently handled.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with MARPOL. **Cost:** Low	**PS 7.8.3**
Monitoring	N/A			

ALARP Summary

The risk assessment and evaluation has identified a range of control measures that when implemented are considered to manage the impacts and risks of planned liquid discharges from the vessels during the offshore activities. The offshore activities cannot occur without a vessel. The onboard treatment of liquid wastes and their discharge to the marine environment are consistent with the EP Reference Case (National Energy

Resources Australia, 2017[20]), all relevant codes and standards and are considered to be the most environmentally sound method of disposal compared to onboard storage and transport back to shore for disposal at suitable waste facilities. With the implementation of appropriate management controls and with no other additional controls or alternatives available that would offer a net environmental benefit, it is considered that the impacts and risk of vessel discharges to the marine environment have been reduced to ALARP.

7.8.5 Demonstration of Acceptability

BHP considers a range of factors when determining that a level of impact and risk to the environment is broadly acceptable, as summarised in Table 7-16.

Table 7-16: Demonstration of acceptability for liquid waste

Criteria	Question	Demonstration
Codes and Standards	Is the impact or risk being managed in accordance with relevant Australian or International legislation, Ministerial Conditions or standards?	Impacts and risks associated with vessel discharges will be managed in accordance with relevant legislation (e.g. Protection of the Sea (Prevention of Pollution from Ships) Act 1983), and codes and standards (e.g. MARPOL, Marine Orders) and relevant Reference Case (National Energy Resources Australia, 2017[21].
ESD	Is the proposed impact consistent with the principles of ESD?	BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct, which endorse the continuous improvement in health, safety and environmental performance in ways that protect people and the environment through the responsible management of petroleum activities and their impacts. BHP considers that adherence to these principles is consistent with the principles of ESD.
Internal Context		
BHP Charter and HSEC Management System Compliance	Is the proposed impact or risk consistent with the requirements of BHP Our Requirements, Petroleum Standard and HSEC Management Systems?	The vessel discharges will be in compliance with the BHP Charter and HSEC management systems and will be consistent with offshore petroleum activities.
Professional Judgement	Is the impact or risk being managed in accordance with industry best practice?	BHP will comply with relevant legislation, codes and standards to meet performance outcome of compliance for vessel discharges. Control measures identified in this plan are consistent with industry best practice and guidelines, including the relevant Reference Case (National Energy Resources Australia, 2017[22]). Accepted control measures that will be implemented are provided in Table 7-16.
ALARP	Are there any further reasonable and practicable controls that can be implemented to further reduce the impact or risk?	All reasonable and practicable controls have been assessed (Table 7-16; Reference Case [National Energy Resources Australia, 2017[23]]). Additional control measures were considered but were found not to be justifiable in further reducing the impacts and risks of liquid discharges without a grossly disproportionate sacrifice. BHP considers that the residual risk of vessel discharges has been demonstrated to be ALARP.
External Context		

20 Op cit 17
21 Op cit 17
22 Op cit 17
23 Op cit 17

Criteria	Question	Demonstration
Environmental Best Practice	Are controls in place to manage the impacts and risk to the environment that are commensurate with the nature and scale of any environmental sensitivities of the receiving environment?	The environmental performance outcome, performance standards and measurement criteria that determine whether the performance outcome and performance standards have been achieved are commensurate with the environmental significance of the receiving environment.
Stakeholder Views	Do stakeholders have concerns / issues, and if so, have controls been implemented to manage their concerns/ issues?	Stakeholders have been consulted about the offshore activities through a comprehensive and long-term consultation program. Stakeholder concerns have been considered for liquid discharges, and this is reflected in controls designed to mitigate impacts of the activity on environmental sensitivities in the offshore Operations area.

Acceptability Summary

The acceptability of the treated sewage, grey water and macerated food waste discharges that will be generated during the offshore activities is described in the Reference Case (National Energy Resources Australia, 2017)[24].

For the other vessel discharges, including brine, cooling water, oily water and deck drainage, consideration has been given to the potential cumulative effects of different liquid discharges from multiple sources. The environmental impacts associated with these planned discharges during the offshore activities are considered to have a negligible impact on the marine environment.

BHP is satisfied that when the accepted control measure are implemented that the impact and residual risk of planned of these discharges to the environment is considered ALARP. Furthermore, the adopted control measures are considered to be consistent with good oilfield practice/ professional judgement and environmental best practice. Vessel discharges will comply with all relevant laws, codes and standards, as well as the BHP Charter and HSEC Management Systems. All relevant controls were considered as part of the ALARP assessment, and as no other reasonably practicable additional controls were identified that would further reduce the impacts and risks of vessel discharges without a grossly disproportionate sacrifice, the impacts and risks are considered ALARP. BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct and hence the principles of ESD. Stakeholders have been consulted about the offshore activities and no concerns regarding this aspect have been raised. BHP undertakes regular consultation with relevant stakeholders about its operations/ activities providing them with sufficient and reasonable opportunities to raise any new concerns or issues for the duration of this activity. On this basis, it is considered that impacts and risks of vessel discharges will be managed to an acceptable level.

7.8.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Performance Outcome	Controls	Performance Standard	Measurement Criteria
Planned liquid waste discharges are managed to protect environmental values beyond 500 m of the discharge.	Vessels will comply with the following marine orders.	**PS 7.8.1.** **Vessels will comply with the following Marine Orders:** Marine Orders 91 (Pollution Prevention – Oil) as appropriate to vessel class. Marine Order 95 (Pollution prevention – garbage) Marine Order 96 (Pollution prevention – sewage).	Record of vessels complying with Marine Orders.
	Environment awareness induction provided to all vessel crew to advise	**PS 7.8.2.** Environmental awareness induction provided to vessel crew prior to	Induction attendance records demonstrate that environmental awareness

24 Op cit 17

Performance Outcome	Controls	Performance Standard	Measurement Criteria
	waste management requirements	activities to advise waste management requirements.	inductions have been conducted for vessel crew, including waste management information.
	Fuels, oils and hazardous chemicals stored with secondary containment at least 110 % of largest single waste container.	**PS 7.8.3.** Fuels, oils and hazardous chemicals must be stored with secondary containment. Scupper plugs or equivalent deck drainage control measures available where chemicals and hydrocarbons are stored and frequently handled.	Record of containment and drainage inspections on vessel.
			Documentation that Shipboard Oil Pollution Emergency Plan (SOPEP) materials and equipment is maintained and available on vessels during activity.
	Chemical selection process.	**PS 7.8.4.** **APU Hazardous Materials Acquisition Environmental Supplement Procedure:** Where OCNS rating of D or E or a CHARM rating of Silver or Gold rated chemicals are used, no further control required. If other non-rated chemicals are required, chemical selection procedures described in APU Hazardous Materials Acquisition Environmental Supplement Procedure will be followed.	Documentation showing that chemicals used are ranked D or better on OCNS ranked list or Silver or better on CHARM rating.
			Where chemicals are not D/E rated through OCNS or Gold/Silver rated through CHARM, then documented evidence is available to show that APU Hazardous Materials Acquisition Environmental Supplement Procedure has been followed.

7.9 Waste Management

7.9.1 Summary of Impact and Risk Assessment and Evaluation

Aspect	Source of Risk	Impact	Consequence	Severity	Likelihood	Residual Risk	Acceptability
Waste Management	Waste (hazardous and non-hazardous) generated during offshore activities	Increased landfill	Additional usage of onshore waste reception facilities.	1	Highly Likely	30	Tolerable
	Loss of non-hazardous solid waste (rubbish) overboard	Impacts to marine fauna and/ or water quality	Impacts to fauna (e.g. ingestion, entanglement). Water quality degradation (e.g. plastics with long-term decomposition and smaller particle size degradation pathway).	1	Unlikely	1	Tolerable

7.9.2 Source of Risk

Offshore vessels produce a variety of solid and liquid wastes (not discharged via the overboard water discharge system), including domestic and industrial wastes, such as aluminium cans, bottles, paper and cardboard, scrap steel and hazardous materials such as chemicals and chemical containers, batteries, waste oil and medical wastes. These materials could potentially impact the marine environment if discharged in significant quantities.

Waste is segregated onboard the vessel and stored in designated skips and waste containers. Wastes are segregated into the following categories:

- Non-hazardous waste (or general waste);
- Hazardous waste; and
- Recyclables (further segregation is conducted in line with practices at existing BHP operations in the region).

Non-hazardous Waste

General non-hazardous waste includes domestic and galley waste, and recyclables such as scrap materials, packaging, wood and paper and empty containers. Volumes of non-hazardous waste generated on vessels are generally low.

Hazardous Waste

Hazardous wastes are defined as wastes that are or contain ingredients harmful to health or the environment. Hazardous wastes likely to be generated by vessels includes oil contaminated materials (e.g. sorbents, filters and rags), chemical containers and batteries. The volumes of hazardous wastes generated are relatively small.

7.9.3 Environmental Impact Assessment

Improper management of wastes may result in pollution and contamination of the environment. There is also the potential for secondary impacts (ingestion and/ or entanglement) on marine fauna that may interact with wastes such as packaging and binding materials, should these enter the ocean.

All waste (hazardous and non-hazardous) generated during offshore activities is transported to and managed appropriately by 3rd parties. Environmental impacts associated with onshore disposal relate to the small incremental increase in waste volumes received at the onshore licensed waste recycling and/or disposal sites. The environmental impacts associated with waste disposal onshore are anticipated to be low because of the minor quantities involved, recycling of some materials and the localised area of impact.

Accidental loss overboard of single items or units of waste may impact the environment through a reduction in water quality, or present a hazard to marine fauna, depending on the waste involved. Given the small volumes of waste generated and the management in place to prevent loss overboard (e.g. covers on skips/bins), the risk of impact is considered to be low. No significant environmental impacts are anticipated because of the minor quantities involved and the localised area of impact.

7.9.3.1 Species Recovery Plans, Conservation Management Plans and Threat Abatement Plans

BHP has considered information contained in recovery plans, conservation management plans, approved conservation advice and threat abatement plans (refer to previous Table 4-7).

Floating non-biodegradable marine debris has been highlighted as a threat to marine turtles, marine cetaceans dugongs and marine seabirds in the Threat Abatement Plan for Impact of Marine Debris on Vertebrate Life (DoEE, 2018). It is also listed as a threat in the Marine Turtle Recovery Plan (Commonwealth of Australia, 2017) and the Background Paper for Albatrosses/Giant Petrels (DSEWPaC, 2011). Management advice to help reduce the threat to marine fauna from marine debris is provided, and of relevant to this Activity is maritime legislation regarding prevention of garbage disposal from vessels. Control measures regarding waste management in place during the activity demonstrate the Activity will be conducted in a manner that reduces potential impacts to ALARP and Acceptable levels.

7.9.4 Demonstration of ALARP

A summary of the ALARP process undertaken for the environmental aspect is presented in Table 7-17. This process was completed as outlined in Section 6.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was not considered suitable (Table 7-17). The result of this ALARP assessment contributes to the overall acceptability of the risk and impact. All routine impacts do not have an allocated residual risk rating and are treated and reduced to ALARP.

Table 7-17: Solid Waste - ALARP assessment summary

Function	Controls	Accept/ Reject	Reason	Performance Standard
Eliminate	N/A			
Substitute	N/A			
Engineer	N/A			
Separate	Consider the waste management hierarchy to eliminate, reduce, recycle or reuse in lieu of disposal in the management plan.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with BHP internal procedure. **Cost:** Low	**PS 7.9.1**
Administrate	Develop and implement a waste management plan for managing waste generation, transport and disposal.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with BHP internal procedure. **Cost:** Low	**PS 7.9.2**
	Vessel comply with the requirements of: Marine Order 94 (Marine pollution prevention – packaged harmful substances) 2014 Marine Order 95 (Pollution prevention – garbage).		**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with AMSA requirements. **Cost:** Low	**PS 7.9.1**
Pollution Control				
Monitoring	Waste type, source, quantity, storage and disposal locations recorded.			

ALARP Summary

The risk assessment and evaluation has identified a range of controls (Table 7-17) that when implemented are considered to manage the impacts and risks of solid wastes from offshore activities on the marine environment. The generation of solid hazardous and non-hazardous waste is unavoidable. No additional or alternative management procedures have been identified that would reduce the environmental impacts and risk associated with solid waste discharge, as such it is considered to be reduced to ALARP. With no reasonable additional controls identified, other than not proceeding with the offshore activities, it is considered that the impacts and risks for solid waste discharges have been reduced to ALARP.

7.9.5 Demonstration of Acceptability

BHP considers a range of factors when determining that a level of impact and risk to the environment is broadly acceptable, as summarised in Table 7-18.

Table 7-18: Demonstration of acceptability for solid waste

Criteria	Question	Demonstration
Codes and Standards	Is the impact or risk being managed in accordance with relevant Australian or International legislation, Ministerial Conditions or standards?	Impacts and risks associated with solid waste will be managed in accordance with relevant legislation (e.g. Protection of the Sea (Prevention of Pollution from Ships) Act, 1983), and codes and standards (e.g. MARPOL, Marine Orders).
ESD	Is the proposed impact consistent with the principles of ESD?	BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct, which endorse the continuous improvement in health, safety and environmental performance in ways that protect people and the environment through the responsible management of petroleum activities and their impacts. BHP considers that adherence to these principles is consistent with the principles of ESD.
Internal Context		
BHP Charter and HSEC Management System Compliance	Is the proposed impact or risk consistent with the requirements of BHP Our Requirements, Petroleum Standard and HSEC Management Systems?	The management of solid waste will be in compliance with BHP charter values and management systems and will be consistent with activities authorised for areas adjacent to a World Heritage Area.
Professional Judgement	Is the impact or risk being managed in accordance with industry best practice?	BHP will return all solid, liquid and hazardous waste (other than sewage, grey water and putrescible wastes) to shore for recycling, disposal or treatment, and waste will be stored in clearly marked and covered waste containers, inspected by containment specialist, and site inductions will include BHP requirements for waste management to meet the performance outcome of preventing unplanned discharges of hazardous and non-hazardous waste to the marine environment. Controls identified in this plan are consistent with industry best practice and guidelines. Accepted controls that will be implemented are provided in Table 7-17.
ALARP	Are there any further reasonable and practicable controls that can be implemented to further reduce the impact or risk?	All reasonable and practicable controls have been assessed (Table 7-18Table 7-17), additional controls were considered but were found not to be justifiable in further reducing the impacts and risks of solid waste without a gross disproportionate sacrifice. BHP considers that the residual risk of solid waste has been demonstrated to be ALARP.
External Context		
Environmental Best Practice	Are controls in place to manage the impacts and risk to the environment that are commensurate with the nature and scale of any environmental sensitivities of the receiving environment?	The environmental performance outcomes, performance standards and measurement criteria that determine whether the performance outcomes and performance standards have been achieved are commensurate with the environmental significance of the receiving environment.
Stakeholder Views	Do stakeholders have concerns / issues, and if so, have controls been implemented to manage their concerns / issues?	Stakeholders have been consulted about the operation through a comprehensive and long-term consultation program. Stakeholder concerns have been considered for solid waste, and this is reflected in controls designed to mitigate impacts of the activity on environmental sensitivities in the vessel operations area.

Acceptability Summary

The disposal of hazardous and non-hazardous solid wastes occurs onshore in full accordance with all regulatory requirements. BHP has procedures in place for verifying waste management procedures for the storage of wastes onboard the vessels and for onshore disposal by waste removal contractors. BHP is satisfied that when the accepted controls are implemented that the impact and residual risk of solid waste to the environment is considered 'ALARP'. Furthermore, the adopted controls are considered to be consistent with good oilfield practice/ professional judgement and environmental best practice.

The management of solid waste will comply with all relevant laws, codes and standards, as well as BHP Charter and HSEC Management Systems. All relevant controls were considered as part of the ALARP assessment, and as no other reasonable additional controls were identified that would further reduce the impacts and risks of solid waste without a gross disproportionate sacrifice, the impacts and risks are considered ALARP. BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct and hence the principles of ESD, e.g. all solid, liquid and hazardous waste (other than sewage, grey water and putrescible wastes) will be returned to shore for recycling, disposal or treatment. Stakeholders have been consulted about the activities and appropriate control measures will be implemented to address any concerns that were raised.

BHP undertakes regular consultation with relevant stakeholders about its operations/ activities providing them with sufficient and reasonable opportunities to raise any new concerns or issues for the duration of this activity. On this basis, it is considered that adherence to the performance standards will manage the impacts and risks of solid wastes to an acceptable level.

7.9.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Performance Outcome	Controls	Performance Standard	Measurement Criteria
No unplanned release of hazardous and non-hazardous solid waste to the marine environment.	Vessel will comply with the requirements of the following: Marine Order 94 (Marine pollution prevention – packaged harmful substances) 2014 Marine Order 95 (Pollution prevention – garbage).	**PS 7.9.1.** **Vessels will comply with the requirements of the following:** Marine Order 94 (Marine pollution prevention – packaged harmful substances) 2014 Marine Order 95 (Pollution prevention – garbage).	Record of vessels complying with Marine Orders.
	Develop and implement a waste management plan for managing waste generation, storage, transport and disposal. Records are maintained of waste type, source and quantities sent onshore.	**PS 7.9.2.** **APU Waste Management Plan:** Waste management plan will be implemented, including preventative and mitigating controls and auditing of registered waste management contractor. Records of waste type, source and quantities, and disposal locations will be maintained including the storage and disposal locations.	Records indicate a waste management plan has been developed and implemented as per the plan. Annual environmental inspections verify waste is managed in accordance with approved waste management plan. Records indicate waste is handled and disposed via a registered waste disposal company.

7.10 Subsea Discharges

7.10.1 Summary of Risk Assessment and Evaluation

Aspect	Source of Risk	Impact	Consequence	Severity	Likelihood	Residual Risk	Acceptability
Planned subsea discharges	Discharges of small quantities of hydrocarbons or chemical from subsea IMR activities and intervention works	Impacts to marine fauna and/or water quality.	Temporary reduction in water quality with potential for acute toxic response over localised area.	1	Highly Likely	30	Tolerable
	Release of treated seawater, hydraulic fluid and/or hydrocarbon gas	Impacts to marine fauna and/or water quality.	Acute/ chronic toxic effect on marine organisms. Decrease in water quality.	2	Unlikely	3	Tolerable
	Marine growth/ scale removal	Impacts to marine fauna and/or water quality.	Temporary and localised reduction in water quality with potential for acute toxic response. Localised deposition of scale/ marine growth onto seabed.	1	Highly Likely	30	Tolerable

7.10.2 Source of Risk

Control Fluid

Small volumes of control fluids will be discharged subsea during normal operation of the production wells and other minor discharges may also result during offshore activities, particularly if intrusive maintenance or repairs of infrastructure are required.

Actuation of Wellhead Valves

Well control will involve intermittent discharges of small amounts (<2.9 L per valve actuation, <0.3 m^3 total per year) of water-based hydraulic fluid (an aqua glycol solution) used to actuate the wellhead valves on the four subsea wells.

Discharges during Intervention Works

In the event that subsea infrastructure needs to be repaired or replaced, there may be a release of fluids to the marine environment during the intervention works. This would typically involve low volumes of hydraulic fluids, corrosion inhibitor, MEG, treated seawater and/or residual production fluids (primarily gas). For works on the field gathering system the system would be depressurised and the hydrocarbons (gas) typically displaced and isolated from the section involved prior to activities that may release inventory. In the event that flushing/displacement of gas was not effective, up to a maximum of 752 m^3 of gas could require venting or up to a maximum of 53 m^3 in the chemical injection lines. Umbilicals may also be cut or disconnected, in which case a small volume of hydraulic fluid (up to 35 L) may be released.

Marine Growth Removal

If necessary, the removal of marine growth and scale from subsea wellheads/trees will be carried out using ROVs. The cleaning process involves water jetting/ blasting to remove inert materials and marine growth that will be jettisoned into the water column immediately adjacent to the subsea infrastructure and, depending on the size/density of the material, will either be dispersed with the prevailing currents, or sink to the seafloor. An acidification agent (such as citric acid or sulfamic acid) may need to be added to jetting water to facilitate the removal of any marine scale. The acceptability for marine discharge of the acidification agents will be assessed under the BHP chemical selection process to ensure acceptably low marine toxicity and bioaccumulation risk.

The removal of fouling will be a highly targeted process and the volumes of water/chemicals involved will typically be <1 m^3.

Discharge from Flowlines and Umbilicals

Operation

Each of the umbilical sections are bundled with the two 2-inch chemical injection pipelines to the 10-inch pipeline and laid on the seabed out to the Minerva wellheads. Bundle clamps are installed approximately every 6 m. There are relatively small volumes of fluids in the offshore umbilical, approximately 27 m^3 from the wells to the shore crossing. During operation, the umbilical fluid pressures are monitored continuously and any leakage from umbilical is considered unlikely.

Cessation

The chemicals used in the flowline flushing process will be shut into the wells and all flowlines will be flushed with clean seawater and left filled with seawater only. All chemicals used for cessation of production will be displaced and either flushed through back to the land-based Minerva facility or locked in below the well master valves (AMV/PMV).

7.10.3 Environmental Impact Assessment

BHP has adopted a risk-based approach for the selection of chemicals with the least potential for environmental impacts. Where a product may be discharged to the environment (directly or through abandonment activities/ discharges) an environmental assessment is completed before the product is approved for use.

Control fluid used for valve actuation has an OCNS non-CHARM rating of “D” or better. Consequently, the discharge of small volumes (a few litres per actuation) will be subject to rapid dilution/dispersion within a very localised area, will rapidly biodegrade and will not bioaccumulate. Effects on water quality are expected to be minimal.

Intervention activities that result in subsea discharges, such as manifold replacements, are expected to be relatively infrequent. In the oceanic, deep water (>100 m) and dispersive environment of the field, any impacts from the associated subsea discharges would be temporary and localised. Production hydrocarbons, if released, are predominantly gas (<1 % condensate) with limited potential for adverse impacts to marine life either in the water column or at the surface. There are no areas of conservation value or critical habitats for fauna species that might be susceptible to adverse effects from the expected discharges in the operational area. Given the absence of particularly sensitive benthos in the vicinity, the low volumes of liquid hydrocarbons that could be released and the low toxicity and bioaccumulation potential of the chemicals that might be released, the impacts are considered to be low.

On this basis, the main environmental impact associated with the discharge of flowline fluids will be localised exposure of marine biota and very small-scale changes in water quality from residual levels of Oil in Water (OIW) <30 ppm. The contents of the flowlines (i.e. seawater) will be dispersed and diluted to undetectable levels of OIW within a few metres of the discharge point. The area of detectable change in water quality is likely to be <10 m radius. Given the relatively low volume of flowline fluids that would discharged, coupled with the water depth and open ocean environment, the discharge of the flowline contents and any associated low levels of OIW is considered negligible with respect to environmental effects.

7.10.4 Demonstration of ALARP

A summary of the ALARP process undertaken for the environmental risk is presented in Table 7-19. This process was completed as outlined in Section 6.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was not accepted. The result of this ALARP assessment contributes to the overall acceptability of the risk and impact.

Table 7-19: Subsea discharges – ALARP assessment summary

Function	Controls	Accept/ Reject	Reason	Performance Standard
Eliminate	N/A			
Substitute	N/A			

Function	Controls	Accept/ Reject	Reason	Performance Standard
Engineer	N/A			
Separate	N/A			
Administrate	Where OCNS rating of D or E or a CHARM rating of Silver or Gold rated chemicals are used, no further control required.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with BHP internal procedure. **Cost:** Low	**PS 7.8.4**
	If other non-rated chemicals are required, chemical selection procedures described in APU Hazardous Materials Acquisition Supplement Procedure will be followed.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with BHP internal procedure. **Cost:** Low	**PS 7.8.4**
Monitoring	N/A			

ALARP Summary

The risk assessment and evaluation has identified controls available to manage the impacts and risks of subsea discharges to the marine environment resulting from the offshore activities. BHP has procedures in place for the selection of chemicals that may be released to the marine environment, with preference for those with the lowest potential for environmental hazard. The control fluid that is routinely discharged has an OCNS rating of D or better to limit the potential for toxicity or bioaccumulation and ensure biodegradability. No reasonably practicable additional or alternative control measures have been identified that would further reduce the environmental impacts and risk associated with subsea discharges. Therefore, the impact and risk associated with subsea discharges is considered to be reduced to ALARP.

7.10.5 Demonstration of Acceptability

BHP considers a range of factors when determining that a level of impact and risk to the environment is broadly acceptable, as summarised Table 7-20.

Table 7-20: Demonstration of acceptability for residual hydrocarbon release

Criteria	Question	Demonstration
Codes and Standards	Is the impact or risk being managed in accordance with relevant Australian or International legislation, Ministerial Conditions or standards?	Impacts and risks will be managed in accordance with BHP controls and guidelines (e.g. HSEC Controls and drilling guidelines).
ESD	Is the proposed impact consistent with the principles of ESD?	BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct, which endorse the continuous improvement in health, safety and environmental performance in ways that protect people and the environment through the responsible management of petroleum activities and their impacts. BHP considers that adherence to these principles is consistent with the principles of ESD.
Internal Context		
BHP Charter and HSEC Management System Compliance	Is the proposed impact or risk consistent with the requirements of BHP Our Requirements, Petroleum Standard and HSEC Management Systems?	The management of subsea discharges will comply with the BHP Charter and HSEC management systems and will be consistent with offshore petroleum activities.

Criteria	Question	Demonstration
Professional Judgement	Is the impact or risk being managed in accordance with industry best practice?	Control measures identified in this plan are consistent with industry best practice and guidelines. Accepted controls that will be implemented are provided in Table 7-19.
ALARP	Are there any further reasonable and practicable control measures that can be implemented to further reduce the impact or risk?	All reasonable and practicable control measures have been assessed (Table 7-19). Additional controls were not identified that could further reduce the impacts and risks of residual hydrocarbon release. BHP considers that the residual risk of subsea discharges has been demonstrated to be ALARP.
External Context		
Environmental Best Practice	Are control measures in place to manage the impacts and risk to the environment that are commensurate with the nature and scale of any environmental sensitivities of the receiving environment?	The environmental performance outcome, performance standards and measurement criteria that determine whether the outcome and standards have been achieved are commensurate with the environmental significance of the receiving environment.
Stakeholder Views	Do stakeholders have concerns / issues, and if so, have controls been implemented to manage their concerns/ issues?	Stakeholders have been consulted about the offshore activities through a comprehensive and long-term consultation program. No stakeholder concerns have been raised regarding this aspect. The proposed control measures are designed to reduce potential impacts and risks of the activity on environmental sensitivities in the offshore Operations Area.

Acceptability Summary

The adopted control measures are considered to be consistent with good oilfield practice/ professional judgement and environmental best practice. The offshore activities will comply with all relevant laws, codes and standards, as well as the BHP Charter and HSEC Management Systems. All relevant control measures were considered as part of the ALARP assessment, and as no other reasonably practicable additional control measures were identified that would further reduce the impacts and risks of subsea discharges without a grossly disproportionate sacrifice, the impacts and risks are considered ALARP. BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct and hence the principles of ESD. Stakeholders have been consulted about the Minerva Operations and the offshore activities and no concerns regarding this aspect have been raised. BHP undertakes regular consultation with relevant stakeholders about its offshore activities providing them with sufficient and reasonable opportunities to raise any new concerns or issues for the duration of this activity. On this basis, it is considered that adherence to the performance standards will manage the impacts and risks of subsea discharges to an acceptable level.

7.10.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Performance Outcome	Controls	Performance Standard	Measurement Criteria
Planned subsea discharges limited to chemicals assessed as acceptable for release to the marine environment.	Chemical selection process.	**PS 7.8.4** **APU Hazardous Materials Acquisition Environmental Supplement Procedure:** Where OCNS rating of D or E or a CHARM rating of Silver or Gold rated chemicals are used, no further control required. If other non-rated chemicals are required, chemical selection procedures described in APU Hazardous Materials	Documentation showing that chemicals used are ranked D or better on OCNS ranked list or Silver or better on CHARM rating. Where chemicals are not D/E rated through OCNS or Gold/Silver rated through CHARM, then documented evidence is available to show that APU Hazardous

Performance Outcome	Controls	Performance Standard	Measurement Criteria
		Acquisition Environmental Supplement Procedure will be followed.	Materials Acquisition Environmental Supplement Procedure has been followed.

8 Environmental Risk Assessment: Unplanned Activities

This section of the EP outlines the risk assessment, risk evaluation, potential environmental impacts, environmental performance outcomes, environmental performance standards and measurement criteria for the Minerva offshore unplanned activities.

8.1 Risk Assessment and Evaluation

Regulation 13(5) and 13(6) of OPGGS (E) Regulations states that *"the environment plan must include:*

13(5)(a) Details of the environmental impacts and risks for the activity; and

13(5)(b) An evaluation of all the impacts and risks, appropriate to the nature and scale of each impact or risk; and

13(5)(c) Details of the control measures that will be used to reduce the impacts and risks of the activity to as low as reasonably practicable and an acceptable level.

13(6) To avoid doubt, the evaluation mentioned in paragraph (5)(b) must evaluate all the environmental impacts and risk arising directly or indirectly from:

13(6)(a) All operations of the activity.

Further, *Regulation 13 (7) of the OPGGS (E) Regulations states that "the environment plan must:*

13(7)(a) Set environmental performance standards for the control measures identified under paragraph (5)(c); and

13(7)(b) Set out the environmental performance outcomes against which the performance of the titleholder in protecting the environment is to be measured; and

13(7)(c) Include measurement criteria that the titleholder will use to determine whether each environmental performance outcome and environmental performance standard is being met.

The purpose of this Section is to address the requirements of Regulations 13(5), 13(6) and 13(7) by providing an assessment and evaluation of all the impacts and risks for the Activity and associated control measures that will be applied to reduce impacts and risks to an acceptable level, demonstrating how the measures being taken will reduce the level of impact and risk to ALARP. The environmental aspects and sources of risk identified during the ENVID process identified four unplanned activities that are presented in this Section. Table 8-1 provides a summary of the activities, environmental aspects affected and the risk assessment and evaluation that are discussed in the following sections.

Table 8-1: Summary of the unplanned activities, aspects potentially affected and risk assessment and evaluation

Activity		Environmental								Socio-Economic				Risk Assessment & Evaluation			
		Marine Mammals	Marine Turtles	Fish	Seabirds/ Shorebirds	Seabed	Marine Biota	Marine Protected	Key Ecological Features	Commercial Fisheries	Shipping Activities	Tourism and Recreation	Greenhouse Gas	Severity	Likelihood	Residual Risk	Acceptability
Unplanned Events																	
8.2	**Interactions with Marine Fauna**																
	Collision of vessel(s) with marine fauna	x	x											1	Unlikely	1	T
8.3	**Introduction of Introduced Marine Species**																
	Introduction of introduced marine species			x			x			x	x	x		3	Unlikely	10	T
8.4	**Marine Spills of Chemicals or Refined Oils**																
	Surface spills from accidental leaks from storage and equipment	x	x	x	x		x							1	Unlikely	1	T
	Subsea releases from subsea infrastructure	x	x	x	x		x							2	Unlikely	3	T
8.5	**Hydrocarbon Release from Subsea Infrastructure**																
	Loss of well control (LOWC) through tree removal	x		x	x	x	x							2	Highly unlikely	3	T
	LOWC through leakage through closed valves following flowline/small bore fitting damage/failure	x		x	x	x	x							4	Unlikely	9	T
8.6	**Diesel Spill from Bulk Storage**																
	Tank rupture on vessel	x	x	x	x		x			x	x	x		3	Unlikely	3	T

Note: “T” = tolerable acceptability.

8.2 Interference to Marine Fauna

8.2.1 Summary of Impact and Risk Assessment and Evaluation

Aspect	Source of Risk	Potential Impact	Consequence	Severity	Likelihood	Residual Risk	Acceptability
Physical Presence	Presence of vessel during inspection, ROV survey or other inspection/maintenance activities	Interference of vessel with migratory or resident populations	Potential for migratory species to be diverted or, in extreme case, blocked from following normal migratory route.	1	Unlikely	1	Tolerable
Physical Presence – Accident	Vessel collision with marine fauna	Potential lethal impact or harm to protected species.	Potential mortality or injury of protected marine species.	2	Highly Unlikely	0.9	Tolerable

8.2.2 Source of Risk

The physical presence and/ or movements of vessels (and associated subsea equipment and activities) involved in the offshore activities have the potential to interact with marine fauna in the offshore Operations Area, with potential impacts ranging from minor behavioural interferences to severe impacts such as mortality through vessel strikes with large, slow moving cetaceans, marine turtles or whale sharks. Potential behavioural responses to underwater noise emissions from vessels during offshore activities are discussed in Section 7.5.

The duration of potential risk will be restricted to the short periods that vessels are in the Minerva Operations Area for offshore activities.

8.2.3 Environmental Impact Assessment

Considering the low number of vessel movements associated with the activity and the low vessel speeds in the Operations Area, it is unlikely that additional vessel traffic in the Operations Area as a result of offshore activities will have a significant impact on migratory fauna species or other transiting marine fauna that may be present. In the highly unlikely event of a whale or turtle mortality, the effect is not likely to be significant (as defined by EPBC Act significance impact guidelines) at the population level.

Vessel collisions have been known to contribute to the mortality of marine fauna including resident and migrating turtles (Hazel and Gyuris, 2006[25]; Hazel *et al*., 2007[26]) and migratory whales (Laist *et al*., 2001[27]; Jensen and Silber, 2003[28]). For both whales and turtles, the risk of lethal collision is a function of abundance of animals in the area of operations, probability of a collision and the probability of that collision being fatal.

Whales

The likelihood of vessel-whale collision being lethal is influenced by vessel speed. The risk of a collision causing mortality of the whale increases as the vessel speed increases (Laist *et al*., 2001[29]; Jensen and Silber,

[25] Hazel, J. and Gyuris, E. (2006). Vessel-related mortality of sea turtles in Queensland, Australia. *Wildlife Research* 33:149-154.

[26] Hazel, J., Lawler, I.R., Marsh, H. and Robson, S. (2007). Vessel speed increases collision risk for the green turtle *Chelonia mydas.* Endangered Species Research 3: 105-113.

[27] Laist, D.W., Knowlton, A.R., Mead, J.G., Collet, A.S. and Podesta, M. (2001). Collisions between ships and whales. Marine Mammal Science, 17: 35-75.

[28] Jensen, A.S. and Silber, G.K. (2003). Large whale ship strike database. U.S. Department of Commerce. National Oceanic and Atmospheric Administration. Technical Memorandum NMFS-OPR. 37 pp.

[29] Op cit. 27

2003[30]). Vanderlaan and Taggart (2007[31]) found that the chance of lethal injury to a large whale as a result of a vessel strike declines from 80 % at 15 knots to about 20 % at 8.6 knots.

Vessels conducting offshore activities are likely to be either stationary or moving slowly (~4 knots) in the Operations Area, hence the chance of a vessel-whale collision resulting in lethal outcome within these waters is much reduced. According to the data of Vanderlaan and Taggart (2007[32]), it is estimated that the risk is less than 10 % at a speed of 4 knots. Vessel-whale collisions at this speed are uncommon and, based on reported data contained in the US National Ocean and Atmospheric Administration database (Jensen and Silber, 2003[33]) there only two known instances of collisions when the vessel was travelling at less than 6 knots, both of these were from whale watching vessels that were deliberately placed amongst whales.

Turtles

There is no available data on factors affecting the likelihood of a vessel-turtle collision being lethal. It is reasonable to assume that the higher the speed of collision, the greater the risk of mortality, but contact with the propeller would be lethal at almost all speeds. Studies have shown that turtles are less likely to flee from a fast moving vessel, presumably because of poor hearing and visual senses than from a slow-moving vessel (Hazel *et al*., 2007[34]).

Considering the low number of vessel movements associated with the activity and the low speeds in the Operations Area, it is unlikely that vessel traffic will have a significant impact on turtles at the population level.

Species Recovery Plans, Approved Conservation Advice and Threat Abatement Plans

BHP has considered information contained in recovery plans, approved conservation advice and threat abatement plans for cetaceans and marine turtles published by the DoEE (Section 4.2.13). This includes the Conservation Management Plan for the Southern Right Whale (DSEWPaC, 2012), the Conservation Management Plan for the Blue Whale (DoE, 2015), Conservation Advice for the Sei Whale (TSSC, 2015d), Conservation Advice for the Fin Whale (TSSC, 2015e), the Conservation Advice for Humpback Whale (TSSC, 2015f) and the Recovery Plan for Marine Turtles in Australia (DoEE, 2017a).

The Conservation Management Plan for the Blue Whale and Conservation Management Plan for the Southern Right Whale has a long-term objective of minimising anthropogenic threats to allow for the conservation status to improve so that they can be removed from the EPBC Act threatened species list (Endangered and threatened respectively). The Humpback Whale Conservation Advice confirms that the species remains listed as Vulnerable under the EPBC Act. The conservation status of each species is unchanged from previous listings. Nevertheless, both management plans provide summaries of threats to Blue whales, Southern right and Humpback whales, Fin whales and Sei whales of which vessel collision is relevant to the offshore activities as part of Minerva Operations.

The overarching objective of the Recovery Plan for Marine Turtles in Australia is to reduce detrimental impacts on Australian populations of marine turtles and hence promote their recovery in the wild. All six species of marine turtle that occur in Australian waters are listed as threatened under the EPBC Act. Marine turtles are long-lived, slow to mature and are subject to a number of threats of which boat strike is the most relevant to offshore activities as part of Minerva Operations. As discussed in the recovery plan, marine turtles are vulnerable to boat strikes when at the surface to breathe and when resting between dives. This is particularly an issue in waters adjacent to large urban populations where there are large numbers of boats and other pleasure craft. The marine turtle populations affected by boat strike have been identified as: loggerhead turtles from the eastern Australian population; green turtles from the southern Great Barrier Reef population; hawksbill turtles from the north eastern Australian populations; and flatback turtles from Queensland (DoEE, 2017a). On this basis, controls relating to vessel speed for cetaceans (EPBC Regulations 2000 – Part 8 Division 8.1) have been modified to include turtles and whale sharks to mitigate the potential for vessel strikes noting that intervention vessels do not travel at the same speeds that can be attained by recreational pleasure craft.

In summary, BHP considers the proposed activity is not inconsistent with recovery plans for cetaceans and marine turtles published by the DoEE, as impacts and risks associated with noise emissions, vessel collision and unplanned hydrocarbon release were considered in the Environmental Risk Assessment, and a range of preventative controls were identified and adopted during the ALARP assessments, as detailed below.

30 Op cit. 28

31 Vanderlaan, A.S.M. and Taggart, C.T. (2007). Vessel collisions with whales: The probability of lethal injury based on vessel speed. Marine Mammal Science, 23: 144-156.

32 Ibid

33 Op cit. 28

34 Op cit. 26

8.2.4 Demonstration of ALARP

A summary of the ALARP process undertaken for the environmental aspect is presented in Table 8-2. This process was completed as outlined in Section 6.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was not considered suitable (refer Table 8-2). The result of this ALARP Assessment contributes to the overall acceptability of the risk and impact.

Table 8-2: Interference to marine fauna – ALARP assessment summary

Function	Controls	Accept/ Reject	Reason	Performance Standard
Eliminate	N/A			
Substitute	N/A			
Engineer	N/A			
Separate	Restrict timing of offshore activities to reduce potential impacts to whale and turtles during environmentally sensitive periods.	R	**Environmental Benefit:** The risk to all fauna cannot be reduced due to variability in timing of environmentally sensitive periods and the unpredictable presence of some species. **Operability:** The use of vessels-based activities is essential to the Activity. Due to the infrequency and short duration of activities the risk of interaction with marine fauna is considered low. Restricting timing or duration of offshore activities may have logistical implications or costs and/or decrease the effectiveness of the integrity inspection/ intervention program. **Cost:** Given the low risk of interaction with marine fauna, the costs of restricting the activity schedule to avoid multiple / overlapping sensitivity periods is deemed grossly disproportionate to any environmental benefit.	
Administrate	Vessel Masters to operate vessels in accordance with the Part 8 of the OPGGS Act 2006 – (s. 280 (2)(c)); EPBC Regulations 2000 – Part 8 Division 8.1 (r. 8.05) Interacting with Cetaceans (modified to include turtles and whale sharks) to avoid interactions with whales, whale sharks, and marine turtles.	A	**Environmental Benefit:** Reduces interaction risk to Cetaceans (modified to include turtles and whale sharks). **Operability:** Legal obligation to comply with the OPGGS Act 2006 and EPBC Regulations 2000. **Cost:** Low	**PS 7.6.1**
	Environmental awareness induction provided to all marine crew to advise marine fauna interaction requirements.	A	**Environmental Benefit:** Providing training to personnel assists in understanding legal obligations. **Operability:** Inductions form part of any new employee process. **Cost:** Low	**PS 7.6.2**
Pollution Control	N/A			

Function	Controls	Accept/ Reject	Reason	Performance Standard
Monitoring	Sightings of cetaceans, whale sharks and turtles to be conducted on the vessel/s operating in the Operations Area opportunistically and secondary to the primary responsibilities of core crew. Sightings are recorded and reported.			

ALARP Summary

The risk assessment and evaluation has identified a range of control measures that when implemented are considered to manage the risk of interference to marine fauna during offshore activities. The presence and movement of the vessels are critical to the offshore activities and cannot be eliminated.

The following additional/ alternative controls were considered for avoiding impacts:

- Timing of activities: Timing the offshore activities to avoid periods of environmental sensitivity, such as peak whale and turtle abundance, has been considered. The benefit that may accrue from avoiding periods of peak whale density is considered to be negligible based on the simple observation that even with all the oil and gas development (and associated vessel movements) occurring in over the last ten years the humpback whale population (Stock IV) has grown at an estimated 10 % per year to the point where International sewage prevention pollution (IUCN) have removed the humpback whales from the threatened category (IUCN, 2019[35]) and there have been no recorded cases of whale-vessel collisions. The disjunct nature of peak whale (winter) and turtle (summer) abundances would also severely restrict the available operating window. The cost that would be associated with avoiding periods of peak density is highly variable ranging from no cost, should it happen to coincide with suitable vessel availability, to millions of dollars if it requires placing contracted vessels on stand-by. As offshore activities are driven by the results of previous inspections/ monitoring, restrictions on timing of follow-up offshore work could introduce delays resulting in increased subsea infrastructure integrity risks and associated costs. Given that the procedures proposed for preventing vessel-whale collisions have been demonstrated to be effective, it is considered that the potential cost of varying the timing of offshore activities to avoid peak fauna seasons is grossly disproportionate to the benefit that may accrue.
- Avoidance procedure: Extend to turtles and whale sharks a modified version of the avoidance procedure in place for whales. The procedure would prohibit intentionally travelling at greater than 6 knots within 50 m of a turtle and not deliberately approaching closer than 25 m to a turtle (note difference in distance compared to whales is due to practical limitation on sighting turtles in the open ocean). These additional control measures would not incur any additional cost, except on occasions when turtles approach within the caution zone, and were accepted.

The proposed control measures are consistent with regulatory requirements imposed on the whale watching industry (which has far higher incidence and risk of collisions) and best practice for managing interactions with whales. Extending this to other species susceptible to impacts from vessel presence is considered best practice. No further alternative control measures were identified that would be effective or where the cost is not grossly disproportionate to the benefit that may accrue. With the proposed control measures in place, it is considered that the risk or disturbance, injury or mortality to marine fauna from vessel interactions has been reduced to ALARP.

8.2.5 Demonstration of Acceptability

BHP considers a range of factors when determining that a level of impact and risk to the environment is broadly acceptable, as summarised in Table 8-3.

Table 8-3: Demonstration of acceptability for unplanned interference to marine fauna

Criteria	Question	Demonstration
Codes and Standards	Is the impact or risk being managed in accordance with relevant Australian or International legislation, Ministerial Conditions or standards?	Impacts and risks associated with the unplanned interference to marine fauna will be managed in accordance with relevant legislation, codes and standards (e.g. EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with Cetaceans.

[35] IUCN. (2019) IUCN Red List of Threatened Species. Available from: http://www.iucnredlist.org/details/13006/0

Criteria	Question	Demonstration
		In addition, marine fauna will be managed with consideration of the relevant Species Recovery Plan, Approved Conservation Advice and Threat Abatement Plans.
ESD	Is the proposed impact consistent with the principles of ESD?	BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct, which endorse the continuous improvement in health, safety and environmental performance in ways that protect people and the environment through the responsible management of petroleum activities and their impacts. BHP considers that adherence to these principles is consistent with the principles of ESD.
Internal Context		
BHP Charter and HSEC Management System Compliance	Is the proposed impact or risk consistent with the requirements of BHP Our Requirements, Petroleum Standard and HSEC Management Systems?	Interactions with marine fauna will be in compliance with the BHP Charter values and management systems and will be consistent with activities authorised for petroleum activities.
Professional Judgement	Is the impact or risk being managed in accordance with industry best practice?	BHP will establish speed and distance limits around marine fauna to meet the performance outcome of preventing injury or mortality to marine fauna as a result of the offshore activities. Control measures identified in this plan are consistent with industry best practice and guidelines. Accepted controls that will be implemented are provided in Table 8-2.
ALARP	Are there any further reasonable and practicable control measures that can be implemented to further reduce the impact or risk?	All reasonable and practicable control measures have been assessed (Table 8-2). Additional controls were considered but were found not to be justifiable in further reducing the impacts and risks of interactions with marine fauna without a grossly disproportionate sacrifice. BHP considers that the residual risk of interactions with marine fauna has been demonstrated to be ALARP.
External Context		
Environmental Best Practice	Are control measures in place to manage the impacts and risk to the environment that are commensurate with the nature and scale of any environmental sensitivities of the receiving environment?	The environmental performance outcome, performance standards and measurement criteria that determine whether the outcome and standards have been achieved are commensurate with the environmental significance of the receiving environment.
Stakeholder Views	Do stakeholders have concerns / issues, and if so, have control measures been implemented to manage their concerns/ issues?	Stakeholders have been consulted about offshore activities through a comprehensive and long-term consultation program. No stakeholder concerns have been raised regarding this aspect. The proposed control measures are designed to reduce potential impacts and risks of the activity on environmental sensitivities in the offshore Operations Area.

Acceptability Summary

BHP is satisfied that when the accepted control measures are implemented that the impact and residual risk of interactions with marine fauna is considered ALARP. Furthermore, the adopted controls are considered to be consistent with good oilfield practice/ professional judgement and environmental best practice. Interactions with marine fauna will comply with all relevant laws, codes and standards, as well as the BHP Charter and HSEC Management Systems. All relevant control measures were considered as part of the ALARP assessment, and as no other reasonable additional controls were identified that would further reduce the impacts and risks of interactions with marine fauna without a grossly disproportionate sacrifice, the impacts and risks are considered ALARP. BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct and hence the principles of ESD. Stakeholders have been consulted about Minerva Operations and offshore activities and no concerns regarding this aspect have been raised. BHP undertakes regular consultation with relevant stakeholders about its operations/ activities providing them with sufficient and reasonable opportunities to raise any new concerns or issues for the duration of this activity. On this basis, it is considered that impacts and risks of interactions with marine fauna will be managed to an acceptable level.

8.2.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Performance Outcome	Controls	Performance Standard	Measurement Criteria
No injury or mortality to marine fauna as a result of vessel collision.	Vessel Masters to operate vessels in accordance with the Part 8 of the OPGGS Act 2006 – (s. 280 (2) (c)); EPBC Regulations 2000 – Part 8 Division 8.1 (r. 8.05) Interacting with Cetaceans (modified to include turtles and whale sharks) to avoid interactions with whales, whale sharks, and marine turtles.	**PS 7.6.1** ***OPGGS Act 2006* – (s. 280 (2) (c)); EPBC Regulations 2000 – Part 8 Division 8.1 (r. 8.05) Interacting with Cetaceans (modified to include turtles and whale sharks) such that:** Vessels will not knowingly travel at speeds >6 knots within 300 m of a whale/ whale shark, 150 m for a dolphin (50 m for a turtle) (caution zone). Vessels will not knowingly approach closer than 100 m for a whale/ whale shark, or 50 m for a dolphin, and 25 m for a turtle. A lookout for these fauna will be posted, if there is more than 1 person on the vessel, within the relevant caution zones. If the cetacean/whale shark shows signs of being disturbed, the vessel will immediately withdraw from the caution zone at a constant speed of less than 6 knots. Vessels must move at a constant slow speed and with minimal noise away from a cetacean that is approaching so that the vessel remains at least 300 m from the cetacean.	Records of breaches of vessel and cetaceans/ whale sharks/ turtles interaction requirements outlined in EPBC Regulations reported via incident report form and documented in Incident/ Performance Reports.
	Environmental awareness induction provided to all marine crew to advise marine fauna interaction requirements.	**PS 7.6.2** Environmental awareness briefings provided to marine crew prior to activities to advise marine fauna interaction requirements.	Induction attendance records demonstrate environmental awareness briefing has been conducted for marine crew, including sightings and recording requirements.

8.3 Introduced Marine Species

8.3.1 Summary of Impact and Risk Assessment and Evaluation

Aspect	Source of Risk	Potential Impact	Consequence	Severity	Likelihood	Residual Risk	Acceptability
Introduced Marine Species (IMS)	Movement of vessels from known high IMS risk areas	Introduction of IMS to area leading to major impact to native species.	Colonisation of IMS affecting native marine organisms.	3	Unlikely	10	Tolerable

8.3.2 Source of Risk

Vessels undertaking Minerva offshore activities may be sourced from areas that contain marine pests either on hulls (biofouling) or in ballast water. The key IMS vectors requiring management during the proposed Minerva offshore activities are:

- Discharge of ballast water; and
- Biofouling of surfaces and equipment that routinely becomes immersed in water including but not limited to:
  - Vessel and other external niches such as propulsion units, steering gear and thruster tunnels;
  - Vessel internal niches such as sea chests, strainers, seawater pipe work, anchor cable lockers and bilge spaces;
  - Immersible equipment such as ROVs and AUVs; and
  - Subsea infrastructure such as well heads.

8.3.3 Environmental Impact Assessment

The present knowledge base is inadequate to produce a detailed character profile of all marine organisms that may be translocated by shipping beyond their natural range. Ruiz *et al.* (2000) have analysed the common factors influencing success of translocated marine pests. The majority of marine pest species appear to have planktotrophic larvae, however oviparous species are included. Many of them are epibenthic fouling species but some are soft substratum burrowers or planktonic. It seems likely that many of them are transported as ship bottom fouling organisms rather than as propagules in ballast water.

Assessment of environmental risk has considered the probability of introduction of marine pest species between the source and destination and the similarity of source and discharge habitats:

- The probability of introduced species from the Central Indo-West Pacific Province surviving in the area is low, but if they were to be dispersed to the coastal habitats the probability of survival would be high. The potential ecological effect of this relatively high survival potential may be mitigated by the similarity of the marine species of the region; and
- The probability of introduced species from the more distant South Japan, East African, North Indian and Pacific Islands Provinces surviving in the area also is low. If they were dispersed to coastal habitats the impact would be moderate to major, given the greater number of sister and analogue species that could damage the receiving ecosystems.

IMS may also be economically damaging, including direct damage to assets (fouling of vessel hulls and infrastructure), depletion of commercial marine species, and damage to recreational vales of the area (tourism and recreational fishing). Furthermore, once introduced to an area, eradication or control of introduced species may be difficult, expensive and disruptive or damaging to other marine life.

8.3.4 Demonstration of ALARP

A summary of the ALARP process undertaken for the environmental aspect is presented in Table 8-4. This process was completed as outlined in Section 6.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was not considered suitable (Table 8-4). The result of this ALARP Assessment contributes to the overall acceptability of the risk and impact.

Table 8-4: Introduced Marine Species - ALARP assessment summary

Function	Controls	Accept/ Reject	Reason	Performance Standard
Eliminate	Tributyltin (TBT) free anti-fouling systems applied to vessels entering operational area.	A	Industry accepted practice to use non TBT anti-fouling systems.	**PS 8.3.1**
	Eliminate vessels visiting the Operations Area.	R	**Environmental Benefit:** IMS translocation risk reduced. **Operability:** Vessels are specifically required for IMR and cessation activities; therefore it is not feasible to eliminate the use of vessels.	
Substitute	N/A			
Engineer	N/A			
Separate	Only use newly contracted vessels that are based in South East Bioregion and do not travel interstate or internationally.	R	**Environmental Benefit:** Vessels sourced locally present less risk of IMS being translocated. **Operability:** Due to the competitive nature of the marine industry it is commercially prohibitive to only source vessels that operate exclusively within the South East Bioregion. In addition, locally sourced vessels are not always available or capable of meeting the specific technical requirements of the activity. **Cost:** Vessels sourced interstate or internationally are higher cost than locally sourced vessels.	
Administrate	Vessels to implement and undertake ballast water exchange upon entering Australian waters (outside 200 nm limit).	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with the Australian Ballast Water Management Requirements (in order to comply with the Biosecurity Act (2015). **Cost:** Low.	**PS 8.3.2**
	Vessels sourced for offshore activities will comply the APU IMS Management Procedure. Reports to demonstrate that in-water or out-of-water inspection is carried out by Department of Primary Industries and Regional Development (DPIRD) approved inspectors.	A	**Environmental Benefit:** Required information to evaluate performance prior to hire and ongoing requirements for minimal increase in IMS risk. **Operability:** Part of the Marine Management Process for newly contracted vessels to complete prior to hire. **Cost:** Low.	**PS 8.3.3**

Function	Controls	Accept/ Reject	Reason	Performance Standard
Pollution Control	N/A			
Monitoring	Risk assessments of IMS based on last port of call.			

ALARP Summary

The risk assessment and evaluation has identified a range of controls that when implemented are considered to manage the risk of introducing marine species during the offshore activities. The presence and movement of the vessels is critical to undertake the activities and cannot be eliminated if they are to proceed. The mitigation and control measures outlined are therefore considered to reduce the risk to ALARP.

8.3.5 Demonstration of Acceptability

BHP considers a range of factors when determining that a level of impact and risk to the environment is broadly acceptable, as summarised in Table 8-5.

Table 8-5: Demonstration of acceptability for unplanned introduction of IMS

Criteria	Question	Demonstration
Codes and Standards	Is the impact or risk being managed in accordance with relevant Australian or International legislation, Ministerial Conditions or standards?	Impacts and risks associated with introduced marine species will be managed in accordance with relevant legislation (e.g. *Biosecurity Act 2015*), and codes and standards (e.g. International Convention on the Control of Harmful Anti-fouling Systems on Ships,).
ESD	Is the proposed impact consistent with the principles of ESD?	BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct, which endorse the continuous improvement in health, safety and environmental performance in ways that protect people and the environment through the responsible management of petroleum activities and their impacts. BHP considers that adherence to these principles is consistent with the principles of ESD.
Internal Context		
BHP Charter and HSEC Management System Compliance	Is the proposed impact or risk consistent with the requirements of BHP Our Requirements, Petroleum Standard and HSEC Management Systems?	The contracting and use of vessels will be in compliance with BHP charter values and management systems.
Professional Judgement	Is the impact or risk being managed in accordance with industry best practice?	BHP will comply with relevant legislation and standards relating to the contracting and use of vessels to meet the performance outcome of preventing introduction of invasive marine species. Controls identified in this plan are consistent with industry best practice and guidelines.
ALARP	Are there any further reasonable and practicable controls that can be implemented to further reduce the impact or risk?	All reasonable and practicable controls have been assessed (Table 8-4). No additional controls were identified to further reduce the impacts and risks of introduced marine species without a grossly disproportionate sacrifice. BHP considers that the residual risk of unplanned marine spills of chemicals or refined oil has been demonstrated to be ALARP.
External Context		

Criteria	Question	Demonstration
Environmental Best Practice	Are controls in place to manage the impacts and risk to the environment that are commensurate with the nature and scale of any environmental sensitivities of the receiving environment?	The environmental performance outcome, performance standards and measurement criteria that determine whether the performance outcome and performance standards have been achieved are commensurate with the environmental significance of the receiving environment.
Stakeholder Views	Do stakeholders have concerns/ issues, and if so, have controls been implemented to manage their concerns/ issues?	Stakeholders have been consulted about the activities through a comprehensive consultation program. Stakeholder concerns have been considered for introduced marine species, and this is reflected in controls designed to mitigate impacts of the activity on environmental sensitivities in the vessel operations area.

Acceptability Summary

The proposed control measures for preventing and minimising the risk of introduced marine species are comprehensive and consistent with all relevant codes and standards and good oilfield practice. No reasonably practicable additional controls have been identified that would provide a significant net environmental benefit.

Ballast Water

Vessels manage ballast water in accordance with International Maritime Organisation (IMO) Ballast Water Management (BWM) Convention, IMO Guidelines, the mandatory Australian Ballast Water Management Requirements (DAWR 2017[36]) that is enforced under the *Biosecurity Act 2015* and associated local measures intended to minimise the risk of transplanting harmful aquatic organisms and pathogens from ships' ballast water and associated sediments, while maintaining ships safety. Contracted vessels have individual Ballast Water Management Plans.

Vessels arriving from overseas, intending to discharge trim or ballast water in coastal Australian waters are required to have undertaken a ballast water exchange in accordance with Department of Agriculture, Water Resources (DAWR) requirements. The Australian ballast water management requirements are now aligned with the (BWM) Convention:

- All vessels must carry a valid Ballast Water Management Plan;
- Vessels with a ballast water management system (BWMS) should also carry a Type Approval Certificate specific to the type of BWMS;
- All vessels must submit a Ballast Water Report. Vessels intending to discharge ballast are obligated to report;
- International vessels can submit a Ballast Water Report through the Maritime Arrivals Reporting System (MARS) at least 12 hours prior to arrival;
- All vessels must maintain a complete and accurate record of all ballast water movements; and
- Domestic trading vessels can request a low risk exemption through a Domestic Risk Assessment. All applications must be submitted through MARS.

Vessels will exchange ballast water outside ports where possible.

The proposed control measures for IMS introduced by ballast water are consistent with the Australian Ballast Water Management Requirements. They are also consistent with good oilfield practice.

Biofouling

Biofouling on vessel hulls, external niche areas and immersible equipment pose a potential risk of IMS in Australian waters. Under the National Biofouling Management Guidelines Guidance for the Petroleum Production and Exploration Industry [37] and IMO Guidelines for the control and management of ships' biofouling

[36] DAWR. 2017. *Australian ballast water management requirements (Version 7).* Accessed August 2017. http://www.agriculture.gov.au/SiteCollectionDocuments/biosecurity/avm/vessels/ballast/australian-ballast-water-management-requirements.pdf

[37] DAWR, 2018. National Biofouling Management Guidance for the Petroleum Production and Exploration Industry. Accessed 9 October 2018. http://www.agriculture.gov.au/SiteCollectionDocuments/aqis/airvesselmilitary/vessels/pests/offshore-installations-guide.pdf. Accessed 9 October 2018.

to minimize the transfer of invasive aquatic species (resolution MEPC.207(62)[38], DAWR and DoEE guidelines[39] [40] and APU IMS Management Procedure a risk assessment approach is applied to manage biofouling.

The APU IMS Management Procedure outlines:

- Regulatory Framework for management of IMS;
- Identify BHP's marine activities at risk of facilitating introduction/translocation of IMS into WA and Commonwealth waters;
- BHP and Contractors roles and responsibilities;
- Procedure for assessing vessel and immersible equipment for IMS risk; and
- Management and mitigation measures to prevent IMS incursions and manage identified bio-fouling pre hire and post-mobilisation.
    - All contracted vessels are required to complete the IMS risk assessment process described in this procedure. The IMS risk assessment assigns a final risk category of low, moderate, uncertain or high) to vessels based on a range of information including last port of call, age of antifouling coating etc. If a risk category of moderate, uncertain or high is scored, a range of management options are available including inspections, cleaning or treatment of internal seawater systems.
    - Provide all documentation to BHP during the Marine Management Process prior to hire; and
    - Any vessel contracted for greater than 12 months will be audited annually.

The proposed control measures for IMS introduced by biofouling are consistent with the National Biofouling Management Guideline and are also consistent with good oilfield practice.

BHP is managing the risk of IMS consistent with the measures specified following assessment of the project's referral under the EPBC Act. All relevant controls were considered as part of the ALARP assessment, and as no other reasonably practicable additional controls were identified that would further reduce the impacts and risks of introduced marine species without a grossly disproportionate sacrifice, the impacts and risks are considered ALARP. BHP undertakes regular consultation with relevant stakeholders about its operations/ activities providing them with sufficient and reasonable opportunities to raise any new concerns or issues for the duration of this activity.

Given that the management is consistent with conditions of approval for the Development, BHP is satisfied that when the accepted controls are implemented the impact and residual risk of introduced marine species to the environment is considered ALARP and that adherence to the performance standards will manage the impacts and risks of introduced marine species to an acceptable level.

8.3.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Performance Outcome	Controls	Performance Standard	Measurement Criteria
No introduction of introduced marine species as a result of Minerva offshore activities.	TBT free antifouling systems applied to vessels entering operational area.	**PS 8.3.1.** **Marine Orders 8 - Part 98: Marine Pollution - Anti-fouling Systems:** *International Convention on the Control of Harmful Anti-fouling Systems on Ships* (IMO, 2001) Prohibits the use of harmful organotins in antifouling paints used on ships and establishes a mechanism to prevent the potential future use of other harmful substances in anti-fouling systems.	Records indicate ship antifouling systems have not used harmful organotins.
	Vessels to implement and	**PS 8.3.2.**	

[38] IMO Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species (resolution MEPC.207(62) http://www.imo.org/en/OurWork/Environment/Biofouling/Documents/RESOLUTION%20MEPC.207[62].pdf

[39] DAWR, 2018. Offshore Installations Biosecurity Guide. Accessed 9 October 2018.

http://www.agriculture.gov.au/SiteCollectionDocuments/aqis/airvesselmilitary/vessels/pests/offshore-installations-guide.pdf

[40] DAWR and DoE, 2015. Anit-fouling and In-water Cleaning Guidelines. Accessed 9 October 2018.

http://www.agriculture.gov.au/SiteCollectionDocuments/animal-plant/pests-diseases/marine-pests/antifouling-consultation/antifouling-guidelines.pdf

Performance Outcome	Controls	Performance Standard	Measurement Criteria
	undertake ballast water exchange upon entering Australian waters (outside 200 nm limit).	Australian Ballast Water Management Requirements (in order to comply with the Biosecurity Act (2015) regulation B-4 Ballast Water Management Convention [of the International Convention for the Control and Management of Ships' Ballast Water and Sediments]) Ballast water management to occur in accordance with the Australian Ballast Water Management Requirements, (DAWR, 2017)[41].	Documentation of ballast water management in accordance with the Australian Ballast Water Management Requirements, (DAWR, 2017).
	Implement management measures commensurate with the IMS risk to minimise the likelihood of IMS being introduced and established.	**PS 8.3.3.** Australian **BHP Introduced Marine Species Management Procedure:** Newly sourced vessels will complete an IMS risk assessment, before mobilisation to permit area, as described in Introduced Marine Species Management Procedure. The IMS risk assessment assigns a final risk category of low, moderate, uncertain or high) to vessels based on a range of information including last port of call, age of antifouling coating etc. If a risk category of moderate, uncertain or high is scored, a range of management options are available including inspections, cleaning or treatment of internal seawater systems.	Record and review of IMS risk assessment by the Environmental Specialist for newly contracted and locally sourced vessels entering the Operations Area. Records of in-water or out-of-water inspection demonstrate that the inspection is carried out by an approved Biofouling inspector. Record of audit completed.

8.4 Hydrocarbon or Hazardous Chemical Spills or Leaks from Subsea Infrastructure

8.4.1 Summary of Impact and Risk Assessment and Evaluation

Aspect	Source of Risk	Potential Impact	Consequence	Severity	Likelihood	Residual Risk	Acceptability
Hydrocarbon spills (refined oil and lube oil) / hazardous chemicals or liquid waste	Accidental leaks from storage and equipment, including ROV's	Contamination / pollution of water column.	Localised decrease in water quality potentially causing oiling of marine receptors at sea surface.	1	Unlikely	1	Tolerable
Leaks from subsea infrastructure	Release of condensate when the jumper(s) are cut causing release	Contamination / pollution of water column.	Localised reduction in water quality potentially causing oiling of marine receptors at sea surface.	2	Unlikely	3	Tolerable

[41] Department of Agriculture and Water Resources (2017). *Australian ballast water management requirements.* 23 pp.

8.4.2 Source of Risk

A number of scenarios for a loss of containment from the wells or subsea infrastructure were analysed during the ENVID. Consideration was given to potential failures modes including corrosion, seepage, and accidental damage or planned removal of barriers for maintenance.

Unplanned Surface Spills

Various hydrocarbons and environmentally hazardous chemicals are stored on-board the vessels, to power equipment. Such liquids include fuel, refined oil, lube oil, corrosion inhibitors, hydraulic oil, lubricating oils, cleaning and cooling agents, and methanol.

Accidental loss of such liquids or liquid wastes to the marine environment could occur as a result of spillage during handling, inadequate bunding and/ or storage, inadequate method of securing or tank/ pipework failure, leak from equipment or rupture or failure of hoses.

The volume of chemical or refined oil likely to be accidentally released from a leak or spillage and be released into the marine environment, based on a review of past incidents and possible causes, is less than 80 L. The volume of hydraulic oil on a working class ROV which could be used for offshore activities is considered to be in the region of 20 L.

Unplanned Subsea Infrastructure Leaks - Operations

In the unlikely event of leaking or rupture of subsea wet gas pipeline or umbilicals during operations, there is the potential for the release of production fluids (including hydrocarbons) or of chemicals (hydraulic fluids, corrosion inhibitor, MEG) to the marine environment.

A release from the Minerva gas pipeline would involve a gas comprised almost entirely of methane (93.5 %) and nitrogen (5.5 %), with any hydrocarbons that could form a condensate remaining in vapour phase. No liquid hydrocarbons would be released to the sea surface. In the unlikely event of a pipeline rupture, the wells can be shut in thereby preventing any further release of gas from the well field through the pipeline. The worst-case would be a gas release at the seabed from a pipeline leak or rupture of 752 m^3 of methane gas, which would contain approximately 7.5 m^3 of condensate.

Unplanned Subsea Infrastructure Leaks - Cessation

During cessation, the pipeline and chemical injection lines will be cleaned. The 10-inch production line cleaning methodology is to pump a total of 2 off pig trains, with surfactant, debris gel, solid pigs and fresh water until the desired cleanliness level is achieved. Fluid return samples will be obtained and analysed to confirm the hydrocarbon levels of <2 % volume or <5 % Lower Explosive Limit (LEL) have been achieved. Pumping will occur from onshore with as found contents and slugs to be injected downhole. The pipeline will be left with filtered, chemically treated potable water.

The 2-inch chemical injection lines shall be flushed, at a flowrate to ensure turbulent flow, using filtered potable water. Fluid returns shall be sampled upon initial receipt to determine a baseline, fluid sampling shall then continue until the trend in sample results has plateaued. Flushing shall be performed utilising a temporary pumping spread rigged up onshore tied into the 2-inch chemical injection line, towards Minerva-4 well, through the MEG crossover loop, through Minerva-3 before returning to shore. Fluid shall be sampled for volatile organic compounds and/or MEG content.

8.4.3 Environmental Impact Assessment

Unplanned Surface Spills

The accidental discharge of chemicals and refined oil has the potential to cause localised toxic effects on marine fauna and flora (phytoplankton) and a localised reduction in water quality. The potential impacts would most likely be highly localised and restricted to the immediate footprint of the spill, for the short period until it became dispersed and diluted.

Pelagic fish, cetaceans and marine reptiles are unlikely to remain in a location affected by a spill for long enough to be exposed to lethal concentrations. Plankton entrained in the spill could be impacted; however, due to the small volumes, and the rapid dilution and dispersal that will result at the oceanic location, the environmental effects will be temporary and localised, with significant impacts not expected owing to the small area of impact relative to the widespread distribution of receptors.

Leaks from Subsea Infrastructure

Impacts to seabed biota in the vicinity of the pipeline are negligible in the absence of any significant habitat along the pipeline route.

There are relatively small volumes of control fluid in the offshore umbilical (27 m^3) and 2-inch lines have a volume of 53 m^3 of corrosion inhibitor. In the event that the umbilical ruptures, which is considered extremely unlikely given the integrity of fabrication, dilution will be high and effects localised to the release point.

The active compounds in the corrosion inhibitor (ethylene glycol and 2-butoxyethanol) will be rapidly diluted within a very localised area, rapidly biodegrade and will not bioaccumulate. The well control fluid is used for valve actuation (i.e. is intended for marine discharge) with an OCNS non-CHARM rating of "D" and would result in low environmental impact if there was an unplanned release.

On the basis of the above, the consequences of an unplanned release causing impacts is minor and the residual risk is considered to be tolerable.

8.4.4 Demonstration of ALARP

A summary of the ALARP process undertaken for the environmental aspect is presented in Table 8-6. This process was completed as outlined in Section 6.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was not considered suitable (Table 8-6). The result of this ALARP Assessment contributes to the overall acceptability of the risk and impact.

Table 8-6: Hydrocarbon or Hazardous Chemical Spills or Leaks from Subsea Infrastructure - ALARP assessment summary

Function	Controls	Accept/ Reject	Reason	Performance Standard
Eliminate	N/A			
Substitute	N/A			
Engineer	N/A			
Separate	N/A			
Administrate	Vessels will comply with AMSA Marine Orders - Part 91: Marine Pollution Prevention – Oil, as appropriate to vessel class.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with Marine Orders. **Cost:** Low	**PS 8.4.1**
	Vessels will comply with AMSA Marine Order 95 (Pollution prevention – garbage).	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with MARPOL. **Cost:** Low.	**PS 8.4.2**
	Fuels, oils and hazardous chemicals must be stored with secondary containment at least 110 % of largest single waste container.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with MARPOL. **Cost:** Low.	**PS 8.4.3**
	Risk-based program of on-going inspection, monitoring and maintenance/repair of the well head	A	**Environmental Benefit:** Required information to evaluate performance requirements.	**PS 8.4.4**

Function	Controls	Accept/ Reject	Reason	Performance Standard
	and pipeline takes places to provide assurance of ongoing integrity.		**Operability:** Inspection, monitoring and maintenance is part of normal operations to ensure ongoing integrity assurance. **Cost:** Low.	
Pollution Control	Minerva OPEP implemented and maintained.			
Monitoring	N/A			

ALARP Summary

The risk assessment and evaluation has identified a range of controls that when implemented are considered to manage the risk of chemical and refined oil spills to the marine environment. No additional or alternative controls were identified that could further reduce the risk and impact of a chemical or refined oil spill to the marine environment. Hazardous chemicals and refined oil are required to undertake the offshore activities and their removal is not a viable option. The extensive mitigation and control measures outlined are therefore considered to reduce the risk to ALARP.

The risk assessment and evaluation has identified a range of controls that when implemented are considered to manage the risk of chemical and refined oil spills and leaks from subsea infrastructure to the marine environment. No additional or alternative controls were identified that could further reduce the risk and impact of a chemical or refined oil spill or a leak from subsea infrastructure to the marine environment. Hazardous chemicals and refined oil are required to undertake the offshore activities and their removal is not a viable option.

An umbilical rupture is considered extremely unlikely given its integrity, dilution will be high and effects localised to the release point. High quality materials are used for pipeline construction with all welds inspected and signed off. The pipeline is designed to take into account operational and environmental loads. Corrosion inhibitor is used to mitigate against internal corrosion. The pipeline is clad with Corrosion Resistant Alloy (CRA) located in the pipeline where corrosion rates are potentially higher. The umbilical is double armoured with stainless steel armour wire within which is located flexible stainless steel tubes containing the umbilical fluids. Inspection tools are run inside the pipeline to detect metal loss. The offshore gas stream arriving at the plant is continuously monitored for evidence of corrosion in pipeline. In-line corrosion monitoring spools are installed at strategic locations to detect the onset of internal corrosion. The umbilical fluid pressures are monitored continuously in the control room during operations.

A risk based program of on-going inspection, monitoring and maintenance/repair of the well head and pipeline takes places (refer to Section 3.6) to provide assurance of ongoing integrity. The extensive mitigation and management controls are considered to reduce the risk to ALARP.

8.4.5 Demonstration of Acceptability

BHP considers a range of factors when determining that a level of impact and risk to the environment is broadly acceptable, as summarised in Table 8-7.

Table 8-7: Demonstration of acceptability for marine spills of chemicals and refined oils

Criteria	Question	Demonstration
Codes and Standards	Is the impact or risk being managed in accordance with relevant Australian or International legislation, Ministerial Conditions or standards?	Impacts and risks associated with unplanned marine spills of chemicals or refined oil will be managed in accordance with relevant legislation (e.g. *Protection of the Sea (Prevention of Pollution from Ships) Act* 1983), and codes and standards (e.g. MARPOL, Marine Orders).
ESD	Is the proposed impact consistent with the principles of ESD?	BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct, which endorse the continuous improvement in health, safety and environmental performance in ways that protect people and the

Criteria	Question	Demonstration
		environment through the responsible management of petroleum activities and their impacts. BHP considers that adherence to these principles is consistent with the principles of ESD.
Internal Context		
BHP Charter and HSEC Management System Compliance	Is the proposed impact or risk consistent with the requirements of BHP Our Requirements, Petroleum Standard and HSEC Management Systems? the proposed impact or risk consistent with the requirements of BHP Our Requirements, Petroleum Controls and HSEC Management Systems?	The storage of chemicals and refined oil will be in compliance with BHP charter values and management systems.
Professional Judgement	Is the impact or risk being managed in accordance with industry best practice?	BHP will comply with relevant legislation and standards relating to the storage of chemicals and refined oil to meet the performance outcome of preventing spills to the marine environment. Controls identified in this plan are consistent with industry best practice and guidelines. Accepted controls that will be implemented are provided in Table 8-6.
ALARP	Are there any further reasonable and practicable controls that can be implemented to further reduce the impact or risk?	All reasonable and practicable controls have been assessed (Table 8-6). No additional controls were identified to further reduce the impacts and risks of marine spills without a gross disproportionate sacrifice. BHP considers that the residual risk of unplanned marine spills of chemicals or refined oil has been demonstrated to be ALARP.
External Context		
Environmental Best Practice	Are controls in place to manage the impacts and risk to the environment that are commensurate with the nature and scale of any environmental sensitivities of the receiving environment?	The environmental performance outcome, performance standards and measurement criteria that determine whether the performance outcome and performance standards have been achieved are commensurate with the environmental significance of the receiving environment.
Stakeholder Views	Do stakeholders have concerns/ issues, and if so, have controls been implemented to manage their concerns/ issues?	Stakeholders have been consulted about the activities through a comprehensive and long-term consultation program. Stakeholder concerns have been considered for unplanned marine spills, and this is reflected in controls designed to mitigate impacts of the activity on environmental sensitivities in the vessel operations area.

Acceptability Summary

The proposed control measures for preventing and minimising the risk of accidental release of chemicals and refined oils occurring are comprehensive and consistent with all relevant codes and standards and good oilfield practice. No reasonably practicable additional controls have been identified that would provide a significant net environmental benefit.

The magnitude of the worst-case spill is unlikely to be greater than 80 L. The offshore location of the offshore activities is such that any spills will be rapidly diluted and dispersed, with any environmental effects being temporary and localised, with significant impacts not expected owing to the short exposure timeframe.

