

LONGTOM ENVIRONMENT PLAN

2020 5 YEAR REVISION

Document Number

LT-ENV-PL-0001 Rev 9

DOCUMENT CONTROL

File number		LT-ENV-PLN-0001			
Rev	Date	Description	Prepared	Review	Approved
9	23/07/20	Revised addressing NOPSEMA RFFWI (2)	J Anderson	R Tyler	M Hall
8	29/05/20	Revised addressing NOPSEMA OMR	J Anderson	R Tyler	M Hall
7	30/01/2020	Revised addressing NOPSEMA RFFWI	J Anderson	R Tyler	M Hall
6	09/08/2019	August 2019 5 year Revision	H Proctor / L Scourtis	R Tyler	M Hall
5	24/09/2018	Revised following NOPSEMA Inspection	R Tyler	R Tyler	M. Hall
4	17/10/2016	Revised to SGHE Format	K. Martin	R Tyler	M. Hall
3	18/04/2014	Revised addressing NOPSEMA comments	R Tyler	M Hall	M Hall
2	11/12/2013	Revised for submission to NOPSEMA	V Long	R Tyler	M Hall
1	02/08/2011	Revised with DPI comments	R Tyler	J Ah-Cann	J Ah-Cann
0	06/07/2011	Issued for submission to DPI	L Wilson	R Tyler	J Ah-Cann

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ACRONYMS

AFMA	Australian Fisheries Management Authority (Cmlth)
AHO	Australian Hydrographic Office
AHTS	Anchor Handling, Tug, and Supply (vessel)
AMOSC	Australian Maritime Oil Spill Centre
AMSA	Australian Maritime Safety Authority
APASA	Asia-Pacific Applied Science Associates
API	American Petroleum Institute
APPEA	Australian Petroleum Production & Exploration Association
AQIS	Australian Quarantine Inspection Service
AS/NZS	Australian Standards/New Zealand Standards
ASX	Australian Stock Exchange
BOD	Biological Oxygen Demand
BVI	Blade-Vortex Interaction
CAMBA	China/Australia Migratory Birds Agreement 1986
CAR	Corrective Action Request
CHARM	Chemical Hazard Assessment and Risk Management
CITES	Convention on International Trade in Endangered Species of Wildlife and Flora
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAFF	Department of Agriculture, Fisheries and Forestry (now Department of Agriculture)
DAWE	Department of Agriculture, Water and Environment
DAWR (now DAWE)	Department of Agriculture and Water Resources
DNV	Det Norske Veritas
DSDBI (now DJPR)	Department of State Development, Business and Innovation.
DELWP	Department of Environment, Land, Water and Planning
DJPR	Department of Jobs, Precincts and Regions (formerly Department of Economic Development, Jobs, Transport and Resources)
DEPI	Department of Environment and Primary Industries. <i>Note:</i> Previously the Department of Sustainability and Environment (DSE)
DoEE (now incorporated into DAWE)	Department of the Environment and Energy
DOI	Department of Industry
DRET	Department of Resources, Energy and Tourism (dissolved Sept. 2013 with the majority of its functions assumed by the Department of Industry (except for tourism which was assumed by the Department of Foreign Affairs and Trade)

EHU	Electro Hydraulic Umbilical
EIAPP	Engine International Air Pollution Prevention
EMBA	Environment that may be affected
EP	Environment Plan
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cmlth)
ERA	Environmental Risk Assessment
ERP	Emergency Response Plan
ESD	Environmentally Sustainable Development
FFG Act	<i>Flora and Fauna Guarantee Act, 1988</i> , (Vic.)
GDA	Geocentric Datum of Australia
GHG	Greenhouse Gas
HIS	High-Speed Impulsive
HQ	Hazard Quotient
IAPP	International Air Pollution Prevention
IMO	International Maritime Organisation
IMS	Incident Management System
ISO	International Standards Organisation
JAMBA	Japan/Australia Migratory Birds Agreement 1974
JRCC	Joint Rescue Coordination Centre
LC	Lethal Concentration
LEFCOL	Lakes Entrance Fishermen's Cooperative Limited
MBES	Multi Beam Echo Sounder
MCMPR	Ministerial Council on Minerals and Petroleum Resources
MDO	Marine diesel oil
MGA	Map Grid of Australia
MSDS	Material Safety Data Sheet
MODU	Mobile Offshore Drilling Unit
MUTA	Main Umbilical Termination Assembly
NCEP	National Centres for Environmental Predictions
NCR	Non-Compliance Report
NEBA	Net Environmental Benefit Analysis (SGH)
NEPM	National Environment Pollution Measure
NES	National Environmental Significance
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority (Cmlth)
NOPTA	National Offshore Petroleum Titles Administrator
OCNS	Offshore Chemical Notification Scheme
OIW	Oil-in-Water
OPEP	Oil Pollution Emergency Plan
OPGGS	Offshore Petroleum and Greenhouse Gas Storage (Act and Regulations)

OSCP	Oil Spill Contingency Plan (see OPEP)
OSMP	Operational and Scientific Monitoring Plan
OSPAR	Oslo-Paris Convention
OSRO	Oil Spill Response Organisation
OSRT	Oil Spill Response Team
PMS	Planned Maintenance System
PLEM	Pipeline End Manifold
PLONOR	Pose Little or No Risk
RCC	Rescue Coordination Centre
ROV	Remotely Operated Vehicle
SBP	Sub Bottom Profiler
SETFIA	South East Trawl Fishing Association
SEWPaC	Department of Sustainability, Environment, Water, Population and Communities (Cmlth) – now the Department of Environment and Energy
SFRT	Subsea First Response Toolkit
SFT	Surface Flow Tree
SOPEP	Shipboard Oil Pollution Emergency Plan
SSS	Side Scan Sonar
SSSV	Sub-Surface Safety Valve
SST	Sub-Sea Tree
STP	Sewage Treatment Plant
TD	Total Depth
TVDRT	True Vertical Depth Below Rotary Table
VSC	Vessel Safety Case
VSP	Vertical Seismic Profile
WBM	Water-based mud
WOMP	Well Operations Management Plan
ZPI	Zone of potential impact (see EMBA)

UNITS OF MEASUREMENT

'	Foot (30 cm)
"	Inch (2.54 cm)
bbl	Barrel (159 litres)
Bcf	Billion cubic feet
°C	Degrees centigrade
°F	Degrees Fahrenheit
cP	Centipoise
dB	Decibels
dB(A)	Decibels A-weighting
hp	Horse power
Hz	Hertz
kl	Kilolitre (1,000 litres)
km	Kilometre (1,000 metres)
km ²	Square kilometres
kW	Kilowatt
L	Litre (1,000 ml)
m	Metre (100 cm)
ML	Megalitre (1 million litres)
m ²	Square metre
m ³	Cubic metre
mcf	Million cubic feet
mg/L	Milligrams per litre
ml	Millilitre
mm	Millimetre
MM	Million
MMboe	Million barrels of oil equivalent
nm	Nautical mile (1.856 km)
PJ	Petajoule
ppg	Pounds per gallon
ppm	Parts per million
t	Tonne (1,000 kg)
µm	Micrometre (micron)
V	Volt

1 Introduction

1.1 Background

SGH Energy VICP54 Pty Ltd (ABN: 35 108 405 009 and otherwise known as SGH Energy or SGHE, and previously Nexus) are the title holder and operator of the Longtom gas field, in production licence VIC/L29, and the Longtom pipeline (VIC/PL38).

This Operations Environment Plan (EP) was prepared in accordance with the requirements of the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGs Act) and associated *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (OPGGs(E)R), and with reference to the *Environment Plan Content Requirements Guidance Note* produced by NOPSEMA.

This Operations EP is a description of environmental management for operation of the offshore facilities and the maintenance activities associated with the Longtom Gas facilities, including production from a third subsea well, Longtom-5. The drilling, installation and tie-in of Longtom-5 into the existing Longtom pipeline will be covered by a separate EP.

The EP was last accepted by NOPSEMA on the 11th August 2014 and this revision has been prepared to respond to NOPSEMA comments associated with its 5 year revision submitted in 2019 and subsequent comments on further submissions in 2020.

1.2 Longtom Outline

The Longtom gas field was discovered in June 1995 and lies approximately 30km offshore of Orbost in East Gippsland, Victoria (Figure 1.1).

The Longtom subsea facilities commenced production in October 2009 and are shown schematically in Figure 1.2. The subsea facilities consist of the following:

- Two existing subsea wells and production trees in water depths of approximately 51 to 57 m and plans for the tie in of one future well.

Production can take place from subsea wells, Longtom-3 and Longtom-4. A third subsea well, Longtom-5, is proposed to be drilled within 150 m of the Longtom-3 well and will tie-in to the existing offshore facilities (subject to a separate EP). The subsequent operation and maintenance of this third well will be undertaken as per the requirements set out in this EP.

- A 17 km 300mm nominal diameter pipeline originating at the Longtom-3 well and connecting into the offshore end of the Patricia Baleen (PB) pipeline, covered by pipeline licence VIC/PL38.
- A subsea umbilical extension connected to the existing Patricia Baleen umbilical line that provides electrical, hydraulic and chemical services to the Longtom facilities.

Longtom production flows to shore via the Patricia Baleen offshore gas pipeline, and then to the Orbost gas plant. The PB pipeline is owned and operated by Cooper Energy. The Orbost gas plant is owned and operated by APA.

The Patricia Baleen gas field, pipeline and gas plant are the responsibility of Cooper and APA, as described above and are outside the scope of this EP.

In May 2015 production was suspended from the Longtom field due to an electrical fault which led to the loss of communications. The Patricia Baleen offshore gas pipeline was later shut down and operations at the Patricia Baleen gas plant suspended. It is currently unknown when the electrical fault can be rectified to allow production to be reinstated from the Longtom-3 and Longtom-4 wells. Maintenance campaigns will continue to be carried out and this EP will remain in force to cover these activities and the Longtom production operations on recommencement.

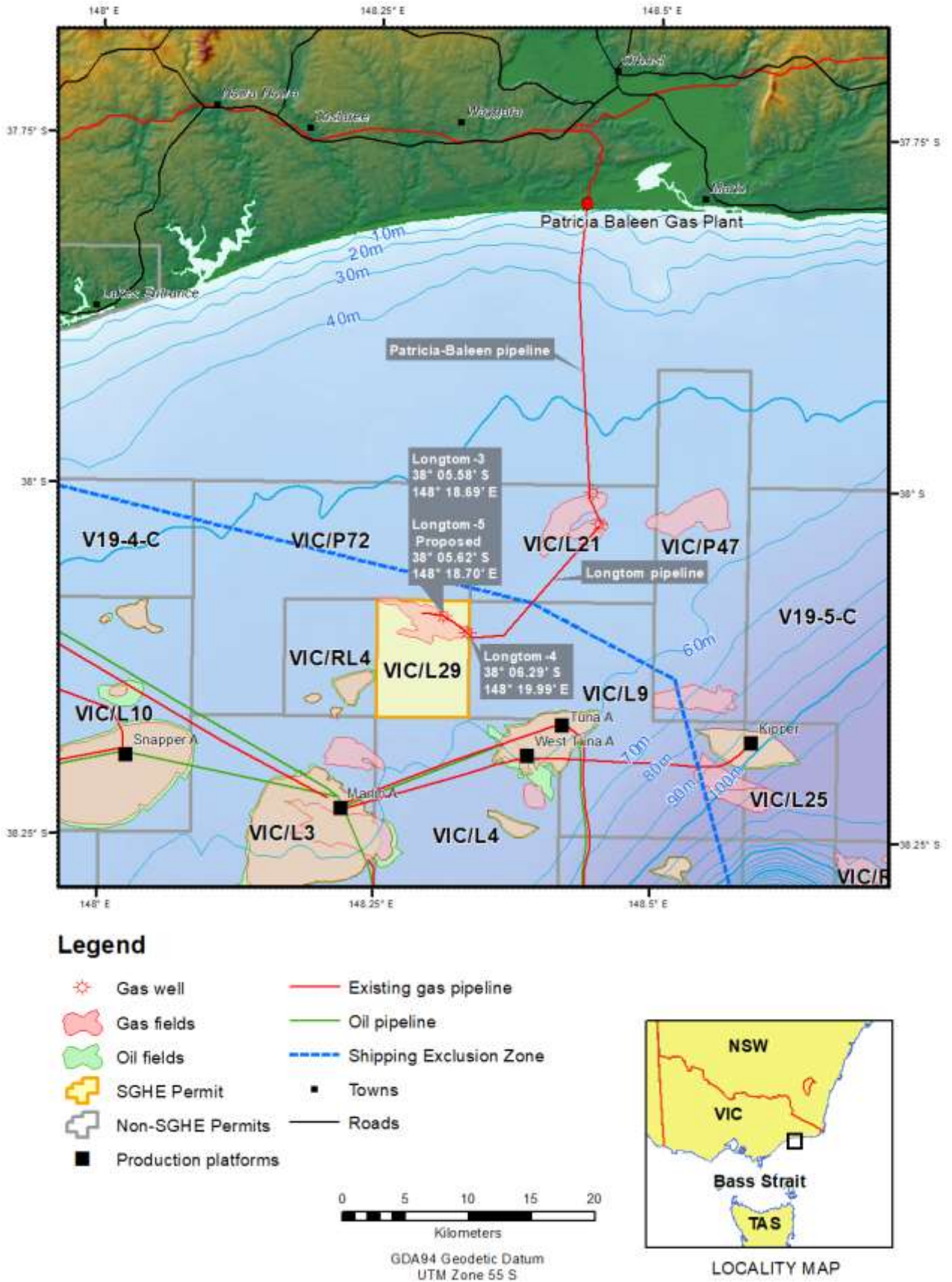


Figure 1-1 Project location

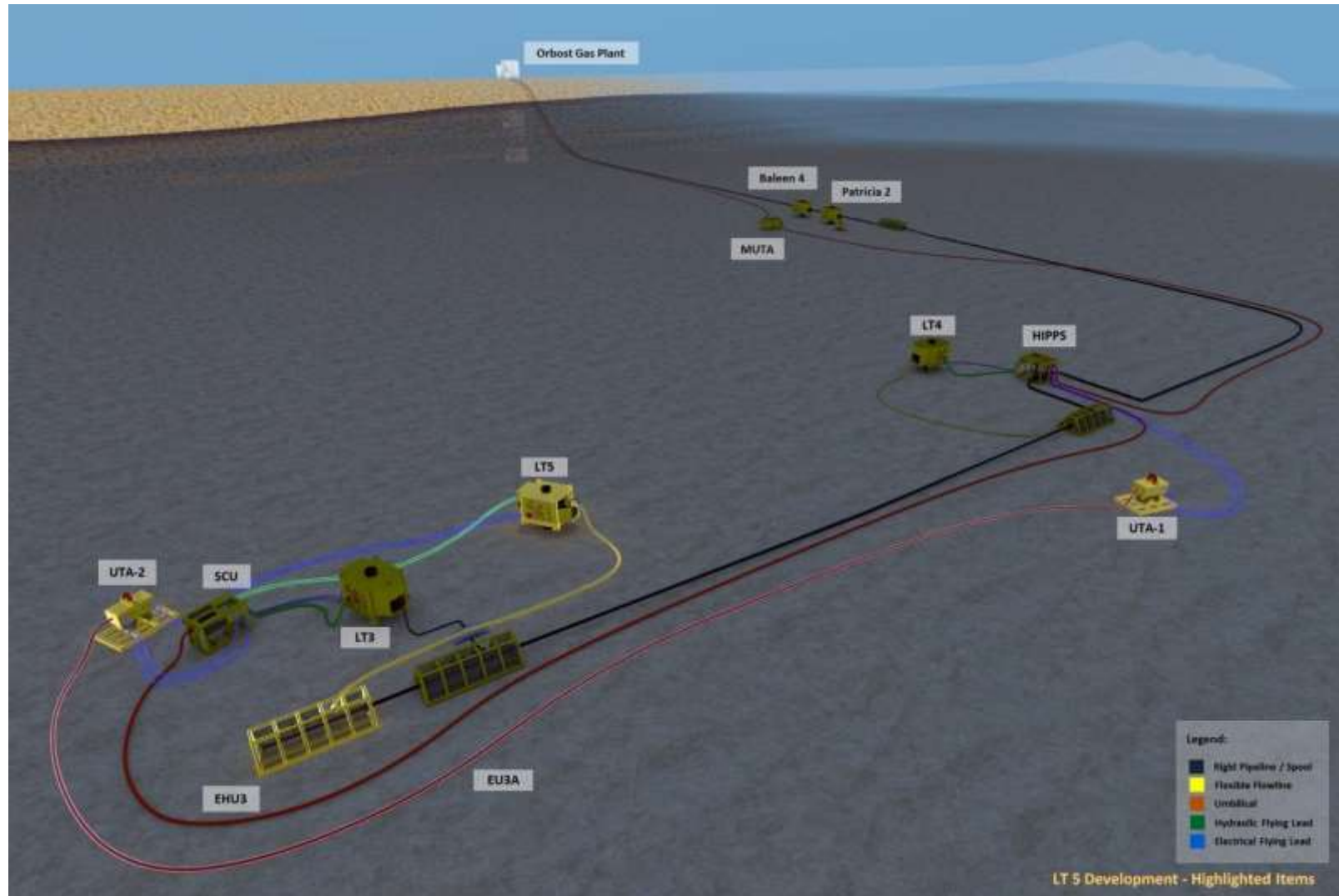


Figure 1-2 Longtom Gas Project – schematic

1.3 Longtom Operator

SGH Energy VICP54 Pty Ltd (SGH Energy or SGHE) is the licence holder of production licence VIC/L29 and pipeline licence VIC/PL38. SGHE is the nominated environmental operator of the Longtom pipeline facility and this includes the associated wells and piping.

SGHE is part of Seven Group Holdings Limited, an Australian diversified operating and investment group with investments in media, oil and gas and industrial services. SGHE acquired Nexus Energy in December 2014 which incorporated the following oil and gas assets:

- Production:
 - VIC/L29 (100% interest) – Longtom gas production.
- Development:
 - AC/L9 (15% interest) – Crux field development.
- Exploration and appraisal:
 - WA-377-P (100% interest) – Echuca Shoals field.

The business address for SGH Energy VICP54 Pty Ltd (ABN: 35 108 405 009) is:

160 Harbour Esplanade
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VIC 3008 Australia

The environmental contact for this activity is:

Rob Tyler
HSEC Adviser
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160 Harbour Esplanade
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Telephone: (03) 8628 7277
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The Regulator will be notified of a change in titleholder, a change in the environmental contact or change in the contact details for either the titleholder or the environmental contact in accordance with Regulation 15(3) of the OPGGS (E) Regulations.

1.4 Purpose of the Environment Plan

This EP has been prepared by SGHE in accordance with the OPGGS (E) Regulations (under the OPGGS Act), and more specifically with regard to Regulation 9 for submission to, and acceptance from, NOPSEMA.

This EP covers:

- Description of the activity.

- Stakeholder consultation.
- Description of the environment.
- Description of environmental impacts and risks.
- Environmental performance objectives, standards and measurement criteria.
- Implementation strategy.
- Reporting arrangements.

The environmental assessment contained within the EP aims to systematically identify and assess the potential environmental impacts associated with the project and presents measures to avoid, mitigate and manage known and potential adverse impacts to the environment, in particular the marine environment.

1.4.1 Scope of the Environment Plan

In accordance with Regulation 4(1) of the OPGGS (E) Regulations, an EP is required for all 'petroleum activities'. This EP covers the following 'petroleum activities' related to the Longtom Gas Project:

1. Operation and production of hydrocarbons from subsea wells (Longtom-3, Longtom-4 and future Longtom-5) in VIC/L29.
2. Maintenance activities related to these wells and the Longtom pipeline (in pipeline licence VIC/PL38).

Operational activities include choke changes to manage production rates and the testing of subsea valves. Operational activities will occur throughout the life of this EP.

Maintenance activities may include, but are not limited to, ROV and/or diving campaigns to:

- Inspect the subsea facilities.
- Conduct testing of the subsea equipment.
- Replace communication, hydraulic or electrical cables and other subsea equipment.
- Stabilise the subsea facilities with sand bags/concrete mattresses.
- Install a temporary pig launcher and conduct pipeline pigging.

Maintenance activities are expected to take place approximately once every 3 years and will generally only last about a week. The exact requirements are dependent on the maintenance activity, equipment availability and the duration may be extended due to adverse weather conditions and other operational requirements.

This EP does not cover decommissioning activities, does not include the Patricia Baleen facilities (operated by Cooper Energy) and does not include any Longtom well intervention, workover or the drilling, installation and tie-in of a Longtom 5 subsea tree. These Longtom activities will be covered by separate EP submissions.

1.5 Legislative Requirements

This section describes the regulatory requirements that apply to the project and are relevant to the project's environmental management. As the project is located in Commonwealth waters, only applicable Commonwealth legislation is discussed. Table 1-1 presents a summary of Commonwealth legislation (including any international conventions enacted) potentially relevant to the project.

1.5.1 Offshore Petroleum and Greenhouse Gas Storage Act 2006

The OPGGS Act provides the regulatory framework for all offshore oil and gas exploration and production in Commonwealth waters (those areas more than three nautical miles from the Territorial sea baseline and extending seaward to the outer limits of the continental shelf).

The OPGGS (E) Regulations have been made under the OPGGS Act. The objective of these Regulations is to ensure that any petroleum activity carried out in an offshore area is consistent with the principals of ecologically sustainable development and has appropriate environmental performance objectives, standards, measurement criteria and an implementation strategy, such that the environmental impacts and risks of the activity are reduced to as low as reasonably practicable..

As of 1 January 2012, NOPSEMA took over the responsibility for administration of offshore environmental regulation from all the State and Territory-based designated authorities.

1.5.2 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) protects nationally and internationally important flora, fauna, ecological communities and heritage places, defined in the EPBC Act as matters of National Environmental Significance (Protected Matters) (NES). Under the EPBC Act, all activities that are likely to have a significant impact on a matter of NES require Commonwealth assessment and approval.

The relevant matters of NES are:

1. Listed threatened species and communities.
2. Listed migratory species.
3. Ramsar wetlands of international importance.
4. Commonwealth marine environment.
5. World heritage properties.
6. National heritage places.
7. Marine environment (and the Great Barrier Reef Marine Park).
8. Nuclear actions.

Drilling of Longtom 3 was deemed “Not a controlled action” (EPBC2005/2494) with no conditions on 20 January 2006 (provided in Attachment 2).

Given the relatively small temporal and spatial scale of the project, and that no impacts on matters of NES were predicted, the Longtom project was referred to the then Commonwealth Department of Environment and Heritage (DEH) under the EPBC Act, on 26 September 2006, and was deemed “Not a controlled action” on 23 October 2006 (EPBC Ref: 2006/3072) (provided in Attachment 2), with no conditions.

Drilling of Longtom 4 was deemed “Not a controlled action” (EPBC2007/3915) with no conditions on 17 January 2008 (provided in Attachment 2).

Whilst not relevant to this EP Nexus also submitted an EPBC Referral for the Longtom-5 drilling campaign (including details of the proposed flowline tie-in to the existing Longtom pipeline) to the then Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) on 6 August 2012 (EPBC Ref 2012/6498). The referral was deemed 'Not a controlled action if undertaken in a particular manner' on 6 September 2012 (the referral, associated documents and the decision are provided in Attachment 2).

The ‘manner in which the proposed action (Longtom-5) must be taken’ is as follows:

The following measures must be taken to avoid significant impacts on

- Wetlands of international importance (sections 16 & 17b)
- Listed threatened species and ecological communities (section 18 & 18A)
- Listed migratory species (sections 20 & 20A)
- Commonwealth marine areas (sections 23 & 24A)

1. The drilling and tie-in must be undertaken in accordance with the Environment Plan (inclusive of an Oil Spill Contingency Plan), as described in the referral, accepted by NOSEMA prior to the proposed action **commencing**

2. Oil spill protection priorities must be implemented as stated in Attachment 3 to the referral.

3. The drilling and tie-in must be undertaken in accordance with the Well Operations management Plan as described in the referral, accepted by NOPSEMA prior to the proposed action **commencing**.

Commencing: as described in the referral EPBC 2012/6498. The action will have commenced once drilling has started.

These conditions will be met by the development and acceptance of a drilling specific Environment Plan (inclusive of an Oil Spill Contingency Plan) and this Operations Environment Plan as it relates to the operation. The oil spill protection priorities are consistent with those described in the EP and OPEP. A Longtom 5 drilling Well Operations Management Plan will be developed for the drilling, installation and tie-in campaign. All these regulatory documents will need to be accepted prior to drilling and tie-in of Longtom-5.

1.5.3 Australian Ballast Water Management Requirements (DAWR, 2017)

The Australian Ballast Water Management Requirements set out the obligations on vessel operators with regards to the management of ballast water and ballast tank sediment when operating within Australian seas.

Its application to the Longtom activity is that it provides requirements on how vessel operators should manage ballast water when operating within Australian seas to comply with the Biosecurity Act and helps address IMS risk – see section 6.3.12.

1.5.4 Environment Guidelines and Codes of Practice

1.5.4.1 Government Guidelines

This EP was initially developed in accordance with NOPSEMA's Guidance Note on 'Environment plan content requirements' (N4700-GN1074, NOPSEMA, January 2013). This guidance note interprets the EP requirements that need to be met and demonstrated under the OPGGS (E) Regulations. Other, more recently issued NOPSEMA Guidelines, Guidance Notes and Information Papers, were reviewed as relevant for the 2019, 5 yearly update of this EP (e.g. GN1344, Environment plan content requirements, Rev 4, April 2019).

1.5.4.2 Industry Code of Practice

In Australia, the petroleum exploration and production industry operates within an industry code of practice developed by the Australian Petroleum Production and Exploration Association (APPEA); the APPEA Code of Environmental Practice (2008). This code provides guidelines for activities that are not formally regulated and have evolved from the collective knowledge and experience of the oil and gas industry, both nationally and internationally.

The APPEA Code of Practice covers general environmental objectives for the industry, including planning and design, assessment of environmental risks, emergency response planning, training and inductions, auditing and consultation and communication. For the offshore sector specifically, it covers issues relating to geophysical surveys, drilling and development and production.

SGHE adheres to the APPEA Code of Environmental Practice when undertaking petroleum exploration and production activities.

1.5.5 Associated Regulatory Approvals

In association with this EP, the following documents have been, or will be, submitted to regulatory agencies for approval:

- Oil Pollution Emergency Plan (OPEP): Issued to NOPSEMA for acceptance in conjunction with this EP, and to AMSA, AMOSC and the Victorian Department of Transport (DoT) for information.
- Longtom Pipeline Safety Case accepted by NOPSEMA.

- Well Operations Management Plan (WOMP) accepted by NOPSEMA.