The volume of hydrocarbons through valve passing or when the jumper(s) are cut is less than 1 m^3. The low volume of hydrocarbons combined with the depth of the infrastructure (60 m) will result in the released hydrocarbon rapidly diluting in the immediate vicinity of the discharge point. The offshore location is such that any hydrocarbon releases from subsea infrastructure would be rapidly diluted and dispersed, with any environmental effects being temporary and localised, with significant impacts not expected owing to the short exposure timeframe.

BHP is satisfied that when the accepted controls are implemented that the impact and residual risk of unplanned spills of stored chemicals and refined oils to the environment is considered 'ALARP'. Furthermore, the adopted controls are considered to be consistent with good oilfield practice/professional judgement and environmental best practice. The storage of chemicals and refined oils will comply with all relevant laws, codes and standards, as well as BHP Charter and HSEC Management Systems. All relevant controls were considered as part of the ALARP assessment, and as no other reasonable additional controls were identified that would further reduce the impacts and risks of unplanned spills of stored chemicals and refined oils without a gross disproportionate sacrifice, the impacts and risks are considered ALARP. BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct and hence the principles of ESD. Stakeholders have been consulted about the activity and appropriate control measures will be implemented to address any concerns that were raised. BHP undertakes regular consultation with relevant stakeholders about its operations / activities providing them with sufficient and reasonable opportunities to raise any new concerns or issues for the duration of this activity. On this basis, it is considered that adherence to the performance standards will manage the impacts and risks of unplanned spills of stored chemicals and refined oils to an acceptable level.

8.4.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Performance Outcome	Controls	Performance Standard	Measurement Criteria
No accidental release of environmentally hazardous chemicals or refined oil to the marine environment.	Vessels will comply with the following marine orders.	**PS 8.4.1.** **Vessels will comply with AMSA Marine Orders - Part 91:** Marine Pollution Prevention – Oil, as appropriate to vessel class.	Record of vessels complying with Marine Orders.
	Vessels will comply with the following marine orders.	**PS 8.4.2.** **Vessels will comply with the following Marine Orders:** Marine Order 95 (Pollution prevention – garbage.	Record of vessels complying with Marine Orders.
	Fuels, oils and hazardous chemicals must be stored with secondary containment at least 110 % of largest single waste container.	**PS 8.4.3.** Fuels, oils and hazardous chemicals must be stored with secondary containment at least 110 % of largest single waste container.	Containment inspection to ensure appropriate secondary containment.
	Risk-based program of on-going inspection, monitoring and maintenance/repair of the well head and pipeline takes places to provide assurance of ongoing integrity.	**PS 8.4.4.** Risk-based program of on-going inspection, monitoring and maintenance/repair of the well head and pipeline takes places to provide assurance of ongoing integrity.	Maintenance, inspection and monitoring documentation.

8.5 Loss of Well Control

8.5.1 Summary of Impact and Risk Assessment and Evaluation

Aspect	Source of Risk	Credibility	Potential Impact	Consequence	Severity	Likelihood	Residual Risk	Acceptability
Loss of well control	Closed valve leakage	Credible	Contamination / pollution of water column	Temporary and localised reduction in water quality Localised reduction in air quality	2	Unlikely	3	Tolerable
	Tree removal	Non Credible but assessed for spill risk	Localised decrease in water quality. GHG emissions.	Temporary and localised reduction in water quality Localised reduced in air quality	4	Highly unlikely	9	Tolerable

8.5.2 Source of Risk

A number of scenarios for a loss of containment from the wells or subsea infrastructure were analysed during the ENVID. Consideration was given to potential failures modes including corrosion, seepage, and accidental damage or planned removal of barriers for maintenance.

8.5.2.1 Closed Valve Leakage

Failure of the flowline or umbilical/flying lead small bore fittings connecting to the Subsea tree, whereby a small leakage occurs through subsea tree valves in closed position. For this to occur the Production Master Valve (PMV)/Production Wing Valve (PWV) and the SCSSV all need to fail to properly seal. Given that the routine test criteria allows for very low leakage to be an acceptance criteria, it is proposed that the leak rate of the acceptance criteria be used as a basis for the credible leak – that is 15 scf/min. Such small leaks occur due to a potentially imperfect metal to metal sealing of the valve surface, and can come about when valve gate slab floats, typically where closure occurs under a low pressure differential. In an emergency valve closure situation, typically high pressure differentials are experienced, and it is more likely that a tight valve closure would be achieved. Furthermore, there is built in redundancy through the availability of 3 valves in series (SCSSV, PMV and PWV). Given these circumstances, the scenario is considered unlikely but credible.

The results of the analysis are summarised in Table 8-8.

Table 8-8: Summary of LOWC – Closed Valve Leakage Release Volumes - Credible

Aspect	Description	Gas Volume (Worse Case Discharge)	Condensate Volume (Worse Case Discharge)	Timeframe
Loss of well control	Closed Valve leakage	0.3024 MMscf	0.16 m^3	14 days

Table 8-9: LOWC – Closed Valve Leakage Description, Controls and Credibility Assessment

Description	Preventative Controls	Credibility Assessment
Leakage through closed valves following flowline or small bore fitting failure	• Fail closed valve design; • Routine valve testing; • Valve redundancy (SCSSV, PMV, PWV); • Double Barrier well envelopes; and	Credible

Description	Preventative Controls	Credibility Assessment
	• High differential closure pressures in emergency closure.	

To quantify the release rate, a fixed rate of 15 scf/min has been assigned based on the acceptance criteria for routine valve performance testing. A leakage rate could continue until an ROV intervention could be performed to provide an additional barrier. The required ROV operation is not specified, however could take the form of installation of a sealing plug in an exposed pipe bore, closure of an additional ROV gate valve or small bore needle valve. Whilst ROV mobilisation can be progressed reasonably rapidly to respond to an emergency scenario, it is possible that specialised tooling might need to be identified and mobilised internationally. A 14 day response time has been assigned as a response duration to address the minor leak. The calculated release rate and volume for a Minerva well LOWC – closed valve leakage is presented in Table 8-8.

Table 8-10: LOWC – Closed Valve Leakage Calculated Release Rate

	Daily Release Rate	Cumulative Release (14 day response)
Gas Volume (MMscf)	0.0216	0.3024
Condensate (m^3)	0.011	0.16

8.5.2.2 Tree Removal – Non Credible

During normal operations, in the extremely unlikely event that both the tree and SCSSV failed simultaneously, there would be a release of gas from the well comprised almost entirely of methane (93.5 %) and approximately 5.5% of other small chained gaseous form hydrocarbons, with any hydrocarbons (0.05 %) that could form a condensate remaining in the vapour phase upon interaction with cooler ambient temperatures.

The well flowrate estimated from such an event is approximately 129 MMscf/day. With a condensate to gas ratio (CGR) of 3.3 bbl/MMscf, the condensate release rate may be in the range of 69 m^3/day. The time taken to drill a relief well would be approximately 97 days (which includes the approximate time taken to tow a rig from the North west shelf or Singapore), resulting in a total gas release of 12,500 MMscf and condensate release of 6,709 m^3.

BHP has previously assessed (as part of WOMP exercise) the minimum time to execute an emergency relief well including rig mobilisation would be 69 days (this figure includes a tow allowance of 23 days from northern Australia. As an alternative reference point, the Montara well blow out in 2009 response took 74 days until a relief well was successfully executed by that Operator. These include the planning for:

- Mobilise Rig (Assumed from South East [SE] Asia Worst Case). Rig Acquisition includes identify candidate rig, suspend other operators operation and pull anchors;
- Rig tow to well location of 23 days is based on 2200 miles at 4 knots;
- Drill to likely intercept point (9 5/8” production shoe) timings based on timings for typical offshore Australia well, plus 25 % contingency;
- Well kill assumes intercept achieved on 4th attempt with each intercept cycle taking 4 days based on Engineer’s best judgement; and
- Timings assume that if a stimulation vessel or supply vessel mounted pumping spread is required for well kill, the mobilisation time occurs concurrently with the rig mobilisation and drilling of the relief well.

While LOWC – tree removal scenario is considered the worst case discharge, it is also assessed to be non-credible or unrealistic due to controls that are in place. For this reason, the time to kill the well blowing out and stop any potential discharge, has not been provided in further definition, and relief well operations have been predicated as 97 days and would be conducted as per standard Minerva WOMP practices accepted by NOPSEMA Drilling Department (22/12/2017).

Table 8-11: Summary of LOWC – Tree Removal Volumes

Aspect	Description	Gas Volume (Worse Case Discharge)	Condensate Volume (Worse Case Discharge)	Timeframe
Loss of well control	Tree removal	12,500 MMscf	6,709 m^3	97 days

Table 8-12: LOWC - Tree Removal Description, Controls and Credibility Assessment

Description	Preventative Controls	Credibility Assessment
Complete loss of tree and non-functional SCSSV	• Robust lateral load resistant design (structural strength); • Flowline/Umbilical connectors represent weak point (not tree connector); • SCSSV is independent of tree and in event of loss of tree, SCSSV is expected to remain functional; • Lack of recognisable impact sources; and • No known analogues (not known to have occurred in industry).	Non Credible

The removal and loss of the Minerva subsea tree with a full failure of the SCSSV to close, renders the well flowing unrestricted to the seabed. To quantify the release rate, a nodal analysis calculation has been performed for the Minerva 4 well using Petroleum Experts PROSPER software. The release rate is that for a flowing well head pressure equivalent to 60 m sea water depth (8.6 barg). The flow rate for the well would continue until such a time as a relief well could be drilled and the well killed. Over this timeframe there is no significant reservoir depletion expected, and as such the release rate has been treated as constant for simplification.

The calculated release rate and volume for Minerva-4 LOWC – tree removal is presented in Table 8-13.

Table 8-13: LOWC - Tree Removal Calculated Release Rate

	Daily Release Rate	Cumulative Release (97 day response)
Gas Volume (MMscf)	129	12,500
Condensate (m^3)	69	6,709

8.5.3 Environmental Impact Assessment

8.5.3.1 Closed Valve Leakage

In the unlikely event of loss of the flowline or umbilical/flying lead small bore fittings connecting to the Subsea tree during operations, there is the potential for the release of production fluids (including hydrocarbons) or of chemicals (methanol, biocide, control fluid) to the marine environment. Impacts to seabed biota in the vicinity of the wells are negligible in the absence of any significant habitat.

The small volumes of gas (8,552 m^3) and condensate (0.16 m^3) released would undergo rapidly dilution, with effects localised to the release point.

8.5.3.2 Tree Removal – Non Credible

The worst case scenario of a complete LOWC by the removal of the subsea tree with failure of SCSSV is considered to be non-credible, from a sub-surface engineering perspective. The potential worst case volume of the gas and or condensate released if the wellhead is damaged would likely be a greater volume (gas 354 ksm^3/day, condensate 69 m^3/day) over 97 days but at a low leak rate. Further, as the reservoir is heavily depleted and it would not take long for the pressure above and below the well to equalise, and thereby for the hydrocarbon release to cease rapidly. This scenario would result in localised toxicity but as it is a low volume, it will likely disperse before it reaches the surface waters. At the cessation phase the wells are flushed and bull-headed and the SCSSV on each well will have been tested and closed. The SCSSV prevents the release of hydrocarbons from the reservoir even if a catastrophic event such as damage to the wellhead from an anchor drag occurs.

The volume of hydrocarbons through valve passing or when the jumper(s) are cut is less than 1 m^3. The low volume of hydrocarbons combined with the depth of the infrastructure (60 m) will result in the released hydrocarbon rapidly diluting and not exceeding surface water thresholds. Therefore the environmental impact from such an unplanned release is expected to be insignificant.

8.5.4 Demonstration of ALARP

A summary of the ALARP process undertaken for the environmental aspect is presented in Table 8-14. This process was completed as outlined in Section 6.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was not considered suitable (Table 9-8). The result of this ALARP Assessment contributes to the overall acceptability of the risk and impact.

Table 8-14: Loss of Well Control - ALARP assessment summary

Function	Controls	Accept/ Reject	Reason	Performance Standard
Eliminate	N/A			
Substitute	N/A			
Engineer	**Well Barrier Elements – Primary Well Barriers** • Casing Cement • Casing (Prod) Production packer • Tubing string • Subsea Hanger • Tubing Hanger seals • Tubing Hanger Plug • PMV Surface Controlled SCSSV piston and seal packing	A	**Operability:** Controls based on BHP requirements, such as fail closed valve design; Valve redundancy (SCSSV, PMV, PWV) and double Barrier well envelopes requirements must be accepted. Control is feasible, standard practice and with minimal cost	**PS 8.5.1.**
	Well Barrier Elements - Secondary Well Barriers • Casing cement • Casing (Surface) • Casing (Prod) • Casing Hanger & Seals • Wellhead • Subsea Tree to WH connector (VX) • Subsea tree internal • Internal tree cap • SCSSV control line • SIV • PMV • Chem injector vale C1 (CIV1) • Chem injector valve C2 (CIV2) • Crossover valve • Annulus Workover Valve (AWO)	A	**Operability:** Controls based on BHP requirements, such as fail closed valve design; Valve redundancy (SCSSV, PMV, PWV) and double Barrier well envelopes requirements must be accepted. Control is feasible, standard practice and with minimal cost	**PS 8.5.1.**

Function	Controls	Accept/ Reject	Reason	Performance Standard
	Annulus Master (Valve)			
Separate	N/A			
Administrative	Maintain Petroleum Safety Zones (500 m) and Cautionary Areas surrounding the fixed structures.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with the Petroleum Safety Zone regulations. **Cost:** Low	**PS 7.3.1**
	Maintain wells in accordance with the Minerva WOMP, including well valve leak off function tests.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with BHP internal procedure and OPGGS Act 2006. **Cost:** Low	**PS 8.5.1**
Contingency Planning	Minor leak response within 14 days in accordance WOMP practices.	A	**Environmental Benefit:** Reduce the volume of hydrocarbons to the environment through barrier system implementation. **Operability:** Legal obligation to comply with BHP internal procedure. **Cost:** Low	**PS 8.5.1**
	Relief well to be drilled in 97 days.	A	**Environmental Benefit:** Reduce the volume of hydrocarbons to the environment through relief well drilling implementation. **Operability:** Legal obligation to comply with BHP internal procedure. **Cost:** Low	**PS 8.5.1**
Pollution Control	Minerva OPEP implemented and maintained.			
Monitoring	Implement monitoring measures for Subsea trees as per WOMP practices described for LOWC tree removal	A	Controls based on BHP requirements, such as routine valve testing, must be accepted. Control is feasible, standard practice and with minimal cost	**PS 8.5.1**
	Post spill monitoring will include water quality, and potentially marine biota and other sensitive receptors.			

ALARP Summary

The risk assessment and evaluation has identified a range of controls that when implemented are considered to manage the risk of loss of well control to the marine environment. No additional or alternative controls were identified that could further reduce the risk and impact of a spill to the marine environment. The extensive mitigation and management controls outlined are therefore considered to reduce the risk to ALARP.

8.5.5 Demonstration of Acceptability

BHP considers a range of factors when determining that a level of impact and risk to the environment is broadly acceptable, as summarised in Table 8-15.

Table 8-15: Demonstration of acceptability for hydrocarbon release from subsea infrastructure

Criteria	Question	Demonstration
Codes and Standards	Is the impact or risk being managed in accordance with relevant legislation, Ministerial Conditions or standards?	Impacts and risks associated with unplanned release of hydrocarbons from subsea infrastructure will be managed in accordance with relevant legislation codes and standards.
ESD	Is the proposed impact consistent with the principles of ESD?	BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct, which endorse the continuous improvement in health, safety and environmental performance in ways that protect people and the environment through the responsible management of petroleum activities and their impacts. BHP considers that adherence to these principles is consistent with the principles of ESD.
Internal Context		
BHP Charter and HSEC Management System Compliance	Is the proposed impact or risk consistent with the requirements of BHP Our Requirements, Petroleum Standard and HSEC Management Systems?	The maintenance and integrity of subsea infrastructure will be in compliance with BHP Charter values and HSEC Management systems and will be consistent with activities authorised for the offshore petroleum industry.
Professional Judgement	Is the impact or risk being managed in accordance with industry best practice?	BHP will comply with relevant standards relating to the maintenance and integrity of subsea infrastructure to meet the performance outcome of preventing spills to the marine environment. Controls identified in this plan are consistent with industry best practice and guidelines. Accepted controls that will be implemented are provided in Table 8-14.
ALARP	Are there any further reasonable and practicable controls that can be implemented to further reduce the impact or risk?	All reasonable and practicable controls have been assessed (Table 8-14). Additional controls were considered but were found not to be justifiable in further reducing the impacts and risks of hydrocarbon release without a gross disproportionate sacrifice. BHP considers that the residual risk of hydrocarbon release from subsea infrastructure has been demonstrated to be ALARP.
External Context		
Environmental Best Practice	Are controls in place to manage the impacts and risk to the environment that are commensurate with the nature and scale of any environmental sensitivities of the receiving environment?	The environmental performance outcome, performance standards and measurement criteria that determine whether the performance outcome and performance standards have been achieved are commensurate with the environmental significance of the receiving environment.
Stakeholder Views	Do stakeholders have any concerns, if so, have controls been implemented to manage them?	Stakeholders have been consulted about the activities through a comprehensive and long-term consultation program. Stakeholder concerns have been considered for hydrocarbon releases from subsea infrastructure, and this is reflected in controls designed to mitigate impacts of the activity on environmental sensitivities in both of the AMBAs.

Acceptability Summary

Closed Valve Leakage

BHP has assessed the spill risk to the marine environment damage to a flowline and/or small bore fitting resulting in a valve leakage, and is managing the risk consistent with good oilfield practice/ professional judgement and environmental best practice. All relevant controls were considered in accordance with the

WOMP as part of the ALARP assessment, and as no other reasonably practicable additional controls were identified that would further reduce the impacts and risks of introduced marine species without a grossly disproportionate sacrifice, the impacts and risks are considered ALARP. BHP undertakes regular consultation with relevant stakeholders about its operations/ activities providing them with sufficient and reasonable opportunities to raise any new concerns or issues for the duration of this activity.

Given that the management is consistent with conditions of approval for the Development, BHP is satisfied that when the accepted controls are implemented the impact and residual risk to the marine environment is considered ALARP and that adherence to the performance standards will manage the impacts and risks to a LOWC to an acceptable level. On this basis, it is considered that adherence to the performance standards will manage the impacts and risks of closed valve leakage resulting in unplanned subsea release to an acceptable level.

Tree Removal

The worst case scenario of a complete LOWC by the removal of the subsea tree with failure of SCSSV is considered to be non-credible, from a sub-surface engineering perspective, and considered tolerable from an Environmental risk perspective. BHP has assessed the spill risk to the marine environment and is managing the risk consistent with good oilfield practice/ professional judgement and environmental best practice. All relevant controls were considered as part of the ALARP assessment, and as no other reasonably practicable additional controls were identified that would further reduce the impacts and risks of introduced marine species without a grossly disproportionate sacrifice, the impacts and risks are considered ALARP. BHP undertakes regular consultation with relevant stakeholders about its operations/ activities providing them with sufficient and reasonable opportunities to raise any new concerns or issues for the duration of this activity.

Given that the management is consistent with conditions of approval for the Development, BHP is satisfied that when the accepted controls are implemented, the impact and residual risk to the marine environment is considered ALARP and that adherence to the performance standards will manage the impacts and risks to a LOWC – tree removal to an acceptable level. On this basis, it is considered that adherence to the performance standards will manage the impacts and risks of tree removal resulting in LOWC resulting in unplanned subsea release to an acceptable level.

8.5.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Performance Outcome	Controls	Performance Standard	Measurement Criteria
No release to the marine environment.	All subsea infrastructure (including suspended) will be monitored in accordance with the Minerva WOMP to prevent loss of containment from the infrastructure.	**PS 8.5.1.** Minerva wells are managed in accordance with the Minerva WOMP in accordance with *the OPGGS (Resource Management and Administration) Regulations, 2011*, which includes the Minerva Well Integrity Management System to prevent loss of containment from the wells.	Records including well valve leak off and function testing indicate that wells are managed in accordance with the Management System.
	Navigation, bridge and communication equipment will be compliant with appropriate marine navigation and vessel safety requirements.	**PS 7.3.1.** **BHP Petroleum HSEC Controls, EC 1 Marine Operations: Marine Control 3: Facility Safety Zones: 3.1 Establishment of Safety Zone: Establish and maintain a Facility Safety Zone for Offshore Facilities:** Maintain an exclusion zone around the wells with a minimum distance of 500 m.	Breaches of vessel access within the 500 m exclusion zone during offshore activities recorded in Marine Logbook and reported via incident report form and documented in Monthly Incident Report and Environmental Performance Report.
	Notification of details of offshore activities to AMSA which triggers 'Notice to Mariners'	**PS 7.3.2.** Notification of details (e.g. location, duration of activities, etc.) of offshore activities (>7 days duration) to AMSA which triggers issue of MSI	Documentation of notification to AMSA and AHS advising of the

Performance Outcome	Controls	Performance Standard	Measurement Criteria
		notifications and to the AHS which will issue a 'Notice to Mariners'.	details of offshore activities >7 days.

8.6 Loss of Diesel from Marine Vessel

8.6.1 Summary of Impact and Risk Assessment and Evaluation

Aspect	Source of Risk	Impact	Consequence	Severity	Likelihood	Residual Risk	Acceptability
Diesel spill from ruptured fuel tank due to vessel collision	Tank rupture	Contamination / pollution of water column.	Visual pollution (i.e. slicks and sheens) potential acute toxic response over localised area.	3	Highly Unlikely	3	Tolerable

8.6.2 Source of Risk

Marine grade oil (diesel) is stored onboard vessels as a fuel for vessel engines and generators. There will be no bunkering in the offshore Operations Area during operations and so the potential for significant release of hydrocarbons to the marine environment is limited to a loss of bulk storage on a vessel as a result of a collision.

Rupture of a vessel fuel tank(s) requires a direct collision with enough force to rupture a wing tank. Direct stern and direct bow impacts are unlikely to rupture a fuel tank because the tanks in these areas are protected by overhang of the deck.

AMSA have analysed historical data (DNV, 2011[42]) to identify the spill frequency per year for all ship types and accident types. The overall frequency of collision accidents leading to a spill event in Australian waters is 1.6×10^{-5}). By applying a predicted spill size frequency distribution (based on historical data) it is possible to derive a plot of probability of release versus quantity of release, as indicated by Figure 8-1.

It considered that a credible worst-case would involve rupture of a single wing tank. The maximum volume likely to be released from a single tank rupture on a typical offshore vessel is approximately 125 m^3. The estimated probability of a release of this quantity is 2.72×10^{-6} (= 0.00027 %; refer to Figure 8-1). Since vessel tanks are typically filled to less than 90 % capacity, the maximum volume likely to be released from a single vessel tank rupture is approximately 100 m^3.

42 DNV. 2011. Final Report Assessment of the Risk of Pollution from Marine Oil Spills in Australian Ports and Waters. Report for Australian Maritime Safety Authority, Report No PP002916 Rev 5, 14 December 2011. Accessed from: http://www.amsa.gov.au/forms-and-publications/environment/publications/Other-Reports/index.asp

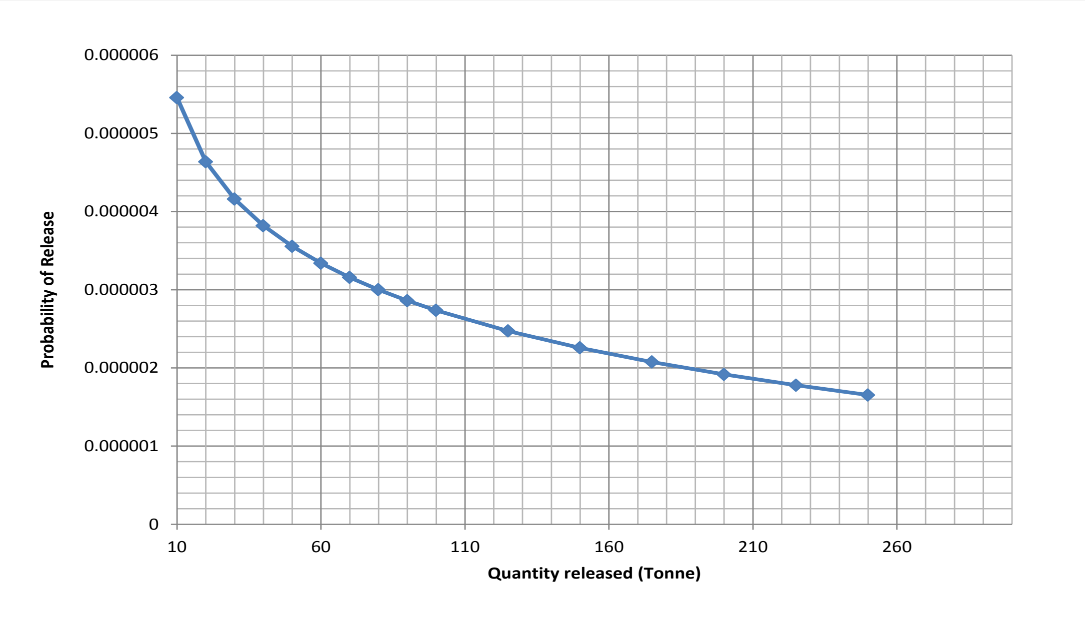


Figure 8-1: Estimation of probability of release of hydrocarbon from collision assuming a 1,000 tonne vessel, plotted against quantity of hydrocarbon released

(Adapted from DNV, 2011[43] data presented Appendix IV, Sections 3.5 and 3.7)

8.6.3 Environmental Impact Assessment

Diesel fuel is a light petroleum distillate with a predominance of 12 carbon atoms to 14 carbon atoms (C12 to C14) hydrocarbon compounds. Diesel fuels may vary in their properties depending on their origin and particular additives but are generally comprised of moderate concentrations of benzene, toluene, ethylene and xylene (BTEX) and low concentrations of polycyclic aromatic hydrocarbons (PAHs) of low molecular weight such as naphthalene, fluorene and phenanthrene.

The marine diesel oil is a medium grade (classified as a Group III oil) used in the maritime industry. The specific gravity of diesel ranges from 0.84 to 0.88 g/cm^3 (30 to 32 API) and the pour point varies between -17^{o}C and - 30^{o}C. Diesel fuels have a low viscosity of approximately 13 cSt (at 20^{o}C) and are categorised, using the International Tanker Owners Pollution Federation methods, as light persistent oils.

8.6.3.1 100 m^3 Diesel Spill

The AMBA in Section 4.1 for a 100 m^3 was determined by a weathering study for a diesel spill (100 m^3) as described in Section 2.1.1 of the Minerva OPEP (BHP, 2014). The weathering study was carried out with the ADIOS2 (Automated Data Inquiry for Oil Spills) software. ADIOS2 is an oil weathering model that incorporates a database containing more than a thousand crude oils and refined products, and provides estimates of the expected characteristics and behaviour of oil spilled into the marine environment.

The ADIOS 2 weathering study predicted that diesel spills of the nature identified above will spread and weather relatively rapidly. Under historical metocean conditions recorded in the area, the majority of surface spilled hydrocarbons will dissipate (86 %), and evaporate (14 %) after 6 hours (i.e. surface diesel would only be visible for the first 6 hours of the spill). In short, for the environmental conditions experienced in the Minerva Operations Area, diesel spills are predicted to undergo rapid spreading and this, together with evaporative loss, will result in a relatively rapid breakup of the slick.

BHP (2014) vector calculations of the potential transport of a 100 m^3 diesel spill predict that no hydrocarbons will come ashore. The output of the modelling and vector calculations showed that the maximum distance that a 100 m^3 spill of diesel was 8.2 km in any direction (BHP, 2014). A conservative boundary of 10 km from the Minerva Operations Area has been set for the unplanned diesel spill AMBA (Section 4.1).

[43] Op cit. 42

8.6.3.2 Diesel Spill Weathering

If diesel is spilled to sea surface, the more volatile BTEX components will evaporate or breakdown rapidly leaving behind the PAH components, which evaporate or breakdown more slowly over several days as it thins out on the water surface. For the environmental conditions experienced at the Minerva gas field and pipeline, diesel is expected to undergo rapid spreading and this, together with evaporative loss, will result in a relatively rapid slick break up. Figure 8-2 illustrates the predicted fate of diesel over time. The modelling indicates that 50 % of the diesel spilt will evaporate from sea surface within about 24 hours.

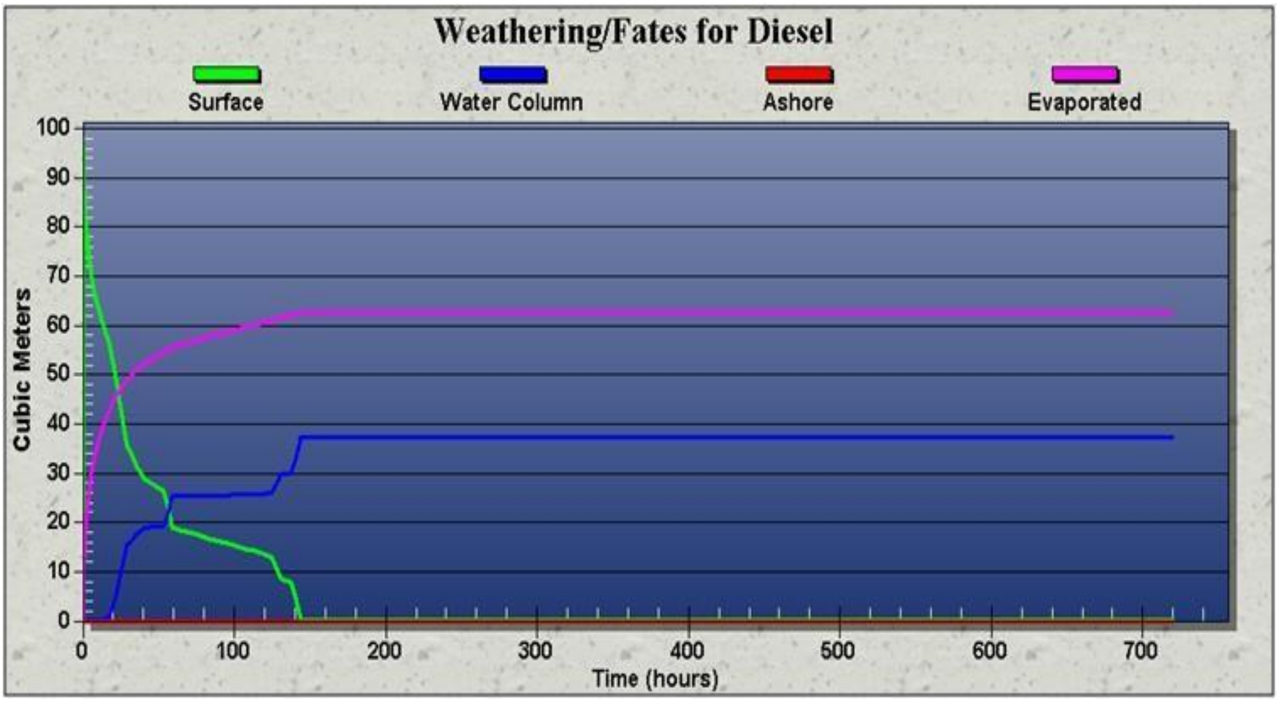


Figure 8-2: Predicted weathering and fates graph, as a function of volume, for a single spill trajectory. Results are based on an instantaneous 100 m^3 surface release of diesel tracked for 30 days

8.6.3.3 Potential Impact to Receptors from Marine Diesel

The BTEX components in diesel are the main source of toxicity to marine organisms and hence it is generally observed that the toxicity of spilled diesel decreases as the diesel weathers; decreasing from about 8 to 12 ppm for fresh to weathered diesel (Neff *et al.*, 2000). A diesel spill in the Minerva well field area will have an immediate, short term, acute localised impact on the water column biota in the vicinity of the spill origin.

Given the water depth (60 m), a surface spill of diesel will not impact directly on the seafloor benthos.

In the unlikely event of a vessel collision resulting in the loss of bulk storage marine diesel to the marine environment, the modelling and vector calculations predicted that diesel does not extend further than ~8 km from the operation area and does not contact any shoreline and thereby shoreline/intertidal habitats.

The potential sensitive receptors present in the immediate area of the diesel spill will include fish and marine mammals, marine reptiles and seabirds at the sea surface that become coated in diesel or through ingestion. The impact on these sensitive receptors is likely to be negligible and is likely to be limited to a small number of transient individuals, given the distance from the nearest shoreline, 12 km is the minimum distance from the expected spill at 10 μm threshold) and as there are no important areas of habitat present in the immediate vicinity. The potential impacts to the key values and sensitivities in the spill AMBA are described in the following.

Potential Impact to Key Species and Ecological Systems

Marine Mammals

Marine mammals (whales and dolphins) come to the sea surface to breathe air. They are therefore theoretically vulnerable to exposure to diesel spill impacts caused by intersecting an area of the slick on the sea surface. Whales and dolphins are smooth-skinned, hairless mammals, so oil tends not to stick to their skin and since they do not rely on fur for insulation, they will not be sensitive to the physical effects of exposure to diesel.

Small doses of diesel may cause acute fatal pneumonia in mammals when aspirated. Studies on effects of petroleum vapours on terrestrial mammals and seals showed (in cases of prolonged exposures and high concentrations) absorption of hydrocarbons in organs and other tissues, and damage to the brain and central nervous system (AMSA, 2013). However, short-term inhalation of petroleum vapours at concentrations similar to those found in oceanic oil spills may not be necessarily detrimental either in terms of structural tissue damage or respiratory gas exchange.

Ingested hydrocarbon, particularly the lighter fractions, can be toxic to marine mammals. Ingested oil can remain within the gastro-intestinal tract and be absorbed into the bloodstream and thus irritate and/or destroy epithelial cells in the stomach and intestine.

The way whales and dolphins consume their food may well affect the likelihood of their ingesting diesel. Baleen whales (such as humpback whales), which skim the surface, are more likely to ingest oil than toothed whales, which are 'gulp feeders' (Etkin, 1997[44]). Spilled diesel may also foul the baleen fibres of baleen whales, thereby impairing food-gathering efficiency or resulting in the ingestion of diesel or diesel-contaminated prey. Baleen whales may therefore be vulnerable to diesel when feeding. It should be noted that adult humpback whales, which are seasonally present and relatively abundant in the region, are not thought to be feeding during their migration through the region.

Studies of bottlenose dolphins, a species common throughout the region, found that this species was able to detect and actively avoid a surface slick after a few brief contacts and that there were no observed adverse effects of the brief contacts with surface slick (Smith *et al*., 1983[45]). It is not known if other marine mammals likely to be in the area are able to similarly detect and avoid diesel slicks. It has been proposed that even though whales and dolphins may be able to detect a diesel slick, the strong attraction to specific areas for breeding, feeding or resting may override any tendency to avoid hydrocarbons. The nearest such area is Exmouth Gulf, which is used as a resting area by humpback whales during the southern migration.

No information is available regarding the susceptibility or sensitivity of dugongs to diesel spills. Like whales and dolphins, they are likely to be able to detect a surface slick, but it is not known whether they will in fact do so or whether the brief contact may cause eye damage or other significant damage.

Marine Reptiles

Turtles: There is little documented evidence of the effect of diesel on turtles. Should turtles make contact with a spill, the impact is likely to include oiling of the body as well as irritations caused by contact with eyes, nasal and other body cavities and possibly ingestion or inhalation of toxic vapours (Jones, 1986[46]). Within the spill AMBA, turtles may be exposed to diesel, in the event of a large spill occurring, through direct contact with a surface slick. This can lead to the following effects on turtles (AMSA, 1998[47]):

- Digestion/absorption of hydrocarbons through food contamination or direct physical contact, leading to damage to the digestive tract and other organs; and
- Irritation of mucous membranes (such as those in the nose, throat and eyes) leading to inflammation and infection.

Turtles are vulnerable at beach nesting sites during the breeding season (September to March for green and loggerheads and July to March for hawksbill turtles). However, areas where offshore activities may occur are further from nesting beaches than the maximum distance trajectory analysis indicates surface hydrocarbons above impact threshold levels are expected to travel.

The very short duration of activities and the remote likelihood of a large spill occurring reduces the risk of impacts to turtle populations in the region.

44 Etkin, D.S. (1997). The impact of oil spills on marine mammals. OSIR Report 13 March 1997 Special Report.

45 Smith, T.G., Geraci, J.R. and St. Aubin, D.J. (1983). Reaction of bottlenosed dolphins, *Tursiops truncates*, to a controlled oil spill. Canadian Journal of Fisheries and Aquatic Science 40(9):1522–1525.

46 Jones, H.E. (1986). Marine Resource Map of Western Australia: Part 2 - The Influence of Oil on Marine Resources and Associated Activities with an Emphasis on Those Found in Western Australia. Report No. 74, Fisheries Department of Western Australia, Perth.

47 AMSA. (2013). The Effects of Maritime Oil Spills on Wildlife including Non-Avian Marine Life. Australian Maritime Safety Authority, Canberra. http://www.amsa.gov.au/environment/maritime-environmental-emergencies/national-plan/General-Information/oiled-wildlife/marine-life/index.asp. Accessed July 2014.

Fish

The toxicity of dissolved hydrocarbons and dispersed diesel to fish species has been the subject of a large number of laboratory studies. However, fish mortalities are rarely observed to occur as a result of diesel spills.

This has generally been attributed to the possibility that pelagic fish are able to detect and avoid waters underneath diesel spills by swimming away from the affected area. Where fish mortalities have been recorded, the spills have occurred in sheltered bays.

It is not known whether whale sharks would be able to detect and avoid diesel slicks as has been shown for other fish species. Whale sharks occasionally feed on plankton near or on the water surface and it is possible that they may come into direct contact with diesel, or even ingest diesel if a large-scale spill occurred when they are seasonally present.

Seabirds

Birds which congregate in large numbers on the sea or shorelines to breed, feed or moult are particularly vulnerable to hydrocarbon pollution. A seabird's immediate response to oiling is to preen itself. It has been shown that seabirds are able to preen themselves to remove small amounts of adhered hydrocarbon (Birkhead *et al*., 1973[48]). But, as it preens at its feathers, the bird also inhales or swallows toxic compounds that may damage its liver, lungs, kidneys, intestines, and other internal organs causing lethal or sub-lethal effects (Piatt *et al*., 1990[49]). The effect of diesel on the different life stages of seabirds has been the subject of several studies. Diesel ingested by nesting birds may reduce the fertility of eggs that are laid (Grau *et al*., 1977[50]).

Within the AMBA seabirds may be exposed to diesel, in the event of a diesel spill occurring, through feeding or contact with diesel adhered to other surfaces. Many seabirds found in the AMBA feed by picking or snatching prey from, at or near the water surface (for example frigate birds, noddies) or while paddling on the water (wedge-tailed shearwaters and petrels are examples) and in doing so can contact diesel on the sea surface. Accounts of seabird mortalities from spill events indicate that seabirds with these types of feeding habits are the most likely to be severely affected.

The potential exists for mortalities of seabirds in the event of a large (100 m^3) diesel spill occurring. The species with highest potential to be impacted are those that feed at sea near or on the water surface. Several of these species notably; the flesh-footed shearwater, the common noddy and petrels have relatively long fledgling periods, low rates of reproduction, or low clutch size, and are under stress from loss of habitat in other parts of their migratory range. Consequently impacts from a diesel spill event on local populations of these seabirds is possible but limited by the relatively small extent of the spill area (2 km) and the rapid degradation and hence toxicity of diesel with 24 – 48 hours.

Ecosystems

<u>Plankton and Pelagic Ecosystem Process</u>: The effects of hydrocarbons on plankton have been well studied in controlled laboratory and field situations. The different life stages of a species often show widely different tolerances and reactions to hydrocarbon pollution (Harrison, 1999[51]). Usually the eggs, larval and juvenile stages will be more susceptible than the adults.

Post-spill studies on plankton populations are few, but those that have been done have shown either no effects or temporary minor effects (Kunhold, 1978[52]). The prime reason put forward to explain the lack of observed effects is that many marine species produce very large numbers of eggs and larval stages to overcome natural losses (such as through predation by other animals; adverse hydrographical and climatic conditions; or failure to find a suitable habitat and adequate food). Therefore it is unlikely that any localised losses of eggs or larvae caused by a single diesel spill event in the open ocean would have a discernible effect on the size or health of future adult populations in the area.

A possible exception to this would be if the diesel spill slick were to coincide with, and be transported to, a mass synchronous spawning event, such as that which is known to occur for corals over a four to five-day period in March/April (Simpson, 1985[53]). Recently spawned gametes and larvae may be especially vulnerable

[48] Birkhead, T.R., Lloyd, C. and Corkhill, P. (1973). Oiled seabirds successfully clean their plumage. British Birds, 66:535–537

[49] Piatt, J.F., Lensink, C.J., Butler, W.B., Kendziorek, M. and Nysewander, D.K. (1990). Immediate impact of the 'Exxon Valdez' oil spill on marine birds. Auk, 107:387–397

[50] Grau, C.R., Roudybush, T., Dobbs, J. and Wathen, J. (1977). Altered yolk structure and reduced hatchability of eggs from birds fed single doses of petroleum oils. Science, 195:779–781.

[51] Harrison, P.L. (1999). Oil pollutants inhibit fertilisation and larval settlement in the scleractinian reef coral *Acropora tenuis* from the Great Barrier Reef, Australia. Sources, Fates and Consequences of Pollutants in the Great Barrier Reef and Torres Strait, GBRMPA: 11-12.

[52] Kunhold, W.W. (1978). Effects of the water soluble fraction of a Venezuelan heavy fuel oil (No. 6) on cod eggs and larvae. In: Wilson, M.P., McQuin, J.P. and Sherman, K. (eds). In the Wake of the Argo Merchant. Centre for Ocean Management Studies, University of Rhode Island. pp.126–130.

[53] Simpson, C.J. (1985). Mass Spawning of Scleractinian Corals in the Dampier Archipelago and the Implications for Management of Coral Reefs in Western Australia. Bulletin 244, Department of Conservation and Environment, Perth.

to diesel spill effects since they are generally positively buoyant and would be exposed to surface slicks. The potential impact of this exposure is likely to be mitigated by the very low likelihood of a large spill; a) occurring, and b) reaching the nearshore waters containing coral reefs where spawn would occur in significant density.

Macroalgae, Seagrass and Mangroves: No shoreline contact of diesel at or above the thickness threshold of 10 µm was predicted by the spill modelling, as such macroalgae, seagrass and mangroves are not predicted to be affected by a 100 m^3 diesel spill.

Potential Effect on Marine Park

An unplanned 100 m^3 diesel spill may traverse into a small section of the south west corner of Twelve Apostles Marine Park near the 3 nm State water boundary. Indeed, oil spill modelling of 100 m^3 release of diesel has shown that the maximum distance diesel would disperse in a worst case scenario is 8.2 km but that there would be no shoreline contact anywhere along the adjacent islands or mainland. Importantly, the iconic rock formations of the Twelve Apostles Marine National Park are 10.5 km from the Minerva-3 well and pipeline. Therefore, no surface oil contact with any important shallow water subtidal, intertidal or rock formation of environmental value within the marine park is predicted nor is any shoreline accumulation predicted. Similarly, no conservation values of The Arches Marine Sanctuary are predicted to be contacted by a 100 m^3 diesel spill.

Potential Effect on Socio-Economic Factors

Tourism

Tourism within the region is focussed on coastal and nearshore marine recreation activities. As shoreline contact from a 100 m^3 diesel spill is predicted to not occur, it is unlikely that tourism would be significantly affected.

Fisheries

The level of fishery activities in the zone of potential impact is low. It is possible that commercial and recreational fishing activities may be hampered if commercial fishing is prohibited in the spill AMBA. However, this area potentially affected represents a very small proportion of the low intensity fishery zones and the consequences would be very minor if any at all.

Shipping

No impact on shipping is predicted to occur in the event of large diesel spill.

Risk Evaluation Summary

In the event of a vessel collision within the offshore Operations Area, the potential for impacts would be limited due to the rapid spreading of the diesel released on the sea surface, the short period that volatile components would remain and the relatively small area over which diesel would persist at concentrations above impact threshold levels. Therefore, a spill may result in acute impacts to a small number of individuals but is unlikely to impact the viability of local populations. Impacts on socio-economic values would similarly be limited by the relatively short duration and extent of a surface spill.

The potential consequences of a large (100 m^3) diesel spill were considered to be moderate. However, given that offshore activities will typically involve only a single vessel operating in accordance with all maritime standards and regulations, and the very short duration (one to two weeks annually) that the vessel is expected to be undertaking offshore activities, the likelihood of a collision occurring and resulting in a spill that causes moderate consequences was determined to be very rare. With the controls that will be implemented, the residual risk is considered tolerable.

Species Recovery Plans, Approved Conservation Advice and Threat Abatement Plans

BHP has considered information contained in recovery plans, approved conservation advice and threat abatement plans (refer to Table 4-7).

The activity will be undertaken with control measures in place to minimise the risk of marine oil pollution events which are consistent with legislative codes, standards and procedures, and good oil field practice. The combination of the preventative control measures (to reduce the likelihood of the event occurring) and spill response strategies (which are aimed at reducing the consequence of the event) together reduce the potential for habitat degradation and/or modification from spill events.

BHP's OPEP and response strategies include oiled wildlife response and management measures for marine fauna and their habitats. Implementation of these measures is prioritised based on the relative sensitivities and conservation significance of the fauna involved. Therefore the OPEP includes management for conservation species and their habitats, consistent with the requirements of the relevant recovery plans, approved conservation advice and threat abatement plans.

With control measures in place, in line with the relevant actions prescribed in the recovery plans, approved conservation advice and threat abatement plans, the activity will be conducted in a manner that reduces potential impacts from an unplanned spill event (diesel) to ALARP and an acceptable level.

8.6.4 Demonstration of ALARP

A summary of the ALARP process undertaken for the environmental aspect is presented in Table 8-16. This process was completed as outlined in Section 6.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was not considered suitable (Table 8-16). The result of this ALARP Assessment contributes to the overall acceptability of the risk and impact.

Table 8-16: Diesel Spill: bulk storage - ALARP assessment summary

Function	Controls	Accept/ Reject	Reason	Performance Standard
Eliminate	N/A			
Substitute	N/A			
Engineer	NA			
Separate	N/A			
Administrate	Maintain a 500 m exclusion zone around the wells. Wells and pipeline are gazette and marked on navigational charts.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with the Petroleum Safety Zone regulations. **Cost:** Low	**PS 7.3.1**
	Notification of details (e.g. location, duration of activities, etc.) of offshore activities to AMSA which triggers issue of Maritime Safety Information (MSI) notifications and to the Australian Hydrographic Service (AHS) which will issue a 'Notice to Mariners'.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with AMSA regulations. **Cost:** Low	**PS 7.3.2**
	Vessels will comply with AMSA Marine Orders - Part 91: Marine Pollution Prevention – Oil, as appropriate to vessel class.	A	**Environmental Benefit:** Required information to evaluate performance requirements. **Operability:** Legal obligation to comply with Marine Orders. **Cost:** Low	**PS 8.4.1**
Pollution Control	Minerva OPEP implemented and maintained.			
Monitoring	Bridge-watch on all vessels to be maintained 24-hours per day.			
	Conduct regular stakeholder Community Reference Group Meetings.			

ALARP Summary

The risk assessment and evaluation identified a range of controls that when implemented are considered to manage the risks and impacts of a diesel spill of bulk storage from a vessel collision to the marine environment. No alternative options to the use of vessels are possible in order to undertake the offshore activities. Bulk storage of diesel is required onboard the vessels as a fuel for vessel engines and generators. Without bulk storage of diesel onboard the vessels, excessive additional refuelling at sea would be required. The storage of excessive supplies of fuel would also add additional safety and environmental risks to the offshore activities, which in turn would have a greater consequence in the unlikely event of a vessel collision resulting in a tank rupture. As no additional reasonable control measures were identified to reduce the environmental risk of vessel collision and subsequent impact, the risks and impacts are considered ALARP.

8.6.5 Demonstration of Acceptability

BHP considers a range of factors when determining that a level of impact and risk to the environment is broadly acceptable, as summarised in Table 8-17.

Table 8-17: Demonstration of acceptability for unplanned diesel spill from bulk storage

Criteria	Question	Demonstration
Codes and Standards	Is the impact or risk being managed in accordance with relevant legislation, Ministerial Conditions or standards?	Impacts and risks associated with an unplanned diesel spill from bulk storage will be managed in accordance with relevant legislation (e.g. *Navigation Act* 2012), codes and standards (e.g. MARPOL, Marine Orders) and BHP Standards.
ESD	Is the proposed impact consistent with the principles of ESD?	BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct, which endorse the continuous improvement in health, safety and environmental performance in ways that protect people and the environment through the responsible management of petroleum activities and their impacts. BHP considers that adherence to these principles is consistent with the principles of ESD.
Internal Context		
BHP Charter and HSEC Management System Compliance	Is the proposed impact or risk consistent with the requirements of BHP Our Requirements, Petroleum Standard and HSEC Management Systems?	The management of diesel in bulk storage will be in compliance with BHP Charter values and HSEC management systems.
Professional Judgement	Is the impact or risk being managed in accordance with industry best practice?	Navigation aids on the vessels (including lighting, compass/radar), bridge and communication equipment will be compliant with appropriate marine navigation and vessel safety requirements; AIS will be fitted and maintained in accordance with Regulation 19-1 of Chapter V of Safety of Life at Sea (SOLAS); crew undertaking vessel bridge-watch will be qualified in accordance with International Convention of STCW95, AMSA Marine Order - Part 3: Seagoing Qualifications or certified training equivalent; and bridge-watch on all vessels to be maintained 24-hours per day. Notification of the location of the offshore activities and timing, etc., will be issued to AMSA RCC and the Australian Hydrographic Office (AHO) which lead to the issue of an AusCoast Warning and a 'Notice to Mariners'. Controls identified in this plan are consistent with industry best practice and guidelines. Accepted controls that will be implemented are provided in Table 8-17.
ALARP	Are there any further reasonable and practicable controls that can be implemented to further reduce the impact or risk?	All reasonable and practicable controls have been assessed (Table 8-17), additional controls were considered but were found not to be justifiable in further reducing the impacts and risks of an unplanned diesel spill from bulk storage without a gross disproportionate sacrifice. BHP considers that the residual risk of a diesel spill from bulk storage has been demonstrated to be ALARP.
External Context		

Criteria	Question	Demonstration
Environmental Best Practice	Are controls in place to manage the impacts and risk to the environment that are commensurate with the nature and scale of any environmental sensitivities of the receiving environment?	The environmental performance outcome, performance standards and measurement criteria that determine whether the performance outcome and performance standards have been achieved are commensurate with the environmental significance of the receiving environment.
Stakeholder Views	Do stakeholders have any concerns, if so, have controls been implemented to manage them?	Stakeholders have been consulted about the activities through a comprehensive and long-term consultation program. Stakeholder concerns have been considered for an unplanned diesel spill from bulk storage, and this is reflected in controls designed to mitigate impacts of the activity on environmental sensitivities in both of the AMBAs.

Acceptability Summary

In the unlikely event of a vessel collision resulting in the loss of bulk storage marine diesel to the marine environment, the stochastic modelling undertaken predicts that no surface diesel at or above the minimum thickness threshold of 10 µm would approach or contact any shoreline. Following a diesel spill, surface waters to the southwest of the diesel release location would most likely to come into contact with diesel above 10 µm thickness threshold.

The proposed management controls for preventing and minimising the risk of vessel collision resulting in the loss of bulk storage marine diesel are comprehensive and consistent with all relevant codes and standards including the *Navigation Act 1912*, SOLAS 1974 and Marine Order – Part 30: Prevention of Collisions.

In the event of a vessel collision occurring resulting in a diesel spill, the relevant codes and standards for mitigation measures include MARPOL Annex 1 (Prevention of Pollution by Oil) that includes the requirement for a current Shipboard Oil Pollution Emergency Plan for all vessels over 400 gross tonnage. In addition, BHP has developed the Minerva OPEP to deal with the impacts of an emergency situation in this scenario in conjunction with the vessel SOPEP.

BHP is satisfied that when the accepted controls are implemented the impact and residual risk of an unplanned diesel spill from bulk storage to the environment is considered ALARP. Furthermore, the adopted controls are considered to be consistent with good oilfield practice/ professional judgement and environmental best practice. The management and storage of bulk diesel will comply with all relevant laws, codes and standards, as well as the BHP Charter and HSEC Management Systems. All relevant controls were considered as part of the ALARP assessment, and as no other reasonably practicable additional controls were identified that would further reduce the impacts and risks of an unplanned diesel spill from bulk storage without a grossly disproportionate sacrifice, the impacts and risks are considered ALARP. BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct and hence the principles of ESD. Stakeholders have been consulted about the Activity and appropriate control measures will be implemented to address any concerns that were raised. BHP undertakes regular consultation with relevant stakeholders about its operations/ activities providing them with sufficient and reasonable opportunities to raise any new concerns or issues for the duration of this activity. On this basis, it is considered that adherence to the performance standards will manage the impacts and risks of an unplanned diesel spill from bulk storage to an acceptable level.

8.6.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Performance Outcome	Controls	Performance Standard	Measurement Criteria
No accidental release of hydrocarbons to the marine environment from vessel collision.	Navigation, bridge and communication equipment will be compliant with appropriate marine navigation and vessel safety requirements.	**PS 7.3.1.** **BHP Petroleum HSEC Controls, EC 1 Marine Operations: Marine Control 3: Facility Safety Zones: 3.1 Establishment of Safety Zone: Establish and maintain a Facility Safety Zone for Offshore Facilities:**	Breaches of vessel access within the 500 m exclusion zone during offshore activities recorded in Marine Logbook and reported via incident report form and documented in Monthly Incident Report

Performance Outcome	Controls	Performance Standard	Measurement Criteria
		Maintain an exclusion zone around the wells with a minimum distance of 500 m.	and Environmental Performance Report.
	Notification of details of offshore activities to AMSA which triggers ‘Notice to Mariners’	**PS 7.3.2.** Notification of details (e.g. location, duration of activities, etc.) of offshore activities (>7 days duration) to AMSA which triggers issue of MSI notifications and to the AHS which will issue a ‘Notice to Mariners’.	Documentation of notification to AMSA and AHS advising of the details of offshore activities >7 days.
	Vessels will comply with the following marine orders.	**PS 8.4.1.** **Vessels will comply with AMSA Marine Orders - Part 91:** Marine Pollution Prevention – Oil, as appropriate to vessel class.	Record of vessels complying with Marine Orders.

9 Hydrocarbon Spill Response

As required by Regulation 14(8AA) of the OPGGS (E) Regulations, BHP has prepared the Minerva OPEP. The OPEP is the primary reference document and key control measure to be implemented in the event of an oil spill during the offshore activities and has been developed as a formal means of establishing the processes and procedures to ensure that BHP maintains a constant vigilance and readiness to prevent and, where required, respond to and effectively manage oil spill incidents that may occur during the offshore activities. The OPEP has been developed to be compliant with the OPGGS (E) Regulations.

This section of the EP provides a description of the proposed oil spill response strategies based on the credible and worst-case spill scenarios that could occur during the offshore activities. The response strategies presented are based on the outcome of a Strategic Net Environmental Benefit Analysis (NEBA). For each of the proposed response strategies, their benefits and constraints are presented along with an assessment of the associated risks and impacts that may occur from their implementation.

9.1 Source of Risk

This Environment Plan has identified all credible and worst-case hydrocarbon spill scenarios defined as Level 1 and Level 2 below:

- Level 1: Unplanned chemical and refined oil offshore spills of <80 L (refer to 8.4);
- Level 2: Unplanned hydrocarbon release from subsea infrastructure releases of 50 m^3/day (refer to Section 8.5); and
- Level 2: Unplanned diesel spill as a result of vessel collision resulting in a ruptured fuel tank – 100 m^3 diesel spill (refer to Section 8.6).

9.2 Strategic Net Environmental Benefit Analysis of Response Options

In the oil spill response planning process, BHP has adopted a comprehensive NEBA methodology to select and justify the appropriate response strategy combinations for individual credible and worst-case hydrocarbon spill scenarios. A strategic NEBA was conducted in a workshop to select the potential oil spill response strategies in the event of a Level 1 or 2 hydrocarbon spills. The focus of the NEBA was to understand the consequences of ‘no action’ and to select an oil spill response strategy that delivered a net environmental benefit using the OPEP Priorities.

The NEBA methodology utilised is described as follows:

- LIST the response strategies available;
- IDENTIFY the benefit, environmental impact and operational challenge of each response strategy;
- EVALUATE the viability of each response strategy in a particular credible scenario;
- FILTER the result to identify all the viable strategies for a particular credible scenario;
- FORMULATE options of different strategy combinations; and
- COMPARE these options and select the preferred option of strategy combination.

From these results, the priority application ZONE of each strategy is identified in the preferred strategy combination by selecting the:

- Primary response strategy, which is confirmed to be used and should be applied as soon as possible;
- Secondary response strategy, which will be only applied if needed and practical; and
- Nil response strategy, which is a non-preferred option, will not be used and does not identify a net environmental benefit.

In the event of an oil spill, an Operational NEBA will be undertaken to select spill response options that have a net environmental benefit. It is likely that spill response will involve a combination of response options and will evolve over time as conditions change.

9.2.1 Strategic NEBA Level 1 and 2 - 10 to 100 m^3 Hydrocarbon Releases

The vessels for Minerva offshore activities will have a current vessel specific SOPEP in accordance with the requirements of AMSA Marine Orders 91. These plans outline responsibilities, specify procedures and identify resources available in the event of an oil or chemical spill. Spills that occur beyond the capability of the vessel will be managed in accordance with the OPEP.

The worst-case scenario for the credible discharge of 100 m^3 indicates there is a 0 % probability of shoreline contact anywhere in the open ocean or along the Australian mainland and islands.

Table 9-1 provides the results of the strategic NEBA and summarises the benefits and impacts of the different response strategies for responding to a diesel spill. In normal conditions, evaporation and dispersion is likely to naturally occur for a diesel spill in open waters. The diesel spill would spread and thin very quickly to less than a 1 µm surface film, and recovery of diesel is not considered practical with such a thin film thickness. No response strategies that recovered or dispersed oil were considered to provide a net environmental benefit. The response strategy (RS) for a 50 to 100 m^3 hydrocarbon release would therefore include the following:

- Report spill;
- Implement SOPEP;
- Source Control - Well and Subsea Infrastructure (RS 1.1);
- Source Control: Vessel Control (RS1.1);
- Mobilise IMT:
    - For support to control source of spill;
    - For supply and logistics support during surveillance;
- Monitor and Evaluate (RS2) using boats, aircraft observation and tracker buoys as required;
- Shoreline Clean-up (RS8) potentially activated for Level 2 (100 m^3 diesel spills) depending on reports/ observations of RS2: Monitor and Evaluate);
- Natural Recovery (RS9);
- Environmental Monitoring (RS10) (for Level 2 spills only);
- Oiled Wildlife Response (RS11);
- Forward Command Post potentially activated for Level 2 (100 m^3 diesel spills) depending on reports/ observations of RS2: Monitor and Evaluate; and
- Waste Management (RS13).

Further detail on the response strategies is contained in the OPEP Section 4.1. In the event of a spill, Operational NEBAs (refer to Section 3.2 of the OPEP) will be completed daily, to take into account spill trajectories, prevailing weather and planned actions for the day.

9.2.1.1 Response Strategies Screened Out for Level 1 and 2 Spills

Table 9-1 includes those response strategies that are not feasible for Level 1 and 2 spills:

- Dispersants: vessel and aerial application;
- Marine Recovery;
- Shoreline Protection;
- Mechanical Dispersion; and
- In-Situ Burning.

Table 9-1: Strategic NEBA response to 10 to 100 m^3 hydrocarbon release

RS #	Strategy	Benefits	Impacts	Constraints	Apply	Priority
RS1.1	Source Control – Vessel Control	Limits the release of diesel discharged to environment (e.g. pump out leaking tank, repair leak). Prevent oil entering environment.	No significant impacts	Source control may be delayed in serious incident where safety of personnel is priority.	Yes	Primary
RS2	Monitor and Evaluate – Aerial and/or Marine Surveillance	Constant monitoring and evaluation by surveillance is a mandatory strategy required for real time decision making during a spill event.	Noise from vessels and aircraft. Interference to marine fauna. Vessel collision. Obstacles to other sea users.	Weather constraints for use of aerial observation. Metocean constraints for use of marine observation Navigation of multiple vessels within a small area.	Yes	Primary
RS3	Dispersants – Vessel Application; Aerial Application	Can remove oil from sea surface and dilute into water column, but no significant benefit to high sensitivity receptors. Due to constraints – only a small proportion of diesel potentially treated (may be nil). Entrained diesel will break down faster and lowers impacts on sea surface fauna.	Discharge of dispersant into environment. Adds chemical to environment when spill is not likely to impact high or extreme environment receptors.	Diesel spreads and weathers rapidly and window for application is less than mobilisation time for aerial spraying. Weather, dispersant to oil ratio (DOR) and efficacy (dispersant effectiveness) may limit option. In high winds, natural dispersion is more beneficial.	No	Nil
RS4	Containment and Recovery	If effective, can physically remove floating surface oil from the water, thereby preventing shoreline impacts. Recovered oil may be reprocessed.	Operation of vessels (e.g. burn fuel, physical presence, discharges) for placement and movement of booms. Waste disposal of recovered oily water. Cleaning and disposal of contamination from boom.	Inefficient and impractical on thinhydrocarbons. Requires surface oil thick enough, typically Bonn Agreement Oil Appearance Code 4 (discontinuous true colour) and 5 (continuous true oil colour). Metocean conditions, skimmer/pump selection, operating hours may limit efficiency of oil recovery in the offshore environment. Boom deployment may be delayed in serious incident where safety of personnel is priority. Diesel spreads rapidly and unlikely to encounter films greater than 20 to 25 microns. Thick films are required for boom to be effective in corralling surface diesel.	No	Nil
RS5	Shoreline Protection	Can deflect diesel from sea surface for capture and recovery and/or dilute into water column.	Operation of vessels (e.g. burn fuel, physical presence, discharges).	Diesel spreads and weathers rapidly and window for application is likely to be less than mobilisation time for spraying operation. Equipment uptime and usability affected by metocean conditions and access to coastal, nearshore areas. Modelling predicts no shoreline contact	No	Nil

RS #	Strategy	Benefits	Impacts	Constraints	Apply	Priority
RS6	Mechanical Dispersion	Very small quantities of oil dispersed due to design of vessels, no significant benefit.	Operation of vessels (e.g. burn fuel, physical presence, discharges).	Offshore vessel propellers are designed to not cavitate, so not efficient at breaking up hydrocarbon films. Small particle size required otherwise material resurfaces. Wind speeds above 20 knots provide natural dispersion, making method redundant. Cannot be performed on recently release diesel – potential for fumes and formation of emulsion.	No	Nil
RS7	In-Situ Burning	High oil elimination rate possible. Minimal environmental impact.	Operation of a 4 vessel spread (2 x boom sweep, 1 x igniter, and 1 x observer). Black smoke and localised reduction in air quality.	Diesel spreads rapidly and unlikely to encounter films greater than 20 to 25 microns. Thick films are required to be concentrated to get an ignitable thickness (>3 mm). Unlikely diesel can be ignited. Requires specialist equipment and expertise from outside Australia. Inefficient in inclement weather, high seas. Not previously used in Australian response. Burn residue can be difficult to recover and requires disposal.	No	Nil
RS8	Shoreline Clean-up	Benefits outweigh impacts.	Labour intensive. Logistics. Waste management.	Shoreline characteristics (substrate type, beach type, exposure to wave action, biological, social, heritage or economic resources). Clean up efficiency depends on manual and mechanical tools/machinery and oil state.	Standby – Level 2 spills only	Secondary
RS9	Natural Recovery	No additional impacts associated with response activities.	No significant impacts.	No constraints.	Yes	Primary
RS10	Scientific Monitoring	Benefits outweigh impacts. Primary tool for determining the extent, severity and persistence of environmental impacts from oil spills and how effective oil spill response is being in protecting the environment.	Labour intensive. Logistics. Operation of vessel (e.g. burn fuel, physical presence, discharges). Noise from support vessels and aircraft. Vessel collision. Obstacles to other sea users.	Weather constraints.	Yes – Level 2 spills only	Secondary
RS11	Oiled Wildlife Response	Pre-oiling activities including onshore exclusion barriers, hazing and pre-emptive capture used to reduce incidence of animals becoming oiled. Post-oiling activities including collection and rehabilitation to treat oiled fauna and return to similar suitable habitat.	Labour intensive. Logistics. Operation of vessel (e.g. burn fuel, physical presence, discharges). Hazing: Accidentally drive oiled wildlife into oil, or separate groups/individuals (e.g. parent/ offspring pairs).	Wind is a key constraint, calm seas and ideal conditions are considered necessary for capture operations. Weather constraints for use of aerial observation/ tracking fauna. Navigation of multiple vessels within a small area.	Yes	Secondary

RS #	Strategy	Benefits	Impacts	Constraints	Apply	Priority
		Utilisation of local skilled veterinarians for treatment of oiled wildlife.	Pre-emptive capture and post-oiled collection: Risk of injury and inappropriate field collection/ handling during pre-emptive capture and post-oiled collection. Rehabilitation: inadequate/ inappropriate animal husbandry leading to stress/ injury/ death. Inappropriate relocation points leading to disorientation / stress.	Availability of suitable space/ location in township to handle rehabilitation and fauna treatment.		
RS12	Forward Command Post (FCP)	Marine/shoreline operations can be managed from the FCP. Limited local resources required for response to this level spill.	Logistics. Mobilisation of personnel to Melbourne / Warnambool – aviation fuel, etc.	Grab bag for 1st Response.	Standby – Level 2 spills only	Secondary
RS13	Waste Management	Benefits outweigh impacts. Oiled waste removed from site by trained contractors and dealt with at an approved waste management facility.	Labour intensive. Logistics.	Low persistence hydrocarbon not expected to generate any waste. Logistics constraints in moving waste from site to approved waste facility.	Yes	Secondary

9.3 Evaluation of Impacts and Risks

9.3.1 Evaluation Process

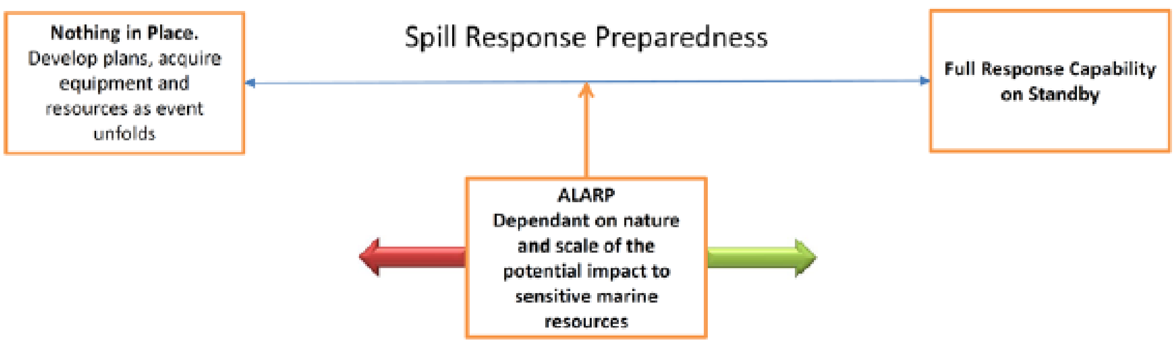
For each response strategy, the following is provided:

- A summary of the Response Strategy 'Activity';
- The potential environmental impacts and risks associated with the implementation of the Response Strategy;
- The hierarchy of controls to mitigate the risks and impacts for implementation of the Response Strategy including an evaluation of the effectiveness of the controls;
- Demonstration of ALARP(described in further detail below);
- Demonstration of Acceptability; and
- The environmental performance standards required to maintain risks and impacts associated with implementation of the Response Strategy to ALARP.

In considering the approach to demonstrate ALARP for an unplanned event, the focus is upon examining ways in which it is possible to mitigate the consequences of the event and in particular what is reasonable to have in place in terms of preparedness for a spill response event. In the case of demonstrating ALARP for oil spill response, it is necessary to define the objective for which ALARP option will be evaluated. The objective in this case is:

To prevent or minimise the impact to sensitive environmental resources

In the case of demonstrating ALARP for spill response preparedness the assessment must evaluate what is the level of preparedness that should be in place to implement the response strategy?



To evaluate the ALARP level of preparedness for each response strategy the following guide questions were used to consider potential controls for a response in the following categories:

- Planning and Design;
- Resources; and
- Equipment.

Planning and Design Guidewords:

Aspect	Guidewords
No Procedures or Plans	Develop response plans and procedures at time of event.
Generic Plans Developed	Generic plans in place that can be applied to the specific response scenario.
Contracts in place	Contract in place with specialist service provider to develop incident specific plans.

Campaign Specific Plans Developed	Plans are developed for a specific region or activity.
Industry Drills	Similar desk top drills and exercises conducted (Other operator / other regions) may include physical deployment.
BHP Drills	Similar desk top drills and exercises conducted by BHP.
APU Desk Top Exercise	Desk top exercise for the spill response strategy conducted by APU Incident Management Team (IMT).
Deployment and drills conducted on location	Field based testing of response plans on location of activity.

Resource Guidewords:

Aspect	Guidewords
No Personnel Identified	All personnel that would be used for the response option would be identified and sourced at time of event
Resource Lists	Personnel lists developed but where personnel would be sourced from has not been identified
Personnel via Contract	Contract in place to obtain Personnel. Personnel would be ordered at time of event
International Personnel	Personnel are available international through cooperative arrangement in place (i.e. Oil spill response limited [OSRL])
Regional Personnel	Personnel are available regionally through cooperative arrangement in place (i.e. AMOSC)
Local Personnel	Personnel are available at Geelong
Dedicated Personnel on Standby at Location	Some personnel in field/trained ready for immediate deployment

Equipment Guidewords:

Aspect	Guidewords
No Equipment in place	All equipment that would be used for the response option would be identified and sourced at time of event.
Equipment Lists	Equipment lists developed but where equipment would be sourced from has not been identified.
Equipment Lists and Contracts	Contract in place to obtain equipment/service. Equipment/service would be ordered at time of event.
Equipment Stockpile International	Equipment is available international through cooperative arrangement in place (i.e. OSRL).
Equipment Stockpile Regional	Equipment is available national through cooperative arrangement in place (i.e. AMOSC).
Equipment Stockpile Local	Equipment is available at Geelong.
Partial Equipment on Standby	Some equipment is in field ready for immediate deployment.
Dedicated equipment on location and ready to mobilise	All equipment is in field ready for immediate deployment.

In developing the performance standards that apply to the Response Strategy, BHP has considered the level of performance that is reasonable to achieve for each control measures and the ‘effectiveness’ of the control measures.

The effectiveness of the control measures is assessed considering the following criteria and follows the definitions in NOPSEMA (2012; N04300-GN0271)[54], with ranking provided in Table 9-2:

- Availability: the status of availability to BHP;
- Functionality: a measure of functional performance;
- Reliability: the probability that the control will function correctly;
- Survivability: the potential of the control measure to survive an incident; and
- Independence / Compatibility: the degree of reliance on other systems and/ or controls, in order to perform its function.

Table 9-2: Evaluation criteria for ranking effectiveness

Evaluation Criteria	Effectiveness Ranking	
	Low	High
Availability	BHP does not have equipment/ resources on standby, or contracts, arrangements, and/ or Memorandum of Understanding's (MoU's) in place for the provision of equipment/ resources. BHP has internal processes and procedures in place to expedite timely provision of equipment/ resources.	BHP has equipment/ resources on standby, and/ or contracts, arrangements, or MoU's in place for the provision of equipment/ resources.
Functionality	Implementation of the control measure does not greatly reduce the risk/ impact.	Implementation of the control measure has material difference in reducing the risk/ impact.
Reliability	The control measure is not reliable (e.g. has not been tried and tested in Australian waters) and/ or low assurance can be given to its success rate/ effectiveness.	The control measure is reliable (e.g. has been tried and tested in Australian waters) and/ or high assurance can be given to its success rate/ effectiveness.
Survivability	Control measure has a low operating timeframe and will need to be replaced regularly throughout its operation period in order to maintain its effectiveness.	Control measure has a high operating timeframe and will not need to be replaced regularly throughout its operation period in order to maintain its effectiveness.
Independence/ Compatibility	Control measure is reliant on other control measures being in place and/ or the control measure is not compatible with other control measures in place.	Control measure is not dependent on other control measures being in place and / or control measure can be implemented in unison with other control measures.

Each control was then evaluated taking into consideration the environmental benefit gained from implementation compared with its practicability (i.e. control effectiveness, cost, response capacity and implementation time) to determine if the control was either:

- Accept and implement; or
- Reject.

9.3.2 RS1 Source Control – Vessel Control

9.3.2.1 Summary of Activities

Source Control – Vessel Control methods are implemented for Level 1 and 2 spills and is the primary response strategy for responding to single point releases from bulk diesel storage tank rupture from vessel collision. Source Control-Vessel Control will be activated immediately by persons onboard, under the direction of the Vessel Master, to reduce or control the discharge and conducted according to the vessel-specific MARPOL-compliant SOPEP for vessels, as required under *International Convention for Protection of the Sea (Prevention*

[54] NOPSEMA (2012). Control Measures and Performance Standards Guidance Note. N040300-GN0271 Revision No. 4. December 2012.

of Pollution from Ships) Act 1983; AMSA Marine Orders – Part 91 and Part 94; and MARPOL Annexes I and III. Source Control – Vessel Control activities will always include consideration of human health and safety.

Source Control – Vessel Control activities will be dependent on the type of incident but may include:

- Closing valves, isolating pipework and shutting down pumps to halt the flow of hydrocarbons from the source point;
- The use of temporary patches or bungs/ plugs to seal holes to prevent further releases, until more permanent measures can be made;
- The use of spill response equipment located around the vessel, including small booms, absorbent pads, spill absorbent litter, spill recovery containers, permissible cleaning agents and other materials available onboard to clean-up spilled material on deck. Remaining oily spill residues on decks or other surfaces may be washed into drains leading to the oil-water separator system to treat the effluent prior to discharge; and
- The transfer of product between tanks on the vessel or between vessels – in the event of a leaking tank or tank rupture from a vessel collision.

The purpose of this section is to describe BHP's strategy in relation to Source Control – Vessel Control to:

- Limit the release of oil discharged to the marine environment and prevent further release of oil by isolating the source of the release; and
- Manage to ALARP and acceptable levels the risks and impacts of Source Control – Vessel Control response strategy to environmental sensitivities.

The strategy includes identification of the risks and impacts associated with vessel control during the Level 1 and 2 spills, which includes consideration of the benefits associated with vessel control. It then demonstrates that these impacts and risks can be reduced to ALARP and acceptable levels, enabling vessel control to be a primary response strategy in responding to Level 1 and 2 spills.

Specifically this section includes:

- Identification of the potential impacts of vessel control, which includes discussion on vessel control effectiveness, demonstrating that the application of vessel control can reduce the total volume of oil released into the marine environment;
- Demonstration of oil spill preparedness;
- Controls in place to mitigate the impacts and risks of vessel control on sensitive environmental receptors;
- Demonstration that the vessel control strategy proposed by BHP is ALARP and acceptable; and
- Environmental performance outcome, performance standards and measurement criteria for vessel control.

9.3.2.2 Potential Environmental Impacts

The impacts associated with the vessels involved in the response activities from their physical presence, noise and atmospheric emissions from vessels, interference with marine fauna, routine and unplanned discharges have been discussed in the following previous sections:

- Physical presence (Section 7.3);
- Seabed disturbance (Section 7.4)
- Noise emissions (Section 7.5);
- Atmospheric emissions (Section 7.7);
- Liquid discharges (Section 7.8);
- Solid wastes (Section 7.9);
- Unplanned interference to marine fauna (Section 8.2);
- Unplanned hydrocarbon or chemical spills or leaks from subsea infrastructure (Section 8.4);

- Unplanned hydrocarbon release from loss of well control (Section 8.5); and
- Unplanned diesel spill from bulk storage (Section 8.6).

9.3.2.3 Unplanned diesel spill from bulk storage (Section Oil Spill Preparedness)

Sections 8.4 to 8.6 provide details on control measures in place prior to and during the offshore activities that demonstrate oil spill preparedness (ship-based oil spills). These controls include, but are not limited to, the vessels having current MARPOL-compliant SOPEPs in place, and SOPEP materials and equipment maintained and available on vessels.

9.3.2.4 Hierarchy of Controls

The evaluation of controls associated with the Source Control – Vessel Control Response Strategy assessing the response capacity (i.e. how much oil is treated), the units, implementation time (i.e. how fast can BHP access and start using it), cost sacrifice (Minor = <$100K, Moderate $100K - $1M, Major > $1M) and control effectiveness (defined in Section 9.3.1) is summarised in Table 9-3.

Existing controls in place to mitigate risks and impacts associated with physical presence of vessels, noise and atmospheric emissions from vessels, interference with marine fauna, routine and non-routine discharges have been presented previously.

Table 9-3: Evaluation of effectiveness of controls associated with RS.1 Source Control – Vessel Controls

Function	Control Measure	Rationale	Response Capacity	Units	Implementation Time (days)	Cost	Effectiveness				
							Availability	Functionality	Reliability	Survivability	Independence /Compatibility
Eliminate	No source control	Do nothing option	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Substitute	-	-	-	-	-	-	-	-	-	-	-
Engineer	-	-	-	-	-	-	-	-	-	-	-
Separate	-	-	-	-	-	-	-	-	-	-	-
Administrate	Spill response executed in accordance with vessel's MARPOL-compliant SOPEP.	Control is based on legislative requirements – MARPOL Annex I (Prevention of Pollution by Oil).	N/A	N/A	0-2 hrs	Minor	High	High	High	High	High
	Operational NEBA to include evaluation of requirement for implementation of source control – vessel control response strategy.	Source control activated and supported by Operational NEBA to provide a net environmental benefit to prevent environmental impacts to sensitive environmental receptors.	N/A	N/A	0-2 hrs	Minor	High	High	High	High	High
	Spill clean-up equipment tested, maintained and available on the vessels.	Control is based on legislative requirements – MARPOL Annex I (Prevention of Pollution by Oil).	N/A	N/A	0-2 hrs	Minor	High	High	High	High	High
	Scupper plugs or equivalent deck drainage control measures available where hazardous chemicals and hydrocarbons stored and frequently handled.	Control is based on legislative requirements – MARPOL Annex I (Prevention of Pollution by Oil).	N/A	N/A	0-2 hrs	Minor	High	High	High	High	High
	Modelling predictions of released diesel trajectory to be undertaken to support the Operational NEBA.	Used as tool to gain situational awareness through real-time spill trajectory modelling to enable evaluation of which sensitive receptors require priority protection.	N/A	N/A	0-2 hrs	Minor	High	High	High	High	High
	Response strategy activities continued until termination criteria met.	Ensures that the source control – vessel control response strategy continues until the performance outcome has been achieved.	N/A	N/A	Immediate and on-going	Minor	High	High	High	High	High
	Scalable Options										
	Dedicated support vessel on standby on location or nearest port with offshore boom equipment to surround casualty.	On standby 24/7 during operations to expedite initiation of booming containment operations.	Small	1	0-1	Major	High	High	High	High	High

9.3.2.5 Demonstration of ALARP

The evaluation of environmental benefit gained compared with practicability and ALARP summary for controls associated with source control – vessel control is provided in Table 9-4. With the implementation of accepted controls and with no other additional controls identified, that would further reduce the impacts and risks without a gross disproportionate sacrifice, , it is considered that the impacts and risks from the RS1 Source Control – Vessel Control response strategy have been reduced to ALARP.

Existing controls in place to mitigate risks associated with physical presence of vessels, noise and atmospheric emissions from vessels, interference with marine fauna, routine and unplanned discharges have been presented previously.

A risk assessment for unplanned spills and uncontrolled releases of hydrocarbons from vessels to the marine environment has been carried out in the EP (Sections 8.4 and 8.6). In the event of a leak or uncontrolled vessel spill, the SOPEP procedures will be implemented, resulting in low level environmental impact. However, failure to implement the SOPEP procedures will increase the severity of the event to a moderate impact to the ecosystem or non-threatened species. The risk assessment and evaluation in Sections 8.4 and 8.6 identified a range of controls that when implemented are considered to manage the risk of unplanned spills and uncontrolled releases of refined oils and diesel to the marine environment, respectively. The primary existing control in place to mitigate risks and impacts associated with unplanned spills and uncontrolled releases of diesel is compliance with the vessel-specific SOPEP (as per MARPOL Annex I) and the vessels will be equipped with spill kits as outlined in Sections 8.4 and 8.6. Based on weathering modelling, a diesel release to the environment will not be persistent and will have a tolerable consequence to the marine environment; in addition, following a strategic NEBA (Table 9-1), 'natural recovery' has been identified as the best method for removal of concentrated hydrocarbons from the marine environment. However it is BHP's intention to undertake the RS1.1 Source Control – Vessel Control Response Strategy as soon as practically possible to reduce the input of hydrocarbons to the environment. With the existing extensive mitigation and control measures in place and with no other additional or alternative controls identified to reduce the environmental impact, while also providing the required level of safety, other than not implementing this response strategy, it is considered that the impacts and risks from the RS1.1 Source Control – Vessel Control Response Strategy are therefore considered to be reduced to ALARP.

Table 9-4: Evaluation of environmental benefit gained compared with practicability and ALARP summary for controls associated with RS1.1 Source Control – Vessel Control

Function	Control Measure	Environmental Benefit Gained	Practicability	ALARP Summary	Performance Standard
Eliminate	Do nothing option	No environment benefit would be gained from this option. Halting the release of hydrocarbons and spill clean-up activities are essential.	The do nothing option is not considered acceptable.	**Reject**: Source control is a recognised strategy for the mitigation of oil spill impacts.	-
Substitute	-	-	-	-	-
Engineer	-	-	-	-	-
Separate	-	-	-	-	-
Administrate	Spill response executed in accordance with vessels' MARPOL-compliant SOPEP.	Control is based on legislative requirements – MARPOL Annex I (Prevention of Pollution by Oil).	Controls have high effectiveness; are available, functional and reliable and in general are serviceable and compatible with other control measures. Controls have minor cost implications for the operation.	**Accept**: Controls based on legislative requirements must be accepted. Controls are practicable and the cost sacrifice is not disproportionate to the environmental benefit gained.	**PS RS1.1.1**
	Operational NEBA to include evaluation of requirement for implementation of source control - vessel control response strategy.	Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The Operational NEBA will be completed based on specific circumstances of the spill incident, using real-time information (spill trajectory modelling, spill observations, weather and sea state conditions etc.) to confirm the appropriate response strategies to adopt for protection of priority locations and sensitive receptors.			**PS RS1.1.2**
	Spill clean-up equipment tested, maintained and available on the vessels.	Control is based on legislative requirements – MARPOL Annex I (Prevention of Pollution by Oil).			**PS RS1.1.3**
	Scupper plugs or equivalent deck drainage control measures available where hazardous chemicals and hydrocarbons stored and frequently handled.	Control is based on legislative requirements – MARPOL Annex I (Prevention of Pollution by Oil).			**PS RS1.1.4**
	Modelling predictions of released diesel trajectory to be undertaken to support the Operational NEBA.	Positive environmental benefit gained as oil spill trajectory modelling will assist in the effectiveness of response strategies and will enable real-time evaluation of which sensitive receptors require priority protection.			**PS RS1.1.5**
	Response strategy activities continued until termination criteria met.	Positive environmental benefit gained from ensuring that the source control – vessel control response strategy continues until the performance outcome has been achieved.			**PS RS1.1.6**
	Scalable Options				

Function	Control Measure	Environmental Benefit Gained	Practicability	ALARP Summary	Performance Standard
	Dedicated support vessel on standby on location with offshore boom equipment to surround casualty.	Minor positive environment benefit gained by having dedicated boom deploying vessels on standby to immediately surround casualty and contain the spatial extent of any spilled diesel.	Dedicated standby vessels and equipment/crew has substantial costs that would be incurred for the duration of the operation.	**Reject**: This control has high costs that are disproportionate to any environmental benefit that might be gained. This takes into consideration additional fuel required for having vessels on standby at site, additional collision risk, and interference with other sea users, when weighed against the containment potential of the booming operations that is unlikely to be successful in offshore conditions, the environment benefit is deemed to be negligible.	-

9.3.2.6 Demonstration of Acceptability

BHP considers a range of factors when determining that a level of impact and risk to the environment is broadly acceptable, as summarised in Table 9-5.

Table 9-5: Demonstration of acceptability for RS1 Source Control- Vessel Control

Criteria	Question	Demonstration
Codes and Standards	Is the impact or risk being managed in accordance with relevant Australian or International legislation, Ministerial Conditions or standards?	Source Control – Vessel Control is an industry-wide standard response strategy for Level 1 and 2 spills in accordance with relevant codes and standards for control measures in the event of release of hydrocarbons required by the *International Convention for Protection of the Sea (Prevention of Pollution from Ships) Act 1983*. Impacts and risks associated with marine spills are managed in accordance with relevant legislation (e.g. Protection of the Sea (Prevention of Pollution from Ships) Act 1983; and relevant codes and standards (e.g., AMSA Marine Orders – Part 91 and Part 94; and MARPOL Annexes I and III). Compliance with EPBC Act 1999 – Ministerial Approval Decision April 2006 (EPBC 2005/2034) conditions in relation to fuel and chemical handling and transfer procedures.
ESD	Is the proposed impact consistent with the principles of ESD?	BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct, which endorses the continuous improvement in health, safety and environmental performance in ways that protect people and the environment through the responsible management of petroleum activities and their impacts. BHP considers that adherence to these principles is consistent with the principles of ESD. Source Control – Vessel Control is a standard and recognised strategy to meet the performance outcome of reducing impacts to environmental sensitivities from offshore spills.
Internal Context		
BHP Charter and HSEC Management System Compliance	Is the proposed impact or risk consistent with the requirements of BHP Our Requirements, Petroleum Standard and HSEC Management Systems?	The approval and implementation of Source Control – Vessel Control will be in compliance with BHP Charter values and management systems.
Professional Judgement	Is the impact or risk being managed in accordance with industry best practice?	Source Control – Vessel Control is the standard response strategy that is utilised across the oil and gas and maritime industry to respond to offshore spills. Controls identified in this plan are consistent with industry best practice and guidelines.
ALARP	Are there any further reasonable and practicable controls that can be implemented to further reduce the impact or risk?	All reasonable and practicable controls have been assessed for their effectiveness (Table 9-3). Additional controls were considered but were found to have a negligible environmental benefit or have grossly disproportionate costs. BHP considers that the residual risk with the implementation of Source Control – Vessel Control has been demonstrated to be ALARP.
External Context		
Environmental Best Practice	Are controls in place to manage the impacts and risk to the environment that are commensurate with the nature and scale of any environmental sensitivities of the receiving environment?	The environmental performance outcome, performance standards and measurement criteria that determine whether the performance outcome and performance standards have been achieved are commensurate with the environmental significance of the receiving environment.

Criteria	Question	Demonstration
Stakeholder Views	Do stakeholders have any concerns, if so, have controls been implemented to manage them?	Stakeholders have been consulted about the activities through a comprehensive and long-term consultation program. Stakeholders concerns over the activities have been addressed. Stakeholders raised no specific concerns in relation to offshore spills.

9.3.2.7 Acceptability Summary

The proposed control measures for preventing and minimising the risk of accidental releases of refined oils and diesel to the marine environment are comprehensive and consistent with all relevant codes and standards and good oilfield practice. The relevant codes and standards for control measures in the event of release of hydrocarbons are *International Convention for Protection of the Sea (Prevention of Pollution from Ships) Act* 1983; AMSA Marine Orders – Part 91 and Part 94; and MARPOL Annexes I and III.

Predictions indicate that no shoreline will be contacted by hydrocarbons. More than 50 % of the diesel will be evaporated within 24 hours of an accidental surface spill of 100 m^3 (i.e. the worst case diesel spill). The offshore location is such that any spills will be rapidly diluted and dispersed. Any environmental effects being temporary and localised, with significant impacts not expected owing to the short exposure timeframe.

Given the aforementioned, unlikelihood of any significant impacts owing to the temporary and localised effects from exposure to hydrocarbons resulting from Level 1 and 2 spills, BHP is satisfied that when the accepted controls are implemented that the impact and residual risk of the vessel control response strategy to the environment is considered 'tolerable'. Furthermore, the adopted controls are considered to be consistent with good oilfield practice/professional judgement and environmental best practice, and consistent with vessel control operations used elsewhere. In the improbable event of a Level 1 or Level 2 spill, vessel control operations will comply with all relevant laws, codes and standards, as well as BHP Charter and HSEC Management Systems. All relevant controls were considered as part of the ALARP assessment, and as no other reasonable additional controls were identified that would further reduce the impacts and risks of Source Control – Vessel Control without a gross disproportionate sacrifice, the impacts and risks associated with this strategy are considered ALARP.

BHP undertakes petroleum activities in a manner that is consistent with the principles of ESD. Stakeholders have been consulted about the activities and appropriate control measures will be implemented to address any concerns that were raised. BHP undertakes regular consultation with relevant stakeholders about its operations/ activities providing them with sufficient and reasonable opportunities to raise any new concerns or issues for the duration of this activity. On this basis, it is considered that adherence to the performance standards will manage the impacts and risks of Source Control – Vessel Control associated with vessel activities in the event of Level 1 and 2 spills to an acceptable level.

9.3.2.8 Environmental Performance Outcome, Performance Standards and Measurement Criteria

RS1.1: Source Control – Vessel Control			
Performance Outcome	**To prevent the impact on water quality and marine biota resulting from Level 1 and 2 spills by reducing, controlling or halting the discharge of hydrocarbons to the marine environment to ALARP by the implementation of the vessel-specific MARPOL-compliant SOPEP.**		
Aspect	**Number**	**Performance Standard**	**Measurement Criteria**
Planning and design	**PS RS1.1.1.**	Source Control – Vessel Control to be managed in accordance with vessel-specific SOPEP for vessels, in line with MARPOL Annex I.	SOPEP documentation.
			Spill reports logged as per vessel procedures.
	PS RS1.1.2.	Operational NEBA to include evaluation of requirement for implementation of vessel source control.	Documentation of completed Operational NEBA.
Resources	**PS RS1.1.3.**	Onboard response capabilities in the event of an oil spill are tested maintained and available prior to mobilisation to demonstrate preparedness.	Record of SOPEP drills and spill exercises in vessel log.
			Documentation that SOPEP materials and equipment are

RS1.1: Source Control – Vessel Control			
Performance Outcome	**To prevent the impact on water quality and marine biota resulting from Level 1 and 2 spills by reducing, controlling or halting the discharge of hydrocarbons to the marine environment to ALARP by the implementation of the vessel-specific MARPOL-compliant SOPEP.**		
Aspect	**Number**	**Performance Standard**	**Measurement Criteria**
			maintained and available on the vessels.
Equipment	**PS RS1.1.4.**	Scupper plugs or equivalent deck drainage control measures available where hazardous chemicals and hydrocarbons stored and frequently handled.	Inspection records/ checklist demonstrate evidence of scupper plugs or equivalent deck drainage control has been maintained.
	PS RS1.1.5.	Modelling predictions of released diesel trajectory to be undertaken to support the Operational NEBA	Documentation of Contract with AMOSC who maintains call-off contract with RPS-APASA.
	PS RS1.1.6.	Response strategy activities continued until termination criteria met.	Spill reports and incident response reports detail the source of hydrocarbons has been identified and actions have been taken to prevent any further release.

The initiation criteria, course of action, resources, supporting documentation and termination criteria associated with each response strategy are detailed in the Minerva OPEP (Appendix F).

9.3.3 RS2 Monitor and Evaluate

9.3.3.1 Summary of Activity

The Monitor and Evaluate Response Strategy will be implemented for all spills. Constant monitoring and evaluation by surveillance is a mandatory strategy required for real-time decision-making during a spill event. This strategy includes assessment of the location, weather and sea state conditions, volume of oil being released, oil weathering state, and trajectory of the spill. The spill will be monitored constantly and evaluated by surveillance techniques. The results of surveillance operations are crucial for implementing further strategies for responding to and managing a spill event. Additionally this response strategy will provide information in support of the decision-making process of whether natural dispersion is an appropriate strategy. If aerial surveillance reports that extreme or high sensitivity receptors are at risk of being impacted by surface hydrocarbons (refer to OPEP Table 2), then RS10 Environmental Monitoring will be activated.

The purpose of this section is to describe BHP's approach in relation to the monitor and evaluate response strategy in order to:

- Track and monitor the trajectory of the spill to enable real-time decisions to be made to prevent impacts to extreme and highly sensitive environmental receptors; and
- Manage to ALARP and acceptable levels the risks and impacts of the Monitor and Evaluate Response Strategy on sensitive environmental receptors.

The strategy includes a description of the impacts and risks associated with monitor and evaluate operations during Level 1 and 2 spills, which includes consideration of the benefits associated with the Monitor and Evaluate Response Strategy. It then demonstrates that these impacts and risks can be reduced to ALARP and acceptable levels, enabling monitor and evaluate to be a key response strategy in the event of hydrocarbon spills.

Specifically this section includes:

- Assessment of the potential impacts and risks of the Monitor and Evaluate Response Strategy and the benefits of the response strategy;
- Controls in place to mitigate the impacts and risks of the Monitor and Evaluate Response Strategy on sensitive environmental receptors;
- Demonstration that the Monitor and Evaluate Response Strategy proposed by BHP is ALARP and acceptable; and

- Environmental performance outcome, performance standards and measurement criteria for the Monitor and Evaluate Response Strategy.

Monitoring and evaluation will require access to aircraft, vessels, equipment and personnel. In the event of a spill, the following monitoring and evaluation methods will typically be implemented, dependent on the volume of the spill:

- Aerial surveillance;
- Vessel surveillance; and
- Spill Trajectory Modelling via the deployment of oil spill tracker buoys (OSTBs).

Aerial Surveillance

Aerial observations will be conducted to track the oil spill using the Aerial Observers Log. Surveillance will be commissioned by the Incident Commander or by a designated officer of the nominated Control Agency. Aerial surveillance will be by helicopter with trained observers. BHP has access to 45 trained aerial observers within industry through Industry Mutual Aid MoU. BHP would access helicopters based in Warrnambool or Tooradin. In addition to the air crew, trained aerial surveillance observers will be included on the flights to confirm the size of the spill and its location. This information will be sent back to IMT for further processing. A schedule of flights will be developed, to ensure sufficient timely information is available for fate modelling. Aerial observations will only be undertaken during daylight hours.

The aerial surveillance will include a two dimensional sketch or image of the spill, the Global Positioning System (GPS) coordinates of the spill extremities, an estimate of the spill thickness and the time of the observations.

Vessel Surveillance

Marine surveillance, if deemed necessary, will be carried out by vessels that can be chartered from nearby ports.

Oil Spill Tracker Buoys

Self-Locating Datum Marker Buoys (SLDMB) or OSTB will monitor the movement of hydrocarbons via satellite.

Spill Trajectory Modelling

Oil spill trajectory modelling will be conducted to predict the extent of impacts to offshore habitat or areas protected for the purpose of conservation. The IMT will engage RPS-APASA via a call-off contract maintained by AMOSC to start modelling the spill, and correlate it with real data received from aerial surveillance, OSTBs.

From these sources, RPS-APASA will develop an oil spill trajectory model for the next 5 days, which will allow the IMT to direct resources for the next phase of the response. Alternative oil spill modelling agencies may be selected dependent on operational requirements.

9.3.3.2 Potential Environmental Impacts

The risks and impacts associated with the vessels and aircraft involved in the Monitor and Evaluate Response Strategy activities from their physical presence, noise and atmospheric emissions, interference with marine fauna, routine and unplanned discharges, and accidental spills have been discussed previously:

- Physical presence (Section 7.3);
- Noise emissions (Section 7.5);
- Atmospheric emissions (Section 7.7);
- Liquid discharges (Section 7.8);
- Solid wastes (Section 7.9);
- Unplanned interference to marine fauna (Section 8.2);
- Unplanned hydrocarbon or chemical spills or leaks from subsea infrastructure (Section 8.4);
- Unplanned hydrocarbon release from loss of well control (Section 8.5); and
- Unplanned diesel spill from bulk storage (Section 8.6).

9.3.3.3 Oil Spill Preparedness

Oil spill preparedness for the elements of Monitor and Evaluate Response Strategy activities (below) comprise contractual arrangements with Oil Spill Response Agencies (OSRAs, e.g. AMOSC/ OSRL) and/or service agreements with third party vendors for the provision of services such as OSTBs. Further details are provided in Table 9-6 and Table 9-7 for:

- Aerial surveillance;
- Vessel surveillance;
- Vessel surveillance;
- Oil Spill Trajectory Modelling (OSTM) via the deployment of OSTBs;
- Satellite imagery; and
- Subsea plume tracking via the deployment of AUVs.

9.3.3.4 Hierarchy of Controls

The evaluation of controls associated with the Monitor and Evaluate Response Strategy assessing the response capacity, the units, implementation time (i.e. how fast response strategy can be implemented), cost sacrifice (Minor = <$100K, Moderate $100K - $1M, Major > $1M) and control effectiveness (defined in Section 9.3.1) is summarised in Table 9-6.

Existing controls in place to mitigate risks and impacts associated with the physical presence of additional vessels, noise and atmospheric emissions, interference with marine fauna, routine and unplanned discharges have been presented previously in Section 7.3, 7.5, 7.7, 7.8, 8.2, 8.4, 8.5 and 8.6.

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Table 9-6: Evaluation of effectiveness of controls associated with RS2 Monitor and Evaluate

Function	Control Measure	Rationale	Response Capacity	Units	Implementation Time	Cost	Effectiveness				
							Availability	Functionality	Reliability	Survivability	Independence /Compatibility
Eliminate	No situational awareness.	Do nothing option	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Substitute	-	-	-	-	-	-	-	-	-	-	-
Engineer	-	-	-	-	-	-	-	-	-	-	-
Separate	-	-	-	-	-	-	-	-	-	-	-
Administrate	Monitor and evaluate operations to be reviewed and managed by IMT through Incident Action Plan (IAP) process.	Within the first 24 hours, BHP IMT will develop IAPs.	N/A	N/A	N/A	Minor	High	High	High	High	High
	Spill fate modelling initiated within 2 hours of incident notification to support Operational NEBA.	Used as tool to gain situational awareness through real-time spill trajectory modelling to enable evaluation of which sensitive receptors require priority protection.	N/A	N/A	0-2 hrs	Minor	High	High	High	High	High
	Operational NEBA to include evaluation of requirement for various monitoring and evaluation activities to be employed i.e. trajectory/spill modelling, aerial/vessel surveillance; autonomous underwater vehicles; OSTBs; and satellite imagery.	Various techniques for tracking, monitoring and evaluating the spill. The methods employed will be dependent on the volume of the spill, sea state/ weather conditions and health/safety considerations.	N/A	N/A	0-2 hrs	Minor	High	High	High	High	High
	Current Capability										
	Contract in place with AMOSC who maintains call-off contract with RPS-APASA* to provide spill modelling in the event of a hydrocarbon spill. Ensure spill modelling capability meets and exceeds the ASTM F2067-07 Standard Practice for Development and use of oil spill models as follows: • Within 2 hours following initial spill notification, oil spill modelling agency to be on standby for trajectory modelling; • Within 4 hours of notification, oil spill modelling agency to provide oil spill trajectory modelling report; and • Oil spill modelling agency to undertake any additional modelling requirements as per daily IAP. *Alternative oil spill modelling agencies may be selected dependent on operational requirements.	Real-time monitoring and evaluation of the spill is a mandatory primary response strategy implemented for Level 1 and 2 spills required for real-time decision-making during a spill event. BHP has agreements and contracts in place to expedite implementation of monitor and evaluate activities.	N/A	N/A	N/A	Minor	High	High	High	High	High
	OSTB's located at AMOSC (Geelong)	BHP has access to OSTB's at AMOSC (Geelong).	N/A	4	~2-5 hours by helicopter from FPSO or AMOSC (Exmouth) depending on weather	Moderate	High	High	High	High	High
	BHP has agreement in place with OSRL/ third party for the provision of satellite imagery.	Real-time monitoring and evaluation of the spill is a mandatory primary response strategy implemented for Level 1 – 2 spills required for real-time decision-making during a spill event. BHP has agreements in place to expedite acquisition of satellite imagery in the event of a spill.	N/A	N/A	< 24 hours for acquisition of first satellite image.	High	High	High	High	High	High
	Scalable Options										
	Support vessels (Australia, SE Asia).	Acquisition of charter vessels on the spot-market from around Australia	Medium	As required	10-15 hrs	Minor	High	High	High	High	High

Function	Control Measure	Rationale	Response Capacity	Units	Implementation Time	Cost	Effectiveness				
							Availability	Functionality	Reliability	Survivability	Independence /Compatibility
	Access to additional OSTB's through AMOSC (Fremantle).	BHP has agreements in place to expedite resourcing additional OSTB's through AMOSC in the event of a spill.	N/A	2	<48 hrs	Moderate	High	High	High	High	High
	Access to aerial surveillance and trained observers from AMOSC Core Group or OSRL.	BHP has agreements in place to expedite resourcing additional aerial surveillance and trained observers in the event of a spill.	Medium	100	24-48 hrs	Moderate	High	High	High	High	High
	Access to aerial surveillance and trained observers via mutual aid MoU.	BHP has mutual aid MoU's in place to expedite resourcing additional aerial surveillance and trained observers in the event of a spill.	Medium	50	24-48 hrs	Moderate	High	High	High	High	High
	Dedicated Oil spill response(OSR) vessel on standby on location.	On standby 24/7 during operations to expedite initiation of vessel.	Small	1	0-1 hrs	Major	High	High	Low	High	High
	Dedicated OSR vessel on standby at nearby port.	On standby 24/7 during operations to expedite initiation of vessel surveillance. Requests for offshore vessel support can be made by AMSA.	Small	1	0-1 hrs	Major	High	High	Low	Low	High

9.3.3.5 Demonstration of ALARP

The evaluation of environmental benefit gained compared with practicability and ALARP summary for controls associated with Monitor and Evaluate Response Strategy is provided in Table 9-7. Monitoring and evaluation is integral to the management and verification of spill response strategies for all spill scenarios. The information obtained is important to maintain situational awareness throughout an emergency response, and will always have a positive environmental benefit. There are no additional significant environmental impacts expected from monitoring and evaluation that have not already been described in the previous sections of the EP.

With the implementation of accepted controls and with no other additional controls identified, other than not implementing this response strategy, it is considered that the impacts and risks from the RS2 Monitor and Evaluate Response Strategy have been reduced to ALARP.

Table 9-7: Evaluation of environmental benefit gained compared with practicability and ALARP summary for controls associated with RS2 Monitor and Evaluate

Function	Control Measure	Environmental Benefit Gained	Practicability	ALARP Summary	Performance Standard
Eliminate	Do nothing option	No environment benefit would be gained from this option. Developing a Monitor and Evaluate Response Strategy is a necessary contingency to have in place prior to and during the activities and cannot be eliminated. Monitoring and evaluation is integral to the management and verification of spill response strategies for all spill scenarios.	The do nothing option is not considered acceptable.	Reject: The Monitor and Evaluate Response Strategy is a mandatory response strategy to have in place and cannot be eliminated.	-
Substitute	-	-	-	-	-
Engineer	-	-	-	-	-
Separate	-	-	-	-	-
Administrative	Monitor and Evaluate Response Strategy operations to be reviewed and managed by IMT through IAP process.	Positive environmental benefit from identification of the most effective Monitor and Evaluate Response Strategy activities to track the spill trajectory and to feed into real-time decision making for further strategies for responding to and managing a spill event. The review/evaluation of Monitor and Evaluate Response Strategy options will be implemented immediately for Level 1 and 2 spills.	Controls have high effectiveness; are available, functional and reliable and in general are serviceable and compatible with other control measures. Controls have minor cost implications for the operation.	**Accept:** Controls based on legislative requirements must be accepted. Controls are practicable and the cost sacrifice is not disproportionate to the environmental benefit gained.	**PS RS2.1** **PS RS2.9**
	Spill fate modelling initiated within 2 hours of incident notification to support Operational NEBA.	Positive environmental benefit gained as oil spill trajectory modelling will enable real-time evaluation of which sensitive receptors require priority protection.			**PS RS2.2**
	Operational NEBA to include evaluation of requirement for various monitoring and evaluation activities to be employed (e.g. aerial/vessel surveillance and OSTBs).	Positive environmental benefit from identification of the most effective Monitor and Evaluate Response Strategy to track the spill dependent on sea state and weather conditions, spill volume and health/safety considerations. The Operational NEBA will be completed based on specific circumstances of the spill incident, using real-time information (e.g. spill trajectory modelling, spill observations, weather and sea state conditions) to confirm the appropriate response strategy options to			**PS RS2.3**

Function	Control Measure	Environmental Benefit Gained	Practicability	ALARP Summary	Performance Standard
		adopt for protection of priority locations and sensitive receptors. Information received from the various Monitor and Evaluate Response Strategy activities implemented will be crucial in decision-making for the activation of other response strategies. Other considerations include the time of year of the spill to take account of environmental sensitivities (e.g. whale migrations).			
	Current Capability				
	Contract in place to mobilise response vessel onsite.	Positive environmental benefit gained from having dedicated vessel for spill surveillance activities on site. Dependent on the size of the spill, vessel surveillance would be initiated immediately.	Control has high effectiveness; it is available, functional and reliable and in general it is reliable and compatible with other control measures. Control has minor cost implications.	**Accept:** Controls are practicable and the cost sacrifice is not grossly disproportionate to the environmental benefit gained.	**PS RS2.4**
	Access to support vessels (mutual aid, local charter).	Positive environmental benefit gained from having vessels already readily obtained through MoU's for spill surveillance activities. Dependent on the size of the spill, vessel/ surveillance will be initiated immediately.	The response capacity is small but the effectiveness is generally high (vessel operations are only possible during daylight hours). The cost of using all available those available through Mutual Aid, and on the local spot-charter market in proximal ports has minor cost implications. Cost during activation would be moderate.		
	Contract in place with AMOSC who maintains call-off contract with RPS-APASA* to provide spill modelling in the event of a hydrocarbon spill. Ensure spill modelling capability meets and exceeds the ASTM F2067-07 Standard Practice for Development and Use of Oil Spill Models as follows: • Within 2 hours following initial spill notification, oil spill modelling agency to be on standby for trajectory modelling; • Within 4 hours of notification, oil spill modelling agency to provide oil spill trajectory modelling report; and • Oil spill modelling agency to undertake any additional modelling requirements as per daily IAP. *Alternative oil spill modelling agencies may be selected dependent on operational requirements.	Positive environmental benefit gained from implementation of this control measure. Oil spill trajectory modelling will be conducted to predict the extent of impacts to offshore habitat, for any physical disturbance that may impact shoreline, nearshore areas, or areas protected for the purpose of conservation. The IMT will engage RPS-APASA* via a call-off contract maintained by AMOSC to start modelling the spill, and correlate it with real data received from aerial surveillance, OSTBs. From these sources, RPS-APASA will develop an oil spill trajectory model for the next 5 days, which will allow the IMT to direct resources for the next phase of the response. Alternative oil spill modelling agencies may be selected dependent on operational requirements.	Control has high effectiveness; it is available, functional and reliable and in general it is reliable and compatible with other control measures. Control has minor cost implications.		**PS RS2.5**
	Response strategy activities continued until termination criteria met.	Positive environmental benefit gained from ensuring that the monitor and evaluate response strategy continues until the performance outcome has been achieved.	During the response, control has high effectiveness for situational awareness and response planning and response evaluation. Control has minor cost implications.		**PS RS2.8**
	Scalable Options				
	Support vessels (Australia).	Positive environmental benefit by implementation of this control measure. The ongoing charter of more support vessels will continue on an 'as required' basis during the spill response.	The response capacity is small for vessel operations but the control effectiveness is generally high (vessel operations are only possible during daylight hours) and the cost of using marine vessels available as required through the spot-charter market around Australia has minor cost implications. Cost during activation would be moderate.	**Accept:** Controls are practicable and the cost sacrifice is not grossly disproportionate to the environmental benefit gained.	**PS RS2.7**
	Access to additional OSTB(s) through AMOSC.	Positive environment benefit gained from implementation of this control measure BHP has agreements in place to expedite resourcing additional OSTB(s) through AMOSC in the event of a spill.	The response capacity is small but the control effectiveness is generally high. The cost of using resources/ equipment already under contract to BHP is minor.		
	Access to aerial surveillance and trained observers from AMOSC Core Group and/or OSRL.	Positive environment benefit gained from implementation of this control measure BHP has agreements in place to expedite resourcing additional aerial surveillance and trained observers in the event of a spill.			
	Access to aerial surveillance and trained observers via mutual aid.	Positive environment benefit gained from implementation of this control measure BHP has mutual aid MoU's in place to expedite resourcing additional aerial surveillance and trained observers in the event of a spill.			

Function	Control Measure	Environmental Benefit Gained	Practicability	ALARP Summary	Performance Standard
	Dedicated aircraft on standby at proximal airport.	Positive environment benefit gained by having dedicated aircraft/ vessels on standby to immediately monitor the spill.	Dedicated standby vessels and aircraft have substantial costs for standby vessels and aircraft, respectively that would be incurred for the duration of the operation.	Reject: These controls have high costs that are disproportionate to the potential environmental benefit that might be gained particularly taking into the logistics of a first strike response considering the short response time for mobilisation to site.	
	Dedicated OSR vessel on standby on location.				
	Dedicated OSR vessel on standby at nearby port.				

9.3.3.6 Demonstration of Acceptability

BHP considers a range of factors when determining that a level of impact and risk to the environment is broadly acceptable, as summarised in Table 9-8.

Table 9-8: Demonstration of acceptability for RS2 Monitor and Evaluate

Criteria	Question	Demonstration
Codes and Standards	Is the impact or risk being managed in accordance with relevant Australian or International legislation, Ministerial Conditions or standards?	Monitor and evaluation is a mandatory and industry-wide standard response strategy for Level 1 and 2 spills. Activities on surveillance vessels will be in accordance with relevant codes, standards.
ESD	Is the proposed impact consistent with the principles of ESD?	BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct, which endorses the continuous improvement in health, safety and environmental performance in ways that protect people and the environment through the responsible management of petroleum activities and their impacts. BHP considers that adherence to these principles is consistent with the principles of ESD. Monitor and evaluate is a standard and recognised strategy to meet the performance outcome of reducing impacts to environmental sensitivities.
Internal Context		
BHP Charter and HSEC Management System Compliance	Is the proposed impact or risk consistent with the requirements of BHP Our Requirements, Petroleum Standard and HSEC Management Systems?	The approval and use of Monitor and Evaluation Response Strategy activities be in compliance with BHP charter values and management systems and will be consistent with activities authorised for monitoring oil spills.
Professional Judgement	Is the impact or risk being managed in accordance with industry best practice?	Monitor and Evaluate is the standard response strategy that is utilised across the oil and gas and maritime industry to respond to Level 1 and 2 spills. Controls identified in this plan are consistent with industry best practice and guidelines. Accepted controls that will be implemented are provided in Table 9-7.
ALARP	Are there any further reasonable and practicable controls that can be implemented to further reduce the impact or risk?	All reasonable and practicable controls have been assessed for their effectiveness (Table 9-6). Additional controls were considered but were found to have a negligible environmental benefit or have grossly disproportionate costs. BHP considers that the residual risk of monitor and evaluate response strategy has been demonstrated to be ALARP.
External Context		
Environmental Best Practice	Are controls in place to manage the impacts and risk to the environment that are commensurate with the nature and scale of any environmental sensitivities of the receiving environment?	The environmental performance outcome, performance standards and measurement criteria that determine whether the outcome and standards have been achieved are commensurate with the nature and scale of spill incidents and the environmental significance of the receiving environment.
Stakeholder Views	Do stakeholders have any concerns, if so, have controls been implemented to manage them?	Stakeholders have been consulted about the activities through a comprehensive and long-term consultation program. Stakeholders concerns over the activities have been addressed.

9.3.3.7 Acceptability Summary

The proposed controls measures for preventing and minimising the risks associated with using a Monitor and Evaluate Response Strategy to the marine environment are comprehensive and consistent with all relevant codes and standards and good oilfield practice. This response strategy is a mandatory strategy that enables the acquisition of real-time data required for decision-making during a spill event and implementing further strategies for responding to and managing spills; therefore the impact and risks associated with the response strategy are considered to be acceptable.

Given the aforementioned and the low probability of the requirement for spill response activities (due to the highly unlikely probability of a diesel spill occurring), BHP is satisfied that when the accepted controls are implemented that the impact and residual risk of Monitor and Evaluate Response Strategy to the environment is considered 'ALARP'. Furthermore, the adopted controls are considered to be consistent with good oilfield practice/professional judgement and environmental best practice. In the event of a Level 1 and 2 spills, Monitor and Evaluate Response Strategy operations will comply with all relevant laws, codes and standards, as well as BHP Charter and HSEC Management Systems. All relevant controls were considered as part of the ALARP assessment, and as no other reasonable additional controls were identified that would further reduce the impacts and risks of Monitor and Evaluate Response Strategy without a gross disproportionate sacrifice, the impacts and risks associated with this strategy are considered ALARP. BHP undertakes petroleum activities in a manner that is consistent with the principles of ESD. Stakeholders have been consulted about the activities and appropriate control measures will be implemented to address any concerns that were raised. BHP undertakes regular consultation with relevant stakeholders about its operations/ activities providing them with sufficient and reasonable opportunities to raise any new concerns or issues for the duration of this activity. On this basis, it is considered that adherence to the performance standards will manage the impacts and risks of Monitor and Evaluate Response Strategy activities in the event of Level 1 and 2 spills to an acceptable level.

9.3.3.8 Environmental Performance Outcome, Performance Standards and Measurement Criteria

RS2 Monitor and Evaluate			
Performance Outcome	**Monitor and evaluate capability will be maintained to prevent spill impacts to extreme and highly sensitive environmental receptors and to maintain situational awareness throughout emergency response activities.**		
Aspect	**Number**	**Performance Standard**	**Measurement Criteria**
Planning and Design	**PS RS2.1**	Monitor and Evaluate operations to be reviewed and managed in accordance with the IAP.	Daily IAPs
	PS RS2.2	Spill fate modelling initiated within 2 hours of incident notification.	Trajectory modelling request form issued within 2 hours of spill notification.
	PS RS2.3	Operational NEBA to include evaluation of requirement for various monitoring and evaluation activities to be employed (e.g. aerial/vessel surveillance and OSTBs).	Documentation of completed Operational NEBA.
Resources	**PS RS2.4**	AMOSC / OSRL contracts and Mutual Aid MoU's, and other third party agreements for provision of equipment/ supplies, resources and assistance in the event of spill incidents.	Documentation of AMOSC / OSRL contracts and Mutual Aid MoU's and other third party agreements stored.
	PS RS2.5	Contract with AMOSC who maintain a call-off contract with RPS-APASA* to provide spill modelling as required. Ensure spill modelling capability meets and exceeds the ASTM F2067-07 Standard Practice for Development and Use of Oil Spill Models as follows: -Within 2 hours following initial spill notification, oil spill modelling agency to be on standby for trajectory modelling; -Within 4 hours of notification, oil spill modelling agency to provide oil spill trajectory modelling report; and	Documentation of Contract with AMOSC who maintains call-off contract with RPS-APASA. *Alternative oil spill modelling agencies may be selected dependent on operational requirements.

RS2 Monitor and Evaluate			
Performance Outcome	**Monitor and evaluate capability will be maintained to prevent spill impacts to extreme and highly sensitive environmental receptors and to maintain situational awareness throughout emergency response activities.**		
Aspect	**Number**	**Performance Standard**	**Measurement Criteria**
		-Oil spill modelling agency to undertake any additional modelling requirements as per daily IAP. *Alternative oil spill modelling agencies may be selected dependent on operational requirements.	
Equipment	**PS RS2.7**	Maintain capability to monitor spill location and movement via aerial surveillance and observations to enable identification of potential contact with sensitive receptors: -Ensure first aerial observation flights can be completed (in daylight hours) within 8 hours post-spill; and -Enable surveillance information to be used to inform IAPs and response strategy selection.	Records of aerial surveillance logs maintained.
	PS RS2.8	Response strategy activities continued until termination criteria met.	-Spill reports and incident response reports detail no -Hydrocarbons detected by any of the surveillance techniques.
	PS RS2.9	Surveillance data and spill trajectory modelling incorporated into daily IAP preparation process for the response strategies.	Spill reports and incident response reports.

The initiation criteria, course of action, resources, supporting documentation and termination criteria associated with each response strategy are detailed in the Minerva OPEP (Appendix F).

9.3.4 RS9 Natural Recovery

Natural recovery makes use of the natural degradation and weathering processes to breakdown and remove surface oil and stranded hydrocarbons. Effectively this response strategy means that no direct action is taken other than to monitor and evaluate the oil spill trajectory, the rate of dispersion of the hydrocarbon, and the rate of habitat/ community recovery. As such, no additional risks or impacts will occur, other than those already described in Sections 8.4 and 8.6 for Level 1 and 2 spills. Environmental Monitoring Programs are summarised in 9.3.5 and detailed in the OPEP.

9.3.5 RS10 Environmental Monitoring

9.3.5.1 Summary of Activity

Post-spill Environmental Monitoring will be initiated for Level 2 spills to support the oil spill response strategies and to understand any effects on sensitive receptors. Environmental monitoring programs, as described in the Oil Spill Monitoring Guidelines developed by Australian Maritime Safety Authority (AMSA, 2003), that are specific to the oil spill incident will be implemented.

BHP’s environmental monitoring is optimised through the efficient implementation of robust sampling designs from the onset of a potential incident. BHP environmental monitoring procedures have been developed as a formal means of establishing the processes and procedures to ensure that BHP is capable of monitoring effects of oil spills on the marine environment that may occur during exploration, production and operational activities. They also act as a valuable tool to access the effectiveness of the response strategies and thereby feed into the ongoing planning of the response strategies.

Specifically, environmental monitoring procedures describe the work instructions for daily monitoring activities, any specifications of the analytical laboratory, such as sample handling and storage procedures, reporting of results and Quality Assurance/ Quality Control (QA/QC) procedures. They also inform the effectiveness of response strategies and feed into the ongoing planning of response strategies. Table 9-9 provides a summary of the environmental receptors that will be monitored in the event of a Level 2 spill incident on the basis of their sensitivity. It also provides the corresponding monitoring procedure that will be provided to the external consultant to undertake the work, noting that the same company may not necessarily be contracted for all monitoring scopes.

Table 9-9: Summary of environmental receptors and description of monitoring

Receptor	Sensitivity Ranking	Baseline Data	Impact Monitoring	Initiation Criteria	Monitoring Method
Water Quality	High	No	Reactive post-spill pre-impact	Level 2 spills	*Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna*
Sediment Quality (Shoreline, Intertidal, Subtidal)	High	No	Post-spill	Level 2 spills if RS2 Monitor and Evaluate indicates receptor at risk of contact	*Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna*
Benthic Infauna (Shoreline, Intertidal, Subtidal)	High	No	Post-spill	Level 2 spills if RS2 Monitor and Evaluate indicates receptor at risk of contact	*Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna*
Avifauna	High	Yes – access to publicly available data	Post-spill	Level 2 spills if RS2 Monitor and Evaluate indicates receptor at risk of contact	*Monitoring Effects of an Oil Spill on Birds*
Marine mammals (e.g. whales, dolphins)	High	Yes – access to publicly available data	Post-spill	Level 2 spills if RS2 Monitor and Evaluate indicates receptor at risk of contact	*Monitoring Effects of an Oil Spill on Marine mammals and Megafauna*
Shallow Water Habitats (Macroalgae andSeagrass)	High	No	Post-spill	Level 2 spills if RS2 Monitor and Evaluate indicates receptor at risk of contact	*Monitoring Effects of an Oil Spill on Benthic Habitats and Benthic Primary Producers*
Marine Reptiles (Turtles)	Low	No	Post-spill	Level 2 spills if RS2 Monitor and Evaluate indicates receptor at risk of contact	*Monitoring Effects of an Oil Spill on Marine Reptiles*
Commercial and Recreational Fish Species	High	Yes – access to publicly available data	Post-spill	Level 2 spills if RS2 Monitor and Evaluate indicates receptor at risk of contact	*Monitoring Effects of an Oil Spill on Commercial and Recreational Fish Species*
Fishes	High	No	Post-spill	Level 2 spills if RS2 Monitor and Evaluate indicates receptor at risk of contact)	*Monitoring Effects of an Oil Spill on Fishes*

Post-Spill, Pre-Impact Monitoring

Oil spill modelling indicates that there will be no shoreline impacts from hydrocarbon spill events during the Minerva offshore activities. On this basis, the procedure for post-spill pre-impact monitoring will follow the Type I guidelines outlined in AMSA (2003) (i.e. prioritising data that can be collected quickly and inexpensively in the field and analysed later such as oil, sediment and water samples). Specifically, post-spill pre-impact monitoring done under these time constraints will prioritise:

Water Quality – Surface and water column samples (i.e. to quantify dispersed oil) to prioritise chemical parameters such as total petroleum hydrocarbons (TPH) and BTEX.

The development of post-spill pre-impact sampling designs will use scientific principles such as multiple control locations to allow for comparisons with any impacted locations, as well as sampling before and after the incident with replicated samples and at replicated sites to allow for robust statistical analyses to assess any environmental impacts (as described by Underwood [1994]). The sampling intensity (i.e. number of replicates/sites) will depend on the nature of the oil spill and the environmental sensitivities under assessment.

Scalability and Flexibility of Sampling Designs for Environmental Monitoring

The overarching aim of the environmental monitoring procedures will be the collection of monitoring data that allows comparisons of post-impact data with baseline data to determine oil spill response efficiency, as well as the extent and effectiveness of remediation of impacted areas. The sampling designs for the monitoring programs will provide adequate cover for situations where baseline data are out of date due to recent changes in sensitive receptors or not relevant to the event that has occurred. Pre-impact monitoring will be designed with post-impact monitoring in mind to provide data that are directly relevant and comparable to the data gathered during post-impact monitoring. In situations where limited or no baseline data are available, post-impact monitoring data will be collected following 'beyond- BACI' principles, resulting in data that are amenable to statistical techniques such as asymmetrical analyses of variance following procedures as described by Underwood (1994) and Glasby (2006). This type of analysis involves the comparison of the disturbed location to the average of multiple unaffected control or reference locations, which is a proven and reliable technique for determination of environmental impacts. BHP would ensure modern statistical approaches were used to assess the effects of an oil spill on sensitive environmental receptors where historical baseline datasets were intended to be compared with post-impact data.

Effective oil spill response management will be contingent on knowledge of the distribution of sensitive receptors coupled with access to an oil spill forecast model and situational awareness (i.e. RS2 'Monitor and Evaluate') to inform sampling effort, equipment deployment and field logistics in the post-spill pre-impact period. The sampling designs and field procedures specified in the Oil Spill Monitoring Guidelines (OSMGs) follow scientific principles such as multiple control locations to allow for comparisons with any impacted locations, as well as sampling before and after the incident with replicated samples and at replicated sites to allow for robust statistical analyses and the assessment of any environmental impacts (as described by Underwood [1994]). Given that these OSMGs have been written for a disturbance that has an extremely low probability of occurrence and is unplanned, specific locations or sampling sites have not been specified in the guidelines. Rather, these will be informed by OSTM and RS2 Monitor and Evaluate. Thus, by their nature, these sampling designs, and the resources required for their implementation, are flexible and will be scaled either upwards or downwards depending on the nature and scale of the oil spill.

9.3.5.2 Potential Environmental Impacts

Environmental Monitoring will be labour intensive and involve the deployment of vessels, equipment and personnel. Impacts and risks associated with the physical presence of vessels, including noise and atmospheric emissions, interference with marine fauna, routine and unplanned discharges; and accidental spills have been previously described in Sections 7.3 to 8.6.

9.3.5.3 Oil Spill Preparedness

The resource capacity and on-going scalability in the preparedness for environmental monitoring is outlined in Section 9.3.5.4. BHP has contracts in place with SGS (24/7 standby arrangement for emergency response), Bennelongia and GHD Pty Ltd who maintain resources and equipment to implement the relevant OSMG's. Four personnel are available for immediate deployment to a spill emergency increasing to 25 people by Day 7 and reaching 60 people by Day 14 in the event of an incident.

9.3.5.4 Hierarchy of Controls

The evaluation of controls associated with environmental monitoring assessing the response capacity (i.e. how much oil is treated), the units, implementation time (i.e. how fast can BHP access and start using it), cost sacrifice (Minor = <$100K, Moderate $100K - $1M, Major > $1M) and control effectiveness (defined in Section 9.3.1) is summarised in Table 9-10.

Table 9-10: Evaluation of effectiveness of controls associated with RS10 Environmental Monitoring

Function	Control Measure	Rationale	Response Capacity	Units	Implementation Time (days)	Cost	Effectiveness				
							Availability	Functionality	Reliability	Survivability	Independence/ Compatibility
Eliminate	No environmental monitoring	Do nothing option	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Substitute	-	-	-	-	-	-	-	-	-	-	-
Engineer	-	-	-	-	-	-	-	-	-	-	-
Separate	-	-	-	-	-	-	-	-	-	-	-
Administrate	Environmental monitoring operations reviewed and managed by IMT through IAP process	Within the first 24 hours, the BHP IMT will develop IAPs.	N/A	N/A	N/A	Minor	High	High	High	High	High
	Operational NEBA to include evaluation of requirement for implementation environmental monitoring operations, initiate mobilisation of resources within 24 hours notification by Incident Commander.	The environmental monitoring response strategy will be activated if Operational NEBA indicates the implementation would provide a net environmental benefit in understanding potential environmental impacts to sensitive environmental receptors.	N/A	N/A	0-1	Minor	High	High	High	High	High
	Modelling predictions of oil trajectory to be undertaken to support the Operational NEBA	Used as tool to gain situational awareness through real-time spill trajectory modelling to enable direction of daily environmental monitoring operations.	N/A	N/A	0-2 hrs	Minor	High	High	High	High	High
	Trained personnel to implement environmental monitoring operations	Use of skilled personnel to implement environmental monitoring operations will increase efficiency of oil spill protection efforts	N/A	N/A	N/A	Minor	High	High	High	High	High
	Activation of environmental monitoring guidelines will follow pre-designated plans for establishing works areas to protect environmental sensitivities	Increases the potential that impacts to sensitive receptors will be prevented by avoiding areas with environmental sensitivity.	N/A	N/A	N/A	Minor	High	High	High	High	High
	Vessels used to implement environmental monitoring will be fit-for-purpose and no anchoring of vessels will occur on emergent reefs or other fragile / sensitive benthic habitats	Increases the potential that impacts to sensitive receptors will be prevented by using plant and equipment that is fit-for-purpose.	N/A	N/A	N/A	Minor	High	High	High	High	High
	Environmental monitoring operations will avoid cultural heritage sensitivities	Increases the potential that impacts to sensitive receptors will be prevented by avoiding areas of known cultural significance.	N/A	N/A	N/A	Minor	High	High	High	High	High
	Sampling operations for marine water, sediment quality and benthic infauna to follow Environmental monitoring procedures to allow determination of any environmental impacts and inform effectiveness of response strategies. Laboratory analyses will follow: -US EPA Method 8260 (volatile organic hydrocarbons); and -US EPA Method 8015 (total petroleum hydrocarbons).	Standard procedures and methodologies (US EPA) are in place for laboratory analysis.	Small	N/A	N/A	Minor	High	High	High	High	High
	Sampling operations for marine mammals and megafauna, avifauna, shallow water benthic habitats, marine reptiles, commercial/ recreational fish species and mobile and site-attached fishes associated with seagrasses, macroalgal beds, deep-water sponge gardens, etc. will follow Environmental monitoring procedures to allow determination of any environmental impacts and inform effectiveness of response strategies.	Development of oil spill environmental monitoring appropriate to the nature and scale of the environmental risk to determine the extent, severity and duration of impact to relevant environmental receptors.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Response strategy activities continued until termination criteria met.	Ensures that the operational and environmental response strategy continues until the performance outcome has been achieved.	N/A	N/A	N/A	Minor	High	High	High	High	High
	Current Capability										
	Access to first strike environmental monitoring responders for water quality, sediment quality and benthic infauna via 24/7 standby contract with analytical laboratory	Mobilisation of standby emergency responders to collect water and sediment samples in the post-spill pre-impact period.	Small	4	0-1	Minor	High	High	High	High	High

Function	Control Measure	Rationale	Response Capacity	Units	Implementation Time (days)	Cost	Effectiveness				
							Availability	Functionality	Reliability	Survivability	Independence/ Compatibility
	Access to scientific field sampling personnel	Mobilisation of scientific field sampling personnel to collect environmental data (birds, marine mammals, megafauna, benthic habitats and benthic primary producers, marine reptiles, fisheries and fishes) following sampling designs and procedures outlined in the relevant procedure.	Small	25	7	Minor	High	High	High	High	High
	Scalable Options										
	Access to more environmental monitoring responders	Mobilisation of more scientific field sampling personnel to Melbourne from Perth to collect environmental data (birds, marine mammals, megafauna, benthic habitats and benthic primary producers, marine reptiles, fisheries and fishes) following sampling designs and procedures outlined in the relevant procedure.	Small	50	14-21	Minor	High	High	High	High	High
	Dedicated environmental monitoring crew with sampling equipment on standby at Melbourne	On standby 24/7 during operations to expedite initiation of environmental monitoring operations.	Small	1	0-1	Major, >10 people at $1,000/day	High	High	Low	High	High

9.3.5.5 Demonstration of ALARP

The evaluation of environmental benefit gained compared with practicability and ALARP summary for controls associated with Environmental Monitoring Strategy is provided in Table 9-11. Existing controls in place to mitigate risks associated with physical presence of vessels, noise and atmospheric emissions from vessels, interference with marine fauna, routine and unplanned discharges, and accidental spills have been presented previously. All industry standard response management measures to minimise environmental impacts from Environmental Monitoring will be implemented. It is considered that the overall net environmental benefit from implementing Environmental Monitoring outweighs the impacts and risks from implementation of the Environmental Monitoring Programs.

With the implementation of accepted controls and with no other additional controls identified, other than not implementing this response strategy, it is considered that the impacts and risks from the RS10 Environmental Monitoring response strategy have been reduced to ALARP.

Table 9-11: Evaluation of environmental benefit gained compared with practicability and ALARP summary for controls associated with RS10 Environmental Monitoring

Function	Control Measure	Environmental Benefit Gained	Practicability	ALARP Summary	Performance Standard
Eliminate	Do nothing option.	No environment benefit would be gained from this option; environmental data on any oil spill impacts will be required to understand recovery from any disturbance and to inform the effectiveness of the response strategies.	This control is practicable and not implementing it would not be satisfactory from a stakeholder perspective.	Reject: Environmental monitoring is a recognised strategy for understanding the effects of an oil spill on environmental sensitivities.	-
Substitute	-	-	-	-	-
Engineer	-	-	-	-	-
Separate	-	-	-	-	-
Administrative	Environmental monitoring operations reviewed and managed by IMT through IAP process.	Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The review/evaluation of shoreline protection operations will take place almost immediately in the event of a Level 2 spill. The shoreline protection operations would be adapted based on real-time information regarding the spill incident: determine if sea state and weather conditions are conducive to operations and applicability with other response strategies.	Controls have high effectiveness; are available, functional and reliable and in general are serviceable and compatible with other control measures. Controls have minor cost implications for the operation.	**Accept**: Controls based on legislative requirements must be accepted. Controls are practicable and the cost sacrifice is not disproportionate to the environmental benefit gained.	**PS RS10.1**
	Operational NEBA to include evaluation of requirement for implementation of Environmental Monitoring operations, initiate mobilisation within 24 hours of notification by Incident Commander.	Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The Operational NEBA will be completed based on specific circumstances of the spill incident, using real-time information (e.g. spill trajectory modelling, spill observations, weather and sea state conditions) to confirm the appropriate response strategies to adopt for protection of priority locations and sensitive receptors. Environmental monitoring will be activated by the Operational NEBA to understand environmental impacts to sensitive receptors.			**PS RS10.2**

Function	Control Measure	Environmental Benefit Gained	Practicability	ALARP Summary	Performance Standard
	Modelling predictions of oil trajectory to be undertaken to support the Operational NEBA.	Positive environmental benefit gained as oil spill trajectory modelling will assist in the effective deployment of environmental monitoring field teams to areas where sensitive receptors require priority protection.			**PS RS10.4**
	Trained personnel to implement environmental monitoring operations within 24 hours of notification by Incident Commander.	Positive environmental benefit gained by using skilled personnel to implement environmental monitoring guidelines, which will increase efficiency of response efforts, increases the potential that impacts to sensitive receptors will be prevented and reduces the possibility that mistakes are made that magnify the severity of the situation.			**PS RS10.3**
	Vessels used to implement environmental monitoring will be fit for-purpose and no anchoring of vessels will occur on emergent reefs or other fragile / sensitive benthic habitat.	Positive environmental benefit gained by using small marine craft that are fit for purpose in working in shallow water and not anchoring on emergent coral reefs or other sensitive benthic habitats.			**PS RS10.5**
	Environmental monitoring operations will avoid cultural heritage sensitivities.	Positive environmental benefit gained by taking into consideration any advice from State government agencies and spatial information to avoid impacts to sensitive cultural heritage sensitivities.			**PS RS10.9**
	Response strategy activities continued until termination criteria met.	Positive environmental benefit gained from ensuring that the environmental response strategy continues until the performance outcome has been achieved.			**PS RS10.10**
	Current Capability				
	Access to first strike environmental monitoring responders for water quality, sediment quality and benthic infauna via 24/7 standby contract with analytical laboratory	Positive environmental benefit gained from implementation of these control measures. The objective of environmental monitoring is to collect data to understand the effect of an oil spill on environmental sensitivities.	The response capacity is small but the control effectiveness is generally high. BHP has access to this capability through contractual arrangements with preferred vendors. Control has minor cost implications for the operation.	**Accept:** Controls are practicable and the cost sacrifice is not grossly disproportionate to the environmental benefit gained.	**PS RS10.6**
	Access to scientific field sampling personnel				**PS RS10.6**
	Sampling operations for marine water, sediment quality and benthic infauna to follow Environmental monitoring procedures to allow determination of any environmental impacts and inform effectiveness of response strategies. Laboratory analyses will follow: -US EPA Method 8260 (volatile organic hydrocarbons); and -US EPA Method 8015 (total petroleum hydrocarbons).				**PS RS10.7**
	Sampling operations for marine mammals and megafauna, avifauna, shallow water benthic habitats, marine reptiles, commercial/ recreational fish species and mobile and site-attached fishes associated with seagrasses, macroalgal beds, deep-water sponge gardens and other relevant habitats will follow Environmental monitoring procedures to allow determination of any environmental impacts and inform effectiveness of response strategies.				**PS RS10.8**
	Scalable Options				
	Access to more environmental monitoring responders.	Positive environmental benefit gained from implementation of this control measure. The objective of environmental monitoring is to collect data to understand the effect of an oil spill on environmental sensitivities.	The response capacity is small but the control effectiveness is generally high. BHP has access to this capability through contractual arrangements with preferred vendors. Control has minor cost implications for the operation.	**Accept:** Controls are practicable and the cost sacrifice is not grossly disproportionate to the environmental benefit gained.	**PS RS10.7**

9.3.5.6 Demonstration of Acceptability

BHP considers a range of factors when determining that a level of impact and risk to the environment is broadly acceptable, as summarised in Table 9-12.

Table 9-12: Demonstration of acceptability for RS10 Environmental Monitoring

Criteria	Question	Demonstration
Codes and Standards	Is the impact or risk being managed in accordance with relevant Australian or International legislation, Ministerial Conditions or standards?	Environmental monitoring is a demonstrated response strategy and the accepted controls are consistent with international guidance (e.g. IPIECA/OGP).
ESD	Is the proposed impact consistent with the principles of ESD?	BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct, which endorse the continuous improvement in health, safety and environmental performance in ways that protect people and the environment through the responsible management of petroleum activities and their impacts. BHP considers that adherence to these principles is consistent with the principles of ESD. Implementation of Environmental Monitoring is a recognised strategy to meet the performance outcome of understanding impacts to environmental sensitivities.
Internal Context		
BHP Charter and HSEC Management System Compliance	Is the proposed impact or risk consistent with the requirements of BHP Our Requirements, Petroleum Standard and HSEC Management Systems?	The implementation of Environmental Monitoring will be in compliance with BHP charter values and management systems.
Professional Judgement	Is the impact or risk being managed in accordance with industry best practice?	Environmental Monitoring is a demonstrated response strategy that has been utilised in multiple oil spill events in Australia and internationally. Controls identified in this plan are consistent with industry best practice and guidelines. BHP understands the value of Environmental Monitoring operations, and as such, has contractual arrangements in place for environmental emergency responders to be available onsite at and collecting samples at short notice.
ALARP	Are there any further reasonable and practicable controls that can be implemented to further reduce the impact or risk?	All reasonable and practicable controls have been assessed for their effectiveness, where additional controls were considered but were found not to be justifiable in further reducing the impacts and risks of environmental monitoring without a gross disproportionate sacrifice. BHP considers that the residual risk of shoreline protection has been demonstrated to be ALARP.
External Context		
Environmental Best Practice	Are controls in place to manage the impacts and risk to the environment that are commensurate with the nature and scale of any environmental sensitivities of the receiving environment?	The environmental performance outcome, performance standards and measurement criteria that determine whether the outcome and standards have been achieved are commensurate with the environmental significance of the receiving environment.
Stakeholder Views	Do stakeholders have concerns/ issues, and if so, have controls been implemented to manage their concerns/ issues?	Stakeholders have been consulted about the operation through a comprehensive and long term consultation program. Stakeholder concerns have been considered for environmental monitoring operations, and this is reflected in controls designed to mitigate impacts of the response activity on environmental sensitivities. The decision to activate environmental monitoring operations would be taken by the BHP Incident Commander.

9.3.5.7 Acceptability Summary

BHP has taken all practicable means to prevent a hydrocarbon spill occurring during the Minerva offshore activities and the likelihood of a loss of containment is extremely low when considering industry statistics and the preventative controls in place. BHP has undertaken extensive planning and assessment in the selection of the spill response options presented based on:

- The nature and scale of the worst-case hydrocarbon pollution events;
- The accessibility, the availability and the location of appropriate spill response equipment; and
- The predicted timings of contact of hydrocarbons and loadings of hydrocarbons to sensitive environmental receptors, and the capability and scalability of spill response resources.

BHP has a sound knowledge of the relevant environmental values and sensitivities at risk from hydrocarbon spill events and indirectly from spill response activities.

Given the aforementioned and low probability of the requirement for spill response activities, BHP is satisfied that when the accepted controls are implemented that the impact and residual risk of the Environmental Monitoring strategy to the environment is considered 'tolerable'. Furthermore, the adopted controls are considered to be consistent with good oilfield practice/professional judgement and environmental best practice, and consistent with environmental monitoring operations used elsewhere. In the unlikely event of an unplanned hydrocarbon release incident, Environmental Monitoring operations will comply with all relevant laws, codes and standards, as well as BHP Charter and HSEC Management Systems. All relevant controls were considered as part of the ALARP assessment, and as no other reasonable additional controls were identified that would further reduce the impacts and risks of Environmental Monitoring without a gross disproportionate sacrifice, the impacts and risks associated with this strategy are considered ALARP. BHP undertakes petroleum activities in a manner that is consistent with the principles of ESD. Stakeholders have been consulted about the activity and appropriate control measures will be implemented to address any concerns that were raised. BHP undertakes regular consultation with relevant stakeholders about its operations / activities providing them with sufficient and reasonable opportunities to raise any new concerns or issues for the duration of this activity. On this basis, it is considered that adherence to the performance standards will manage the impacts and risks of environmental monitoring associated with any loss of well containment to an acceptable level.

9.3.5.8 Environmental Performance Outcome, Performance Standards and Measurement Criteria

RS10 Environmental Monitoring			
Performance Outcome	**In the event of a Level 2 spill, initiate Environmental Monitoring programs to support and to inform spill response planning, assess the spill effects of spills and monitor post-spill recovery of sensitive environmental receptors.**		
Aspect	**Number**	**Performance Standard**	**Measurement Criteria**
Planning and Design	**PS RS10.1**	Environmental monitoring to be reviewed and managed in accordance with the IAP.	Daily IAPs
	PS RS10.2	Mobilisation of vessels, equipment and personnel to conduct environmental monitoring in areas where hydrocarbons predicted to make contact with sensitive environmental receptors and where Operational NEBA identified a net environmental benefit of initiating the response strategy.	Spill modelling reports submitted and logged by IMT.
			Documentation of completed Operational NEBA.
Resources	**PS RS10.3**	Initiate mobilisation of environmental monitoring personnel (and equipment/ vessels) to site within 24 hours of notification by Incident Commander.	Contracts/ Agreements in place for all pre- and post-spill environmental monitoring activities.
	PS RS10.4	Spill surveillance reports and spill trajectory modelling predictions incorporated into daily IAP preparation process for response strategies.	-Daily IAPs. -Incident response reports. -Spill modelling reports submitted and logged by IMT.

RS10 Environmental Monitoring			
Performance Outcome	**In the event of a Level 2 spill, initiate Environmental Monitoring programs to support and to inform spill response planning, assess the spill effects of spills and monitor post-spill recovery of sensitive environmental receptors.**		
Aspect	**Number**	**Performance Standard**	**Measurement Criteria**
	PS RS10.5	Vessels used to implement environmental monitoring will be fit-for-purpose and no anchoring of vessels will occur on emergent reefs or other fragile / sensitive benthic habitats.	-Contracts for use of small vessels with OSRAs. -Daily field reports show no anchoring on sensitive habitats.
	PS RS10.6	Access to first strike environmental monitoring responders for water quality, sediment quality and benthic infauna via 24/7 standby contract with analytical laboratory. Access to scientific field sampling personnel.	Agreements in place with preferred environmental monitoring vendors.
Equipment	**PS RS10.7**	Sampling operations for marine water, sediment quality and benthic infauna to follow Environmental monitoring procedures to allow determination of any environmental impacts and inform effectiveness of response strategies. Laboratory analyses will follow: -US Environmental Protection Authority (EPA) Method 8260 (volatile organic hydrocarbons); and -US EPA Method 8015 (total petroleum hydrocarbons).	-Chain of custody, laboratory results and analytical technique documented. -Records of independent peer review of the taxonomy of benthic invertebrates. -Environmental monitoring reports containing assessments of environmental impacts.
	PS RS10.8	Sampling operations for marine mammals and megafauna, avifauna, shallow water benthic habitats, marine reptiles, commercial/ recreational fish species and mobile and site-attached fishes associated with seagrasses, macroalgal beds, deepwater sponge gardens and other habitats will follow Environmental monitoring procedures to allow determination of any environmental impacts and inform effectiveness of response strategies.	Environmental monitoring reports containing assessments of environmental impacts.
	PS RS10.9	Environmental monitoring operations will avoid cultural heritage sensitivities	Records of IAPs and field reports include review and management of heritage values.
	PS RS10.10	Environmental Monitoring activities continued until termination criteria met.	-Report analysis determines that Environmental Monitoring Programs have achieved their endpoint criteria, and approved by the Incident Commander in consultation with stakeholders.

The initiation criteria, course of action, resources, supporting documentation and termination criteria associated with each response strategy are detailed in the Minerva OPEP (Appendix F).

9.3.6 RS11 Oiled Wildlife Response

9.3.6.1 Summary of Activity

Oiled wildlife response includes pre-oiling activities such as the installation of onshore exclusion barriers (e.g. fencing) to stop shorebirds and terrestrial fauna gaining access to shoreline areas affected by the hydrocarbon spill; hazing techniques, either on the water or on shorelines and may involve a combination of visual and auditory devices to shepherd fauna away from oil slicks or oiled shorelines; and pre-emptive capture and removal of fauna that may otherwise come into contact with oil if they were to stay in the area.

Post-oiling activities will include the collection and rehabilitation to treat oiled fauna at dedicated Oiled Wildlife Response Centres and once treated, to return them to similar suitable habitat.

9.3.6.2 Potential Environmental Impacts

Oiled wildlife response will require vessels, aircraft, trained personnel and a suitable Oiled Wildlife Response Centre for the cleaning and aftercare treatment of oiled wildlife. There will be impacts associated with the aircraft/ vessels involved in the response activities from their physical presence, noise and atmospheric emissions from anchor handling tug supply (AHTS) vessels, interference with marine fauna, routine and non-routine discharges and from accidental spills. Impacts from these risks have been discussed in the following previous sections:

- Physical presence (Section 7.3);
- Noise emissions (Section 7.5);
- Atmospheric emissions (Section 7.7);
- Liquid discharges (Section 7.8);
- Solid wastes (Section 7.9);
- Unplanned interference to marine fauna (Section 8.2);
- Unplanned hydrocarbon or chemical spills or leaks from subsea infrastructure (Section 8.4);
- Unplanned hydrocarbon release from loss of well control (Section 8.5); and
- Unplanned diesel spill from bulk storage (Section 8.6).

Potential risks and impacts from implementation of the Oiled Wildlife Response strategy also include:

- Non-oiled fauna may be accidentally driven into surface oil slicks or impacted shorelines during hazing and pre-emptive capture activities resulting in increased numbers of oiled wildlife;
- During hazing and pre-emptive capture activities, oiled fauna may be accidentally driven into surface oil slicks or impacted shorelines rather than away from oil during hazing activities;
- Inappropriate equipment and capture techniques resulting in distress, fatigue, injury and/ or the separation of faunal groups (adult/juvenile pairs);
- Inadequate/ inappropriate cleaning and husbandry techniques/ conditions resulting in distress, disease and/ or injury; and
- Release of captured wildlife to inappropriate relocation areas.

The overall aim of the Oiled Wildlife Response Strategy is to mitigate the effects of oil on wildlife. Specifically, the response strategy seeks to define a system that addresses the overall aim focussing on the following key objectives:

- Respond safely and efficiently to oiled wildlife;
- Protect the health and welfare of wildlife threatened or impacted by oil;
- Co-ordinate field reconnaissance of at risk or impacted wildlife;
- Prevent or minimise exposure of wildlife to oil where possible;
- Recover oiled wildlife in a safe and effective manner;
- Prioritise the treatment of species of conservation value when resources are limited;
- Establish an effective system for the treatment and rehabilitation of oiled wildlife;
- Release wildlife back into the wild as healthy, contributing members of a population; and
- Identify and remove dead oiled wildlife from the coastal environment.

9.3.6.3 Oil Spill Preparedness

BHP has developed oiled wildlife response capability in conjunction with AMOSC and Oil and Gas operators. An Oiled Wildlife Response sub-Working Group under APPEA, of which BHP is an active participant, has developed a framework that includes:

The IPIECA Key principles for the protection, care and rehabilitation of oiled wildlife document, developed as part of the IPIECA-IOGP Oil Spill Response Joint Industry Project and authored by the 11 organisations comprising the Global Oiled Wildlife Response System (GOWRS) Project, serves as a reference to illustrate what should be considered as international 'standards of practice' for animal protection and care in an oiled wildlife response. The document is designed to give broad-based details to help response organisations engaged as part of an international response follow internationally-accepted protocols. It also complements good practices in wildlife response preparedness and aims to encourage the development of protocols and procedures that relate to each of the points listed in this document.

The diesel AMBA does not enter any Marine park boundary or have any shallow water, shoreline or coral impacts (Section 8.6). The need is to have capacity to mobilise a response to oiled wildlife from Day 1 ready to receive first casualties. The capacity for the Oiled Wildlife Response (OWR) will be sustained until the termination criteria for RS11 OWR (refer to OPEP) is achieved. Populations of wildlife that occur in the area are variable.

The environmental benefit of the Oiled Wildlife Response Strategy is the humane treatment of oiled wildlife through mitigation of impacts from oil. The priority areas for wildlife protection include marine mammals, turtle nesting locations and migratory shorebird habitats. Should a spill occur during turtle nesting season and / or the migratory shorebird season (September to April) priority will be given to resourcing oiled wildlife response at these areas. BHP recognises wildlife abundance varies with differing shoreline types, and consequently, Shoreline clean-up and assessment technique (SCAT) teams will cover the shorelines across the whole impact area and not just those in the high priority areas.

Response Arrangements

The level of OWR planning used as a reference for the Minerva personnel numbers and equipment requirements is Level 6, as defined in Table 9-13.

Table 9-13: Oiled wildlife response planning level

OWR level	Duration of OWR	Birds general	Birds OWR complex #	Turtles - hatchlings / juveniles / adults	Dolphins / Whales	Pinnipeds	Mammals terristrial	Reptiles	Dugongs
Level 1	<3 days	1-2 birds per day or < 5 total	No complex birds	None	None	None	None	None	None
Level 2	4-14 days	1-5 birds per day or <20 total	No complex birds	< 20 hatchlings no Juveniles or adults	None	None	None	None	None
Level 3	4-14 days	5-10 birds per day or < 50 total	1-5 birds per day or <10 total	< 5 juv/adults, < 50 hatchlings	None	< 5 seals	< 5	< 5 - no crocodiles	None
Level 4	>14 days	5-10 birds per day or < 200 total	5-10 birds p/day	< 20 juv/adults < 500 hatchlings	< 5 or known habitats affected	5-50 seals	5-50 mammals	5-50 reptiles	Dugong habitat affected only
Level 5	>14 days	10-100 birds per day or > 200 total	10-50 birds per day	>20 juv/adults, > 500 hatchlings	>5 dolphins	> 50 seals	> 50 mammals	>50 reptiles	Dugongs oiled
Level 6	>14 days	>100 birds for day	10-50 birds per day	>20 juv/adults, > 500 hatchlings	>5 dolphins	> 50 seals	> 50 mammals	>50 reptiles	Dugongs oiled
# Threatened species, protected by treaty, or specialist feeders									

Source: WAOWRP V1.1; 18/08/2014

Equipment

Site selection of OWR facilities would be prioritised, which covers the likely region of expected oiled wildlife. Initially, BHP would mobilise and construct 1 x OWR Washing and Rehabilitation Facility capable of treating 500 oiled wildlife units (Figure 9-1). AMOSC are the custodians of OWR equipment and can provide the OWR capabilities (Table 9-14). The need for additional OWR Washing and Rehabilitation facilities would be determined from:

- Monitoring the load of the oiled wildlife in the facility;
- SCAT reports for locations and numbers of oiled wildlife in the field; and
- SCAT reports using predictions from the OSTM that may impact unaffected populations.