1.6 Environment Policy Statement

SGHE publicly recognises its obligation to the community to take all practicable steps to ensure that its operations and activities are conducted in an efficient and environmentally responsible manner. In achieving this, the project will be managed to comply with the SGHE Health, Safety, Environment and Community Policy (provided as Attachment 1).

Table 1-1 Key Commonwealth legislation relevant to the project

Legislation	Coverage	International Convention Enacted	Administering Authority
<p><i>Offshore Petroleum and Greenhouse Gas Storage Act 2006</i> and <i>Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009</i></p>	<p>The OPGGS Act addresses all licensing, health, safety, environmental and royalty issues for offshore petroleum exploration and development operations extending beyond the 3 nautical mile limit. Ensures that petroleum activities are undertaken in an ecologically sustainable manner and in accordance with an EP. Section 572(1) of the Act requires that a titleholder maintain in good condition all structures and equipment in the title area, and that a titleholder remove from the title all structures and equipment that are neither used nor to be used for the operations. Note this EP was originally submitted in December 2013 under the then applicable Environment Regulations and updated in 2019 for relevant amendments.</p>	<ul style="list-style-type: none"> • Not applicable. 	<p>NOPSEMA</p>
<p><i>Environment Protection and Biodiversity Conservation Act 1999</i></p>	<p>Protects matters of NES, provides for Commonwealth environmental assessment and approval processes and provides an integrated system for biodiversity conservation and management of protected areas.</p>	<ul style="list-style-type: none"> • Convention on Biological Diversity and Agenda 21, 1992. • Convention on International Trade in Endangered Species of Wildlife and Flora, 1973 (CITES). • Japan/Australia Migratory Birds Agreement, 1974 (JAMBA). • China/Australia Migratory Birds Agreement 1986 (CAMBA). • Republic of Korea/Australia Migratory Birds Agreement, 2006 (ROKAMBA). • Convention on Wetlands of International Importance especially Waterfowl Habitat, 1971 (Ramsar Convention). • International Convention for the Regulation 	<p>DoEE</p>

Table 1-1 Key Commonwealth legislation relevant to the project

Legislation	Coverage	International Convention Enacted	Administering Authority
		<ul style="list-style-type: none"> of Whaling, 1946. • Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), 1979. 	
<i>Environment Protection (Sea Dumping) Act 1981</i>	Aims to prevent the deliberate disposal of wastes (loading, dumping, and incineration) at sea from vessels, aircraft, and platforms.	<ul style="list-style-type: none"> • Convention on the Prevention of Marine Pollution by Dumping of Waste and Other Matter, 1972 (London Convention). 	DoEE
<i>Australian Maritime Safety Authority Act 1990</i>	Sets out the functions of the Australian Maritime Safety Authority (AMSA), with responsibilities for maritime safety, search and rescue, and ship sourced pollution prevention functions.	<ul style="list-style-type: none"> • International Convention on Oil Pollution (Preparedness, Response and Cooperation), 1990 (OPRC). 	AMSA
<i>Historic Shipwrecks Act 1976</i>	Protects the heritage values of shipwrecks and relics (older than 75 years) below the low water mark.	<ul style="list-style-type: none"> • Convention on Conservation of Nature in the South Pacific (APIA Convention), 1976. • Australia and Netherlands Agreement Concerning Old Dutch Shipwrecks, 1972. • Convention on the Protection of Underwater Cultural Heritage, 2001. 	DoEE
<i>Hazardous Waste (Regulation of Exports and Imports) Act 1989</i>	Regulates the import and export of hazardous waste material.	<ul style="list-style-type: none"> • Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal, 1992. 	DoEE
<i>Ozone Protection and Synthetic Greenhouse Gas Management Act 1989</i>	Regulates the manufacture, import and export of ozone depleting substances.	<ul style="list-style-type: none"> • Montreal Protocol on Substances that Deplete the Ozone Layer, 1987. • UN Framework Convention on Climate Change, 1992. 	DoEE
<i>Navigation Act 2012</i>	Regulates ship-related activities (safety of life at sea, safe navigation) and invokes certain requirements of the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) relating to equipment and construction of ships and prevention of pollution to the marine environment.	<ul style="list-style-type: none"> • Certain sections of the MARPOL Convention (MARPOL 73/78). 	AMSA
<i>Protection of the Sea</i>	Regulates ship-related operational activities and	<ul style="list-style-type: none"> • Certain sections of the MARPOL 	AMSA

Table 1-1 Key Commonwealth legislation relevant to the project

Legislation	Coverage	International Convention Enacted	Administering Authority
<i>(Prevention of Pollution from Ships) Act 1983</i>	invokes certain requirements of the MARPOL convention relating to discharge of noxious liquid substances, sewage, garbage, air pollution etc.	Convention (MARPOL 73/78).	
<i>Australian Ballast Water Management Requirements (DAWR, 2017)</i>	The Australian Ballast Water Management Requirements set out the obligations on vessel operators with regards to the management of ballast water and ballast tank sediment when operating within Australian seas.	<ul style="list-style-type: none"> • International Convention for the Control and Management of Ships' Ballast Water and Sediments (adopted in principle in 2004 and in force on 8 September 2017) 	DAWR
<i>Biosecurity Act 2015</i>	<p>Manages diseases and pests that may cause harm to human, animal or plant health or the environment.</p> <p>Requires Captains of ships to notify the Department of Agriculture and Water Resources, (Agriculture Biosecurity) of any ill travellers (listed human diseases) before the ship docks.</p> <p>Manages biosecurity risks in relation to goods (including those posed by diseases or pests) that are brought into Australian territory and from vessels entering it including ship sanitation.</p> <p>Implements the Ballast Water Convention and regulates the ballast water and sediment of certain vessels, requiring reporting of intended or actual discharges of ballast water in Australian territorial seas.</p>	<ul style="list-style-type: none"> • International Health Regulations (2005), Geneva • SPS Agreement (Agreement on the Application of Sanitary and Phytosanitary Measures set out in Annex 1A to World Trade Organization Agreement) • Ballast Water Convention (International Convention for the Control and Management of Ships' Ballast Water and Sediments), (2004), London • United Nations Convention on the Law of the Sea (1982), Montenegro Bay • Biodiversity Convention (Convention on Biological Diversity) (1992), Rio de Janeiro 	DAWR

2 Description of the Activity

This chapter describes the project's operational activities and the maintenance activities proposed in accordance with Regulation 13 (1) of the OPGGS (E) Regulations.

The chapter describes the following:

- Project location
- History and timing.
- Field characteristics.
- Operational activities (production and non-production phase).
- Proposed inspection, maintenance and repair activities (production and non-production phase).
- Design standards.

A list of all key items of equipment associated with the title, production licence VIC/L29, and currently in-situ is provided in Attachment 6. With the exception of the Longtom 1 and 2 wells (already plugged and abandoned), all the Longtom installed equipment will be used in connection with future operations. There is currently no SGHE property that can be removed prior to the ultimate end of field life. Further details on removal of equipment and decommissioning are provided in Section 2.8.

2.1 Location

The Longtom gas field is located in eastern Bass Strait within production licence VIC/L29, approximately 30 km (16.2 nm) offshore south-southwest of Orbost in Commonwealth waters at approximately 55 m depth (see Figure 1-1). The project area comprises a pipeline corridor 17 km long between the Longtom 3 well and the tie into the Patricia Baleen pipeline. The coordinates of the project area are listed in Table 2-1

Table 2-1 Coordinates for the project area

	Latitude	Longitude
Longtom-3 well	38° 05' 34" S	148° 19' 06" E
Longtom-4 well	38° 06' 18" S	148° 20' 00" E
Proposed Longtom-5 well	38° 05' 37" S	148° 18' 43" E
Patricia Baleen tie-in	38° 01' 34" S	148° 27' 03" E

Projection: GDA 94 Zone 55S

The Longtom-5 well is planned to be drilled within approximately 150m of Longtom-3.

2.2 Field History and Timing of Activities

The Longtom gas field is located among a prolific oil and gas production province that has supplied oil and gas to Victoria since 1969.

Operational activities commenced with the project's first gas on 23 October 2009 and will continue throughout the life of this EP. Project maintenance activities are expected to occur for approximately one week every 3 years.

The facilities were shutdown for 4 months in 2012-2013 due to an electrical fault. In February 2014 an electrical fault resulted in the shutdown of Longtom-3, and in May 2015 a further electrical fault resulted in shutdown of Longtom-4 and the cessation of production.

The ongoing suspension of production activities is not a strategy to extend or defer end of field life abandonment timeframes, the reasons for the ongoing shutdown of the longtom facilities are beyond SGHE control. SGHE are maintaining the VIC/L29 title as a production licence and have no plans to relinquish it or convert it to a retention lease. SGHE continue to plan for recommencement of production however at the time of writing it is unknown when the operational arrangements and commercial agreements with third parties, can be finalised to allow production to be reinstated from the Longtom-3 and Longtom-4 wells.

The Longtom-5 well will be tied into the Longtom pipeline to support commercial production rates. However the timing of this activity is also currently unknown as it too depends on the operational arrangements and commercial agreements with third parties.

2.3 Field Characteristics

A number of wells have been drilled within, and in close proximity to, the Longtom Gas Project, including Longtom-1, Longtom-2, Longtom-3, Longtom-4, Grayling-1A, Sunfish-1 and Sunfish-2. Of these wells, Longtom-3 and Longtom-4 are the only active wells capable of producing gas and small amounts of condensate.

Geologically, the project area is well understood. This includes the reservoir pressures, temperature and composition of the hydrocarbons (Table 2-2). The Longtom wells are sweet gas wells (no H₂S) with small amounts of associated condensate (10 barrels per MMSCF). Condensate is a vapour at reservoir conditions and a liquid at atmospheric conditions, it has the following properties:

- A density of 777.4 kg/m³ at 25 °C.
- An API gravity of 51.2.
- A dynamic viscosity of 1.081 cP at 20°C.
- A pour point of -9 °C (when fresh).

If released into the environment, this condensate will evaporate quickly and not persist on the water surface. Reviews by APASA indicate that within 24 hours the condensate will have largely evaporated leaving behind waxy flakes posing little environmental impact.

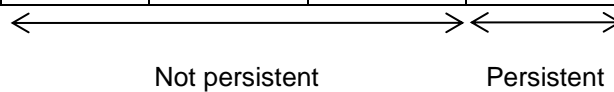
The volumes of persistent and non-persistent components of the condensate are given in Table 2-3. The Longtom condensate contains 61.5% volatiles, 35.5% semi- to low-volatiles and only 3% of persistent residues.

Table 2-2 Longtom field gas compositions

Component	Mol %				
	Longtom-1	Longtom-2	Longtom-3 ST1	Longtom-3H	Longtom-4H
Hydrogen Sulphide	0.00	0.00	0.00	0.00	0.00
Carbon Dioxide	0.73	1.13	0.93	1.30	2.00
Nitrogen	0.97	1.10	0.77	1.28	0.83
Methane	92.48	91.16	92.83	88.62	89.20
Ethane	3.46	3.86	3.49	4.60	4.67
Propane	1.16	1.37	1.10	1.74	1.70
Iso-Butane	0.18	0.25	0.19	0.40	0.32
n-Butane	0.23	0.32	0.22	0.48	0.38
iso-Pentane	0.07	0.10	0.06	0.17	0.13
n-Pentane	0.07	0.09	0.05	0.15	0.10
Hexanes	0.15	0.11	0.08	0.25	0.14
Heptanes	0.24	0.15	0.14	0.34	0.21
Octanes	0.11	0.15	0.05	0.14	0.08
Nonanes	0.09	0.06	0.04	0.11	0.06
Decanes	0.05	0.04	0.01	0.11	0.04
Undecanes	0.01	0.03	0.01	0.10	0.02
Dodecanes plus	0.00	0.08	0.03	0.21	0.12
Totals	100.00	100.00	100.00	100.00	100.00
Gravity	0.622	0.635	0.614	0.676	0.657

Table 2-3 Physical characteristics and boiling ranges of the Longtom condensate

Characteristic	Volatiles (%)	Semi-volatiles (%)	Low Volatility (%)	Residual (%)	Density at 25°C (kg/m ³)	Viscosity (cP)
Boiling point (°C)	<180	180 – 265	265 – 380	>380		
Longtom condensate	61.5	14.3	21.2	3	777.4	1.081 @20°C



2.4 Operational Activities

The Longtom gas field consists of subsea wells that can be produced via a pipeline that connects to the existing Patricia Baleen offshore pipeline and the Patricia Baleen or Orbost Gas Plant. The development comprises:

- Three subsea wells and production trees in water depths of approximately 51 to 57 m. Hydrocarbons can be produced from Longtom-3 and Longtom-4 with facilities available for the future tie-in of Longtom-5 (see Section 2.6). The operational activities described in this section are applicable to all subsea wells.
- A 17 km 300mm nominal diameter pipeline originating at the Longtom-3 well and connecting into the offshore end of the Patricia Baleen pipeline in pipeline licence VIC/PL38.
- A subsea umbilical extension connected to the existing Patricia Baleen umbilical line that provides electrical, hydraulic and chemical services to the Longtom wells and Longtom and pipeline.

Production from the Longtom gas field commenced in 2009. In 2012-2013, the field produced 11.3 PJ of gas and 88,243 bbl of condensate. The facilities were shutdown for 4 months in 2012-2013. In February 2014 an electrical fault resulted in the shutdown of Longtom-3, the closed status of the Longtom 3 wellhead valves was confirmed by ROV in March 2014. In May 2015 production from Longtom-4 was also suspended due to another electrical fault. The pipeline has been depressured to about 700 kPa and an IMR campaign in 2017 has confirmed that the wellhead and pipeline valves are all closed.

2.4.1 Description of the Longtom Pipeline

2.4.1.1 Pipeline Overview

The Longtom pipeline extends 17 km from the Longtom-3 well and connects with the offshore end of the Patricia Baleen pipeline via the pipeline end manifold.

Gas from the Longtom wells flows firstly through the Longtom pipeline and then through the Patricia Baleen pipeline before arriving at the Patricia Baleen Gas Plant (see Figure 2-1).

The operation, monitoring and control of the Longtom wells is conducted from the Gas Plant by the use of an umbilical line which runs from the Gas Plant to the Longtom wells. This umbilical provides:

- Hydraulic and electrical power to open and close valves on the Longtom wells.
- Instrumentation to monitor and record flows, pressures, temperatures and valve status.
- Ability to inject hydrate prevention and corrosion inhibition chemicals into the Longtom pipeline.

To protect the Patricia Baleen pipeline, which has a lower design pressure than the shut-in pressure of the Longtom wells, a subsea High-Integrity Pressure Protection System (HIPPS) has been installed. The use of a HIPPS allows the Patricia Baleen pipeline and associated downstream components to be rated to a lower pressure than the Longtom wells' shut-in pressure. The Longtom HIPPS package is located just downstream of the Longtom-4 tie-in assembly. The HIPPS has been the subject of Safety Integrity Level (SIL) determinations and SIL verification to ensure that it provides a sufficient level of protection. The SIL level was determined to be Level 2. The HIPPS has been designed to API 17D/6A.

During start-up and operations, methanol and monoethylene glycol (MEG) is pumped from the onshore Chemical Injection System via the umbilical into the subsea wells to prevent the formation of hydrates. Methanol is only required for start-up while MEG is continuously injected during operations.

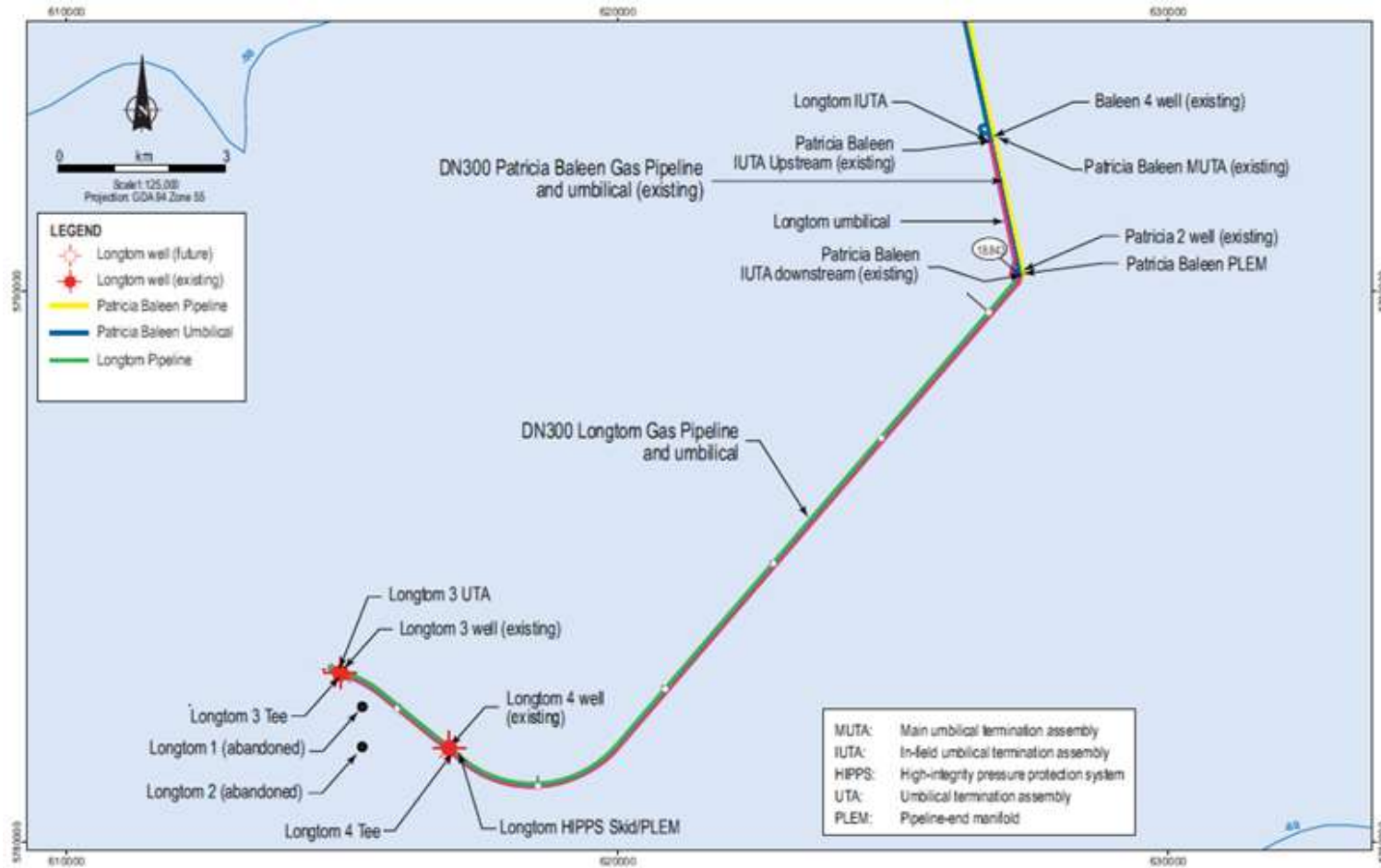
The operating limits for the pipelines are provided in Table 2-4.

Table 2-4 Longtom / Patricia Baleen Pipelines - anticipated operating range

System	Pressure (MPa(g))
Longtom Pipeline (upstream of the HIPPS)	up to 27.6
Longtom Pipeline (downstream of the HIPPS)	up to 10.0
Patricia Baleen Pipeline	up to 10.0

Operating pressures and temperatures for the pipelines are included in the information provided to Gas Plant operations personnel.

The Hydraulic Power Unit (HPU) that controls the well has been isolated at the Orbest gas plant and is covered by an isolation certificate. This isolation will remain in place until APA, Cooper and SGHE agree to its removal, with the isolation in place there is no power (electrical or hydraulic) to the offshore facilities and they will remain shutdown.



Note: The planned Longtom-5 is within approximately 150 m of Longtom-3 and will be within the same petroleum safety zone. Longtom-5 will be connected by a new flowline / spool arrangement as shown in Figure 1-2.

Figure 2-1 Location of subsea infrastructure

2.4.1.2 Design Life

The design life for the Longtom pipeline is 25 years. Corrosion inspection of the pipeline in May 2013 and January 2017 indicated that corrosion values are within the design range and that the design life is still applicable.

2.4.1.3 Key Design Parameters

The following metocean parameters were used for the design of the Longtom pipeline (refer also to Table 2-5):

- Mean Sea Temperature: 16.7°C.
- Still Water level: 61.1m.
- Highest Tide: 0.75m.
- Maximum Single Wave Height: 9.5m.
- Current Strength: 0.4 m/s (@ -54.7m).

Table 2-5 Longtom Pipeline – Key Design Parameters

Parameter	Value
Nominal outside diameter	323.9 mm
Nominal length	17,000 m
Internal corrosion allowance	3 mm
External corrosion allowance	None
External pipeline protection	Coating and sacrificial anodes
Principal design code	AS/NZS 2885.4 (DNV OS F101)
Pressure	27.6 MPag upstream of the HIPPS 10.0 MPag downstream of the HIPPS
Raw gas flow-rate	88.8 MMscfd
Temperature (maximum)	90°C
Temperature (minimum)	-20°C spools -10°C pipeline

2.4.1.4 General Design Considerations

The following design loading conditions for pipeline design, construction and operation were considered during the detailed design of the pipeline, consistent with the Offshore Standard DNV-OS-F101 (Submarine Pipeline Systems) (2000 edition).

- Pipeline size.
- Mechanical design, including pressure containment, collapse, buckling and stability.

- Spanning.
- Fatigue.
- Fracture control.

2.4.1.5 Pipeline Size

A 300 mm nominal diameter (323.9 mm outside diameter) was selected for the Longtom pipeline, which is the same size as the Patricia Baleen pipeline. Spool pieces that connect the wells to the pipeline were sized at 150 mm nominal diameter (168.3 mm outside diameter).

2.4.1.6 Wall Thickness

The wall thicknesses for the pipeline and tie-in spools are provided in Table 2-6.

Table 2-6 Longtom pipeline and spools – wall thicknesses

	Pipeline	LT 3 Rigid Spool	LT 4 Flexible Jumper
Outside Diameter (mm)	323.9	168.3	225.2
Steel Grade	DNV HFW 450 I SUD	DNV OS F101 22Cr IS	Duplex 2205 (Carcass)
Wall Thickness	KP 0.0 – 2.9 14.8mm KP 2.9 – 17.1 13.2mm	10.97mm	Multilayer flexible piping.

2.4.1.7 Stability

The Longtom pipeline is designed to be stable during extreme weather conditions. Stability is achieved using wall thickness and concrete weight coat for the entire pipeline route. Concrete coating has been applied to the offshore pipeline to provide stabilisation without additional requirements for secondary stabilisation including trenching or mattresses. The concrete coating details are shown in Table 2-7.

Table 2-7 Offshore Pipeline Concrete Coating

KP Start	KP Finish	Concrete thickness (mm)	Concrete density (kg/m3)
0.0	2.9	50	2800
2.9	16.4	40	2800
16.4	17.1	50	2800

2.4.1.8 Spanning

Allowable free span lengths have been calculated for three conditions – installation, hydrotest and operations for the entire route of the offshore pipeline.

During the post-lay survey, survey in 2011 and partial survey in early 2014, no pipeline span lengths which exceeded the allowable value were detected. In January 2017 an IMR campaign identified a number of minor spans and these were rectified by the installation of sand / grout bags. The pipeline and any freespans are monitored and if any spans exceeding the allowable are detected during IMR campaigns they will be rectified, as and when required by installation of sandbags or similar, see Section 2.5.3 for more details.

The majority of the pipeline runs parallel to the main currents and the sea floor is relatively flat, hence spanning issues are not considered a significant concern.

2.4.1.9 Tie-in Spools

Longtom-3 is connected to the pipeline through a 150 mm nominal diameter UNS S32205 rigid tie-in spool which is connected to the wellhead and the pipeline using API 1 7D 5000# flanges. The spool is approximately 40 m long.

Longtom-4 is connected to the pipeline through a 150 mm nominal diameter NKT flexible flowline which is connected to the wellhead and the pipeline using ANSI Class 2500 weld neck flanges. The flowline is approximately 56 m long.

Longtom-5 is likely to be connected to the pipeline through a 150mm nominal diameter flexible flowline (or spools) which is connected to the wellhead and the pipeline. The flowline will be approximately 150m long. Further details on the tie-in of Longtom-5 have been provided in Section 2.6.

2.4.1.10 Accidental Loading

The pipeline protection philosophy is based on a qualitative/quantitative assessment of the frequency of events that could possibly threaten the pipeline, and a quantitative assessment of the consequence of loads from fishing gear and dropped objects.

Protective structures are provided for the HIPPS, tie-in assemblies, PLEMs and all other valves. The protective structures provide protection from the following accidental loads:

- Cable snagging.
- Anchor dragging.
- Trawl-board impact.
- Dropped object.

2.4.1.11 Fatigue

Pipeline fatigue can occur through environmental loads or pressure fluctuations. For the Longtom pipeline, environmental loads can arise from severe storms causing seabed sediments to move resulting in pipeline spans, or damage to the pipeline itself through excessive movement. As noted in Section 2.4.1.7, the pipeline has been designed to be

stable during extreme weather conditions. The need for a survey of the pipeline after severe storms to assess excessive spans will be determined at the time.

Pressure fluctuations experienced by the Longtom pipeline are sufficiently limited that they need not be considered from a fatigue perspective.

2.4.1.12 Fracture Control

Materials meet the fracture toughness requirements of the Offshore Standard DNV-OS-F101 (Submarine Pipeline Systems).

2.4.1.13 Internal Corrosion Management

The Longtom pipeline carries gas containing carbon dioxide in the presence of free water. Although the concentration of carbon dioxide and the gas pressure are both low by comparison with other operating wet gas pipelines, it is necessary to inject corrosion inhibitor into the well stream to maintain the wall thickness required for pressure containment. The corrosion inhibitor is delivered to the Longtom wellheads via the umbilical pre-mixed with the MEG and low dose hydrate inhibitor. The overall operation of the corrosion prevention system is checked by corrosion coupons and corrosion probes located at the onshore section of the Patricia Baleen pipeline in the Gas Plant and by iron counts from samples of pipeline fluids collected at the Gas Plant.

The Longtom pipeline has an internal corrosion allowance of 3 mm. The pipeline IMR campaigns in May 2013 and January 2017 indicated that internal corrosion is well within the design parameters.

Pipeline end manifolds (PLEMs) are installed at the offshore ends of both the Longtom and Patricia-Baleen pipelines in order to provide future access for pigging, if required. Each manifold includes a full-bore main valve, bleed valves, other valves and additional equipment, all contained in a protective structure.

More detailed information on internal corrosion management is provided in the Corrosion Management Plan (PB-STO-7000-001).

2.4.1.14 External Corrosion Management

Anti-corrosion Coating

External corrosion protection of the pipeline is provided by a 2.2 mm three-layer polyethylene coating. Protection of the field joints is provided by Canusa MIS 100 heat shrink sleeves.