At 75 % capacity of the OWR facility, or based on the need from SCAT reports, BHP would commence mobilisation of resources and construction of another OWR Facility.

Through its arrangements with AMOSC, BHP has access to equipment sufficient to construct 2 x OWR Washing and Rehabilitation facilities to treat 1,000 oiled wildlife units. This includes contracts with vendors to construct the facility. If the spill demanded a larger oiled wildlife response, additional response equipment would be acquired.

BHP Materials and Logistics team has evaluated the list of equipment / suppliers and the potential for long lead items. Any gaps in the equipment requirements to meet the needs of the oiled wildlife response, whatever level it may be, will be filled by the ongoing procurement of oiled wildlife equipment using the lists and suppliers identified above, and/or sourcing more equipment from international response agencies including OSRL, if equipment within Australia was exhausted.

The reliability and effectiveness of BHP's oiled wildlife response equipment is considered to be matched to the level of consequence of the spill. Table 9-15 provides an indicative schedule of oiled wildlife response arrangements.

Table 9-14: Oiled wildlife response equipment

Resource	Location	Provider / Owner	Units	Deployment	Capacity
OWR Kit	Exmouth, Karratha, Dampier, Geelong, Barrow Is., Broome, Fremantle	AMOSC, AMSA, Chevron (Mutual Aid)	10	Within 24 hrs of incident notification	1 unit caters for approximately 100 wildlife units
OWR (20 ft.) Container	Geelong, Fremantle	AMOSC	2	Within 24 hrs of incident notification	Approx. 500 wildlife units
OWR Container	Dampier, Darwin, Devonport, Townsville	AMSA	4	Activated at short notice of National Plan.	Approx. 500 wildlife units
OWR Container	Sydney	NSW Maritime	1	Activated at short notice of National Plan.	Approx. 500 wildlife units

Figure 9-1: Internal setup of the AMOSC oiled wildlife containerised wash facility

Table 9-15: Indicative schedule of oiled wildlife response arrangements

Activity	Day															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	to	TC
Notify AMOSC / AMSA																
Mobilise AMOSC (x2) OWR containerised washing and rehabilitation facilities and trained OWR resources																
Mobilise AMOSC, Mutual Aid and National Plan Oiled Fauna Kits, first strike kits and trained OWR resources																
BHP GIS Team to advise on the location of any aboriginal registered sites of cultural significance																
Operational NEBA to identify environmental sensitivities for preferred OWR site and staging areas																
Operational NEBA to identify environmental sensitivities and locations of ongoing oiled wildlife surveys, incorporated into daily IAP, ongoing throughout response																
Mobilise unskilled labour																
Mobilise vets, wildlife carers, wildlife rehabilitation resources																
First strike OWR kits operational																
Commence construction of the OWR Washing and Rehabilitation facility #1 as per details in WAOWRP and PROWRP.																
OWR Wash and Rehabilitation facility #1 operational and ready to receive oiled wildlife																
Oiled wildlife recovery teams deployed to assigned shoreline segments for wildlife reconnaissance, as described in the daily IAP																
Evaluate capacity of OWR facility and determine needs for more personnel / equipment / additional OWR facility																
Mobilise additional support (Sea Alarm, OSRL etc.) as necessary																

Activity	Day															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	to	TC
Commence construction of OWR Washing and Rehabilitation facility #2																
Mobilise AMSA OWR container																
Commence training courses for specialist roles in OWR Organisation Structure, ongoing throughout response																
OWR facility #2 operational																
Key	Mobilisation				Field / office activity				Equipment standby					TC = termination criteria met		

Personnel

Implementation of the OWR by BHP would involve mobilisation of trained personnel from the AMOSC OWR Industry team and established relationships though MoUs. Table 9-16 summarises the trained OWR personnel available to establish OWR capability.

Table 9-16: Oiled wildlife response personnel

Resource	Provider / Owner	Number	Deployment
OWR Officer	AMOSC	1	OWR Development
OWR Industry team	AMOSC	18	Trained to Level 2-4 (Parks and Wildlife training – aligning with OWR Levels and Personnel Requirements described in the West Australia Sate Plan, OWR)
Facilities management group	AMOSC call off contracts (on behalf of industry)	-	DWYERtech NZ; availability within 24 hours of call off
Blue Planet Marine	AMOSC	10-20	Developed relationships
Massey University	AMOSC	4-6	Developed relationships
International Bird Rescue	AMOSC	4	Developed relationships
Phillip Island National Parks (PINP)	AMOSC	50 PINP staff – collection/ facility ops/ rehabilitation 45 volunteers – collection/ facility ops/ rehabilitation 20 staff – animal feeding 6 PINP staff - wildlife emergency response Inc. cetacean stranding/ entanglement etc. 17 PINP staff - wildlife team leaders 5 PINP staff - IMT trained	Established MoU in 2018
University of California, Davies	AMOSC	-	Developing MoU Specialist advice, peer review, support – planning, preparedness and response

Table 9-17 summarises the roles and resource capacity required to establish an OWR washing and rehabilitation facility.

Table 9-17: Resources required for OWR washing and rehabilitation facility

Training Level	Response Function	Roles	OWR Facility 1	OWR Facility 2	Source
OWR Skill Level 4	Wildlife Advisors	Wildlife Advisors	2	4	AMOSC OWR Core Group
	Wildlife Resource Coordinators	Wildlife Resource Coordinators			
	Wildlife Field Coordinator	Wildlife Field Coordinator, Deputy Field Coordinator			
OWR Skill Level 3	Functional Unit Supervisors	Planning Officers, Logistics Officer, Finance/Admin Officer, Operations Officer	4	8	AMOSC OWR Core Group

Training Level	Response Function	Roles	OWR Facility 1	OWR Facility 2	Source
OWR Skill Level 2	Division Leaders	Reconnaissance; Field Rescue Staging Area; Facilities, Rehabilitation Coordinators, Communications officer	18	36	AMOSC OWR Core Group
OWR Skill Level 1	Responders	Drying/washing team; Rescue/collection team; Rehabilitation team; Intake team; Transport Team	90	180	Unskilled labour hire (e.g. BHP contracted resource provider)
	Vets	Vets, Carers, Rehabilitation	4	4-8	Local / WA
	Other specified skills		4		External resources to be confirmed
TOTAL			**122**	**236**	

Source: WAOWRP V1.1; 18/08/2014

A gap in the ability to sustain the oiled wildlife response is access to trained specialists, e.g. vets, and oiled wildlife responders. To fill the gap in trained specialists, veterinarians across the region, State and within Australia would be sourced. Wildlife specialists from across Australia would be sourced if the spill demanded a large personnel response. Similarly, gaps in the trained personnel numbers would be filled from either:

- International skilled resources and including OSRL and Sea Alarm;
- Initiation of training courses in Perth to upskill responders prior to mobilisation to site (2 days); and
- For the unskilled labour, training has been included in the mobilisation schedule.

The reliability and effectiveness of the oiled wildlife responders is considered to be matched to the level of consequence of the spill.

A key risk for the oiled wildlife response is that fauna will be affected by inappropriate handling, treatment or transport. BHP will access trained personnel who will be leading the response and specialist equipment through its existing agreement with AMOSC. These controls will minimise the risk of inappropriate methods or equipment being used in the response. The proposed controls for the oiled wildlife response strategy will mitigate the potential environmental impacts of implementing this response strategy ensuring the environmental benefits of the strategy outweigh impacts associated with its implementation or, conversely, non-implementation.

Oiled Wildlife Response Logistical Considerations

DJPR will be notified immediately in all instances where injured wildlife is found. DJPR will advise the response actions required.

Upon retrieval from shoreline the affected animals would be transported by road to Warrnambool for rehabilitation. Animals collected from marine environment shall be collected at the Marine Staging Areas and transported to Warrnambool for rehabilitation (OPEP Section 4.7).

Depending on the scale oiled wildlife response, additional equipment and resources can be obtained through OSRL and Sea Alarm which provide:

- 24/7 readiness to assist Members worldwide;
- Mobilisation procedures for wildlife response assistance;
- Maintaining wildlife response equipment for the different OSRL bases;
- Mobilisation procedures for the wildlife equipment;
- Advice and assistance with managing oiled wildlife response incidents;
- Assist with finding qualified wildlife responders that can be contracted by OSRL members to respond to a particular wildlife incident;

- Assist with the integration of the contracted wildlife responders into the response; and
- Develop awareness and preparedness amongst wildlife response organisations in relation to assistance of OSRL Members.

Sea Alarm is widely recognised as an independent and impartial facilitator and is able to bridge gaps between industry, governments and NGOs during and between oil spill incidents.

In summary, mobilisation, construction and implementation of the BHP OWR strategy with specialist equipment and trained resources are sufficient, timely and appropriate for the mitigation of potential impacts to oiled wildlife and match the consequences of a worst-case spill because:

- The response will be based on Vic State (Victorian Emergency Animal Welfare Plan [VEAWP]) approved plans;
- OWR Wash and Rehabilitation facilities can be built and mobilised in a timely manner, e.g. immediate access to First Strike OWR kits (10 kits each capable of treating 100 units) with the main OWR facility operational and ready to receive oiled wildlife by Day 5, with sufficient equipment surplus to initial requirements to construct a second facility being mobilised early in response and available onsite, if needed; and
- Response strategies detailed within the Vic State approved plans will be implemented by trained specialists and oiled wildlife responders using appropriate equipment.

9.3.6.4 Hierarchy of Controls

The evaluation of controls associated with oiled wildlife assessing the response capacity (i.e. how much oil is treated), the units, implementation time (i.e. how fast can BHP access and start using it), cost sacrifice (Minor = <$100K, Moderate = $100K - $1M, Major = > $1M) and control effectiveness (defined in Section 9.3.6.3) is summarised in Table 9-18.

Existing controls in place to mitigate risks associated with physical presence of vessels, noise and atmospheric emissions from vessels, interference with marine fauna, routine and non-routine discharges, and accidental spills have been previously presented in Sections 7.5 - 7.8, and Sections 8.2 - 8.6. Using vessels and resources already involved in other parallel responses strategies to implement this strategy contributes to reducing the risks and impacts to ALARP.

Table 9-18: Evaluation of effectiveness of controls associated with RS11 Oiled Wildlife Response

Function	Control Measure	Rationale	Response Capacity	Units	Implementation Time (days)	Cost	Effectiveness				
							Availability	Functionality	Reliability	Survivability	Independence / Compatibility
Eliminate	No oiled wildlife response	Do nothing option	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Substitute	-	-	-	-	-	-	-	-	-	-	-
Engineer	-	-	-	-	-	-	-	-	-	-	-
Separate	-	-	-	-	-	-	-	-	-	-	-
Administrate	Oiled wildlife response operations will be reviewed and managed by IMT through IAP process.	Within the first 24 hours, the BHP IMT will develop IAPs.	N/A	N/A	0-1	Minor	High	High	High	High	High
	Operational NEBA to include evaluation of requirement for implementation of oiled wildlife response.	The oiled wildlife response strategy will be activated if Operational NEBA indicates the implementation would provide a net environmental benefit in preventing impacts to sensitive receptors.	N/A	N/A	0-1	Minor	High	High	High	High	High
	Lead response personnel are trained and experienced for the activities to which they are assigned.	Use of skilled personnel to implement oiled wildlife response will increase efficiency of oil spill protection efforts.	N/A	N/A	5	Minor	High	High	High	High	High
	Activation and implementation of oiled wildlife response will follow pre-designated plans for establishing works areas, as described in VEAWP and guidance from the IPIECA Key principles for the protection, care and rehabilitation of oiled wildlife.	Increases the potential that impacts to sensitive receptors will be prevented by avoiding areas with environmental sensitivity.	N/A	N/A	5	Minor	High	High	High	High	High
	Oiled wildlife response operations will avoid cultural heritage sensitivities.	Increases the potential that impacts to sensitive receptors will be prevented by avoiding areas of known cultural significance.	N/A	N/A	N/A	Minor	High	High	High	High	High
	Response strategy activities continued until termination criteria met.	Ensures that the oiled wildlife response strategy continues until the performance outcome has been achieved.	N/A	N/A	N/A	Minor	High	High	High	High	High
	Current Capability										
	Access to containerised oiled wildlife wash facility (via AMOSC contract) and trained responders, mobilisation within 24 h of notification by IMT Incident commander, facility ready to take oiled wildlife within 72 hours of reaching site.	Contract with AMOSC for mobilisation to Warrnambool and access to resources and equipment.	N/A	N/A	5	Minor	High	High	High	High	High
	Scalable Options										
	Access to more oiled wildlife responders	Mobilise more oiled wildlife responders from around Australia and SE Asia	N/A	N/A	14-21	Minor	High	High	High	High	High
	Pre-deployment of oiled wildlife container on standby at Warrnambool during offshore activities.	On standby 24/7 during operations to expedite initiation of operational and scientific monitoring operations.	Small	1	0-1	Moderate, $425 / day x 156 = ~$66K	High	High	Low	High	High

9.3.6.5 Demonstration of ALARP

Existing controls in place to mitigate risks associated with physical presence of vessels, noise and atmospheric emissions from vessels, interference with marine fauna, routine and non-routine discharges, and accidental spills have been previously presented in Sections 7.5 - 7.8, and Sections 8.2 - 8.6. Oiled Wildlife Response personnel will bring existing technical skills and expertise applicable to an oiled wildlife response. All additional personnel will require training specific to oiled wildlife response. It is anticipated that AMOSC, in collaboration with an oiled wildlife response provider, will develop and recommend specific training requirements for various levels of oiled wildlife response personnel. It is also the intention of AMOSC to maintain a database of trained oiled wildlife response personnel and technical specialists from within Australia and beyond.

With the implementation of accepted controls and with no other additional controls identified, other than not implementing this response strategy, it is considered that the impacts and risks from the RS11 Oiled Wildlife response strategy have been reduced to ALARP. Using vessels and resources already involved in other parallel responses strategies to implement this strategy contributes to reducing the risks and impacts to ALARP.

Table 9-19: Evaluation of environmental benefit gained compared with practicability and ALARP summary for controls associated with RS11 Oiled Wildlife Response

Function	Control Measure	Environmental Benefit Gained	Practicability	ALARP Summary	Performance Standard
Eliminate	Do nothing option	No environment benefit would be gained from this option.	This control is practicable and not implementing it would not be satisfactory from a stakeholder perspective.	**Reject:** Oiled wildlife response is a recognised strategy for preventing impacts of an oil spill on environmental sensitivities.	-
Substitute	-	-	-	-	-
Engineer	-	-	-	-	-
Separate	-	-	-	-	-
Administrate	Oiled wildlife response operations reviewed and managed by IMT through IAP process.	Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The review/evaluation of oiled wildlife operations will take place almost immediately in the event of a Level 3 spill. The oiled wildlife operations would be adapted based on real-time information (situational awareness / OSTM) regarding the spill incident to inform collection of wildlife.	Controls have high effectiveness; are available, functional and reliable and in general are serviceable and compatible with other control measures. Controls have minor cost implications.	**Accept**: Controls are practicable and the cost sacrifice is not disproportionate to the environmental benefit gained.	**PS RS11.1**
	Operational NEBA to include evaluation of requirement for implementation of oiled wildlife response.	Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The Operational NEBA will be completed based on specific circumstances of the spill incident, using real-time information (spill trajectory modelling, spill observations, weather and seastate conditions etc.) to confirm the appropriate response strategies to adopt for protection of priority locations and sensitive receptors. Oiled wildlife response will be activated by the Operational NEBA to prevent impacts to sensitive receptors.			**PS RS11.2**
	Lead response personnel are trained and experienced for the activities to which they are assigned.	Positive environmental benefit gained by using skilled personnel to implement oiled wildlife response following Industry and Vic State Government plans, which will increase efficiency of response efforts, increases the potential that impacts to sensitive receptors will be prevented and reduces the possibility that mistakes are made that magnify the severity of the situation.			**PS RS11.3**
	Activation and implementation of oiled wildlife response will follow pre-designated plans for establishing works areas, as described in VEAWP and guidance from the IPIECA Key principles for the protection, care and rehabilitation of oiled wildlife.				**PS RS11.8**
	Oiled wildlife response operations will avoid cultural heritage sensitivities.	Positive environmental benefit gained by taking into consideration any advice from State government agencies and spatial information to avoid impacts to sensitive cultural heritage sensitivities.			**PS RS11.10**
	Response strategy activities continued until termination criteria met.	Positive environmental benefit gained from ensuring that the oiled wildlife response strategy continues until the performance outcome has been achieved.			**PS RS11.9 and PS RS11.11**
	Current Capability				
	Access to containerised oiled wildlife wash facility (via AMOSC contract) and trained responders, mobilisations within 24 h of notification by IMT Incident commander, facility ready to take oiled wildlife within 72 hours of reaching site.	Positive environmental benefit gained from implementation of this control measure. The objective of oiled wildlife response is to prevent effects of an oil spill on environmental sensitivities.	The response capacity is small but the control effectiveness is generally high. BHP has access to this capability through contractual arrangements with AMOSC. Control has minor cost implications.	**Accept**: Controls are practicable and the cost sacrifice is not grossly disproportionate to the environmental benefit gained.	**RS11.4 PS RS11.5, PS RS11.6 and PS RS11.7**
	Scalable Options				

Function	Control Measure	Environmental Benefit Gained	Practicability	ALARP Summary	Performance Standard
	Access to more oiled wildlife responders.	Positive environmental benefit gained from implementation of this control measure. The objective of oiled wildlife response strategy is to prevent effects of an oil spill on environmental sensitivities.	The response capacity is small but the control effectiveness is generally high. BHP has access to this capability through contractual arrangements with AMOSC. Control has minor cost implications.	**Accept**: Controls are practicable and the cost sacrifice is not grossly disproportionate to the environmental benefit gained.	**PS RS11.6**
	Pre-deployment of oiled wildlife container on standby during offshore activities.	The environmental benefit associated with oiled wildlife response strategy is considered to be significant, which has the potential to reduce the environmental severity from a Material Risk rating of 5 (serious or extensive impacts <20 years) to a Non-Material Risk rating of 4 (major impacts <5 years; Section 6). Scalable options for oiled wildlife response involve a pre-deployment and establishment of the oiled wildlife facility to be on standby, fully functional and capable of receiving oiled wildlife on Day 1 of an incident.	Dedicated standby oiled wildlife crews have substantial costs, in the order of >$66K that would be incurred for the duration of the Minerva offshore activities campaign.	**Reject**: This control has moderate costs that are disproportionate to the potential environmental benefit that might be gained particularly taking into consideration the availability and mobility of the containerised oiled wildlife wash facility operated by AMOSC and available in Perth, i.e. 36 hours by road freight once activated by the BHP IMT.	-

ALARP Considerations

BHP's preparedness for oiled wildlife response includes access to equipment and trained personnel through arrangements with AMOSC and OSRL. BHP has capacity to mobilise a response to oiled wildlife from Day 1 and ready to manage the first casualties. The first OWR Washing and Rehabilitation Facility capable of treating up to 500 oiled wildlife units would be operational and ready to receive wildlife by Day 5. If the spill needed a larger oiled wildlife response, BHP would continue scaling up its activities using the systems and procedures outlined in the VEAWP plans to sufficiently match the consequence of the spill.

With the existing arrangements in place for equipment, there would be a limited additional environmental benefit in purchasing more oiled wildlife response equipment. Additional mobile container units would have the benefit of being able to treat more wildlife, however, other facilities can be adapted to perform the same function in similar timeframes. The hardware required for fitting out an oiled wildlife facility (i.e. tanks, pumps, hoses, benches) are readily available from a number of hardware/industrial suppliers. The cost, therefore, of this option is disproportionate relative to the environmental gained.

Training more personnel would have the environmental benefit of being able to mobilise the third OWR facility more expediently. The cost of the training, identification of personnel suitable for the training and management of these resources is not considered to be commensurate to the risk of the event. The gap in trained specialists and responders would be filled by contracting more veterinarians, sourcing international skilled resources and initiation of training courses to upskill responders prior to mobilisation to site.

With the implementation of accepted controls and with no other additional controls identified, other than not implementing this response strategy, it is considered that the impacts and risks from the RS11 Oiled Wildlife response strategy have been reduced to ALARP.

9.3.6.6 Demonstration of Acceptability

BHP considers a range of factors when determining that a level of impact and risk to the environment is broadly acceptable, as summarised in Table 9-20.

Table 9-20: Demonstration of acceptability for RS11 Oiled Wildlife Response

Criteria	Question	Demonstration
Codes and Standards	Is the impact or risk being managed in accordance with relevant Australian or International legislation, Ministerial Conditions or standards?	Oiled wildlife is a demonstrated response strategy and the accepted controls are consistent with standards that have been developed. Oiled wildlife collection and response will be undertaken in accordance with permits issued by the relevant regulatory authority.
ESD	Is the proposed impact consistent with the principles of ESD?	BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct, which endorse the continuous improvement in health, safety and environmental performance in ways that protect people and the environment through the responsible management of petroleum activities and their impacts. BHP considers that adherence to these principles is consistent with the principles of ESD. Implementation of oiled wildlife response is a recognised strategy to meet the performance outcome of understanding impacts to environmental sensitivities.
Internal Context		
BHP Charter and HSE Management System Compliance	Is the proposed impact or risk consistent with the requirements of BHP Our Requirements, Petroleum Standard and HSEC Management Systems?	The implementation of oiled wildlife response will be in compliance with BHP charter values and management systems and will be consistent with activities utilised in oil spill events internationally.
Professional Judgement	Is the impact or risk being managed in accordance with industry best practice?	Oiled wildlife response is a demonstrated response strategy that has been utilised in multiple oil spill events internationally. Controls identified in this plan are consistent with industry best practice and guidelines. Accepted controls that will be implemented are provided in Table 9-19.

Criteria	Question	Demonstration
		BHP understands the value of oiled wildlife response operations, and as such, has access to a containerised oiled wildlife wash facility (via AMOSC contract) and trained responders, with mobilisations within 24 h of notification by IMT Incident commander, facility ready to take oiled wildlife within 72 hours of reaching site.
ALARP	Are there any further reasonable and practicable controls that can be implemented to further reduce the impact or risk?	All reasonable and practicable controls have been assessed for their effectiveness (see Table 9-19) additional controls were considered but were found not to be justifiable in further reducing the impacts and risks of oiled wildlife response without a gross disproportionate sacrifice. BHP considers that the residual risk of oiled wildlife response has been demonstrated to be ALARP.
External Context		
Environmental Best Practice	Are controls in place to manage the impacts and risk to the environment that are commensurate with the nature and scale of any environmental sensitivities of the receiving environment?	The environmental performance outcome, performance standards and measurement criteria that determine whether the performance outcome and performance standards have been achieved are commensurate with the environmental significance of the receiving environment.
Stakeholder Views	Do stakeholders have concerns / issues, and if so, have controls been implemented to manage their concerns / issues?	Stakeholders have been consulted about the Minerva offshore activities through a comprehensive and long-term consultation program. Stakeholder concerns have been considered for oiled wildlife response, and this is reflected in controls designed to mitigate impacts of the response activity on environmental sensitivities, e.g. cultural heritage sites. The decision to activate oiled wildlife response would be taken by the IMT Incident commander.

9.3.6.7 Acceptability Summary

BHP has taken all practicable means to prevent a reservoir hydrocarbon spill occurring during the petroleum activity and the likelihood of a loss of reservoir hydrocarbons is extremely low when considering industry statistics and the preventative controls in place. The activities are typical of offshore petroleum activities occurring elsewhere in Australian waters. BHP has undertaken extensive planning and assessment in the selection of the spill response options presented based on:

- The nature and scale of the worst-case hydrocarbon pollution events;
- The accessibility, the availability and the location of appropriate spill response equipment; and
- The predicted timings of contact of hydrocarbons and loadings of hydrocarbons to sensitive environmental receptors, and the capability and scalability of spill response resources.

The proposed control measures for preventing and minimising the risks associated with using an oiled wildlife response strategy to the marine environment are comprehensive and consistent with all relevant codes and standards and good oilfield practice. This response strategy enables the collection of oiled wildlife and relocation to a rehabilitation facility where animals can recover until release back into the environment. This strategy has been used on oil spills elsewhere and is considered by BHP to be an acceptable strategy in the unlikely event of a reservoir hydrocarbon spill. With the implementation of the accepted controls, the impact and risks associated with the response strategy are considered to be acceptable.

Given the aforementioned and low probability of the requirement for spill response activities, BHP is satisfied that when the accepted controls are implemented that the impact and residual risk of the oiled wildlife response strategy to the environment is considered 'tolerable'. Furthermore, the adopted controls are considered to be consistent with good oilfield practice/professional judgement and environmental best practice, and consistent with oiled wildlife response operations used elsewhere. In the unlikely event of a loss of reservoir hydrocarbons, oiled wildlife response operations will comply with all relevant laws, codes and standards, as well as BHP Charter and HSE Management Systems. All relevant controls were considered as part of the ALARP assessment, and as no other reasonable additional controls were identified that would further reduce the impacts and risks of oiled wildlife response without a gross disproportionate sacrifice, the impacts and risks associated with this strategy are considered ALARP. BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct and hence the principles of ESD. Stakeholders have been consulted about the Minerva offshore activities and appropriate control measures will be implemented to address any concerns that were raised. BHP undertakes regular consultation with relevant stakeholders about its operations / activities providing them with sufficient and reasonable opportunities to raise any new concerns or issues for the duration of this activity. On this basis, it is considered that adherence to the performance standards will manage the impacts and risks of oiled wildlife response associated with any loss of reservoir hydrocarbons to an acceptable level.

9.3.6.8 Environmental Performance Outcome, Performance Standards and Measurement Criteria

RS11 Oiled Wildlife Response			
Performance Outcome	**Protect exposed marine fauna by removal and relocation or treatment and release during a spill event.**		
Aspect	**Number**	**Performance Standard**	**Measurement Criteria**
Planning and Design	**PS RS11.1.**	Oiled Wildlife Response operations to be managed in accordance with the IAP.	Daily IAPs.
	PS RS11.2.	Mobilisation of vessels to conduct Oiled Wildlife Response in areas where surface oil predicted to travel and make contact with sensitive environmental receptors and where Operational NEBA identified a net environmental benefit of initiating the response strategy.	Spill modelling reports submitted and logged by IMT.
			Documentation of completed Operational NEBA.
Resources	**PS RS11.3.**	Lead response personnel are trained and experienced for the activities to which they are assigned.	Training records.
	PS RS11.4.	Mobilisation of containerised oiled wildlife wash facility (via AMOSC contract) within 24 h of notification by IMT Incident commander.	Contract with AMOSC for mobilisation to Exmouth and access to equipment.
	PS RS11.5.	Initiate mobilisation of national and international oil spill responders within 24 h of notification by IMT Incident commander.	Contract/ Agreement in place for first responder oiled wildlife personnel available for mobilisation to Exmouth.
	PS RS11.6.	Capacity to respond to oiled wildlife will be in place within 72 h of arrival to site of oiled wildlife response resources.	Records of IAP conducted for the period of response incorporating Oiled Wildlife Response.
	PS RS11.7.	Prior confirmation that Oiled Wildlife Response Centre has capacity to receive and treat oiled fauna.	Oiled Wildlife Response Centre communication log.
Equipment	**PS RS11.8.**	Activation and implementation of oiled wildlife response will follow pre-designated plans for establishing works areas.	Oiled wildlife logs demonstrate that the PROWRP processes and procedures have been followed.
	PS RS11.9.	Response strategy activities continued until termination criteria met.	Incident response reports from ‘Monitor and Evaluate’ activities and observation logs detail surface oil slick has been broken up to extent that continuation

RS11 Oiled Wildlife Response			
Performance Outcome	**Protect exposed marine fauna by removal and relocation or treatment and release during a spill event.**		
Aspect	**Number**	**Performance Standard**	**Measurement Criteria**
			of the operations is no longer considered to be effective and / or surface oil slick is no longer deemed a potential threat to sensitive environmental receptors.
	PS RS11.10.	Oiled wildlife operations will avoid cultural heritage sensitivities. Consultation with (and authority where necessary) the Department of Aboriginal Affairs will be required for entry to these sensitivities.	Records of IAPs and field reports include review and management of heritage values.
	PS RS11.11.	Oiled wildlife response capability to be maintained for the duration of the response and rehabilitation.	Records of animals relocated, treated, released and deceased.

The initiation criteria, course of action, resources, supporting documentation and termination criteria associated with each response strategy are detailed in the Minerva OPEP (Appendix F).

9.3.7 RS12 Forward Command Post

9.3.7.1 Summary of Activity

The Forward Command Post Response Strategy will be implemented for Level 2 spills. Constant monitoring and evaluation by people on-location is a mandatory strategy required for real-time decision-making during a spill event. The objective of this response strategy is to assist the IMT in planning the oil spill response activities in the spill zone by assisting in the development of IAPs, oversee field operations, manage rosters and provide situational briefings/debriefings. Personnel within the forward command post will also maintain liaison with local emergency service organisations, industry, and other government departments active in the spill zone.

9.3.7.2 Potential Environmental Impacts

There are no relevant environmental risks and impacts associated with mobilising BHP employees and third party contractors to Warrnambool to establish a Forward Command post outside of standard BHP HSE requirements.

9.3.7.3 Demonstration of ALARP

A forward command post is integral to the management and coordination of spill response strategies. The information obtained for the IMT and disseminated to the on-ground responders is important for the safe and efficient implementation of spill response strategies throughout an emergency response, and will always have a positive environmental benefit. There are no additional significant environmental impacts expected from a forward command post that have not already been described in the previous sections of the EP.

The risk assessment and evaluation has identified controls that when implemented are considered to manage the risk of the forward command post response strategy. Developing a forward command post response strategy is a necessary contingency and should not be eliminated from the response activities. No reasonably practicable alternative controls have been identified that would provide significant net environmental benefit. Therefore the impacts and risks associated with the RS12 Forward Command Post Response Strategy are therefore considered to be reduced to ALARP.

9.3.7.4 Demonstration of Acceptability

This response strategy enables the acquisition and dissemination of information required for decision-making during a spill event and implementing further strategies for responding to and managing spills.

BHP has taken all practicable means to prevent a hydrocarbon spill occurring during the petroleum activity and the likelihood of a Level 2 spill is extremely low when considering industry statistics and the preventative controls in place. The vessels operated by BHP is typical of offshore petroleum activities occurring elsewhere in Australian waters. BHP has undertaken extensive planning and assessment in the selection of the spill response options presented based on the:

- Nature and scale of the worst-case hydrocarbon pollution events;
- Accessibility, the availability and the location of appropriate spill response equipment; and
- Predicted timings of contact of hydrocarbons and loadings of hydrocarbons to sensitive environmental receptors, and the capability and scalability of spill response resources.

Given the aforementioned and low probability of the requirement for spill response activities, BHP is satisfied that when the accepted controls are implemented that the impact and residual risk of the forward command post strategy to the environment is considered 'tolerable'. Furthermore, the adopted controls are considered to be consistent with good oilfield practice/professional judgement and environmental best practice, and consistent with forward command posts that have been established elsewhere. In the unlikely event of a Level 2 spill, forward command post operations will comply with all relevant laws, codes and standards, as well as the BHP Charter and HSE Management Systems. All relevant controls were considered as part of the ALARP assessment, and as no other reasonable additional controls were identified that would further reduce the impacts and risks of forward command post operations without a gross disproportionate sacrifice, the impacts and risks associated with this strategy are considered ALARP. BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct and hence the principles of ESD. Stakeholders have been consulted about the activity and appropriate control measures will be implemented to address any concerns that were raised. BHP undertakes regular consultation with relevant stakeholders about its operations / activities providing them with sufficient and reasonable opportunities to raise any new concerns or issues for the duration of this activity. On this basis, it is considered that adherence to the performance standards will manage the impacts and risks of forward command post operations associated with any Level 2 spill to an acceptable level.

The proposed control measures for preventing and minimising the risks associated with a forward command post response strategy are comprehensive and consistent with all relevant codes and standards and good oilfield practice. This response strategy enables the acquisition and dissemination of information required for decision-making during a spill event and implementing further strategies for responding to and managing spills; therefore the impact and risks associated with the response strategy are considered to be acceptable.

9.3.7.5 Environmental Performance Outcome, Performance Standards and Measurement Criteria

RS12 Forward Command Post			
Performance Outcome	**Forward command post will be maintained to prevent environmental impacts to sensitive environmental receptors.**		
Aspect	**Number**	**Performance Standard**	**Measurement Criteria**
Planning and Design	**PS RS11.1.**	Mobilise BHP personnel, third party contractors mobilised to Warrnambool within 24 hours of notification by IMT Incident commander.	IMT communication logs demonstrate mobilisation to site within 24 hours of notification by the IMT Incident commander.
Equipment	**PS RS11.2.**	Maintain capability to monitor spill location and coordinate response activities on the ground via location of key personnel at the forward command post for the duration of the oil spill response.	IMT communication logs demonstrate that forward command post has been maintained for the duration of the oil spill response.

The initiation criteria, course of action, resources, supporting documentation and termination criteria associated with each response strategy are detailed in the Minerva OPEP (Appendix F).

9.3.8 RS13 Waste Management

9.3.8.1 Summary of Activity

The modelling indicated that no shoreline contact would occur. BHP will use Cleanaway who are capable of collection, transport, treatment and disposal of oil wastes generated by a large scale emergency response situation.

9.3.8.2 Potential Environmental Impacts

During an oil spill clean-up, the disposal of waste material must not pose any threat to the health and safety of people or the environment, and must be carried out in accordance with relevant state legislation. The type and amount of waste generated will depend on the spill itself and its location. It is important to note that the volumes of oily waste recovered from shorelines may be significantly greater than the volume of oil spilled. Typical waste volumes generated will be influenced by a bulking factor of:

- For offshore recovery there is a 1:10 increase in waste volume generation due to water being collected with the oil and emulsification occurring; and
- For shoreline clean-up there is a 1:10-50 significant increase of waste volume generation due to collection of sand and detritus from the high water mark and surrounding environment.

Table 9-21 identifies the types of waste likely to be generated from a spill from the Minerva offshore activities.

Table 9-21: Response strategies and their effect on waste generation

Response Strategy	Effect on Waste Stream	Type of Waste Generated
Shoreline Clean-up	The type of spilled oil will often have a profound effect on the amount of oily waste generated. Waste segregation and minimisation techniques are critical to ensure an efficient operation. These should be established at the initial recovery site and maintained right through to the final disposal site otherwise waste volumes will spiral out of control. Waste sites should be managed in such a way as to prevent secondary pollution.	• Oiled equipment/vessels • Oiled Personal Protective Equipment (PPE) and workforce • Recovered oil • Oiled vegetation • Oily water • Oiled sorbent materials • Oiled beach material: ○ Oiled flotsam and jetsam ○ Animal carcasses ○ Oiled transport

For any spill likely to produce significant amounts of waste, a Waste Management Plan –Oil Spill will be developed to ensure that:

- Oily waste is properly handled and stored;
- Oil and oily debris is adequately segregated, treated and stored at the point of collection;
- Oil and oily debris is rapidly collected and taken to designated sites for storage, treatment or disposal; and
- Treatment or disposal practices ensure that the waste poses no future threat to the environment.

In addition, the Waste Management Plan will identify how waste volumes will be minimised.

Table 9-22: Waste management hierarchy

Waste Management Hierarchy	
Reduction	Efficient response strategies selected for oil spill clean-up to ensure that the minimum material is used and/or contaminated during the process.
Reuse	This is the reuse of an item for its original purpose, i.e. clean-up equipment should be cleaned and reused in place of disposable items. An example might be the cleaning of PPE so that it can be reused.

Waste Management Hierarchy	
Recovery	This is the production of marketable product for waste, e.g. taking waste oil to a refinery for conversion into other useable products. This will be directly affected by the quality of the recovered product, i.e. highly contaminated material is less likely to be suitable for recycling.
Refuse	Refuse is the final and least desirable option. If none of the above methods can be carried out for whatever reasons the waste must be disposed of effectively though some means. This may be the case for highly mixed wastes of oils, plastics, organic debris, water, sediments etc. which cannot be separated.

The basis for such a Waste Management Plan will include a demonstration of:

- Temporary on-site waste storage:
    - Care will be taken in the selecting a location for a temporary waste handling base to allow for waste separation. Local authorities and waste management contractors will be consulted regarding the selection of suitable disposal routes, local regulations and may provide local facilities.
- Segregation of waste:
    - Wherever possible, wastes will be segregated in accordance with the preferred segregation. It may be required to separate oil from associated water, sediment and debris, in order to minimise volumes. It is preferable that this is not attempted on the spill site.
- Onsite handling:
    - Attention will be given to the prevention of leaching or spillage of oil from vehicles or containers. Onsite handling equipment is available via DJPR, AMOSC or AMSA.
- Offsite transport and storage:
    - Only State licensed waste contractors will be used. Care will be taken that all vessels, vehicles, or containers used for the transport of oily wastes are effectively sealed and leak-proof.
- Waste treatment and disposal options:
    - The disposal method most appropriate in an incident will depend on several factors, including the nature and consistency of the waste, the availability of suitable sites and facilities, the costs involved, as well as regulatory restrictions.
- Waste separation:
    - Waste separation is usually undertaken offsite at a designated waste processing area.
- Disposal:
    - Waste must be disposed of in accordance with Vic regulations.
- Establishing a field decontamination facility:
    - The size and complexity of field decontamination facilities required will depend on the character of the oil and on the scale and nature of the clean-up being implemented.

Temporary Storage Site Suitability Assessment

A key consideration in selecting temporary areas is to ensure effective waste management does not hinder recovery operations and minimise length transport requirements. Temporary storage disposal locations will likely vary depending on the concentrations of contaminates and location ashore.

In event of a major oil spill incident temporary storage sites will need to be quickly identified and assessed in accordance with Vic Regulatory agencies. The following criteria shall be considered:

- Three step identification, assessment and control process for determining applicability of temporary sites:

  Step 1: Preliminary Site Identification Criteria: to be completed by incident management team / planning officer / waste division coordinator (Table 9-23).

  Step 2: Secondary site assessment and approval to be completed includes hydro-geological assessment and site owner approvals.

Step 3: Standard control measures to be implemented for storage, bunding and drainage, earthen pit construction.

Table 9-23: Temporary storage area site identification criteria

Suitable	Not Suitable
Federal land **Crown land** **Military owned land** **State land** **Highway projects** **State reserves** **Waste disposal sites active/inactive** **Port authority owned and** **Coastal reserves** **Forestry Agricultural lands** **Oil or mining company property or leases** **Industrial waste disposal sites** **Utility company property.**	Critical Habitat for threatened species Wildlife refuge areas National Parks World Heritage Areas Water courses such as streams, rivers, lakes, ponds, wetlands, protected under RAMSAR, JAMBA & CAMBA treaties Previously contaminated areas (although these areas may be considered depending in the nature of the area) Land with slope >5°

A coordinated approach would be adopted to assist with access and final locations will be selected and checked with input and advice from DELWP, DJPR, Vic Department of Transport (DoT), Local Government and other relevant stakeholders. Office of the EPA will advise and grant approval for a local landfill or similar to accept waste in a certain area under the *Environmental Protection Act 1970*.

Monitoring and Reporting of Waste

The Onshore Materials Logistics Co-ordinator will be responsible for maintaining a Waste Management Register for all waste generated from the shoreline response strategy. The designated Waste Contractor will monitor measure and record all waste streams that are disposed of onshore.

Measurement as required by Waste Contractor Conditions, including without limitation:

- Types of waste collected (e.g. liquid oily waste);
- Quantities of types of wastes collected (e.g. tonnes, litre);
- Destination of waste collated (named authorised disposal facility);
- Method of waste disposal (e.g. landfill, recycling); and
- Quantity of recyclable waste by type.

The Materials and Logistics Supervisor shall ensure that adequate waste disposal records are being maintained by the Waste Contractor, and that the Waste Reference Number for all waste is communicated to the Onshore Materials Logistics Coordinator for updating the Waste Management Register once waste is disposed.

Waste management reporting will be in compliance with the following reporting requirements:

- Environment Protection (Industrial Waste Resource) Regulations 2009*;*
- BHP Our Requirements HSEC Reporting; and
- National Pollutant Inventory annual reporting of emissions and discharges relating to resource consumption e.g. waste effluent.

9.3.8.3 Oil Spill Preparedness

BHP has arrangements in place with Cleanaway for the provision of waste management services during a spill incident.

Cleanaway have performed and continue to perform a variety of emergency response tasks involving a wide range of hazardous materials. Hydrocarbon spills comprise the majority of emergency response tasks, and Cleanaway have a wealth of experience in this area. In addition to a range of waste bin collection vehicles and trailer and tanker transport, Cleanaway operate a fleet of vacuum loading heavy vehicles, with capacities ranging up to 12,000 L and an oil separator farm and 250,000 L storage.

Based on the road travel time from Portland to Port Campbell of approximately 2 hours and 3 hours from Melbourne, it is reasonable to state that Cleanaway will be able to provide BHP with waste storage and transport of waste facilities within 24 hours of mobilisation.

Table 9-24: Portland Waste Management Vehicles

Storage	Quantity	Volume	Type
Hooklift	1	15 m^3	Oiled PPE, oiled equipment, oiled sorbent materials, oiled vegetation.
Vacuum truck	5	12,000 L	Recovered oil, oily water, transfer of liquid wastes from other containers for storage.
Prime Mover	1	430,000 L	Recovered oil, oily water, transfer of liquid wastes from other containers for storage.
SteelTanker	1	25,000 L	Recovered oil, oily water, transfer of wastes from other containers for storage.
Isotanker	1	25,000 L	Recovered oil, oily water, transfer of wastes from other containers for storage
Ute	4		Oiled PPE, oiled equipment.
Vertical Oil Separator / Tank farm			Recovered oil, oily water, transfer of wastes from other containers for storage
Tank Storage	1	250,000 L	Oily water storage for shoreline protection and clean-up strategies.

In addition, BHP hold service agreements with other Waste Management agencies and in the event of a worst-case discharge would activate further agencies for assistance for removal and disposal of waste from an oil spill;

- Cleanaway, which is a Transpacific company, is a leading Australasian provider of integrated total waste management, recycling and industrial solutions, with long-standing expertise in the management of liquid and hazardous wastes including, oily waters, oily sludge’s and contaminated soil from petroleum hydrocarbons.

9.3.8.4 Hierarchy of Controls

The evaluation of controls associated with waste management assessing the response capacity (i.e. How much oil is treated), the units, the implementation time (i.e. how fast can BHP access and start using it), the cost sacrifice (Minor = <$100k, Moderate = $100K - $1M, Major = > $1M) and the control effectiveness (defined in Section 9.3.8.3) is summarised in Table 9-25).

Existing control in place to mitigate risks and impacts associated with the physical presence of additional vessels, noise and atmospheric emissions, interference with marine fauna, routine and non-routine discharges have been previously presented in Sections 7.5 - 7.8, and Sections 8.2 - 8.6.

Table 9-25: Evaluation of effectiveness of controls associated with RS13 Waste Management

Function	Control Measure	Rationale	Response Capacity	Units	Implementation Time (days)	Cost	Effectiveness				
							Availability	Functionality	Reliability	Survivability	Independence / Compatibility
Eliminate	No waste management	Do nothing option	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Substitute	-	-	-	-	-	-	-	-	-	-	-
Engineer	-	-	-	-	-	-	-	-	-	-	-
Separate	-	-	-	-	-	-	-	-	-	-	-
Administrate	Waste management operations reviewed and managed by IMT through IAP process	Within the first 24 hours, the BHP IMT will develop IAPs.	N/A	N/A	N/A	Minor	High	High	High	High	High
	Operational NEBA to include evaluation of requirement for implementation of waste management operations	The waste management response strategy will be activated to prevent environmental impacts to sensitive environmental receptors.	N/A	N/A	0-2 hours	Minor	High	High	High	High	High
	Mobilisation of equipment and personnel to conduct waste management response within 24 hours of notification by IMT following outcomes of first IAP and maintained regularly in daily IAP outcomes.		N/A	N/A	0-2 hours	Minor	High	High	High	High	High
	Crude oil waste retrieved to be managed in accordance with the Waste Management Plan.	Ensures waste management policies and procedures are being followed.	N/A	N/A	0-2 hours	Minor	High	High	High	High	High
	Implement operational and scientific monitoring to determine the ongoing acceptability of the environmental risk associated with waste management methods.	Environmental monitoring will be used to determine the effectiveness of waste management controls and techniques for removing waste oil from site.	N/A	N/A	0-2 hours	Minor	High	High	High	High	High
	Waste management operations will avoid cultural heritage sensitivities.	Increases the potential that impacts to sensitive receptors will be prevented by avoiding areas of known cultural heritage significance.	N/A	N/A	N/A	Minor	High	High	High	High	High
	Response strategy activities continued until termination criteria met.	The waste management response strategy will continue to prevent environmental impacts to sensitive environmental receptors until the performance outcome has been achieved.	N/A	N/A	0-2 hours	Minor	High	High	High	High	High
	Current Capability										
	Access to waste management plant and equipment in place prior to the commencement of Minerva offshore activities.	Enables rapid response of waste management resources from Portland.	Large	NWA	0-1	Moderate	High	High	High	High	High
	Scalable Options										
	Access to more waste management plant and equipment.	Acquisition of more waste management plant and equipment from Melbourne and around Australia.	Small	As required	10-15	Moderate	High	High	High	High	High

9.3.8.5 Demonstration of ALARP

The evaluation of environmental benefit gained compared with practicability and ALARP summary for controls associated with waste management is provided in Table 9-26. With the implementation of accepted controls and with no other additional or alternative controls identified, to reduce environmental impact, while also providing the required level of safety during recovery and removal of oiled waste, other than not implementing this response strategy, it is considered that the impacts and risks from the RS13 Waste Management response strategy have been reduced to ALARP.

Table 9-26: Evaluation of environmental benefit gained compared with practicability and ALARP summary for controls associated with RS13 Waste Management

Function	Control Measure	Environmental Benefit Gained	Practicability	ALARP Summary	Performance Standard
Eliminate	Do nothing option.	No environmental benefit would be gained from this option; experience from past oil spills suggests that environmental sensitivities can be protected effectively when waste management operations are activated.	Waste management is practicable and the do nothing option is not considered within the external context (e.g. stakeholder views) to be a viable option.	**Reject**: Waste management is a recognised strategy for the mitigation of oil spill impacts.	**-**
Substitute	-	-	-	-	-
Engineer	-	-	-	-	-
Separate	-	-	-	-	-
Administrate	Waste management operations reviewed and managed by IMT through IAP Process.	Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The review/evaluation of waste management operations will take place almost immediately in the event of a Level 3 spill. The waste management operations would be adapted based on real-time information regarding the spill incident.	Controls have high effectiveness; are available, functional and reliable and in general are serviceable and compatible with other control measures. Controls have minor cost implications.	**Accept**: Controls are practicable and the cost sacrifice is not disproportionate to the environmental benefit gained.	**PS RS13.1**
	Operational NEBA to include evaluation of requirement for implementation of waste management operations.	Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The Operational NEBA will be completed based on specific circumstances of the spill incident, using real-time information (spill trajectory modelling, spill observations, weather and seastate conditions etc.) to confirm the appropriate response strategies to adopt for protection of priority locations and sensitive receptors. Waste management will be activated to prevent/minimise environmental impacts to sensitive shorelines and shoreline receptors.			**PS RS13.2**
	Mobilisation of equipment and personnel to conduct waste management response within 24 hours of notification by IMT following outcomes of first IAP and maintained regularly in daily IAP outcomes.	Positive environmental benefit gained from rapid response of waste management plant, equipment and resources from Dampier / Karratha.			**PS RS13.3**
	Crude oil waste retrieved to be managed in accordance with the Waste Management Plan.	Positive environmental benefit gained from rapid response of waste management plant, equipment and resources from Portland.			**PS RS13.5**
	Implement operational and scientific monitoring to determine the ongoing acceptability of the environmental risk associated with waste management methods.	Positive environmental benefit gained from environmental monitoring in understanding the effectiveness of waste management controls and techniques for removing waste oil from site. Outcomes of operational and scientific monitoring will be used to inform waste management response strategy through the daily IAP's.			**PS RS13.6**
	Waste management operations will avoid cultural heritage sensitivities.	Positive environmental benefit gained by taking into consideration any advice from State government agencies and spatial information to avoid impacts to cultural heritage sensitivities.			**PS RS13.7**
	Response strategy activities continued until termination criteria met.	Positive environmental benefit gained from ensuring that the waste management response strategy continues until the performance outcome has been achieved.			**PS RS13.8**
	Current Capability				
	Access to waste management plant and equipment in place prior to the commencement of Minerva offshore activities.	Positive environmental benefit gained from implementation of this control measure. The objective of waste management is to prevent impacts to sensitive receptors by the removal of oiled waste from site.	Control has high effectiveness; are available, functional and reliable and in general are serviceable and compatible with other control measures. Controls have minor cost implications	**Accept**: Control is practicable and the cost sacrifice is not grossly disproportionate to the environmental benefit gained.	**PS RS13.4**

Function	Control Measure	Environmental Benefit Gained	Practicability	ALARP Summary	Performance Standard
			for the Minerva offshore activities but moderate to major costs if implemented.		
	Scalable Options				
	Access to more waste management plant and equipment.	The environmental benefit associated with waste management is considered to be significant, which has the potential to reduce the environmental severity. Scalable options involve accessing more plant and equipment from Melbourne and if needed around Australia.	This control is effective and the cost of acquiring more plant equipment from Perth and around Australia would potentially have moderate cost implications. Cost during activation would be major.	**Accept**: Controls are practicable and the cost sacrifice is not grossly disproportionate to the environmental benefit gained.	**PS RS13.4**

9.3.8.6 Demonstration of Acceptability

BHP considers a range of factors when determining that a level of impact and risk to the environment is broadly acceptable as summarised in Table 9-27.

Table 9-27: Demonstration of acceptability for RS13 Waste Management

Criteria	Question	Demonstration
Codes and Standards	Is the impact or risk being managed in accordance with relevant Australian or International legislation, Ministerial Conditions or standards?	Waste management is a demonstrated response strategy and the accepted controls are consistent with international guidance (e.g. IPIECA/OGP).
ESD	Is the proposed impact consistent with the principles of ESD?	BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct, which endorse the continuous improvement in health, safety and environmental performance in ways that protect people and the environment through the responsible management of petroleum activities and their impacts. BHP considers that adherence to these principles is consistent with the principles of ESD. The use of waste management plant and equipment is a recognised response strategy to meet the performance outcome of reducing impacts to environmental sensitivities.
Internal Context		
BHP Charter and HSE Management System Compliance	Is the proposed impact or risk consistent with the requirements of BHP Our Requirements, Petroleum Standard and HSEC Management Systems?	The implementation of waste management will be in compliance with BHP charter values and management systems and will be consistent with activities utilised in oil spill events internationally.
Professional Judgement	Is the impact or risk being managed in accordance with industry best practice?	Waste management is a demonstrated response strategy that has been utilised in multiple oil spill events in Australia and internationally. Controls identified in this plan are consistent with industry best practice and guidelines. Accepted controls that will be implemented are provided in Table 9-27. BHP has an understanding of the efficiency of waste management operations as well as the potential for seasonal sensitivities around environmental receptors e.g. sites of cultural significance, and has assigned controls that take this understanding into account.
ALARP	Are there any further reasonable and practicable controls that can be implemented to further reduce the impact or risk?	All reasonable and practicable controls have been assessed for their effectiveness (Table 9-27). Additional controls were considered but were found not to be justifiable in further reducing the impacts and risks of waste management without a gross disproportionate sacrifice. BHP considers that the residual risk of waste management has been demonstrated to be ALARP.
External Context		
Environmental Best Practice	Are controls in place to manage the impacts and risk to the environment that are commensurate with the nature and scale of any environmental sensitivities of the receiving environment?	The environmental performance outcome, performance standards and measurement criteria that determine whether the performance outcome and performance standards have been achieved are commensurate with the environmental significance of the receiving environment.
Stakeholder Views	Do stakeholders have concerns / issues, and if	Stakeholders have been consulted about the Minerva offshore activities through a comprehensive and long-term consultation

Criteria	Question	Demonstration
	so, have controls been implemented to manage their concerns / issues?	program. Stakeholder concerns have been considered for waste management operations, and this is reflected in controls designed to mitigate impacts of the response activity on environmental sensitivities, e.g. cultural heritage sites. The decision to activate waste management operations would be taken by the IMT Incident commander.

9.3.8.7 Acceptability Summary

The proposed management controls for preventing and minimising the risks and impacts associated with using a waste management response strategy are comprehensive and consistent with all relevant codes and standards and good oilfield practice. This response strategy enables the collection and processing of oiled waste and is an accepted strategy in any oil spill; therefore the impact and risks associated with the response strategy are considered acceptable.

Given the aforementioned and the low probability of the requirement for spill response activities, BHP is satisfied that when the accepted controls are implemented that the impact and residual risk of the waste management response strategy to the environment is considered 'tolerable'. Furthermore, the adopted controls are considered to be consistent with good oilfield practice/professional judgement and environmental best practice, and consistent with waste management operations used elsewhere. In the unlikely event of a loss of reservoir hydrocarbons, waste management operations will comply with all relevant laws, codes and standards, as well as BHP Charter and HSE Management Systems. All relevant controls were considered as part of the ALARP assessment, and as no other reasonable additional controls were identified that would further reduce the impacts and risks of waste management operations without a gross disproportionate sacrifice, the impacts and risks associated with this strategy are considered ALARP. BHP undertakes petroleum activities in a manner that is consistent with the APPEA Principles of Conduct and hence the principles of ESD. Stakeholders have been consulted about the Minerva offshore activities and appropriate control measures will be implemented to address any concerns that were raised. BHP undertakes regular consultation with relevant stakeholders about its operations / activities providing them with sufficient and reasonable opportunities to raise any new concerns or issues for the duration of this activity. On this basis, it is considered that adherence to the performance standards will manage the impacts and risks of waste management operations associated with any loss of reservoir hydrocarbons to an acceptable level.

9.3.8.8 Environmental Performance Outcome, Performance Standards and Measurement Criteria

RS13 Waste Management			
Performance Outcome	**Prevent impacts to identify extreme and highly sensitive shorelines, shoreline receptors, and sites of cultural heritage from Level 2 spills, through the removal of waste oil, and to manage to ALARP impacts to other ecosystems by the implementation of the waste management response strategy.**		
Aspect	**Number**	**Performance Standard**	**Measurement Criteria**
Planning and Design	**PS RS13.1.**	Waste management to be reviewed and managed in accordance with the IAP.	Daily IAPs.
	PS RS13.2.	Undertake a preliminary IAP and Operational NEBA within 24 hours of an incident, to inform mobilisation of waste management response requirements.	Daily IAPs. Operational NEBA.
Resources	**PS RS13.3.**	Mobilisation of equipment and personnel to conduct Waste Management response within 24 hours of notification by IMT following outcomes of first IAP and maintained regularly in daily IAP outcomes.	Logs of Daily IAPs and NEBA assessments.
	PS RS13.4.	Contracts and other third party agreements for provision of equipment/ supplies and assistance for waste management in place prior to the	Records of contracts and other third party agreements in place prior to the

RS13 Waste Management			
Performance Outcome	**Prevent impacts to identify extreme and highly sensitive shorelines, shoreline receptors, and sites of cultural heritage from Level 2 spills, through the removal of waste oil, and to manage to ALARP impacts to other ecosystems by the implementation of the waste management response strategy.**		
Aspect	**Number**	**Performance Standard**	**Measurement Criteria**
		commencement of Minerva offshore activities.	commencement of Minerva offshore activities.
Equipment	**PS RS13.5.**	Waste retrieved to be managed in accordance with the Waste Management Plan (Waste Management Plan –Oil Spill.	Waste records/ manifests.
	PS RS13.6.	Implement operational and scientific monitoring to determine the ongoing acceptability of the environmental risk associated with waste management methods.	Monitoring records document ongoing review of the environmental risk and acceptability of waste management.
	PS RS13.7.	Waste management operations will avoid cultural heritage sensitivities. Consultation with (and authority where necessary) the Department of Aboriginal Affairs will be required for entry to these sensitivities.	Records of IAPs and field reports include review and management of heritage values.
	PS RS13.8.	Response strategy activities continued until termination criteria met.	Analysis by the SCAT team, and approved by the IMT Incident commander in consultation with stakeholders, has determined that continued waste management is not environmentally and socially beneficial to identified sensitive shorelines and shoreline receptors.

The initiation criteria, course of action, resources, supporting documentation and termination criteria associated with each response strategy are detailed in the Minerva OPEP (Appendix F).

10 Implementation Strategy for Planned Activities and Non-Hydrocarbon Spill Events

In accordance with Regulation 14(1) and 14(10) of the OPGGS (E) Regulations, the sections below detail the implementation strategy for the routine activities and unplanned non-hydrocarbon spill events associated with the Minerva offshore activities. The strategy provides specific practices and procedures to ensure that the environmental impacts and risks of the offshore activities will be continuously identified and reduced to ALARP and that the environmental performance outcomes and standards in this EP are met over the duration of the offshore activities. It also supports and provides context to the Performance Standards for the environmental risks, as detailed in Sections 7 and 8.

The implementation strategy of the Minerva Activities describes how training, competencies and ongoing environmental awareness will be maintained for the duration of the activity, for all personnel and contractors with responsibilities under this EP. In particular, the implementation strategy outlines a process to ensure the competency and training for those persons who are responsible for implementing critical control measures for environmental impacts and risks in order to demonstrate that those control measures can be effectively implemented.

As the activity described in this EP is ongoing, the implementation strategy ensures that identification of relevant persons is periodically reviewed to ensure new relevant persons are identified and consulted through regular on-going CRG meetings, as described in Section 5.

10.1 Systems, Practices and Procedures

10.1.1 BHP HSEC Management System

The BHP Petroleum HSEC Management system defines the boundaries within which all activities are conducted. It provides a structured framework to set common requirements, boundaries, expectations, governance and assurance for all activities. It also supports accountabilities and responsibilities as defined in the organisational structure. The overarching objective of BHP Petroleum HSEC Management system is to aspire to zero harm to people, communities and the environment, and achieve leading industry practice. The structure of the BHP Petroleum HSEC Management system is hierarchical (Figure 10-1).

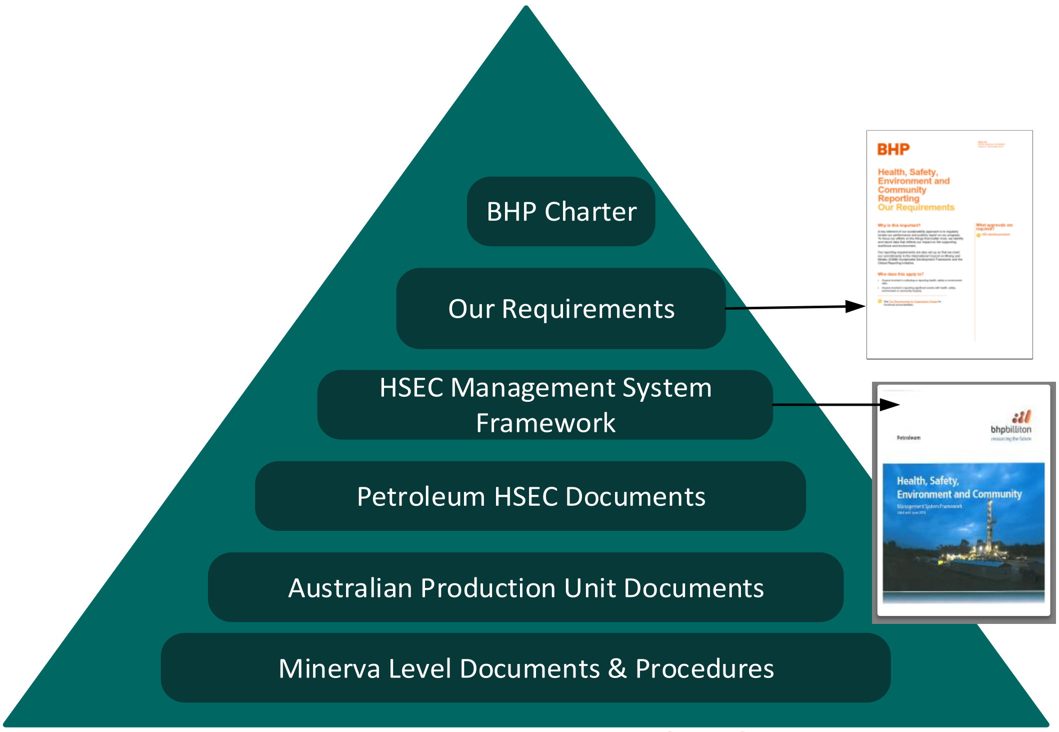


Figure 10-1: BHP Petroleum HSEC Management System Hierarchy

The documents in Figure 10-1 address specific areas (e.g. corporate performance reporting, risk management, incident investigation) where it is important that activities are conducted consistently across the organisation.

The top level of the triangle shown in Figure 10-1 is the BHP Charter (Appendix A). The Charter details BHP's values and directs the approach to all activities in BHP. It includes value statements on each of sustainability, integrity, respect, performance, simplicity and accountability. It also provides a means of aligning BHP's values with strategic direction and measures of success. The Charter is supported by BHP's Code of Business Conduct and Working with Integrity. The Charter is signed by the BHP Chief Executive Officer.

The BHP Our Requirements detail and define business planning, risk management, and assurance expectations of key process areas. They also serve as audit protocol against which all groups in BHP are assessed. Categories of Our Requirements include (for example) HSEC, Human Resources, Legal, Corporate Affairs, Supply, and Information Management.

Direction for environmental performance in BHP is established by the Environment and Climate Change – Our Requirements. The BHP Charter provides a public statement and commitment to zero harm through planning and execution. The Minerva offshore Activities will be operated in accordance with the objectives of this Charter, which includes compliance or exceedance with regulatory requirements, setting of objectives and targets and continual improvement. The Charter will be available to all personnel involved in the activity through the intranet, and hard copies where appropriate.

The HSEC Management System framework establishes the foundation for continual improvement through the application of consistent requirements across all aspects of Petroleum activities including:

- Identification of statutory obligations and commitments to ensure maintenance of licence to operate;
- Implementation of petroleum risk management processes, including this EP;
- Establish and maintain the competencies for personnel, and provision of training to promote expected behaviours;
- Management of all contractors and suppliers of petroleum goods and services; and
- Completion of reviews, and reporting outcomes of these reviews.

The BHP Petroleum Standards detail the mandatory HSEC performance requirements as described in the HSEC related Our Requirements and are met through the HSEC management system framework. They address specific performance requirements that define functional and governance expectations. The controls apply to the entire lifecycle of petroleum activities, processes and products. Contractors are required to comply with the controls and partners and suppliers are encouraged to adopt the intent and nature of the performance requirements. The controls cover the following broad areas and are regularly monitored through scheduled audit and verification activities:

- Hazards and risk management;
- Crisis and emergency management;
- Security;
- Health and hygiene;
- Aviation;
- Marine operations;
- Fatal risks;
- Environment; and
- Data reporting.

10.2 Structure and Responsibility

A defined chain of command with the roles and responsibilities for key BHP and contractor personnel in relation to Environment Plan implementation, management and review are described below in Table 10-1. It is the responsibility of all BHP employees and contractors to ensure that the BHP's Petroleum HSEC related Our Requirements and the BHP Charter (Appendix A) are applied in their areas of responsibility.

Table 10-1: Key Personnel and Environmental Responsibilities

Title	Environmental Responsibilities
BHP Field Manager	• Ensure compliance with the BHP Charter and Management Standards; • Sufficient resources are provided to implement the commitments made in this EP; • Vessel contractors are provided with the EP and are made aware of the requirements for their activities; • Ensure Facility Operator reports HSE incidents to regulatory authorities as required; and • Assist the Incident Management Team in the development of a response strategy in the event of a spill incident.
BHP HSE Manager	• Ensure compliance with BHP's Charter and Management Standards, this EP and regulatory responsibilities; and • Environmental incidents or breaches of environmental performance outcomes, standards or measurement criteria, are reported in line with BHP's incident reporting requirements
APU HSE Specialist	• Liaise with the Field Manager, PIC and vessel Masters to ensure compliance to legislation, procedures, standards and commitments; • Carry out environmental education and inductions; • Ensure compliance with this EP, regulatory and HSE responsibilities; • Participate in the oil spill response drills; • Complete environmental audits to ensure compliance with this EP; and • Report environmental recordable incidents to NOPSEMA.
Client Representative	• Monitor and audit the works to ensure compliance with this EP and the regulatory and HSE responsibilities; and • Environmental incidents or breaches of environmental performance outcomes, standards or measurement criteria on vessels, are reported in line with BHP's incident reporting requirements.
Contractor Manager	• Prepare, maintain and implement of Contractor HSE Management Plans and Procedures; • Ensure compliance with this EP, regulatory and HSE responsibilities relevant to their scope of work; and • Maintain clear lines of communication with the BHP Field Manager.
Vessel Master	• Manage activities and safety on board vessel for the duration at sea, and operate under BHP Marine Controls, relevant Commonwealth Acts and regulations; • Ensure vessel operations are undertaken as per this EP and any approval conditions; • Report environmental incidents or reaches of objectives, standards or criteria on vessel, are in line with BHP's incident reporting requirements; and • Recordable incident reporting.
All crew	• Work in accordance with accepted HSE practices; • Comply with this EP, and all regulatory and Project obligations applicable to their assigned role; • Report any hazardous condition, near miss, unsafe act, accident or environmental incident immediately to their supervisor; and • Attend HSE meetings and training/ drills when required.

The interface for Minerva Operations is provided in Figure 10-2.

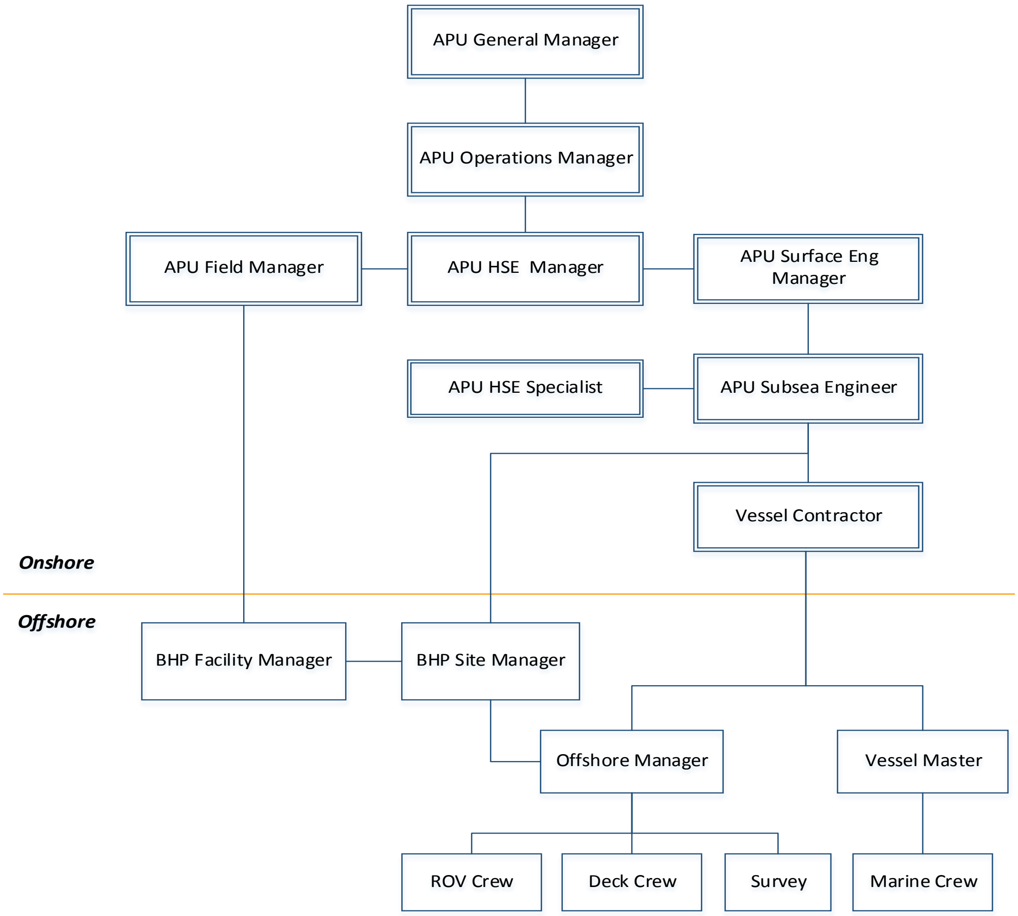


Figure 10-2: Vessel activities interface diagram

10.3 Implementation and Operations

10.3.1 Competence, Environmental Awareness and Training

BHP' HSEC Management System framework establishes the foundation for continual improvement through the application of consistent requirements across all aspects of Petroleum activities including the establishing and maintenance of the competencies for personnel, and provision of training to promote expected behaviours.

For BHP contractors, environmental risks in contracts are managed in accordance with the requirements outlined in BHP HSEC Management Standards. As part of the contractor management process, the Contractor's Environmental Management System is assessed to ensure it is aligned with BHP's Petroleum HSEC related Our Requirements, the BHP Charter, and BHP HSEC Management Standards and meets all commitments made in this EP. If, and wherever, the Contractor's Environmental Management System is found to be deficient it will be required to be modified prior to mobilisation to site.

All personnel on vessels are required to be competent and suitably trained to undertake their assigned positions. This may be in the form of 'On the Job' or external training. The vessel contractor is responsible for identifying training needs and keeping records of training undertaken. Environmental awareness inductions (Section 10.3) are required to be undertaken by all personnel as part of their induction to vessels undertaking activity in the Minerva field.

10.3.2 Operational Control

Operations activities are identified, planned and carried out in accordance with relevant legislation, EP commitments and internal environment standards and procedures. Verification processes are in place to ensure these controls and requirements are being implemented to reduce significant risks to acceptable levels. Some of the key operational controls include:

- Task specific toolbox talks, Job Safety Analysis (or equivalent), and associated procedures / checklists;
- Contractors' vessel-specific procedures;
- Scheduled Preventative Maintenance Systems, tracked through dedicated software packages; and
- Environmental inspections by the HSE Specialist.

10.3.3 Campaign Specific Environmental Awareness

At the beginning of, and during a new activity, personnel arriving on the vessels are required to undertake a site induction before commencing work. This induction covers health, safety and environmental requirements for the vessel and environmental information specific to the permit areas. The induction will include the following environmental information:

- General description of the activity location, including any environmentally sensitive areas;
- Adherence to standards and procedures, and the use of Job Safety Analysis and Permit to Work hazard identification and management process;
- Incident reporting process;
- Spill management including prevention, response and clean-up, location of spill kits and reporting requirements;
- Waste management requirements and process (segregation of landfill, recycle and hazardous wastes) and location of bins; and
- Reporting procedure for sightings of marine mammals including the location of marine fauna sighting datasheets.
- All personnel who undertake the induction are required to sign an attendance sheet, which is retained by the vessel contractor.

A copy of EP performance standards and measurement criteria are provided to the vessel Masters.

10.3.4 Marine Operations and Assurance

Systems and procedures are in place to ensure all marine operations for the Minerva Facility operations are conducted in accordance with environmental regulatory requirements and BHP marine controls, which cover management of marine operations and contracting of vessels.

The Marine Management Process require a number of audits be completed prior to hiring a vessel and marine operations suppliers to be audited and verified prior to engagement. This includes a search of Offshore Vessel Inspection Database (OVID) for all relevant records and certification, and/or additional audits for the following as identified in the risk assessment process:

- Marine Management Process;
- Dynamically positioned vessel review;
- Containment audit to ensure contained transport, storage and discharge of petroleum based and chemical products;
- Lifting and rigging audit; and
- Emergency response audit.

10.3.5 Emergency Preparedness and Response

BHP HSEC Standards set out the framework and requirements for incident response and crisis management during BHP activities, providing, direction and management at the site of an incident or emergency and provides a framework of organisational responsibility and lines of communication.

The APU IMT Incident Commander is the onshore coordinator for an offshore emergency. The IMT control centre is located in BHP's head office in Perth. The IMT is on call 24 hours a day to manage the coordination of lifesaving and rescue, minimise damage to the environment and facilities, and liaise with external support, authorities and agencies.

BHP Incident Management Manual applies to the incident management of any emergency situation impacting BHP activities across Australia. It includes measures for identification and assessment of any hazards to personnel or the environment.

10.3.6 Drills and Exercises

Environmental drills and exercises are regularly carried out on the vessels in line with the IMO (e.g. SOLAS and MARPOL) requirements to crew in using response equipment and implementing response procedures. These drills include, but are not limited to, spill response, fire and explosion events and collision incidents.

10.4 Monitoring, Auditing and Management of Non-Conformance and Review

10.4.1 Monitoring Environmental Performance

Environmental performance is required to be consistent with BHP HSEC Standards and commitments made in this EP. The on-going environmental performance of contractors is the responsibility of key personnel described in Table 10-1. Key data that will be monitored and recorded during the Minerva offshore activities are summarised in Table 10-2.

Table 10-2: Monitoring and Record Keeping Summary

Parameter	Monitoring	Record Keeping	Frequency
Seabed Disturbance	Recovery of dropped objects where practicable to do so and where recovery will provide a net environmental benefit.	Documentation of dropped object retrieval.	As required
Marine Fauna Interactions	Cetacean sightings and interactions (secondary to primary work activities/ responsibilities).	Fauna Sighting Datasheet. Incident Report Form. Monthly Incident Report; and Environmental Performance Report.	As required As required Monthly
	Injury or death of listed threatened or migratory marine fauna species.	Incident Report Form; Monthly Incident Report; Environmental Performance Report. Incident reported to NOPSEMA. Vessel strikes with cetaceans will be reported in the National Ship Strike Database at https://data.marinemammals.gov.au/report/shipstrike	As required
Introduced Marine Species	Management of biofouling	Marine Management process to be completed prior to hire of vessels.	Prior to on-hire.
		Record and review of IMS risk assessment by the Environmental Specialist for newly contracted vessels and immersible equipment entering the Operations Area.	Prior to on-hire.
		Locally sourced vessels that can demonstrate that they have only operated within the South East Bioregion for a period of no greater than 3 years since they were last assessed as low risk as the result of an in-water or out-of-water IMS inspection (by a DPIRD approved inspector). This includes vessels that have exited the south east bioregion for periods of less than seven consecutive days, yet remained within state (Vic) or offshore (>12 nm).	Prior to on-hire and every 3 years.

Parameter	Monitoring	Record Keeping	Frequency
		Records of in-water or out-of-water inspection demonstrate that the inspection is carried out by DPIRD approved inspectors.	Prior to on-hire.
	Management of ballast.	Approved Ballast Water Management Plan (BWMP); Approved ballast water management certificate (IBWMC); and Ballast water records.	Prior to entering Australian waters or outside Port in the south east
Waste	Sewage and grey water.	Support vessel log.	Monthly
		Maintenance records for sewage/grey water equipment.	Monthly
	Hazardous and non-hazardous solid waste.	Garbage Record Book.	Monthly
		Maintenance records demonstrate functioning macerator onboard Vessel.	Monthly
	Oily water – Bilges and machinery spaces.	Oil Record Book.	Monthly
	Fuels and oils.	Containment and inspections, maintenance records, PMS records, checklists.	Monthly
	Hazardous chemicals.	Hazardous chemical locker inspection.	Monthly
	Loss or discharge to sea of harmful materials.	Record log of report to AMSA RCC.	As required
Vessel movement interactions	Interactions with shipping and commercial fishing vessels movements.	Incidents recorded in the BHP 1SAP system.	As required
Training	Details of crew vessel inductions/drills	Induction Record Sheets/ drill reports	As completed
Incident Reporting	Number and details of environmental incidents	Incidents recorded on the BHP 1SAP Reporting system	As required
Annual Environmental Performance Review	Review of environmental commitments and implementation strategy	Annual review of controls, ALARP assessment, to allow continual improvement. Internal compliance audit, EP and OPEP review.	Annual
Compliance Reporting	Compliance with commitments in outcomes and standards.	Monthly recordable incident reports.	Monthly
		Annual Environmental Performance Report to NOPSEMA.	Annual
Well Operations	As per WOMP	Well operations monitoring	As required
Relief Well Capability	Regional surveillance of MODUs / vessels capable of drilling a relief well.	MODU / vessel availability reports	Monthly

10.4.2 Record Management

For the duration of the activities and an additional five years thereafter, BHP will store records and reports such as, but not limited to the following:

- External communications (e.g. stakeholder consultation logs, reporting of incidents);
- Training and competency assessments;
- Emissions and discharges reports (e.g. Envirosys Records; National Pollutant Inventory Report);
- Cetacean and whale shark sighting datasheets;

- Environmental Performance Reports;
- Reportable and recordable incidents reports and/ or near misses, and investigation reports where applicable;
- Audit and inspection reports, test certificates, non-conformance register; and corrective action reports;
- EP revisions and supporting documentation;
- Daily/ Scheduled Reports;
- Records of periodical tests and maintenance of HSE-related (and other) equipment and tools;
- Records of HSE meetings and training/ emergency drills;
- Modification and changes authorised by BHP and/ or contractor; and
- Risk assessments (e.g. management of changes).

Key data that will be monitored and recorded during the offshore activities are summarised in Table 10-2.

10.4.3 Auditing, Assurance, Management of Non-Conformance and Continuous Improvement

The environmental performance of BHP activities will be reviewed in a number of ways in order to:

- Ensure all significant environmental aspects of the activity are covered in the EP;
- Ensure that management measures to achieve environmental performance outcomes are being implemented, reviewed and where necessary amended;
- Ensure that all environmental commitments have been met before completing the activity;
- Ensure that impacts and risks will be continuously identified and reduced to ALARP; and
- Identify potential non-conformances and opportunities for continuous improvement.

BHP conducts reviews and audits of their contractors involved in offshore activities at various stages including pre-award of contract, pre-activity and during activity, in accordance with BHP HSEC Management System performance. The environmental performance of subcontractors to BHP involved in activities will be reviewed through the following activities including (but not limited to):

- Inspections of vessel contractor’s HSEC Management systems and procedures;
- Pre-activity audits;
- Scheduled audits and inspections during the activity (Table 10-3);
- Review of reporting documentation;
- Monitoring of progress;
- Auditing and assurance program;
- Regular review of incident, audit, inspection, observation, safety meeting and daily operations reports;
- Action item tracking and closeout; and
- End of campaign reviews.

The environmental performance of BHP activities will be reviewed through:

- An inspection(s) of the vessels carried out by the BHP HSE Specialist before or during the activity to ensure that procedures and equipment are in place to enable compliance with the EP;
- Inspections will be documented and actions tracked through a non-compliance register, which is monitored on a regular basis;
- The Environmental Performance Standards and Measurement Criteria will be distributed to the Vessel Master(s) and monitored on a regular basis by BHP; and
- All environmental mitigation and management commitments from the EP will be documented and a description of compliance with each commitment will be maintained.

Annually an Environmental Performance Review (AEPR) will be undertaken to determine the continuing suitability, adequacy and effectiveness of the implementation strategy. The Environmental Performance Review (EPR) is conducted to determine the continuing suitability, adequacy and effectiveness of the implementation strategy. It is also reviews the performance of the activity against the Performance Outcomes, Standards and Measurement Criteria and provide for a review of the effectiveness of the control measures in the EP. The reviews are documented, including observations, conclusions, recommendations and follow-up. The AEPR will review:

- Internal annual EP compliance audit, inspections and reports;
- Annual EP compliance assurance review;
- External (i.e. NOSPEMA) audits, inspections and reports;
- Incident reports from operations or other operations;
- ALARP and acceptability statements of activities including oil spill response strategies;
- Improvements in technology or capability for oil spill response.

Audit findings, close-out reports and feedback from ongoing monitoring allow continuous improvement initiatives to be developed and inform the development of future EPs.

10.4.4 Management of Change

Permanent or temporary changes to organisation, equipment, plant, standards or procedures that have a potential health, safety, integrity and/or environmental impact are assessed and subject to formal review and approval as outlined in BHP HSEC Management Standards. This standard requires the change to be justified and authorised, risk assessed to understand the potential impacts of the change, a plan to be in place that clearly specifies the timescale for the change and any control measures to be implemented and the situation to be reassessed if there is an unexpected change in circumstances. The level of management approval for each change is commensurate with the risk.

Identification of potential changes to the Minerva activities (e.g. timing or activity details described in this EP) is the responsibility of BHP's Field Manager. Changes to the EP and OPEP will be made in accordance with Management of Change procedures outlined in the BHP HSEC Management Standards (refer to previous Section 10.4.4). The Management of Change will be assessed and subject to formal review to determine if a revision of the accepted EP in force for the activity is required to be submitted to NOPSEMA pursuant to Regulation 17 of the OPGGS (E) Regulations.

10.5 Routine and Incident Reporting

10.5.1 Routine Reporting

10.5.1.1 External Reporting

BHP will report information on environmental performance to regulators to remain in compliance with key environmental legislation and regulations. The regulatory reporting requirements are summarised in Table 10-3. In the event that M Operations end before the five year validity of this EP is reached, BHP will provide the associated end of Activity reports to NOPSEMA in accordance with Regulation 29 and 26C of the OPGGS (E) Regulations.

Table 10-3: Routine reporting requirements

Report	Recipient	Frequency	Content
Environmental Performance Report	NOPSEMA	Annual	In accordance with the OPGGS (E) Regulations 26C, confirmation of compliance with the Performance Outcomes, Performance Standards and Measurement Criteria of this EP. Reporting period 1 July to 30 June. Report must include sufficient information to enable NOPSEMA to determine whether or not the environmental performance outcomes and performance standards in the EP have been met.

Report	Recipient	Frequency	Content
Cetacean and Whale Shark Sighting Reporting	Australian Antarctic Division	Biannually	Summary of cetacean and whale shark sightings for the previous reporting period, 1 January to 30 June or 1 July to 31 December.

10.5.2 Incident Reporting

BHP employees and contractors are required to report all environmental incidents and non-conformance with commitments made in the EP. It is the responsibility of the BHP HSE Manager to ensure that reporting of environmental incidents meets both regulatory reporting requirements and BHP HSEC Standards.

1SAP is used for the recording and reporting of these incidents. Detailed investigations are completed for all actual and high potential environmental incidents. The classification, reporting, investigation and actioning of all incidents including environmental are undertaken in accordance with BHP Petroleum Event and Investigation Management Protocol. Incident (potential or actual) corrective actions are monitored using 1SAP.

In addition to the notification and reporting requirements outlined in BHP Event Management Procedure, the process that BHP will follow when notifying regulatory authorities of a reportable or recordable incident and the action timeframes are outlined in Table 10-4.

Any breach of these performance outcomes, standards and commitments will be considered a recordable incident and managed in line with the notification and reporting requirements outlined in Table 10-4.

Table 10-4: Activity notification and incident reporting

<table>
<tr><th>Regulation</th><th>Requirements</th><th>Required Content</th><th>Timing</th><th>Communication Type</th><th>Recipient</th></tr>
<tr><td colspan="6">Before the Activity</td></tr>
<tr><td>Regulation 29 & 30 in relation to Notifications</td><td>NOPSEMA must be notified that the Activity is about to commence.</td><td>Complete using NOPSEMA’s FM1405 – Regulation 29 – Notification of Start and End of Activity – Rev 0 – February 2014.</td><td>At least 10 days before the Activity commences.</td><td>Written</td><td>NOPSEMA, DJPR</td></tr>
<tr><td colspan="6">During the Activity</td></tr>
<tr><td rowspan="2">Regulation 16(c), 26(4) & 26A in relation to Reportable Incidents</td><td rowspan="2">NOPSEMA must be notified of all reportable incidents in relation to the Activity. For the purpose of Regulation 16(c), a reportable incident is defined as:
• Uncontrolled release of reservoir hydrocarbons to the marine environment;
• Uncontrolled release of hydrocarbons or environmentally hazardous chemicals of more than 80 litres to the marine environment;
• Gaseous releases of more than 300 kg (~255 m^3 at Standard Ambient Temperature and Pressure);
• Release of ODS;
• Unplanned discharge of wastes (solid wastes, untreated sewage and machinery space bilge drainage);
• Unplanned impact to a Matter of National Environmental Significance (MNES); and
• Harm or mortality to Commonwealth EPBC Act</td><td>The oral notification must contain:
• All material facts and circumstances concerning the reportable incident known or could be obtained by reasonable search or enquiry; and
• Any action taken to avoid or mitigate any adverse environment impacts of the reportable incident; and
• The corrective action that has been taken, or is proposed to be taken, to stop, control or remedy the reportable incident.</td><td>As soon as practicable, and in any case not later than 2 hours after the first occurrence of the reportable incident; or if the reportable incident was not detected at the time of the first occurrence, the time of becoming aware of the reportable incident</td><td>Oral</td><td>NOPSEMA</td></tr>
<tr><td>A written record of the oral notification must be submitted. The written record is not required to include anything that was not included in the oral notification. A written report must contain:
• All material facts and circumstances concerning the reportable incident known or could be obtained by reasonable search or enquiry; and
• Any action taken to avoid or mitigate any adverse environment impacts of the reportable incident; and
• The corrective action that has been taken, or is proposed to be taken, to</td><td>As soon as practicable after making the oral notification, and in any case, not later than 3 days after the first occurrence of the reportable incident unless NOPSEMA specifies otherwise.
Within 7 days after giving a written report of a reportable incident to NOPSEMA, the same written report must be provided to National Offshore Petroleum Titles Administrator (NOPTA).
As soon as practicable, to the National Ship Strike Database.</td><td>Written reports to NOPSEMA may take the form of an email, letter or report.</td><td>NOPSEMA, NOPTA, DoEE</td></tr>
</table>

Regulation	Requirements	Required Content	Timing	Communication Type	Recipient
	Listed marine fauna attributable to the well abandonment activity.	stop, control or remedy the reportable incident; and • The action that has been taken, or is proposed to be taken, to prevent a similar incident occurring in the future. Written reporting to NOPSEMA can be via completion of NOPSEMA's FM0831 - Report of an Accident, Dangerous Occurrence or Environmental Incident – Rev 6 – February 2014. Vessel collisions with marine fauna are to be submitted to the National Ship Strike Database.			
Regulation 26B in relation to Recordable Incidents	NOPSEMA must be notified of all recordable incidents in relation to the Activity. For the purpose of Regulation 26B, a recordable incident is defined as a breach of an environmental performance outcome or environmental performance standard, in the Environment Plan that applies to the activity that is not a reportable incident.	A written report must contain: • A record of all recordable incidents that occurred during the calendar month; • All material facts and circumstances concerning the recordable incidents known or could be obtained by reasonable search or enquiry to find out; • Any action taken to avoid or mitigate any adverse environment impacts of the recordable incidents; • The corrective action that has been taken, or is proposed to be taken, to stop, control or remedy the recordable incident; and • The action that has been taken, or is proposed to be taken, to prevent a similar incident occurring in the future.	As soon as practicable after the end of the calendar month, and in any case, not later than 15 days after the end of the calendar month.	Written	NOPSEMA

Regulation	Requirements	Required Content	Timing	Communication Type	Recipient
		If no recordable incidents have occurred, a 'nil incident' report should be submitted to NOPSEMA. Written reporting to NOPSEMA of recordable incidents and 'nil incidents' can be via completion of NOPSEMA's FM0928 – Monthly Environmental Incident Reports – Rev 3 – March 2014.			
OPGGS (RMA) Regulations (5.26 and 5.26A) in relation to Reportable Incidents	Reportable incidents in relation to a well in the title area must be notified to the Regulator (NOPSEMA) in accordance with new regulations (5.26 and 5.26A). A reportable incident in relation to a well is defined as follows (as per regulation 5.02): • A loss of integrity of the well including a well kick, resulting in a release of more than 1 kg of gas or 80 litres of liquid; • A failure of hydrostatic pressure as a primary barrier, leading to a build-up of pressure or a positive flow back; and the operation of a blow-out prevention or diversion system; • Damage to, or failure of, well-related equipment that has led or could lead to a loss of integrity of the well; • Any other unplanned occurrence that requires the titleholder to implement measures or arrangements to regain control of the well; • If there has been a confirmed flow from the well and the well has been shut in by means of a BOP and there is positive pressure	The verbal response must contain (i) all available material facts and circumstances concerning the reportable incident, and (ii) any action taken or proposed to be taken to stop, control or remedy the reportable incident.	Reportable incidents must be verbally reported to NOPSEMA incident phone number (08) 6461 7090. as soon as practicable after the reportable incident or after first becoming aware of a reportable incident, having given due regard to any immediate emergency response necessary.	Verbal	NOPSEMA
		Contents of the report will be: • All material facts and circumstances concerning the reportable incident that the titleholder knows or • is able to find out; and • Action taken, or proposed, to stop, control or remedy the incident; and • Any action taken, or proposed, to prevent future occurrence of a similar incident. In situations where all of the material facts and circumstances cannot be identified within the 3 days, then an initial report shall be submitted, with all available information, and a later final report submitted with all material facts at a time frame agreed with NOPSEMA. This would be for situations where additional time is required to conduct an investigation into the incident.	A written report of a reportable incident must be undertaken by the Titleholder after the initial verbal notification via email/ secure file transfer. The report must be submitted no later than 3 days after the first occurrence of the reportable incident using the NOPSEMA report form N-03000-FM1635 available from the NOPSEMA website. Requests for additional timeframe for submission of a final report are made through submissions@nopsema.gov.au	Written	NOPSEMA

Regulation	Requirements	Required Content	Timing	Communication Type	Recipient
	reading on the well, or flow from the well has been recorded, then such an incident would be reportable. Well related equipment is defined under the Act as "plant, or equipment or other thing for containing pressure on the well". If damage to or failure of well-equipment has, or could lead to a loss of well integrity, then such equipment would generally be pressure containing equipment relating to the barrier envelope of a well at its various stages of construction and operation.				
At the End of the Activity					
Regulation 29 in relation to Notifications	NOPSEMA must be notified that the Activity is completed.	Complete using NOPSEMA's FM1405 – Regulation 29 – Notification of Start and End of Activity – Rev 0 – February 2014.	Within 10 days after the completion.	Written	NOPSEMA

10.5.3 Other Incident Reporting Requirements

Any vessel strikes with cetaceans will be reported in the National Ship Strike Database at https://data.marinemammals.gov.au/report/shipstrike.

In accordance with the *Navigation Act 2012*, the AMSA will be notified by the Vessel Master if any of the following incidents (being of potential environmental relevance) occur:

- An oil pollution incident has occurred in Commonwealth waters (Marine Notice 1/1996);
- The vessel has received damage or is defective, affecting its seaworthiness; or
- There is a serious danger to navigation (e.g. a sizable piece of equipment overboard likely to float creating a shipping hazard).

The national 24-hour emergency notification contact details are:

Freecall: 1800 641 792

Fax: (02) 6230 6868

Email: mdo@amsa.gov.au

For all hydrocarbon spill reporting, refer to Section 11.14.

In accordance with the OPGGS (Environment) Regulations and BHP HSEC Standards, the following other incident reporting requirements also apply:

- Any loss or discharge to sea of harmful materials is to be reported using the prescribed Pollution Report (POLREP) form to the RCC;
- Victoria State Waters – All suspected or known instances of introduced aquatic pests or disease detected in Victorian waters to be reported to the DELWP immediately: Telephone: 136 186; and
- Director of National Parks (DNP) should be made aware of oil/gas pollution incidences which occur within a marine park or are likely to impact on a marine park as soon as possible. Marine Compliance Duty Officer on 0419 293 465 (24 hours).

11 Implementation Strategy for Hydrocarbon Spill Response

11.1 Section Overview

Regulation 14 of the OPGGS (E) Regulations states that the environment plan must contain an implementation strategy for the activity in accordance with this regulation and that:

> *14(8) The implementation strategy must contain an oil pollution emergency plan and provide for the updating of the plan;*

In accordance with Regulation 14 of the OPGGS (E) Regulations, implementation strategy for hydrocarbon spill emergency conditions during the Minerva offshore activities is provided in this section. The strategy outlines the response framework in the event of a hydrocarbon spill and the emergency response arrangements for a Level 1 or 2 oil spill event based on the provisional NEBA assessment (Section 9.2). Specific BHP practices and procedures are presented to ensure that the environmental impacts and risks of spill response activities will be continuously identified and reduced to ALARP, along with environmental performance outcomes, performance standards and management criteria for spill response activities.

As part of the implementation strategy, BHP has developed an OPEP unique to the Minerva offshore activities, namely the Minerva OPEP (Appendix F). The implementation strategy includes BHP processes and procedures for how training, competencies and on-going environmental awareness will be maintained for the duration of the activity, for all personnel and contractors involved in spill response activities (resourced by BHP).

11.2 Spill Response Approach

To establish oil spill response arrangements that can be scaled up or down depending on the nature of the incident by integrating with other local, regional, national and industry plans and resources, a level-response approach has been adopted. The criteria for determining the hydrocarbon spill 'levels' for the purpose of the OPEP have adopted the National Plan for Maritime Environmental Emergencies (NatPlan) and are described in Table 11-1. The 'level-rating' for oil spill response provides a magnitude description of the potential impact and the effort to support oil spill response. The 'Level' is determined by the relevant Commander, such as the Field Response Team (FRT) Commander (for a small spill) or by the IMT Incident commander.

Table 11-1: Worst case credible spill scenarios for Minerva Operation Activities and incident classification used to inform oil spill response

Level	Spill Scenario	Level Definition
1	Refined Oil/ Hazardous Chemicals (<80 L) Loss of hydrocarbon from pipeline rupture (<1 m^3)	An incident: • Occurs within a single jurisdiction; • Simple IAP required; • Resourced from within one area; • -Environmental impacts will be isolated and/or natural recovery expected within weeks; • Wildlife impacts limited to individual fauna; • That has no immediate concern of shoreline impact; and • With a BHP Risk Matrix Consequence Level 1-2.
2	Marine Diesel Spill from Vessel Collision (100 m^3) Loss of containment from Well (68 m^3/day)	An incident: • Occurs across multiple jurisdictions; • Outline of the IAP required; • Requires intra-state resources; • Significant environmental impacts, recovery may take months, remediation required; • Wildlife impacts to groups of fauna or threatened fauna;

Level	Spill Scenario	Level Definition
		• Shoreline impact is expected; and • With a BHP Risk Matrix Consequence Level 4.
3	(Major loss of hydrocarbons) – Not applicable as not a likely scenario during the Minerva offshore activities	An incident: • Occurs across multiple / international jurisdictions; • Detailed IAP required; • Requires national / international resources; • Significant environmental area impacted, recovery may take months, remediation required; • Wildlife impacts to large numbers of fauna; • With a BHP Risk Matrix Consequence Level 5.

Typically, Level 1 spill responses can be resourced with shipboard or port located spill kits. All vessels over 400 gross tonnage are required to have a current SOPEP in place and appropriate spill kits, response capabilities and trained personnel. Likewise, designated ports and harbours are required to have as a minimum Level 1 response capability on site.

For Level 2 spills, BHP will maintain a broad set of spill response capabilities. BHP also has contracts and MoUs with National and International third-party spill response providers to ensure response capabilities can be drawn upon (refer to Sections 11.7-11.10).

11.3 Oil Spill Response Arrangements

11.3.1 Incident Jurisdictions

In the event of an oil spill, Control Agencies are assigned to respond to the various levels of spills is outlined in Table 11-2. The 'Statutory Agency' and 'Control Agency' are defined as follows:

> ***Statutory Agency:*** *the State or Commonwealth Agency having statutory authority for marine pollution matters in their area of jurisdiction. For offshore petroleum exploration and production in Commonwealth waters or in State/Territory waters where powers are conferred, the Statutory Agency is NOPSEMA.*
>
> ***Control Agency:*** *is the agency with operational responsibility in accordance with the relevant contingency plan to take action to respond to an oil and/or chemical spill in the marine environment.*

Table 11-2: Statutory and lead control agencies for oil spill pollution incidents

Area	Spill Source	Statutory Agency	Lead Control Agency	
			Level 1	Level 2
Commonwealth Waters	Vessel	AMSA	AMSA	AMSA
State Waters	Vessel	Department of Jobs, Precincts and Regions (DJPR) - Energy and Earth Resources Division.	DJPR - Emergency Management Division	DJPR - Emergency Management Division
Port Waters	Vessel	Port Authority	Port Authority/ DJPR	Port Authority/ DJPR

11.4 National, State and Industry Plans

The OPEP has been developed to meet all relevant requirements of the OPGGS (E) Regulations and the following external documents have been used or referred to in the development of the OPEP and the implementation strategy for hydrocarbon spill emergency conditions that may occur during Minerva offshore activities:

- NATPLAN;

- Australian Marine Oil Spill Centre Plan (AMOSPlan);
- AMSA Australian Government Coordination Arrangements for Maritime Environmental Emergencies; and
- Victorian Plan Pollution Contingency Plan (VICPLAN).

This Minerva offshore activities OPEP interfaces with National, State and BHP plans as shown in Figure 11-1.

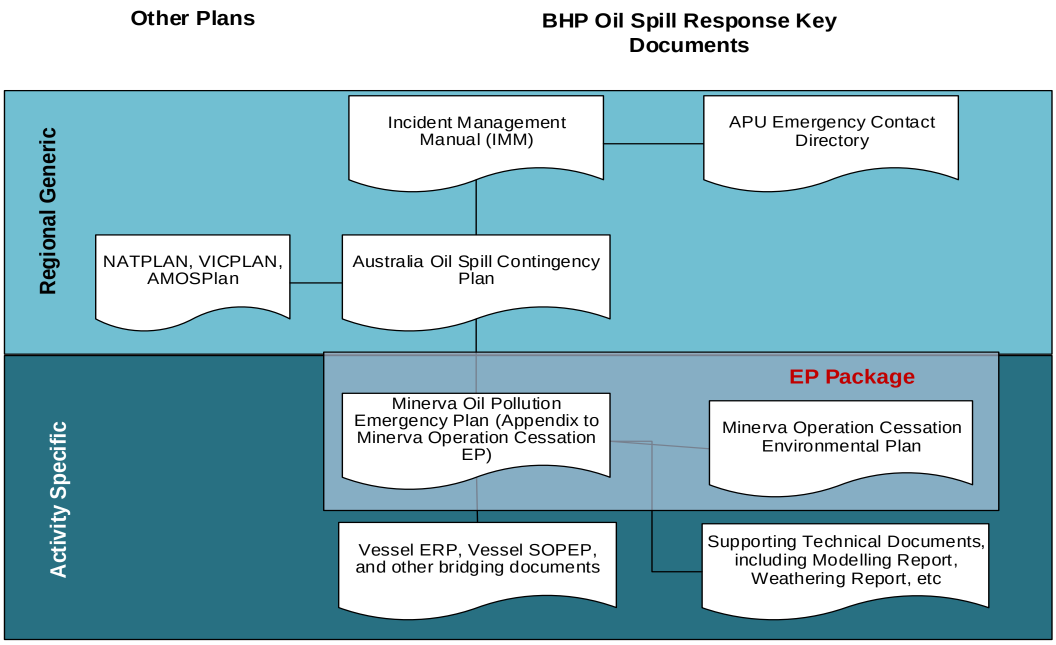


Figure 11-1: Integration with BHP Documents

11.4.1 National and State Plans

Applicable National and State plans include:

- NATPLAN (AMSA, 2017); and
- VICPLAN

11.4.2 Industry Plans

Applicable industry plans include:

- AMOSPlan; and
- Industry Joint Venture Plans: Various Plans developing general and assisted Oil Spill Response Capabilities.

11.4.3 BHP and Contractor Plans

The BHP - Crisis and Emergency Management Control 3: Plans, requires the following:

Develop Emergency Response plans that are scaled according to the Petroleum activities, associated hazards, material risks and applicable regulatory requirements.

To support this requirement, the following documents have been developed and implemented:

- Incident Management Manual – Australia;
- APU Emergency Contact Directory;
- The Minerva EP (this document) and OPEP; and

- Contractor Emergency Response Plans (ERPs), SOPEPs and bridging documents.

Current versions of these documents are available in the BHP Emergency Response Room.

11.5 BHP Incident Response

11.5.1 BHP Response Organisation Structure

The BHP Crisis and Emergency Management (CEM) philosophy is based on three levels of response teams (Table 11-3), which allow for a flexible response with the appropriate level of leadership and support, according to the nature of the specific incident.

Table 11-3: BHP Response Structure

BHP Response Structure	
Team	**Role**
Field Response Team [FRT]	The FRT is responsible for physically controlling incidents in the field, where possible, and communicating known facts to the IMT.
Incident Management Team [IMT]	The Incident Management Team's role is to provide technical and logistical support to the Field Response Team. It is based in Perth, Australia.
Emergency Management Team [EMT]	The role of the EMT is to provide strategic leadership and support. It is based in Houston, USA.
Teams are progressively activated depending on the severity of an incident	

In line with BHP -Crisis and Emergency Management Control 2 – Emergency Response Structure, the following sections describe the teams listed in Table 11-3 based on the anticipated spill level of the spill scenarios for the drilling activities.

11.5.1.1 Field Response Team

The FRT will depend on the vessel involved in the incident and will be described in the vessel Emergency Response Plan. The Master of the vessel will be in command and will relay the information to the BHP representative.

The role of the FRT is to provide local and on scene response by implementing priority objectives and attempts to control or contain the source and make appropriate emergency notifications. The FRT reports to the IMT.

Roles and responsibilities of the BHP mobilised FRT are illustrated in Table 11-4.

Table 11-4: FRT roles and responsibilities

Role	Responsibilities
Emergency Commander	The Emergency Commander has overall responsibility for management of an incident.
Safety	The primary role of the Safety Representative is to provide advice and guidance on HSE issues as the incident develops.
On-Scene Commander	The On-Scene Commander is responsible for determining the status of the emergency and providing assistance to the Emergency Commander, as requested
Emergency Communications Coordinator	The role of the Emergency Communications Coordinator is to provide a link between the Incident Management Room and the on-site response operations and to assist them in controlling the incident.
Emergency Coordinator	The Emergency Coordinator provides technical support during the emergency response and communicates with the Emergency Commander.

11.5.1.2 APU Incident Management Team

11.5.1.2.1 Organisational Chart [Level 1 Spill Response]

The IMT is responsible for the initial spill response for all spills. The on-duty IMT will handle a tier 1 response. The BHP APU Incident Management Manual outlines the roles and responsibilities of personnel in all response scenarios. Those responsible for an oil spill response are shown in Figure 11-2 with allocated responsibilities detailed in Table 11-5.

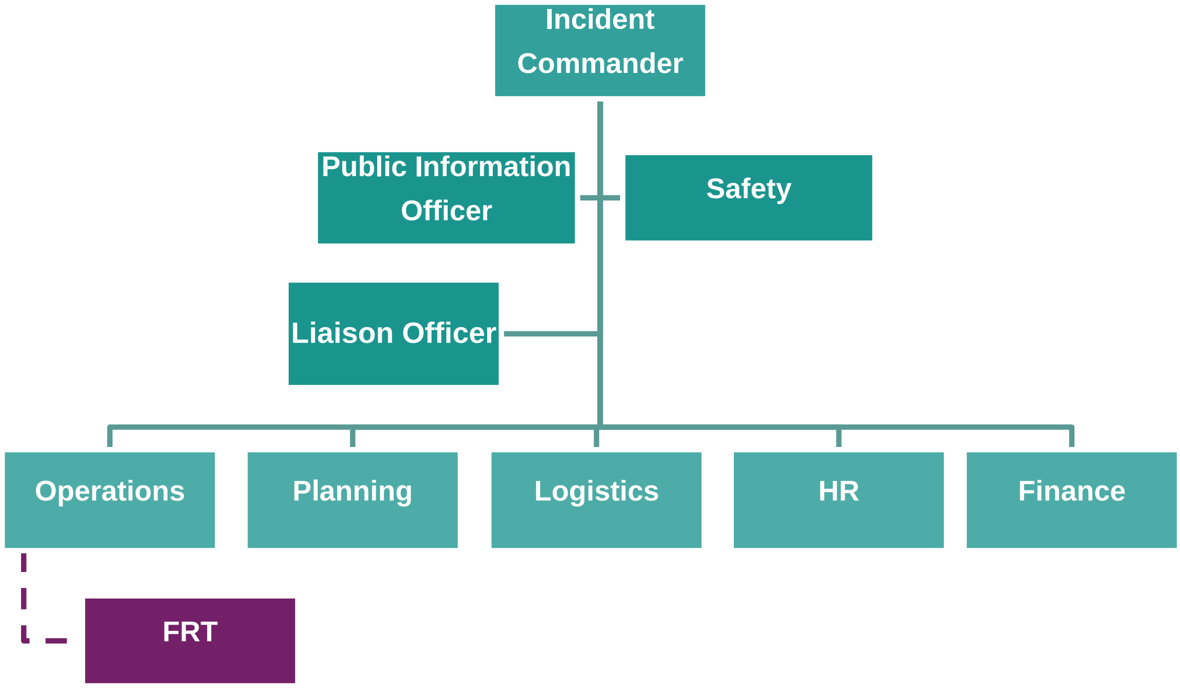


Figure 11-2: APU IMT organisational chart [level 1 spill response]

Table 11-5: IMT roles and responsibilities

Role	Responsibilities
Incident Commander	The Incident Commander directs incident activities, including development and implementation of strategic objectives, and liaises with the EMT Leader.
Safety	Safety is responsible for monitoring and assessing hazardous and unsafe actions, in addition to developing measures for assurance of personnel safety, and assessment of any further hazards to the environment.
Public Information Officer	Corporate Affairs is responsible for developing and releasing information about APU incidents through external communications channels and by direct engagement with relevant community and government stakeholders.
Legal	Provision of legal advice to the Incident Commander relating to response activities, applicable regulatory requirements and any potential liabilities or investigative issues.
Operations	The Operations Section is responsible for all activities directly applicable to the response. The Operations Section Chief will act as the Point of Contact between the FRT and the Incident Commander.
Planning	The Planning Section is responsible for collecting, evaluating, and disseminating the tactical information related to the incident, and for preparing and documenting IAPs.
Logistics	Logistics are responsible for directing all of the services and support needs of an incident, including obtaining and maintaining essential personnel, facilities, equipment and supplies.
Finance	Finance track financial expenditures.
Liaison Officer	At the Incident Commanders discretion, a Government Agencies can join the IMT team to provide support in the oil spill response planning and disseminate information through the State Combat committee Executive Advisory Group (EAG).

The APU IMT is made up of personnel on a roster basis, with each individual being available for 1 week on a 24 hour basis, throughout the year, based in Perth. There is a weekly handover and briefing of the operations for the coming week. The APU IMT consists of a number of defined roles, which enables BHP to respond to a variety of incidents, including Oil Spills. The APU IMT facility is located in the BHP Perth offices and is fully equipped to manage incidents.

IMT members undergo pre-requisite Competency Based Training and Assessment (CBTA) before fulfilling their position on the IMT. The CBTA modules have been developed by BHP to specifically address the BHP CEM procedures and processes. The candidate is provided with a CBTA learning module, an assessment module and the accompanying IMT procedures and manuals and completes the assessment documentation. The candidate is then assessed based on written and verbal responses to the assessment module.

To supplement the CBTA training, each IMT member participates in desk top exercises and additional minor and major exercises. The training “desk top” exercises are also arranged during the weekly handover sessions, to test a range of IMT responses including oil spill response. There is a calendar of desk top exercises which are facilitated in house. Major exercises are facilitated by an external Emergency Response provider.

The APU HSE Manager is responsible for the overall management of the IMT including:

- Training and competency; and
- Ensuring the IMT is adequately resourced.

The IMT consists of key personnel with a broad range of disciplines (e.g. operations, engineering, maintenance, HSE, supply, external affairs, human resources, finance), together with other support service personnel as necessary.

The IMT has key corporate and external communications responsibilities for:

- Providing tactical and strategic direction, technical expertise and support during an emergency;
- Informing and liaising with relevant emergency services and regulatory authorities as appropriate;
- Managing external communications with media, relatives, contractors, customers, etc.;
- Managing external communications with media, workforce, government, customers, community, etc; and
- Documenting all aspects of the emergency response activities and communications.

In the event that response to an oil spill incident requires a prolonged spill response, the IMT Commander may activate Australian Marine Oil Spill Centre (AMOSC) (including its core group members) and Oil Spill response Limited (OSRL) to augment the IMT’s capacity, and request that a Deputy be assigned to the following positions:

- IMT Commander;
- Safety Officer;
- Operations Section Chief;
- Planning Section Chief;
- Logistics Section Chief; and
- Finance Section Chief.

AMOSC or OSRL deputies assigned to the APU IMT will be responsible for providing BHP guidance on the Incident Command structure (ICS) process and oil spill response strategies. Guidance and support will be available via phone/video conference.

OSRL are an OSRA based in Singapore and Southampton. BHP has contracted OSRL to provide support during an oil spill response.

11.5.1.2.2 Organisational Chart [Level 2 Spill Response)

In addition to the positions outlined for response to a Level 1 response, BHP will where appropriate assign additional roles and responsibilities based on the nature and scale of a Level 2 response as shown in Figure 11-3. Specialist (Environment) sits under the Planning Section Chief and is responsible for providing operational and scientific monitoring decision making, and technical assistance in preparing and documenting IAPs.

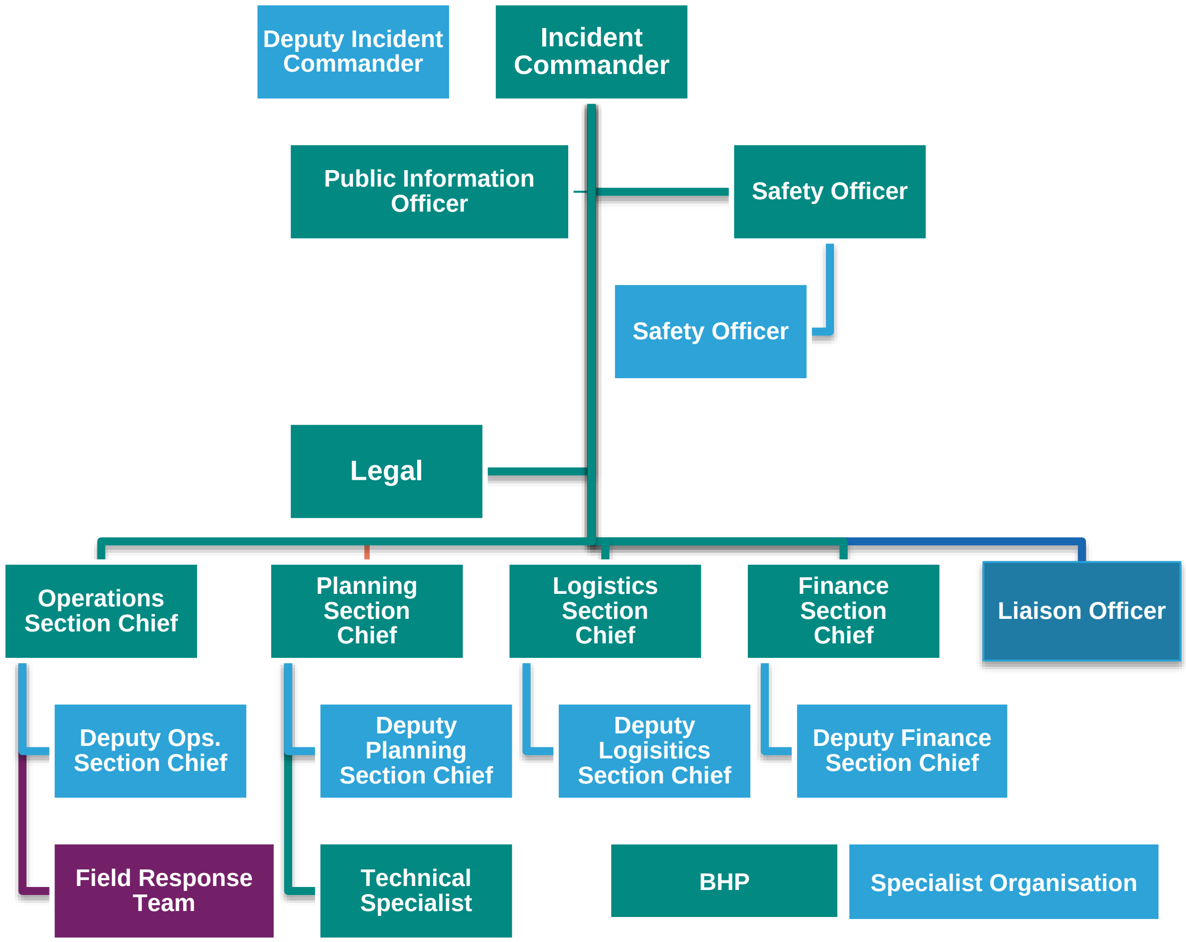


Figure 11-3: APU IMT organisation chart [Level 2 spill response]

11.5.1.3 Potential Resources Needs

Potential resource requirements for all Levels of response (per 12 hour operational period) are detailed in Table 11-6. BHP's response arrangements can be scaled up or down dependent on the nature and 'level' of the incident.

Table 11-6: Potential resource needs

Function / Position	Level 1	Level 2
Incident Commander	1 per incident; Incident Commander may have Deputies as needed.	
Command Staff: Safety Officer, Public Information Officer, Liaison Officer	1 per incident: Command Staff may have assistants and deputies as needed.	
Operations		
Operations Section Chief	1 per operational period	
Deputy Operations Section Chief	NA	2
Recovery & Protection Branch Director [dependent on AMBA]	NA	3-4
Air Operations Branch Director	NA	3-4

Function / Position	Level 1	Level 2
Wildlife Branch Director [dependent on AMBA]	NA	1
Staging Area Director	NA	1 per Staging Area
Planning		
Planning Section Chief	NA	1 per operational period
Deputy Planning Section Chief	NA	2
Resource Unit Leader	NA	1
Situation Unit Leader	NA	1
Technical Specialist	NA	As needed
Field Observer	NA	2
Environmental Unit Leader	NA	1
Documentation Unit Leader	NA	1
Demobilisation Unit Leader	NA	1
Logistics		
Logistics Section Chief	NA	1 per operational period
Deputy Logistics Section Chief	NA	1
Service Branch Director	NA	As needed
Support Branch Director	NA	As needed
Finance		
Logistics Section Chief	1 per operational period	
Deputy Logistics Section Chief	NA	1
Time Unit Leader	NA	1
Procurement Unit Leader	NA	1
Compensation Specialist	NA	1
Please note: In a large scale response each function listed above may require a number of people or teams.		

11.5.2 Additional Personnel

Additional personnel, not on the APU IMT would be resourced due to their specific discipline to provide support to the IMT. Perth office has 120 personnel that would fulfill this requirement.

- As all events would be managed by the online EMQnet system, additional resources could be sort remotely i.e. BHP Operations in Trinidad and Tobago, Gulf of Mexico and Houston;
- For long term protracted events, additional expertise would be sort from Houston and deployed to the APU to provide support to the IMT for the on ongoing management of the event;
- Co-located at 125 St Georges Terrace is the Mineral Australia EMT and there resource structure would be made available; and
- AMOSC Core group are able to provide Technical support as well as manpower. Coregroup – 100 personnel available under the joint agreement.

Off rostered personnel from the Pyrenees, Macedon and Minerva facilities would also be available to provide man power support if required.

11.6 Emergency Management Team

The role of the EMT is to provide strategic leadership and support. The EMT Leader is notified within 15 minutes of IMT Activation by the Incident Commander or the BHP Emergency and Crisis Centre (ECC). The

BHP EMT is based in Houston, USA. The EMT structure is show in

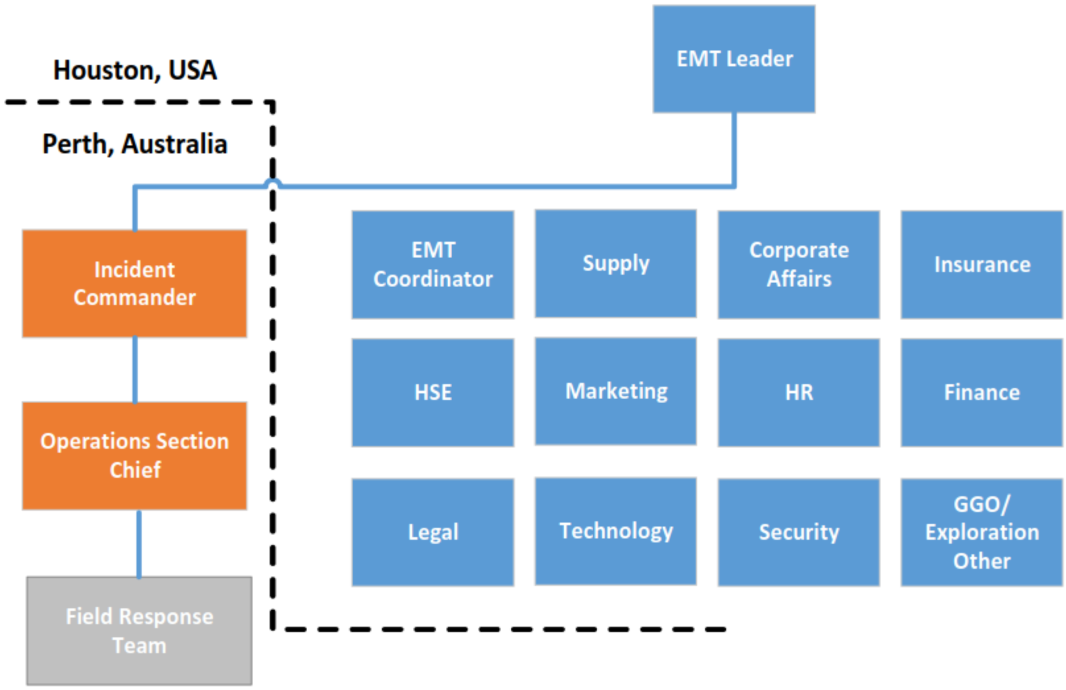


Figure 11-4 and the Roles and Responsibilities are described in
Table 11-7.

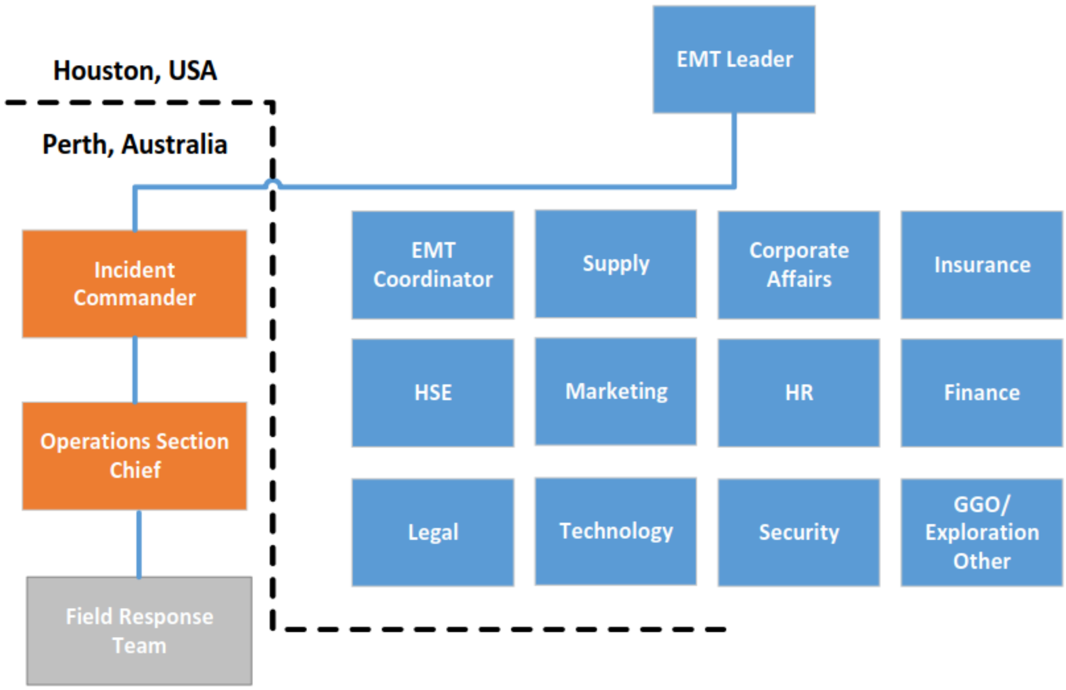


Figure 11-4: Emergency management team structure

Table 11-7: EMT roles and responsibilities

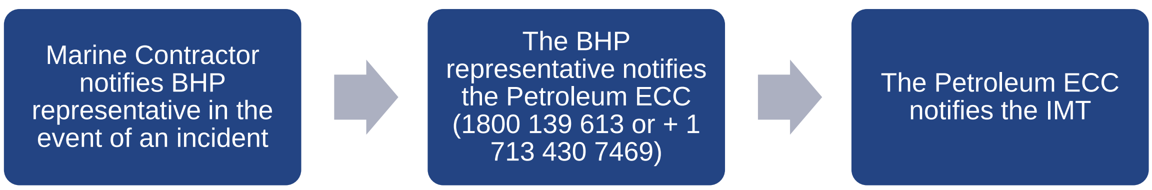
Role	Responsibilities
EMT Leader	Overall responsibility for the management of the response including setting strategic objectives, assigning tasks and providing updates to the Asset President, Petroleum President and Group CEO.
EMT Coordinator	Coordinating all information management needs for the EMT. This includes documentation of incident information and providing administrative support for the EMT.
Legal	Provision of legal advice relating to response activities and public communications, applicable regulatory requirements and any potential liabilities or investigative issues.
Corporate Affairs	Managing Internal and External stakeholder\s as well as media and other communications related to the incident
Human Resources	Management of all personnel issues including family liaison and communication with contractors as appropriate.
Technology	Specialist advice and support relating to all technology systems and implementation of the Disaster recovery plan
HSE	Safety and effective Risk Management of incident response and providing functional oversight and planning expertise for health, safety and environment.
Security	Provision of specialist security advice pertinent to the incident and other affected locations. Security will also liaise with relevant international or local security agencies.
Finance	Tracking financial expenditures for the response, forecasting potential financial impacts and ensuring appropriate systems are in place to make emergency payments.
Marketing	Ensuring the interpretation of the past or current state or condition of one or more commodity markets (or a prediction as the future state or condition of the same), including an opinion as to the nature or effect of events in or affecting such markets.
Supply	Facilitation of the end-to-end procurement process through engagement with third party commercial counterparties by leveraging technical and commercial expertise.
Insurance	Provide support on global insurance exposure, underwriting information and external insurance policies.
GGO/Exploration or Other	The GGO/Exploration function is responsible for supporting the lead contractor during a GGO/Exploration event.

11.7 Notifications

The marine contractor will provide the initial response to an oil spill. Response equipment is located on each vessel and the contractor will provide facilities, such as support vessels as the initial responders. The marine contractor will follow their SOPEP procedures regarding use of appropriate spill response and amount of spill equipment required.

BHP will be notified immediately of any incident (as shown in Figure 11-5).

Figure 11-5: Notification process



11.8 Oil Spill Response Organisations

In line with BHP - Crisis and Emergency Management Control 4: Provision of Resources, BHP will have established formalised third party contracts and agreements with defined performance standards/criteria for the provision of resources, services or equipment in support of emergency response activities. These resources will be activated, dispatched and deactivated prior to and during an emergency.

BHP maintains contracts with a number of OSRAs. The main relationships are detailed in the sub-sections below.

11.8.1 AMOSC

The AMOSC is an industry funded oil spill response facility based in Geelong, Victoria. AMOSC resources include:

- AMOSC spill response equipment stored at AMOSC and at other locations;
- Oil company equipment based at various locations; and
- Trained industry response (“Core Group”) personnel.

AMOSC form part of BHP’s First Strike and primary response strategy to a spill, and will be deployed within 12 hours of notification. Only nominated BHP personnel can request the assistance of AMOSC (see APU Emergency Contact Directory) and this is usually conducted via the Perth IMT. AMOSC can be placed on the advice levels in Table 11-8. Information regarding activation and mobilisation is outlined in Section 3 of the OPEP.

Table 11-8: AMOSC advice levels

AMOSC Advice Level	Status	AMOSC Requirements
Level 1	Forward Notice	• Advise a potential problem. • Provide or update data on oil spill. • Update information on spill and advise 4 hourly.
Level 2*	Standby	• AMOSC Resources may be required. • Assessment of resources and destination to be made. • Update information on spill and advise 2 hourly.
Level 3*	Callout	• AMOSC Resources are required. • Detail required resources and destination

* Levels 2 and 3 can incur mobilisation costs.

AMOSC maintains a core group of approximately 100 key personnel from oil industry member companies around the country who are trained and regularly exercised in oil spill response operations. Access to the Core Group is via AMOSC.

The cooperative arrangements for response to oil spills by Australian oil and associated industries are brought together under the AMOSPlan. The AMOSPlan will be activated by BHP when the response to an oil spill incident is regarded by BHP as requiring resources beyond those of the company itself.

In the event that the oil spill response requires the call out of AMOSC’s own resources, the call out request is made directly to AMOSC by the Perth IMT. Should the response require mutual aid from equipment owned and personnel employed by another company, the request for assistance is made directly company to company via each company’s nominated Mutual Aid Contact.

In addition, BHP will also be required to contact AMOSC to activate the Standing Agreement (92032701.WP5) and the Service Contract (for the borrowing company), in the event that BHP require equipment from another company.

11.8.2 Oil Spill Response Limited (OSRL)

BHP is a member of the OSRL group. OSRL is an industry-funded oil spill response organisation with offices in Singapore, Bahrain, Southampton, Aberdeen, and London. OSRL have capacity to mobilise additional equipment and personnel to APU from their Singapore location.

Updates on the availability of OSRL's equipment availability is provided via a weekly Equipment Stockpile Status Report from OSRL's website at:

http://www.oilspillresponse.com/activate-us/equipment-stockpile-status-report

The Equipment Stockpile Status Report provides a quick and timely overview of the availability of OSRL's equipment stockpile globally and is especially useful in assuring OSRL's readiness. It also provides a vital overview of the resources that BHP will be able to access in the event of a spill. Under OSRL's Service Level Agreement (SLA), the first member who initiates mobilisation of OSRL will be entitled to a maximum 50 % of the stockpile, while the second member is entitled to a maximum 50 % of the remaining stockpile (and so on).

In addition to the Equipment Stockpile Status Report, OSRL provides a response equipment list that provides an overview of the size, type and ancillaries required for the equipment that is available at their bases. To ensure efficient and timely response capability, OSRL also have also pre-packaged some of the equipment into loads ready for dispatch, that are suitable for general spill situations and operating environments. This equipment list can be found at:

http://www.oilspillresponse.com/files/OSRL_Equipment_List.pdf.

In addition to providing response equipment, OSRL also supply a selection of ground staff who have the practical skill and experience to assist and support BHP in a spill response and are trained in using the ICS structure. Response teams will comprise:

- Team Manager;
- Operations Manager; and
- Senior technicians/ technicians.

OSRL can be called upon to provide immediate technical advice and to mobilise personnel if required. OSRL will be called on to lead small specialist teams and/or provide supplementary labour and equipment if ongoing response is required. Any OSRL resources being mobilised from Singapore will be expected to be on the scene in Perth following notification by the IMT in a similar timeframe as resources mobilised from eastern Australia. Only nominated BHP personnel may request the assistance of OSRL via the Incident Commander.

OSRL also has a MoU with AMOSC, and OSRL may also be activated by AMOSC to provide resources to AMOSC to respond to a situation. Following initial spill notification, OSRL may be mobilised if required within 8 hours.

11.8.3 The Response Group

BHP has a contract in place with The Response Group, located in USA, for the provision of oil spill response personnel and resources for combating an oil spill. They can provide support remotely or deploy personnel to the APU (IMT or FRT).

The Response Group maintain a 24-Hr Support contact: +1 (281) 880-5000.

11.8.4 Technical Support

BHP has arrangements in place with SGS Australia to provide 24/7/365 emergency response support in the form of access to emergency response teams. In the first week of a response, SGS would make available personnel from their global emergency response team network at week 2 taking into account staff rotations. Similarly, BHP has arrangements in place with Bennelongia Environmental Consultants who have a staff of up to 10 personnel that could be rotated through specialist avifauna environmental monitoring positions, which could be expanded through access to the Birds Australia network.

BHP has arrangements in place with GHD Pty Ltd to provide environmental monitoring services in support to the emergency response teams. GHD would make available 10-15 personnel, increasing to 20 personnel, with environmental science qualifications and environmental monitoring skills, to rotate through field monitoring positions. To meet any need for additional personnel, GHD would draw from a wider pool of 40-50 environmental staff and GHD subcontractors across Australia.

11.8.5 General Support

BHP has arrangements in place with labour resource companies that would be used to populate the SCAT, shoreline protection, and shoreline clean-up and waste management teams with a temporary contract workforce (unskilled labour) to scale-up post first strike. This includes direct engagement with:

- Hays Corporate Personnel

BHP has access to four providers via Minerals Australia National Contract Panel:

- Chandler McLeod;
- One Key;
- Programmed; and
- Scotford and Fennessy.

BHP also has access to contracting companies that provide fixed term roles to BHP:

- Dare Contract Management

BHP would utilise these providers to supply personnel as required, for example 40-50 each[55] to populate the response teams. BHP has tested these arrangements[56] and considers that approximately 500 personnel for shoreline clean-up operations can be sourced to match and maintain the consequence of a worst-case spill. BHP will aim to mobilise shoreline crews prior to the predicted arrival of hydrocarbons. These crews will focus on pre-cleaning beach areas (e.g. removing debris such as seaweed to areas above the high tide mark) and establishing staging areas to enable a more efficient response when hydrocarbons are arriving ashore.

Additional labour resource requirements above the arrangements described for a temporary contract workforce can be drawn from the significant staff resources of BHP's global petroleum operations, Iron Ore and other divisions that operate in Western Australia and more broadly across Australia. For example, BHP Iron Ore can use direct employees, contractor workforce or utilise current arrangements with Contractors to source additional personnel for shoreline clean-up.

Based on the risk assessment, particularly the source of the risk being diesel, it is unlikely that large numbers of response personnel will be required for a spill event during Minerva offshore activities as there are no scenarios where shoreline impact is predicted. However if personnel are required, these can be sourced through the labour hire arrangements with training provided upon mobilisation and supervision provided by the trained responders.

11.9 State and National Resources

In accordance with the VicPlan, additional personnel to assist with labour intensive aspects of a response (if required) will be sourced through the State Combat Committee (Executive Advisory Group). Depending on the level of response required, sources of labour may include the local shire, and AMSA.

Under the National Plan, a National response team (NRT), comprising experienced personnel from operator to senior spill response manager level from Commonwealth/State/NT agencies, industry and other organisations, has been developed. The services of the NRT will be obtained through the Environment Protection Group (EPG) and AMSA, which has made arrangements with the respective government and industry agencies, for the release of designated personnel for oil spill response activities. These services will be activated when it is assessed that an oil spill incident exceeds the resource availability at the state level.

During a National Plan incident, the BHP Perth IMT or the Marine Pollution Controller appointed by a Control Agency may submit a request to AMSA for personnel from other States/NT to become part of the Incident Management Team or the incident response team. A request should be made initially through the Environment Protection Duty Officer via the Emergency Response Centre on 1800 641 792 or 02 6230 6811. This request must be followed by written confirmation within three (3) hours of the verbal request.

[55] Pers. Coms David Irinve, Hays State Business Director, 19 October 2018.

[56] Hays –200 by Day 2/+500 by Day 21; Dare- 50 by Day 2/200 p/d to 2,000 by Day 12 (pers. coms. Feb 2015).

The following information will be provided when making such a request:

- Roles or skills required (e.g. Planning Officer, Aerial Observer);
- Number of personnel required to fill each role;
- Contact name, address, and time of where personnel are to initially report; and
- Brief overview of the work to be undertaken.

Suitable personnel will then be selected by AMSA from the National Response Team (NRST), unless special circumstances exist.

11.10 Industry Resources

BHP is a Full Member of AMOSC and as such has access to Industry Mutual Aid Arrangement equipment and National Plan equipment held as part of the contingency plans of the Australian Oil Industry and the Australian Government. AMOSC require confirmation from mobilisation authorities to access equipment listed under the National Plan.

All National Plan, AMOSC and those industry equipment resources that are registered with AMOSC, which are potentially available for response to an incident, are listed in the Marine Oil Spill Equipment System (MOSES) database. The MOSES database is a computer database that lists the type, quantity, location, status and availability of pollution control equipment. It is also used to manage audits, maintenance and repair of AMSA owned equipment

Normal requests for assistance are directed to AMOSC in Geelong to coordinate, but equipment may also be accessed through the MOSES database, or AMSA – Marine Environmental Protection Services (MEPS).

11.11 Government Agency Notification

BHP response teams are hierarchical in nature, and response teams and resources are progressively activated depending on the severity of an incident. Government Agencies and Industry Organisations may also be mobilised. The Stakeholder Management Plan will be used to maintain contact with identified stakeholders.

11.12 Industry Joint Venture Programmes

BHP undertake Joint Venture Programmes with other operators and organisations including, but not limited to, Santos, Woodside, Exxon Mobil, Vermillion and AMOSC. These programmes aim to develop operational guidelines, operational tests, training processes and plans to inform and prepare oil spill response strategies. The programmes also provide guidance and training around First Strike incident plans, key operational considerations, understanding of shoreline sensitivities and lists of resources required to implement response.

11.13 Review and Testing of the OPEP

11.13.1 Control and Distribution of the OPEP

The Minerva OPEP (Appendix F) shall be controlled as described by the *APU Document Control Procedure (AOIM-0001)*. This procedure describes the process of approval, issue and withdrawal of APU controlled documents. The APU Document Controller is responsible for the distribution of the OPEP.

11.13.2 Review of the OPEP

A review of the OPEP by BHP will be undertaken annually and following a reportable incident. The review of the OPEP will consider:

- Experienced gained from exercises;
- Changes to activity, operations and/or organisation;
- Recommendations from audits;

- New, or other, legal requirements; and
- Other improvement opportunities to demonstrate ALARP.

The APU HSE Manager is responsible for conducting the review. The findings from the review shall consider updates to other current OPEPs and OSCPs. The following triggers will be used as guidance to update the OPEP where there is a significant relevant change:

- BHP Organisation;
- Key contractors listed in the OPEP;
- Response equipment; and
- New environmental risk.

The APU HSE Manager is responsible for assessing the change and deciding if the changes require a resubmission of the OPEP under Section 17 of the Environment Regulations.

11.13.3 Response Testing

Regulation 14(8) of the OPGGS (E) Regulations states the environment plan must contain an implementation strategy for the activity in accordance with this regulation and that:

> *14(8A) The implementation strategy must include arrangements for testing the response arrangements in the oil pollution emergency plan that are appropriate to the response arrangement and to the nature and scale of the risk of oil pollution for the activity.*

Key responsibilities for personnel are provided in Table 10-1. Testing of the response arrangements described in the OPEP will align with the *APU Incident Management Team Desktop Exercises Procedure*. In a typical year, there are 14 desktop exercises, of which at least 4 are oil spill related.

As a minimum requirement, the Minerva OPEP shall be tested and recorded through an exercise:

- When implemented; and
- When a significant modification to the plan has occurred.

11.13.4 Schedule of Response Testing

Regulation 14(8B) and 14(8)(C) of the OPGGS (E) Regulations states the environment plan must contain an implementation strategy that includes arrangements for testing the response arrangements in the oil pollution emergency plan and that:

> *14(8B) The arrangements for testing the response arrangements must include:*
>
> *(a) a statement of objectives of testing; and*
>
> *(b) a proposed schedule of tests; and*
>
> *(c) mechanisms to examine the effectiveness of response arrangements against the objectives of testing; and*
>
> *(d) mechanisms to address recommendations arising from tests.*
>
> *14(8C) The proposed schedule of tests must provide for the following:*
>
> *(a) testing the response arrangements when they are introduced;*
>
> *(b) testing the response arrangements when they are significantly amended;*
>
> *(c) testing the response arrangements not later than 12 months after the most recent test;*
>
> *(d) if a new location for the activity is added to the environment plan after the response arrangements have been tested, and before the next test is conducted – testing the response arrangements in relation to the new location as soon as practicable after it is added to the plan;*
>
> *(e) if a facility becomes operational after the response arrangements have been tested and before the next test is conducted – testing the response arrangements in relation to the facility when it becomes operational.*

The schedule for testing the response arrangements of the OPEP are provided in Table 11-9. The schedule will be revised if any of the conditions identified in Regulation 14(8C) change. The objectives of the response exercises are to test BHP oil spill response arrangements for Australian offshore operations, which includes the Minerva Operations. Testing is completed in accordance with the Petroleum Health Safety and Environment - Crisis and Emergency Management Standard Appendix 6. This describes the performance requirements to conduct emergency response training and exercises, including the review of role requirements and applicable plans. The mechanism for examining the effectiveness of each test against the objectives is determined by: Exercise Facilitator(s), Crisis and Emergency Management Subject Matter Experts, and HSE Manager during the planning and execution of each exercise.

Table 11-9: Schedule for response testing of the OPEP

Test	Schedule	Measurement Criteria
Major	Annual Testing Response for Primary and Secondary Response Strategies for Level 2 spills. Staged response over life of EP.	Documented record of: • Exercise scenario based on credible oil spill event; • Exercise plan incorporating objectives of the exercise and arrangements within the OPEP; and • Post exercise report on achievement of objectives of exercise, alignment with OPEP arrangements and actions.
Desktop	Newly accepted EP. Prior to or within 1 month of commencement of EP.	
Desktop	Minimum 2 oil spill related Exercises per year to test EP and OPEP requirements. May relate to: (a) acceptance of new EP; (b) area identified as requires testing due to operational requirements; and (c) areas as identified as requires testing due to industry trends, observations and feedback.	
IMT Training	Role specific - varies depending (a) time on roster since last training and (b) involvement in exercises in last FY.	Documented record.
Oil Spill Response Agency (OSRA)Specific IMT Training	IMT Training in OSRA Capability and BHP Plans with AMOSC and OSRL varies depending on focus areas identified by HSE and Operations Management as requiring improvement.	Documented record.
IMT Training	Role specific - varies depending (a) time on roster since last training and (b) involvement in exercises in last FY.	Documented record.
OSRA Specific IMT Training	IMT Training in OSRA Capability and BHP Plans with AMOSC and OSRL varies depending on focus areas identified by HSE and Operations Management as requiring improvement.	Documented record.

The objectives of the response exercises are to test BHP oil spill response arrangements for Australian offshore operations, which includes the Minerva Operations. The effectiveness of the response arrangements are assessed against the objectives via feedback from exercise participants, feedback from exercise facilitators and evaluators in the form of written reports, and by comparing external parties performance with BHP IAPs. Actions from exercises will be tracked and closed out via the BHP 1SAP system.

11.13.5 Response Personnel Training [Management]

The APU HSE Manager is responsible for the overall management of the IMT including:

- Training and competency;
- Ensuring the IMT is adequately resourced; and
- Maintaining the associated training documentation for Emergency Response.

The IMT is mainly resourced by personnel from the BHP APU, except for the Legal team where additional external specialists make up part of the team. An individual is assigned to join the APU IMT roster by their line manager and the APU HSE Manager. Where possible the IMT role is aligned to an individual's current role responsibilities (Table 11-10). For example, the Operations Section Chief is drawn from the Engineering and

Operations teams. This ensures that a person assigned to an IMT role brings a depth of technical knowledge to the APU IMT.

Table 11-10: IMT Competencies

IMT Position	Selected from	CEM Induction	CBTA General Principles	CBTA Role Specific
Incident Commander	Functional Managers	Y	Y	Y
Operations Section Chief	Engineers and Operations Specialists	Y	Y	Y
Planning Section Chief	Engineers	Y	Y	Y
Logistics Section Chief	M&L Specialists	Y	Y	Y
Human Resources Coordinator	HR Specialists	Y	Y	Y
Log keeper	Technical Assistants	Y	Y	Y
Public Information Officer	Corporate Affairs Specialists	Y	Y	Y
Legal	Legal Specialists and Internal Counsel	Y	Y	Y
Safety	HSE Specialists	Y	Y	Y

Once nominated for an IMT role, the candidate must complete the following CBTA before engagement in an IMT role:

- An online BHP CEM induction program;
- General IMT Principles CBTA; and
- IMT Role Specific CBTA.

The CBTA modules have been developed by BHP to specifically address the BHP CEM procedures and processes. The candidate is provided with a CBTA learning module, an assessment module and the accompanying IMT procedures and manuals and completes the assessment documentation. The candidate is then assessed based on written and verbal responses to the assessment module. The General Principles CBTA is assessed by a HSE specialist from the HSE Department. The Role Specific CBTAs are assessed by assigned Role Custodians. The Role Custodians are selected for their seniority and knowledge of the IMT role and the business. All IMT training and competency information is collated and tracked on BHP skills database (Skills XP).

To supplement the CBTA training, each IMT member participates in regular desktop exercises and additional minor and major exercises as described in Section 11.13.3. The desktop exercises are also arranged during the weekly handover sessions to test a range of IMT responses, including oil spill response, as per the exercise schedule in *APU Incident Management Team Desktop Exercises Procedure*.

The APU IMT is mobilised to the IMT Room located in the BHP offices 125 St Georges Terrace, Perth, Western Australia and is capable of responding to an incident within 1 hour of activation. Test call-out notifications are conducted each Thursday. In addition, a weekly unscheduled test notification is made to check response times to the call out message. IMT members will be identified to undertake further training to further develop in-house capabilities and knowledge around oil spill response. Alternative providers for the identified courses may also be used if they meet the required outcomes.

In order to implement and maintain core group competencies, BHP will align with current AMOSC practice of a skills maintenance program, which requires that members complete skills maintenance activity before the end of the 36 month timeframe (as outlined in the AMOSC Core Group Program and Policies). As part of the weekly IMT handovers, set desktop exercise's and additional oil spill response training, BHP maintain a continual improvement cycle of core group competences and training in relation to oil spill response readiness.

11.13.6 Contractors Competency

The readiness and competency of the vessels to respond to general emergencies and incidents such as deck spills is maintained and tested by conducting periodic drills. Vessel specific spill drills are also held on a regular basis. After each exercise, the team holds a debrief session during which the exercise is reviewed and lessons learnt and areas for improvement are identified for incorporation into emergency procedures where appropriate.

11.13.7 Field Response Personnel Competency

The personnel required for all phases of the field environmental monitoring response studies outlined in the environmental monitoring procedures must have tertiary qualifications with appropriate levels of experience operating in the field within the oil and gas industry (Table 11-11).

Table 11-11: Competencies and training requirements for all phases of environmental monitoring in the field

Role	Tertiary Qualification	> 5 years Field Experience; Knowledge of Sampling Designs	> 2 years Field Experience	MSIC, TBOSIET	Coxswains, Marine Radio Operators
Principal Environmental Scientist	✓	✓	✓	R	R
Environmental Scientist	R	N/A	✓	R	R

R = Recommended
MSIC (Maritime Security ID)
TBOSIET – Tropical Basic Offshore Safety Induction and Emergency Training

11.13.8 Audits

11.13.8.1 Audits of External Organisations

A formal audit of AMOSC is done by representatives of member companies annually. At the conclusion of an audit, improvement opportunities and corrective actions are formally noted and corrective actions assigned. In some instances changes may be required to the OPEP, but changes will only be made in accordance with the OPGGS (E) Regulations.

11.13.8.2 Audits of Internal Actions

Following an emergency spill incident there may be a requirement for legal and/ or other regulatory or formal HSEC incident investigations to be conducted in accordance with the BHP HSEC Management System. In addition to this, it is essential that the IMT response actions are reviewed as soon as practicable after an incident. The aim of the incident review is to identify any particular lessons that should be shared across the Company, and that can be used to improve the plans or response actions in the future. Post-spill debriefs will address:

- Spill causes, if known;
- Spill response;
    - Speed;
    - Operation;
    - Effectiveness;
    - Equipment suitability;
- Health and safety issues, as appropriate; and
- Integration of plan and procedures with other response organisations, consultants, and or agencies.

11.14 Incident Reporting Requirements

BHP employees and contractors are required to report all environmental incidents and non-conformance with commitments made in the EP. A computerised database called 1SAP is used for the recording and reporting of these incidents. Detailed investigations are completed for all actual and high potential environmental incidents. The classification, reporting, investigation and actioning of environmental incidents are undertaken in accordance with BHP HSEC Management Standards. Incident corrective actions are monitored with 1SAP and closed out in a timely manner. In addition to the internal notification and reporting requirements outlined above, the regulatory reporting requirements for environmental incidents are outlined in Section 10.5 of this EP.

In addition to the reporting and advising of environmental incidents in accordance with the *Navigation Act 2012*, the OPGGS (E) Regulations and BHP HSEC Standards, the following incident reporting requirements apply:

- Commonwealth waters - All oil pollution incidents in Commonwealth waters will be reported by the Vessel Master to AMSA; and
- Any loss or discharge to sea of harmful materials is to be reported using the prescribed POLREP form to the AMSA RCC.

11.15 OPEP Consultation

The BHP APU HSE Manager will arrange for copies of the OPEP requirements to be forwarded to the following key response Agencies:

- AMOSC.

11.16 Pollution Insurance

BHP and all subsidiary companies, including BHP Petroleum Australia maintain liability insurance for sudden and accidental pollution up to a limit of US$800 million per occurrence.

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Appendix A

BHP Charter

BHP

Our Charter

We are BHP, a leading global resources company.

Our Purpose

To bring people and resources together to build a better world.

Our Strategy

Our strategy is to own and operate large, long-life, low-cost, expandable, upstream assets diversified by commodity, geography and market.

Our Values

Sustainability
Putting health and safety first, being environmentally responsible and supporting our communities.

Integrity
Doing what is right and doing what we say we will do.

Respect
Embracing openness, trust, teamwork, diversity and relationships that are mutually beneficial.

Performance
Achieving superior business results by stretching our capabilities.

Simplicity
Focusing our efforts on the things that matter most.

Accountability
Defining and accepting responsibility and delivering on our commitments.

We are successful when:

Our people start each day with a sense of purpose and end the day with a sense of accomplishment.

Our teams are inclusive and diverse.

Our communities, customers and suppliers value their relationships with us.

Our asset portfolio is world-class and sustainably developed.

Our operational discipline and financial strength enables our future growth.

Our shareholders receive a superior return on their investment.