Tie-in spools, PLEMs and tee assemblies are coated with three layer coating system approved for subsea applications.

Cathodic Protection

The Longtom pipeline system cathodic protection has been designed so that the Longtom pipeline is electrically continuous with the Patricia-Baleen pipeline and the sacrificial galvanum

anodes have been designed (quantity, sizing and spacing) with due regard to the current condition of the Patricia Baleen pipeline anodes and the Patricia Baleen pipeline future current demand. Cathodic protection has been designed in accordance with the Recommended Practice DNV RP B401 (Cathodic Protection Design).

2.4.1.15 Flow Assurance

The Longtom pipeline is operated under a Hydrate Management Plan (Document Number: LT-ENG-RP-005). Hydrate management shall normally be by the continuous injection of MEG from the Gas Plant via the umbilical and into the pipeline at the Longtom wellheads and HIPPS. The MEG will be recovered from the liquid arriving at the Gas Plant for re-use.

Methanol can be injected via a dedicated methanol line in the umbilical to further suppress the formation of hydrates (e.g., during start-up) or to disperse a hydrate should one form.

2.4.1.16 Control Umbilical

An umbilical installed from the end of the existing Patricia Baleen umbilical to the Longtom wells and the HIPPS provides chemicals (corrosion inhibitor, MEG and methanol), hydraulic power, electrical power and control services to the Longtom facilities. The electrical section of the umbilical between Longtom 4 and Longtom 3 was bypassed via the installation of a new electrical / communications cable installed in 2017.

A schematic showing the gas export and umbilical lines is given in Figure 2-2.

A Subsea Control Module (SCM) is installed on the HIPPS skid for the control of the HIPPS and the nearby Longtom-4 wellhead and a Subsea Control Unit (SCU) is installed adjacent to Longtom-3 for the control of the Longtom-3 wellhead. An additional SCM will be installed as part of the Longtom-5 tie-in activities to control Longtom-5.

Operational control of the Longtom facilities is from the Patricia Baleen Gas Plant. Gas plant operations personnel are able to open and close the wellhead valves, operate the Longtom well chokes, the HIPPS valves and inject MEG and potentially methanol into the facilities at various locations to control and manage hydrates.

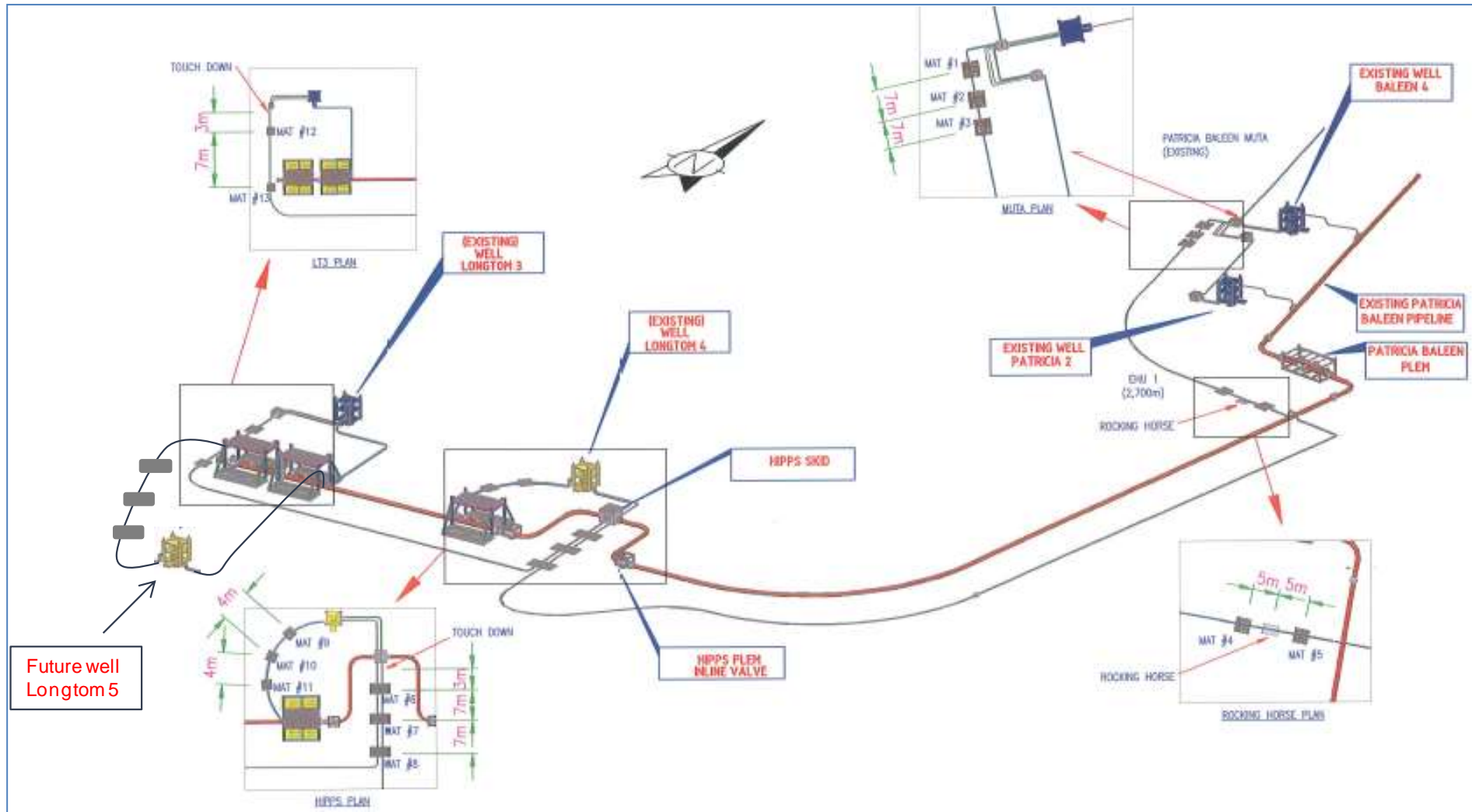


Figure 2-2 Gas export and umbilical lines (schematic)

2.4.2 Production Phase Operations Overview

Note that the Longtom facilities are currently shut down due to an initial electrical fault in the Patricia Baleen or Longtom umbilical. The following section describes how the facilities were operated and how they could be operated once the electrical fault is resolved.

Operation of the Longtom facilities has been integrated with the existing Patricia Baleen facilities. The onshore Patricia Baleen facilities (Orbost gas plant) are manned 24 hours a day by rotating operational shifts. The Orbost Gas Plant controls operation of the wells and the pipeline.

All Longtom functions are monitored and controlled from the Orbost Control Room through the existing Master Control System (MCS) using a Subsea Control Module located at each wellhead or on the UTA adjacent to the wellhead. Well monitoring functions include wellhead pressure and temperature, flowline pressure and temperature, production choke position and other tree valve positions.

The subsea control system is an electro-hydraulic system and a Hydraulic Power Unit (HPU) provides the hydraulic power to the subsea controls while the Electrical Power Unit (EPU) supplies power to the umbilical. Production, hydrate control and internal corrosion control will operate within a closed-loop system, with no planned discharges to the marine environment.

During production the main operational activity is adjusting the wellhead chokes for the required daily production rate. The only planned discharge during operations is hydraulic fluid from the operation of the subsea valves. Other operational activities conducted from the gas plant include the testing of the shutdown systems. The control system has been designed to provide full redundancy so that there is no loss of control or production following the failure of any single component within the control system, including the HPU. The control system has been configured so that in the event of loss of electrical power or signal to the wells, the subsea tree is left in its current state. However, a loss of power to the HIPPS will result in closure of the HIPPS valves and shut-in of production. Production will also be shut-in in the event of loss of hydraulic power as all shutdown systems are designed to be fail closed on loss of hydraulic pressure.

2.4.3 Non-production Phase Overview

There are no planned discharges associated with the non-production phase of Longtom. There is no ongoing injection of chemicals into the Longtom infrastructure for hydrate or corrosion control. This is not required as the current pipeline contents were inhibited via the chemical injection at the trees during production. Regular inspection and monitoring of the wells and subsea equipment via offshore vessel campaigns will continue during the non-production phase (see Section 2.5).

2.4.3.1 Wells

The Longtom 3 and Longtom 4 wells are currently shut-in at their subsea trees and all isolation valves on the subsea trees were verified closed during the IMR campaign in 2017. As described above, since an offshore electrical fault which occurred in May 2015, direct control and monitoring of the subsea system from the Orbost Gas Plant is not possible.

2.4.3.2 Pipeline

The downstream pipeline system is isolated at the HIPPS (valves confirmed closed and holding pressure) and at the onshore plant inlet. The 17 km section of the Longtom pipeline downstream of the HIPPS and the approximately 30km Patricia Baleen pipeline was then blown down to 230 kPa. After being blown-down the pipeline was then injected with nitrogen to establish a pressure of 630 kPa. This positive pressure has been chosen to exceed the seawater head by 100 kPa to support the early identification of a passing valve and prove ongoing pipeline integrity.

Based on the above and known liquid hold-ups in the line, this downstream pipeline section contains approximately 2,700 m³ natural gas, 4,550 m³ Nitrogen, 5 m³ Longtom condensate and 150 m³ MEG/water mix (40:60).

Residual fluids in the pipeline have been left in-situ based on the following:

- The pipeline is not considered to be subject to internal corrosion, therefore purging/flushing to remove hydrocarbons upon suspension is not required (in accordance with AS2885); and
- A complete purge/flush of the pipeline would require an offshore campaign and potential diving/pigging operations, i.e. introduction of additional risks which are not justified due to the negligible risk of internal corrosion and minimised hydrocarbon pipeline contents.

Upstream of the HIPPS and back to the Longtom-3 well the pipeline is still pressured and contains hydrocarbons at 6,450 kPa. This upstream pipeline section contains approximately 10,600 m³ natural gas, 1 m³ Longtom condensate and 30 m³ MEG/water mix (40:60).

The Patricia Baleen pipeline has been placed in a nonoperational state and the pipeline is isolated at the gas plant.

2.4.3.3 Umbilical

Due to the electrical fault, the umbilical's power/communication signal, hydraulic and chemical injection functions are inactive and were subsequently isolated at the gas plant. The cores in the Longtom umbilical are filled with the water based hydraulic control fluid, MEG and methanol, the volumes of these are approximately 12 m³, 18 m³ and 6 m³ respectively.

2.4.4 Longtom Restart

Once the operational arrangements and commercial agreements for future Longtom production are reached the restart of the facilities will be planned. This will likely require an

inspection and maintenance campaign to visually inspect the facilities, check and repair power and communication links if necessary and monitor the restart offshore. Personnel at the gas plant will be trained in SGHE requirements, the Longtom restart and operating procedures, the environment plan, safety case, WOMP and the emergency response (including oil spill) arrangements. Re-start will be conducted remotely from the gas plant control room and apart from small amounts of water based hydraulic fluid released from the valves there would be no other planned releases or environmental impacts.

2.5 Inspection, Maintenance and Repair (IMR) Activities

The Longtom offshore facilities are unmanned, and any inspection or maintenance and repair activities will be conducted from an offshore vessel.

Inspection, maintenance and repair (IMR) programs are undertaken on the Longtom subsea infrastructure to confirm and maintain the integrity of the subsea systems. IMR programs are detailed in the accepted Safety Case for subsea infrastructure and accepted WOMPs for wells. The facility has an Integrity Management Plan that details the management, monitoring, mitigation and inspection activities determined necessary to ensure integrity is maintained for the subsea infrastructure and wells. The IMP covers all aspects of facility lifecycle management.

Equipment is managed with a risk-based maintenance plan with the objective to maintain it in 'good condition and repair' per Section 572¹ of the OPGGS Act and to enable removal, if required, at end of field life decommissioning. As detailed in the accepted Safety Case and WOMP a risk assessment methodology is used to assess potential threats to the subsea assets, risk mitigations and determine appropriate integrity monitoring plans including required frequency of subsea inspections to maintain Longtom integrity for future operation.

Inspection, maintenance and repair programs consist of activities such as:

- Inspection of wellheads, pipelines and subsea structures (Section 2.5.1).
- Maintenance or repair of the pipeline, wells and associated subsea infrastructure (Section 2.5.2); and
- Span rectification (Section 2.5.3).

¹ **572 Maintenance and removal of property etc. by titleholder**

Maintenance of property etc.

A titleholder must maintain in good condition and repair all structures that are, and all equipment and other property that is:

- (a) in the title area; and
- (b) used in connection with the operations authorised by the permit, lease, licence or authority.

Removal of property etc.

A titleholder must remove from the title area all structures that are, and all equipment and other property that is, neither used nor to be used in connection with the operations:

- (a) in which the titleholder is or will be engaged; and
- (b) that are authorised by the permit, lease, licence or authority.

2.5.1 Inspection

- Pipeline inspection via side scan sonar (SSS) and/or single or multi beam surveys, expected to occur once every 3 years and take approximately 1 week.
- Pipeline inspection via ROV survey and external inspection of equipment status and condition, expected to occur once every 3 years and take approximately 1 week, concurrent with SSS or multi beam survey.
- Internal inspection of the pipeline may also be carried out in the form of intelligent pigging inspections. This would involve divers and a dive support vessel. Pigging is not expected to be required but if it did the dive campaign would probably be a week or so.

Inspections typically monitor:

- anode wastage
- coating damage
- cathodic protection measurements
- external and internal corrosion
- marine growth
- damage (impact, environment or third party)
- scour and pipeline spans
- variation of inspected components or operating conditions; and
- leaks (gas or liquid).

2.5.2 Maintenance and Repair

The facilities were designed to require minimal maintenance. While normal operations do not require maintenance activities, a severe storm, fishing impact, failure of subsea equipment or a requirement to pig the pipeline may require the occasional maintenance or repair activity.

Maintenance and repair activities are typically conducted in response to inspection findings, engineering analyses, and/or external events. Maintenance and repair activities are expected to be rare and infrequent. If a repair is required, it is expected that it may take approximately a week.

Table 2-8 summarises the typical maintenance and repair activities that may be undertaken but this list is not exhaustive. The table also includes details of the initiation criteria for the various maintenance programs.

Table 2-8 Typical Maintenance and Repair Activities

Maintenance and Repair Type	Description	Initiation Criteria

Cathodic protection system maintenance	Replacement of anodes and continuity straps. Installation of cathodic skids.	Anodes are retrofitted when the existing anodes have depleted, or are about to deplete, beyond 90% of their original volume.
Leak testing	Leak testing is undertaken as required to verify the pressure integrity of components. Leak testing involves filling the component with water dosed with inhibitor, biocide and dye (normally fluorescent) and pressurising the pipeline to an appropriate test pressure.	Where the integrity of the pipeline system must be re-confirmed following a significant wall thickness defect.
Excavation for inspection, maintenance or repair	To undertake subsea IMR, localised excavation may be required directly adjacent to the subsea system, allowing access to buried infrastructure. Typically, this is conducted by jetting, mechanical and/or digging equipment from an ROV, vessel, or by using divers.	Access required to buried subsea infrastructure for inspection, maintenance or repair.
Marine growth and hard deposit removal	Marine growth and deposits may be removed by water jetting or manual cleaning from an ROV or by divers to access equipment. Water jetting may use potable or sea water.	Access required to subsea infrastructure for inspection, maintenance or repair.
Physical valve operation	Operation of valves by ROV.	Remote operation of valve is not functioning.
Removal of debris or fishing net	Removal of debris such as ropes and fishing nets that may become entangled on infrastructure.	Inspection identifies hazardous debris on infrastructure.
Rectification of electrical or hydraulic fault	Rectification of an electrical or hydraulic fault associated with an umbilical and associated connected equipment. Replacement of electrical/hydraulic/chemical umbilical or flying leads, cleaning of connectors, testing of connectors.	Electrical or hydraulic fault.
Pipeline repair	Pipeline repair which may, depending upon the damage the pipeline has sustained, include composite wrap application, mechanical clamp installation and anode retrofit. Pipeline cut-out and section replacement would only be undertaken for loss of containment events where pipeline contents have already been discharged.	Inspection identifies significant corrosion or damage to pipeline or a loss of containment from the pipeline.
Flexible jumper replacement	Replacement of flexible jumper with either rigid or flexible flowline between existing flange connections.	Flexible jumper significantly damaged or not functioning.
Subsea control module (SCM) / unit (SCU) change out	Replacement, or in situ servicing, of SCM / SCU including cleaning of interface and testing of connections.	SCM / SCU significantly damaged or not functioning:
Replacement of equipment on the	Where subsea equipment cannot be repaired it may be replaced. This would typically occur in the same location or near to the previous	Subsea equipment significantly damaged or not functioning.

seafloor	location.	
Mattress, grout and sand bag deployment	Mattresses, grout and sand bags maybe used where EFLs or HFLs are observed to be “floating” or additional protection is deemed to be needed for subsea infrastructure (such as umbilical at trench entry/exit points). Includes replacement of mattresses.	Inspection identified EFL or HFL “floating” or other infrastructure requires physical protection.
Subsea trees, flowline, flanges and mechanical connections servicing	Tensioning, blanking or polymer sealant application to restore or preserve integrity to subsea conduits.	Subsea equipment significantly damaged or not functioning.

All maintenance and repair activities will be risk assessed to ensure that the proposed activity does not pose a greater environmental risk than those assessed and presented within this EP. If it is determined that the activity is of greater environmental risk, then a revised EP will be submitted to NOPSEMA for approval before the activity can commence.

Note that any physical well intervention or workover will be covered by a separate EP.

2.5.3 Span Rectification

In addition to maintenance and repair of the Longtom facilities, pipeline span anomalies could potentially occur requiring remediation, these would likely be identified from the pipeline inspection. Spans can be rectified by the use of sand bags and grout bags, (a bladder/bag that is positioned under the pipeline and pumped full of grout until the bag supports the pipeline) and/or the installation of concrete mattresses. Depending of the inspection campaigns and the capability of the vessel and ROV, span rectification may be conducted during the same inspection campaign or may require an additional offshore vessel campaign. There have been minor spans previously rectified and these activities have been completed by ROV in less than a day.

2.5.4 Offshore Vessels

Any offshore IMR campaign will require an appropriate offshore support or installation vessel. The size of the vessel will depend on the activity being conducted and may vary from a small vessel out of Lakes Entrance with 10 personnel to conduct a simple visual ROV inspection, to a larger offshore installation vessel potentially with up to 120 personnel if a major maintenance or diving campaign is required, such as for an internal pigging run.

Vessels utilised for previous IMR activities range from small local vessels such as the Bass Trek and Silver Star to larger South East Asia based construction vessels such as the Skandi Hercules. The Bass Trek has a gross tonnage of 95 tonnes and a fuel capacity of 25 m³ with fuel spread between numerous tanks (maximum 11.5 m³). The Silver Star has a gross tonnage of 300 tonnes and a fuel capacity of 48 m³ with fuel spread between numerous tanks

(maximum 12 m³). The larger vessels with a gross tonnage of up to 10,000 tonnes may have fuel tanks up to 220 m³ (Table 2-9)

Only vessels using Marine Diesel Oil (MDO) (or a fuel with similar or lower environmental impact) will be utilised, vessels using Heavy Fuel Oil (HFO) or Intermediate Fuel Oil (IFO) will not be used. Given the short period of time that the vessels are expected to be in the field, vessels will return to port to refuel.

Whilst conducting petroleum activities the vessels will be operating at low speeds (≤ 2 knots) or stationary. Vessels will not anchor in the field.

Helicopters are not anticipated to be required for operations and maintenance activities. However, a helicopter may be required for medical emergencies and for transfers where vessel-based options are not suitable. Helicopters and fixed wing aircraft may also be utilised in the event of an incident to provide aerial monitoring.

The vessels are considered part of the 'petroleum activity', as defined by Regulation 4(1) of the OPGGS (E) Regulations, while they are within the VIC/L29 production licence (the 'petroleum instrument') and actively engaged (i.e. with an ROV or diver in the water). The vessels come under the regulatory jurisdiction of AMSA under the *Navigation Act 2012* (Cmlth) at all times.

2.5.5 Use of Remotely Operated Vehicles

ROVs will be used to conduct visual observations and, where possible and appropriate, to conduct subsea maintenance, repair and span rectification activities.

Table 2-9 Typical vessels and fuel storage capacities

Vessel	Type	POB	Gross Tonnage	Total fuel volume (m ³)	Number of fuel-Tanks	Fuel tank sizes (m ³)
Seven Eagle	DSV / Large Construction	106	9556	1644	17	18 – 190
SIEM AHTS VS491	AHTS	60	7473	1224	15	3 – 195
Skandi Hercules	Construction / Large ROV	90	4960	2416	1	1
Go Altair	AHTS	¹	4500	600	10	31 – 119
Deep Sea	AHTS	¹	4500	1242	15	23 – 212
Fugro Mariner	ROV Support / Maintenance	58	3466	976	12	41 – 118
Harvest Shine	Multipurpose / ROV	50	992	536	10	15 – 55
Bhagwan Dryden	Multipurpose / Med ROV	40	1475	130	1	1
Offshore Solution	Multipurpose / Med ROV	42	902	120	1	1
MV Offshore Guardian	Multipurpose / small ROV	28	316	60	1	1
Silver Star	Survey / small ROV	32	300	48	1	< 12
Bass Trek	Survey / small ROV	~24	95	25	1	< 11.5

¹Information not publicly available

2.5.6 Diving

The inspection, maintenance or repair of the pipeline, wellheads and/or trees may require diving where the work is too complex to undertake via ROV. Diving could include air diving, saturation diving or hard suit diving.

2.6 Longtom-5

The following section is provided for information only, the actual drilling, installation and tie-in of Longtom-5 will be the subject of a separate EP. The Longtom-5 subsea well will be tied into the Longtom facilities by undertaking the following:

- Tie-in of hydraulic and electric flying leads (HFL and EFL).
- Tie-in of a flexible flowline or rigid spools.
- Pressure/leak testing.

The tie in and commissioning of Longtom-5 will probably take about 10 days in the field. As the drilling campaign is yet to be confirmed the timing of the tie-in campaign is also currently unknown.

2.6.1 Longtom-5 Equipment and Installation

The Longtom-5 wellhead and subsea tree system will be approximately 3 x 3 x 2.5 m in size and similar to the existing Longtom 3 and 4 trees, these will be installed under a separate drilling EP.

Longtom-5 will be connected to the existing production pipeline through a 150mm nominal diameter flowline or spools approximately 150m long. Longtom 5 will be installed within the existing Longtom 3 petroleum safety.

It is likely that some of the tie-in activities will require divers and hence a Dive Support vessel will be required to undertake the work.

2.6.2 Longtom-5 Commissioning

The flowline or spools will be pre-commissioned and pressure tested prior to mobilisation, so that minimum offshore hydrostatic pressure testing is required (although a leak test will be required on completion of installation). Testing is normally performed by filling the flowlines with MEG or water and applying a pressure and then monitoring the pressure for indications of a leak. MEG is expected to be used for this and this will then be produced along with the Longtom-5 gas and processed within the onshore gas plant, as such offshore discharges will be minimised.

If water is used it is generally dosed at a controlled rate with four types of chemicals:

- Biocide.
- Oxygen Scavenger.
- Dye.
- Corrosion inhibitor.

These chemicals will be reviewed for environmental acceptability and will be subject to the SGHE chemical selection process. Examples of these are chemicals are provided in section 6.3.15.

Biocide and oxygen scavenger in the line-fill and hydrotest water are required to protect the inner wall of the pipeline from oxidation and biological activity during pre-commissioning. The dye is used in the hydrotesting process so that any leaks could be visually detected.

Corrosion inhibitor added to the hydrotest water inhibits corrosion.

Commissioning will commence once the well has been completed and after the hook-up. Commissioning confirms the integrity of the facilities and the state of readiness to operate

safely. Commissioning will be subject to detailed commissioning procedures and these will need to be signed off and accepted prior to the introduction of hydrocarbons.

Commissioning of Longtom-5 will be carried out from the onshore Control Room and may be monitored from a vessel.

2.7 Design Standards

Table 2-10 lists the key standards and testing requirements of the subsea wellheads and trees.

Further information on the design and standards can be found in the Longtom Pipeline Safety Case. The safety case will be revised prior to the tie-in of Longtom-5 and the design will be subject to independent third-party validation as part of the safety case revision process. The validation will confirm the appropriateness of the design codes and standards to ensure their implementation will result in a design that achieves ALARP.

Table 2-10 Wellhead and Tree standards

Code/Standard	Description
ISO9001 (2000)	Quality Management System requirements.
API Q1	Specification for quality programs for the petroleum, petrochemical and natural gas industry (seventh edition).
API Specification 6A	Wellhead equipment.
ASME Section IX	Weld procedures.
API 17D	Specifications for subsea wellhead and xmas tree equipment.
DNV RP B401	Cathodic protection design.
NAS 1638	Requirements of parts used in hydraulic systems (class 6).
API RP 17H	Remotely operated vehicle (ROV) interfaces for subsea equipment.
NACE MR0175/ISO 15156	Sulfide stress cracking resistant metallic material for oilfield equipment.
DNV 2.7.1	Offshore freight containers – design and certification.
AS 1666	Wire rope slings.
Testing requirement	Hydrotesting, gas testing and function testing.
Certification	Lloyds certified design verification package.

Table 2-11 lists the standards and codes relevant to the pipeline, umbilical and subsea structures and were drawn from the project Basis of Design codes and standards. Where no Australian Standard provides coverage, international codes and standards were used.

Table 2-11 Pipeline and umbilical codes and standards

Code/Standard	Description
API 17A	Recommended practice for the Design and Operation of Subsea Systems.
ISO 13628-5	Specification for Subsea Production Control Umbilicals.

API 17F	Specification for Subsea Production Control Systems.
API 17G	Recommended Practice for the Design and Operation of Completion/Workover Riser Systems.
API 17I	Installation Guidelines for Subsea Umbilicals.
AS/NZS 2885.4	Pipelines – Gas and liquid petroleum – Offshore submarine pipeline systems.
BS 4832	Specification for compatibility between elastomeric materials and hydraulic fluids.
PR-178-9731 (AGA)	Submarine Pipeline on-bottom Stability Analysis and Design Guidelines (Volume 1).
DNV-OS-F101	Submarine pipeline systems.
DNV RP B401	Cathodic Protection Design.
DNV RP E305	On-Bottom Stability Design of Submarine Pipelines.
DNV RP F105	Free Spanning Pipelines.
DNV RP F103	Cathodic Protection of Submarine Pipelines by Galvanic Anodes.
Table 2ISO/DIN 10474	Material Testing Certificates.
NACE 1638	Cleanliness Requirements for Parts Used in Hydraulic Systems.
SAE J517	Hydraulic Hoses.
SAE J343	Tests and Procedures for Hydraulic Hoses.