Andrew S Mackenzie

Andrew Mackenzie
Chief Executive Officer

May 2019

Appendix B

Relevant Legislation, Regulations and Other Requirements

Commonwealth Legislation and Regulations

Legislation or Regulation	Description
Australian Maritime Safety Authority Act 1990	The Australian Maritime Safety Authority (AMSA) is a Commonwealth agency responsible for regulation of maritime safety, search and rescue, and ship sourced pollution prevention functions under the Navigation Act 1912 (Cth), protection of the sea legislation, including the Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (Cth) and subordinate legislation made pursuant to these Acts.
Biosecurity Act 2015	This Act is about managing diseases and pests that may cause harm to human, animal or plant health or the environment. The proposed amendments also strengthen Australia’s ability to manage ballast water in ships. They will provide additional protection for coastal environments from the risk of marine pest incursions by fostering new ballast water treatment technologies and phasing out ballast water exchange.
Biosecurity Regulation 2016	The Biosecurity Regulation prescribes a number of measures and obligations that are common between the Biosecurity Act. Pre-arrival reporting, cost recovery and the isolation and export power provisions all support business as usual activities that were available under the Quarantine Act and therefore represent no substantive change.
Customs Act 1901	Act concerns the movement of goods and people across Australian borders and to collect customs and other revenue.
Environment Protection & Biodiversity Conservation Act 1999 (EPBC Act)	Commonwealth Department of Sustainability, Environment, Water, Population & Communities administers Act that provides legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places—defined in the EPBC Act as matters of national environmental significance (NES). These include nationally threatened species and ecological communities, migratory species and Commonwealth marine areas. The Act regulates assessment and approval of proposed actions likely to have a significant impact on a matter of NES. The approval decision is made by a delegate of the Australian Government Environment Minister.
Environment Protection and Biodiversity Conservation Regulations 2000	Regulations provide for a wide range of detail essential for the operation of the Act, including regulations relating to management of Commonwealth reserves, information requirements for assessment processes, enforcement, granting of various permits, publication requirements and criteria that need to be met in relation to a wide variety of decision making processes provided for under the Act.
Environment Protection and Biodiversity Conservation Act 1999 - Proclamation - Ningaloo Marine Park (Commonwealth Waters)	Declaration of Ningaloo Marine Park in Commonwealth Waters.
Environment Protection (Sea Dumping) Act 1981	Act to regulate the dumping at sea of controlled material (including certain wastes and other matter), the incineration at sea of controlled material, loading for the purpose of dumping or incineration, export for the purpose of dumping or incineration, and the placement of artificial reefs. Permits are required for any sea dumping activities. Operational discharges from vessels are not defined as ‘dumping’ under the 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 and therefore not regulated under the Act.
Hazardous Waste (Regulation of Exports and Imports) Act 1989	Relates to controls over import and export of hazardous waste material. Permits are required to import waste into Australia.
Historic Shipwrecks Act 1976	Act protects shipwrecks that are at least 75 years old, whether their location is known or unknown, and associated relics. It also enables the Minister to protect shipwrecks that have been sunk for less than 75 years if they are of historic significance, such as ships wrecked during World War II. All relics associated with historic shipwrecks are protected both while associated with the shipwreck and after their removal, provided that they went down with the ship. The Act also enables the Minister to declare protected zones around historic shipwrecks. A permit is required to carry out prescribed activities, such as trawling, diving or mooring or using ships in a protected zone. The Act

Legislation or Regulation	Description
	prohibits conduct that may interfere with protected shipwrecks and their associated relics.
Historic Shipwrecks Regulations 1978	Regulations prescribe activities prohibited in protected zones and fees association with operation of the Act.
Industrial Chemicals (Notification and Assessment Act) 1989	Act establishes the National Industrial Chemicals Notification and Assessment Scheme (NICNAS) to regulate the supply of chemicals into Australia, and importers or manufacturers of chemicals or chemical products must comply. The Act involves assessing and registering industrial chemicals in a national scheme and applies to solvents, adhesives, plastics, laboratory chemicals and paints, as well as chemicals used in cleaning products. Chemicals are defined by exclusion: a substance is an industrial chemical if it is not an agricultural or veterinary product, medicine or medicinal product, food additive, contaminant or natural toxicant.
Maritime Transport and Offshore Facilities Security Act 2003	Department of Infrastructure & Transport (Maritime Security for Offshore Oil & Gas) regulate offshore security plans and Maritime Security Identification Cards (MSIC's).
Maritime Transport and Offshore Facilities Security Regulations 2003	Department of Infrastructure & Transport (Maritime Security for Offshore Oil & Gas) regulate offshore security plans and MSICs.
National Environment Protection Council Act 1994	Act provides for the establishment of a National Environment Protection Council (NEPC), and empowers the setting of National Environmental Protection Measures (NEPM). Under the NEPC Act, the Commonwealth has agreed to apply any adopted NEPM to its activities as part of the fulfilment of its obligations under the Intergovernmental Agreement on the Environment 1992 and enables application of State law to ensure uniformity in national pollution standards and environmental protection. NEPMs can only be made to address the following 7 environmental issues: 1.ambient air quality; 2.ambient marine, estuarine and fresh water quality; 3.noise standards; 4.site contamination assessment guidelines; 5.hazardous waste impacts; 6. re-use and recycling of used material; and 7.motor vehicle noise and emissions.
National Environment Protection (National Pollutant Inventory) Measure 1998	The National Pollutant Inventory (NPI) is a database established to provide information on substances being emitted to the air, land and water, and transported in waste. The inventory tracks the magnitude of emissions and the amounts transported in waste of 93 substances. While the NPI NEPM is a federal initiative, each state has legislation giving effect to the program.
National Greenhouse and Energy Reporting Act 2007	Act provides for the reporting and dissemination of information related to greenhouse gas emissions, greenhouse gas projects, energy production and energy consumption, and for other purposes.
Navigation Act 2012	Act establishes framework for controls on navigation, marine safety and shipping for ships in Australian waters or territories primarily proceeding on international or inter-state voyages.
Navigation (Orders) Regulations 1980	Details the penalty where Marine Orders are prescribed as "Penal Provisions".
Marine Orders	Marine Orders (MO) are subordinate rules made pursuant to the Navigation Act 1912 and Protection of the Sea (Prevention of Pollution from Ships) Act 1983 affecting the maritime industry. They are a means of implementing Australia's international maritime obligations by giving effect to international conventions in Australian law.
Marine Order 32 - Cargo Handling Equipment	MO32 relates to loading and unloading of cargo, and the safe transfer of persons, from ships, off-shore industry vessels and off-shore industry mobile units
Marine Order 41 Carriage of Dangerous Goods	MO41 gives effect to Part A Chapter VII of SOLAS, in particular the International Maritime Dangerous Goods Code (IMGDC) which deals with the carriage of dangerous goods in packaged form, together with prescribing other matters related to carriage of dangerous goods in ships, notice of intention to ship dangerous goods, and provisions related to the loading, stowing, carriage or unloading in ships of cargo.
Marine Order 58 – International Safety Management Code	MO58 specifies the requirements of the International Safety Management (ISM) Code and gives effect to Chapter IX of SOLAS. The purpose of the ISM Code is to provide an international standard for the safe management and operation of ships and for pollution prevention.
Marine Order 59 –Offshore Industry Supply Vessels	MO59 specifies a number of performance-based requirements for safe navigation and a safe system of operations for off-shore industry vessel operations, including arrangements for safe operations during emergencies. The Order specifies guidelines considered to satisfy these performance-based requirements. The Order also allows alternative practices to be considered

Legislation or Regulation	Description
	and approved as equivalent to those practices in the specified guidelines (NWEA Guidelines). MO59 applies to vessels not registered in Australia, if vessel is engaged in operations associated with or incidental to petroleum exploration or production activity.
Marine Order 91 - Marine Pollution Prevention - Oil	MO91 gives effect to Annex I of the International Convention for the Prevention of Pollution from Ships 1973, as amended by the Protocol of 1978 (MARPOL 73/78).
Marine Order 93 - Marine Pollution Prevention - Noxious Liquid Substances	MO93 gives effect to Annex II of the International Convention for the Prevention of Pollution from Ships 1973, as amended by the Protocol of 1978 (MARPOL 73/78). Details the discharge criteria and measures for the control of pollution by noxious liquid substances carried in bulk. It subdivides substances into and contains detailed operational standards and procedures. Some 250 substances are appended to the London Convention. The discharge of their residues is allowed only to reception facilities until certain concentrations and conditions (which vary with the category of substances) are compiled with. In any case, no discharge of residues containing noxious substances is permitted within 12 miles of the nearest land.
Marine Order 94 - Marine Pollution Prevention – Package Harmful Substances	MO94 gives effect to Annex III of the International Convention for the Prevention of Pollution from Ships 1973, as amended by the Protocol of 1978 (MARPOL 73/78) in relation to packaged harmful substances.
Marine Order 95 - Marine Pollution Prevention - Garbage	MO95 gives effect to Regulation 8 of Annex V (dealing with port State control on operational requirements) and prescribes matters in relation to Regulation 9 of Annex V (dealing with placards, garbage management plans and garbage record-keeping) to the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78).
Marine Order 96 Marine Pollution Prevention - Sewage	MO96 sets out MARPOL requirements in relation to survey and certification requirements; how sewage should be treated or held aboard ship; and the circumstances in which discharge into the sea may be allowed.
Marine Order 97 - Marine Pollution Prevention - Air Pollution	MO96 sets out MARPOL requirements in relation to air pollution.
Marine Order 98 Marine Pollution - Anti-fouling Systems	MO98 gives affect Articles 3, 4 and 10 of the Anti-Fouling System Convention and Annex 4 to that Convention which provides for controls on anti-fouling systems, and the survey, inspection and certification of ships in relation to those systems. MO98 also prescribes various matters, such as survey and certification requirements and forms to be used to report incidents, for the purposes of the Protection of the Sea (Harmful Anti-fouling Systems) Act 2006.
Notices to Mariners	Issues Nautical Charts. Manages marking of Safety Zones after NOPSEMA gazetting under OPGGSA Section 612 and Marine Cautionary Zones.
Offshore Petroleum and Greenhouse Gas Storage Act 2006	Legislation concerning Australian offshore petroleum exploration & production in Commonwealth Waters. National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) is an independent safety and environmental management Authority funded by levies on industry participants and regulates matters with powers conferred directly from OPGGSA and via Regulations concerned with: Occupational Health & Safety law at Facilities and offshore operations under Schedule 3 Environmental management Structural integrity of Wells under Resource management regulations. NOPSEMA may also declare a 500 metre petroleum safety zone around wells associated with drilling operations.
Offshore Petroleum and Greenhouse Gas Storage (E) Regulations 2009	Regulations administered by NOPSEMA to ensure offshore petroleum activity is carried out in a manner consistent with the principles of ESD and in accordance with an accepted environment plan, in particular: Assessment of environment plans (EP), including associated oil pollution emergency plans (OPEPs) [previously oil spill contingency plans (OSCPs)]; and Investigation of accidents, occurrences and circumstances with regard to deficiencies in environmental management.

Legislation or Regulation	Description
Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009	Regulations administered by NOPSEMA particularly requiring that an accepted Safety Case is in force for a facility. A facility can include a Mobile Offshore Drilling Unit, and aspects of the Safety Case may interrelate with environmental considerations, such as the Facility Description and matters related to technical integrity of the facility.
Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011	NOPSEMA acceptance of well operations management plan (WOMP) & administration of regulations associated with well integrity.
Offshore Petroleum and Greenhouse Gas Storage (Regulatory Levies) Act 2003	Act to impose levies relating to the regulation of offshore petroleum activities, including well levies and environment plan levy.
Offshore Petroleum and Greenhouse Gas Storage (Regulatory Levies) Regulations 2004	Regulations prescribing the amount and method of calculation for imposition of levies relating to the regulation of offshore petroleum activities, including well levies and environment plan levy.
Ozone Protection and Synthetic Greenhouse Gas Management Act 1989	Act gives effect to Australia's obligations under the Vienna Convention and the Montreal Protocol by introducing, a system of controls on the manufacture, import and export of substances that deplete ozone in the atmosphere and synthetic greenhouse gases.
Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995	Regulation contain controls relating to: import/export/manufacture licensing; manufacture and disposal of scheduled substances; refrigeration and air-conditioning; methyl bromide; and fire protection; import and export of any products and equipment containing hydrofluorocarbons, perfluorocarbons and SF6; and a requirement for importers and manufacturers to pay a levy incorporating a carbon charge component based on the equivalent carbon price.
Protection of the Sea (Harmful Anti-fouling Systems) Act 2006	Gives effect to the Control of Harmful Anti-Fouling Systems on Ships (HAF) Convention which makes it an offence for any ship bearing harmful chemical compounds on their hulls or external parts or surfaces to enter an Australian port, shipyard or offshore terminal, unless the ship bears a coating to prevent such compounds leaching into the water. A similar offence applies to Australian ships entering a port, shipyard or offshore terminal elsewhere in the world.
Protection of the Sea (Powers of Intervention) Act 1981	Act authorises AMSA to take measures for the purpose of protecting the sea from pollution by oil and other noxious substances discharged from ships and implements the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties and the Protocol relating to Intervention on the High Seas in Cases of Pollution by Substances other than Oil. Act enables AMSA to take measures on the high seas to prevent, mitigate or eliminate the danger apparent upon a maritime casualty where there is grave and imminent danger to the coastline of Australia, or to the related interests of Australia from pollution or threat of pollution of the sea by oil which may reasonably be expected to result in major harmful consequences. Similar powers apply in relation to a ship which is in internal waters, is in the Australian coastal sea, or any Australian ship on the high seas where oil or a noxious substance is escaping, and gives AMSA power to take such measures as it considers necessary to achieve a number of objectives detailed in the Act.
Protection of the Sea (Prevention of Pollution from Ships) Act 1983	Act administered by the Australian Maritime Safety Authority (AMSA), deals with the protection of the marine environment from ship-sourced pollution. The Act implements the International Convention for the Prevention of Pollution from Ships 1973 and the subsequent 1978 Protocol to the Convention (collectively MARPOL 73/78) and setting operational and construction standards for ships to prevent pollution and regulating normal operational discharges from ships. MARPOL 73/78 annexes regulate the discharge of oil (Annex I), noxious liquid substances (Annex II), the disposal from ships of sewage (Annex IV) and garbage (Annex V) and prohibit the disposal of harmful substances carried by sea in packaged forms (Annex III).
Protection of the Sea (Prevention of Pollution from Ships) (Orders) Regulations 1994	Sets penalty levels for non-compliance.
Protection of the Sea (Shipping Levy Collection) Act 1981	Levy is a charge against ships and is based on the "potential polluter pays" principle. The levy applies to vessels which are more than 24 m in length and have onboard more than 10 tonnes of oil in bulk as fuel or cargo.

Victorian Legislation and Regulations

Legislation or Regulation	Description
Offshore Petroleum and Greenhouse Gas Storage Act 2010	Legislation concerning offshore petroleum exploration & production in Victorian State Waters. The purpose of this Act is to re-enact (with modifications) provisions regulating petroleum exploration and recovery activities and petroleum facilities; and provide for the regulation of geological storage of carbon dioxide in the Victorian offshore area.
Offshore Petroleum and Greenhouse Gas Storage Regulations 2011	The objective of these Regulations is to provide for the elimination and minimisation, so far as is practicable, of the environmental, health and safety hazards and risks involved in undertaking petroleum and greenhouse gas activities and, in particular, to make provision in relation to (a)the manner in which certain petroleum activities, greenhouse gas activities or greenhouse gas injection and storage activities are carried out in the offshore area; and (b) the manner in which certain facilities are designed, constructed, installed, operated, modified and decommissioned in the offshore area; and (c) to ensure that operations in the offshore area are carried out in accordance with good oilfield practice and are compatible with optimum long-term recovery of petroleum; and (d) to prescribe requirements for various administrative activities, fees and other matters.
Victorian Petroleum (Submerged Lands) Act, 1982 and Regulations 2004	The purpose of the Regulations is to introduce an objective based system for regulation of offshore petroleum well activities.
Victorian Environment Protection Act, 1970 and associated regulations	Key aims of the Act include sustainable use and holistic management of the environment, ensuring consultative processes are adopted so that community input is a key driver of environment protection goals and programs and encouraging a co-operative approach to environment protection.
Victorian Pollution of Waters by Oil and Noxious Substances Act 1986.	The purpose of the Pollution of Waters by Oils and Noxious Substances Act 1986 (POWBONS) is to protect the sea and other waters from pollution by oil and noxious substances. This Act also implements the MARPOL Convention (the International Convention for the Prevention of Pollution from Ships 1973).

Standards, Codes and Guidelines

Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000
Australian Ballast Water Management Requirements 2011
Australian National Guidelines for Whale and Dolphin Watching 2005
EPBC Act Policy Statement 2.1 - Interactions between Offshore Seismic Activities and Whales (May 2007)
Guidelines on Minimising Acoustic Disturbance to Marine Fauna 1997 – WA Department of Mines and Petroleum.
National Biofouling Management Guidance for the Petroleum Production and Exploration Industry
National Marine Safety Committee principal technical standard, the National Standard for commercial vessels. National Standard for Commercial Vessels (NSCV)
Australia’s Oceans Policy
National Maritime Emergency Response Arrangement (NMERA)

Appendix C

Stakeholder Consultation and Response (withheld due to Sensitive Information)

Appendix D

Description of the Environment

Regional Setting

The Minerva operation is located in the South East Marine Bioregion as defined in the South East Commonwealth Marine Reserves Network Management Plan 2013–23 (Director of National Parks, 2013).

The Southeast Marine Bioregion incorporates Commonwealth waters extending from near the far south coast of New South Wales, around Tasmania and as far west as Kangaroo Island in South Australia. It includes the Commonwealth waters of Bass Strait and those surrounding Macquarie Island in the Southern Ocean. The Commonwealth marine area starts at the outer edge of state waters, 3 nm from the shore (territorial sea baseline) and extends to the outer boundary of Australia's exclusive economic zone, 200 nautical miles from the territorial sea baseline (EPBC Act s. 24). State and territory jurisdictions extend from the shoreline to 3 nm offshore.

The Southeast Marine Bioregion contains 11 provincial bioregions (Figure 1), and includes a broad range of temperate and sub-Antarctic environments. Provincial bioregions can be either provinces or transitions. Provinces are areas of ocean with similar fauna, flora and ocean conditions. Transition bioregions are regions of overlap between provinces. Warm temperate waters occur at latitude 35°S in the Encounter Bay area in South Australia and to 37°S east of Mallacoota in Victoria. The transition to cool temperate waters occurs at 38–45°S in Bass Strait and around Tasmania. Sub-Antarctic Southern Ocean waters surrounding Macquarie Island occur at 58°S. Depths in the bioregion range from 40 m on the continental shelf to greater than 4000 m on the abyssal plain.

The seafloor features of the bioregion are diverse and include seamounts, canyons, escarpments, soft sediments and rocky reefs, which support high levels of biodiversity and species endemism.

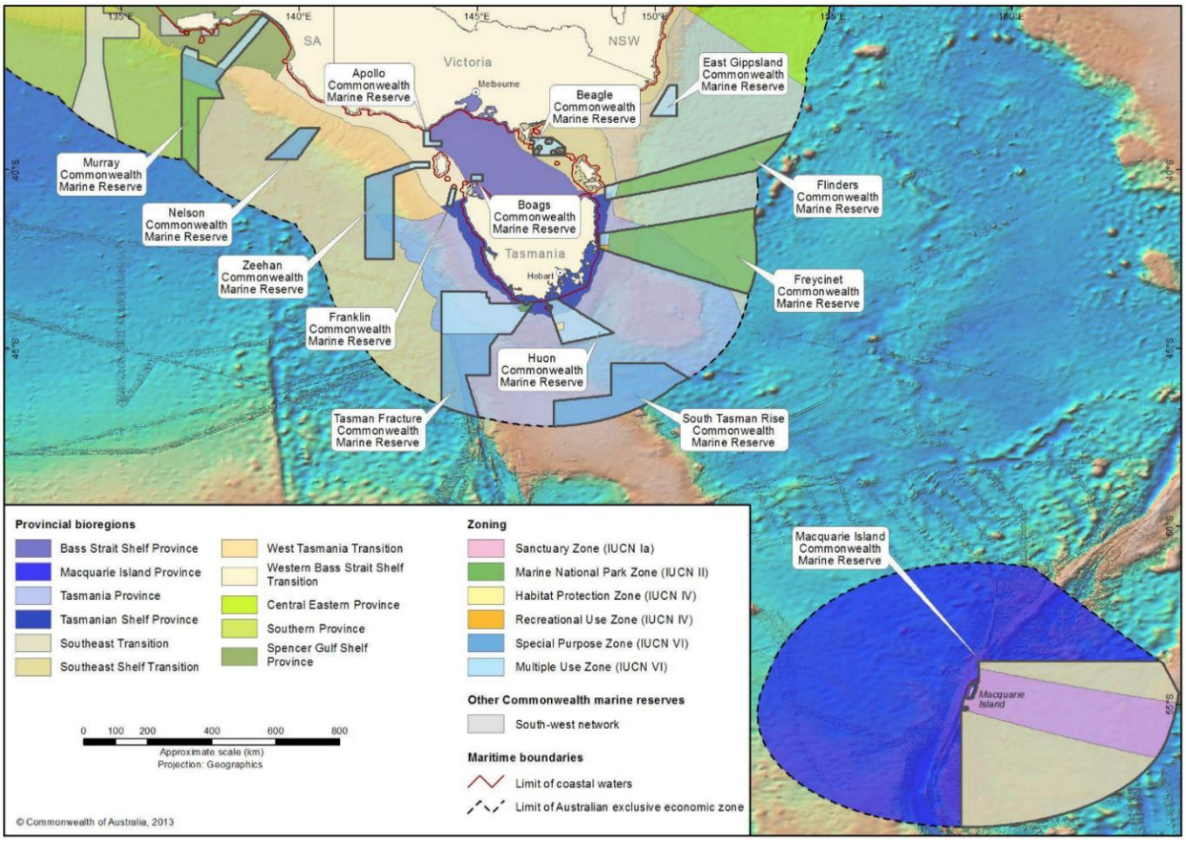


Figure 1: Provincial bioregions represented in the South East Commonwealth Marine Reserves Network (Director of National Parks, 2013)

The South East Marine Bioregion is recognised as a major marine biogeographic region. When compared to most other marine environments worldwide, the marine environments of temperate

Australia display an enormous diversity of plant and animal species and are believed to have the most diverse marine floral assemblage in the world (Director of National Parks, 2013).

In addition to high diversity, the bioregion has large numbers of endemic species. For example, the fish fauna of southern temperate Australia includes around 600 species, of which 85% are thought to be endemic and 11% are common only to waters of neighbouring New Zealand. Up to 95% of molluscs, approximately 90% of echinoderms and up to 62% of macroalgae (seaweed) species are only found in South East Marine Bioregion. It is thought that the high diversity and endemism in the bioregion is a result of the complex interaction of evolutionary, geological and biological processes, as well as the interactions among organisms. The geological and climatic history of the South East Marine Bioregion have promoted the development of a variety of flora and fauna species that have evolved, adapted and spread in isolation. The relative stability of the climate, due to the steady northward movement of the Australian tectonic plate, has created favourable conditions for marine life over long geological timescales. The repeated submergence and emergence of Bass Strait has strongly moulded the present-day composition and distribution of species. Over time, the warm and cool currents of the bioregion have prevented the migration of species and created an environment where new species have been able to evolve.

Physical Environment

Climate

The climate in the south west region of Victoria is described as mild to warm. Summers are slightly cooler than in Melbourne, while winters are slightly warmer. On average, rainfall is greater than in most of Victoria. The climate averages for the region are outlined in Table 1. The closest Bureau of Meteorology (BoM) synoptic station is at Warrnambool, approximately 20 km to the west of the operational area.

Table 1: Warrnambool climate statistics for from 1998 to 2017 (BoM, 2017)

Month	Mean Maximum Monthly Temperature (°C)	Mean Minimum Monthly Temperature (°C)	Mean Rainfall (mm)
January	24.5	11.8	36.1
February	24.8	12.4	31.5
March	23.2	10.9	49.7
April	20.0	8.9	54.4
May	16.5	7.4	71.0
June	14.1	5.9	79.1
July	13.5	5.6	85.6
August	14.4	5.9	93.8
September	16.1	6.8	71.8
October	18.0	7.3	62.6
November	20.4	9.0	51.1
December	22.7	10.1	47.1

Surface Winds

Historic wind data for the region was derived from measurements collected at the Otway Light Station by the BoM Australia, at hourly intervals between 1999 and 2001.

Winds during the May to October period are typically strong with a predominately offshore wind direction. The maximum speed measured for the May to October period between 1999 and 2001 was 39 knots (approximately 72 km/h or 20 m/s), with a mean speed of 12.4 knots (approximately 23 km/h or 6.4 m/s). The November to April period was typically onshore. The maximum speed measured for the November to April period was 36 knots (approximately 66.7 km/h or 18.5 m/s), with a mean speed of 11.5 knots (approximately 21.3 km/h or 5.9 m/s).

Oceanography

Currents and Tides

Currents and oceanic properties, such as temperature and nutrients, play a vital role in the ecosystems of the region. Ocean currents link marine systems, while fronts and upwelling events drive the productivity of open ocean environments. Compared to other marine areas, the South East Marine Bioregion is relatively low in nutrients and primary productivity; however, in some locations, water bodies converge and mix to create areas of relatively high biological productivity.

The west coast of Victoria is predominantly influenced by the Leeuwin and Zeehan currents. The Leeuwin Current transports warm, subtropical water southward along the Western Australian coast and then eastward into the Great Australian Bight where it mixes with the cool waters from the Zeehan Current running along the west coast of Tasmania. These currents are stronger in winter than in summer.

Seasonal and transient upwelling events are important ecological features of the bioregion. The Bonney Upwelling in south east South Australia is active during autumn and summer. At the shelf break east of Bass Strait, nutrient-rich waters rise to the surface in winter as part of the processes of the Bass Strait Water Cascade, where the eastward flushing of the shallow waters of the strait over the continental shelf mix with cooler, deeper nutrient-rich water.

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

At local scales around Port Campbell, wind driven currents are also an important characteristic. In adverse weather conditions, storm-generated currents can exceed 0.5 m/s near the bottom of the nearshore region. These currents are directed along the bathymetry, which runs parallel to the coast and in the majority of cases from west to east. In the Port Campbell area the wave crests move parallel to the coast, resulting in strong long-shore currents. In waters less than 10 m deep, the water movements are dominated by orbital motion waves and wave generated currents. Tidal currents are in the order of 0.1 m/s, running in an east to southeast direction for the majority of the time. For less than 26% of the time, the current swings round to the west and north-west.

Waves

The area is dominated by high-energy conditions. The most common wave heights in the Port Campbell region are between 2.0 and 3.5 m for 50% of the time, though in winter they are known to exceed 7.6 m. Conditions are more severe in winter, but all seasons show a relatively high level of wave activity. The location of wave break depends on depth, with larger waves breaking at greater depths. It is estimated that 50% of the time, waves will begin to break at around the 7 m depth contour and 81% of the time waves will be breaking at water depths of 5 m.

Sea Temperature

A seasonal thermocline is formed at a depth of approximately 30 m in early December, which then moves to approximately 100 m in May, thereafter it rapidly disintegrates. The typical surface temperatures vary from 13 to 18 °C, and bottom temperatures in the region of 11 to 15 °C (WNI Science and Engineering, 1995).

Bathymetry and Geomorphology

Fugro (1994) surveys noted the following subsea conditions in the Port Campbell area:

- Relatively smooth seabed, consisting of sand and some rocky outcrops from approximately 12 km offshore to the cliff base, just west of the port Campbell township; and
- Several large cliff and reef structures towards the entrance to Port Campbell inlet.

Offshore in the vicinity of the Rutledge Creek and Sherbrook River mouths east of Port Campbell, a number of rocky reefs and underwater cliffs were also noted (Fugro, 1994).

Biological Environment

Shoreline and Intertidal Environments

The Operations Area or hydrocarbon spill AMBA is not predicted to contact any shoreline or intertidal environments.

Shallow Water Benthic Environments

The Operations Area (500 m around the Minerva wells and 100 m around the pipeline) is restricted to depths of approximately 50 to 65.

The spill AMBA (8.2 km around Minerva-3 and Minerva-4) extends to depths up to approximately 25 m at approximately 1 km from the coastline. In the deeper parts of the Twelve Apostles Marine National Park (refer to EP Section 4.2.5) that intersect the shallower parts of the spill AMBA, the area is likely to be composed of mainly subtidal soft sediments or sand supporting communities of bivalves, polychaetes and amphipods. The AMBA may also intersect some of the Arches Marine Sanctuary (refer to EP Section 4.2.5), which contains complex geological formations. This hard substrate provides footing for giant kelp, and associated fauna communities such as seastars, sponges, gorgonians, hydroids and bryozoans (Parks Victoria, 2006).

Pelagic Environments

Plankton

There have been relatively few studies of phytoplankton populations in the Otway and Bass Strait regions, with most concentrating on zooplankton. A high diversity of zooplankton is reported in eastern Bass Strait, with over 170 species recorded. However, only 80 species have been reported in western and central Bass Strait.

Plankton distribution is dependent upon prevailing ocean currents including the East Australia Current, flows into and from Bass Strait, and Southern Ocean water masses. Populations near the operational area are expected to be highly variable both spatially and temporally, and are likely to comprise a mix of characteristics of tropical, southern Australian, central Bass Strait and Tasman Sea populations.

Fish

In the neighbouring marine parks, a variety of species are known to occur. Conspicuous species include rock lobsters, jellyfish, magpie morwongs, sweeps, blue-throated wrasse, stingrays and bottom dwelling sharks (pers. comm. M.O'Toole, 2006).

Deep Water Benthic Environments

The subtidal zone of the area extends to water depths of approximately 60 m at a distance of approximately 10 km offshore.

Currie (1995) identified a total of 196 invertebrate species from 5,053 individuals in the deep waters around (at the well head to 200 m out) the Minerva field, of which 63% where crustaceans, 15% polychaetes, 5% echinoderms and 9% were members of other phyla. Currie (1995) found that the benthic infauna was composed of a small number of abundant species and a large number of less common species. The most abundant species was the bivalve mollusc *Katelysia sp*.

Large tracts of open sand, with little or no epifauna, characterise the deep environment surrounding the area. Infaunal communities of bivalves, polychaetes and crustaceans dominate the biological component in this open sand habitat. However, areas of reef dominated by sponges have also been observed in the deep environment. Other epifauna occurring in this habitat includes hydrozoans, bryozoans, algae, echinoderms and molluscs. Fishes such as wrasse, gurnard and perch inhabit these reefs. Abalone and lobster are also likely to occur.

Matters Protected Under the EPBC Act

Overview

A search of the *EPBC Act* Protected Matters database was undertaken to identify matters of national environmental significance and other matters protected by the *EPBC Act 1999* that are likely to occur within the area that may be affected (the AMBA) by the Activity. Refer to Appendix E of the EP for the results of the individual *EPBC Act* Protected Matters Reports.

National heritage places

There are no National Heritage Places within the Operations Area.

The spill AMBA intersects part of the Great Ocean Road and Scenic Environs as a historical listing, ID 105875. This listing extends along the coastline from Apollo Bay to Warrnambool, up to approximately 2 km seaward and has been listed due to its natural and historic significance. Potential risks and impacts to this National Heritage Place from the unplanned Activity are assessed in Section 8.

Australian Marine Parks

South East Marine Parks Network

The South East Marine Parks Network protects places that support a diverse range of marine species. Migratory whales make their way through these waters on their journey to and from Antarctica along Australia's east coast twice a year. Other iconic species such as great white sharks, southern bluefin tuna and blue whales are known in the area. The deep habitats support a diverse range of fishes and other creatures, such as crustaceans, coral, echinoderms and sponges that have specialised adaptations to survive in deep, low light environments.

The South East Marine Park comprises 14 Australian Marine Parks of which 13 were proclaimed under s. 344 of the EPBC Act, and one, Macquarie Island Commonwealth Marine Park, which was proclaimed under the *National Parks and Wildlife Conservation* Act 1975. Together these reserves represent examples of the ecosystems of the South East Marine Region. The 14 Marine Park are:

- Apollo Commonwealth Marine Park (proclaimed on 28 June 2007);
- Beagle Commonwealth Marine Park (proclaimed on 28 June 2007);
- Boags Commonwealth Marine Park (proclaimed on 28 June 2007);
- East Gippsland Commonwealth Marine Park (proclaimed on 28 June 2007);
- Flinders Commonwealth Marine Park (proclaimed on 28 June 2007);
- Franklin Commonwealth Marine Park (proclaimed on 28 June 2007);
- Freycinet Commonwealth Marine Park (proclaimed on 28 June 2007);
- Huon Commonwealth Marine Park (proclaimed on 28 June 2007);
- Macquarie Island Commonwealth Marine Park (proclaimed on 27 October 1999);
- Murray Commonwealth Marine Park (proclaimed on 28 June 2007);
- Nelson Commonwealth Marine Park (proclaimed on 28 June 2007)
- South Tasman Rise Commonwealth Marine Park (proclaimed on 28 June 2007);
- Tasman Fracture Commonwealth Marine Park (proclaimed on 28 June 2007); and
- Zeehan Commonwealth Marine Park (proclaimed on 28 June 2007).

The nearest Australian Marine Park to the Minerva operation is the Apollo Marine Park, which is located approximately 50 km south east of the Minerva wells, situated to the south of Cape Otway and Apollo Bay in western Victoria, and north-west of King Island. The cool waters of the reserve are less than 50 m deep near Cape Otway. The reserve includes the Otway Depression, a 100 m deep undersea valley joining the Bass Basin to the open ocean. This valley was an outlet channel for the ancient Bass Lake and mainland river systems, which existed during the last ice age. The waters of the reserve are exposed to large swell waves generated from the southwest and strong tidal flows. The seafloor has many rocky reef patches interspersed with areas of sediment and, in places, has rich, benthic fauna dominated by sponges. Seabirds, dolphins, seals and white sharks forage in the reserve, and blue whales migrate through Bass Strait. The MV City of Rayville, a United States of America freighter, which lies in the reserve south of Cape Otway, was sunk in 1940 by a mine.

Marine Parks and Marine Management Areas

Twelve Apostles Marine Park

The Twelve Apostles Marine National Park/Port Campbell National Park (7,500 ha) is located south-east of Port Campbell between Broken Head and Pebble Point, and extends offshore 3 nm to the limit of Victorian waters. It is 7km from the Operational Area and intersect the wider AMBA. The Park is the second-largest Marine National Park in Victoria. Important values for Twelve Apostles Marine National Park include:

- Unique limestone rock formations, including the Twelve Apostles;
- A range of marine habitats representative of the Otway marine bioregion;
- Indigenous culture based on spiritual connection to sea Country and a history of marine resource use;
- The wreck of the Loch Ard;
- Opportunities to view marine life; and
- Spectacular scenery within the park.

The Arches Marine Sanctuary (45 ha) is approximately 600 m offshore from Port Campbell. Important values for the Arches Marine Sanctuary include:

- Underwater limestone formations of arches and canyons that support giant kelp (a threatened ecological community (refer to EP Section 4.2.7);
- A diverse range of encrusting invertebrates; and
- Indigenous culture based on spiritual connection to sea Country.

The Port Campbell National Park includes 1,830 ha of coastline from Curdies Inlet to Princetown and is known for its wave-sculpted rock formations and vistas of the Twelve Apostles.

Key Ecological Features

There are no KEFs within the vicinity of the Operations Area or wider AMBA. The nearest KEF is over 70 km from the Activity area. No KEFs would therefore be impacted by planned or unplanned events from the cessation activities.

Species of Conservation Significance

Marine Mammals - Threatened

Threatened marine mammals species with the potential to occur within the Operations Area and wider AMBA are listed in Table 1. Descriptions of these threatened species are provided in the following sub-sections.

Table 1: Listed threatened marine mammal species that may occur within the AMBAs

Common Name	Species	EPBC Act Status
Blue whale	*Balaenoptera musculus*	Endangered & Migratory
Southern right whale	*Eubalaena australis*	Endangered & Migratory
Humpback whale	*Megaptera novaeangliae*	Vulnerable & Migratory
Fin whale	*Balaenoptera physalus*	Vulnerable & Migratory
Sei whale	*Balaenoptera borealis*	Vulnerable & Migratory

Blue Whale (*Balaenoptera musculus*)

Blue whale sightings in Australian waters have been widespread, and it is likely that the whales occur right around the continent at various times of the year. However, much of the Australian continental shelf and coastal waters have no particular significance to the whales and are used only for migration and opportunistic feeding. The only known areas of significance to Blue whales are feeding areas around the southern continental shelf, notably the Perth Canyon in Western Australia, and the adjacent upwelling areas of South Australia and Victoria (DEH, 2005).

The Bonney Upwelling extends west from Cape Nelson (38°26' S, 141°33' E; ~130 km west of the Minerva-3 well) to Kangaroo Island (~138°E). It is part of a regional upwelling system with an alongshore extent of ~800 km, from butlerales aggregate to feed in the upwelling surface plume during November to May. A study by Gill *et al.* (2011) of Blue whale distribution patterns in Australia examined a range of oceanographic predictor variables (e.g. depth, SST, chl-a, distance to shore etc) to define three physio-graphically discrete regions in south eastern Australia between Adelaide and the entrance to Bass Strait. These are the western zone, central zone, and the eastern zone, with the Bonney Upwelling surface plume differentiating the central zone from the other zones (Gill *et al.*, 2011).

The Minerva field lies within the eastern zone defined by Gill *et al.* (2011). Of the three zones, the central was the most consistently utilised by Blue whales (Gill *et al*, 2011). In the eastern zone, encounter rates with Blue whales increase from December to a peak in February, indicating movement into this zone as upwelling intensifies. The six years of Blue whale monitoring data presented by Gill *et al.* (2011) show that there has not been a single observation in the 10 km by 10 km monitoring grid that covers the Minerva well operational area. Indeed, the nearest observation is a single occurrence in a 10 km x 10 km monitoring grid located in deeper water to the south of the Minerva field.

The Bonney upwelling is approximately 20,000 km² in area. When the occasional feeding ground to the west and south of Kangaroo Island is included, the total area is 26,000 km². These estimates are based on confirmed sighting records collected by a Blue whale study (Australocetus Research and Deakin University) since 1998.

According to the PMST report, the blue whale and foraging, feeding or related behaviour likely to occur within area within the area and considering the close vicinity to the known foraging area, the likelihood of this species in the AMBAs is considered high.

Southern Right Whale (*Eubalaena australis*)

The Southern right whale is listed as endangered and migratory under the EPBC Act, and the AMBA intersects a known Biologically Important Area (BIA) as part of the Bonney Upwelling's for these whales.

The Southern right whale is listed as endangered and migratory under the EPBC Act. Southern right whales are seasonally present on the Australian coast between about May and November. The southern right whale can often be seen from the cliffs along the Great Ocean Road, but particularly off the heads and Logan's Beach in Warrnambool. There is a seasonal closure to vessels in the immediate vicinity of the right whale calving area at Warrnambool, Victoria, however, this is not within a Marine Park Authority context. Regulatory provisions under the *Wildlife* Act 1975 are in place to protect southern right whales in the calving grounds at Logans Beach, Warrnambool by prohibiting boating in the area during southern right whale occupancy and to manage the impacts of whale watching in all Victorian coastal waters. The Minerva offshore location is located approximately 20 km from Logans Beach.

According to the PMST report, the southern right whale and their habitat are likely to occur within the area and considering the close vicinity to the known calving ground, the likelihood of this species in the AMBAs is considered high.

Humpback Whale (*Megaptera novaengliae*)

The humpback whale is listed as vulnerable and migratory under the EPBC Act, and the AMBA intersects a known Biologically Important Area (BIA) as part of the migratory corridor for these whales.

Humpback whales migrate annually between their summer feeding grounds in Antarctica to their tropical breeding grounds in winter. In Australia, there are two migratory populations of humpback whales, a west coast population and an east coast population. It has been reported that humpback whales may undertake feeding in Victorian waters as part of their migration in all months except February (Warneke, 1995).

According to the PMST report, the humpback whale and their habitat is likely to occur within the AMBA and considering the likely utilisation of the waters as migratory.

Sei Whale (*Balaenoptera borealis*)

Sei whales is listed as vulnerable and migratory under the EPBC Act. They are not commonly recorded in Australian waters and their similarity to Bryde's whales has resulted in confusion about their distributional limits and the accuracy of recorded observations (DoEE, 2018). There are no known mating or calving areas in Australian waters. The species migrates between Australian waters and Antarctic feeding areas but their movements are unpredictable and not well documented. They have been sighted inshore (in the proximity of the Bonney upwelling in Victoria) as well as in deeper offshore waters and have only been sighted in summer and autumn (DoEE, 2018).

The PMST report lists Sei whales and their foraging, feeding or related behaviour likely to occur within area habitat; however due to infrequent sightings in Australia, it is deemed less likely to be present.

Fin Whale (Balaenoptera physalus)

The fin whale is listed as vulnerable and migratory under the EPBC Act. The fin whale is the second-largest whale species after the blue whale. Fin whale distribution in Australian waters is known primarily from stranding events and whaling records. Due to scarcity of sighting records, the distribution cannot be accurately determined although it is thought to be present along the western coast of Australia, southern Australia around to Tasmania. The Australian Antarctic waters are important feeding grounds but there are no known mating or calving areas in Australian waters (Morrice *et al*., 2004). The migration routes and location of winter breeding grounds are uncertain but presence in Australian waters also been detected in summer and autumn months (DoEE, 2017c).

According to the PMST report, the fin whale and foraging, feeding or related behaviour likely to occur within the AMBA; however due to infrequent sightings in Australia the likelihood of these whales being present is low.

Marine Mammals - Migratory

An additional three listed Migratory species under the *EPBC Act*: Pygmy Right whale, Killer whale, and Dusky dolphin (Table 2). Descriptions of these migratory species are provided below.

Table 2: Listed migratory marine mammal species that may occur within the AMBAs

Common Name	Species
Pygmy Right Whale	*Caperea marginata*
Dusky Dolphin	*Lagenorhynchus obscurus*
Orca, killer whale	*Orcinus orca*

Pygmy Right Whale (*Caperea marginata)*

Records of Pygmy Right Whales in Australian waters are distributed between 32° S and 47° S, but are not uniformly spread around the coast (Kemper, 2002). Few or no records are available for NSW, eastern Victoria, and the northern part of the Great Australian Bight, while Western Australia has fewer records than comparative eastern Australian states (Kemper, 2002). Concentrations of stranded animals have occurred at the entrance of the gulfs in South Australia and around Tasmania, but live sightings have predominated in the former region (Kemper, 2002).

According to the PMST report, the Pygmy Right whale and their habitat to occur within the AMBA; however due to infrequent sightings in Australia the likelihood of these whales being present is low.

Dusky Dolphin (*Lagenorhynchus obscurus)*

Dusky Dolphins occur throughout the Southern hemisphere, mostly in temperate and sub-Antarctic zones. They are primarily found from about 55° to 26°S, with extensions well northwards in association with cold currents. Although they are presumed to be primarily an inshore species, Dusky Dolphins may also be pelagic at times, possibly related to a desire for colder waters (Gill, *et al.,* 2000; Ross, 2006).

According to the PMST report, the Dusky dolphin and their habitat to occur within the AMBA; however due to infrequent sightings in Australia the likelihood of these dolphins being present is low.

Killer Whale (*Orcinus orca)*

Largest member of the dolphin family usually travels in groups of 10-30. Exists in both tropical and temperate waters in oceanic, pelagic and neritic waters (DoEE, 2017).

Killer whales make seasonal migrations, and may follow regular migratory pathways; however this has not been proven. No specific information on migratory pathways along the WA coast is documented. Killer whales have been recorded relocating to Antarctic waters during summer months and back to warmer waters during winter.

According to the PMST report, the killer whale and their habitat may occur within the AMBA and, this assessment is believed to be accurate.

Marine Reptiles - Threatened

Threatened marine reptile species with the potential to occur within the AMBAs are listed in Table 3. Descriptions of these threatened species are provided below.

Table 3: Listed Threatened Marine Reptile Species that may occur within the AMBAs

Common Name	Species	EPBC Act Status
Loggerhead turtle	*Caretta caretta*	Endangered & Migratory
Green turtle	*Chelonia mydas*	Vulnerable & Migratory
Leatherback turtle	*Dermochelys coriacea*	Endangered & Migratory

Loggerhead Turtle (*Caretta caretta*)

The loggerhead turtle is listed as endangered and migratory under the EPBC Act, and the AMBA. The loggerhead turtle has a worldwide distribution, living and breeding in subtropical to tropical locations (Limpus, 2008).

According to the PMST report, the loggerhead turtle and their habitat is likely to occur within the AMBA; however in consideration of the few sightings and lack of nesting sites, this turtle is unlikely to be found in this area.

Green Turtle (*Chelonia mydas*)

The green turtle is listed as endangered and migratory under the EPBC Act. Green turtles are omnivores, mainly feeding in shallow benthic habitats on seagrass and/or algae, but are also known to feed on sponges, jellyfish and mangroves. Green turtles are unlikely to forage or dwell within deeper off shore waters due to the water depths; however they may occasionally migrate through it.

According to the PMST report, the green turtle and their habitat is likely to occur within the AMBA; however in consideration of the few sightings and lack of nesting sites, this turtle is unlikely to be found in this area.

Leatherback Turtle (*Dermochelys coriacea)*

The leatherback turtle is listed as endangered and migratory under the EPBC Act. The leatherback turtle has the widest distribution of any marine turtle, and can be found from tropical to temperate waters throughout the world (Márquez, 1990). There are no major centres of nesting activity that have been recorded in Australia, although scattered isolated nesting (one to three nests per annum) occurs in southern Queensland and the Northern Territory (Limpus & McLachlin, 1994).

The species is most commonly reported from coastal waters in central eastern Australia (from the Sunshine Coast in southern Queensland to central NSW); south-east Australia (from Tasmania, Victoria and eastern South Australia) and in south-western Western Australia (Bone, 1998; Hamann *et al*., 2006;

Limpus & MacLachlan, 1979). It is regularly seen in southern Australian waters (Bone 1998; Green, 1971). Limited data from overseas indicates that Leatherback Turtles concentrate in areas where currents converge with steep bathymetric contours, presumably where food is more readily available (Eckert *et al*., 1989; Houghton *et al*. 2006). More detailed assessments of foraging area distribution for the species are needed.

According to the PMST report, the leatherback turtle and their habitat is likely to occur within the AMBA; however in consideration of the few sightings and lack of nesting sites, this turtle is unlikely to be found in this area.

Marine Reptiles - Migratory

All threatened marine reptiles are also listed as migratory.

Fish - Threatened

Threatened fish and shark species listed under the EPBC Act with the potential to occur within the AMBAs are listed in Table 4. Descriptions of these threatened species are provided below.

Table 4: Listed Threatened Fish and Shark Species that may occur within the AMBAs

Common Name	Species	EPBC Act Status
Australian Grayling	*Prototroctes maraena*	Vulnerable
Great white shark	*Carcharodon carcharias*	Vulnerable & Migratory

Australian Grayling (*Prototroctes maraena)*

The Australian grayling is listed as Vulnerable and Migratory under the EPBC Act.

Currently, the Australian Grayling occurs in streams and rivers on the eastern and southern flanks of the Great Dividing Range, from Sydney, southwards to the Otway Ranges of Victoria and in Tasmania. The species is found in fresh and brackish waters of coastal lagoons, from Shoalhaven River in NSW to Ewan Ponds in South Australia (Cadwallader & Backhouse, 1983; DPI, 2006; Jenkins *et al*. 2009).

According to the PMST report, the Australian grayling and their habitat may occur within the AMBA, however due to their preferred habitat streams and rivers, the likelihood of them being present is low.

Great White Shark (*Carcharodon carcharias*)

The great white shark is listed as Vulnerable and Migratory under the EPBC Act and the AMBA intersects a known BIA. Area used by White sharks as they move between nursery areas, opportunistic feeding. Great White Sharks are widely, but not evenly, distributed in Australian waters. Juveniles appear to aggregate seasonally in certain key areas including the 90 Mile Beach area of eastern Victoria and the coastal region between Newcastle and Forster in NSW (Bruce & Bradford, 2008). Other areas, such as the Portland region of western Victoria and the coast off the Goolwa region of South Australia, are also reportedly visited by juvenile Great White Sharks. Within Australian waters, the majority of recorded great white shark movements occur between the coast and the 100 metre depth contour. Both adults and juveniles have been recorded diving to depths of 1000 metres (Bruce et al., 2006; Bruce & Bradford, 2008).

The Great White Shark moves seasonally along the south and east Australian coasts, moving northerly along the coast during autumn and winter and returning to southern Australian waters by early summer (Bruce et al., 2006).

According to the PMST report, the killer whale and their habitat may occur within the area and, the likelihood of this species in the AMBAs is considered high.

Fish - Migratory

An additional 6 listed Migratory fish and shark species under the *EPBC Act* as detailed in Table 5.

Table 5: Listed Migratory Fish and Shark Species that may occur within the AMBAs

Common Name	Species
Porbeagle, Mackerel shark	*Lamna nasus*

Porbeagle, Mackerel Shark *(Lamna nasus)*

The porbeagle, also named mackerel shark is wide-ranging and inhabits temperate, subarctic and subantarctic waters of the North Atlantic and Southern Hemisphere (Francis *et al.,* 2002). In Australia, the species occurs in waters from southern Queensland to south-west Australia (Last & Stevens 2009). Animals typically occur in oceanic waters off the continental shelf, although they occasionally enter coastal waters (Francis *et al.,* 2002); it is possible that it may occur within this area.

Fish - Other

The search of the *EPBC Act* Protected Matters database also identified a further 26 listed marine fish species with a potential to occur within the Operations Area and wider AMBA. These pipefish and seahorse species are listed in the *EPBC Act* Protected Matters Reports in Appendix E.

Marine Birds - Threatened

A search of the EPBC Act Protected Matters database identified 27 listed threatened bird species (of which 14 are also listed as Migratory) (Table 6). Summary descriptions of these species are provided below.

Table 6: Listed Threatened Bird Species that may occur within the AMBAs

Common Name	Species	EPBC Act Status
Australasian Bittern	*Botaurus poiciloptilus*	Endangered
Red knot	*Calidris canutus*	Endangered
Curlew sandpiper	*Calidris ferruginea*	Critically Endangered
Antipodean albatross	*Diomedea antipodensis*	Vulnerable & Migratory
Southern royal albatross	*Diomedea epomophora*	Vulnerable & Migratory
Wandering albatross	*Diomedea exulans*	Vulnerable & Migratory
Northern royal albatross	*Diomedea sanfordi*	Endangered & Migratory
Blue petrel	*Halobaena caerulea*	Vulnerable
Bar-tailed Godwit	*Limosa lapponica baueri*	Vulnerable & Migratory
Northern Siberian Bar-tailed Godwit	*Limosa lapponica menzbieri*	Critically Endangered
Southern giant petrel	*Macronectes giganteus*	Endangered & Migratory
Northern giant petrel	*Macronectes halli*	Vulnerable & Migratory
Orange-bellied parrot	*Neophema chrysogaster*	Critically Endangered
Eastern curlew	*Numenius madagascariensis*	Critically Endangered
Fairy prion	*Pachyptila turtur subantarctica*	Vulnerable
Sooty albatross	*Phoebetria fusca*	Vulnerable & Migratory
Gould's petrel	*Pterodroma leucoptera leucoptera*	Endangered
Soft-plumaged petrel	*Pterodroma mollis*	Vulnerable
Australian Fairy Tern	*Sternula nereis nereis*	Vulnerable
Buller's albatross	*Thalassarche bulleri*	Vulnerable & Migratory
Northern Bullers albatross	*Thalassarche bulleri platei*	Vulnerable
Shy albatross	*Thalassarche cauta cauta*	Vulnerable & Migratory

Common Name	Species	EPBC Act Status
White-capped albatross	*Thalassarche cauta steadi*	Vulnerable & Migratory
Grey-headed albatross	*Thalassarche chrysostoma*	Endangered & Migratory
Campbell albatross	*Thalassarche impavida*	Vulnerable & Migratory
Black-browed albatross	*Thalassarche melanophris*	Vulnerable & Migratory
Salvins albatross	*Thalassarche salvini*	Vulnerable

Australasian Bittern (*Botaurus poiciloptilus*)

The Australasian bittern is listed as Endangered under the EPBC Act. The Australasian bittern is a secretive, stocky, heron-like bird, living in wetlands where it forages. The species or species habitat is known to occur within this area, although given it is a wetland bird it is unlikely to be found in the AMBAs.

Red Knot (*Calidris canutus*)

The red knot is listed as Endangered and Migratory under the EPBC Act and the species or species habitat may occur within the wider AMBA. The red knot breeds in Siberia and spends the non-breeding season in Australia and New Zealand. Non-breeding season is spent on tidal mudflats or sandflats where the omnivorous species feeds on intertidal invertebrates, especially shellfish. Although the species is found throughout main suitable habitats in Australia, In Queensland, the Red Knot migrates along the coast north of 19 °S, sometimes in large numbers; it is widespread along the coast south of Townsville and along the coasts of NSW and Victoria. It is widespread along the coast south of Townsville and along the coasts of NSW and Victoria.

Curlew Sandpiper (*Calidris ferruginea*)

The curlew sandpiper is listed as Critically Endangered shorebird under the EPBC Act and the species or species habitat may occur within the wider AMBA. Curlew sandpiper breeding grounds occur in Siberia and they reach the northern shores of Australia in late August and early September (Higgins & Davies, 1996). Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast. This species forages mainly on invertebrates, including worms, molluscs, crustaceans, and insects, as well as seeds. This species may occur within the coastal areas during their migrating season.

Antipodean Albatross (*Diomedea antipodensis*)

The antipodean albatross is listed as Vulnerable and Migratory under the EPBC Act and intersects a known BIA for foraging. They are endemic to New Zealand, however forages widely in open water in the south-west Pacific Ocean, Southern Ocean and the Tasman Sea, notably off the coast of NSW (Elliott & Walker, 2005; Environment Australia, 2001; Garnett & Crowley, 2000). This species may occur within the AMBA; although is not an area this species uses for breeding or resting, it may be used as foraging ground.

Southern Royal Albatross (*Diomedea epomophora)*

The southern royal albatross is listed as Vulnerable and Migratory under the EPBC Act and the species or species habitat may to occur within the wider AMBA. There are no nesting or feeding areas within the AMBA. The species is not predicted to occur within the Operations Area.

Wandering Albatross (*Diomedea exulans*)

The wandering albatross is listed as Vulnerable and Migratory under the EPBC Act and intersects a known BIA for foraging. It breeds on six sub-Antarctic island groups including Macquarie Island and feeds throughout the Southern Ocean (DoE, 2014a). This species is wide-ranging and may potentially over-fly the AMBA from time-to-time in transit or for foraging. This species may occur within the AMBA; although is not an area this species uses for breeding or resting, it may be used as foraging ground.

Northern Royal Albatross (*Diomedea sanfordi)*

The northern royal albatross is listed as Endangered and Migratory under the EPBC Act and the species or species may to occur within the wider AMBA. The Northern Royal Albatross ranges widely over the Southern Ocean, with individuals seen in Australian waters off south-eastern Australia (Environment Australia 2001). The Northern Royal Albatross feeds regularly in Tasmanian and South Australian waters, and less frequently in NSW waters (Garnett & Crowley, 2000). This species is wide-ranging and may potentially over-fly the worst-case hydrocarbon AMBA from time-to-time in transit or for foraging. There are no nesting or feeding areas within the AMBA. The species is not predicted to occur within the Operations Area.

Blue Petrel *(Halobaena caerulea)*

The blue petrel is listed as Vulnerable under the EPBC Act. The blue petrel previously bred on Macquarie Island itself, but breeding is now restricted to offshore stacks near Macquarie Island. There are no nesting or feeding areas within the AMBA. The species is not predicted to occur within the Operations Area.

Bar-tailed Godwit (baueri) (*Limosa lapponica baueri*)

The bar-tailed godwit is listed as Vulnerable and Migratory under the EPBC Act and spends non-breeding seasons in Australia. One of two sub-species, Baueri forages at the water's edge mainly around tidal estuaries and shallow water habitats. The species feeds on worms, molluscs, and crustaceans. This species may occur within the coastal areas during their migrating season.

Northern Siberian Godwit (*Limosa lapponica menzbieri*)

The northern Siberian godwit is listed as Critically Endangered under the EPBC Act. This species is closely related to the Baueri sup-species, however breeds in northern Siberia. The migratory bar-tailed godwit (northern Siberian) does not breed in Australia. During the non-breeding period, it is widespread in the Torres Strait and along the east and south-east coasts of Queensland, NSW and Victoria. This species may occur within the coastal areas during their migrating season.

Southern Giant Petrel (*Macronectes giganteus*)

The southern giant petrel is listed as Endangered and Migratory under the EPBC Act. The southern giant petrel is considered to be a sibling species to the northern giant-petrel. It is a large seabird with a widespread distribution range through the Southern Ocean from the Antarctic to subtropical waters. The southern giant-petrel breeds once a year between August and September, returning from foraging locations to breeding grounds in Antarctic waters. There are no breeding (August and September), roosting grounds or critical feeding areas within the Operations Area, although this species may transit the AMBA from time-to-time foraging for food.

Northern Giant Petrel (*Macronectes halli*)

The Northern giant petrel is listed as Vulnerable and Migratory under the EPBC Act. It is a highly active migratory bird which has a large natural range. The northern giant petrel breeds in the sub-Antarctic, and visits areas off the Australian mainland mainly during the winter months (May - October). This species may over-fly the AMBA from time-to-time in transit or for foraging; there are no known nesting sites within the AMBA. The species is not predicted to occur within the Operations Area.

Orange-bellied parrot (*Neophema chrysogaster*)

The Orange bellied parrot is listed as a Critically Endangered under the EPBC Act. The orange-bellied parrot is a small ground-feeding bird that migrates between distinct breeding and non-breeding ranges. Breeding occurs in south-west Tasmania in summer, and the birds overwinter on the coast of south-east mainland Australia. The migration route follows the west coast of Tasmania, and at least some birds stop on King Island during the northward migration in autumn. This species may over-fly the AMBA in transit or for foraging; there are no known nesting sites within the AMBA. The species is not predicted to occur within the Operations Area.

Eastern Curlew (*Numenius madagascariensis*)

The Eastern curlew is listed as a Critically Endangered and a Migratory shorebird under the EPBC Act. Within Australia, the Eastern curlew has a primarily coastal distribution. The species is found in all states, particularly the north, east, and south-east regions including Tasmania. They have a continuous distribution from Barrow Island and Dampier Archipelago, Western Australia, through the Kimberley and along Northern Territory, Queensland, and NSW coasts and the islands of Torres Strait. They are patchily distributed elsewhere.

The Eastern curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes use the mangroves. The Eastern curlew is carnivorous, mainly eating crustaceans (including crabs, shrimps and prawns), small molluscs, as well as some insects. This species may occur on coastal areas of the AMBA during their migrating season. The species may occur within the Operations Area.

Fairy Prion (*Pachyptila turtur subantarctica*)

The Fairy prion petrel is listed as Vulnerable under the EPBC Act. The fairy prion breeds on Macquarie Island and a number of other sub Antarctic islands outside of Australia. The subspecies digs burrows among rocks or low vegetation in which to nest. Burrows may be dug below mat forming herbs. Feeds by plucking food from the ocean surface. Some individuals may migrate towards New Zealand and southern Australia in winter. This species may occur on coastal areas of the AMBA during their migrating season. The species may occur within the Operations Area.

Sooty Albatross (*Phoebetria fusca*)

The Sooty albatross is listed as a Vulnerable and a Migratory shorebird under the EPBC Act. The Sooty Albatross has sometimes been observed foraging in inshore waters in southern Australia (Thiele, 1977). The Sooty Albatross is a rare, but probably regular migrant to Australia, mostly in the autumn-winter months, occurring north to south-east Queensland, NSW, Victoria, Tasmania and South Australia (Pizzey & Knight 1999). The species breeds on subtropical and sub Antarctic islands in the Indian and Atlantic Oceans, on vegetated cliffs and steep slopes that are sheltered from prevailing winds, often amongst tussock grass (Weimerskirch *et al.,* 1986). This species may occur on coastal areas of the AMBA during their migrating season. The species may occur within the Operations Area.

Gould's petrel (*Pterodroma leucoptera leucoptera*)

The Gould's petrel is listed as Endangered under the EPBC Act. The Australian subspecies of the Gould's Petrel breeds in NSW on Cabbage Tree Island and nearby Boondelbah Island, near Port Stephens (Fullagar, 1976; Priddel & Carlile 1997, 1997a), and at least one pair on Montague Island, near Narooma (ABC News, 2013). Though the Gould's Petrel is seldom recorded away from its breeding islands, the subspecies is apparently absent from the islands between May and late August (Fullagar, 1976; Marchant & Higgins, 1990). While its distribution at sea is poorly known, it has been suggested that most individuals would occur in the Tasman Sea (Marchant & Higgins, 1990), with most records at sea from waters off south-eastern Australia, especially off Tasmania, mainly between December and April (Reid *et al*., 2002). This species may occur on within the Operations Area and AMBA.

Soft-plumaged Petrel (*Pterodroma mollis*)

The soft-plumaged petrel is listed as Vulnerable under the EPBC Act. This marine bird is found in temperate and sub-Antarctic regions. The petrel is a regular and quite common visitor to southern Australian seas, but is more common on the west than in the south and south-east (Marchant and Higgins, 1990). The population in Australia is currently unknown. Breeding is believed to take place on south Australian islands with fledglings dispersing mainly northwards during May and June. The soft-plumaged petrel may transit through the AMBA and Operations Area.

Australian Fairy Tern (*Sternula nereis nereis*)

The Australian fairy tern is listed as Vulnerable and Migratory under the EPBC Act. Breeding occurs between October to February on continental islands, coral cays, on sandy islands and beaches inside estuaries, and on open sandy beaches. The fairy tern may transit through the AMBA and Operations Area.

Bullers Albatross (*Thalassarche bulleri platei*)

The Bullers albatross is listed as Vulnerable under the EPBC Act and intersects a known BIA for foraging. The Pacific Albatross is a non-breeding visitor to Australian waters. Foraging birds are mostly limited to the Pacific Ocean and the Tasman Sea, although birds do reach the east coast of the Australian mainland (Environment Australia, 2001). This species may occur within the AMBA; although is not an area this species uses for breeding or resting, is likely used as a foraging ground.

Shy Albatross (*Thalassarche cauta cauta*)

The shy albatross is listed as Vulnerable and Migratory under the EPBC Act and intersects a known BIA for foraging. The shy albatross appears to occur in all Australian coastal waters below 25°S. It is most commonly observed over the shelf waters around Tasmania and south-eastern Australia. Breeding occurs on Albatross Island, Bass Strait, and Mewstone and Pedra Branca, off southern Tasmania. The shy albatross feeds in waters over the continental shelf as well as within harbours and bays. This species is likely to occur within the AMBA; although is not an area this species uses for breeding or resting, it may be used as foraging ground.

White-capped Albatross (*Thalassarche cauta steadi*)

The white-capped albatross is listed as Vulnerable and Migratory under the EPBC Act. This is a marine species that occurs in sub-Antarctic and subtropical waters. The White-capped Albatross is probably common off the coast of south-east Australia throughout the year. The White-capped Albatross has been noted in shelf-waters around breeding islands and over adjacent rises. During the non-breeding season, birds have been observed over continental shelves around continents. Breeding colonies occur on islands south of New Zealand (Double *et al.,* 2003). It is thought that the species breeds annually and colonially, laying eggs in mid-November. This species is likely to occur within the AMBA; although is not an area this species uses for breeding or resting, it may be used as foraging ground.

Grey-headed Albatross (*Thalassarche chrysostoma*)

The Grey-headed albatross is listed as Endangered and Migratory under the EPBC Act and intersects a known BIA for foraging. In Australian territory, Grey-headed Albatross breed on the southern and western flanks of Petrel Peak, Macquarie Island (Copson, 1988). Breeding and non-breeding birds disperse widely across the Southern Ocean, at more southerly latitudes in summer than in winter, when they frequent the waters off southern Australia and New Zealand (Marchant & Higgins 1990; Waugh *et al.,* 1999). Most Australian records come from south and west of Tasmania, occasionally in Victorian waters, rarely in South Australia and Western Australia, and only as a vagrant in NSW. This species is likely to occur within the AMBA; although is not an area this species uses for breeding or resting, it may be used as foraging ground.

Campbell Albatross (*Thalassarche melanophris impavida*)

The Campbell albatross is listed as Vulnerable and Migratory under the EPBC Act. The Campbell albatross is a non-breeding visitor to Australian waters. The Campbell albatross only breed on Campbell Island, south of New Zealand. The population migrates northward towards the end of the breeding season and the species is common during the non-breeding period in continental shelf waters around Australia, New Zealand and the Pacific Island. This species is likely to occur within the AMBA; although is not an area this species uses for breeding or resting, it may be used as foraging ground.

Black-browed Albatross (*Thalassarche melanophris*)

The Black-browed albatross is listed as Vulnerable and Migratory under the EPBC Act and intersects a known BIA for foraging. Individuals are mostly confined to subantarctic and Antarctic waters surrounding these islands in the breeding season (Brooke, 2004; Lawton, 2004; Marchant & Higgins 1990; Terauds *et al*., 2006). The population migrates northward towards the end of the breeding season (Brooke 2004; Marchant & Higgins 1990; Reid *et al*., 2002; Tickell, 2000; Woehler *et al*., 1991) and the species is common in the non-breeding period at the continental shelf and shelf-break of South Australia, Victoria, Tasmania, western and eastern Bass Strait and NSW (Barrett *et al.,* 2003; Barton, 1979; Blakers *et al.,* 1984; Cox, 1973, 1976; Marchant, 1977; Milledge 1977; Reid *et al*., 2002; Swanson, 1973; Tickell 2000; Woehler *et al.,* 1991; Wood, 1992). This species is likely to occur within the AMBA; although is not an area this species uses for breeding or resting, it may be used as foraging ground.

Salvins Albatross (*Thalassarche salvini*)

The Salvins albatross is listed as Vulnerable under the EPBC Act. Salvin's Albatross is a non-breeding visitor to Australian waters. Salvin's slbatross is a marine species occurring in subantarctic and subtropical waters, reaching the tropics in the cool Humboldt Current, off South America (Marchant & Higgins 1990). During the non-breeding season, the species occurs over continental shelves around continents. It occurs both inshore and offshore (Cox, 1976; Falla, 1937; Marchant, 1977) and enters harbours and bays (Jehl, 1973). This species is likely to occur within the AMBA; although is not an area this species uses for breeding or resting, it may be used as foraging ground.

Marine Birds - Migratory

An additional 7 listed Migratory bird species under the *EPBC Act* may potentially occur within the AMBAs (Table 7). Descriptions of these species are provided below.

Table 7: Listed Migratory Bird Species that may occur within the AMBAs

Common Name	Species
Common sandpiper	*Actitis hypoleucos*
Fork-tailed Swift	*Apus pacificus*
Flesh-footed shearwater	*Ardenna carneipes*
Little Tern	*Sternula albifrons*
Sharp-tailed sandpiper	*Calidris acuminata*
Pectoral sandpiper	*Calidris melanotos*
Osprey	*Pandion haliaetus*

Common Sandpiper (*Actitis hypoleucos*)

The Common sandpiper is listed as a Migratory species under the EPBC Act, breeding in eastern Europe before migrating to spend its non-breeding season in Australia. In Australia, it can be found singularly or in small groups along all coastlines and many inland areas. The species inhabits a wide range of coastal wetlands, and is most often found around the muddy margins, mangroves and rocky shores. Their diet consists of bivalves, crustaceans and a variety of insects and are mostly found in coastal and inland locations. The species may occur within the Operations Area and AMBA.

Fork-tailed Swift (*Apus pacificus*)

The Fork-tailed swift is a listed Migratory species under the EPBC Act. It is a medium to large swift that migrates between Australia and its breeding grounds in Siberia. The swift usually arrives in Australia around October and departs in April, passing via Indonesia (Higgins, 1999). The Fork-tailed swift is widespread but sparsely scattered in all regions of Victoria (Higgins, 1999). Whilst in Australia the swift is highly mobile occurring mostly over inland plains but also coastal areas, over cliffs and on beaches. The Fork-tailed swift may occur around the coastal sections of the wider AMBA.

Flesh-footed Shearwater (*Ardenna carneipes*)

The Flesh-footed shearwater is listed as a Migratory species under the EPBC Act. It is a large broad-winged shearwater that typically forages over continental shelves/slopes and occasionally inshore waters. The distribution of the shearwater is mainly off southern Australia migrating between breeding colonies in the southern Indian and south-western to north-western Pacific Ocean (Marchant and Higgins, 1990). As such, individuals may transit the Operations Area and the AMBA.

Little tern (*Sternula albifrons*)

The Little tern is listed as a Migratory species under the EPBC Act. The species is widespread in Australia, with breeding sites widely distributed from north-western Western Australia, around the northern and eastern Australian coasts to south-eastern Australia. In Australia, it appears that the population and range of Little terns are currently expanding, at least partly as a result of ongoing management of key breeding areas, particularly those in NSW and Victoria (Garnett & Crowley, 2000; Ross *et al*., 1999). The species may occur within the AMBA.

Sharp-tailed Sandpiper (*Calidris acuminata*)

The sharp-tailed sandpiper is listed as a Migratory species under the EPBC Act and spends the non-breeding season in Australia. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. The species inhabits intertidal mudflats, sheltered bays, inlets, estuaries and seashores. Foraging habitat includes the seagrass wrack on shorelines and algal mats. The species are common throughout Australia between August – March. The species may occur within the AMBA.

Pectoral sandpiper (*Calidris melanotos*)

The pectoral sandpiper is listed as a Migratory species under the EPBC Act. The pectoral sandpiper is a small-medium wader that spend their non-breeding season across Australia. In Victoria the Pectoral Sandpiper is mainly found from Port Phillip Bay and the valley of the Murray River between Kerang and Piangil. It has also been recorded at Coronet Bay (in Westernport Bay), Wimmera and Mallee (Higgins & Davies 1996). This species is most commonly found around coastal areas but may transit the AMBA.

Osprey (*Pandion haliaetus*)

The Osprey is listed as a Migratory species under the EPBC Act. It is a medium-sized raptor that primarily inhabits coastal and estuarine habitats (Marchant and Higgins, 1990). The species prefers littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. Breeding range extends around the northern coast of Australia from Albany in WA to Lake Macquarie in NSW, with a second breeding population on the coast of SA. The total range of the species is much more widespread, extending from Esperance in Western Australia to NSW, where records become scarcer towards the south, and into Victoria and Tasmania, where the species is a rare vagrant (Barrett *et al.,* 2003; Blakers *et al*., 1984; Johnstone & Storr 1998; Marchant & Higgins 1993; Morris *et al.,* 1981). Individuals may transit the Operations Area and the wider AMBA.

Marine Birds - Other

The search of the EPBC Act Protected Matters database also identified 2 other listed marine bird species with a potential to occur within the AMBA. These species are listed in the EPBC Act Protected Matters Reports in Appendix E.

Cultural Environment

The cultural and conservational environment refers to places of Commonwealth, Indigenous and European heritage, places listed on the Register of National Estate, proposed marine reserves and endangered or vulnerable marine biota. This section identifies and describes the potential impacts upon the cultural and conservational environment as a result of the Cessation activities.

Indigenous Heritage and Cultural Values

Given its remote offshore location, there are no known or suspected Aboriginal heritage values within the planned activity AMBA or spill AMBA. However, there are known Aboriginal spiritual connections to the wider sea Country and a history of marine resource affiliated with the Twelve Apostles Marine National Park/Port Campbell National Park and the Arches Marine Sanctuary.

Indigenous Heritage and Cultural Values

DSEWPaC (2005) have identified five shipwrecks in the Port Campbell area. These are the *Napier*, *Newfield*, *Lochard*, Schomberg and *Young Australia*. The closest wreck to the Operational Area is the *Napier*, which is within 1.5 km of the pipeline corridor and would be within the spill AMBA.

Socio-economic Environment

Tourism and Recreational Fishing

The coast of Victoria is a high activity coastline and supports an extensive range of human usage. Much of the coast is designated national park and marine reserves. Exposed beaches are nestled between headlands and reefs. The beaches from Apollo Bay to Queenscliff are some of the most popular outside of Port Phillip Bay. To the east, Point Nepean, San Remo, Venus and Waratah Bays are also popular summer locations.

Designated scuba diving areas extend along most of the coast, with the exceptions of the gazetted ports and Ninety Mile Beach as far as Sand Patch Point.

Recreational fishing in the area is mostly with rod and line from access points along the shore such as cliff-tops, beaches and rock shelves. Fishing also occurs from boats during calm conditions, and some spear fishing and pot fishing is also undertaken (Dames & Moore, 1991). Species popular with recreational anglers includes snapper (*Pagrus auratus*), Australian salmon (*Arripis trutta*), mulloway (*Argyrosomus japonicus*), black bream (*Acanthopagrus butcherii*), sea mullet (*Mugil caphalus*), King George whiting (*Sillaginodes punctata*), yellow tail kingfish (*Seriola lalandi*), sea sweep (*Scorpis aequipinnis*), southern sea garfish (*Hyporhamphus melanochir*), pike (*Dinolestes lewini*), trevally (*Pseudocaranx dentex*), gummy shark (*Mustelus antarcticus*) and school shark (*Galeorhinus galeus*).

Commercial Fishing and Aquaculture

In general, commercial fishing activity in the area is low. The most significant fishery in the Minerva area is the Southern Rock Lobster Fishery, of which the majority of activity is in the shallower waters less than 60 m deep. Information about the intensity and timing of each of the fisheries operating in the region are provided next.

Commercial Fisheries

Commonwealth-managed fisheries include all commercial fisheries operating within the Australian Fishing Zone, which extends 200 nm from the mainland coast. Several Commonwealth-managed fisheries potentially operate within or adjacent to the Minerva offshore facilities, including:

- Bass Strait Central Zone Scallop Fishery – Targeting Pecten fumatis species, which are harvested from muddy to coarse sandy bottoms with a towed dredge. The fishery area extends the entire offshore Commonwealth waters area of Victoria between the coast and Tasmania, to a line extended to the NSW and SA borders (refer to http://www.afma.gov.au/wp-content/uploads/2010/06/bsczsf.pdf for a map of the fishery area). The highest catches from the Bass Strait Central Zone Scallop Fishery are centered in waters north east of Flinders Island and the waters around King Island. The fishery operates on opening criteria, with a detailed closed area spatial management regime where the majority of the fishery is closed to commercial fishing and only discrete areas open to harvesting. Protection is also provided to the fishery in the peak spat settlement periods over summer.
- Eastern Tuna and Billfish Fishery (ETBF) - The ETBF extends from Cape York, Queensland, to the south Australian/Victorian border. The fishery targets tuna species that occur in the area, as well as broadbill swordfish (*Xiphias gladius*) and striped marlin (*Tetrapturus audux*). Fish area harvested by pelagic longline and minor line (handline, troll, and rod and reel) methods. Fishing intensity in the ETBF in the Minerva area is very low, with most of the activity for this fishery focused on off the coast of New South Wales and Queensland. The fishery operates all year round.
- Eastern Skipjack Tuna Fishery (Australian Fishing Zone, Sub-Area 03) – Southern Inshore North - The Eastern Skipjack Fishery extends from Cape York Peninsula to the South Australian/Victorian border. The fishery targets solely skipjack tuna (*Katsuwonus pelamis*) using purse seine, pole and line and longline methods. The relative intensity of activity in the Eastern Skipjack Tuna Fishery in the Minerva area is very low, with most of the activity focused on off the east coast of Australia. Fishing from the Eastern Skipjack Tuna Fishery occurs all year round.
- Small Pelagic Fishery (SPF) (Western Sub-Area) - The SPF extends from the Queensland/NWS border, typically outside 3 nm, around southern Australia to a line near Lancelin, Perth. Fish included in the fishery include mackerel, redbait and sardines by purse seine and midwater trawl methods.
- Southern and Eastern Scalefish and Shark Fishery (SESSF) – The SESSF covers the area of the Australian Fishing Zone extending southwards from Barranjoey Point (north of Sydney) around NWS, Victorian and Tasmanian coastlines to cape Jervis in South Australia. Principle species include blue grenadier, tiger flathead, pink ling and spotted warehou. Fishing methods include otter trawl, Danish seine with some midwater trawling and pair trawling. Activity and intensity of fishing in the Minerva region in the SESSF is low, with higher intensity fishing in the

region occurring to the west off the coast of Portland and extending towards the South Australian border. Fishing from the SESSF occurs all year round, and is a limited entry fishery.

- Southern Bluefin Tuna Fishery – Cover all waters surrounding Australia and targets Thunnus maccoyii by purse seine methods. The activity of the Southern Bluefin Tuna Fishery in the Minerva region is very low, with the majority of activity off the coast of Western Australia, South Australia, and east coast of Australia. Fishing from the Southern Bluefin Tuna Fishery operates all year round, primarily from December to March.
- Squid Jig Fishery (SSJF) – The SSJF includes Commonwealth waters adjacent to NSW, Victoria, South Australia, Tasmania and Queensland up to sandy Cape. The fishery targets the arrow squid (*Nototodarus gouldi*) by squid jigging. The activity of SSJF fishery in the Minerva region is very low, with the majority of activity in the region further to the east around Apollo Bay and west offshore from Portland extending towards the South Australian border. The SSJF operates all year round, with most jig catch occurring from January to June each year, with the highest catches in March to April. Trawl catches are constant throughout the year.

State Fisheries

Blacklip abalone (*Haliotis rubra*) is Victoria's most valuable commercial fishery. The landed value of the Victorian Total Allowable Commercial Catch is currently about $20 million.

Southern Rock Lobster (*Jasus edwardsii*) is caught in waters in the area up to 150 m deep. However, lobsters have a higher abundance near the shore with the majority of the catch of Victoria, South Australia, and Tasmania taken from waters less than 60 m. Historic catch results for Southern Rock Lobster in the Minerva operational area are approximately 50 – 200 kg/km^2/ year. The fishery operates all year round with the following exceptions:

- Taking of females is banned from 1 June to 15 September; and
- Complete fishery closure between 15 September and 15 November each year.

The rock lobster fishery is the second most valuable commercial fishery in Victoria. There are more fishing boats, crew and processors associated with the rock lobster fishery than any other State fishery. Currently, the total annual catch is limited to 386 tonnes and landings are valued at $15 million. Post-harvest processing and live exportation to markets in Asia greatly enhance the value of the landings. The fishery has a long history and makes an important contribution to the economy and employment of the rural coastal communities. The fishery is managed through size limits, area and seasonal closures, fishing gear specifications and individual transferable quotas and limited entry.

The social and economic values associated with diving for rock lobsters is recognised by the recreational fishing community and contributes to the tourist industry along the Victorian coast. The recreational catch of rock lobsters is only estimated to be about 10 to 20 tonnes.

Aquaculture

There are no known aquaculture sites in the vicinity of the Minerva area. The nearest aquaculture operators are located in Port Phillip Bay.

Shipping

There are no shipping channels in the vicinity of the Minerva area. Analysis of shipping movements in 2011 (AMSA, 2013) show that vessel movements are common in deeper waters of this area and avoid the coastlines. Shipping may be encountered on the deeper ocean-side of the Minerva site.

Exploration Activities

Australia's first discoveries of gas were in Bass Strait in the mid-1960s. As of 2011, Victoria (mostly the offshore Gippsland Basin), accounts for 14% of Australia's oil and condensate production, and 17% of Australia's gas production, second behind Western Australia. There are a number of production fields located in the Otway Basin and includes the Otway gas project, Casino gas project and the Minerva gas project whereby:

- The Otway Gas Project (Origin Energy) has two fields located 55 and 70 km from Port Campbell; and
- Casino Gas Project (Santos) has gas field is located 35 km offshore.

Summary of Windows of Ecological and Socio-economic Sensitivities

Table 8 provides a summary of the windows of ecological sensitivity for values identified within and around the AMBA.

Table 8: Windows of Sensitivity

Sensitivity	Presence Type	Known Areas	J	F	M	A	M	J	J	A	S	O	N	D
Marine Mammals														
Sei whale	Feeding, resting	Port Lincoln, Bonney Upwelling, Bass Strait												
Blue whale	Feeding, resting	Eastern GAB, Bonney Upwelling												
Southern right whale	Feeding, resting	Head of GAB, Fowlers Bay, Encounters Bay, Portland, Port Fairy, Port Campbell												
Humpback whale	Feeding, resting	NSW coast, east Tasmania												
Fish														
Great white shark	Aggregation and feeding	Neptune Islands off Port Lincoln, Page Islands, Seal Bay on Kangaroo Island, Dangerous Reef, Lewis Island, West Waldegrave Island, Olive Island, Purdiue Island												
Marine Birds														
Albatross	Feeding, resting	Albatross Island, Bass Strait, Mewstone-TAS												
Petrels	Feeding, resting													
Shearwaters	Feeding, resting	Port Lincoln coastal waters												
Terns	Feeding, resting	Port Lincoln coastal waters												
Curlew sandpiper	Migration pathway													
Eastern curlew	Migration pathway													
Socio-economic														
Commercial fishing														
Recreational fishing														
Tourism		Marine and coastal parks												
	Peak presence													
	Known presence													
	Potential presence													

Appendix E

EPBC Act Protected Matters Search Tool (PMST): Operational Area

Australian Government

Department of the Environment and Energy

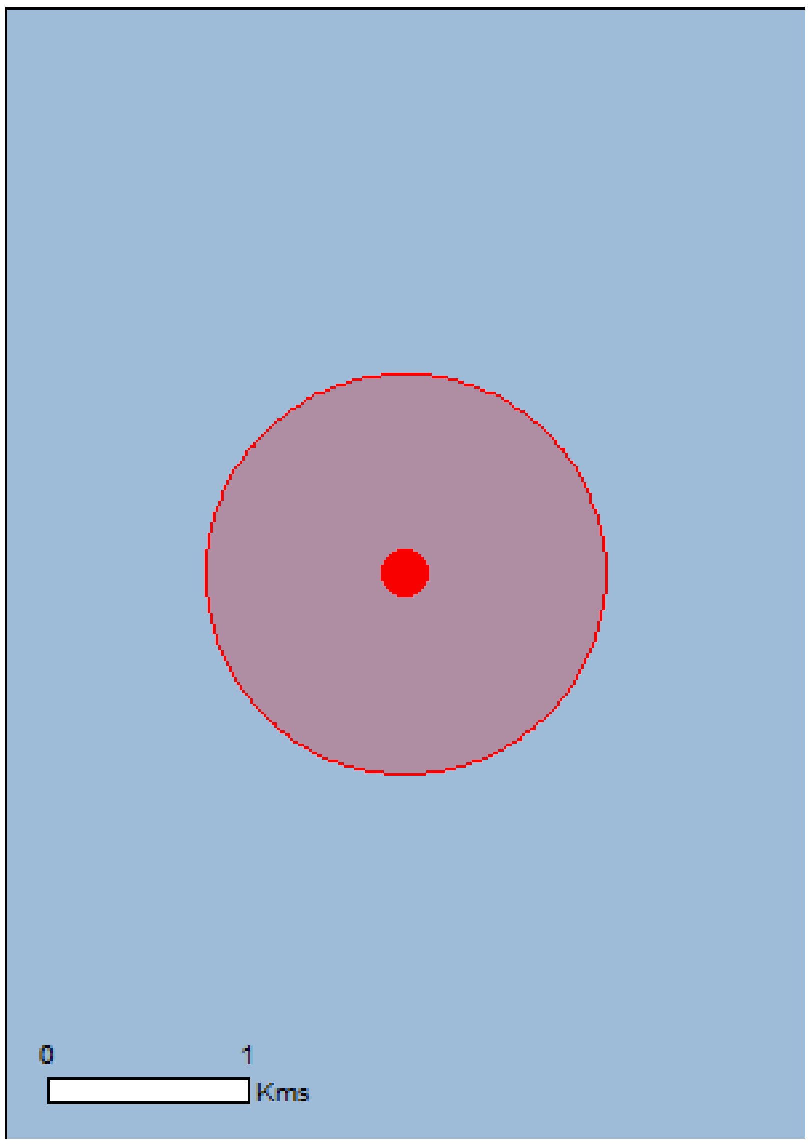
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

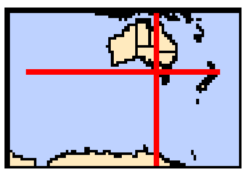
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 27/02/19 15:55:44



Coordinates
Buffer: 1.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	34
Listed Migratory Species:	36

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	60
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	None
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
South-east

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within

Name	Status	Type of Presence
		area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Fish		
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat may occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known

Name	Status	Type of Presence
		to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed	Vulnerable	Foraging, feeding or

Name	Threatened	Type of Presence
Albatross [64459]		related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Fish		
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Hypselognathus rostratus Knifesnout Pipefish, Knife-snouted Pipefish [66245]		Species or species habitat may occur within area
Kaupus costatus Deepbody Pipefish, Deep-bodied Pipefish [66246]		Species or species habitat may occur within area
Leptoichthys fistularius Brushtail Pipefish [66248]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys semistriatus Halfbanded Pipefish [66261]		Species or species habitat may occur within area
Mitotichthys tuckeri Tucker's Pipefish [66262]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus robustus Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area

Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-38.71871 142.96223

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Department of the Environment
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

EPBC Act PMST: Wider AMBA

Australian Government

Department of the Environment and Energy

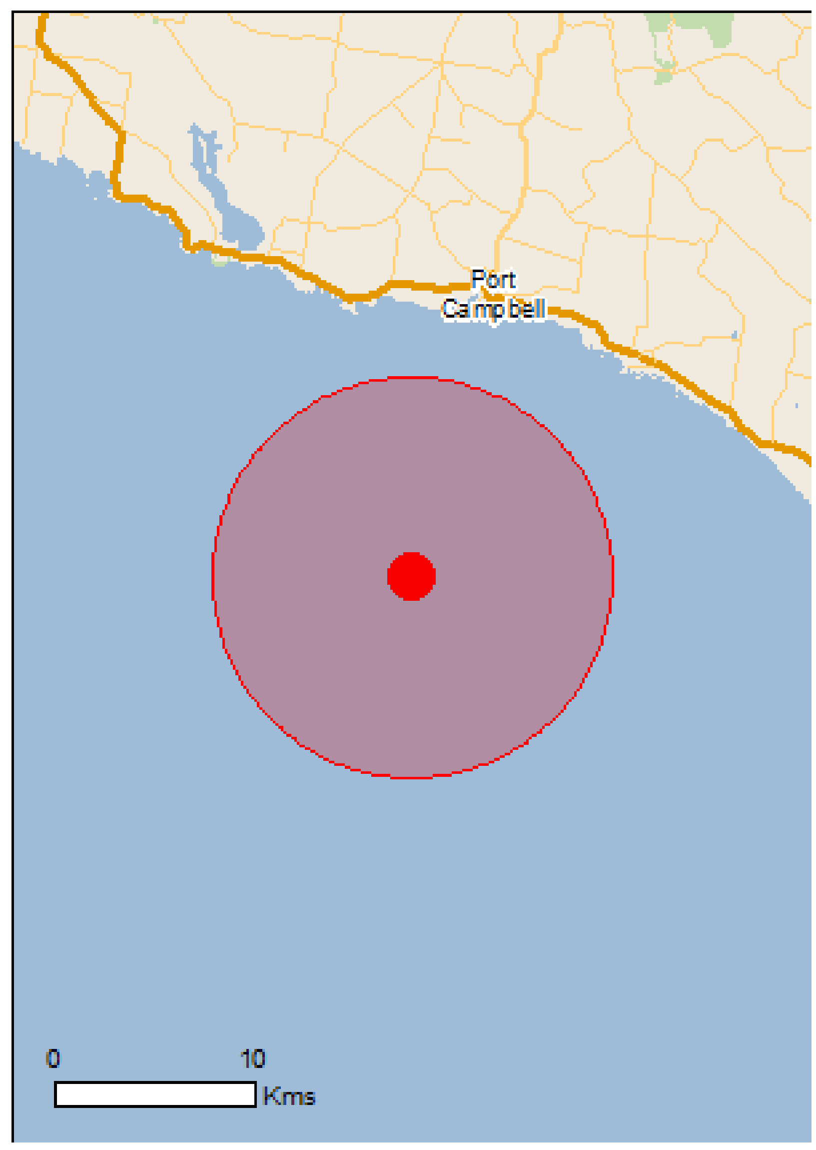
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

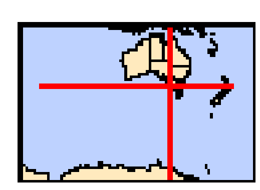
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 27/02/19 15:56:59



Coordinates

Buffer: 10.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	38
Listed Migratory Species:	38

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	63
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	None
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
South-east

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Giant Kelp Marine Forests of South East Australia	Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Diomedea antipodensis		
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora		
Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans		
Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi		
Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area

Name	Status	Type of Presence
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Fish		
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Litoria raniformis Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog [1828]	Vulnerable	Species or species habitat known to occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely

Name	Threatened	Type of Presence
		to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may

Name	Threatened	Type of Presence
		occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Sterna albifrons Little Tern [813]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Fish		
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Hypselognathus rostratus Knifesnout Pipefish, Knife-snouted Pipefish [66245]		Species or species habitat may occur within area
Kaupus costatus Deepbody Pipefish, Deep-bodied Pipefish [66246]		Species or species habitat may occur within area
Leptoichthys fistularius Brushtail Pipefish [66248]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys semistriatus Halfbanded Pipefish [66261]		Species or species habitat may occur within area
Mitotichthys tuckeri Tucker's Pipefish [66262]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus robustus Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area

Name	Status	Type of Presence
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-38.71871 142.96223

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Department of the Environment
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

Appendix F

Minerva Oil Pollution Emergency Plan

BHP

MINERVA OIL POLLUTION EMERGENCY PLAN

Document No: MN/HSEC/14/020

REVISION RECORD					
Rev	**Date**	**Description**	**Prepared by**	**Reviewed by**	**Approved by**
4	14/06/2019	Issued for submission to NOPSEMA	L Centa	B Starkey	D Nottingham

Revision History		
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3	14/04/2014	Revised submission to NOPSEMA
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1	27/01/2012	Reviewed as per OMS Audit
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A	15/10/2010	Update as part of the 5 yr resubmittal to NOPSEMA

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1 Introduction

1.1 Purpose

This Minerva Oil Pollution Emergency Plan (OPEP) has been developed to establish the processes and procedures within BHP Billiton Petroleum Pty Ltd (BHP) to ensure a constant vigilance and readiness is maintained to prevent and, where required, respond to and effectively manage incidents that may occur during the Operation and Cessation phases in permit areas VIC/L22 and VIC PL33, offshore Victoria over a 5 year period.

This OPEP is an appendix to the Minerva Operation and Cessation Environment Plan (EP) (Commonwealth) (MN/HSEC/04/021) and is required under the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations* (OPGGS (E) Regulations) for approval to undertake petroleum activities in Commonwealth waters.

The Minerva Gas Plant development was assessed as a joint Commonwealth / State Environmental Impact Statement (EIS) – Victorian Environment Effects Statement (EES) under the *Commonwealth Environmental Protection (Impact of Proposals) Act 1974* and the Victorian *Environment Effects Act 1978*. The Victorian Government approved the Environmental impact assessment (EIA) in March 2000 and approval from the Federal Government was granted in March 2001.

1.2 Scope

This OPEP shall apply to both normal operations and cessation activities including inspection/monitoring, maintenance and repair (IMR) activities associated with the Minerva Operation as well.

Operational activities include:

- Well control (subsea remote underwater vehicle [ROV]/ pigging operations, subsea intervention, and performing a relief well drilling activity from mobile offshore drilling unit [MODU]);
- Inspections/surveys of subsea components and pipeline;
- Maintenance of infield flowlines and umbilicals, manifold, jumpers, flying leads and subsea facilities (including cleaning); and
- Commissioning, controls testing, repair, replacement and installation.

Cessation activities include:

- Intervention activities to ‘‘shut in’’ this infrastructure so that it is cleared of hydrocarbons, depressurised and purged/treated with water to reduce the remaining risks;
- Field management of remaining infrastructure;
- Vessel-based activities including subsea inspections/ interventions; and
- Vessel-based activities including subsea flowline disconnection/cutting and plugging.

The activities include vessels used for the performance of these activities.

Specifically in reference to oil spill preparedness, this OPEP contains:

- A summary description of the activity and locations (Section 1.4);
- A list of the spill scenarios that may occur during the activity (Section 2);
- An overview of the operational Net Environmental Benefit Analysis (NEBA) in relation to the spill scenarios (Section 0);
- Outline of activities associated with a First Strike Response to an oil spill (Section 3.1); and
- Details associated with each of the response strategies (Section 4).

The *Offshore Petroleum and Greenhouse Gas Storage* Act (OPGGS Act) provides the regulatory framework for all offshore petroleum exploration and production and greenhouse gas activities in Commonwealth waters (those areas more than 3 nm from the Territorial sea baseline and within Commonwealth Petroleum Jurisdiction Boundary).

Victoria has specific emergency management legislation, and during a spill this legislation takes precedence. The scope of this plan includes oil spills that may cross jurisdictional boundaries and assumes that if a spill occurs, agencies will respond in a manner consistent with their legislation and advice provided during consultation.

1.3 Environmental Performance Outcomes

Environmental Performance Outcomes	Measurement Criteria
Prevent impact to extreme and highly sensitive environmental receptors from a worst-case hydrocarbon spill and manage to as low as reasonably practical (ALARP) impact to other ecosystems.	Monitoring report results. Outcome of operational NEBAs recorded during an incident response.
No effects on water quality, marine biota or sensitive habitats or Aboriginal registered sites of cultural heritage after termination of the spill response.	Sampling analysis reports.
As per Stakeholder Management Plan (SMP), keep stakeholders informed of status of the hydrocarbon spill response to aid in the mitigation of impacts to social and economic activities.	Communication log indicating stakeholders have been advised as per the SMP.

BHP aims to achieve the primary Environmental Performance Outcomes (EPO) of this OPEP by maintaining a constant vigilance and readiness to prevent and, where required, respond to and effectively manage incidents via the following strategies:

- Initiating source ***Control*** activities as soon as reasonably practicable in order to minimize the spread of oil to the sea surface.
- ***Assessing*** spill characteristics in order to ***Report*** clear and accurate information.
- ***Monitoring*** spill in order to identify key marine and coastal resources in need of protection.
- ***Responding*** to spill using response strategies which are efficient and do not, themselves, damage the environment.

1.4 Activity Description and Location

The Minerva gas field is located approximately 10 km offshore from Port Campbell, Victoria, in the VIC/L22 permit area.

The offshore facilities include the Minerva-3 and Minerva-4 wells, which are subsea completions located in the northern and southern fault blocks respectively of the Minerva gas field. Each well is capable of supplying the maximum gas plant throughput of 150 TJ/d.

A single 10-inch gas production flowline provides transportation of the gas from the field to the onshore Gas Plant. This flowline is bundled with a single hydraulic control umbilical that provides wellhead control and two chemical injection lines that carry chemicals to be injected into the gas stream to provide the subsea infrastructure protection from corrosion and hydrate formation.

The flowline is laid on the surface of the seabed for approximately 10 km, from the subsea wells to the shoreline. At the shore crossing the flowline and umbilical pass through two 1.6 km long directional drilled boreholes located under the shoreline before continuing underground onshore for a further 3.4 km to the Minerva Gas Plant. The field location is shown in the EP in Section 3.1.

Table 1-1: Minerva offshore locations

LOCATION DETAILS	
Location:	(VIC/L22), approximately 10 kms offshore • Latitude 38° 42' 31.5"S • Longitude 142° 57' 43.1"E
Water Depth:	Well site in approximately 86 m depth

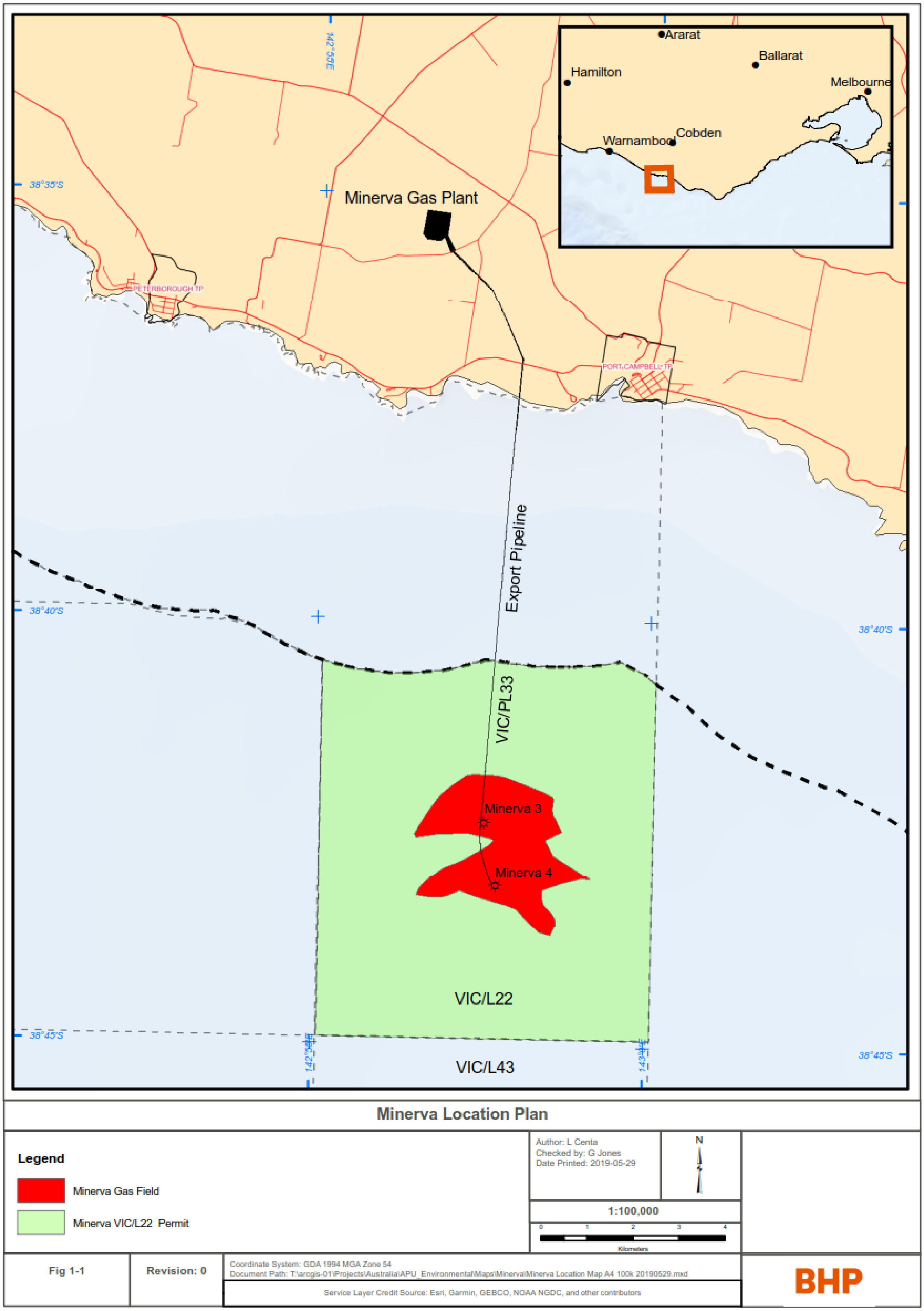

Figure 1-1: Minerva Gas Field Location

2 Identified Risks

2.1 Credible Spill Scenarios for Minerva Operations

The spill scenarios in which hydrocarbons may be released to the marine environment during operations or cessation activities are provided in Table 2-1. The justification for the selection of these spill scenarios are described in the Minerva Operation and Cessation EP.

This OPEP will be based on a–100 m^3 diesel spill from a vessel as it is the worst case credible will scenario. Section 7 and 8 of the EP details the risk assessment and management for each of these scenarios respectively, which is not repeated in this document. This includes:

- Description of the spill scenarios;
- Spill frequency;
- Hydrocarbon properties;
- Area that may be affected;
- Risk analysis conclusion and ranking;
- Objectives for spill prevention; and
- Control measures.

Table 2-1: Hydrocarbon Spill Scenarios

Hydrocarbon	Activity	Scenarios	Volume	Likelihood
Hydraulic Oils and Lubricating Fluids	Vessel	Burst Hose	0.08 m^3	Possible
Gas, condensate	Subsea Infrastructure	Damage to flow lines, subsea infrastructure, rupture of pipeline	Condensate 0.035 m^3 Gas 752 m^3	Unlikely
Chemical Injection	Subsea Infrastructure	Rupture of umbilical	26.4 m^3	Unlikely
Wells condensate and gas	LOWC - Closed Valve Leakage	Loss of the flowline or umbilical/flying lead small bore fittings connecting to the Subsea tree	Condensate (1 STB / 0.16 m^3) Gas (0.3024 MMscf / 0.0085 ksm^3)	Unlikely
Marine Diesel	Vessel	Vessel collision resulting in a ruptured fuel tank	Up to 100 m^3	Highly Unlikely

*Spills less than 80 L are managed by vessel Shipboard Oil Pollution Emergency Plan (SOPEP) and not covered in this OPEP.

2.2 Area That May Be Affected

Definition of the Area that may be Affected (AMBA) for hydrocarbon spills from Minerva Operations Cessation is included in the EP. In defining the AMBA, a range of factors detailed in the National Offshore Petroleum Safety and Environment Management Authority (NOPSEMA) Oil Spill Contingency Guideline (NOPSEMA, 2012) have been considered. Specifically, the size of the AMBA has been based upon the quantity of oil, duration of discharge, concentration of hydrocarbons, film thickness of oil that can result in ecological impacts, zone of oil spill response activities and the environment conditions that contribute to largest distance travelled by the most persistent hydrocarbon.

2.2.1 Diesel

A weathering study was carried out on the release of 100 m^3 diesel in the environment encountered at the Minerva well site using the ADIOS2 (Automated Data Inquiry for Oil Spills) software. ADIOS2 incorporates a database containing more than a thousand crude oils and refined products, and provides quick estimates of the expected characteristics and behaviour of oil spilled into the marine environment.

To inform the setup of ADIOS2, climate data was taken from Section 4 of the EP and multiple scenarios where run to assess the characteristic weathering outcomes of releasing 100 m^3 into the environment. The data selected is outlined in Table 2-2.

Table 2-2: Input data for ADIOS2 scenarios

Oil Type	Wind Speed (Knots)	Wind Direction	Wave Height (m)	Temperature	Salinity	Current speed (m/sec)	Current direction
Marine Diesel (API 31.6, Pour Point - 12º)	Average 11-12 Max 36-39	Onshore	Average 2-3.5 Max 7.6	Winter 9-12 Summer 15-18	32 g/kg	0.1	East-south-east

The purpose of the ADIOS2 study was to understand how a 100 m^3 release to the environment under consideration would act and how soon a diesel release would reach a stage where it was considered removed from the surface environment.

It should be noted, that ADIOS2 does not provide information on sea surface thickness nor concentrations of entrained or dissolved fractions in the water column. Therefore, an 'end point' of when visible diesel is removed from the sea surface is difficult to ascertain. For the purposes of this exercise it was considered that when the dispersed fraction had reached >70% and remaining oil was <15%, that the majority of the diesel had become weathered and removed from the sea surface. A summary of the results include:

- By running multiple scenarios it was found that wave height was the dominant factor in assisting in dispersion and evaporation of the release volume;
- Dispersion was the main pathway of removal of the diesel components;
- While events with wave heights of 7.6 m were considered, the outcome was not carried forward, as operational restrictions would prevent a vessel being in the field at this time; and,
- Based on the inputs and outputs selected, the time for the diesel to become predominantly weathered was between 3-8 hours.

Using these results, a further step was taken to estimate how far a diesel slick would travel, using the time to the predominant weathered stage, the current speed and direction and wind speed and direction. As a rule of thumb oil will move on water with 3% of the wind's energy and 100% of the current speed. A resultant trajectory can be calculated for the expected location of the oil spill as per example in Figure 2-1.

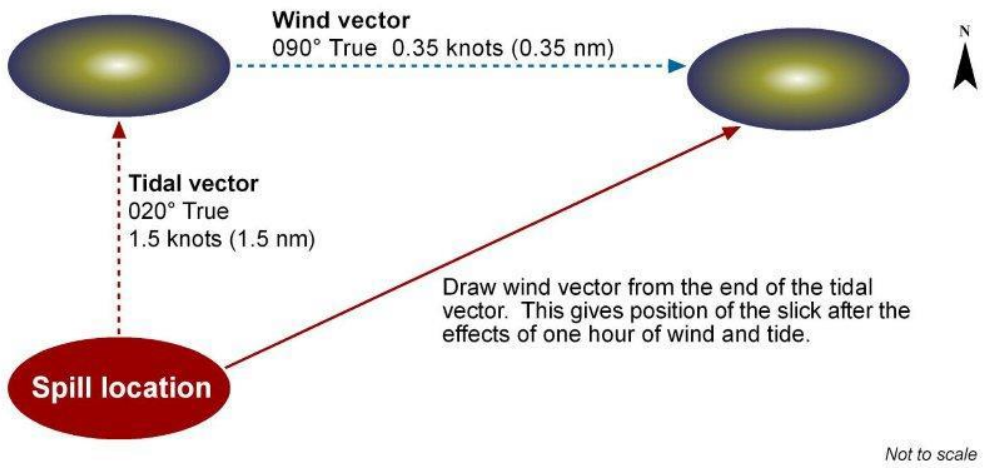

Figure 2-1: Manually predicting spill movement

By using the outputs of the ADIOS2 weathering study, it was possible to calculate how far a diesel slick would travel based on the inputs discussed above. The conclusion of which identified that the furthest distance that may be covered by a 100 m^3 diesel slick at the Minerva well heads in any direction would be 8.2 km, the results can be seen in Table 2-3 and the resultant AMBA in Figure 2-2. From these calculations it can be shown that a diesel spill of 100 m^3 from the Minerva offshore location is not predicted to come ashore.

Table 2-3: Calculation of trajectory results

Current Vector distance	Wind Vector Distance	Wind Speed (Knots)	Wave Height (m)	Current Speed	Time to predominant Dispersion (hrs)	Distance covered by slick trajectory (km)
1.08	5.99	36	3.5	0.1m/sec	3	7.07
2.16	3.66	11	3.5	0.1m/sec	6	5.82
2.88	5.33	12	2.0	0.1m/sec	8	8.21
1.08	6.49	39	2.0	0.1m/sec	3	7.57

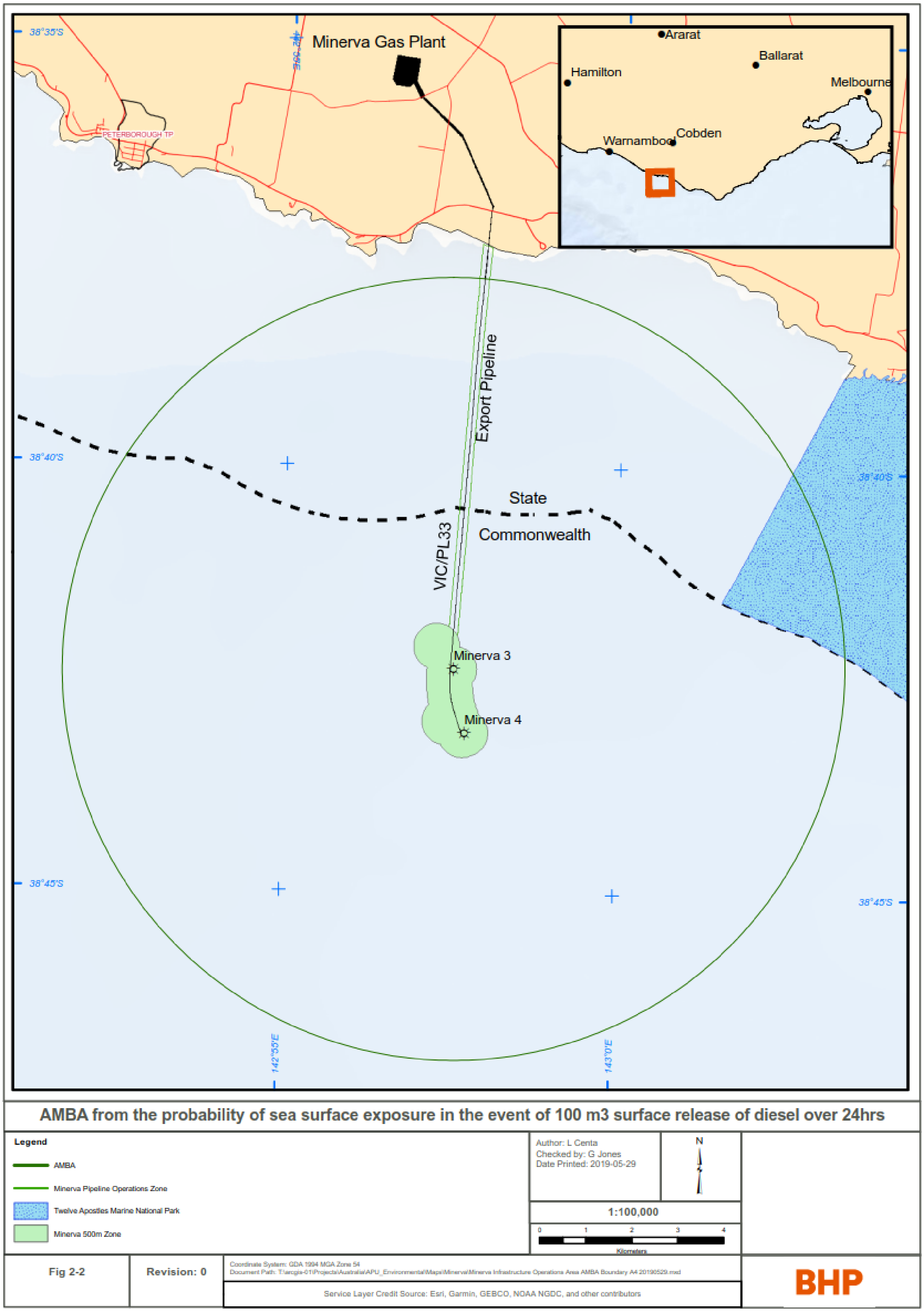

Figure 2-2: AMBA from the probability of sea surface exposure in the event of a 100 m^3 surface release of diesel over 24 hours

2.2.2 Loss of Well Control

A release from the Minerva gas wells would involve a gas comprised almost entirely of methane (93.5 %) and other small chained gases (5.5%), with any hydrocarbons that could form a condensate remaining in vapour phase. There would not be any liquid hydrocarbons on the sea surface.

LOWC - Closed Valve Leakage (loss of the flowline or umbilical/flying lead small bore fittings connecting to the Subsea tree) would result in small loss of 0.16 m^3 condensate and 8,552 m^3 gas. Impacts to seabed biota in the vicinity of the wells are negligible in the absence of any significant habitat. Any release rapidly dilute, with effects localised to the release point.

2.3 Sensitivity of Resources

A full description of the biological environment is given in the Minerva Operations Cessation EP. To develop a spill response plan, resources need to be ranked based on their sensitivity. The ranking can then be used to prioritise oil spill response techniques or allocation of resources. As described in Section 2.2 a diesel spill does not reach coral habitats or shorelines and therefore shallow water habitats are not affected. Therefore, the spill response planning for diesel spills are in the open ocean.

Table 2-4: Summary of Receptors and Sensitivity Ranking. Adapted from IPIECA, 1996

Sensitivity	Open Ocean	Shallow Water	Response
Extreme		Migratory shorebirds and their habitat	The AMBA (Level 2 spill) intersects with migratory shorebirds and their habitats. Shoreline response measures will be put in place to manage the impact to this extremely sensitive environment.
	Threatened Ecological Community (TEC)	TEC	There are giant kelp marine forests in South Eastern Australia that may occur within the AMBA during a spill. The best assessed course of action for remediation of macroalgae from smothering is to allow natural wave energy to assist in the natural dispersion of weathered oil, any mechanical recovery or dispersant use may only increase the impact to the reef system (IPIECA, 1990-2005 Volume 3).
High	Twelve Apostles Marine National Park	Twelve Apostles Marine National Park	There are unique limestone formation including the twelve apostles, and a range of marine habitats mainly subtidal soft sediments or sand supporting communities of bivalves, polychaetes and amphipods with the AMBA. Response strategies will be to undertake marine recovery and shoreline response, therefore impacts to marine habitats will be managed by all reasonable efforts to remove hydrocarbons.
		Arches Marine Sanctuary	There are underwater limestone formations of arches and canyons that support giant kelp hard, and associated fauna communities such as seastars, sponges, gorgonians, hydroids and bryozoans. Shoreline response will be undertaken so that impacts to biota or sensitive habitats will be managed by all reasonable efforts to remove hydrocarbons.
	Marine mammals (whales, seals, dolphins) and sharks	Marine mammals (whales, seals, dolphins) and sharks	It has been identified that marine mammals and sharks may be present within the AMBA for all levels of a spill. The purpose of the response measures will be to manage these impacts by removing observable and detectable spilt hydrocarbons to the marine environment.
	Marine reptiles (e.g. turtles)	Marine reptiles (e.g. turtles)	No natal beaches, mating areas nor feeding areas fall within the AMBAs, however there may be some marginal feeding and pelagic habitats. Response strategies will be to undertake oiled wildlife response and shoreline protection / response, therefore impacts to biota or sensitive habitats will be managed by all reasonable efforts to remove hydrocarbons.
	Avifauna	Avifauna	There are many species of seabirds within the AMBA that could be affected by an oil spill. Response strategies will be to undertake oiled wildlife response and shoreline protection /

Sensitivity	Open Ocean	Shallow Water	Response
			response, therefore impacts to biota or sensitive habitats will be managed by all reasonable efforts to remove hydrocarbons.
Moderate		Tourism and Recreational Fishing	There are fish and fish habitat and human usage along much of the coastline within the AMBA that could be affected by an oil spill. Response strategies will be to undertake shoreline protection / response, where possible, therefore impacts to biota or sensitive habitats will be managed by all reasonable efforts to remove hydrocarbons.
	Commercial Fisheries	Commercial Fisheries	Commercial fisheries within the AMBA is low, however could be affected by an oil spill. Response strategies will be to undertake marine recovery and shoreline response, therefore impacts to fisheries will be managed by all reasonable efforts to remove hydrocarbons.
Low		Exposed Rocky Shores and Cliffs	Within these areas the natural degradation of oil would be rapid due to strong wave action. Beaching of oil residue may result in the mortality of the animals inhabiting the shores, primarily molluscs and barnacles. Recovery rates are considered moderate too fast.

Adapted from IPIECA 1996

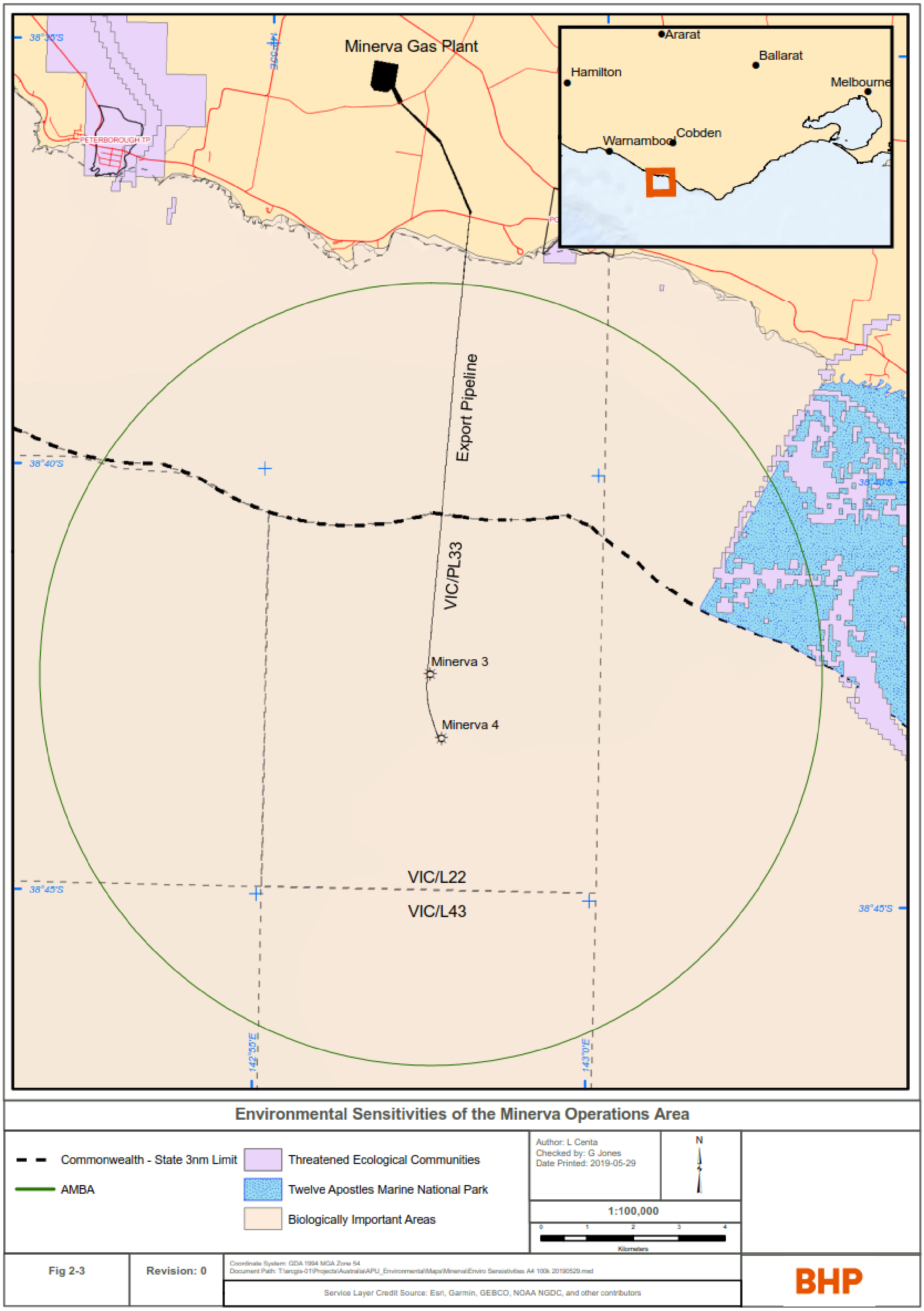

Figure 2-3: Environmentally sensitive areas for Minerva Operations Area

3 First Strike Response

3.1 First 24 Hours of an Incident

The following First Strike Plan provides guidance to the BHP Incident Management Team (IMT) in the first 24 hours of the spill to respond to a loss of hydrocarbons. Operational phases are listed in 2, 8, 16 and 24 hour periods post-mobilisation of the IMT. In some cases there may be no specific actions described for an activity period.

Post 24 hours, the BHP IMT will develop Incident Action Plans (ICS Form 204) and Operational NEBAs, which is described further in Section 3.2.

The time-steps provided in the First Strike Plan for each response strategy that follow are consistent with achieving the OPEP Performance Outcomes that are described in previous Section 1.3.

Table 3-1: IMT actions in first 24 hours of a spill

Response Strategy	Response Activity	Level 1	Level 2	Level 2 - LOWC Closed Valve Leakage
		10 m^3 diesel spill	100 m^3 diesel spill	0.16 m^3 condensate and 8,552 m^3
Notification & Establish Response Organisation	IMT	Notify*	Activate*	Activate*
	Emergency Management Team (EMT)	Notify*	Notify*	Notify*
	Regulatory Agency	Notify*	Notify*	Notify*
	Technical Support	Notify*	Notify*	Notify*
Source Control	Source control	Activate	Activate	Activate (Note1)
Determine Potential Impacts	Oil Spill Trajectory Modelling	×	Activate	Activate
	Monitor and Evaluate - Aerial Surveillance	Optional	Activate	Activate
	Monitor and Evaluate - Marine Surveillance	Activate	Optional	Optional
Offshore Response	Mobilise Dispersant	×	×	×
	Aerial Dispersant Application	×	×	×
	Marine Dispersant Application	×	×	×
	Marine Recovery	×	×	×
	Mechanical Dispersion	×	×	×
	Natural Recovery	Yes	Yes	Yes
Shoreline Response	Forward Command Post	×	Standby	Standby
	Shoreline Protection	×	Standby	Standby
	Shoreline Clean-up	×	Standby	Standby
	Environmental Monitoring Procedures	×	Standby	Standby
	Oiled Wildlife Response	×	Standby	Standby
	Waste Management Plan	×	Standby	Standby

* Process described in detail in the BHP Incident Management Manual

(Note 1) Source control includes subsea intervention from vessel for LOWC Closed valve leakage

3.1.1 IMT Mobilisation

2 h

- Incident Commander to consider additional resources to support Event Emergency Response and Oil Spill Response requirements as per Incident Management Manual (IMM).
- Incident Commander to notify EMT of incident.

8 h

- Incident Commander to prepare for back up IMT team to be mobilised if response is going to extend beyond 8 h.

16 h

- Incident Commander to prepare further IMT team resources to be mobilised if response is going to extend beyond 16 h.

24 h

- Incident Commander to prepare handover to back up IMT teams.

>24 h

- Undertake, review and prepare daily handover under response conditions.
- Co-ordinate and communicate IAP updates to relevant parties.

3.1.3 Notifications

2 h	• Incident Coordinator to contact Regulatory Agencies based on spill response level as listed in the table below <2 h.
8 h	• Liasion officer to provide updates to regulatory agencies.
16 h	• Liasion officer to provide updates to regulatory agencies.
24 h	• Liasion officer to arrange for Vic DoT to mobilise to BHP IMT if there is a potential for shoreline impact (Level 2/3 Response).
>24 h	• Liasion officer to maintain communication with regulatory agencies as and when required.

Supporting Information

Agency	Pollution Report (POLREP)* required	Level 1	Level 2	Level 2 - LOWC Closed Valve Leakage	Telephone
NOPSEMA	Yes	Notify	Notify	Notify	08 6461 7090
Australian Maritime Safety Authority (AMSA)	Yes	No	Notify	No	1800 641 792
Vic Department of Transport (DoT)	Yes	No	Notify and Mobilise	Notify	(03) 9208 3404 (03) 5525 0900 (24 hours)
Victorian Fisheries Authority	Yes	No	Notify	Notify	1800 226 226
Department of Jobs, Precincts and Regions (DJPR)	No	No	Notify	Notify	(03) 9651 9999 State Animal Welfare Commander 136186
Department of the Environment and Energy (DoEE)	No	No	Notify	Notify	02 6274 1372 1800 110 395
Director of National Parks (DNP)	No	No	Notify	Notify	0419 293 465 (24 hours).

*refer to Appendix A.

3.1.4 Technical Resource Support

2 h

- Operations to advise AMOSC of incident, request for technical assistance to be mobilised into the IMT Room.

8 h

- AMOSC and OSRL Technical Support available to Perth IMT Leader either in person (AMOSC) or via Video Conference or telephone (OSRL).
- IMT to advise OSRL and request for technical assistance in Perth and onsite at the forward command post.

16 h

- AMSOC / OSRL develop Technical Support Roster to IMT for next 72 h.

24 h

- IMT and OSRL develop mobilisation plan for OSRL specialists to Perth.
- Mobilise OSRL Specialists to Perth.

>24 h

- Maintain and log channels of communication with OSRA's.
- Complete daily debriefing with OSRA's and outline IAPs.

Supporting Information

Key Contacts

Australian Marine Oil Spill Centre (AMOSC)	Tel: 03 5272 1555
The Response Group (TRG) 24-Hr Support contact	Tel: +1 (281) 880-5000
Oil Spill Response Limited (OSRL Duty Manager)	Tel: +65 6266 1566

AMOSC Call out Phases

AMOSC Advice Level	Status	AMOSC Requirements
Level 1	Forward Notice	Advise a potential problem. Provide or update data on oil spill. Update information on spill and advise 4 hourly.
Level 2	Standby	AMOSC resources may be required. Assessment of resources and destination to be made. Update information on spill and advise 2 hourly.
Level 3	Callout	AMOSC resources are required. Detail required resources and destination.

BHP OSRA Activation Authorities

Oil Spill Response Agency (OSRA)	BHP Activation Authority
AMOSC	Incident Commander / IMT Leader / EMT Leader / Power of Attorney (POA) Execution Authority / Senior Drilling and Completions Manager
OSRL	

3.1.5 Source Control

2 h	• Operations to confirm spill status with OIM. • Vessel spill / release from bulk storage: transfers from damaged tank to alternative tanks or vessel.
8 h	• Update IMT on spill size, volume and situation.
16 h	• Update IMT on spill size, volume and situation.
24 h	• Establish plan for source control of diesel spills up to 100 m^3, within 24 h. • Establish plan for source control of loss of containment, within 24 h
>24 h	• Complete daily safety analysis for the next 24 h period. • Carry out source control requirements as per IAP.

3.1.6 Forward Command Post

2 h	• Inform City of Warrnambool forward command post to be set up in Warrnambool. • Logistics Coordinator to determine what BHP resources can be mobilised to Warrnambool (or Melbourne).
8 h	• Secure accommodation and rental vehicles in Warrnambool (or Melbourne).
16 h	• Confirm IT connection to Forward Command Post is up and running.
24 h	• BHP representative on site in Warrnambool (or Geelong). • BHP representative establishes ground logistics plan with Warrnambool Light Industrial.
>24 h	• Complete daily safety analysis and NEBA for next 24 h period. • Carry forward logistics requirements as per IAP.

Supporting Information

Forward Command Post	
City of Warrnambool Contact	Tel: 03 5559 4800
State Emergency Service (SES) Warrnambool	Tel: 1300 796 356

3.1.7 Monitor and Evaluate

3.1.7.1 Aerial Surveillance

2 h
- Arrange Helicopters from Warrnambool or Tooradin and provide spill location.
- Mobilise trained aerial surveillance people.

8 h
- Complete first aerial observation flights (daylight hours).
- Aerial surveillance observer logs (Appendix C) to be submitted to IMT.

16 h
- Planning second flight based on oil spill trajectory modelling and spill tracking buoy locations.

24 h
- Establish long term aerial observation plans with additional aircraft and trained observers from AMOSC or OSRL.

>24 h
- Complete daily safety analysis for the next 24 h period.
- Complete surveillance requirements as per IAP.

3.1.7.2 Vessel Surveillance

2 h
- Planning Section Chief request for fast response vessel in the area the need to mobilise for oil spill response.
- Advise surveillance of location of spill and any safety precautions.

8 h
- Spill location information and observations reported to IMT.

16 h
- Spill location information and observations reported to IMT.

24 h
- Continue to provide surveilance until directed by IMT.

>24 h
- Complete daily safety analysis for the next 24 h period.
- Complete surveillance requirements as per IAP.

3.1.7.3 Oil Spill Trajectory Modelling

2 h

- Confirm deployment of oil spill tracker buoy.
- Planning Section Chief to contact AMOSC, activate RPS-APASA OSTM contract.
- Planning Section Chief to obtain and communicate necessary modelling input data to RPS-APASA.

8 h

- Oil spill trajectory modelling report received.
- Provide trajectory modelling results to logistics for aerial surveillance planning.
- Identify AMBA and determine areas for 'post-spill / pre-impact' monitoring.
- Confirm hydrocarbon characteristics and confirm with RPS-APASA.

16 h

- Obtain spill tracker data.
- Correlate spill trajectory modelling with real time data from oil spill tracker buoy and communicate to RPS-APASA for update of trajectory modelling.
- Determine need and, if required, frequency of additional tracker buoy deployments.

24 h

- Obtain most recent spill trajectory modelling and communicate to logistics for planning.

>24 h

- Complete daily safety analysis for the next 24 h period.
- Complete modelling requirements as per IAP.

Supporting Information

AMOSC	Tel: 03 5272 1555
RPS-APASA Contact Details:	RPS-Asia-Pacific Applied Science Associates (RPS-APASA)* p: 07 5574 1112 | | www.apasa.com.au
Data Needed for Initial Modelling	Hydrocarbon type, discharge rate / volume
	Discharge release point - coordinates and depth
	Wind conditions (strength and direction)

*Oil spill modelling contractor may vary depending operational needs during a spill response.

3.1.7.4 Satellite Imagery

2 h
- Planning Section Chief request to OSRL for provision of satellite images.

8 h
- Planning Section Chief and Incident Commander to determine image acquisition frequency e.g. daily.

16 h
- Third party satellite imagery provider to inform OSRL of the first available satellite image acquisition time and advise BHP IMT accordingly.

24 h
- OSRL / third party satellite imagery provider deliver satellite image.
- Satellite imagery showing oil spill trajectory used in development of the IAP to inform all response strategies, and used as an input to any OSTM.

>24 h
- Communicate satellite imagery requirements to OSRL for the next 24 h period.
- Complete surveillance requirements as per IAP.

Supporting Information

<table>
<tr><th colspan="2">Details</th><th>Satellite Imagery</th></tr>
<tr><td>Contact</td><td>Tel: +65 6266 1566
OSRL Notification Form - Appendix B</td><td rowspan="4"></td></tr>
<tr><td>Location</td><td>OSRL Singapore</td></tr>
<tr><td>Response Time</td><td>< 24 hours</td></tr>
<tr><td>Tasks</td><td>Determine the Area of Interest (AOI)/coordinates;
Select image acquisition frequency e.g. daily;
Client contact person and email address who wish to receive the image; and
Vendor to inform OSRL of the first available satellite image acquisition time and advise IMT accordingly.</td></tr>
</table>

3.1.8 Environmental Monitoring

2 h

- Planning Section Chief to advise Incident Commander of monitoring contractor requirement to mobilise and issue relavant Operational and Scientific Montoring Guidelines.

8 h

- Monitoring contractor to specify logistics requirements for sampling plan to logistics.
- Confirm ETA of monitoring contractor in Geelong.

16 h

- Planning Section Chief to confirm sampling locations from oil spill trajectory reports.

24 h

- Planning Section Chief confirm monitoring team has arrived onsite.
- Risk assessment for monitoring activities completed.
- Planning Section Chief to confirm sampling is ready to commence, Incident Commander to approve sampling.

>24 h

- Complete daily safety analysis for the next 24 h period.
- IMT to confirm sampling locations based on oil spill trajectory reports.
- Monitoring Contractor to implement monitoring as per IAP.

Supporting Information

Post-spill pre impact environmental monitoring will be initiated. The sampling procedures to assess water and sediment quality, benthic habitats and marine wildlife are described in BHP Australian Production Unit (APU) Environmental Monitoring Procedures. These documents outline work instructions for external consultant(s) undertaking the work noting that the same company may not necessarily be contracted for all monitoring scopes.

	Environmental Monitoring Contractors
Monitoring Contractor – 24/7 Standby Agreement	**SGS Australia Pty Ltd** 10 Reid Road Newburn, Perth Airport, WA 6105 Tel: 1300 487 706
Avifauna – Standby Notification	**Bennelongia** Refer to Appendix C – Contact Directory
Marine fauna, benthic habitats, marine reptiles, and commercial/ recreational fisheries and fishes – Standby Notification	**GHD Pty Ltd** Refer to Appendix C – Contact Directory

3.1.9 Shoreline Protection

2 h	• Operations Section Chief to advise AMOSC of requirement to deploy boom to identified sensitive resources in the State Arches Marine Sanctuary and the Twelve Apostles Marine National Park.
8 h	• Operations Section Chief to advise Vic DoT of potential shoreline contact and intention to deploy protective boom to identified sensitive resources based on OSTM (Section 4.1.3).
16 h	• AMOSC arrange for access to Warrnambool Port to mobilise boom equipment.
24 h	• Mobilise boom equipment from Geelong to selected location.
>24 h	• Complete daily safety analysis for the next 24 h. • Assess efficiency of booming and build response actions into daily IAP. • Complete NEBA for next operational period.

Supporting Information

Mobilise AMOSC shoreline response team to coordinate delivery of shoreline response equipment from Geelong

Deployment of Shoreline Protection Boom/Skimming Equipment	
AMOSC	Tel: 0438 379328
Victorian Department of Transport (Vic DoT)	Tel: (03) 9208 3404

3.1.10 Shoreline Clean-Up

2 h

- Advise AMOSC and OSRL that SCAT Teams and trained shoreline responders are to be placed on standby for mobilisation to Warrnambool (or Melbourne).
- Planning Section Chief to determine size of unskilled workforce.

8 h

- SCAT Team Coordinator to work with SES/ City of Warrnambool / Vic DoT to access predicted impact shorelines.
- Planning Section Chief and HR Chief activate contract with personnel resource company and request mobilisation of unskilled workforce to Warrnambool (or Melbourne).

16 h

- SCAT Team Coordinator to update IMT with predicted scale and scope of oiling and any pre-emptive shoreline clean-up.

24 h

- IMT/SCAT Team Coordinator to establish shoreline protection priorities and begin mobilisation of prority equipment.
- IMT Leader to determine if workforce support is required from other BHP business units (e.g. Iron Ore).

>24 h

- Dependent on OSTM and potential impacts to priority sensitivities, SCAT Teams and trained shoreline responders to begin mobilising to Warrnambool (or Melbourne).
- Planning Section Chief to monitor size of unskilled / BHP shoreline response workforce and amend as necesary.

Supporting Information

Mobilise AMOSC and OSRL Shoreline clean-up and assessment technique (SCAT) Team Leaders and personnel to coordinate delivery of shoreline response equipment from Geelong.

Shoreline Clean-Up	
AMOSC	Tel: 03 5272 1555
OSRL	Tel: +65 6266 1566

3.1.11 Oiled Wildlife Response

2 h
- Advise AMOSC wildlife recovery equipment and team is required to be mobilised.

8 h
- Advise Vic DoT / DJPR oiled wildlife response is necessary, and ETA of equipment and personnel.

16 h
- Monitor progress of oiled wildlife response logisitics.

24 h
- Monitor progress of oiled wildlife response logisitics.

>24 h
- Complete daily safety analysis for the next 24 h.
- Carry out wildlife response as per IAP under advisement of wildlide response experts.

Supporting Information

Advise AMOSC to mobilise oiled wildlife kit, and wildlife response experts.

Notification and Logistics for Oiled Wildlife Response	
AMOSC	Tel: 03 5272 1555
Vic DoT	Tel: 03 9208 3404
DJPR	Tel: 03 9651 9999 Sate Animal Welfare Commander 136186

3.2 Decision Making Criteria for Response Strategy Selection

For oil spill response, the Incident Action Plan (IAP) response strategies are identified through a process that involves the review of key decision making criteria the outcome if which are used as inputs to the Operational NEBA, as outlined in Figure 3-1. This ensures the most effective response strategies with the least detrimental impacts can be selected and implemented.

The IMT must first gain situational awareness by obtaining answers to the following key questions, which are fundamental to any oil spill response:

1) What type of oil has been released?
2) What is the expected behaviour of the oil that has been released?
3) What volume has been released?
4) Is the source under control?
5) Where is the oil going?
6) What environmental receptors/sensitivities are in the path of the predicted oil trajectory?
7) Can the oil be approached or are there safety concerns?
8) Can the oil be contained?
9) Can the oil be dispersed?
10) Will shoreline impact occur and clean-up be required?

To answer these questions, the Incident Commander must review key information such as Engineering advice on the volume and characteristics of the oil released, Oil Spill Trajectory Modelling, Oil Spill Tracker Buoys (OSTB), the weather forecast, AIS vessel feed, aircraft data feeds, operational reports from field teams and environmental monitoring teams to determine presence and/or extent of environmental receptors, advice from the State Government Environmental Scientific Coordinator, any other external advice, the window of Ecological Sensitivity (Section 4.2.6 of EP), oil spill reference documents (as detailed in each response strategy within the EP) and any other Daily Field Reports.

The outcome of this data review step is then used as input to the Operational NEBA process, which assesses the impacts and risks of response strategy options on environmental sensitivities. The spill response risk assessment applies pre-defined assessment classifications (3P to 3N), as shown in Table 3-2, assess the potential "impact" for the receptor sensitivities for each response option (Table 3-3). To aid interpretation where both positive and negative impacts have been indicated for a spill response in Table 3-3, cross-referencing potential impacts with the receptor's protection priority can be used to weight benefit/risk to receptors; and those with higher protection priorities can be weighted as of greater importance than risk to lower priorities for the determination of net environmental benefit.

Where a response has "zero" scores for all receptors and sensitivities, this may still be assessed as being of Net Environmental Benefit (or carried forward to ALARP assessment) based on potential for indirect (rather than direct) reduction in risk. For example, Response Strategy (RS) 2 Monitor and Evaluate has no direct impact on the spill due to implementation of this strategy, but the situational awareness gained from the response allows proactive and effective application of other response strategies thereby contributing to reduction of risk to ALARP.

The NEBA Matrix (Table 3-3) prioritises environmental sensitivities, and assesses the individual net effect that each response option may have on it allowing informed decision to be made. If there are conflicting outcomes for a particular response option then the sensitivity with the higher priority becomes the preferred response option. A NEBA is a decision-making process and will ultimately result in a trade-off of priorities and response strategies. It is possible for a response strategy to be used for one sensitivity, even if it has been identified that this response option may not benefit one or several other sensitivities. The final outcome of the response, however, should result in an overall net environment benefit. Spill response options identified by BHP are outlined in Section 4. An evaluation of the impacts and risks of the spill response options is provided in Section 8 of the EP.

The IMT will apply the Operational NEBA process to identify the response options that are preferred for the situation, oil type and behaviour, environmental conditions, direction of plume, and protection priority of sensitive receptors.

The steps in the Operational NEBA aim to identify:

1. Key ecological values, environmental, socioeconomic and cultural heritage receptors (Table 3-3, Section 4.2.6 of the EP, Geographical Information Systems (GIS) datasets / maps) within the plume path and predicted AMBA based on oil spill modelling;
2. Protection priorities of either High, Medium or Low and determine if receptor is listed as Endangered (E), Threatened (T) or Migratory (M) under the EPBC Act Section 4.2. of the EP) for the period of the oil spill;
3. New situational awareness information that becomes available such as updated spill trajectory models, observations of oil on the water and/or shorelines, locations of sensitive receptors, effectiveness of implemented response strategies, Daily Field Reports, any updated advice from the Emergency and Crisis Centre (ECC) / other external sources for inclusion into daily updates of the Operational NEBA to optimise the IAP. Some sensitive receptors are mobile (e.g. fish, mammals, birds) and may move in and out of the predicted oil path on numerous occasions throughout the response, requiring frequent review of the NEBA table and selection of response techniques documented in IAPs by the IMT; and
4. Select response strategies to be included in the IAP work instruction

The Planning Section Chief will supervise the development of the IAP by the oil spill technical team. The Incident Commander authorises the IAP prior to releasing it to the Operations Section Chief.

Figure 3-1: IMT Oil Spill Response Strategy Decision Tree

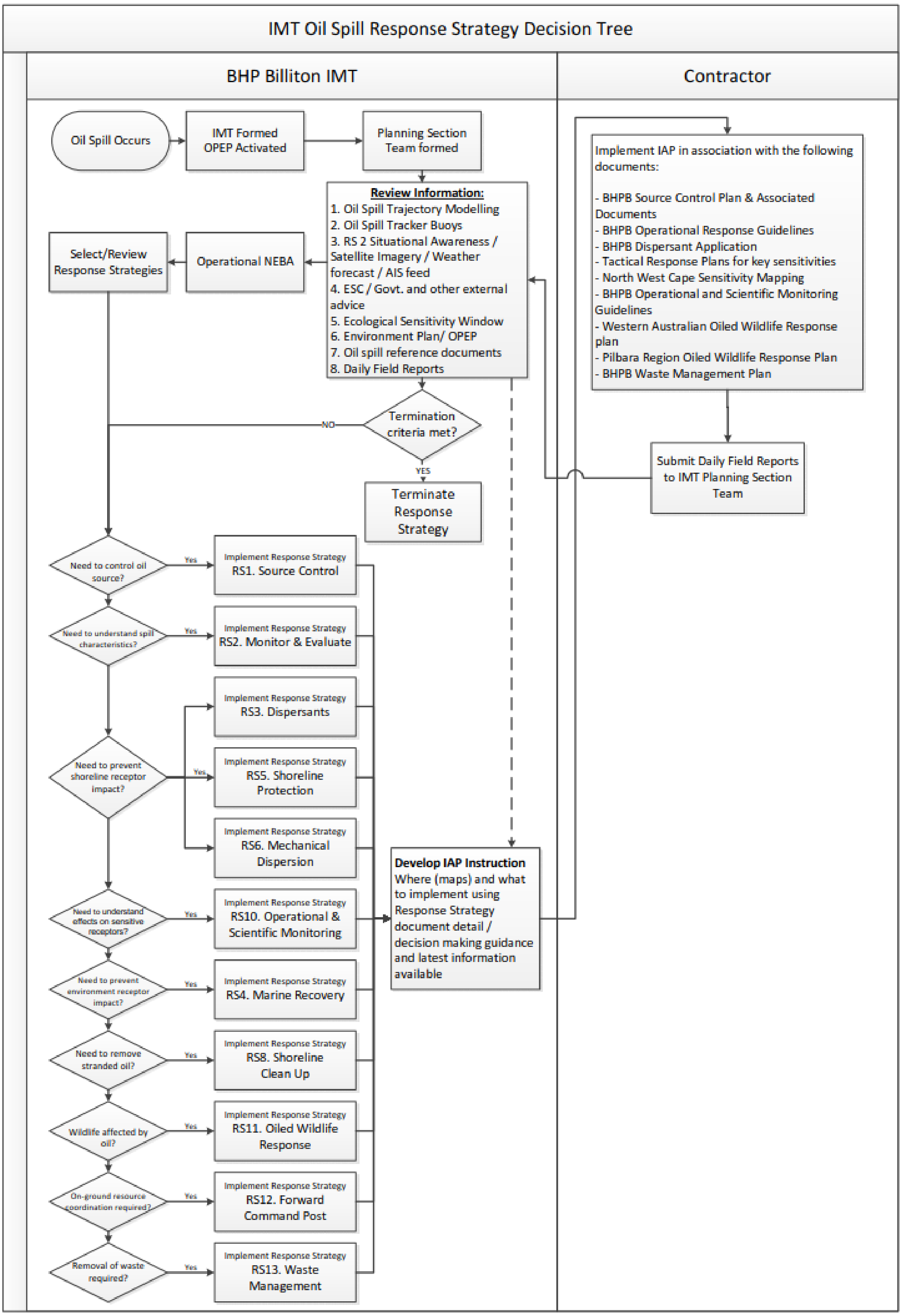

Table 3-2: NEBA impact categories. Categories identify potential change in impact due to response strategies, relative to the impact of the spill

NEBA Categories			Degree of Impact	Potential Duration of Impact	Equivalent BHP Severity Risk Matrix Consequence Level
Positive	**3P**	Major	Likely to prevent: • Behavioural impact to biological receptors; • Behavioural impact to socio-economic receptors, e.g. changes day-to-day business operations, public opinion/behaviours (e.g. avoidance of amenities such as beaches), or regulatory designations.	Decrease in duration of impact by > 5 years	N/A
	2P	**Moderate**	Likely to prevent: • Significant impact single phase of reproductive cycle for biological receptors; or • Detectable financial impact, either directly (e.g. loss of income) or indirect (e.g. via public perception), for socio-economic receptors. This level of negative impact is recoverable and unlikely to result in closure of business/industry in the region.	Decrease in duration of impact by 1-5 years	N/A
	1P	**Minor**	Likely to prevent impact to: • Significant proportion of population or breeding stages, for biological receptors; or • Significant impact to the sensitivity of protective designation for socio-economic receptors; or significant long term impact to business/ industry.	Decrease in duration of impact by several seasons (< 1 year)	N/A
	0	**Non-mitigated spill impact**	**No detectable difference to unmitigated spill difference**		
Negative	**1N**	**Minor**	Likely to result in: • Behavioural impact for biological receptors; • Behavioural impact for socio-economic receptors, e.g. changes day-to-day business operations, public opinion/behaviours (e.g. avoidance of amenities such as beaches), or regulatory designations. **[Note 1]**	Decrease in duration of impact by several seasons (< 1 year)	Minor impact/s (<3 months) to land biodiversity, ecosystem, services, water resources or air. BHP Risk Matrix Severity Level 2, Non Material Risk
	2N	**Moderate**	Likely to result in: • Significant impact single phase of reproductive cycle for biological receptors; or • Detectable financial impact, either directly (e.g. loss of income) or indirect (e.g. via public perception), for socio-economic receptors. This level of negative impact is recoverable and unlikely to result in closure of business/industry in the region.	Increase in duration of impact by 1-5 years	Major impact/s (<5 years) to land biodiversity, ecosystem, services, water resources or air. BHP Risk Matrix Severity Level 4, Non Material Risk
	3N	Major	Likely to result in impact to: • Significant proportion of population or breeding stages, for biological receptors; or • Significant impact to the sensitivity of protective designation for socioeconomic receptors; or • Significant long term impact to business / industry for socioeconomic receptors.	Increase in duration of impact by > 5 years or unrecoverable	Severe (>20 years) to permanent impact/s to land biodiversity, ecosystem, services, water resources or air. BHP Risk Matrix Severity Level 6-7, Material Risk
[Note 1]			Behavioural impacts tend to be short-term and limited in their impact (even on a regional scale). The maximum likely should be considered if a response strategy directly impacts behaviour that results in an impact to reproduction and/or the breeding population, e.g. failure of fish spawning aggregations, then score should be a 2 or 3 rather than 1.		

Table 3-3: Operational NEBA – Response Strategy Selection

Sensitivity	Protection Priority* (based on severity of impact and recovery time)	Seasonal presence on Continental Shelf												Response Strategy										
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	RS1 Source Control	RS2 Monitor and Evaluate	RS3 Dispersant Application	RS4 Marine Recovery	RS5 Shoreline Protection	RS6 Mechanical Dispersion	RS7 In situ Burning	RS8 Shoreline Clean-up	RS10 Environmental Monitoring	RS11 Oiled Wildlife Response	RS13 Waste Management
Ecological																								
Whales	High (T, M)	Y	N	N	N	N	N	Y	Y	Y	Y	Y	Y	2P	0	1N	1P	0	1N	2N	0	0	0	0
Seals	High	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	1N	1P	0	1N	2N	0	0	0	0
Dolphins	High (M)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	1N	1P	0	1N	2N	0	0	0	0
Sharks	High (T, M)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	1N	1P	0	1N	2N	0	0	0	0
Fishes (resident, demersal, pelagic)	High	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	1N	1P	0	1N	2N	0	0	0	0
Turtles (foraging, pelagic habitats)	High (T, M)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	1N	1P	0	1P	2N	0	0	2P	0
Migratory birds	Extreme (T, M)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	2P	1P	1P	2P	2N	0	0	2P	0
Seabirds	Medium	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	2P	1P	1P	2P	2N	0	0	2P	0
Shorebirds	Medium	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	2P	1P	1P	2P	2N	1P	0	2P	0
Habitat/Ecosystem																								
Threatened Ecological Community (TEC)	Extreme	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	1P	1P	2P	1P	3N	1P	2P	0	2P
Twelve Apostles Marine National Park	Medium	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	1P	1P	2P	1P	3N	1P	2P	0	2P
Arches Marine Sanctuary	Medium	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	1P	1P	2P	1P	3N	1P	2P	0	2P
Sandy beaches	Low	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	1P	1P	1P	1P	1P	1P	2P	0	2P
Rocky shore	Low	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	1P	1P	1P	1P	1P	0	2P	0	0
Open waters	Low	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	1N	1P	0	1N	2N	0	2P	0	0
Socio-economic																								
Tourism	Low	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	1P	1P	2P	1P	2N	2P	0	0	2P
Fisheries	Low	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	1N	0	0	1N	2N	0	0	0	0
Response strategy provides Net Environmental Benefit?														Yes	Yes	Potential	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Response strategy feasible?														Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Is response strategy recommended (and ALARP assessment required)?														Yes	Yes	Potential	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes

***Protection priority**: This ranking is based on a combination of factors including the likelihood of impact (time of year), severity of impact (type of exposure to the sensitivity, where the sensitivity is listed as Threatened (T) or Migratory (M) under the EPBC Act) and recovery time after exposure to hydrocarbons).

Shoreline response: Where shoreline clean-up has been given a negative score, this indicates that the use of equipment, machinery and personnel in that environment is likely to have negative effect, potentially causing more damage and prolonging the recovery and environmental benefit to that sensitivity.

3.3 IMT Incident Briefing Documents and Task Checklists

The purpose of the IMT is to gain control of an incident or event and bring it to a safe resolution whilst minimising the impact on personnel, the environment, assets and reputation. The key to achieving control of an incident is successful transition from an initial reactive mode to a proactive planning mode. This can be achieved through a series of iterative stages that create and refine an IAP as summarised in Figure 3-2.

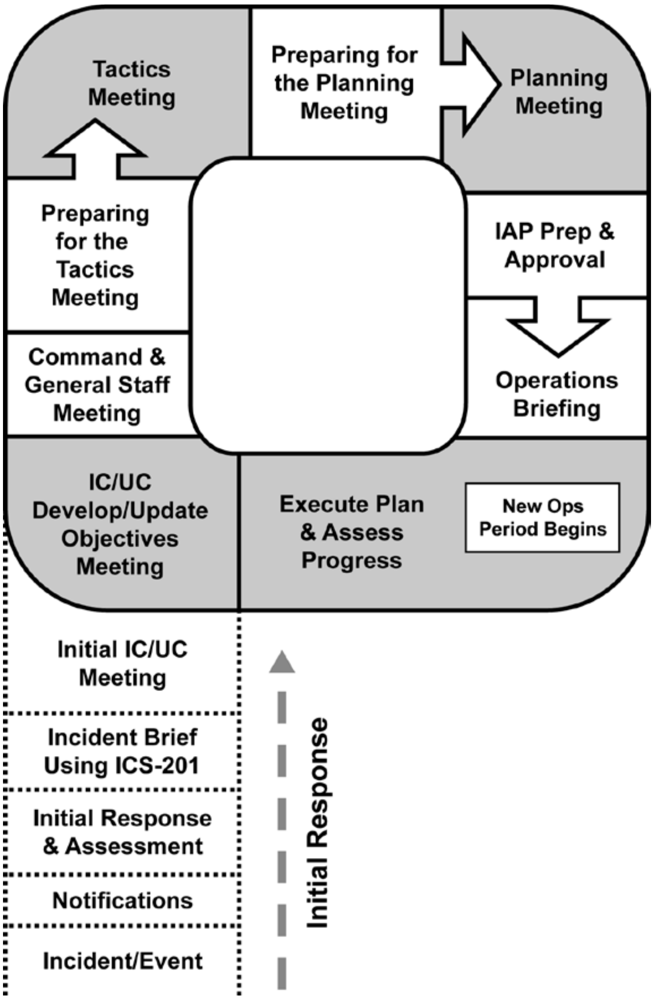

Figure 3-2: Planning cycle used by BHP IMT

The Incident Briefing Checklist acts as the IAP for the initial response (i.e. within the first 24 hours of the incident) and is used and updated until Planning prepares the first incident IAP that is approved by IMT Leader. This checklist also acts as a permanent record of the initial response to the incident.

The BHP Incident Management Manual (AOHSE-ER-0001) provide IMT members task checklists and guidance on systems, processes and procedures to establish the IMT during first hours of the response

4 Response Strategies

A summary of the strategies selected during the NEBA process for each specific scenario assessed is presented in Table 4-1. Further description of each strategy includes a risk assessment on carrying it out, the control options and a conclusion as to how the strategy demonstrates ALARP and BHP acceptability criteria.

Table 4-1: Summarised Response Strategies for the Minerva Activities

Response Strategy		10 m^3 Diesel (Level 1)	100 m^3 Diesel (Level 2)	LOWC – Closed Valve Leakage 0.16 m^3 condensate and 8,552 m^3 Level 2
RS1.1:	Source Control – Vessel Control	✓	✓	✓
RS1.2:	Source Control – Wells loss of containment			✓
RS2:	Monitor and Evaluate	✓	✓	✓
RS3:	Dispersant Application		✗	✗
RS4:	Marine Recovery			
RS5:	Shoreline Protection			
RS6:	Mechanical Dispersion		✗	✗
RS7:	In-Situ Burning			
RS8:	Shoreline Clean-up			
RS9:	Natural Recovery	✓	✓	✓
RS10:	Operational and Scientific Monitoring		✗	✗
RS11:	Oiled Wildlife Response		✗	✗
RS12:	Forward Command Post		✗	✗
RS13:	Waste Management		✓	✓

* Potentially activated depending on reports/observations of RS2 Monitor and Evaluate.

Each option has advantages and disadvantages with regard to effectiveness, operational constraints, and environmental impacts. Consequently, spill response strategies need to be assessed on a case by case basis, taking into account the nature of the spill, Oil Spill Trajectory Modelling (OSTM), the weather conditions, and the advantages and disadvantages of each response strategy.

4.1 RS1.1 Source Control – Vessel

1. Response Strategy	Source Control – Vessel
2. Objective	To prevent the impact on water quality and marine biota resulting from Level 1 and 2 spills by reducing, controlling or halting the discharge of hydrocarbons to the marine environment to ALARP by the implementation of the vessel-specific MARPOL-compliant SOPEP.
3. Rationale	Source control is a priority for any loss of hydrocarbon containment. Managing control of the source will contribute to the broader aim of preventing impacts to sensitive environmental receptors.
4. Initiation Criteria	Level 1: 10 m^3 diesel spill Level 2: 100 m^3 diesel spill Level 2: LOWC - closed valve leakage - Condensate
5. Activation Time	Level 1/2: < 2 hours following a diesel spill. Level 2: LOWC - closed valve leakage: < 24 hours after notification from BHP IMT.