2.8 Decommissioning and Removal of Equipment

Whilst there are no immediate plans to decommission the Longtom facilities due to the requirement for production operations, in accordance with Section 572(2) of the OPGGS Act, SGHE commits to remove from the VIC/L29 title area all VIC/PL38 related structures, equipment and property that is neither used nor to be used in connection with the operations in which SGHE is or will be engaged and that are authorised by the licences, in accordance with future permissioning documents submitted by SGHE and accepted by NOPSEMA. In these future permissioning documents, SGHE may propose justified alternatives to complete removal where these are assessed as the preferred decommissioning option via a Comparative Assessment process that considers all risks and impacts. Until such time as final decommissioning options are determined, SGHE will ensure the appropriate maintenance of Longtom facilities so as not to preclude removal, consistent with Section 572(1) of the OPGGS Act.

2.8.1 Decommissioning Planning Activities Conducted

SGHE have a high level scope, plan and cost estimate for the eventual plugging and abandonment of the two existing Longtom wells. This was developed by AGR in 2012 and the scope is unchanged and still valid, with the cost estimates considered to be conservative based on the relative rig day rates between 2012 and 2020.

2.8.2 Future Decommissioning Planning Activities and Schedule

The following table presents the earliest estimated abandonment and decommissioning timelines for the Longtom facilities. Note that these dates will be dependent on a number of factors, including;

- Timing of recommencement of operation from existing Longtom wells.
- Commencement of Longtom-5 drilling and tie-in.
- Production rates and reservoir performance.
- Potential to utilise Longtom assets for other reservoir developments or adjacent projects.
- Combining Longtom decommissioning with other decommissioning activities in the area.
- Rig and vessel availability.
- Regulatory approvals.

Table 2-12 Indicative Decommissioning Plan

Asset	Scope	Estimated Earliest Timing	Notes
Longtom Field	Maintain Production Title	Ongoing	SGHE will maintain a production title for the restart of and continuing production operations.
Longtom Field	Maintain Pipeline Licence	Ongoing	SGHE will maintain a pipeline licence for the restart of and continuing production operations.
Longtom Field	Engineering, comparative studies and detailed planning	2028	Define decommissioning scope and commence detailed planning and regulatory approvals to support end of field life
Longtom 3	Plug and abandon production well	2031	May be extended to 2035 and conducted in a single campaign with Longtom-5
Longtom 4	Plug and abandon production well	2031	May be extended to 2035 and conducted in a single campaign with Longtom-5
Longtom Field	Potential end of production.	2033	Notional date
Longtom 5	Plug and abandon production well	2035	Note - not yet drilled.
Longtom Pipeline	Decommissioning of pipeline, umbilical, HIPPs, jumpers	2036	Project initiated after end of production, with project

	and associated structures		execution phase expected to commence after P&A of wells. Project execution period includes confirmation of final scope, major equipment contracting, final regulatory approvals and then field work. Estimated earliest completion in 2036.
Longtom Pipeline	Relinquish/surrender Pipeline Licence	2036	Title surrendered in discussion with NOPTA and post decommissioning.
Longtom Field	Relinquish/surrender Production Licence.	2036	Title surrendered in discussion with NOPTA and post decommissioning.

The activities and timelines in the above table are reviewed annually and the SGHE activities and plans in relation to field development and production included in the Annual Title Assessment Reports submitted to NOPTA. As these activities become nearer and fall within the timeline of the Environment Plan, the plans, processes, environmental impacts and specific controls associated with these activities will be further documented in an Environment Plan revision. This revision will include appropriate performance standards and measurement criteria for any new and/or changed controls to ensure risks continue to be managed to ALARP.

3 Stakeholder Consultation

The SGHE HSEC Policy includes a commitment to communicating openly with the community regarding SGHE activities. This section outlines how SGHE (and formerly Nexus) has worked to achieve this commitment.

Consultation with stakeholders is also a requirement of offshore petroleum exploration and production legislation and is increasingly becoming a major requirement of operators' management systems. SGHE (formerly Nexus) has developed a good reputation as a responsible industry operator and has had active engagement with stakeholders, where a stakeholder is defined as:

'those who have an interest in a particular decision, either as individuals or representatives of a group. This includes people who influence a decision, or can influence it, as well as those affected by it' (MCMPR, 2005).

Stakeholders include fishing interests, conservation interests, non-government organisations, and government agencies.

3.1 Regulatory Requirements

Regulation 11A of the OPGGS (E) Regulations requires that the titleholder consult with 'relevant persons' in the preparation of an EP.

A relevant person is defined as:

- a) Each Department or agency of the Commonwealth to which the activities to be carried out under the environment plan, or the revision of the environment plan, may be relevant;
- b) Each Department or agency of a State or the Northern Territory to which the activities to be carried out under the environment plan, or the revision of the environment plan, may be relevant;
- c) The Department of the responsible State Minister, or the responsible Northern Territory Minister;
- d) A person or organisation whose functions, interests or activities may be affected by the activities to be carried out under the environment plan, or the revision of the environment plan;
- e) Any other person or organisation that the titleholder considers relevant.

Regulation 14(9) of the OPGGS(E)R also defines a requirement for ongoing consultation to be incorporated into the Implementation Strategy (see Section 8.11). In addition, Regulation 16(b) of the OPGGS(E)R requires that the EP contain a summary and full text of this consultation. It should be noted that the full text is not made publicly available for privacy reasons.

To meet these requirements, SGHE has and will continue to undertake stakeholder consultation with persons and organisations that operate or have an interest in the area where the Longtom Gas Project activities are undertaken.

Provided in this section is a description of the consultative process applied, the list of relevant persons identified for consultation and the standard notifications proposed for these persons.

3.2 Stakeholder Consultation Objectives

The principal objectives of the project's stakeholder consultation activities are to:

- Identify all relevant stakeholders i.e. confirm existing stakeholders and identify whether there are additional stakeholders to those identified with regard to previously accepted activities for the Longtom Gas Project.
- Ensure relevant stakeholders are fully informed about the project and its environmental and social impacts and risks.
- Provide timely information to relevant stakeholders to ensure adequate time to consider the information and ask questions or raise issues of concern to them.
- Establish an open and transparent process for input.
- Capture concerns raised by stakeholders so that they may be assessed in the relevant regulatory documentation (such as this EP).
- Demonstrate to NOPSEMA that stakeholders have been consulted in line with the requirements of the OPGGS (E) Regulations 2009.
- Provide for ongoing consultation that reflects the requirements of stakeholders and the activity schedule.

3.3 Stakeholder Identification

Relevant stakeholders were and are identified by:

- Longtom Gas Project consultation, for previous drilling, installation and operation EPs
- Existing stakeholders identified as relevant and contained within the SGHE stakeholder register.
- Social receptors identified in the existing environment section.
- Communication with Commonwealth and State fisheries jurisdictions.
- Fishing industry representatives in the region.
- The Australian Government Guidance Offshore Petroleum and Greenhouse Gas Activities: Consultation with Australian Government agencies with responsibilities in the Commonwealth Marine Area; and
- Review of other operators' EPs in Bass Strait.

Consultation on the Longtom Gas Project began in 2005. Consultation has been ongoing through the drilling of Longtom 3 and 4, the pipeline installation campaign, commencement of operation, prior to IMR campaigns, the EP revision in 2014 and has been maintained by SGHE. Additional consultation was undertaken in 2019/2020 for this 5 yearly revision and stakeholders will be contacted at least annually going forward. Since 2005 SGHE has consulted with stakeholders in the region and built on the good working relationships already established. Consequently, SGHE believes it has effectively identified relevant stakeholders and has a good understanding of issues and areas of interest. During the scoping exercise for this revision, it was identified that some stakeholders previously engaged are no longer relevant or no longer exist and they have been identified as such in the SGHE stakeholder register.

Note that for this revision of the EP where there are no changes to the footprint of operations, there is considered to be no new impact or risk to any of the stakeholders.

3.3.1 Identified Relevant Stakeholders

Relevant stakeholders identified during previous consultations, including the recent consultation undertaken for this EP revision, are given below:

Department or agency of the Commonwealth to which the activities to be carried out under the EP may be relevant
Australian Fisheries Management Authority (AFMA).
Australian Maritime Safety Authority (AMSA).
Department of Agriculture, Water and the Environment Biosecurity
Department of Agriculture, Water and the Environment Parks Australia – Director of National Parks
Department of Defence Australian Hydrographic Office (AHO)
Department of Agriculture, Water and Environment
National Offshore Petroleum Titles Administrator (NOPTA)

Each Department or agency of a State or the Northern Territory to which the activities to be carried out under the EP may be relevant
Victoria
Department of Transport (DOT) - SREC Note: DOT now (2019) coordinate the consultation with the following Victorian agencies

Department of Jobs, Precincts and Regions (DJPR)
Department of Environment, Land, Water and Planning (DELWP)
Environment Protection Authority (EPA)
Transport Safety Victoria – Maritime Safety
Victorian Fisheries Authority (VFA)
Parks Victoria
Department of Jobs, Precincts and Regions (DJPR) - Biosecurity and agricultural services
Tasmania
Department of Primary Industries, Parks , Water and Environment (DPIPWE)
NSW
Transport for NSW

The Department of the responsible State Minister, or the responsible Northern Territory Minister
DJPR – Earth Resources Regulation (ERR)

A person or organisation whose functions, interests or activities may be affected by the activities to be carried out under the EP & any other person or organisation that the Titleholder considers relevant
Commercial Fishing
Lakes Entrance Fishing Co-operative (LEFCOL).
South East Trawl Fishery Industry Association (SETFIA).
Commonwealth Fisheries Association.
Lakes Entrance Scallop Fishing Industry Association
Victorian Scallop Fishermen’s Association.
Seafood Industry Victoria (SIV)
Southern Squid Jig Fishery
Victorian Abalone Divers Association (VADA)
Tasmanian Seafood Industry Council (TSIC)

Tasmanian Scallop Fishermen's Association
Recreational Fishing
Victorian Recreational Fishing Peak Body (VR Fish).
Oil and Gas Industry
Beach Energy
ExxonMobil
Cooper Energy
APA Group

3.4 Mechanisms for Consulting

The stakeholder consultation process has, and will continue to, utilise a number of mechanisms to communicate with stakeholders, both formal and informal. These include:

- Project briefings – project briefings have been held with stakeholders at project milestone points.
- One-on-one technical discussions – one-on-one meetings with stakeholders for information dissemination and obtaining stakeholder input to technical issues. Particularly relevant to oil spill response providers such as AMSA and DOT.
- Emails (including the provision of project information sheets) and phone calls
- Information releases – provision of information to the wider community, including:
 - Media releases (e.g., information updates in the local and regional newspapers).
 - Information mail-outs (e.g., project brochures and notifications. A specific mail-out was undertaken in February 2014 to support that revision of this EP). No feedback was received, and alternate methods (e.g. SMS alerts from SETFIA) have since been used to communicate with the fishing industry.
- SMS alerts from SETFIA to the fishing industry.

3.5 Summary of Stakeholder Consultation

The Consultation Summary Log with associated documentation is provided in Attachment 4.

The Consultation Log was established to record the contact details of relevant stakeholders, and to document the consultation undertaken, any response received and the relevant outcomes (i.e. assessment of merit and any resulting commitments and requirements).

The log was originally established for the drilling of Longtom-3 but has since been utilised to record consultation for drilling Longtom-4, the construction phase of the project, the Longtom-

5 drilling EP and this current revision of the EP. The log is a live document and will continue to be maintained for future activities.

None of the organisations or persons consulted to date have raised any significant objections or claims regarding this revision to the EP. Most of the organisations that responded were pleased to receive the information and advised that they would like to receive further information prior to the installation of Longtom-5.

4 Existing Environment

This chapter describes the physical, biological and socio-economic environment in the project area and surrounds, including the values and sensitivities of the region.

As a result of significant oil and gas exploration and production in the eastern part of Bass Strait for several decades, significant physical and ecological data has been collected for the region, which has been referenced in this chapter (including Longtom-specific surveys). SGHE has determined that this information is comprehensive and indicative of the existing environment within the project area and surrounds, and does not warrant the collection of additional field data to support this EP.

4.1 Environment that may be affected (EMBA)

SGHE has identified the environment that may be affected (EMBA) by the project (6.2.1). The EMBA has been used to describe the extent of the existing environment included in this chapter and is based on the oil spill modelling and the consequences/impact of a Longtom condensate or marine diesel oil (MDO) spill on the environment (see Section 6.2.1 for further details).

The EMBA has been defined by stochastically modelling two hydrocarbon spill scenarios², taking into account the NOPSEMA bulletin on oil spill modelling (NOPSEMA, April 2019).

1. A 900 bbl/day subsea release of Longtom condensate over 90 days. This relates to an 81,000 bbl subsea release in the event of a loss of well control (blowout) where the release is halted after relief well drilling.
2. An 80m³ MDO spill from an offshore vessel over 6 hours, plus ADIOS modelling of the duration/extent of a 220m³ MDO spill.

From these two scenarios the EMBA is defined by the area which is the greater extent of:

- Surface hydrocarbons floating on the sea equal to or above 1 g/m²
- Shoreline stranded hydrocarbon equal to or above 10 g/m²
- Entrained oil with instantaneous concentrations of 100 ppb
- Dissolved hydrocarbons within the water column with instantaneous concentrations of 50 ppb hydrocarbon

² For details on modelling parameters and metocean data used, refer Section 6.2.1.4, Oil Spill Modelling

This area is represented as Zone 1 in the figure below.

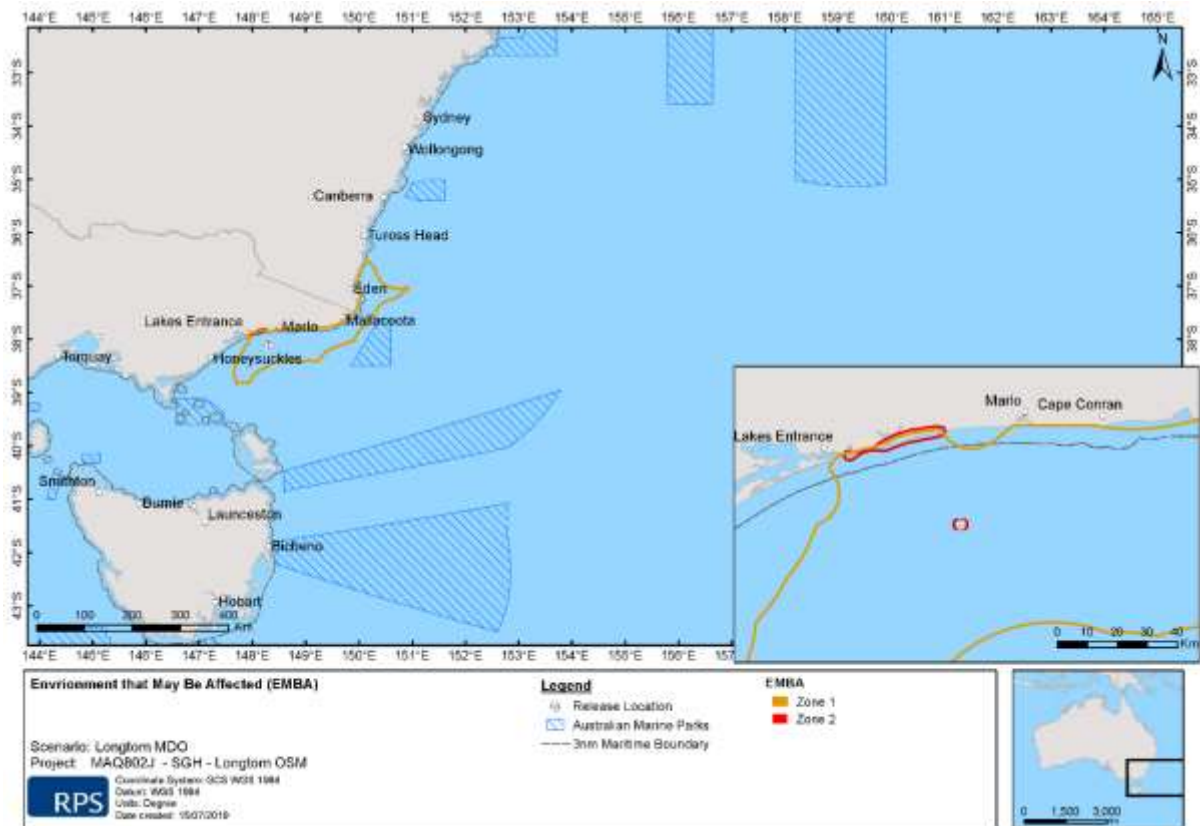


Figure 4-1 Indicative EMBA

Zone 2 represents the area potentially exposed to;

- Surface hydrocarbons floating on the sea equal to or above 10 g/m²
- Shoreline stranded hydrocarbon equal to or above 100 g/m²
- Entrained oil with concentrations of 100 ppb for at least 48hrs
- Dissolved hydrocarbons within the water column with concentrations of 50 ppb hydrocarbon for at least 48hrs

4.2 Physical Environment

4.2.1 Climate and Meteorology

4.2.1.1 Temperature

Lakes Entrance is the nearest meteorological station to the project area, located approximately 37 km northwest of the Longtom wells. Data collected from 1965 to 2006 indicates that the mean maximum temperature varies from 14.6°C in July to 23.8°C in February, with the mean minimum temperature being 6.0°C in July and 14.8°C in February (BoM, 2011).

4.2.1.2 Rainfall

Data collected from the Lakes Entrance meteorological station indicates that from 1965 to 2006 the average annual rainfall is 710 mm, with the highest total rainfall occurring in November and the lowest total rainfall occurring in February (BoM, 2011).

4.2.1.3 Winds

Bass Strait is located on the northern edge of the westerly wind belt known as the Roaring Forties. Wind direction and speed depend on the position and movement of synoptic systems.

High resolution wind data was sourced from the National Centre for Environmental Prediction (NCEP) Climate Forecast System Reanalysis from 2008 to 2012 (inclusive) [RPS, 2019]. The CFSR wind model includes observations from many data sources; surface observations, upper-atmosphere air balloon observations, aircraft observations and satellite observations and is capable of accurately representing the interaction between the earth's oceans, lands and atmosphere. The gridded wind data output is available at $\frac{1}{4}$ of a degree resolution (~33 km) and 1 hourly time intervals. Figure 4.2 illustrates the monthly wind rose distributions. Note that the atmospheric convention for defining wind direction, that is, the direction the wind blows from, is used.

The model wind data demonstrates that this region typically experiences strong wind all year round and although the monthly average wind speeds remain under 16 knots, winds can at times blow over 50 knots.

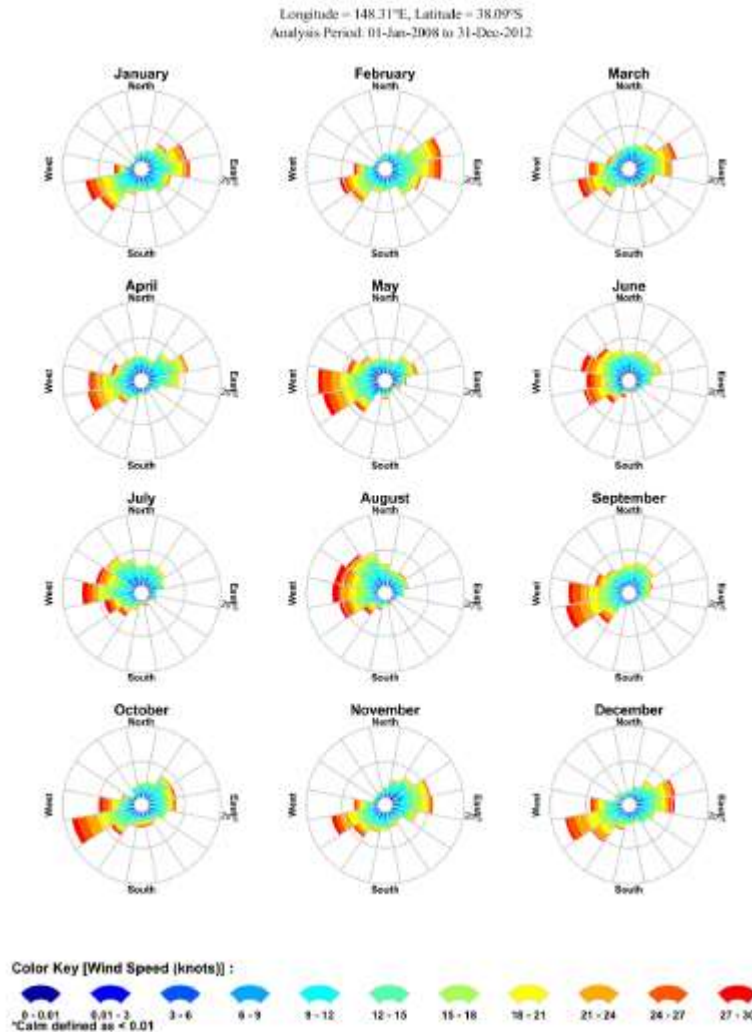


Figure 4-2 Monthly wind rose distributions

4.2.2 Bathymetry and Geology

4.2.2.1 Bathymetry

The seabed bathymetry across the Bass Strait region is highly variable. A steep inshore profile (0 to 20 m water depth) extends to a less steep inner (20-60 m water depth) and moderate profile (60 to 120 m water depth), concluding with a flat outer shelf plain (greater than 120 m water depth). Seaward, the sediments are comprised primarily of sand (92%) and silt/clay (8%). They are composed of organic material, with a median of 64.5% calcium carbonate (GEMS, 2005).

The seabed in the project area is essentially flat with gently undulating bathymetry with no steep slopes or bathymetric anomalies. The direction of shoaling along the pipeline route is towards the north-northeast (Fugro, 2005).

4.2.2.2 Seabed Geology

The following acoustic patterns and interpreted seabed types have been recognised in the project area from the previous Longtom pipeline route survey (Fugro, 2005):

- Type A: Uniform moderate to highly reflective seabed – interpreted as fine to coarse sands with abundant shells and shell fragments, the major seabed type. Type A is present along the majority of the pipeline route.
- Type B: Moderately low reflectivity seabed – interpreted as fine to coarse sands with minor shells and shell fragments, present as relatively small, localised patches.

The main difference between seabed Types A and B is a decrease in shell concentration within Type B.

4.2.2.3 Shallow Geology

Surveys along the Longtom gas pipeline route show that overall, the shallow geology is characterised by a surface layer of fine to coarse unconsolidated sands with shells and shell fragments overlying more consolidated bedded sedimentary sequences (Fugro, 2005). This layer varies between 2.5 and 5.6 m in thickness, with an average of 2.5 m. This geology is indicative of a high-energy environment and is not conducive to forming more stable habitats where marine flora and fauna can establish itself.

4.2.3 Oceanography

The oceanography of the project area is similar to that of the eastern Bass Strait region due to the absence of seafloor anomalies that may influence local oceanographic conditions.

4.2.3.1 Currents and Tides

Currents in eastern Bass Strait are tide and wind-driven. Tidal movements in eastern Bass Strait are predominantly in a northeast-southwest orientation, with a 12.4-hour cycle. The main tidal constituents in Bass Strait vary in phase by about 3 to 4 hours from east to west. Most of this phase change occurs between Lakes Entrance and Wilson's Promontory. Timing of the high tide, for example, can vary by up to 3 hours across this region (GEMS, 2005). Tides in the area from Lakes Entrance to Gabo Island are, however, relatively weak in comparison to other areas of Bass Strait.

Wind-driven currents in the project area may be caused by the direct influence of weather systems passing over the Strait (wind and pressure-driven currents) and the indirect effects of weather systems passing over the Great Australian Bight.

The Gippsland Basin is also influenced by the southern extremity of eddies belonging to the East Australian Current (EAC) that travels southward, carrying warm equatorial waters (Director of National Parks, 2012). The currents were shown to vary from month to month with current speeds of close to 1 m/s encountered in some areas (APASA, 2012). The EAC is up

to 500 m deep and 100 km wide, and is strongest in summer when it can flow at up to 5 knots, and slower in winter flowing at 2-3 knots (Director of National Parks, 2012). The eddies rotate around warm central cores that persist for several months and can be up to 200 km across, forming more commonly off the southern NSW coast (Director of National Parks, 2012). Subsea currents of up to 1 knot or 0.5m/s can be experienced at the Longtom location but they are generally diurnal with a median bottom current of around 0.15m/s (Metocean Design Criteria 2006).

Waters of eastern Bass Strait are generally well mixed but surface warming sometimes causes weak stratification in calm summer conditions. Occasionally, mixing and interaction between varying water masses leads to variations in horizontal water temperature and temperature profiles.

4.2.3.2 Water Temperatures

Sea surface temperatures in the project area range from a minimum of 12.6°C in winter to a maximum of 18.4°C in summer (APASA, 2012).

4.2.3.3 Waves

Bass Strait is a high energy environment exposed to frequent storms and significant wave heights, with highest wave conditions generally associated with strong west to southwest winds caused by the eastward passage of low pressure systems across Bass Strait.

4.2.3.4 Coastlines

The coastline within the EMBA, stretching east from Lakes Entrance to just west of the Cape Howe Marine National Park near the Victorian/NSW border is herein briefly described in terms of its physical attributes. These descriptions are based largely on the Oil Spill Response Atlas (OSRA) mapping and Parks Victoria (2012) park notes (see OPEP for further details). The description of the coastline is discussed moving in an easterly direction from Lakes Entrance. Further detail on marine sensitivities along the coastline is provided in Section 4.6.

The coastline from Lakes Entrance east to Point Hicks is dominated by largely uninterrupted wide sandy beaches with tall, vegetated sand dunes (the Ninety Mile Beach). Behind the sand dunes (east to Marlo) are a series of wetlands and lakes (Gippsland Lakes). These sandy beaches and dunes provide nesting sites for the shorebirds such as the Hooded Plover, which is found along the entire Victorian coastline.

Sub-tidal rocky reefs are found around Point Ricardo, Cape Conran, Pearl Point, Thurra River Estuary, Petrel Point, Rame Head, The Skerries (haul out site for approximately 11,500 Australian fur seals and 300 New Zealand fur seals) through to Little Rame Head, Quarry Head, Bastion Point and Gabo Island (near Cape Howe). Areas between these rocky reefs are dominated by sandy beaches. Gabo Island itself is dominated by sandy dunes and has

Victoria's largest penguin colony (approximately 35,000 breeding penguins, about 50% of the state population) and is the haul out site for up to 50 Australian fur seals.

The Sydenham and Tamboon Inlet estuaries are only intermittently open (usually during spring flooding as a result of snow melts), with these estuaries providing nesting, roosting, and feeding sites for the colonies of several shorebird species.

Clinton Rocks is located immediately east of the Tamboon Inlet and is of State geological significance. Other intertidal rocky shorelines are present around the Thurra River estuary, east of the Mueller River estuary, Petrel Point and Sandpatch Point. Intertidal rocky habitats dominate the shoreline from Little Rame Head to Mallacoota Entrance. East of Mallacoota Entrance, the shoreline is once again dominated by sandy beaches.

The Giant Kelp Marine Forests of South East Australia ecological community is located on the coasts of Victoria, Tasmania and South Australia and is protected under the EPBC Act as a threatened ecological community. The ecological community is made up predominately of giant kelp (*Macrocystis pyrifera*) plants and reef associated fish and invertebrates that shelter, feed and reproduce within Giant Kelp Marine Forests (SEWPaC, 2012c).

The Giant Kelp Marine Forests of South East Australia ecological community is distinguished by giant kelp plants that have formed a forest with a closed or semi-closed canopy at or below the water's surface. Giant kelp plants grow on rocky reefs at depths generally greater than eight metres below sea level and in water conditions that are cool, relatively nutrient rich and moderately calm (SEWPaC, 2012c).

4.2.3.5 KEF: Upwelling East of Eden

The Upwelling East of Eden is defined as a key ecological feature (KEF) as it is an area of high productivity and aggregations of marine life. The KEF is located along the eastern Victorian and southern NSW coasts but this feature displays seasonal and annual variation.

Dynamic eddies of the East Australian Current cause episodic productivity events when they interact with the continental shelf and headlands. The episodic mixing and nutrient enrichment events drive phytoplankton blooms that are the basis of productive food chains including zooplankton, copepods, krill and small pelagic fish.

The upwelling supports regionally high primary productivity that supports fisheries and biodiversity including top order predators, marine mammals and seabirds. Humpback whale feeding has regularly been observed on the southern migration (see Section 4.3.5) off the coast of Eden (NSW) (Stockin & Burgess 2005), however feeding in Australian coastal waters is thought to primarily be opportunistic and forms only a small portion of their nutritional requirements. Also off the coast of Eden is an 'historic high use area with evidence of current use', i.e. potential aggregation area, for the Southern right whale (SEWPaC, 2012d).

4.3 Biological Environment

4.3.1 Benthic Communities

The seascape of the Gippsland Basin is composed of a series of massive sediment flats, interspersed with small patches of reef, bedrock and consolidated sediment (Wilson and Poore, 1987). The sediment flats, such as those present in the project area, are generally devoid of emergent fauna but benthic invertebrates such as polychaetes, bivalves, molluscs and echinoderms are present (Wilson and Poore, 1987). There are also a number of burrowing species, which inhabit the soft seabed, including tubeworms, small crustaceans, nematodes, nemertean and seapens (PBEEES, 2001).

There is an absence of hard substrate or emergent reefs in the project area. Surveys of benthic invertebrates in Bass Strait (Poore et al., 1985; Wilson and Poore, 1987) have shown:

- Crustaceans and polychaetes dominate the infaunal communities, many of which are unknown species.
- The high diversity of a wide range of invertebrate groups has been a recurrent observation of all surveys in Bass Strait and diversity is high compared with equivalent areas of the northern hemisphere.
- Many species are widely distributed across the Strait, suggesting heterogeneous sediments and many microhabitats.
- Some invertebrate groups are allied with fauna from Antarctic seas. In winter, when the east coast of Tasmania is supplied with water from the sub-Antarctic, the overlap with the East Australia current contributes to the high diversity.

Parry et al (1990) also found high diversity and patchiness of benthos sampled off Lakes Entrance, where a total of 353 species of infauna was recorded. Crustaceans (53%), polychaetes (32%) and molluscs (9%) dominated sample results.

The relative homogeneity of seafloor sediment in the project area and across all areas surveyed during the Longtom pipeline route selection process (Fugro, 2005) suggests that the diversity of benthic invertebrates in the project area is low. There was no evidence of unusually high benthic invertebrate diversity in the sediment samples collected along the pipeline route. Sediment samples generally show a brown, coarse shelly sand, moderately well sorted with some shells.

4.3.2 Plankton

Plankton species, including both phytoplankton and zooplankton, are a key component in oceanic food chains. Phytoplankton are photosynthetic organisms that spend either part or all of their lifecycle drifting with the ocean currents. Phytoplankton biomass is greatest at the extremities of Bass Strait (particularly in the northeast) where water is shallow and nutrient levels are high.

Zooplankton are comprised of small protozoa, crustaceans (such as krill) and the eggs and larvae from larger animals. More than 170 species of zooplankton have been recorded in eastern and central Bass Strait, with copepods making up approximately half of the species encountered (Watson & Chaloupka, 1982). The high diversity may be due to considerable intermingling of distinctive water bodies and may be higher in eastern than in western Bass Strait. Although a high diversity of zooplankton has been recorded, Kimmerer and McKinnon (1984) found that seven dominant species make up 80% of individuals.

4.3.3 Fish and Shellfish

4.3.3.1 Commercial and Recreational Species

It is estimated that there are over 500 species of fish found in the waters of Bass Strait, including a number of species of importance to commercial and recreational fisheries (LCC, 1993). Representative species of recreational or commercial significance in Bass Strait are listed in Table 4-1.

Table 4-1 Major commercial fish species in eastern Bass Strait

Habitat	Typical Species
Pelagic	Pilchards (<i>Sardinops neopilchardus</i>) Anchovies (<i>Engraulis australis</i>) Sandy sprats (<i>Hyperlophus vittatus</i>)
Demersal and Benthic	200 species of bony fish including many of commercial value 50 species of sharks and rays, including gummy sharks (<i>Mustelus antarcticus</i>) and school sharks (<i>Galeorhinus galeus</i>)
Nearshore	School whiting (<i>Sillago bassensis</i>) Sand flathead (<i>Platycephalus bassensis</i>) Yank flathead (<i>P. speculator</i>) Jack mackerel (<i>Trachurus declivis</i>) Silver trevally (<i>Pseudocaranx dentex</i>) Blue warhoo (<i>Seriolella brama</i>) Yellowtail scad (<i>Trachurus novaezealandiae</i> and <i>Trachurus declivis</i>)
Mid Continental Shelf	Tiger flathead (<i>P. richardsoni</i>) John dory (<i>Zeus faber</i>) Jackass morwong (<i>Nemadactylus macropterus</i>) Common saw shark (<i>Pristiophorus cirratus</i>) and southern sawshark (<i>P. nudipinnis</i>) Snapper (<i>Pagrus auratus</i>)
Continental Slope	Blue grenadier (<i>Macruronus novaezealandii</i>) Spotted warehou (<i>Seriolella punctata</i>) and blue warehou (<i>S. brama</i>) Ling (<i>Genypterus blacoides</i>) Mirror dory (<i>Zenopsis nebulaosus</i>) Ocean perch (<i>Helicolenus sp.</i>)

Habitat	Typical Species
	Blue eye trevalla (<i>Hyperglyphe antarctica</i>)
	Gemfish (<i>Rexea solandri</i>)
	Orange roughy (<i>Hoplostethus atlanticus</i>)

Species of shellfish of commercial and recreational importance include abalone, scallops, rock lobsters, prawns and squid. Abalone (*Haliotis rubra*) and rock lobster (*Jasus novaehollandiae*) occur mainly on rocky substrates, which are extensive on the coasts of Victoria, Tasmania and the Bass Strait islands. However, this habitat is absent in the project area. Scallops (*Pecten fumatus*) occur on sandy substrates in a number of areas throughout Bass Strait.

Commercial fishing activity in the project area targeting the above species is discussed in Section Table 4-1.

4.3.3.2 Listed Species

Fish species that may occur in the EMBA that are listed as threatened under the EPBC Act are the Australian Grayling (*Prototroctes maraena*) and the Black Rockcod (*Epinephelus daemeli*), both of which are listed as vulnerable. The remaining listed species that may occur in the EMBA are from the family signathidae (pipefish, seahorses and dragonfish). Table 4-2 identifies all fish species that may occur in the EMB (DoEE. 2019). A list of approved conservation advice and/or recovery plans for listed species, where they exist, with key threats relevant to petroleum activities, is shown in table Table 4-3.

Table 4-2 EPBC Act listed fish potentially occurring in the EMBA

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	Type of Presence
<i>Epinephelus daemeli</i>	Black rockcod	V			MO
<i>Heraldia nocturna</i>	Upside-down pipefish			✓	MO
<i>Hippocampus abdominalis</i>	Big-belly sea-horse			✓	MO
<i>Hippocampus breviceps</i>	Short-head seahorse			✓	MO
<i>Hippocampus minotaur</i>	Bullneck sea-horse			✓	MO
<i>Histiogamphelus briggsii</i>	Briggs' crested pipefish			✓	MO
<i>Histiogamphelus cristatus</i>	Rhino pipefish			✓	MO
<i>Hypselognathus rostratus</i>	Knife-snout pipefish			✓	MO
<i>Kaupus costatus</i>	Deep-bodied pipefish			✓	MO
<i>Kimblaeus bassensis</i>	Trawl pipefish			✓	MO
<i>Leptoichthys fistularius</i>	Brushtail pipefish			✓	MO
<i>Lissocampus runa</i>	Javelin pipe-			✓	MO

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	Type of Presence
	fish				
Maroubra perserrata	Sawtooth pipefish			✓	MO
Mitotichthys semistriatus	Halfbanded pipefish			✓	MO
Mitotichthys tuckeri	Tucker's pipefish			✓	MO
Notiocampus ruber	Red pipefish			✓	MO
Phyllopteryx taeniola-tus	Weedy seadragon			✓	MO
Prototroctes maraena	Australian grayling	V			LO
Solegnathus robustus	Robust spiny pipehorse			✓	MO
Solegnathus spinosissimus	Australian spiny pipehorse			✓	MO
Stigmatopora argus	Spotted pipefish			✓	MO
Stigmatopora nigra	Widebody pipefish			✓	MO
Stipecampus cristatus	Ringback pipefish			✓	MO
Syngnathoides biaculeatus	Double-ended pipehorse			✓	MO
Urocampus carinirostris	Hairy pipefish			✓	MO
Vanacampus margaritifera	Mother-of-pearl pipefish			✓	MO
Vanacampus phillipi	Port Phillip pipefish			✓	MO
Vanacampus poecilolaemus	Australian long-snout pipefish			✓	MO
<i>Threatened Species:</i> V Vulnerable CE Critically Endangered	<i>Type of Presence:</i> MO Species or species habitat may occur within the area				

Table 4-3 Conservation advice for threatened fish species and key threats potentially relevant to petroleum activities

Common Name	Conservation Advice or Recovery Plan	Key Threats potentially relevant to petroleum activities
Black Rock cod	Approved Conservation Advice for <i>Epinephelus daemeli</i> (black cod) (DoEE, 2012a)	None Identified
Australian Grayling	National Recovery Plan for the Australian Grayling <i>Prototroctes maraena</i> , 2008 (VDSE, 2008)	Reduction in water quality
Spotted Handfish	Approved Conservation Advice for <i>Brachionichthys hirsutus</i> (spotted handfish) (DoEE, 2012c). Australian national Recovery Plan for Three Handfish Species: spotted handfish (<i>Brachionichthys hirsutus</i>), red handfish (<i>Thymichthys politus</i>) and Ziebell's handfish (<i>Brachiopsilus ziebelli</i>) (DoEE, 2015e)	None identified
Red Handfish	Australian national Recovery Plan for Three Handfish Species: spotted handfish (<i>Brachionichthys hirsutus</i>), red handfish (<i>Thymichthys politus</i>) and Ziebell's handfish (<i>Brachiopsilus ziebelli</i>) (DoEE, 2015)	None Identified

The Australian Grayling (*Prototroctes maraena*), listed as ‘vulnerable’ under the EPBC Act, is a dark brown to olive-green fish growing to 19 cm. In Victoria, this species has been most frequently collected in the Tambo, Barwon, Mitchell and Tarwin river systems. It occurs widely in Tasmania and is known from the northern, eastern and southern coastal river drainages. The Australian Grayling spends most of its life in freshwater (including spawning), migrating between freshwater streams and the ocean, and as such it is generally accepted to be a diadromous (migratory between fresh and salt waters) species and not anadromous (migrating from saltwater to freshwater to spawn) (DSE, 2008). Part of the larval and/or juvenile stages are spent in coastal seas, where they remain for about six months before moving back to freshwater where they spend the rest of their lives. Australian graylings are generally short-lived, with most fish dying after their second year. Threats to the species are related mostly to impacts to its freshwater habitat rather than offshore habitat, including barriers to movement, river regulation and declining water quality.

The Black Rockcod (*Epinephelus daemeli*) is a dark grey-black or blotched black and white cod species. It can grow to 200 cm in length, although most recent sightings of the species were 40 to 80 cm in length. The Black Rockcod generally inhabits near-shore rocky and offshore coral reefs and is distributed along inshore areas of the NSW coastline. Its entire range includes warm temperate and subtropical waters and therefore may be found in southern NSW however recordings in Victoria are rare. There is no known critical habitat for this species in or around the project area or the Gippsland Basin in general. Targeted fishing of the species is banned and the main threat is bycatch (DoEE, 2012a).

Macro-algal (seaweed) habitat in shallow waters provides the key habitat for most species of signathids (pipefishes, seahorses and seadragons). Kelp species such as *Macrocystis angustifolia* and *Eklonia radiata* and the seagrass *Heterozostera tasmanica* (eel seagrass) are the three most common species that provide essential resources for the signathids (of which 30 species are listed as possibly occurring within the EMBA). Generally, signathid species are associated with this vegetation that grows in sheltered to moderately exposed reef areas at a range of depths 0 to 50 m depending on the species (Edgar, 1997), but usually at shallow depths of between 5 to 25 m. The lack of suitable habitat in the project area makes it unlikely that signathid species occur here.

4.3.4 Sharks and Rays

A number of chondrichthyans (sharks and rays) have been known to inhabit the Gippsland Basin. These include the gummy shark (*Mustelus antarcticus*), Port Jackson shark (*Heterodontus portusjacksoni*), school shark (*Galeorhynchus milii*), white-spotted spurdog (*Squalus acanthias*), piked spurdog (*Squalus megalops*), common sawshark (*Pristiophorus cirratus*), draughtboard shark (*Cephaloscyllium laticeps*), southern sawshark (*Pristiophorus nudipinnis*), gulf catshark (*Asymbolus vincenti*), rusty catshark (*Parascyllum ferrugineum*), southern eagle ray (*Myliobatis australis*), broadnose sevengill shark (*Notorynchus cepedianus*), varied catshark (*Parascyllum variolatum*) and the Australian angel shark (*Squatina australis*) (Walker *et al.*, 2001).

Shark species that may occur in the EMBA and that are listed as threatened under the EPBC Act are shown in Table 4-4 and include the great white shark (*Carcharodon carcharias*) (listed as vulnerable), the whale shark (*Rhincodon typus*) (listed as vulnerable) and the grey nurse shark (*Carcharis Taurus – east coast population*) (listed as critically endangered). These three species are briefly discussed below on the basis that they are known to migrate through eastern Bass Strait.

The grey nurse shark (*Carcharis Taurus – east coast population*) has been recorded from southern Queensland and around southeast Australia (NSW coast). The species is uncommon in Victorian, South Australian and Tasmanian waters. The grey nurse sharks are known to migrate up and down the east coast and are known to aggregate according to sex, with females predominately occurring off central NSW while males predominate in southern Queensland waters. Biologically important areas for migration are known to occur on the NSW coast as far down as Eden. Grey nurse sharks prefer warm temperatures and occur either alone or in small to medium sized groups.

The great white shark (*Carcharodon carcharias*) is normally found in inshore waters around the areas of rocky reefs and seal colonies, such as Wilsons Promontory. Biologically important areas for juveniles are found in coastal waters of Gippsland in areas off Ninety Mile Beach, west of the project area, and pupping grounds are likely to be frequented between the months of December and June (Holliday, 2003). The distribution of this species extends over the project area and through the EMBA.

Whale sharks are oceanic and cosmopolitan in their distribution, generally found in warmer oceanic waters (where temperatures range from 21 to 25°C) and mainly in waters off the Northern Territory, Queensland and northern Western Australia. They are known to aggregate in the reef front waters adjacent to the Ningaloo Reef during the autumn months (mid-March through to early-June) (Colman, 1997). This behaviour is only known to occur in a few other places in the world. Whale sharks are not known to aggregate in or near Bass Strait.

However, there have been a few isolated reports of immature male whale sharks (*Rhincodon typus*) from the southeast coast of Australia from New South Wales, Victoria, South Australia and the western fringe of the Great Australian Bight (Last & Stevens, 1994). There is no critical habitat for this species in or around the project area or the Gippsland Basin in general.

Two other species of shark were recorded as potentially migrating within the EMBA according to the DoEE EPBC Online Protected Matters Search Tool – the Shortfin Mako (*Isurus oxyrinchus*) and the Porbeagle/Mackerel Shark (*Lamna nasus*). There is no critical habitat for these species in or around the project area or the Gippsland Basin in general.

Table 4-5 lists the approved conservation advice and/or recovery plans for listed species, where they exist, with key threats potentially relevant to petroleum activities.

Table 4-4 EPBC Act listed sharks potentially occurring in the EMBA

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
<i>Carcharias Taurus</i> (east coast population)	Grey Nurse Shark (east coast population)	CE			d	LO
<i>Carcharodon carcharias</i>	Great White Shark	V	✓		b, d	BKO
<i>Isurus oxyrinchus</i>	Shortfin Mako		✓			LO
<i>Lamna nasus</i>	Porbeagle		✓			LO
<i>Rhincodon typus</i>	Whale Shark	V	✓			MO
<p><u>Threatened Species:</u> V Vulnerable CE Critically Endangered</p> <p><u>Biologically Important Areas:</u> b Breeding d Distribution f Foraging</p>		<p><u>Type of Presence:</u> MO Species or species habitat may occur within the area LO Species or species habitat likely to occur within the area KO Species or species habitat known to occur within the area BKO Breeding known to occur within the area</p>				

Table 4-5 Conservation advice for threatened shark species and Key Threats

Common Name	Conservation Advice or Recovery Plan	Key Threats (potentially relevant to petroleum)

		activities)
Grey Nurse Shark	Recovery Plan for the Grey Nurse Shark (<i>Carcharias Taurus</i>)	None identified
Great White Shark	Recovery Plan for the White Shark (<i>Carcharodon carcharias</i>)	None identified
Whale Shark	Approved Conservation Advice for <i>Rhincodon typus</i> (Whale Shark)	Vessel strike Habitat disruption from mineral exploration, production and transportation, Marine debris

4.3.5 Whales

A number of whale species occur in Bass Strait, most being seasonal visitors during migration. There are 22 whale species that may inhabit the waters within the EMBA according to the DoEE EPBC Online Protected Matters Search Tool, these are listed in Table 4-6. Table 4-7 lists the approved conservation advice and/or recovery plans for listed whale species, where they exist, with key threats potentially relevant to petroleum activities.

Five of these species are listed as nationally threatened under the EPBC Act – the blue (listed as endangered), southern right (listed as endangered), humpback (listed as vulnerable), sei (listed as vulnerable) and fin (listed as vulnerable) whales. These species are briefly discussed below on the basis that they are known to migrate through the Gippsland Basin. While they are known to migrate through the Gippsland Basin, there is little or no potential for interactions between project-related or inspection activities and whales, other than during the short periods of inspection or when Longtom-5 will be tied in, as all facilities (i.e., pipeline, umbilical and subsea trees) have been installed and are operating on the sea floor. As such, the potential presence of these whales in the project area is considered in Chapter 6 insofar as it relates to the inspection and Longtom-5 tie in activities.

Table 4-6 EPBC Act listed whales potentially occurring in the EMBA

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
<i>Balaenoptera acutorostrata</i>	Minke Whale					MO
<i>Balaenoptera bonaerensis</i>	Antartic Minke Whale		✓			LO
<i>Balaenoptera borealis</i>	Sei Whale	V	✓			FLO
<i>Balaenoptera edeni</i>	Bryde's Whale		✓			MO
<i>Balaenoptera musculus</i>	Blue Whale	E	✓		f*	LO
<i>Balaenoptera physalus</i>	Fin Whale	V	✓			FLO
<i>Berardius arnuxii</i>	Arnoux's Beaked Whale					MO
<i>Caperea marginata</i>	Pygmy Right Whale		✓			FLO
<i>Eubalaena australis</i>	Southern Right Whale	E	✓		m	KO
<i>Globicephala macrorhynchus</i>	Short-finned Pilot Whale					MO
<i>Globicephala melas</i>	Long-finned Pilot Whale					MO
<i>Kogia breviceps</i>	Pygmy Sperm Whale					MO
<i>Kogia simus</i>	Dwarf Sperm Whale					MO
<i>Megaptera novaeangliae</i>	Humpback Whale	V	✓		f	FKO
<i>Mesoplodon bowdoini</i>	Andrew's Beaked Whale					MO
<i>Mesoplodon densirostris</i>	Blainville's Beaked Whale					MO
<i>Mesoplodon grayi</i>	Gray's Beaked Whale					MO
<i>Mesoplodon hectori</i>	Hector's Beaked Whale					MO
<i>Mesoplodon layardii</i>	Strap-toothed Beaked Whale					MO
<i>Mesoplodon mirus</i>	True's Beaked Whale					MO
<i>Physeter microcephalus</i>	Sperm Whale		✓			MO
<i>Ziphius cavirostris</i>	Cuvier's Beaked Whale					MO
<u>Threatened Species:</u> V Vulnerable E Endangered		<u>Type of Presence:</u> MO Species or species habitat may occur within the area LO Species or species habitat likely to occur within the area KO Species or species habitat known to occur within the area				

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
<u>Biologically Important Areas:</u> <i>f</i> Foraging <i>m</i> Migration * BIA for sub species		<i>BKO</i> Breeding known to occur within the area <i>FKO</i> Foraging, feeding or related behaviour known to occur within area				

Table 4-7 Conservation advice for threatened whale species and Key Threats

Common Name	Conservation Advice or Recovery Plan	Key Threats (potentially relevant to petroleum activities)
Sei Whale	Approved Conservation Advice for <i>Balaenoptera borealis</i> (Sei Whale)	Anthropogenic noise and acoustic disturbance Habitat degradation including pollution Pollution (persistent toxic pollutants) Vessel strike
Blue Whale	Conservation Management Plan for the Blue Whale, 2015-2025	Noise interference Habitat modification from marine debris or chemical discharge Vessel strike
Fin Whale	Approved Conservation Advice for <i>Balaenoptera physalus</i> (Fin Whale)	Anthropogenic noise and acoustic disturbance Pollution (persistent toxic pollutants) Vessel strike
Southern Right Whale	Conservation Management Plan for the Southern Right Whale, 2011-2021	Entanglement Vessel strike Noise Interference Habitat modification
Humpback Whale	Approved Conservation Advice for <i>Megaptera novaeangliae</i> (Humpback Whale)	Noise interference Habitat degradation Entanglement Vessel disturbance and strike

Blue whales (*Balaenoptera musculus*) are likely to be present around November to December as a result of migration in the vicinity of the project area. They have extensive migration patterns that are not known to follow any particular coastlines or oceanographic features (Bannister *et al.*, 1996). While eastern Bass Strait is not known as a feeding or aggregation area for this mammal species (DEH, 2004a), in the past, sightings of Blue whales have occurred in southeast Victoria from February to March, but are reasonably rare in the Gippsland Basin (Bannister *et al.*, 1996). There are two subspecies of Blue Whale that occur within Australian waters: Antarctic Blue Whale, and the Pygmy Blue Whale. The majority of Bass Strait and the coastal waters of Tasmania have been identified as possible foraging areas (BIA) for the Pygmy Blue Whale (DoEE, 2015). The relatively shallow water (50-55 m)

of the project area may reduce the potential for Blue whales to be present, as Blue whales are known to feed on seasonally abundant krill along the shelf break in western Victoria in depths around 100 m (Gill, 2002).

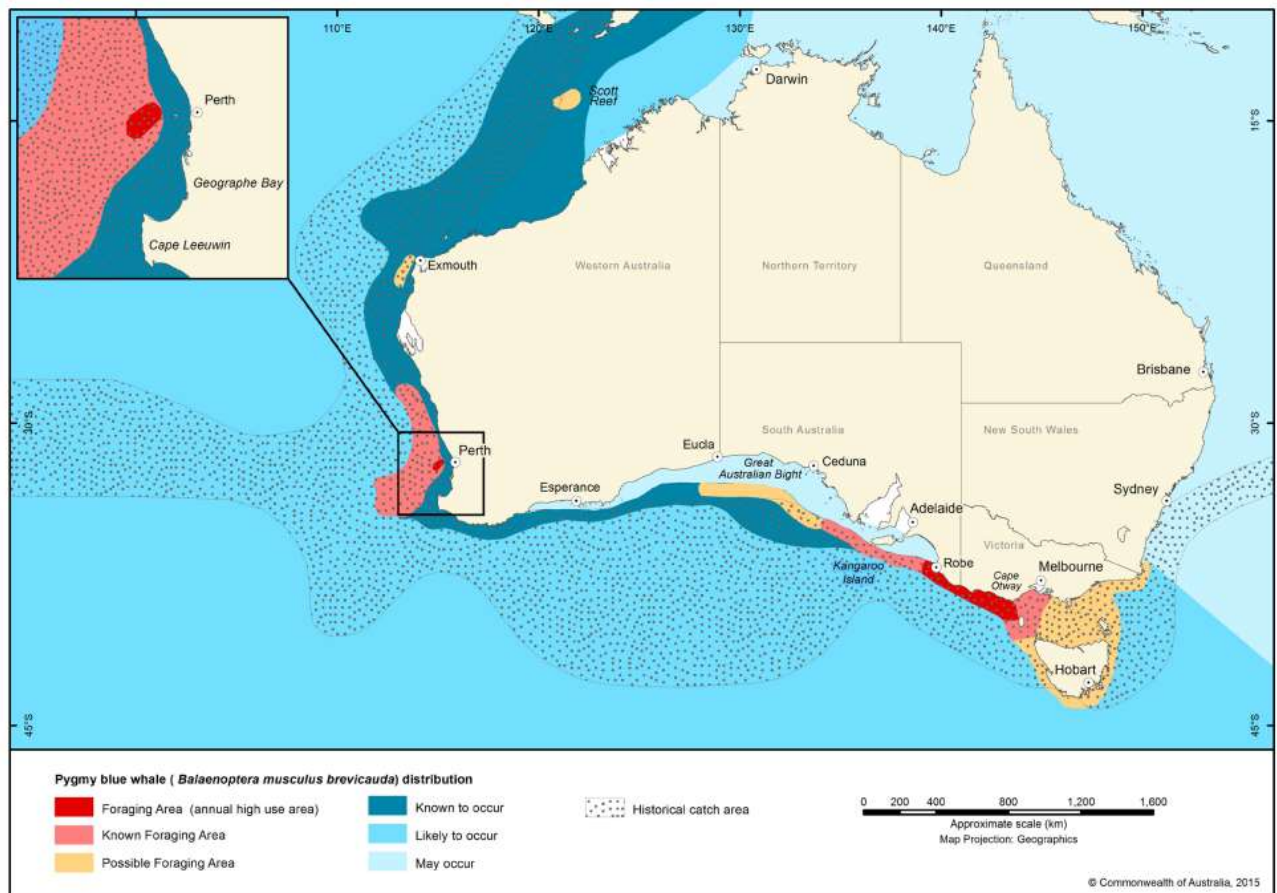


Figure 4-3 Pygmy blue whale distribution

Southern right whales (*Eubalaena australis*) migrate annually from high latitude feeding grounds to lower latitudes for calving and mating. Migration along the eastern coastline is expected to occur between mid-May and September (Environment Australia, 2001). A migration BIA extends in a narrow band parallel with the Victorian coastline and into South Australian waters. Winter in particular is the peak for southern right whale abundance especially along the southern coast of Australia (Kemper *et al.*, 1997). At this time, calving adult females are spotted frequently inshore, in shallow, northeast trending bays over sandy bottoms (Bannister *et al.*, 1996). Although sighted along the Gippsland coast during migration, calving females are most often found off western Victoria near Warrnambool. In 2012, southern right whales were observed in July and August alongside beaches and cliffs around Portland, also in the western part of Victoria and outside of the EMBA. The majority of Bass Strait and the coastal waters of Tasmania have been identified as a distribution BIA.