6. Course of Action

Number	Action	Responsible person	Action status
Diesel spill			
1.	Shut down any transfer operations, and ensure all valves are closed.	Vessel Master / Offshore Installation Manager (OIM)	
2.	For support vessels, relocate away from sensitive areas.	Vessel Master/ OIM	
3.	Where practicable, using oil spill kits (SOPEP) located on board vessel to minimise hydrocarbons entering the marine environment.	Vessel Master/ OIM	
4.	Pump out any leaking tanks, ensuring vessel remains in a stable condition.	Vessel Master/ OIM	
LOWC / Subsea leak			
5.	Upon notification, arrange vessel with ROV capability, transit to spill location	Vessel Master/ OIM	
6.	Set up exclusion zone around site	Vessel Master/ OIM	
7.	Deploy ROV to inspect, confirm any leaks, and rapidly respond	Vessel Master/ OIM	
8.	Identify and mobilise specialised tooling (if required)	Vessel Master/ OIM	

7. Resources

Resource Identifier	Leader	Source / Location, Special Equipment, Remarks
Personnel	Vessel Master	All available resources on vessel involved in source control activities

8. Supporting Documentation

Document title	Reference No.	Notes

Support vessel SOPEP		
9. Generic work assignments		
10. Termination Criteria		
The source of hydrocarbon spill is under control, the site is safe and the release of hydrocarbons to the marine environment has ceased; Deemed unsafe to continue implementing RS1 activities; Agreement is reached with the jurisdictional authority relevant to the spill to terminate the response; and When control of the well leak has been re-established.		

4.2 RS2 Monitor and Evaluate

1. Response Strategy	Monitor and Evaluate
2. Objective	Monitor and Evaluate capability will be maintained to prevent spill impacts to extreme and highly sensitive environmental receptors and to maintain situational awareness throughout emergency response activities.
3. Rationale	This strategy includes assessment of the location, volume, weathering state, and trajectory of spills. The spill will be monitored constantly and evaluated by surveillance. The results of surveillance operations are crucial for implementing further strategies for responding to and managing a spill event. Additionally this response strategy will provide information in support of the decision-making process of whether natural dispersion is an appropriate strategy.
4. Initiation Criteria	Level 1: 10 m^3 diesel spill Level 2: 100 m^3 diesel spill Leve 2: LOWC – closed valve leakage
5. Activation Time	< 2 hours after notification from BHP IMT.
6. Course of Action	

Number	Action	Responsible Person	Action Status
1.	Deploy OSTBs.	OIM / BHP HSR	
2.	Mobilise helicopters with trained aerial oil spill observers.	IMT OSC	
3.	Develop a schedule of aerial surveillance flights.	IMT PSC	
4.	When practicable to do so, activate aerial surveillance of spill area using aerial surveillance logs.	IMT OSC	
5.	Submit aerial surveillance logs to BHP IMT.	Aerial observer	
6.	Activate marine surveillance via mobilisation of BHP contracted fast response vessels	IMT OSC	
7.	Activate OSTM through AMOSC to oil spill modelling agency (RPS-APASA). Advise oil spill modellers to use model settings contained in Table 9.6 of the EP.	IMT PSC	
8.	Provide any aerial surveillance logs or oil spill trajectory data obtained from the OSTBs to oil spill modelling agency.	IMT PSC	
9.	On receipt of the OSTM, provide updates on predicted oil spill trajectories and/or shoreline contact areas to IMT.	IMT PSC	
10.	Activate satellite imagery acquisition via contract with OSRL.	IMT PSC	
11.	Activate subsea surveillance via mobilisation of seagliders through service agreement with third party preferred vendor.	IMT PSC	
12.	Activate RS10 Environmental Monitoring if aerial observers report that Extreme or High Sensitivity receptors (Table 2-4) are at risk of being impacted by surface hydrocarbons.	IMT PSC	

Resource Identifier	Leader	Source / Location, Special Equipment, Remarks

Vessels	BHP contracted vessel Master	Support vessels (or other vessels of opportunity)
Helicopters	Operations Manager	Warrnambool or Tooradin
Personnel	AMOSC Core Group	Standby aerial observers
OSTM	RPS-APASA	Principal oceanographer
OSTBs	Preferred vendor	Surface tracking of oil spill via satellite-linked buoys
Satellite Imagery	OSRL	Large-scale monitoring capability
Seagliders / Autonomous underwater vehicles (AUVs)	Preferred vendor	Subsea monitoring of oil / dispersed oil
7. Supporting Documentation		
Document Title	**Reference No.**	**Notes**
APU Operational Response Guideline 4 – Oil Spill Tracking - Buoy Deployment / Tracking).	AOHSE-ER-0033	
APU Operational Response Guideline 1 – Aerial Surveillance. Confirmation, Quantification and Monitoring of Oil Spills.	AOHSE-ER-0041	Potential for contact with sensitive receptors to serve as potential triggers for Operational and Scientific Monitoring Guidelines: seabirds, marine mammals/whale sharks, benthic habitats, marine reptiles, commercial/recreational fish species and fishes (RS10).
APU Oil Spill Response Strategy – RS2 Monitor and Evaluate	AOHSE-ER-0053	

8. Generic Work Assignments

Monitor and Evaluate:

- Oil spill characteristics – location, dimensions, oil thickness, direction, weather conditions;
- Oiled wildlife; and
- Shoreline contact, accumulation.

9. Termination Criteria

Hydrocarbons not detected by any of the ‘Monitor and Evaluate’ surveillance techniques;
Deemed unsafe to continue implementing RS2 activities; and
Agreement is reached with the jurisdictional authority relevant to the spill to terminate the response.

4.3 RS10 Environmental Monitoring

Environmental monitoring response strategies covered below are:

- Water Quality, Sediment Quality and Benthic Infauna;
- Benthic Habitats and Benthic Primary Producers;
- Seabirds and Migratory Shorebirds;
- Marine Mammals and Megafauna;
- Marine Reptiles;
- Commercial and Recreational Fish Species; and
- Effects of an Oil Spill on Fishes.

4.3.1 Water Quality, Sediment Quality and Benthic Infauna

1. Response Strategy	Environmental Monitoring – Water Quality, Sediment Quality and Benthic Infauna
2. Objective	Identify areas potentially impacted by the oil spill and prioritise sensitive areas at highest risk of oil spill effects to maximise effectiveness of first response; Initiate environmental monitoring programs to support and inform spill response planning; assess the effects of spills and monitor post-spill recovery of sensitive environmental receptors.
3. Rationale	Environmental monitoring will be initiated to support the oil spill response strategies and to understand any effects of an oil spill on sensitive receptors. The sampling instructions to assess the effects of a spill on environmental receptors are described in BHP environmental monitoring procedures. These documents outline details such as equipment lists and analytical requirements, chain of custody templates and reporting of results. Monitoring reports will use standard statistical techniques based on 'Beyond BACI' principles (level of statistical significance p<0.05) to assess the environmental effects of the incident as well as effectiveness of the response strategies. Outcomes of the statistical analyses will be used to determine if termination criteria have been achieved. Termination Criteria will be developed in conjunction and consultation with Regulatory agencies. The decision to terminate environmental monitoring sits with the BHP IMT.
4. **Initiation Criteria**	Level 2: 10 - 100 m^3 diesel spills Leve 2: LOWC – closed valve leakage
5. **Activation Time**	< 8 hours after notification from BHP IMT.

6. Course of Action

Number	Action	Responsible person	Action status
1.	Activate contractual agreement with SGS to mobilise personnel and equipment on 'next flight' to Melbourne.	IMT OSC	
2.	Review the IMT Oil Spill Response Strategy Decision Tree (Figure 3-1) and use all relevant and up-to-date information streams in adapting the Day 1 IAP work instructions. Key Information: a) Oil Spill Trajectory Modelling; b) Oil Spill Tracker Buoys; c) RS 2 Situational Awareness / Satellite Imagery / Weather forecast / AIS feed / Flight data; d) ESC / Govt. and other external technical advice; e) Ecological Sensitivity Window; f) Environment Plan;	IMT PSC & Technical Specialist (Environment)	

	g) Oil spill reference documents; and h) Daily Field Reports		
3.	Sampling designs in the environmental monitoring procedures require the selection of Impact and Reference Locations: **Impact Location** –use OSTM, OSTB, situational awareness from field teams, State Govt. ESC, EP (e.g. BIAs, GIS datasets) and Daily Field Reports to identify oiled areas. Impact Location is any location that is currently being affected by released oil (i.e. within the plume of surface / entrained / dissolved / shoreline accumulated oil) or will be in the pathway of released oil in the future. **Reference Location** – use OSTM, OSTB, situational awareness from field teams, State Govt. ESC, EP (e.g. BIAs, GIS datasets) and Daily Field Reports to identify locations that are not affected by oil. Reference Locations should not be impacted by the oil spill, i.e. outside of the plume and the predicted oil spill trajectory. They need to have equivalent characteristics to Impact Locations, e.g. similar depth, aspect, benthic habitats, distance offshore for whales, beach profile for nesting turtles, intertidal zones for birds etc. Seek specialist advice in selecting Reference Locations.	IMT PSC & Technical Specialist (Environment)	
4.	**Sampling design: Water Quality – Physical and Biological** The sampling design for water quality (physical parameters) at minimum to include collection of 2 replicate water profiles from 3 Zones (nearshore, lagoon, offshore) at 3 Sites within at least 5 Locations (minimum of 1 Impact Location and 4 Reference Locations), which are defined in Step 3. 5 Locations x 3 Sites x 3 Zones x 2 replicates = 90 samples Parameters to be recorded using a water quality profiler are to include salinity, conductivity, dissolved oxygen, pH, turbidity, algae, chlorophyll-a, phytoplankton.	IMT PSC & Technical Specialist (Environment)	
5.	**Sampling design: Water Quality – Chemical** The sampling design for water quality (chemical parameters) at a minimum to include collection of 2 replicate samples from 3 depths (surface, mid-water, near bottom) from 3 Zones (nearshore, lagoon, offshore) at 3 Sites within at least 5 Locations (minimum of 1 Impact Location and 4 Reference Locations), which are defined in Step 3. 5 Locations x 3 Sites x 3 Depths x 3 Zones x 2 replicates = 270 samples Water quality samples will be analysed for recoverable hydrocarbons (further details in AOHSE-ER-0037) at NATA accredited analytical laboratory.	IMT PSC & Technical Specialist (Environment)	
6.	**Sampling design: Sediment Quality** The sampling design for sediment quality at a minimum to include collection of 2 replicate samples at 3 Sites at 2 Zones (inshore and offshore) within at least 5 Locations (minimum of 1 Impact Location and 4 Reference Locations), which are defined in Step 3. 5 Locations x 3 Sites x 2 Zones x 2 replicates = 60 samples Sediment samples will be analysed for recoverable hydrocarbons (further details in AOHSE-ER-0037) at NATA accredited analytical laboratory.	IMT PSC & Technical Specialist (Environment)	
7.	**Sampling design: Benthic Infauna** The sampling design for intertidal benthic infauna at a minimum to include collection by hand held corer of 5 replicate samples from 2 Zones perpendicular to the shoreline (upper-, lower intertidal) at 3 Sites within at least 5 Locations (minimum of 1 Impact Location and 4 Reference Locations), which have been defined in Step 3.	IMT PSC & Technical Specialist (Environment)	

	5 Locations x 3 Sites x 2 Zones x 5 replicates = 150 cores At the same time of collecting the intertidal benthic infauna cores, 2 replicate samples will also be taken for determination of sediment characteristics (particle size distribution and total organic carbon). In summary, the sampling design for intertidal benthic macroinvertebrate sediment characteristics is to comprise: 5 Locations x 3 Sites x 2 Zones x 2 replicates = 60 sediment samples		
8.	Assign GIS Specialist to make a map showing sampling design and sampling locations. Map to be saved in a format that can be cut and pasted into the IAP.	IMT PSC & Technical Specialist (Environment)	
9.	Issue IAP to Operations Section. This is an ongoing step during all phases of the incident including clean-up.	IMT PSC & Technical Specialist (Environment)	
10.	Additional sampling will be undertaken as required if the sampling design is insufficient to detect environmental impacts.	IMT PSC & Technical Specialist (Environment)	
11.	Ensure all environmental monitoring contractors use appropriate PPE at all times.	ALL	
12.	The sampling design and frequency will be determined at the time of the commencement of the study using technical and Government advice and reviewed for appropriateness after 12 months. This monitoring is to be conducted every quarter from the commencement for the first 12 months. After the initial 12 month period, the sampling will be conducted on an annual basis until the termination triggers have been met.	IMT PSC & Technical Specialist (Environment)	

7. Resources

Resource Identifier	Leader	Source / Location, Special Equipment, Remarks
Equipment Water quality sampling equipment Sediment quality sampling equipment Benthic infauna sampling equipment As described in AOHSE-ER-0037 – procedure for resourcing and implementation of Environmental Monitoring	SGS	1300 487 706 Mobilised from Perth
Personnel	SGS	1300 487 706
Helicopters		

8. Supporting Documentation

Document title	Reference No.	Notes
Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna	AOHSE-ER-0037	Work instructions to assess effects of hydrocarbons on marine waters, sediments and benthic infauna; and Equipment lists, analytical and reporting requirements.
APU Oil Spill Response Strategy – RS10 Environmental Monitoring	AOHSE-ER-0060	

9. Generic work assignments
Environmental Monitoring: • SGS Team 1: Impact Locations - collect water, sediment and benthic infauna samples at locations as described in the IAP; • SGS Team 2: Reference Locations - collect water, sediment and benthic infauna samples at locations as described in the IAP; • All samples to be stored and shipped following SGS protocols.
10. Termination Criteria
Oil concentrations in marine waters must not exceed normal background concentrations; (if activated) No statistical difference in hydrocarbon concentrations in sediments between impact and reference locations; (if activated) No statistical difference in benthic infauna abundance and diversity between impact and reference locations; Deemed unsafe to continue implementing RS10 activities; and Agreement is reached with the jurisdictional authority relevant to the spill to terminate the response.

4.3.2 Benthic Habitats and Benthic Primary Producers

1. Response Strategy	Environmental Monitoring – Benthic Habitats and Benthic Primary Producers
2. Objective	Identify areas potentially impacted by the oil spill and prioritise sensitive areas at highest risk of oil spill effects to maximise effectiveness of first response; Initiate environmental monitoring programs to support and inform spill response planning; assess the effects of spills and monitor post-spill recovery of sensitive environmental receptors.
3. Rationale	Environmental monitoring will be initiated to support the oil spill response strategies and to understand any effects of an oil spill on sensitive receptors. The sampling instructions to assess the effects of a spill on environmental receptors are described in BHP environmental monitoring procedures. These documents outline details such as equipment lists and analytical requirements, chain of custody templates and reporting of results. Monitoring reports will use standard statistical techniques based on 'Beyond BACI' principles (level of statistical significance $p<0.05$) to assess the environmental effects of the incident as well as effectiveness of the response strategies. Outcomes of the statistical analyses will be used to determine if termination criteria have been achieved. Termination Criteria will be developed in conjunction and consultation with Regulatory agencies. The decision to terminate environmental monitoring sits with the BHP IMT.
4. Initiation Criteria	If surveillance from RS2 reports that benthic habitats (e.g. corals, seagrasses and macroalgae) or benthic primary producers (e.g. mangroves) will be affected by a Level 2 diesel spill / Level 2 LOWC.
5. Activation Time	< 8 hours after notification from BHP IMT.
6. Course of Action	

Number	Action	Responsible person	Action status
1.	Advise GHD to make arrangements to mobilise field teams and equipment to Melbourne.	IMT OSC	
2.	Review the IMT Oil Spill Response Strategy Decision Tree (Figure 3-1) and use all relevant and up-to-date information streams in adapting the Day 1 IAP work instructions. Key Information: a) Oil Spill Trajectory Modelling; b) Oil Spill Tracker Buoys; c) RS 2 Situational Awareness / Satellite Imagery / Weather forecast / AIS feed / Flight data; d) ESC / Govt. and other external technical advice; e) Ecological Sensitivity Window; f) Environment Plan; g) Oil spill reference documents; and h) Daily Field Reports	IMT PSC & Technical Specialist (Environment)	
3.	Sampling designs in the environmental monitoring procedures require the selection of Impact and Reference Locations: **Impact Location** –use OSTM, OSTB, situational awareness from field teams, State Govt. ESC, EP (e.g. within BIAs, GIS datasets) and Daily Field Reports to identify oiled areas. Impact Location is any location that is currently being affected by released oil (i.e. within the plume of surface / entrained / dissolved / shoreline accumulated oil) or will be in the pathway of released oil in the future. **Reference Location** – use OSTM, OSTB, situational awareness from field teams, State Govt. ESC, EP (e.g. within BIAs, GIS datasets) and Daily Field Reports to identify locations that are not affected by oil. Reference Locations should not be impacted by the oil spill, i.e. outside of the plume	IMT PSC & Technical Specialist (Environment)	

	and the predicted oil spill trajectory. They need to have equivalent characteristics to Impact Locations, e.g. similar depth, aspect, benthic habitats, distance offshore for whales, beach profile for nesting turtles, intertidal zones for birds etc. Seek specialist advice in selecting Reference Locations.		
4.	**Sampling design: Benthic Habitats** The sampling design for monitoring the effects of oil spills on benthic habitats (e.g. corals, macroalgae, seagrass, benthic filter feeders, coral recruitment surveys) at a minimum to be based on observations of percent cover, species diversity, abundance and community composition of benthic habitats within a minimum of at least 5 transects (between 50 – 100 m long) at a minimum of 3 Sites at 2 Depths (Shallow and Deep) within at least 5 Locations (minimum of 1 Impact Location and 4 Reference Locations), which are defined in Step 3. 5 Locations x 3 Sites x 2 depths x 5 transects = 90 replicates (tiles for coral recruitment)	IMT PSC & Technical Specialist (Environment)	
5.	**Sampling design: Mangroves** For benthic primary producers, the sampling design is to be based on counts within a minimum of at least 5 quadrats (1 m^2 for **Faunal Burrows and Pneumatophore Counts**; 4 m^2 **Leaf Health Status**) at a minimum of 3 Sites within at least 5 Locations (minimum of 1 Impact Location and 4 Reference Locations), which are defined in Step 3. 5 Locations x 3 Sites x 5 quadrats = 45 replicates	IMT PSC & Technical Specialist (Environment)	
6.	Issue IAP to Operations Section. This is an ongoing step during all phases of the incident including clean-up.	IMT PSC & Technical Specialist (Environment)	
7.	Additional sampling will be undertaken as required if the sampling design is insufficient to detect environmental impacts.	IMT PSC & Technical Specialist (Environment)	
8.	Ensure all environmental monitoring contractors use appropriate PPE at all times.	ALL	
9.	The sampling frequency will be determined at the time of the commencement of the study and reviewed for appropriateness after 12 months. This monitoring is to be conducted every quarter from the commencement for the first 12 months. After the initial 12 month period, the sampling will be conducted on an annual basis until the termination triggers have been met.	IMT PSC & Technical Specialist (Environment)	

7. Resources

Resource Identifier	Leader	Source / Location, Special Equipment, Remarks
Equipment Field sampling equipment Field safety kit As described in AOHSE-ER-0040 – procedure for resourcing and implementation of Environmental Monitoring	GHD	Mobilised from Perth
Personnel	GHD	Trained field specialists

8. Supporting Documentation

Document title	Reference No.	Notes

Monitoring Effects of an Oil Spill on Benthic Habitats and Benthic Primary Producers	AOHSE-ER-0040	Work instructions to assess effects of hydrocarbons on benthic habitats and benthic primary producers; and Equipment lists and reporting requirements.
APU Oil Spill Response Strategy – RS10 Environmental Monitoring	AOHSE-ER-0060	
9. Generic work assignments		
Environmental Monitoring: • Benthic surveys at locations as described in the IAP.		
10. Termination Criteria		
Oil concentrations in marine waters must not exceed normal background concentrations; No statistical difference in species diversity, abundance, distribution and percentage cover of benthic habitats (e.g. corals, macroalgae and seagrasses) between impact and reference locations; (if activated) No statistical difference in mangrove bioindicators (e.g. faunal burrows, pneumatophore counts, leaf health status) between impact and reference locations; Deemed unsafe to continue implementing RS10 activities; and Agreement is reached with the jurisdictional authority relevant to the spill to terminate the response.		

4.3.3 Seabirds and Migratory Shorebirds

1. Response Strategy	Environmental Monitoring – Seabirds and Migratory Shorebirds
2. Objective	Identify areas potentially impacted by the oil spill and prioritise sensitive areas at highest risk of oil spill effects to maximise effectiveness of first response; Initiate environmental monitoring programs to support and inform spill response planning; assess the effects of spills and monitor post-spill recovery of sensitive environmental receptors.
3. Rationale	Environmental monitoring will be initiated to support the oil spill response strategies and to understand any effects of an oil spill on sensitive receptors. The sampling instructions to assess the effects of a spill on environmental receptors are described in BHP environmental monitoring procedures. These documents outline details such as equipment lists and analytical requirements, chain of custody templates and reporting of results. Monitoring reports will use standard statistical techniques based on 'Beyond BACI' principles (level of statistical significance $p<0.05$) to assess the environmental effects of the incident as well as effectiveness of the response strategies. Outcomes of the statistical analyses will be used to determine if termination criteria have been achieved. Termination Criteria will be developed in conjunction and consultation with Regulatory agencies. The decision to terminate environmental monitoring sits with the BHP IMT.
4. **Initiation Criteria**	If surveillance from RS2 reports that seabirds have been oiled and/or migratory shorebird habitat will be affected by a Level 2 diesel spill.
5. **Activation Time**	< 8 hours after notification from BHP IMT.
6. Course of Action	

Number	Action	Responsible person	Action status
1.	Advise Bennelongia to make arrangements to mobilise field teams and equipment to Melbourne.	IMT OSC	
2.	Review the IMT Oil Spill Response Strategy Decision Tree (Figure 3-1) and use all relevant and up-to-date information streams in adapting the Day 1 IAP work instructions. Key Information: a) Oil Spill Trajectory Modelling; b) Oil Spill Tracker Buoys; c) RS 2 Situational Awareness / Satellite Imagery / Weather forecast / AIS feed / Flight data; d) ESC / Govt. and other external technical advice; e) Ecological Sensitivity Window; f) Environment Plan; g) Oil spill reference documents; and h) Daily Field Reports	IMT PSC & Technical Specialist (Environment)	
3.	Sampling designs in the environmental monitoring procedures require the selection of Impact and Reference Locations: **Impact Location** –use OSTM, OSTB, situational awareness from field teams, State Govt. ESC, EP (e.g. BIAs, GIS datasets) and Daily Field Reports to identify oiled areas. Impact Location is any location that is currently being affected by released oil (i.e. within the plume of surface / entrained / dissolved / shoreline accumulated oil) or will be in the pathway of released oil in the future. **Reference Location** – use OSTM, OSTB, situational awareness from field teams, State Govt. ESC, EP (e.g. BIAs, GIS datasets) and Daily Field Reports to identify locations that are not affected by oil. Reference Locations should not be impacted by the oil spill, i.e. outside of the plume and the predicted oil spill trajectory. They need	IMT PSC & Technical Specialist (Environment)	

	to have equivalent characteristics to Impact Locations, e.g. similar depth, aspect, benthic habitats, distance offshore for whales, beach profile for nesting turtles, intertidal zones for birds etc. Seek specialist advice in selecting Reference Locations.		
4.	**Sampling design: Birds** The sampling design for monitoring the effects of oil spills on seabirds and migratory shorebirds is to be based on 5 surveys (species abundance and diversity) at a minimum of 3 Sites within at least 5 Locations (minimum of 1 Impact Location and 4 Reference Locations), which are defined in Step 3. 5 Locations x 3 Sites x 5 surveys = 45 replicate surveys	IMT PSC & Technical Specialist (Environment)	
5.	Assign GIS Specialist to make a map showing sampling design and sampling locations. Map to be saved in a format that can be cut and pasted into the IAP.	IMT PSC & Technical Specialist (Environment)	
6.	Issue IAP to Operations Section. This is an ongoing step during all phases of the incident including clean-up.	IMT PSC & Technical Specialist (Environment)	
7.	Additional sampling will be undertaken as required if the sampling design is insufficient to detect environmental impacts.	IMT PSC & Technical Specialist (Environment)	
8.	Ensure all environmental monitoring contractors use appropriate PPE at all times.	ALL	
9.	The sampling frequency will be determined at the time of the commencement of the study and reviewed for appropriateness after 12 months. This monitoring is to be conducted every quarter from the commencement for the first 12 months. After the initial 12 month period, the sampling will be conducted on an annual basis until the termination triggers have been met.	IMT PSC & Technical Specialist (Environment)	

7. Resources

Resource Identifier	Leader	Source / Location, Special Equipment, Remarks
Equipment Field sampling equipment Field safety kit As described in AOHSE-ER-0038 – procedure for resourcing and implementation of Environmental Monitoring	Bennelongia	Mobilised from Perth
Personnel	Bennelongia	Trained field specialists

8. Supporting Documentation

Document title	Reference No.	Notes
Monitoring Effects of an Oil Spill on Birds	AOHSE-ER-0038	Work instructions to assess effects of hydrocarbons on seabirds and migratory shorebirds; and Equipment lists and reporting requirements.
APU Oil Spill Response Strategy – RS10 Environmental Monitoring	AOHSE-ER-0060	

9. Generic work assignments
Environmental Monitoring: • Field Team: seabird and migratory shorebird surveys at locations as described in the IAP.
10. Termination Criteria
Oil concentrations in marine waters must not exceed normal background concentrations; No statistical difference in oiled seabird or migratory shorebird abundance and diversity between impact and reference locations; Deemed unsafe to continue implementing RS10 activities; and Agreement is reached with the jurisdictional authority relevant to the spill to terminate the response.

4.3.4 Marine Mammals and Megafauna

1. Response Strategy	Environmental Monitoring – Marine Mammals and Megafauna
2. Objective	Identify areas potentially impacted by the oil spill and prioritise sensitive areas at highest risk of oil spill effects to maximise effectiveness of first response; Initiate environmental monitoring programs to support and inform spill response planning; assess the effects of spills and monitor post-spill recovery of sensitive environmental receptors.
3. Rationale	Environmental monitoring will be initiated to support the oil spill response strategies and to understand any effects of an oil spill on sensitive receptors. The sampling instructions to assess the effects of a spill on environmental receptors are described in BHP environmental monitoring procedures. These documents outline details such as equipment lists and analytical requirements, chain of custody templates and reporting of results. Monitoring reports will use standard statistical techniques based on 'Beyond BACI' principles (level of statistical significance $p<0.05$) to assess the environmental effects of the incident as well as effectiveness of the response strategies. Outcomes of the statistical analyses will be used to determine if termination criteria have been achieved. Termination Criteria will be developed in conjunction and consultation with Regulatory agencies. The decision to terminate environmental monitoring sits with the BHP IMT.
4. **Initiation Criteria**	If surveillance from RS2 reports that marine mammals and megafauna will be affected by a Level 2 diesel spill / Level 2 LOWC.
5. **Activation Time**	< 8 hours after notification from BHP IMT.
6. Course of Action	

Number	Action	Responsible person	Action status
1.	Advise GHD to make arrangements to mobilise field teams and equipment to Melbourne.	IMT OSC	
2.	Review the IMT Oil Spill Response Strategy Decision Tree (Figure 3-1) and use all relevant and up-to-date information streams in adapting the Day 1 IAP work instructions. Key Information: a) Oil Spill Trajectory Modelling; b) Oil Spill Tracker Buoys; c) RS 2 Situational Awareness / Satellite Imagery / Weather forecast / AIS feed / Flight data; d) ESC / Govt. and other external technical advice; e) Ecological Sensitivity Window; f) Environment Plan; g) Oil spill reference documents; and h) Daily Field Reports	IMT PSC & Technical Specialist (Environment)	
3.	Sampling designs in the environmental monitoring procedures require the selection of Impact and Reference Locations: **Impact Location** –use OSTM, OSTB, situational awareness from field teams, State Govt. ESC, EP (e.g. BIAs, GIS datasets) and Daily Field Reports to identify oiled areas. Impact Location is any location that is currently being affected by released oil (i.e. within the plume of surface / entrained / dissolved / shoreline accumulated oil) or will be in the pathway of released oil in the future. **Reference Location** – use OSTM, OSTB, situational awareness from field teams, State Govt. ESC, EP (e.g. BIAs, GIS datasets) and Daily Field Reports to identify locations that are not affected by oil. Reference Locations should not be impacted by the oil spill, i.e.	IMT PSC & Technical Specialist (Environment)	

	outside of the plume and the predicted oil spill trajectory. They need to have equivalent characteristics to Impact Locations, e.g. similar depth, aspect, benthic habitats, distance offshore for whales, beach profile for nesting turtles, intertidal zones for birds etc. Seek specialist advice in selecting Reference Locations.		
4.	**Sampling design: Marine Mammals and Megafauna** The sampling design for monitoring the effects of oil spills on marine mammals and megafauna is to be based on aerial surveys (species abundance and diversity) within a minimum of at least 5 transects at a minimum of 3 Sites within at least 5 Locations (minimum of 1 Impact Location and 4 Reference Locations), which are defined in Step 3. 5 Locations x 3 Sites x 5 transects = 45 replicate counts	IMT PSC & Technical Specialist (Environment)	
5.	Assign GIS Specialist to make a map showing sampling design and sampling locations. Map to be saved in a format that can be cut and pasted into the IAP.	IMT PSC & Technical Specialist (Environment)	
6.	Issue IAP to Operations Section. This is an ongoing step during all phases of the incident including clean-up.	IMT PSC & Technical Specialist (Environment)	
7.	Additional sampling will be undertaken as required if the sampling design is insufficient to detect environmental impacts.	IMT PSC & Technical Specialist (Environment)	
8.	Ensure all environmental monitoring contractors use appropriate PPE at all times.	ALL	
9.	The sampling frequency will be determined at the time of the commencement of the study and reviewed for appropriateness after 12 months. This monitoring is to be conducted every quarter from the commencement for the first 12 months. After the initial 12 month period, the sampling will be conducted on an annual basis until the termination triggers have been met.	IMT PSC & Technical Specialist (Environment)	

7. Resources

Resource Identifier	Leader	Source / Location, Special Equipment, Remarks
Equipment Field sampling equipment Field safety kit As described in AOHSE-ER-0039 – procedure for resourcing and implementation of Environmental Monitoring	GHD	Mobilised from Perth
Personnel	GHD	Trained field specialists
Helicopters		

8. Supporting Documentation

Document title	Reference No.	Notes
Monitoring Effects of an Oil Spill on Marine Mammals and Megafauna	AOHSE-ER-0039	Work instructions to assess effects of hydrocarbons on marine mammals and megafauna; and Equipment lists and reporting requirements.

APU Oil Spill Response Strategy – RS10 Environmental Monitoring	AOHSE-ER-0060	
9. Generic work assignments		
Environmental Monitoring: • Marine Fauna Team: marine fauna surveys at locations as described in the IAP.		
10. Termination Criteria		
Oil concentrations in marine waters must not exceed normal background concentrations; No statistical difference in marine mammal, whale shark abundance between impact and reference locations; Deemed unsafe to continue implementing RS10 activities; and Agreement is reached with the jurisdictional authority relevant to the spill to terminate the response.		

4.3.5 Marine Reptiles

1. Response Strategy	Environmental Monitoring – Marine Reptiles
2. Objective	Identify areas potentially impacted by the oil spill and prioritise sensitive areas at highest risk of oil spill effects to maximise effectiveness of first response; Initiate environmental monitoring programs to support and inform spill response planning; assess the effects of spills and monitor post-spill recovery of sensitive environmental receptors.
3. Rationale	Environmental monitoring will be initiated to support the oil spill response strategies and to understand any effects of an oil spill on sensitive receptors. The sampling instructions to assess the effects of a spill on environmental receptors are described in BHP environmental monitoring procedures. These documents outline details such as equipment lists and analytical requirements, chain of custody templates and reporting of results. Monitoring reports will use standard statistical techniques based on 'Beyond BACI' principles (level of statistical significance $p<0.05$) to assess the environmental effects of the incident as well as effectiveness of the response strategies. Outcomes of the statistical analyses will be used to determine if termination criteria have been achieved. Termination Criteria will be developed in conjunction and consultation with Regulatory agencies. The decision to terminate environmental monitoring sits with the BHP IMT.
4. **Initiation Criteria**	If surveillance from RS2 reports that marine reptiles will be affected by a Level 2 diesel spill / Level 2 LOWC.
5. **Activation Time**	< 8 hours after notification from BHP IMT.
6. Course of Action	

Number	Action	Responsible person	Action status
1.	Advise GHD to make arrangements to mobilise field teams and equipment to Melbourne.	IMT OSC	
2.	Review the IMT Oil Spill Response Strategy Decision Tree (Figure 3-1) and use all relevant and up-to-date information streams in adapting the Day 1 IAP work instructions. Key Information: a) Oil Spill Trajectory Modelling; b) Oil Spill Tracker Buoys; c) RS 2 Situational Awareness / Satellite Imagery / Weather forecast / AIS feed / Flight data; d) ESC / Govt. and other external technical advice; e) Ecological Sensitivity Window; f) Environment Plan; g) Oil spill reference documents; and h) Daily Field Reports	IMT PSC & Technical Specialist (Environment)	
3.	Sampling designs in the environmental monitoring procedures require the selection of Impact and Reference Locations: **Impact Location** –use OSTM, OSTB, situational awareness from field teams, State Govt. ESC, EP (e.g. within BIAs, GIS datasets) and Daily Field Reports to identify oiled areas. Impact Location is any location that is currently being affected by released oil (i.e. within the plume of surface / entrained / dissolved / shoreline accumulated oil) or will be in the pathway of released oil in the future. **Reference Location** – use OSTM, OSTB, situational awareness from field teams, State Govt. ESC, EP (e.g. within BIAs, GIS datasets) and Daily Field Reports to identify locations that are not affected by oil. Reference Locations should not be impacted by the	IMT PSC & Technical Specialist (Environment)	

	oil spill, i.e. outside of the plume and the predicted oil spill trajectory. They need to have equivalent characteristics to Impact Locations, e.g. similar depth, aspect, benthic habitats, distance offshore for whales, beach profile for nesting turtles, intertidal zones for birds etc. Seek specialist advice in selecting Reference Locations.		
4.	**Sampling design: Turtles** The sampling design for monitoring the effects of oil spills on turtles is to include counts and observations (e.g. Nesting abundance and spatial distribution, population dynamics and turtle morphology) at a minimum of 3 Sites within at least 5 Locations (minimum of 1 Impact Location and 4 Reference Locations), which are defined in Step 3 5 Locations x 3 Sites = 15 surveys	IMT PSC & Technical Specialist (Environment)	
5.	Issue IAP to Operations Section. This is an ongoing step during all phases of the incident including clean-up.	IMT PSC & Technical Specialist (Environment)	
6.	Additional sampling will be undertaken as required if the sampling design is insufficient to detect environmental impacts.	IMT PSC & Technical Specialist (Environment)	
7.	Ensure all environmental monitoring contractors use appropriate PPE at all times.	ALL	
8.	The sampling frequency will be determined at the time of the commencement of the study and reviewed for appropriateness after 12 months. This monitoring is to be conducted monthly for a total of 4 months during nesting season from the commencement for the first 12 months. After the initial 12 month period, the sampling will be conducted on an annual basis during nesting season until the termination triggers have been met.	IMT PSC & Technical Specialist (Environment)	

7. Resources

Resource Identifier	Leader	Source / Location, Special Equipment, Remarks
Equipment Field sampling equipment Field safety kit As described in AOHSE-ER-0043 – procedure for resourcing and implementation of Environmental Monitoring	GHD	Mobilised from Perth
Personnel	GHD	Trained field specialists

8. Supporting Documentation

Document title	Reference No.	Notes
Monitoring Effects of an Oil Spill on Marine Reptiles	AOHSE-ER-0043	Work Instructions to assess effects of hydrocarbons on marine reptiles; and Equipment lists and reporting requirements.
APU Oil Spill Response Strategy – RS10 Environmental Monitoring	AOHSE-ER-0060	

9. Generic work assignments

Environmental Monitoring: • Marine Reptile Field Teams: turtle surveys at locations as described in the IAP.
10. Termination Criteria
Oil concentrations in marine waters must not exceed normal background concentrations; No statistical difference in turtle nesting abundance and spatial distribution, population dynamics and turtle morphology between impact and reference locations; Deemed unsafe to continue implementing RS10 activities; and Agreement is reached with the jurisdictional authority relevant to the spill to terminate the response.

4.3.6 Commercial and Recreational Fish Species

1. Response Strategy	Environmental Monitoring – Commercial and Recreational Fish Species
2. Objective	Determine the extent and level of hydrocarbon contamination or tainting of fish and shellfish and/ or bioaccumulation of toxins in fish that may impact commercial and recreational fish species; Determine any mortality of fish/ shellfish species and document any fish-kills that occur during a spill event; Determine if seafood from within the spill area meets statutory limits for hydrocarbon residues and is marketable; Provide regulatory agencies, fisheries managers and other spill responders with information to help them to evaluate the likelihood of contamination of seafood (commercial, aquaculture, recreational) from an oil spill event; and assist in the decision-making process to restrict, ban, close or re-open fisheries.
3. Rationale	Environmental monitoring will be initiated to support the oil spill response strategies and to understand any effects of an oil spill on sensitive receptors. The sampling instructions to assess the effects of a spill on environmental receptors are described in BHP environmental monitoring procedures. These documents outline details such as equipment lists and analytical requirements, chain of custody templates and reporting of results. Monitoring reports will use standard statistical techniques based on 'Beyond BACI' principles (level of statistical significance $p<0.05$) to assess the environmental effects of the incident as well as effectiveness of the response strategies. Outcomes of the statistical analyses will be used to determine if termination criteria have been achieved. Termination Criteria will be developed in conjunction and consultation with Regulatory agencies. The decision to terminate environmental monitoring sits with the BHP IMT.
4. **Initiation Criteria**	If surveillance from RS2 Monitor and Evaluate reports that commercial and recreational fisheries will be affected by a Level 2 diesel spill / Level 2 LOWC.
5. **Activation Time**	< 8 hours after notification from BHP IMT.

6. Course of Action

Number	Action	Responsible person	Action status
1.	Advise GHD to make arrangements to mobilise field teams and equipment to Melbourne.	IMT OSC	
2.	Review the IMT Oil Spill Response Strategy Decision Tree (Figure 3-1) and use all relevant and up-to-date information streams in adapting the Day 1 IAP work instructions. Key Information: i) Oil Spill Trajectory Modelling; j) Oil Spill Tracker Buoys; k) RS 2 Situational Awareness / Satellite Imagery / Weather forecast / AIS feed / Flight data; l) ESC / Govt. and other technical external advice; m) Ecological Sensitivity Window; n) Environment Plan; o) Oil spill reference documents; and p) Daily Field Reports	IMT PSC & Technical Specialist (Environment)	
3.	Sampling designs in the environmental monitoring procedures require the selection of Impact and Reference Locations: **Impact Location** –use OSTM, OSTB, situational awareness from field teams, State Govt. ESC, EP (e.g. within BIAs, GIS datasets) and Daily Field Reports to identify oiled areas. Impact Location is any location that is currently being affected by released oil (i.e. within the plume of surface / entrained / dissolved / shoreline accumulated oil) or will be in the pathway of released oil in the future.	IMT PSC & Technical Specialist (Environment)	

	Reference Location – use OSTM, OSTB, situational awareness from field teams, State Govt. ESC, EP (e.g. within BIAs, GIS datasets) and Daily Field Reports to identify locations that are not affected by oil. Reference Locations should not be impacted by the oil spill, i.e. outside of the plume and the predicted oil spill trajectory. They need to have equivalent characteristics to Impact Locations, e.g. similar depth, aspect, benthic habitats, distance offshore for whales, beach profile for nesting turtles, intertidal zones for birds etc. Seek specialist advice in selecting Reference Locations.		
4.	**Sampling design: Commercial and Recreational Fisheries / Seafood** The sampling design for monitoring the effects of oil spills on commercial and recreational fisheries / seafood includes collection of tissue samples (>30 g per sample) from a minimum of 10 specimens from each target species at a minimum of 4 Sites within at least 5 Locations (minimum of 1 Impact Location and 4 Reference Locations), which are defined in Step 3. 5 Locations x 4 Sites = 20 tissue samples per target species* *Target species is defined as the species targeted by the fisheries impacted, and as agreed by Victorian Fisheries Authority (VFA).	IMT PSC & Technical Specialist (Environment)	
5.	NATA accredited analytical laboratory is to be used to determine if fish, crustaceans and bivalves have acquired a taint or have accumulated detectable levels of hydrocarbons in edible tissues.	IMT PSC & Technical Specialist (Environment)	
6.	Issue IAP to Operations Section. This is an ongoing step during all phases of the incident including clean-up.	IMT PSC & Technical Specialist (Environment)	
7.	Additional sampling will be undertaken as required if the sampling design is insufficient to detect environmental impacts.	IMT PSC & Technical Specialist (Environment)	
8.	Ensure all environmental monitoring contractors use appropriate PPE at all times.	ALL	
9.	The sampling frequency will be determined at the time of the commencement of the study and reviewed for appropriateness after 12 months. This monitoring is to be conducted every quarter from the commencement for the first 12 months. After the initial 12 month period, the sampling will be conducted on an annual basis until the termination triggers have been met.	IMT PSC & Technical Specialist (Environment)	

7. Resources

Resource Identifier	Leader	Source / Location, Special Equipment, Remarks
Equipment Field sampling equipment Field safety kit As described in AOHSE-ER-0048– procedure for resourcing and implementation of Environmental Monitoring	GHD	Mobilised from Perth
Personnel	GHD	Trained field specialists

8. Supporting Documentation

Document title	Reference No.	Notes

Monitoring Effects of an Oil Spill on Commercial and Recreational Fish Species	AOHSE-ER-0048	Work instructions to assess effects of hydrocarbons on commercial and recreational fisheries / seafood; and Equipment lists and reporting requirements.
APU Oil Spill Response Strategy – RS10 Environmental Monitoring	AOHSE-ER-0060	

9. Generic work assignments

Environmental Monitoring:

- Fisheries Field Teams: fish sample collections at locations as described in the IAP.

10. Termination Criteria

Oil concentrations in marine waters must not exceed normal background concentrations;

Hydrocarbon levels in representative commercial and recreational fish species tissue meet statutory specification for food products as per Yender *et al*. (2002);

No statistical difference in hydrocarbon levels in representative commercial and recreational fish species tissue between impact and reference locations;

VFA is satisfied that levels of hydrocarbons in targeted fish species are no longer related to the oil spill event;

Deemed unsafe to continue implementing RS10 activities; and

Agreement is reached with the jurisdictional authority relevant to the spill to terminate the response.

4.3.7 Effects of an Oil Spill on Fishes

1. Response Strategy	Environmental Monitoring – Effects of an Oil Spill on Fishes
2. Objective	Identify areas potentially impacted by the oil spill and prioritise sensitive areas at highest risk of oil spill effects to maximise effectiveness of first response; Initiate environmental monitoring programs to support and inform spill response planning; assess the effects of spills and monitor post-spill recovery of sensitive environmental receptors.
3. Rationale	Environmental monitoring will be initiated to support the oil spill response strategies and to understand any effects of an oil spill on sensitive receptors. The sampling instructions to assess the effects of a spill on environmental receptors are described in BHP environmental monitoring procedures. These documents outline details such as equipment lists and analytical requirements, chain of custody templates and reporting of results. Monitoring reports will use standard statistical techniques based on ‘Beyond BACI’ principles (level of statistical significance $p<0.05$) to assess the environmental effects of the incident as well as effectiveness of the response strategies. Outcomes of the statistical analyses will be used to determine if termination criteria have been achieved. Termination Criteria will be developed in conjunction and consultation with Regulatory agencies. The decision to terminate environmental monitoring sits with the BHP IMT.
4. **Initiation Criteria**	If surveillance from RS2 Monitor and Evaluate reports that benthic habitats will be affected by a Level 2 diesel spill / Level 2 LOWC.
5. **Activation Time**	< 8 hours after notification from BHP IMT.
6. Course of Action	

Number	Action	Responsible person	Action status
1.	Advise GHD to make arrangements to mobilise field teams and equipment to Melbourne.	IMT OSC	
2.	Review the IMT Oil Spill Response Strategy Decision Tree (Figure 3-1) and use all relevant and up-to-date information streams in adapting the Day 1 IAP work instructions. Key Information: a) Oil Spill Trajectory Modelling; b) Oil Spill Tracker Buoys; c) RS 2 Situational Awareness / Satellite Imagery / Weather forecast / AIS feed / Flight data; d) ESC / Govt. and other technical external advice; e) Ecological Sensitivity Window; f) Environment Plan; g) Oil spill reference documents; and h) Daily Field Reports	IMT PSC & Technical Specialist (Environment)	
3.	Sampling designs in the environmental monitoring procedures require the selection of Impact and Reference Locations: **Impact Location** –use OSTM, OSTB, situational awareness from field teams, State Govt. ESC, EP (e.g. within BIAs, GIS datasets) and Daily Field Reports to identify oiled areas. Impact Location is any location that is currently being affected by released oil (i.e. within the plume of surface / entrained / dissolved / shoreline accumulated oil) or will be in the pathway of released oil in the future. **Reference Location** – use OSTM, OSTB, situational awareness from field teams, State Govt. ESC, EP (e.g. within BIAs, GIS datasets) and Daily Field Reports to identify locations that are not affected by oil. Reference Locations should not be impacted by the oil spill, i.e. outside of the plume and the	IMT PSC & Technical Specialist (Environment)	

	predicted oil spill trajectory. They need to have equivalent characteristics to Impact Locations, e.g. similar depth, aspect, benthic habitats, distance offshore for whales, beach profile for nesting turtles, intertidal zones for birds etc. Seek specialist advice in selecting Reference Locations.		
4.	**Sampling design: Fishes in Coral Reef Habitat** The sampling design is to be based on 8 replicate deployments of BRUVs in a minimum of 5 habitat-types* within at least 5 Locations (minimum of 1 Impact Location and 4 Reference Locations), which are defined Step 3. Locations x 5 habitat types x 8 BRUVs replicate = 200 samples Habitat-types to be included when sampling on coral reefs are defined as: • Algal pavement; • Macroalgal beds; • Channels; • Hard coral areas; and • Sand.	IMT PSC & Technical Specialist (Environment)	
5.	**Sampling design: Fishes in Seagrass, Macroalgal Beds and Deep-Water Sponge Communities** The sampling design is to be based on 8 replicate deployments of BRUVs in a minimum of 3 Sites at 2 Depths (Shallow and Deep to a maximal depth of 100 m) within at least 5 Locations (minimum of 1 Impact Location and 4 Reference Locations), which are defined Step 3. 5 Locations x 3 Sites x 2 Depths x 8 BRUVs replicates = 240 samples	IMT PSC & Technical Specialist (Environment)	
6.	**Sampling design: Fishes in Mangroves** To assess the potential effects of an oil spill on the abundance and diversity of fishes associated with mangrove habitats, the sampling design is to be based on 5 replicate gill or seine nets within or immediately adjacent to mangrove habitat at 3 Sites within at least 5 Locations (minimum of 1 Impact Location and 4 Reference Locations), which are defined in Step 3. 5 Locations x 3 Sites x 5 replicates (gill or seine nets) = 75 replicates	IMT PSC & Technical Specialist (Environment)	
7.	Issue IAP to Operations Section. This is an ongoing step during all phases of the incident including clean-up.	IMT PSC & Technical Specialist (Environment)	
8.	Additional sampling will be undertaken as required if the sampling design is insufficient to detect environmental impacts.	IMT PSC & Technical Specialist (Environment)	
9.	Ensure all environmental monitoring contractors use appropriate PPE at all times.	ALL	
10.	The sampling frequency will be determined at the time of the commencement of the study and reviewed for appropriateness after 12 months. This monitoring is to be conducted every quarter from the commencement for the first 12 months. After the initial 12 month period, the sampling will be conducted on an annual basis until the termination triggers have been met.	IMT PSC & Technical Specialist (Environment)	

7. Resources

Resource Identifier	Leader	Source / Location, Special Equipment, Remarks
Equipment Field sampling equipment	GHD	Mobilised from Perth

Field safety kit As described in AOHSE-ER-0051– procedure for resourcing and implementation of Environmental Monitoring		
Personnel	GHD	Trained field specialists
8. Supporting Documentation		
Document title	**Reference No.**	**Notes**
Monitoring Effects of an Oil Spill on Fishes	AOHSE-ER-0051	Work instructions to assess effects of hydrocarbons on species diversity and abundance of fishes associated with coral reefs, seagrasses, macroalgal beds, deep-water sponge gardens and mangroves; and Equipment lists and reporting requirements.
APU Oil Spill Response Strategy – RS10 Environmental Monitoring	AOHSE-ER-0060	
9. Generic work assignments		
Environmental Monitoring: • Fish surveys at locations as described in the IAP.		
10. Termination Criteria		
Oil concentrations in marine waters must not exceed normal background concentrations; No statistical difference in species diversity and abundance, of mobile and site-attached fishes between impact and reference locations; Department of Environment, Land, Water and Planning (DELWP) is satisfied that the patterns of species diversity and abundance of fishes associated with coral reefs, seagrasses, mangroves, macroalgal beds and deep-water sponge gardens (to a depth of 100 m) are no longer related to the oil spill event; Deemed unsafe to continue implementing RS10 activities; and Agreement is reached with the jurisdictional authority relevant to the spill to terminate the response.		

4.4 RS11 Oiled Wildlife Response

1. Response Strategy	Oiled Wildlife Response
2. Objective	Protect exposed marine fauna by removal and relocation, or treatment and release, during a spill event.
3. Rationale	The DJPR Victorian Emergency Animal Welfare Plan (VEAWP) sets out the minimum standard required for an oiled wildlife response (OWR) in Victoria in both Commonwealth and State waters.
4. Initiation Criteria	If surveillance from RS2 Monitor and Evaluate reports oiled wildlife may be affected by a Level 2 diesel spill / Level 2 LOWC.
5. Activation Time	< 24 hours after notification from BHP IMT.

6. Course of Action

Number	Action	Responsible Person	Action Status
1.	Request AMOSC to mobilise OWR first strike response kit and mobilise washing facility from Geelong.	IMT PSC	
2.	Notify Vic DoT Oil Spill Response Coordination Unit (OSRC) and DJPR that OWR equipment is being mobilised.	IMT PSC	
3.	Request AMOSC to mobilise trained OWR responders and resources.	IMT PSC	
4.	Determine size of OWR facility to be established based on estimates of oiled wildlife and initiate construction of the wildlife washing and rehabilitation facility.	IMT PSC	
5.	Pre-emptive capture of turtles (particularly juvenile life stages) if shoreline contact occurs during turtle nesting season should be considered on a case-by-case basis and decided upon following consultation with State regulatory agencies. Auditory hazing techniques may also be useful for moving large flocks of shorebirds out of ‘at risk’ areas.	IMT PSC	
6.	Oiled wildlife recovery teams deployed to assigned shoreline segments as described in the IAP. Oiled wildlife to be transported from oiled location to a staging area, and then onwards to the wildlife washing and rehabilitation facility.	IMT PSC	
7.	Staging sites will be opportunistically established at existing beach access points along the coast (multiple access points are available).	IMT PSC	
8.	Ensure all OWR personnel use appropriate personal protective equipment (PPE) at all times.	ALL	

7. Resources

Resource Identifier	Leader	Source / Location, Special Equipment, Remarks
Equipment OWR First Strike Response kit OWR Container facility PPE	AMOSC	Mobilised from Geelong and Perth (Day 3).
Personnel	AMOSC Core Group	Trained OWR (operations) personnel to act as field supervisors of OWR recovery and rehabilitation teams.

	OSRL	Trained OWR (operations) personnel to act as field supervisors of OWR recovery and rehabilitation teams.
	Sea Alarm	Trained OWR (operations) personnel to act as field supervisors of OWR recovery and rehabilitation teams.
	DJPR	As described in the VEAWP.
	Veterinarians	As described in the VEAWP.
	Wildlife Careers	Volunteers, as described in the VEAWP.
	BHP / Hays	Skilled labour for OWR facility construction and unskilled labour within the washing and rehabilitation teams.

8. Supporting Documentation

Document Title	Reference No.	Notes
Victorian Emergency Animal Welfare Plan (VEAWP)	http://agriculture.vic.gov.au/__data/assets/pdf_file/0003/365088/Victorian-Animal-Emergency-Welfare-Plan_updated.pdf http://www.amosc.com.au/	Custodians – AMOSC / DJPR and Industry.
APU Oil Spill Response Strategy – RS11 Oiled Wildlife	AOHSE-ER-0061	

9. Generic Work Assignments

Oiled Wildlife Response:

- All OWR recovery and rehabilitation activities to be conducted in accordance with procedures and guidelines described in VEAWP.

10. Termination Criteria

No further oiled wildlife recovered from areas affected by the spill.

Rehabilitated wildlife has been returned to the environment.

4.5 RS12 Forward Command Post

1. Response Strategy	Forward Command Post
2. Objective	Forward Command Post maintained during an oil spill response to prevent environmental impact to sensitive environmental receptors.
3. Rationale	The objective of this response strategy is to assist the IMT in planning the oil spill response activities in the spill zone by assisting in the development of incident action plans, oversee field operations, manage rosters and provide situational briefings/debriefings. Personnel within the forward command post will also maintain liaison with local emergency service organisations, industry, and other government departments active in the spill zone. BHP IMT personnel and communications support will be established to enable effective coordination of on-ground resources during an oil spill response. BHP will establish Forward Command Post in either Warrnambool or Geelong.
4. Initiation Criteria	If surveillance from RS2 Monitor and Evaluate reports shoreline environments or oiled wildlife may be affected by a Level 2 diesel spill / Level 2 LOWC.
5. Activation Time	< 24 hours after notification from BHP IMT.

6. Course of Action

Number	Action	Responsible Person	Action Status
1.	Mobilise BHP IMT personnel with operations, logistics, oil spill response, finance and external affairs experience.	IMT Leader	
2.	Mobilise BHP APU IT personnel to facilitate all Information Management requirements of the forward command post including telephone / satellite communications and intranet / internet connections.	IMT Leader	
3.	Mobilise AMOSC / OSRL personnel with oil spill response and operations experience.	IMT Leader	

7. Resources

Resource Identifier	Leader	Source / Location, Special Equipment, Remarks
Equipment As described in procedure for resourcing and implementation of the Forward Command Post	BHP IMT	Mobilised from Perth.
Personnel	BHP IMT	Mobilised from Perth.
	AMOSC 03 5272 1555	Mobilised from Geelong or Perth.
	OSRL +65 6266 1566	Mobilised from Perth / Singapore

8. Supporting Documentation

Document Title	Reference No.	Notes
APU Oil Spill Response Strategy – RS12 Forward Command Post	AOHSE-ER-0062	Procedure to be followed for resourcing and implementation of a Forward Command Post. Contains a pre-populated ICS 204 Form for inclusion in the IAP.

9. Generic Work Assignments
Forward Command Post: • Locate key personnel and communications at a Forward Command Post.
10. Termination Criteria
The source of hydrocarbon spill is under control, the site is safe, the release of hydrocarbons to the marine environment has ceased and the site is free of hydrocarbons.

4.6 RS13 Waste Management

1. Response Strategy	Waste Management
2. Environmental Performance Outcome	Prevent impacts to identified extreme and highly sensitive shorelines, shoreline receptors and sites of cultural heritage from Level 3 spills, through the removal of waste oil, and to manage to ALARP impacts to other ecosystems by the implementation of the waste management response strategy.
3. Rationale	During an oil spill clean-up, the disposal of waste material must not pose any threat to the health and safety of people or the environment, and must be carried out in accordance with state legislation and BHP APU Waste Management Plan.
4. **Initiation Criteria**	If surveillance from RS2 Monitor and Evaluate reports shoreline environments or oiled wildlife may be affected by a Level 2 diesel spill.
5. **Activation Time**	< 24 hours after notification from BHP IMT.

6. Course of Action

Number	Action	Responsible Person	Action Status
1.	Activate Cleanaway waste management contract and other third party agreements for the provision of equipment/ supplies and resources.	IMT PSC	
2.	For any spill likely to produce significant amounts of waste, a Waste Management Plan will be developed in consultation with the waste management provider to ensure that: • Oily waste is properly handled and stored; • Oil and oily debris is adequately segregated, treated and stored at the point of collection; • Oil and oily debris is rapidly collected and taken to designated sites for storage, treatment or disposal; and • Treatment or disposal practices ensure that the waste poses no future threat to the environment. In addition, the developed Waste Management Plan will identify how waste volumes will be minimised.		
3.	Request equipment/ supplies and personnel be mobilised	IMT PSC	
4.	Notify Vic DoT that waste management contractors are mobilising to Warrnambool), and request Vic DoT to supply staff to act as regulatory agency representation at waste management site.	IMT PSC	
5.	Identify priority locations for temporary waste storage suitable for volumes predicted by SCAT teams and based on information gathered during Monitor and Evaluate Response Strategy (RS2).	IMT PSC	

7. Resources

Resource Identifier	Leader	Source / Location, Special Equipment, Remarks
Equipment Vehicles, vacuum trucks Pumps, bins, storage (e.g. IBC's), PPE	Cleanaway 03 5523 7015	Portland or Geelong (from Day 1)
Personnel	Cleanaway 03 5523 7015	Portland or Geelong (from Day 1)

8. Supporting Documentation

Document Title	Reference No.	Notes
Waste Management Plan – Oil Spill	AOHSE-E-0014-001	Details the practices and principles to effectively manage oiled waste and minimise the environmental impact of an incident.
APU Oil Spill Response Strategy – RS13 Waste Management	AOHSE-ER-0063	Defines procedures to ensure that BHP is capable of establishing and maintaining a Waste Management Division.

9. Generic Work Assignments

10. Termination Criteria

No further oiled waste is being generated by marine recovery, shoreline protection and/or the shoreline clean-up response strategies;

Deemed unsafe to continue implementing RS13 activities; and

Agreement is reached with the jurisdictional authority relevant to the spill to terminate the response.

5 Response Equipment

5.1 Equipment

Oil spill response equipment from the AMOSC, OSRL, AMSA National Plan and Vic DoT can be called upon if required. The National Plan equipment, stored in regional stockpiles around Australia is sufficient to deal with spills of up to 20,000 tonnes. The major Victorian stockpile is in Geelong.

5.1.1 BHP OSRA Spill Response Equipment

Oil spill response equipment maintained by AMOSC (Exmouth, Fremantle and Geelong) and OSRL (Singapore) would be available to BHP during a spill response as part of contractual arrangements that are currently in place with these agencies. A complete list of equipment maintained by BHP OSRA's including stockpiles in Geelong from the Marine Oil Spill Equipment System (MOSES) database (equipment owners include AMSA, DoT, Woodside, Chevron, Apache) is provided in Appendix D.

5.1.2 Vessel Support

The marine response strategies outlined in Section 8 of the EP can be undertaken independently or concurrently. It is expected that in a Level 3 spill response that marine strategies will be undertaken concurrently. Table 5-1 outlines the multiple expected vessel requirements for the response strategies. During a response, the IMT may determine that additional vessels are either required or are available to be used and therefore can supplement the expected arrangements. BHP has the ability, through supplier contracts, to scale up (or down) the response to meet the needs of the response. Table 5-1 provides an indication of expected vessel usage across the spill response strategies.

Table 5-1: Response strategy vessel requirements

Response Strategy	Vessel Type	Number	Location	How accessed	Comment	Earliest need
Source Control	Platform Supply Vessel / Vessel with DP2 and ROV capability / MODU	1-2	Local/ Regional	Vessel on contract /vessel of opportunity	1 initially, ramping to 2 as source control activity develops	As identified
Oiled Wildlife	Small recreational craft	2	Local/ Regional	Vessel of opportunity		As identified
	Small utility vessels	2	Local/ Regional	Vessel of opportunity	Cray boats suitable	As identified
Operational Scientific Monitoring	Small utility vessels	1-2	Local/ Regional	Vessel of opportunity	1 initially, ramping to 2 as spill develops for water quality.	Day 1
	Commercial fishing vessel	4	Local/ Regional	charter	Benthic habitats Trap/line/trawl fishing vessels Fish monitoring	As identified
	Small recreational craft	12	Local/ Regional	Vessel of opportunity	Marine mammals	As identified
Shoreline Clean-Up	Landing craft	2	Local/ Regional	Vessel of opportunity	For island clean-up operations.	As identified
	Crew transfer vessel	2	Local/ Regional	Vessel of opportunity	Crew transfer to vessels or offshore islands.	As identified

Response Strategy	Vessel Type	Number	Location	How accessed	Comment	Earliest need
Waste Recovery	PSV	2	Regional	Vessel of opportunity	Waste transfer from vessels / marine recovery.	As identified
Options	Barge	1-4	Regional	Vessel of opportunity	For temporary storage at sea of waste.	As identified
	Tug	1-4	Regional	Vessel of opportunity	Support/towing of barges.	As identified
	Supply vessels/ small utility vessels or tugs	8+	Regional / Australian/ International	Vessel of opportunity	Standby Marine recovery.	As identified

6 References

Australian Maritime Safety Authority (2003). Oil Spill Monitoring Handbook. Prepared by Wardrop Consulting and the Cawthron Institute for the Australian Maritime Safety Authority (AMSA) and the Marine Safety Authority of New Zealand (MSA). Published by AMSA, Canberra. 115 pp.
AMSA (2011) National Plan for the Combat Pollution of the Sea by Oil and Other Noxious and Hazardous Substances (NATPLAN), http://www.amsa.gov.au/Marine_Environment_Protection/National_plan/
AMOSC (2017) Australian Marine Oil Spill Centre Plan (AMOSPlan), https://amosc.com.au/wp-content/uploads/2018/01/AMOSPlan-2017.pdf
BHP (2018) Incident Management Plan – Australia, Doc No. AOHSE-ER-0001
BHP (2016) APU Monitoring Effects of an Oil Spill on Benthic Habitats and Bnethic Primary Producers AOHSE-ER-0040
BHP (2016) APU Monitoring Effects of an Oil Spill on Birds AOHSE-ER-0038
BHP (2016) APU Monitoring Effects of an Oil Spill on Commercial and Recreational Fish Species AOHSE-ER-0048
BHP (2016) APU Monitoring Effects of an Oil Spill on Fishes AOHSE-ER-0051
BHP (2016) APU Monitoring Effects of an Oil Spill on Marine Mammals and Megafauna AOHSE-ER-0039
BHP (2013) APU Operational Response Guideline 1 – Aerial Surveillance. Confirmation, Quantification and Monitoring of Oil Spills AOHSE-ER-0041
BHP (2016) APU Monitoring Effects of an Oil Spill on Marine Reptiles AOHSE-ER-0043
BHP (2013) APU Operational Response Guideline 3 – Oil Spill Trajectory Modelling. Initiation, Data Collection and Progression AOHSE-ER-0044
BHP (2016) APU Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna AOHSE-ER-0037
BHP (2011) Incident Management Manual – Australia (AU IMM), Doc No. AO-HSE-ER-0001
DoT (2010) Victorian Marine Pollution Contingency Plan (VICPLAN), http://www.transport.vic.gov.au/freight/marine-pollution/marine-pollution-contingency-plan
Glasby, T. M. (2006). Analysing data from post-impact studies using asymmetrical analyses of variance: A case study of epibiota on marinas. *Australian Journal of Ecology*, *22*(4), 448-459.
Underwood, A. J. (1994). On beyond BACI: sampling designs that might reliably detect environmental disturbances. *Ecological applications*, *4*(1), 3-15.
DJPR / DELWP (no date) Victorian Emergency Animal Welfare Plan (Revision 1). Victorian State Government. http://agriculture.vic.gov.au/__data/assets/pdf_file/0003/365088/Victorian-Animal-Emergency-Welfare-Plan_updated.pdf

7 Abbreviations

ADIOS	Automated Data Inquiry for Oil Spills
ALARP	As Low As Reasonably Practical
AMBA	Area that may be affected
AMOSC	Australian Marine Oil Spill Centre
AMOSPlan	Australian Marine Oil Spill Plan
AMSA	Australian Maritime Safety Authority
AOI	Area of Interest
API	American Petroleum Institute
APU	Australian Production Unit (BHP)
AUV	Autonomous underwater vehicles
Bbl/hr	Gallons per hour
BHP	BHP Billiton Petroleum Pty Ltd
DELWP	Department of Environment, Land, Water and Planning
DJPR	Department of Jobs, Precincts and Regions
DoEE	Department of the Environment and Energy
DoT	Department of Transport
EES	Environment Effects Statement
EIA	Environmental impact assessment
EIS	Environmental Impact Statement
EMT	Emergency Management Team (BHP)
EP	Environment Plan
EPO	Environmental Performance Outcomes
ECC	Emergency and Crisis Centre
GIS	Geographical Information Systems
hrs	hours
HSE	Health Safety And Environment
HSEC	Health, Safety, Environment and Community
IAP	Incident Action Plan
IBC	Intermediate Bulk Containers
IMM	Australia Petroleum Incident Management Manual (BHP)
IMR	Inspection/monitoring, maintenance and repair
IMT	Incident Management Team
km	Kilometre
LOWC	Loss of well control
LSC	Logistics Section Chief
m^3	Cubic metres
MODU	Mobile offshore drilling unit
MOSES	Marine Oil Spill Equipment System

NATPLAN	National Plan to Combat Pollution of the Sea by Oil and other Noxious and Hazardous Substances (sometimes referred to as “National Plan”)
NEBA	Net Environmental Benefit Analysis
NOPSEMA	National Offshore Petroleum Safety and Environment Management Authority
OIM	Offshore Installation Manager
OPEP	Oil Pollution Emergency Plan
OPGGS (E) Regulations	*Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009*
OPGGS Act	Offshore Petroleum and Greenhouse Gas Storage Act 2006
OSRA	Oil Spill Response Agency
OSRL	Oil Spill Response Limited
OSTB	Oil Spill Tracking Buoy
OSTM	Oil Spill Trajectory Modelling
POA	Power of Attorney
POLREP	Pollution Report
PPE	Personal Protective Equipment
PSC	Planning Section Chief
ROV	Remote Underwater Vehicle
RPS-APASA	RPS Asia-Pacific Applied Science Associates
RS	Response Strategy
SCAT	Shoreline clean-up and assessment technique
SES	State Emergency Service
SMP	Stakeholder Management Plan
SOPEP	Shipboard Oil Pollution Emergency Plan (MARPOL 73/78 Annex I, Reg 26)
TEC	Threatened Ecological Communities
TJ/d	Tera Joules per day
TRG	The Response Group
VEAWP	Victorian Emergency Animal Welfare Plan
VFA	Victorian Fisheries Authority
Vic DoT	Victorian Department of Transport
VICPLAN	Victorian Marine Pollution Contingency Plan
WOMP	Well Operations Management Plan

8 Key Definitions

Control Agency	Means the agency/company having operational responsibility in accordance with the relevant contingency plan to take action to respond to an oil and/or chemical spill in the marine environment.
Environment	Means: a) ecosystems and their constituent parts, including people and communities; and b) natural and physical resources; and c) the qualities and characteristics of locations, places and areas; and d) the heritage value of places; and includes e) the social, economic and cultural features of the matters mentioned in paragraphs (a), (b), (c) and (d).
Petroleum Instrument	a) means an authority granted by an instrument under the Act for the carrying out of a petroleum activity; and b) includes: i.) a petroleum exploration permit; and ii.) a petroleum retention lease; and iii.) a petroleum production license; and iv.) a petroleum-related pipeline license; and v.) an infrastructure license; and vi.) a petroleum access authority; and vii.) a petroleum special prospecting authority.
Petroleum Instrument Holder	For a petroleum activity, means the registered holder of a petroleum instrument for the activity, and includes a permittee, lessee, licensee, pipeline licensee or registered holder of an access authority or special prospecting authority for the activity.
Recordable Incident	For an operator of an activity, means an incident arising from the activity that: a) breaches a performance outcome or standard in the environment plan that applies to the activity; and b) is not a reportable incident.
Regulator	Means: a) in relation to a petroleum activity – NOPSEMA; or b) in relation to a greenhouse gas storage activity - the responsible Commonwealth Minister.
Reportable Incident	For an operator of an activity, means an incident relating to the activity that has caused, or has the potential to cause, moderate to significant environmental damage.
Statutory Agency	Means the State/NT or Commonwealth agency having statutory authority for marine pollution matters in their area of jurisdiction. For offshore petroleum exploration and production in Commonwealth waters, or in State/Territory waters where powers are conferred, the Statutory Agency is NOPSEMA.

Appendix A

OSRL Notification Form

Oil Spill Response

Notification Form

(Initial Incident Information)

Warning! Please telephone the Duty Manager before e-mailing or faxing this completed form

To	Duty Manager		
OSRL Base	Southampton, UK	Loyang, Singapore	Fort Lauderdale, USA
Telephone	+44 (0)23 8033 1551	+65 6266 1566	+1 954 983 9880
Emergency Fax	+44 (0)23 8072 4314	+65 6266 2312	+1 954 987 3001
Email	dutymanagers@oilspillresponse.com		

Safety and Security: Oil Spill Response Limited’s safety policy requires us to work closely with the mobilising party to ensure all aspects of safety and security are addressed for our personnel.

Guidance: Please ensure the information given on this form is accurate at the time of completion. This information will be used to develop and recommend the most appropriate response strategy. If new information should become available, or the situation changes, please inform the Duty Manager as soon as possible.

Section 1 – Contact Details	Mandatory Information Required
Member Company	
Name of Person Notifying OSRL	
Position in Incident	
Direct Phone Number	
Mobile Number	
Fax Number	
Email Address	
Command Centre Address	
Date and Time of Notification	
Section 2 – Location	
Country / Region of Spill	
Latitude / Longitude of Spill Position	
Area Affected	☐Inland ☐River ☐Estuary ☐Shoreline ☐ Port ☐Harbour ☐Offshore ☐Subsea ☐Other
Depth of Water (if applicable)	
Section 3 – Spill Details	
Date and Time (of spill – GMT)	
Source of Spill	
Cause of Spill	
Status of Spill	☐ Secured ☐ Uncontrolled ☐ Unknown

Product Properties	Product Name / Type		**State Units** Alternatively, provide an Assay sheet ☐ Assay sheet provided
	SG or API		
	Pour Point		
	Wax Content		
	Asphaltene		
	Sulphur Content		
	Viscosity		

Release Rate	Instantaneous Release						State Units
	OR						
	Continuous Release		per hour for		☐ Hours	☐ Days	

Section 3 – Spill Details cont.	**Mandatory Information Required**		
Description of Observed Spill	Estimated Quantity		**State Units**
	Size		
	Appearance		
	Direction of Travel		

Section 4 – Weather		
Wind Direction (wind direction given **from**)		**State Units** **Alternatively provide a local weather forecast** ☐ **Weather forecast provided**
Wind Speed		
Air Temperature		
Sea Temperature		
Sea State		
Visibility		
Cloud Base		

Section 5 – Oil Spill Model Request			
Information you supply in Section 3 (Spill Details) and 4 (Weather) will be used for the modelling			
Do you require Oil Spill Trajectory Modelling?	☐ Surface 2D	☐ Sub-surface 3D*	☐Not at this time
Additional Information (please include start date and time)			
*Separate model request form required. Sub-surface models require additional time and costs.			

Section 6 – Safety and Security		
Highlight any known Safety or Security Risks		☐N/A
Describe Security arrangements for OSRL staff (if applicable)		☐N/A

Additional information if available

Section 7 – Resources at Risk	
Environmental or Socio-economic sensitivities that may be impacted (If possible provide the relevant oil spill contingency plan)	
Section 8 – Equipment	

Equipment already deployed or being mobilised (other than OSRL resources)	

http://www.oilspillresponse.com/activate-us/activation-procedures

Oil Spill Response

Mobilisation Authorisation Form

Warning! Please Telephone the Duty Manager before e-mailing or faxing this completed form

To	Duty Manager		
OSRL Base	Southampton, UK	Loyang, Singapore	Fort Lauderdale, USA
Telephone	+44 (0)23 8033 1551	+65 6266 1566	+1 954 983 9880
Emergency Fax	+44 (0)23 8072 4314	+65 6266 2312	+1 954 987 3001
Email	dutymanagers@oilspillresponse.com		

Details of Authorised Contact				
Subject	**Mobilisation of Oil Spill response Limited (OSRL)**			
Incident Name				
Mobilising Company				
Name of Person Authorising OSRL				
Position in Incident				
Direct Phone Number				
Mobile Number				
Fax Number				
Email Address				
Invoice Address				
Purchase Order Number				
I, authorise the activation of Oil Spill Response Limited and its resources in connection with the above incident under the terms of the Agreement in place between above stated Company and Oil Spill Response Limited.				
Signature:		Date / Time:		

If Oil Spill Response Limited personnel are to work under another party's direction please complete details below;

Additional Details	
Company	
Contact Name	
Position in Incident	
Direct Phone Number	
Mobile Number	
Fax Number	
Email Address	

http://www.oilspillresponse.com/activate-us/activation-procedures

Appendix B

OSRL Aerial Surveillance Observer Form

Oil Spill Response

AERIAL SURVEILLANCE OBSERVER LOG

Incident		**Date**		**Observers**	
Aircraft Type		**Call Sign**		**Area of Survey**	
Survey Start Time		**Survey End Time**		**Average Altitude**	Marine fauna, potential for oiled wildlife?
Wind Speed (knots)		**Wind Direction**		**Notes**	
Cloud Base (feet)		**Visibility (nm)**			
Time High Water		**Time Low Water**			
Current Speed (nm)		**Current Direction**			

SLICK DETAILS

Slick	**TIME**	**OIL POSITION (CENTRE)**		**SLICK**	**OIL SLICK LENGTH**			**OIL SLICK WIDTH**			**AREA**	**AREA COVERAGE**	**OILED AREA**
	UTC	**LATITUDE NORTH**	**LONGITUDE EAST / WEST**	**ORIENT Degrees**	**G/SPEED kt**	**TIME Seconds**	**DISTANCE km**	**G/SPEED kt**	**TIME Seconds**	**DISTANCE km**	**km²**	**%**	**km²**
A													
B													
C													
D													
E													

Slick	**OIL APPEARANCE COVERAGE - %**						**MINIMUM VOLUME - m³**	**MAXIMUM VOLUME - m³**	**TYPE OF DETECTION (etc. visual, IR)**
	1	**2**	**3**	**4**	**5**	**OTH**			
A									
B									
C									
D									
E									

THE BONN AGREEMENT OIL APPEARANCE CODE (BAOAC)			
No	**OIL APPEARANCE**	**MIM. VOLUME m3 / km2**	**MAX. VOLUME m3 / km2**
1	**SHEEN**	**0.04**	**0.30**
2	**RAINBOW**	**0.30**	**5.00**
3	**METALLIC**	**5.00**	**50.0**
4	**DISCONTINUOUS TRUE COLOUR**	**50.0**	**200**
5	**TRUE COLOUR**	**200**	**>200**

NOTE: *Ground Speed (G/SPEED) is the speed of the aircraft (helicopter) relative to the ground (sea) measured in knots (kt). One Knot is one nautical mile (nm) per hour.*

1 kt = 1 nm per hour = 1.85 Kilometres (km) per hour

EXAMPLE: A helicopter, flying at 80 knots, takes 130 seconds to fly along the length of an oil slick. What is the length of the oil slick in km?

(Speed x Time = Distance) 80 knots x 130 seconds // (80*1.85) * (130 / 3600) = 5.34 km

Appendix C

Sensitive Information: Contact Directory