The Humpback whale (*Megaptera novaeangliae*) migrates annually along the east coast of Australia heading north to tropical calving grounds from June to August, and south to the

Southern Ocean feeding areas from September to November. The exact timing of the migration period can change from year to year and may be influenced by water temperature, the extent of sea ice, predation risk, prey abundance and location of feeding grounds. While the main migration route of this species is along the east coast of Australia along the continental shelf to the east of Bass Strait, some animals migrate through Bass Strait and could pass through the region (DEH, 2004b). A foraging BIA for the Humpback whale has been identified parallel to the Australian east coast north of the Victoria / NSW border.

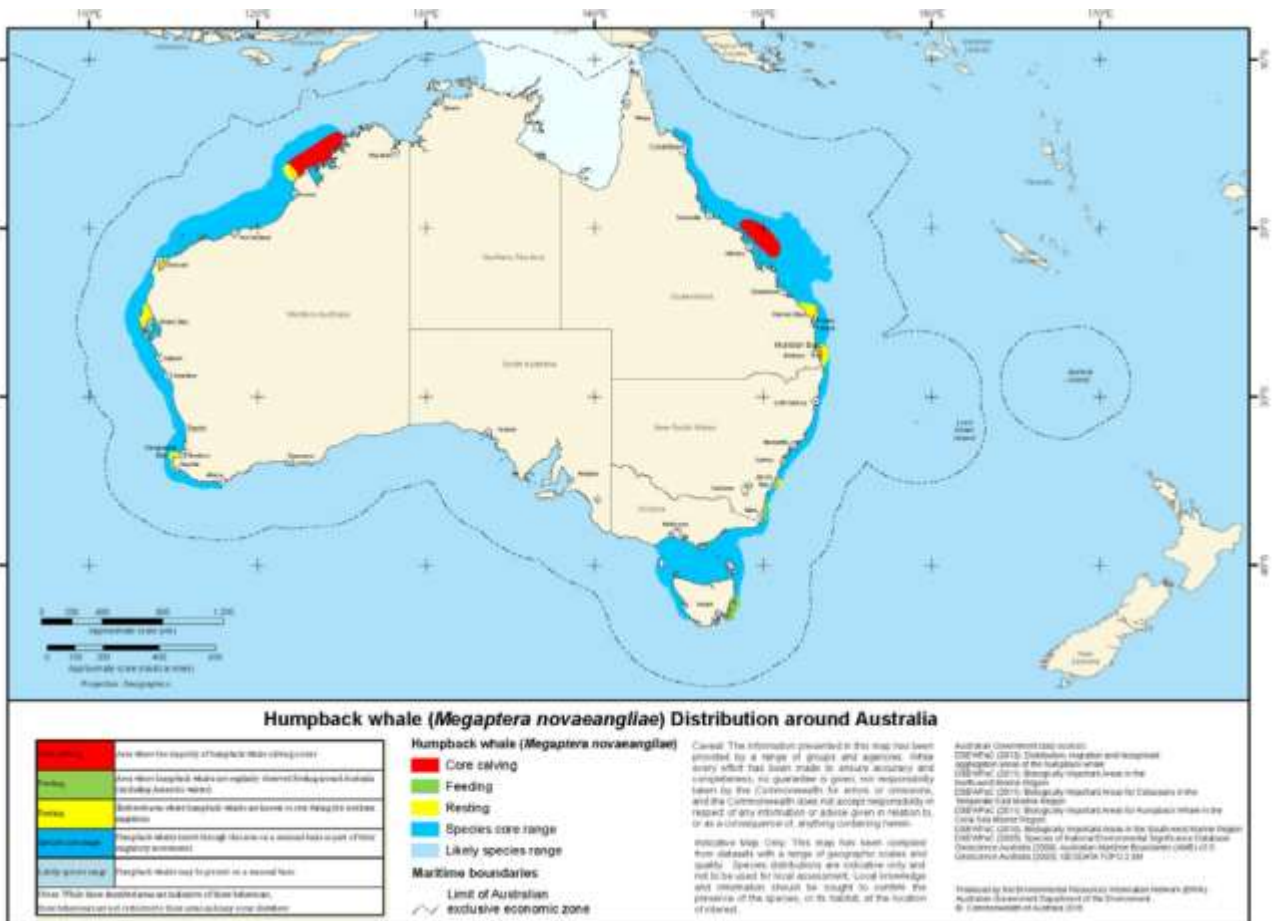


Figure 4-4 Humpback whale distribution

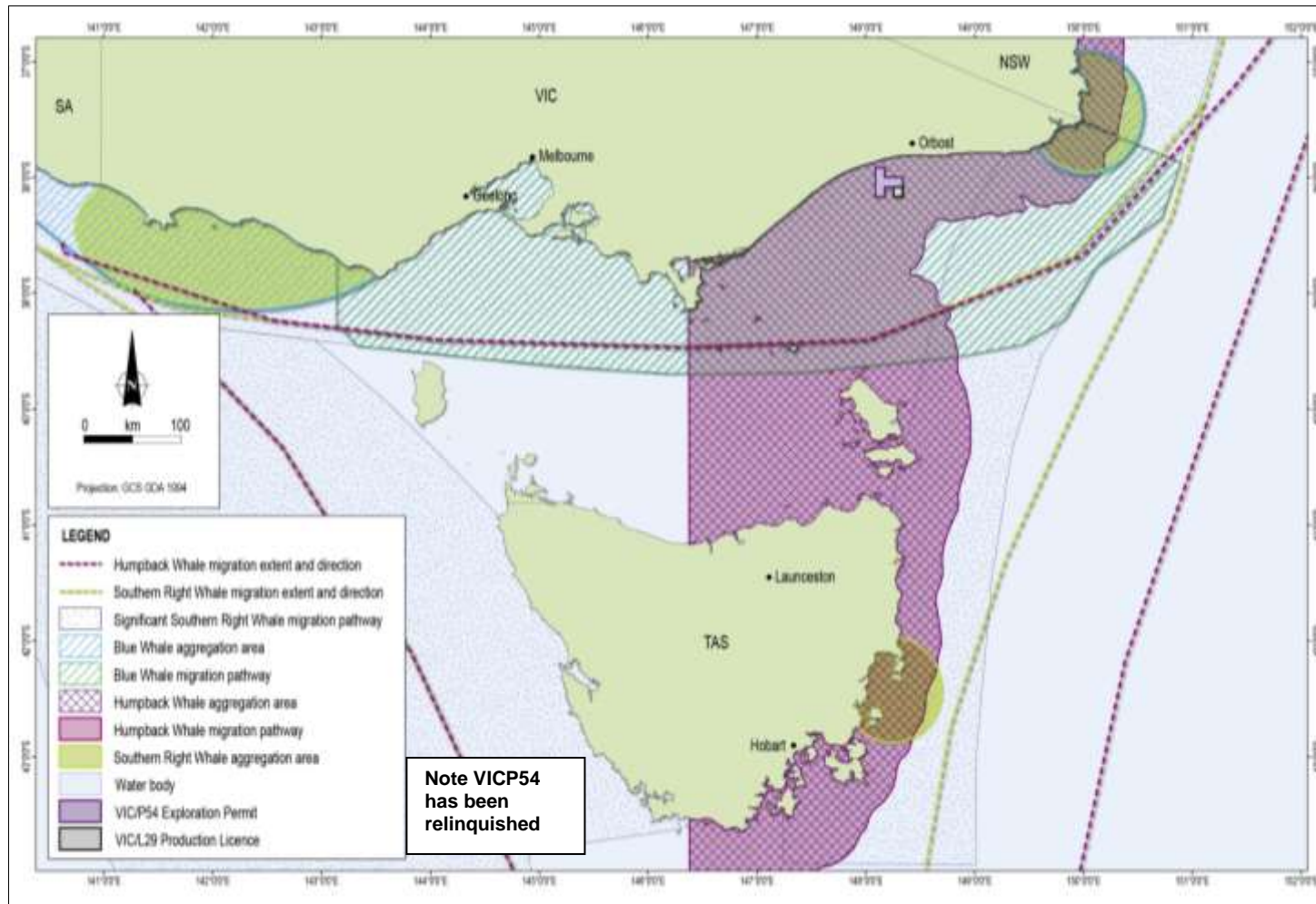
Sei whales (*Balaenoptera borealis*) have the same migration pattern as most other baleen whales, including blue and fin whales, although the timing is generally later. Sei whales are known to swim in small pods and their main breeding season is winter (April to August) Sei whales are not often found near coasts and the species is infrequently recorded in Australian waters, with records only occurring from Western Australia, South Australia, Tasmania and Queensland.

The fin whale (*Balaenoptera physalus*) is the second largest whale species, after the blue whale. It feeds in Australian Antarctic waters and has been sighted inshore in the proximity of the Bonney Upwelling, Victoria, along the continental shelf in the summer and autumn months.

A summary of threatened cetacean activity in Bass Strait is presented in Table 4-8 and a figure showing the migration and aggregation of blue, southern right and humpback whales is provided in Figure 4-5.

Table 4-8 Summary of threatened cetacean species activity in Bass Strait

Species/month	J	F	M	A	M	J	J	A	S	O	N	D
Blue whales, Sei whales, Fin whales	Migrating, feeding										Migrating, feeding	
Humpback whales						Northern migration			Southern migration			
Southern right whales					Southerly migration, calving							



Source: SEWPac Currency, 2000

Figure 4-5 Whale aggregation and migration areas

4.3.6 Dolphins

There are eight dolphin species that may occur in the region according to the DoEE EPBC Act Online Protected Matters Search Tool, these are shown in Table 4-9 below:

Table 4-9 EPBC Act listed dolphins potentially occurring in the EMBA

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
<i>Delphinus delphis</i>	Common Dolphin			✓		MO
<i>Grampus griseus</i>	Risso's Dolphin			✓		MO
<i>Lagenorhynchus obscurus</i>	Dusky Dolphin		✓	✓		LO
<i>Lissodelphiss peronii</i>	Southern Right Whale Dolphin			✓		MO
<i>Orcinus orca</i>	Killer Whale		✓	✓		LO
<i>Pseudorca crassidens</i>	False Killer Whale			✓		LO
<i>Tursiops aduncus</i>	Indian Ocean Bottlenose Dolphin (Spotted Bottlenose Dolphin)			✓	b	LO
<i>Tursiops truncatus s. str.</i>	Bottlenose Dolphin			✓		MO
<u>Threatened Species:</u> V Vulnerable E Endangered <u>Biologically Important Areas:</u> b breeding, calving		<u>Type of Presence:</u> MO Species or species habitat may occur within the area LO Species or species habitat likely to occur within the area				

Common dolphins (*Delphinus delphis*) are recorded in all Australian waters and are not thought to be migratory. The species is associated with high topographical relief of the ocean floor, escarpments and upwelling areas, and there are no known key localities in Australia.

Risso's dolphin (*Grampus griseus*) is distributed through all oceans, occurs inshore and offshore, but is generally considered pelagic and oceanic, and Fraser Island in Queensland has the only known 'resident' population.

The dusky dolphin (*Lagenorhynchus obscurus*) occurs only in the southern hemisphere with no recorded sightings from Victoria or Tasmania. There are no key localities for the species in Australia, and it occurs mainly in temperate and sub-antarctic zones (from about 55° to 26°S) in inshore areas.

The bottlenose dolphin (*Tursiops truncatus*) is a cosmopolitan species found in all Australian waters (except the Northern Territory), and is coastal, estuarine, pelagic and oceanic in nature, with the closest key locality being Port Phillip Bay, Victoria.

With close resemblance to the bottlenose dolphin, the Indian Ocean bottlenose dolphin (*Tursiops aduncus*) occur continuously around the Australian coast and are generally restricted to inshore areas such as bays and estuaries, nearshore waters, open coast environments, and shallow offshore waters (DoEE. 2019b) Breeding, calving may occur in the coastal regions of NSW but not extending into Victoria (NCVA. 2019).

The remaining listed dolphins which may occur in the EMBA are oceanic, pelagic species. Of these the killer whale (*Orcinus orca*) is most likely to be encountered as they are recorded from all states, with concentrations reported around Tasmania. They are most often seen along the continental slope and on the shelf, particularly near seal colonies (DoEE. 2019c).

The distribution of the False killer whale (*Pseudorca crassidens*) and the Southern Right Dolphin (*Lissodelphiss peronii*) is less understood due to the paucity of sightings, however both species are known to have a large range. The False killer whales, recorded in Australia through strandings, prefer deep, tropical to temperate offshore waters (DoEE. 2019d). The Southern Right dolphins are a pelagic species, generally occurring between the Subtropical and Subantarctic Convergences. They are usually found well offshore but when inshore are usually in deep water, or on the outer edges of the continental shelf. In the northern parts of its distribution, it is found associated with cold currents and upwelling conditions (DoEE. 2019a).

4.3.7 Seals

Two seal species are identified in the EPBC database as occurring in the EMBA. These are shown in Table 4-10.

The Australian fur seal (*Arctocephalus pusillus*) has established five breeding areas on Tasmanian islands in Bass Strait (Shaughnessy, 1999), which are Tenth Island, Moriarty Rocks, West Moncoeur, Judgement Rocks and Reid Rocks, the latter two being the largest breeding colonies in Tasmania. The project area is remote from these seal colonies, however seals do use the nearby oil and gas platform structures for resting and were recorded during the Longtom installation campaign hauled out on the installation vessels. Satellite tracking of Australian fur seals in Bass Strait indicates that seals generally forage in waters slightly deeper than at the proposed project site, with movements originating from Wilsons Promontory and The Skerries in east Gippsland (Arnould and Kirkwood, 2008 in Esso, 2012). The preferred habitats for Australian fur seals include rocky islands in exposed places close to the sea, on open slopes, shore platforms and reefs, pebbled beaches and caves (Strahan, 1995). The Australian fur seal diet consists of fish, cephalopods and seabirds and they give birth to live young from late October to late December (Shaughnessy, 1999). The project area is not within close proximity to any breeding colonies.

The New Zealand fur seal (*Arctocephalus forsteri*) is found predominantly in coastal areas of New Zealand, South Australia and southern parts of Western Australia. In Tasmania, New Zealand fur seal numbers are comparatively low, and the species is mainly found off the south and west coasts with breeding restricted to Maatsuyker Islands and other remote islands to the south (DPIWE, 2011). Breeding occurs during the summer months from early December through to January. The species breed ashore (generally on remote islands) and feed at sea, mostly on cephalopods and fish. The project area is not within close proximity to any breeding colonies.

Table 4-10 EPBC Act listed seals potentially occurring in the EMBA

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
<i>Arctocephalus forsteri</i>	New Zealand Fur-seal			✓		MO
<i>Arctocephalus pusillus</i>	Australian Fur-seal			✓	b	BKO
<u>Threatened Species:</u> V - Vulnerable <u>Biologically Important Areas:</u> b – breeding	<u>Type of Presence:</u> MO Species or species habitat may occur within the area BKO Breeding known to occur within the area KO Species or species habitat known to occur within the area					

4.3.8 Seabirds

The Victorian coast and islands of Bass Strait provide feeding, breeding and nesting habitats for many important coastal and migratory bird species. There are no islands or seabird colonies in the immediate vicinity of the project area. Some species, such as cormorants, roost at Cape Conran (Norris and Mansergh, 1981), to the northeast of the project area. Colonies of seabirds occur to the west of the project in Corner Inlet and on the islands around Wilsons Promontory, and to the east at the Skerries, Tullaberga Island and Gabo Island (Harris and Norman, 1981); all of which are over 100 km from the project area.

Seventy-four EPBC Act-listed bird species may occur within the EMBA. Of these, six are listed as critically endangered. These are the Curlew sandpiper (*Calidris ferruginea*), the Great knot (*Calidris tenuirostris*), Northern Siberian Bar-tailed Godwit (*Limosa lapponica menzbieri*), Eastern Curlew (*Numenius madagascariensis*), Swift Parrot (*Numenius madagascariensis*) and the Orange-bellied Parrot (*Neophema chrysogaster*).

The Swift Parrot and the Orange-bellied Parrot are listed marine species whose primary breeding habitat is forest. They breed in Tasmania and migrate to the mainland for winter. The Orange-bellied parrot feeds almost exclusively on seeds and fruits, mainly of sedges and salt-tolerant coastal saltmarsh plants. They are threatened primarily from native predation and loss of habitat (TSSC. 2006).

The remaining critically endangered listed bird species are all migratory wetland species which breed in the northern hemisphere and migrate to the southern hemisphere for winter. Their primary threat is loss of wetland habitat, not only in Australia but in all their resting places on the migratory route from the northern to the southern hemisphere (TSSC. 2016, DoEE.2016a, DoEE. 2016b).

Albatross

There are fifteen species of albatross listed to occur in the EMBA, all of which are either endangered or vulnerable, with the majority being migratory species. The nearest breeding site to the project area is Albatross Island, off the northwest coast of Tasmania, 405 km southwest of the proposed project site. Because albatross have a broad range of diets and foraging behaviours, their at-sea distributions are diverse and combined with their ability to cover vast oceanic distances, all Australian waters can be considered foraging habitat, though the most critical is the waters south of 25°S (SEWPaC, 2011a and 2013a).

Petrels

There are six listed petrel species which may occur in the EMBA, two of which are listed as endangered. The Southern Giant Petrel is one of these species and within Australia is limited to breeding colonies on Macquarie and Heard islands. It is a marine bird that occurs in Antarctic to subtropical waters and in summer mainly occurs over Antarctic waters. It feeds and it is widespread south as far as the pack-ice and onto the Antarctic continent (Marchant & Higgins 1990). It is an opportunist scavenger and predator which will scavenge on penguin carcasses, a wide variety of smaller seabirds, will also eat crustaceans and feed on seal and whale carrion (DoEE. 2019f). Gould's petrel, also endangered is only known to breed in Australia on Cabbage Tree Island, offshore Port Stephens in NSW. Its non breeding and feeding range, however is extensive and recorded as far west as Eyre in WA and therefore may occur within the EMBA (DEC NSW. 2006).

Plovers

Of the four plovers that are listed as occurring in the EMBA, the hooded plover (eastern) is listed as vulnerable. It is a small Australian beach nesting bird. It mainly occurs on wide beaches backed by dunes with large amounts of seaweed and jetsam, creek mouths and inlet entrances. Its distribution is along beaches throughout the Victorian, Tasmanian and the majority of the South Australian coast and extending up to approximately Nowra in NSW. The hooded plover builds its nest above the high water mark. Its greatest threat is disturbance by domestic dogs (DoEE. 2019g).

Scolopacidae

With the scolopacidae family 17 of the 19 listed species which may occur in the EMBA are migratory wetland species. The critically endangered species have been described above.

The Red Knot is endangered, and like the majority of the species in this group is a strong migratory wetland species which breeds in the northern hemisphere and migrates south for the winter. In Australia the Red Knot mainly inhabits intertidal mudflats, sandflats and sandy beaches of sheltered coasts. Its closest site of importance to the project area is in Corner Inlet (DoEE. 2019h).

Others

Of the remaining species the Australasian Bittern, Eastern Bristlebird, and the Australian Painted snipe are endangered. The Australasian Bittern is a secretive, stocky, heron-like bird, living primarily in freshwater wetlands and rarely in estuaries or tidal wetlands. It has a distribution between south-east Queensland to south-east South Australia and is unlikely to be impacted by project activities (TSSC. 2011).

The Eastern Bristlebird is a ground dwelling bird whose habitat primarily occurs as coastal, subcoastal and coastal escarpment scrubland / grassland / sedgeland and as open grassy forest on inland ranges and can extend to coastal dunes where feeding also occurs. Of the four populations known, the southern population is found in the Nadgee Nature Reserve on the Vic /NSW border and in Croajingalong National Park. Its main threats are fragmentation of habitat, predation, particularly by feral species and especially after fire. This species is unlikely to be impacted by project activities (NSW OEH. 2012).

The Australian Painted snipe has been recorded in wetlands in all states of Australia and no specific areas of importance are known around the project area (DoEE. 2019).

Table 4-11 lists conservation advice for threatened bird species and key threats potentially relevant to petroleum activities.

Table 4-11 EPBC Act-listed bird species that may occur within the EMBA

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
Albatross						
<i>Diomedea antipodensis</i>	Antipodean Albatross	V	✓ (M)	✓	f	FLO
<i>Diomedea epomophora</i>	Southern Royal Albatross	V	✓ (M)	✓	f	FLO
<i>Diomedea exulans</i>	Wandering Albatross	V	✓ (M)	✓	f	FLO
<i>Diomedea gibsoni</i>	Gibson's Albatross	V		✓	f	FLO
<i>Diomedea sanfordi</i>	Northern Royal Albatross	E	✓ (M)	✓		FLO
<i>Phoebastria fusca</i>	Sooty Albatross	V	✓ (M)	✓		LO

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
	tross					
<i>Thalassarche bulleri</i>	Buller's Albatross	V	✓ (M)	✓	f	FLO
<i>Thalassarche bulleri platei</i>	Northern Buller's Albatross	V		✓		FLO
<i>Thalassarche cauta</i>	Shy Albatross	V	✓ (M)	✓	f	FLO
<i>Thalassarche chrysotoma</i>	Grey-headed Albatross	E	✓ (M)	✓		MO
<i>Thalassarche eremita</i>	Chatham Albatross	E	✓ (M)	✓		FLO
<i>Thalassarche impavida</i>	Campbell Albatross	V	✓ (M)	✓	f	FLO
<i>Thalassarche melanophris</i>	Black-browed Albatross	V	✓ (M)	✓	f	FLO
<i>Thalassarche salvini</i>	Salvin's Albatross	V	✓ (M)	✓		FLO
<i>Thalassarche steadi</i>	White-capped Albatross	V	✓ (M)	✓	-	FLO
Petrels						
<i>Fregetta grallaria grallaria</i>	White-bellied Storm-Petrel	V			-	LO
<i>Halobaena caerulea</i>	Blue Petrel	V		✓		MO
<i>Macronectes giganteus</i>	Southern Giant Petrel	E	✓ (M)	✓	-	FLO
<i>Macronectes halli</i>	Northern Giant Petrel	V	✓ (M)	✓	-	MO
<i>Pelagodroma marina</i>	White-faced Storm Petrel			✓	f	BKO
<i>Pterodroma leucoptera leucoptera</i>	Gould's Petrel	E				MO
Plover						
<i>Charadrius bicinctus</i>	Double-banded Plover		✓ (W)	✓		RKO
<i>Charadrius ruficapillus</i>	Red-capped Plover			✓		RKO
<i>Thinornis rubricollis</i>	Hooded Plover			✓		KO
<i>Thinornis rubricollis rubricollis</i>	Hooded Plover (eastern)	V		✓		KO
Scolopacidae - Sandpipers						
<i>Actitis hypoleucos</i>	Common Sandpiper		✓ (W)	✓		KO
<i>Calidris acuminata</i>	Sharp-tailed		✓ (W)	✓		RKO

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
	Sandpiper					
<i>Calidris ferruginea</i>	Curlew Sandpiper	CE	✓ (W)	✓		KO
<i>Calidris melanotos</i>	Pectoral Sandpiper		✓ (W)	✓		KO
Scolopacidae - Other						
<i>Arenaria interpres</i>	Ruddy Turnstone		✓ (W)	✓		RKO
<i>Calidris alba</i>	Sanderling		✓ (W)	✓		RKO
<i>Calidris canutus</i>	Red Knot	E	✓ (W)	✓		KO
<i>Calidris ruficollis</i>	Red-necked Stint		✓ (W)	✓		RKO
<i>Calidris tenuirostris</i>	Great Knot	CE	✓ (W)	✓		RKO
<i>Gallinago hardwickii</i>	Latham's Snipe		✓ (W)	✓		RMO
<i>Gallinago megala</i>	Swinhoe's Snipe		✓ (W)	✓		RLO
<i>Gallinago stenura</i>	Pin-tailed Snipe		✓ (W)	✓		RLO
<i>Limosa lapponica</i>	Bar-tailed Godwit		✓ (W)	✓		KO
<i>Limosa lapponica baueri</i>	Bar-tailed Godwit (baueri)	V				KO
<i>Limosa lapponica menzbieri</i>	Northern Siberian Bar-tailed Godwit	CE				MO
<i>Numenius madagascariensis</i>	Eastern Curlew	CE	✓ (W)	✓		KO
<i>Numenius minutus</i>	Little Curlew		✓ (W)	✓		RLO
<i>Numenius phaeopus</i>	Whimbrel		✓ (W)	✓		RKO
<i>Tringa nebularia</i>	Common Greenshank		✓ (W)	✓		KO
Shearwaters						
<i>Puffinus carneipes</i>	Flesh-footed Shearwater		✓ (M)	✓	-	FLO
<i>Puffinus tenuirostris</i>	Short-tailed Shearwater		✓ (M)	✓	-	BKO
Terns						
<i>Sterna albifrons</i>	Little Tern		✓ (M)	✓		BKO
<i>Sterna bergii</i>	Crested Tern		✓ (M)	✓	-	BKO
<i>Sterna caspia</i>	Caspian Tern		✓ (M)	✓		BKO
<i>Sterna fuscata</i>	Sooty Tern			✓		BKO

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
<i>Sterna nereis</i>	Fairy Tern			✓		BKO
<i>Sternula nereis nereis</i>	Australian Fairy Tern	V				BKO
Others						
<i>Apus pacificus</i>	Fork-tailed Swift		✓ (M)	✓		LO
<i>Ardea alba</i>	Great Egret			✓		BKO
<i>Ardea ibis</i>	Cattle Egret			✓		MO
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E				KO
<i>Catharacta skua</i>	Great Skua			✓		MO
<i>Dasyomys brachypterus</i>	Eastern Bristlebird	E				KO
<i>Eudyptula minor</i>	Little Penguin			✓	f	BKO
<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle			✓		BKO
<i>Himantopus himantopus</i>	Black-winged Stilt			✓		RKO
<i>Hirundapus caudacutus</i>	White-throated Needletail		✓ (T)	✓		KO
<i>Larus novaehollandiae</i>	Silver Gull			✓		BKO
<i>Lathamus discolor</i>	Swift Parrot	CE		✓		KO
<i>Merops ornatus</i>	Rainbow Bee-eater			✓		MO
<i>Monarcha melanopsis</i>	Black-faced Monach		✓ (T)	✓		KO
<i>Monarcha trivirgatus</i>	Spectacled Monach		✓ (T)	✓		KO
<i>Myiagra cyanoleuca</i>	Satin Fly-catcher		✓ (T)	✓		KO
<i>Neophema chryso-gaster</i>	Orange-bellied Parrot	CE		✓		MO
<i>Pachyptila turtur</i>	Fairy Prion			✓		KO
<i>Pachyptila turtur sub-antartica</i>	Fairy Prion (southern)	V				KO
<i>Pandion haliaetus</i>	Osprey		✓ (W)	✓		KO
<i>Rhipidura rufifrons</i>	Rufous Fantail		✓ (T)	✓		LO
<i>Rostratula australis</i>	Australian Painted Snipe	E		✓		LO
<u>Threatened Species:</u> V Vulnerable E Endangered		<u>Type of Presence:</u> MO Species or species habitat may occur within the area LO Species or species habitat likely to occur within the area				

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	BIA	Type of Presence
<p><i>CE</i> Critically Endangered</p> <p><u>Migratory Species:</u></p> <p><i>M</i> Marine</p> <p><i>W</i> Wetland</p> <p><i>T</i> Terrestrial</p> <p><u>Biologically Important Areas:</u></p> <p><i>b</i> Breeding</p> <p><i>f</i> Foraging</p>		<p><i>KO</i> Species or species habitat known to occur within the area</p> <p><i>FMO</i> Foraging, feeding or related behaviour may occur within the area</p> <p><i>FLO</i> Foraging, feeding or related behaviour likely to occur within the area</p> <p><i>FKO</i> Foraging, feeding or related behaviour known to occur within the area</p> <p><i>BKO</i> Breeding known to occur within the area</p> <p><i>RMO</i> Roosting may occur within the area</p> <p><i>RLO</i> Roosting likely to occur within the area</p> <p><i>RKO</i> Roosting known to occur within the area</p>				

Table 4-12 Conservation advice for threatened bird species and Key Threats

Common Name	Conservation Advice or Recovery Plan	Key Threats (potentially relevant to petroleum activities)
Antipodean Albatross	National Recovery Plan for Threatened Albatrosses and Giant Petrels, 2011-2016	Marine pollution, including marine debris
Southern Royal Albatross		
Wandering Albatross		
Gibson's Albatross		
Northern Royal Albatross		
Sooty Albatross		
Buller's Albatross		
Pacific Albatross		
Shy Albatross		
Chatham Albatross		
Campbell Albatross		
Black-browed Albatross		
Salvin's Albatross		
White-capped Albatross		
Grey-headed Albatross	National Recovery Plan for Threatened Albatrosses and Giant Petrels, 2011-2016 Approved Conservation Advice for <i>Thalassarche chrysostoma</i> (Grey-headed Albatross)	Marine pollution, including marine debris
White-bellied Storm-Petrel	Lord Howe Island Biodiversity Management Plan	None identified
Blue Petrel	Approved Conservation Advice for <i>Halobaena caerulea</i> (Blue Petrel)	None identified

Common Name	Conservation Advice or Recovery Plan	Key Threats (potentially relevant to petroleum activities)
Southern Giant Petrel	National Recovery Plan for Threatened Albatrosses and Giant Petrels, 2011-2016	Marine pollution, including marine debris
Northern Giant Petrel		
Gould's Petrel	Gould's Petrel (<i>Pterodroma leucoptera leucoptera</i>) Recovery Plan	Oil spills Note: oil spills in the vicinity Cabbage Tree Island are not considered a threat because the Gould's Petrel does not feed in coastal waters however, oceanic oil spills may pose some risk (NSW DEC, 2006)
Hooded Plover (eastern)	Approved Conservation Advice for <i>Thinornis rubricollis</i> (Hooded Plover, Eastern)	Oil spills Entanglements and ingestion of marine debris
Curlew Sandpiper	Approved Conservation Advice for <i>Calidris ferruginea</i> (Curlew Sandpiper)	Habitat loss and degradation from pollution Environmental pollution
Australian Fairy Tern	Approved Conservation Advice for <i>Sternula nereis nereis</i> (Fairy Tern)	Oil spills, particularly in Victoria, where the close proximity of oil facilities poses a risk of oil spills that may affect the species' breeding habitat
Australasian Bittern	Approved Conservation Advice for <i>Botaurus poiciloptilus</i> (Australasian Bittern)	Reduced water quality as a result of increasing salinity, siltation and pollution
Red Knot	Approved Conservation Advice for <i>Calidris canutus</i> (Red Knot)	Habitat loss and degradation from environmental Pollution Pollution or contamination impacts
Great Knot	Approved Conservation Advice for <i>Calidris tenuirostris</i> (Great Knot)	Habitat loss and degradation from environmental Pollution Pollution or contamination impacts
Red knot, Great knot, Bar-tailed godwit, Greater sand plover	Wildlife conservation plan for migratory shorebirds	Habitat loss and degradation from environmental Pollution Pollution or contamination impacts
Eastern Bristlebird	National Recovery Plan for Eastern Bristlebird (<i>Dasyornis brachypterus</i>)	None identified
Swift Parrot	Approved Conservation Advice for <i>Lathamus discolor</i> (Swift Parrot)	None identified
Bar-tailed Godwit (baueri)	Approved Conservation Advice for <i>Limosa lapponica baueri</i> (Bar-tailed Godwit)	Habitat loss and degradation from pollution Pollution/contamination
Orange-bellied Parrot	National Recovery Plan for the Orange-bellied Parrot (<i>Neophema chrysogaster</i>)	None identified
Eastern Curlew	Approved Conservation Advice for <i>Numenius madagascariensis</i> (Eastern Curlew)	Habitat loss and degradation from pollution Environmental pollution
Fairy Prion (southern)	Approved Conservation Advice for <i>Pachyptila turtur subantarctica</i> (Fairy Prion Southern)	None identified

Common Name	Conservation Advice or Recovery Plan	Key Threats (potentially relevant to petroleum activities)
Australian Painted Snipe	Approved Conservation Advice for <i>Rostratula australis</i> (Australian Painted Snipe)	None identified

The little penguin (*Eudyptula minor*) is a flightless seabird that breeds in colonies along the southern coast of Australia. Very little is known about their populations, and Tasmanian estimates range from 110,000 to 190,000 breeding pairs, of which less than 5% are found on mainland Tasmania. Little penguins spend most of their time at sea when not breeding. Male penguins return to coastal colonies between June and August (which is also breeding time) to ready their nests for the egg laying season, which usually peaks in September and October (NOO, 2002). The nearest colonies of little penguins to the project area are located at Phillip Island in Western Port Bay (334 km to the west), Gabo Island (155 km to the east).

4.3.9 Reptiles

There are five reptile species listed in the EPBC Act as potentially occurring in the EMBA. These are shown in Table 4-13. Table 4-14 lists the approved conservation advice and/or recovery plans for listed turtle species, where they exist, with key threats potentially relevant to petroleum activities. One is known to regularly occur in Bass Strait, the leathery or leatherback turtle (*Dermochelys coriacea*), and is discussed further below. Four other potential, but rare, visitors to Bass Strait include the loggerhead turtle (*Caretta caretta*) (listed as endangered), the green turtle (*Chelonia mydas*) (listed as vulnerable), the hawksbill turtle (*Eretmochelys imbricata*) (listed as vulnerable) and the flatback turtle (*Natator depressus*) (listed as vulnerable).

The leathery turtle is listed as endangered under the EPBC Act. The loggerhead and green turtles are listed as endangered and vulnerable respectively, under the EPBC Act. No turtles are known to nest in the EMBA.

Adult Leathery Turtles are oceanic and are rarely found close to the shore in Australia (DSE, 2009). They follow warm water currents while migrating vast distances between their tropical nesting sites to the north of Australia and their temperate water feeding grounds to the south (where they are capable of inhabiting waters of 10 °C or possibly less). Juveniles (< 100 cm) are confined to tropical waters warmer than 26 °C and remain near the coastline (IUCN, 2003). There are no breeding beaches within Victoria or the EMBA and the closest known breeding beach was near Balina in northern NSW. Their movement to temperate waters is generally associated with seasonal increases in sea surface temperatures (SSTs). In Victoria, most sightings occur between January and May when SSTs are 15 °C – 21 °C in northern Bass Strait. Nearly 50 % of Victorian sightings are from April and May.

Bass Strait is considered to have one of the three largest concentrations of feeding Leathery Turtles in Australia (the others being central and southern New South Wales and across the Great Australian Bight) (C. Limpus pers. comm.).

Table 4-13 EPBC Act-listed turtle species that may occur within the EMBA

Scientific Name	Common Name	Threatened Species	Migratory Species	Listed Marine Species	Type of Presence
<i>Caretta caretta</i>	Loggerhead Turtle	E	✓	✓	BLO
<i>Chelonia mydas</i>	Green Turtle	V	✓	✓	FKO
<i>Dermochelys coriacea</i>	Leatherback Turtle	E	✓	✓	FKO
<i>Eretmochelys imbricata</i>	Hawksbill Turtle	V	✓	✓	FKO
<i>Natator depressus</i>	Flatback Turtle	V	✓	✓	FKO
<u>Threatened Species:</u> V Vulnerable E Endangered		<u>Type of Presence:</u> FKO Foraging, feeding or related behaviour known to occur within the area BLO Breeding likely to occur within the area			

Table 4-14 Conservation advice for threatened turtle species and Key Threats

Common Name	Conservation Advice or Recovery Plan	Key Threats (potentially relevant to petroleum activities)
Loggerhead Turtle	Recovery Plan for Marine Turtles in Australia, 2017-2027	Marine debris Chemical discharge Light pollution Habitat modification Vessel disturbance Noise interference
Green Turtle		
Hawksbill Turtle		
Flatback Turtle		
Leatherback Turtle	Recovery Plan for Marine Turtles in Australia, 2017-2027 Approved Conservation Advice for <i>Dermochelys coriacea</i> (Leatherback Turtle)	As above

4.3.10 Introduced Marine Species

In the South-east Marine Region, 115 introduced marine species have been recorded (NOO, 2002). Limited information exists on the nature and extent of introduced marine species, and it is assumed the species described below potentially exist within the EMBA.

The New Zealand screw shell (*Maoricolpus roseus*) is one species that has a well-documented history in Bass Strait. It is likely to have been introduced after 1920 with live oysters imported from New Zealand or within semi-dry ballast in timber vessels. It was first

identified in southeast Tasmania and has since expanded its territory into eastern Bass Strait and further up the east coast of Australia (NOO, 2002). It forms extensive and dense beds on the sandy seafloor in eastern Bass Strait. The screw shell can tolerate water depths ranging from 1 to 130 m. An unusually high abundance (more than 90% of the total biomass of infauna) of the invasive New Zealand screw shell was recorded by Heislars and Parry (2007) at Point Hicks in eastern Bass Strait. Where this invasive species was most abundant, the diversity of infauna was reduced, suggesting that this exotic species poses a serious threat to the high diversity of infauna that is characteristic of much of Bass Strait (Heislars & Parry, 2007).

The northern pacific seastar (*Asterias amurensis*) also has the potential to impact Bass Strait. This species is believed to have arrived in Australia in ships' ballast water from Japan 20 years ago. The seastar feeds on a wide range of native animals and can have a major effect on the recruitment of native shellfish populations that form important components of the marine food chain. This species is already common in southeast Tasmanian waters and in Port Phillip Bay in Victoria and has the potential to cause environmental and economic harm in coastal waters from Sydney to Perth (DSE, 2012).

Abalone viral ganglioneuritis, a highly virulent herpes-like virus, has been recorded in Victoria. The virus affects the nervous tissue of abalone and rapidly causes death. The virus can be spread through direct contact, through the water column without contact and in mucus that infected abalone produce before dying. Originating from aquaculture farms, the virus has spread in wild populations in southwest Victoria since May 2006 (Parks Victoria, 2009).

4.4 Cultural Environment

There are no World Heritage or National Heritage listed places within the project area or within the EMBA. Similarly there are no cultural or natural Commonwealth Heritage listed places within the EMBA. The only Commonwealth Heritage historic listed places occurring within the EMBA are lighthouses (e.g., Gabo Island Lighthouse) however these are not considered relevant.

4.4.1 Indigenous protected Areas

Another form of protected area for indigenous culture is Native title. The Gunai-Kurnai people hold native title over much of Gippsland. The native title determination area (Tribunal file no. VCD2010/001) covers approximately 45,000 hectares and extends from west Gippsland near Warragul, east to the Snowy River, and north to the Great Dividing Range. It also includes 200 metres of offshore sea territory between Lakes Entrance and Marlo. The area includes 10 parks and reserves that are jointly managed by the Victorian government and the Gunai-Kurnai people (NNTT, 2010).

Native title rights do not confer exclusive rights of possession, use and enjoyment of the land or waters. Native title does not exist in minerals, petroleum or groundwater.

4.4.2 Maritime Heritage

The Australian National Shipwreck Database (SEWPaC, 2011b) indicates there are no shipwrecks registered as occurring within or near the project area (Longtom petroleum safety zones and pipeline). Likewise, there are no historic shipwreck protected zones in or near the project area (SEWPaC, 2011c).

There are approximately 57 historic shipwrecks within the EMBA. The majority of which are dotted on the coastline. Approximately 16 are located at or near Lakes Entrance and another approximately 20 shipwrecks are located around Cape Howe on the border of NSW and Victoria (DoEE, 2019e). None of these shipwrecks are within protected zones.

4.4.3 Archaeological Heritage

The Commonwealth Heritage List indicates there are no records of archaeological sites in or around the project area (SEWPaC, 2012a).

4.5 Socio-economic Environment

The South East Regional Marine Plan (NOO, 2002) forms the basis of the description of the socio-economic environment in the region.

4.5.1 Settlements

The communities of Lakes Entrance, Orbost and Marlo are closest to the project area (see Figure 4.4). They are located approximately 37 km, 38 km and 44 km northeast, respectively, in the Shire of East Gippsland.

The 2016 Australian census reveals that the total population for East Gippsland was approximately 47,000, with 11.5% of the population employed within the retail trade sector, 15.08% employed in health care and social assistance, and 9.15% employed in the agriculture, forestry and fishing sectors (East Gippsland Shire Council, 2019).

In NSW within the EMBA, Eden is the largest settlement with a population of approximately 3,100 people. Eden is a part of the Bega Valley Shire in NSW (ABS, 2019). Tourism employment accounts for 11% of the total in the shire and agriculture, forestry and fishing sectors account for 19% of total employment.

4.5.2 Tourism and Recreational Fishing

4.5.2.1 Victoria

The key towns servicing the tourist trade of the region are Lakes Entrance, Metung, Loch Sport, Paynesville and Mallacoota, the (coastal) half-way point between Melbourne and

Sydney. The Ninety Mile Beach is a key draw card to the region, with this stretch of sand and dunes separating the ocean from the Gippsland Lakes. Lakes Entrance has a fishing port that supports offshore commercial (South East Trawl) and recreational fishing. Gippsland Lakes (the southern hemisphere's largest network of inland waterways) being a key draw card for tourists, offering boating, fishing, water sports and nature-based tourism. The Gippsland Lakes consist of three lakes – Wellington, Victoria and King, fed by the Mitchell, Tambo and Nicholson rivers. In 2016-17, tourism was estimated to be worth \$785 million to the region's economy in direct and indirect Gross Regional Product or 6.6 per cent of the region's economy. Tourism generated employment of approximately 8,900 people or 8.6 per cent of the region's employment (direct and indirect jobs) (TEVE. 2019).

Recreational fishing is a significant activity in the nearshore area along Ninety Mile Beach, comprising beach-based fishing and boat-based fishing. Rocky reefs near Marlo, Cape Conran and Lakes Entrance are the main sites for boat angling (and also recreational diving), with boat ramps located at Port Albert, Port Welshpool, McLoughlins Beach, Manns Beach and Lakes Entrance. Species such as gummy shark (*Mustelus antarcticus*) and snapper (*Pagrus auratus*) are fished from the surf beaches and from boats, with other species targeted including sand flathead (*Platycephalus bassensis*), black bream (*Acanthopagrus butcheri*) and Australian salmon (*Arripis trutta*). Most marine recreational fishing in the area is coastal, surf, inland lakes and estuary fishing with only a small proportion of recreational boating activities venturing offshore. Discussions with the recreational fishing body indicated that there is virtually no recreational fishing activity within the projects licence area.

4.5.2.2 NSW

Tourism in the Bega Valley Shire, inclusive of the town of Eden at its southern end, was estimated at \$251M in 2017-2018 (Bega Valley Shire Council. 2019). The coast is referred to as the Sapphire Coast and recreational fishing offered in the forms of game, reef, sport, estuary, rock and beach fishing are all popular from Eden. Tuna and kingfish fishing are popular as well as freshwater fishing, prawning, trapping and diving. Facilities for access are well developed and maintained throughout the coast (NSW DPI. 2016).

4.5.3 Oil and Gas Production

The Gippsland Basin is the most prolific hydrocarbon province in Australia. Oil production peaked in 1985 at about 500kbd or 90% of the total Australian crude oil output that year. Of more than 4 billion barrels (BSTB) of estimated initial oil and condensate reserves and 9.8 trillion cubic feet (TSCF) of initial sales gas reserves in the developed fields, more than 86% and 49% respectively, had been produced by the end of June 1998. As of 2018, Victoria (mostly the offshore Gippsland Basin), accounted for 11.29% of Australia's oil and condensate production, and 9.75% of Australia's gas production, second behind WA (APPEA, 2019). Oil and gas reserves from the Gippsland Basin are currently on the decline. However,

the relatively unexplored Sorell and Bass Basins, indicate that there may be future production potential in the region.

The National Offshore Petroleum Titles office recorded 28 production licences and 15 exploration permits/retention leases as at April 2019 (NPPTA. 2019).

A network of subsea pipelines transports oil and gas from platform and subsea facilities to onshore processing plants at Longford and Orbost (Figure 4-6). Esso operated facilities are located within the EMBA.

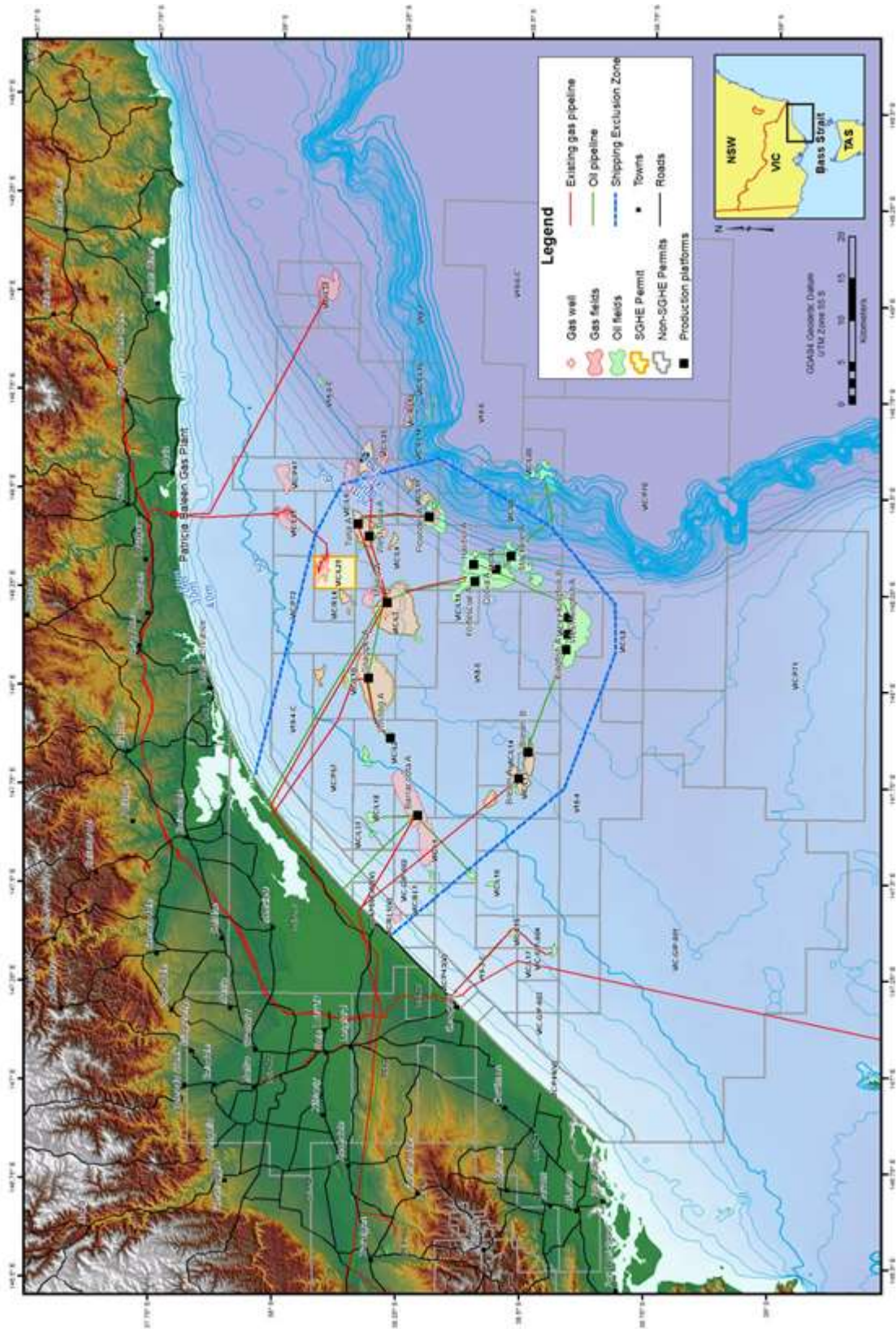


Figure 4-6 Existing oil and gas infrastructure in relation to VICL29

4.5.4 Shipping

Bass Strait is one of the busiest shipping routes in Australia, with more than 3,000 vessels transiting through the area each year (NOO, 2002). Under the Navigation Act 2012 (Cmlth), all vessels operating in Australian waters are required to report their location on a daily basis to the Rescue Coordination Centre (RCC Australia). Shipping patterns can be deciphered on this basis.

By volume, most heavy shipping movements in Bass Strait are east-west and west-east, quite a way south of the project area, between the ports of Fremantle, Western Australia, and Melbourne and Sydney (NOO, 2002; 2004). An 'Area to be Avoided' exclusion zone exists around the operating oil and gas platforms in the Gippsland Basin, whereby unauthorised vessels larger than 200 gross tonnes are excluded. The project area is located within this 'Area to be Avoided' (near the eastern boundary).

Two traffic separation schemes were implemented to enhance safety of navigation around the 'Area to be Avoided' by separating shipping into one-direction lanes for vessels heading north eastwards and those heading south westwards. One separation area is located south of Wilson's Promontory, and the other south of the Kingfisher B platform (DAFF, 2002) (see Figure 4.5). The project area is located approximately 60 km northwest of the main shipping lane (south of Kingfish B) and therefore interaction between commercial shipping vessels and project activities is expected to be negligible.

4.5.5 Commercial Fishing

The project area is overlapped by the jurisdiction of several Commonwealth and State-managed fisheries, as outlined below.

4.5.5.1 Commonwealth-managed Fisheries

Commonwealth fisheries are managed by the AFMA under the *Fisheries Management Act 1991*. Their jurisdiction covers the area of ocean from 3 nm from the coast out to the 200 nm limit (the extent of the Australian Fishing Zone). Fisheries with jurisdictions to fish over the project area include the:

- Southern and Eastern Scalefish and Shark (SESS), incorporating;
 - Southern Shark Fishery.
 - Southeast Trawl Fishery.
 - Southeast Non-trawl Fishery.
 - Great Australian Bight Trawl Fishery.
- Bass Strait Central Zone Scallop.
- Southern Squid Jig.
- Southern Bluefin Tuna.

- Eastern Skipjack (Tuna).
- Eastern Tuna and Billfish.
- Small Pelagic fisheries (AFMA, 2012).

Table 4-15 provides a summary of each of these fisheries and whether their operations interact with the project area and occur within the EMBA. Consultation undertaken with the fishery groups indicates that the only Commonwealth-managed fisheries likely to operate around the project area are the SESS and Small Pelagic fisheries.

4.5.5.2 Victorian-managed Fisheries

Victorian fisheries are managed by the fisheries department of the DEWLP (formerly DEPI) under the *Fisheries Act* 1995. Although Victorian state waters extend only from the coastal baseline (generally the high water mark) out to 3 nm, Victoria's fisheries do extend into Commonwealth waters. Victorian-managed fisheries with jurisdictions to fish over the Longtom area include the:

- Abalone.
- Rock lobster (incorporating giant crab – note there is no giant crab fishing undertaken within the EMBA).
- Scallop.
- Snapper.
- Shark.
- Squid fisheries.

Table 4-15 provides a summary of each of these fisheries and whether their operations interact with the project area and occur within the EMBA. Consultation undertaken with the fishery groups indicates that the only Commonwealth-managed fisheries likely to operate around the project area are the Danish Sein fishers operating out of Lakes Entrance.

Most fishing vessels operating in eastern Bass Strait operate from Lakes Entrance, although not exclusively; trawl, shark and scallop vessels may come from other Victorian and interstate ports.

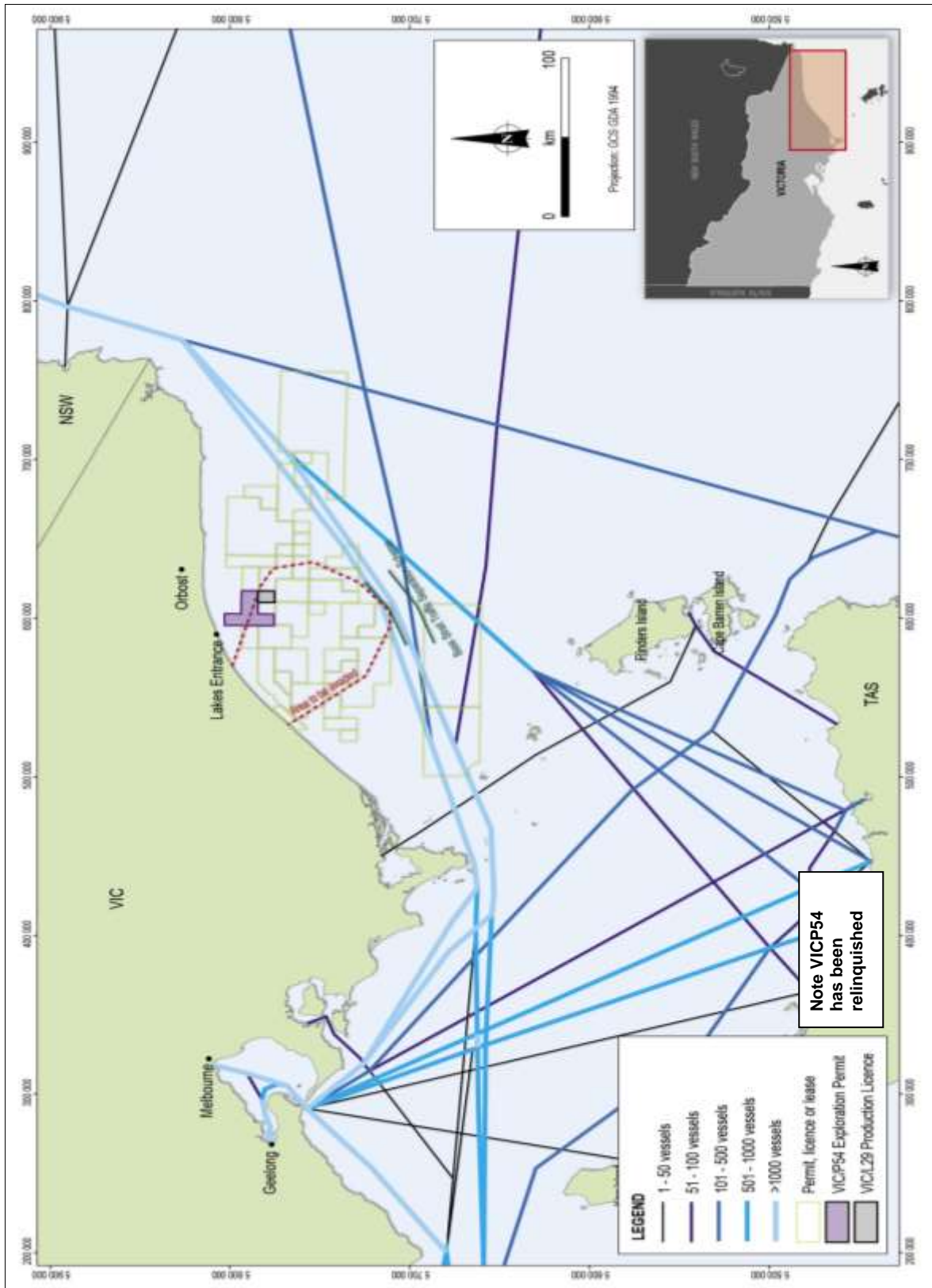


Figure 4-7 Shipping Routes and 'Area to be Avoided' in relation to VICL29

Table 4-15 Commonwealth-managed fisheries with jurisdiction to operate in the project area

Fishery	Area fished/Season	Intersects project site?	Within EMBA?	Main species targeted	Catch/Value	Fishing method	Fishing concession
Southern and Eastern Scalefish and Shark (Shark Gillnet and Shark Hook sector)	Large area, operators are limited to specific areas based on historical fishing methods, as specified on their fishing permits. Season: Open all year. Current closure through much of Bass Strait for all demersal otter trawling and automatic longlining inside the 183 m depth contour in order to protect school and gummy sharks and their habitat.	AFMA mapping = YES. SETFIA indicates that central Bass Strait has a trawl exclusion zone in place. SESS fishing possible in general area.	Yes	34 species, subject to quota management based on historical fishing methods. Target species include: Scalefish – blue eye trevlla, pink ling. Shark hook – gummy shark. Shark gillnet – gummy shark. Trap – pink ling.	\$25.29 million (2016-17). 4,785 tonnes (2007-08).	Scalefish – demersal longline, automatic longline and dropline. Shark hook – demersal longline. Shark gillnet – bottom set gillnet. Trap – fish trap.	Gillnet – 62. Shark hook – 13. Scalefish hook – 58 Trap – 2.
Southern and Eastern Scalefish and Shark (Commonwealth Trawl and Scalefish hook sectors))	The fishery covers the area of the Australian Fishing Zone extending southward from Barranjoey Point (north of Sydney) around the NSW, Victorian and Tasmanian coastlines to Cape Jervis in South Australia. Season: Open all year.	AFMA mapping = YES. Fishing possible in general area.	Yes	Blue grenadier, tiger flathead, pink ling, eastern school whiting and silver warehou.	\$47.01 million (2016-17).	Predominantly otter trawl and Danish seine, with some midwater trawling.	statutory fishing rights: 57 trawl, 37 scalefish hook
Bass Strait Central Zone	All of Bass Strait, between the zones managed by Victoria and Tasmania that lie within 20 nm of	AFMA mapping = YES.	Yes	Commercial scallop (<i>Pecten fumatus</i>). Doughboy scallop	TAC for commercial scallops in	Towed dredge in muddy to coarse sandy	455,000 commercial scallop SFRs.

Fishery	Area fished/Season	Intersects project site?	Within EMBA?	Main species targeted	Catch/Value	Fishing method	Fishing concession
Scallop	<p>their respective coasts.</p> <p>The Victorian Scallop Fishermans Association indicates a maximum fishing depth of about 45 m.</p> <p>Season: 11 July to 31 December (2017), closure allows for peak spat settlement.</p> <p>Managed under a harvest strategy by setting of total allowable catch combined with seasonal and area closures.</p>	<p>Project site is deeper than current maximum scallop fishing depth and historically not subject to scallop fishing = NO</p>		<p>(<i>Chlamys asperimus</i>) as a by-catch.</p>	<p>2017 set at 3,000 tonnes; 100 tonnes for doughboy scallops.</p> <p>2016-17 \$6.00 million</p>	<p>bottoms.</p> <p>Victorian vessels operate out of Lakes Entrance.</p>	<p>455,000 doughboy scallop SFRs.</p> <p>63 permits in 2017 (12 active vessels)</p>
Southern Squid	<p>Includes Commonwealth waters adjacent to NSW, Victoria, South Australia, Tasmania and Queensland up to Sandy Cape.</p> <p>The major fishing grounds are off the southeast corner of Australia. Squid jig catches are mainly taken between Queenscliff and Portland, off the Victorian coastline, and south of Kangaroo Island off the South Australian coast with some historical activity reported from Tasmanian waters.</p> <p>Season: Mostly from Jan to June.</p>	<p>AFMA mapping = YES.</p> <p>Fishing is mainly west of the project site (Port Phillip Bay heads and west) = NO.</p>	No	<p>Gould's squid (<i>Nototodarus gouldi</i>)</p>	<p>213 tonnes</p> <p>2016-17 Value \$0.57 million</p>	<p>Squid jigging</p>	<p>4,900 SFRs in 2017</p> <p>8 active vessels</p>
Eastern Tuna and Billfish	<p>Extends from Cape York (Qld) to the Vic/SA border, out to 200 nm.</p> <p>AFMA indicates that it is the continental shelf and slope waters that are targeted – central Bass Strait is too shallow.</p>	<p>AFMA mapping = YES.</p> <p>AFMA consultation =</p>	No	<p>Yellowfin tuna (<i>Thunnus albacares</i>), bigeye tuna (<i>T. obesus</i>), albacore tuna (<i>T. alalunga</i>), broadbill swordfish (<i>Xiphias gladius</i>) and</p>	<p>For 2016-17: Yellowfin – 1,713 tonnes (\$12.6 million). Bigeye – 449 tonnes (\$7.3</p>	<p>Pelagic longline, minor line (handline, troll, rod and reel).</p>	<p>86 longline permits and 93 minor line only permits.</p>

Fishery	Area fished/Season	Intersects project site?	Within EMBA?	Main species targeted	Catch/Value	Fishing method	Fishing concession
	<p>Season: Open all year.</p> <p>Management methods Total allowable catch and individual transferable quotas</p>	NO.		striped marlin (<i>Tetrapturus audax</i>).	million). Albacore – 992 tonnes (4.1 million). Billfish – 1,461 tonnes (\$10.3 million). Value 2016-17 \$35.67M		
Skipjack Tuna (Eastern)	<p>On the east coast, extends from far north Queensland to Tasmania. Main fishing grounds are off southeast NSW. AFMA indicates that it is the continental shelf and slope waters that are targeted – central Bass Strait is too shallow.</p> <p>Season: Open all year.</p>	<p>AFMA mapping = YES.</p> <p>AFMA consultation = NO.</p>	No	<p>Skipjack tuna (<i>Katsuwonus pelamis</i>)</p> <p>By-catch accounts for less than 2% of total landings.</p>	<p>no catch in 2016-17</p> <p>Value – no fishing in 2016-17</p>	Purse seine (~98%) and pole catch (~2%).	17 licence holders in Eastern Skipjack Fishery.
Southern Bluefin Tuna	<p>All waters in the Australian Fishing Zone (out to 200 nm from the 3nm limit). AFMA indicates that it is the continental shelf and slope waters that are targeted – central Bass Strait is too shallow.</p> <p>Season: Open all year.</p>	<p>AFMA mapping = YES.</p> <p>AFMA consultation = NO.</p> <p>Main area is the Great Australian Bight.</p>	No	Southern bluefin tuna (<i>Thunnus maccoyii</i>).	<p>Purse seine 4,684 T (\$31.4 million)</p> <p>Pelagic Line 650 T (\$7.17 million), Total \$38.54 million (2016-17).</p>	Purse seine.	<p>89 SFR owners</p> <p>6 purse seine vessels</p> <p>16 longline vessels</p>
Small Pelagic (Zone C)	Extends from the Queensland/NSW border, typically outside 3 nm, around southern Australia to a line at	Yes, can occur.	Yes	Jack mackerel (<i>Trachurus declivis</i> , <i>T. symmetricus</i> , <i>T. murphyi</i>), blue mackerel	Value - confidential	Purse seine and mid-water trawl.	30 entities held quota SFRs in 2017–18

Fishery	Area fished/Season	Intersects project site?	Within EMBA?	Main species targeted	Catch/Value	Fishing method	Fishing concession
	latitude 31° south (near Lancelin, north of Perth) Season: Uncertain, likely all year. Management of the SPF is operationalised through a harvest strategy – leading to TAQs and ITQs			(<i>Scomber australasicus</i>), redbait (<i>Emmelichthys nitidus</i>) and Australian sardine (<i>Sardinops sagax</i>).			

Sources: SIV (2011); AFMA (2011).

Acronyms: Commonwealth Victorian Inshore Trawl (CVIT), Commonwealth Trawl Sector (CTS), South East Trawl Fishery (SETF), Statutory Fishing Rights (SFR), Total Allowable Catch (TAC), Australian Fishing Zone (AFZ).

Table 4-16 Victorian-managed fisheries with jurisdiction to operate in the project area

Fishery	Area fished/Season	Intersects project site?	Within EMBA?	Main species targeted	Catch/Value (2017/18)	Fishing method	Fishing licences (2018)
Abalone	All Victorian coastal and offshore waters. Season – open all year.	Occurs close to shore and on reefs = NO.	Yes	Blacklip abalone (<i>Haliotis rubra</i>), greenlip abalone (<i>H. laevigata</i>).	721 tonnes \$20.499 million.	Diving – highly selective with no by-catch.	23 licences in the eastern zone.
Rock lobster	The entire Victorian coastline is available for rock lobster fishing, divided into a western and eastern zone. Season – closed from 15 September to 15 November for males, 1 June to 15 November for females, to protect spawning stock.	YES – Eastern Zone (Lakes Entrance region) however no known rock lobster fishing in Longtom Permit area = NO.	Yes	Eastern rock lobster (<i>Jasus verreauxi</i>), southern rock lobster (<i>J. edwardsii</i>).	287 tonnes \$23.277 million.	Baited lobster pots.	36 licences in the eastern zone.
Giant crab	Linked to the rock lobster fishery. Only Western Zone rock lobster licence holders with a giant crab endorsement are eligible for a giant crab licence. Season – closed from 15 September to 15 November for males, 1 June to 15 November for females, to protect spawning stock.	NO – western zone only.	No	Giant crab (<i>Pseudocarcinus gigas</i>).	Insufficient data	Baited lobster pots.	14
Scallop	Extends 20 nm from the coast (37 km). Maximum diving depth is about 45 m. Season – all year, generally no fishing during December to February.	Technically yes, but site is too deep for scallop fishing = NO.	Yes	Commercial scallop (<i>Pecten fumatus</i>).	Insufficient data	Box-shaped harvester dragged or towed along seabed.	88

Fishery	Area fished/Season	Intersects project site?	Within EMBA?	Main species targeted	Catch/Value (2017/18)	Fishing method	Fishing licences
Snapper	Most snapper are caught in bays, inlets and coastal waters to the west of Wilsons Promontory, with some small fisheries east of Wilsons Promontory, but catches are low. Season – May to end of November.	NO	Yes	Snapper (<i>Pagrus auratus</i>)	64 tonnes. Value unknown.	Long-lines with 200 hook limit is the main method, haul seine and mesh nets also used.	162 licences (open fishery access).
Shark (Shark Gillent and the Shark Hook Sector (SGSHS))	An agreement between Victoria and AFMA means that all gummy and school sharks caught in the Southern Shark Fishery are managed by AFMA.	See Table 4.15. YES.	Yes	Gummy (<i>Mustelus antarcticus</i>), school (<i>Galeorhinus galeus</i>), dog (Family squalidae), whiskery sharks (<i>Furgaleus macki</i>).	See Table 4.15.	See Table 4.15.	See Table 4.15.
Squid	Found in water depths from 50 to 200 m. Season starts in February and ends in June, moving westwards from Port Phillip Bay heads. An agreement between Victoria and AFMA means that this fishery is now managed by AFMA.	See Table 4.15. NO.	Yes	Gould's squid (<i>Nototodarus gouldi</i>) (previously known as Arrow squid).	See Table 4.15.	See Table 4.15.	See Table 4.15.

Sources: SIV (2012), DPI (2012), AFMA (2011) consultation with various fisheries stakeholders.

4.6 Conservation Areas and Sensitivities

This section provides a description of the marine conservation areas established by the Commonwealth and Victorian governments. The EMBA intersects several of these marine reserves, as outlined below.

Australia has developed a marine reserve system through the establishment of a National Representative System of Marine Protected Areas (MPAs). Marine bioregional planning has been implemented in five areas across Australia, these being the south-east, east, north, north-west and south-west. Bass Strait falls within the South-east Marine Region (Figure 4.6).

The conservation of natural and anthropological heritage in Commonwealth marine areas is grouped into the following categories (with the nearest sites listed):

- Commonwealth marine reserves – East Gippsland, Beagle and Flinders Marine Reserves.
- Ramsar sites – Gippsland Lakes.
- World heritage – none in or abutting Bass Strait.
- Commonwealth heritage places – none in or abutting Bass Strait.
- National heritage – none in or abutting Bass Strait.

Brief descriptions of the marine conservation areas and RAMSAR sites closest to the project area or within the EMBA are described below.

4.6.1 Commonwealth Marine Reserves

4.6.1.1 East Gippsland Commonwealth Marine Reserve

The East Gippsland Commonwealth Marine Reserve lies to the east and just beyond the fringe of the EMBA and covers 4137 km² of Commonwealth ocean territory.

The reserve contains a large network of canyons, continental slope and escarpment at depths from 600 m to more than 4000 m. The reserve also contains warm and temperate waters, which may create a habitat for free-floating aquatic plants or phytoplankton communities. Oceanic seabirds are known to forage in these waters, including albatrosses, the great-winged petrel, wedge-tailed shearwater and cape petrel. Humpback whales are also known to pass by during their migrations (SEWPAC, 2013b). Table 4-17 describes the marine park, its values and assigned zones.

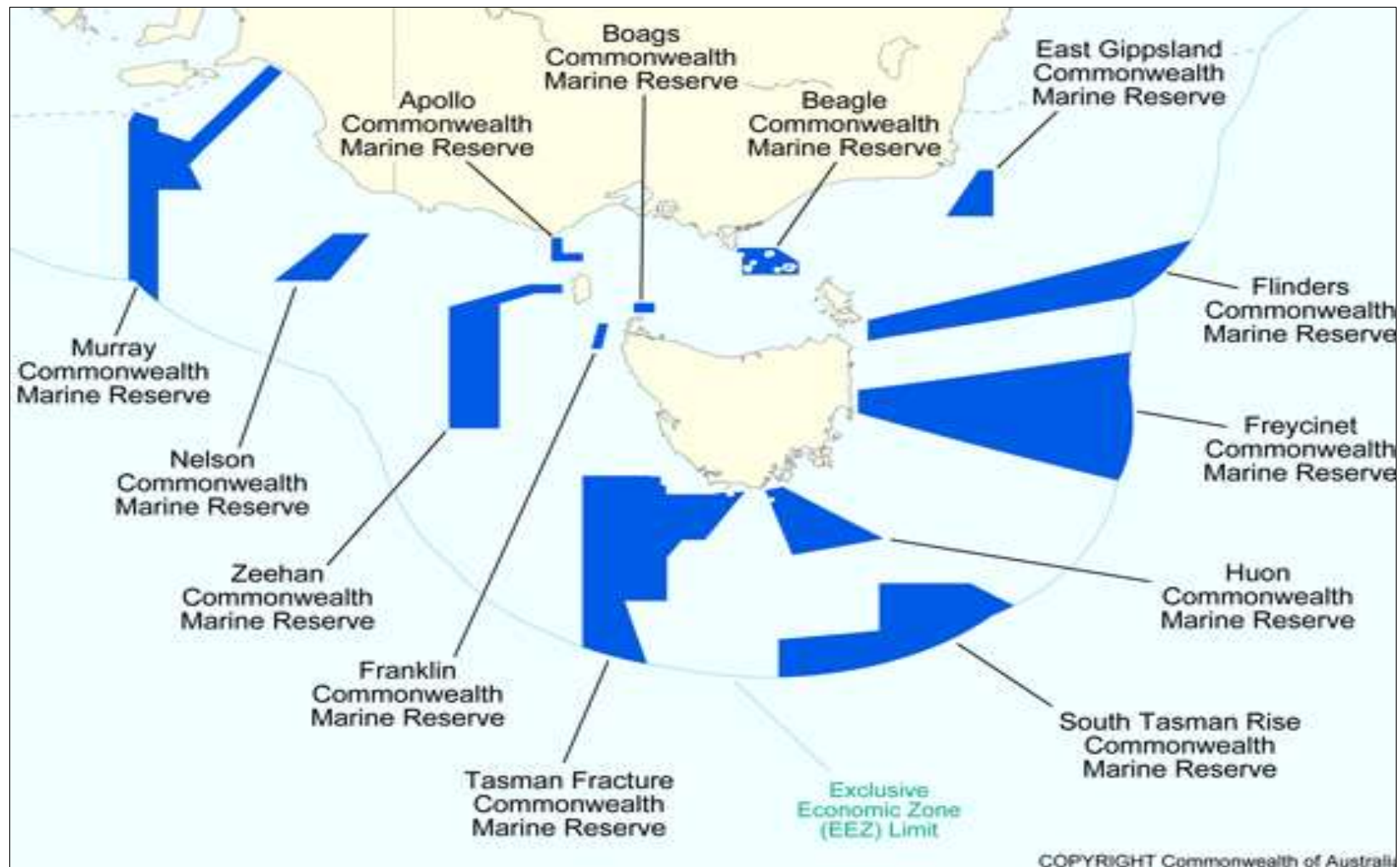


Figure 4-8 South-east Marine Region Marine Reserves

Table 4-17 East Gippsland Commonwealth Marine Reserve Description and Values (DNP. 2013)

Proclaimed	28 June 2007			
IUCN category assigned by this Management Plan and reserve management zone name	IUCN VI—Multiple Use Zone			
Assigned zones in reserve:	IUCN Ia	IUCN II	IUCN IV	IUCN VI
				Multiple Use Zone
Depth of reserve below seabed	100 m			
Total area	4,137 km ² (413 700 ha).			
Major conservation values	<p>Examples of ecosystems, habitats and communities associated with:</p> <ul style="list-style-type: none"> • the Southeast Transition and associated with sea-floor features: <ul style="list-style-type: none"> ○ abyssal plain/deep ocean floor ○ canyon ○ escarpment ○ knoll/abyssal hill ○ slope <p>Features with high biodiversity and productivity:</p> <ul style="list-style-type: none"> • Bass Cascade • upwelling east of Eden <p>Important foraging area for:</p> <ul style="list-style-type: none"> • Wandering, Black-browed, Yellow-nosed and Shy albatrosses; Great-winged petrel; Wedge-tailed shearwater; and Cape petrel <p>Important migration area for:</p> <ul style="list-style-type: none"> • Humpback whale 			
Location	The East Gippsland Commonwealth Marine Reserve is off the north-east corner of Victoria, on the continental slope and escarpment.			
General description of the reserve	<p>The East Gippsland Commonwealth Marine Reserve contains representative samples of an extensive network of canyons, continental slope and escarpment at depths from 600 m to more than 4000 m.</p> <p>The geomorphic features of this reserve include rocky-substrate habitat, submarine canyons, escarpments and a knoll, which juts out from the base of the continental slope.</p> <p>The reserve includes both warm and temperate waters, which create habitat for free-floating aquatic plants or microscopic plants (i.e. phytoplankton) communities. Complex seasonality in oceanographic patterns influences the biodiversity and local productivity.</p> <p>The East Australian Current brings subtropical water from the north, and around Cape Howe the current forms large eddies, with a central core of warm water. Around the outside of the eddies, cooler, nutrient-rich waters mix with the warm water creating conditions for highly productive phytoplankton growth, which supports a rich abundance of marine life. During winter, upwellings of cold water may occur and bring nutrient-rich waters to the surface, boosting productivity.</p> <p>Many oceanic seabirds forage in these waters, including albatrosses (e.g. Wandering, Black-browed, Yellow-nosed and Shy albatrosses), the Great-winged petrel, Wedge-tailed shearwater and Cape petrel.</p> <p>Humpback whales pass by during their migrations north and south along the eastern seaboard.</p>			

4.6.1.2 Beagle Commonwealth Marine Reserve

The Beagle Commonwealth Marine Reserve, located approximately 150 km southwest of the project area, lies just to the west of the EMBA and covers 2,928 km² of Commonwealth ocean territory. The reserve has a depth range between 50 to 70 metres. It was proclaimed in June 2007 and represents an area of shallow continental shelf ecosystems in the major biological zone that extends around south-eastern Australia to the east of Tasmania (SEWPaC, 2011d). The reserve surrounds a collection of Bass Strait islands, containing deep rocky reefs and provides a feeding ground for a variety of seabirds, little penguins and Australian fur seals. The Beagle Commonwealth Marine Reserve is designated as a Multiple Use Zone. Table 4-18 describes the marine park, its values and assigned zones.

Table 4-18 Beagle Commonwealth Marine Reserve Description and Values (DNP. 2013)

Proclaimed	28 June 2007			
IUCN category assigned by this Management Plan and reserve management zone name	IUCN VI—Multiple Use Zone			
Assigned zones in reserve:	IUCN Ia	IUCN II	IUCN IV	IUCN VI
				Multiple Use Zone
Depth of reserve below seabed	100 m			
Total area	2,928 km ² (292 800 ha)			
Major conservation values	<p>Ecosystems, habitats and communities associated with:</p> <ul style="list-style-type: none"> • the Southeast Shelf Transition and associated with sea-floor features: <ul style="list-style-type: none"> ○ basin ○ plateau ○ shelf ○ sill <p>Important migration and resting on migration area for:</p> <ul style="list-style-type: none"> • southern right whale <p>Important foraging area for:</p> <ul style="list-style-type: none"> • Australian fur seal • Killer whale • Shy albatross, Australasian gannet, Short-tailed shearwater, Pacific and Silver gulls, • Crested tern, Common diving petrel, Fairy prion, Black-faced cormorant and Little penguin • White shark <p>Cultural and heritage sites:</p> <ul style="list-style-type: none"> • the wreck of the steamship SS Cambridge • the wreck of the ketch Eliza Davies 			
Location	The Beagle Commonwealth Marine Reserve lies entirely within Bass Strait, with its north-western edge abutting Victorian waters south-east of Wilson’s Promontory. It is a shallow-water reserve surrounding a collection of Bass Strait islands.			
General description of the reserve	The Beagle Commonwealth Marine Reserve represents an area of shallow continental shelf ecosystems in depths of about 50–70 m that extends around south-eastern Australia to the east of Tasmania. The sea floor that it covers formed a land bridge between Tas-			

	<p>mania and Victoria during the last ice age 10 000 years ago.</p> <p>Its boundary encloses Tasmania’s Kent Group Marine Reserve and the Hogan and Curtis Island groups. Nearby to the north-east is Victoria’s Wilsons Promontory Marine National Park.</p> <p>The reserve encompasses the fauna of central Bass Strait, which is expected to be especially rich based on studies of several sea floor–dwelling animal groups. Its ecosystems are similar to those documented for the deeper sections of the Kent Group Marine Reserve, especially those based around habitats of rocky reefs supporting beds of encrusting, erect and branching sponges, and sediment composed of shell grit with patches of large sponges and sparse sponge habitats.</p> <p>Islands encompassed by the reserve and nearby islands support important breeding colonies for many seabirds and for the Australian fur seal. The waters of the reserve provide an important foraging area for those species breeding nearby. The rich marine life also attracts top predators, such as the great white shark and killer whales.</p> <p>The SS Cambridge, a British freighter, which lies in the reserve to the east of Wilson’s Promontory, was sunk in 1940 by a WWII mine.</p> <p>The trading ketch Eliza Davies, which lies in the reserve to the east of Wilson’s Promontory, sunk under tow in 1924.</p>
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4.6.1.3 Flinders Commonwealth Marine Reserve

The Flinders Commonwealth Marine Reserve covers a depth range from about 40 metres on the shallow continental shelf to abyssal depths of 3,000 m or more. The reserve spans the continental shelf, slope and deeper water ecosystems of the major biological zone that extends around south-eastern Australia to the east of Tasmania. Sea bottom dwelling habitats include sheer rocky walls and large rocky outcrops that support a rich diversity of small seabed animals such as lace corals and sponges. These and the large expanses of sandy and muddy sediments are habitats to a wide variety of fishes and to populations of the giant crab.

A prominent feature of this reserve is a large off-shore seamount believed to be too deep to have been fished. Seamounts are generally considered to be important centres of deep ocean biodiversity. Although little is known about the fauna of this seamount, based on information from other better known, offshore seamounts, seabed animals are expected to include endemic species. Table 4-19 describes the marine park, its values and assigned zones.

Table 4-19 Flinders Commonwealth Marine Reserve Description and Values (DNP. 2013)

Proclaimed	28 June 2007			
IUCN category assigned by this Management Plan and reserve management zone name	IUCN II—Marine National Park zone			
Assigned zones in reserve 2	IUCN Ia	IUCN II	IUCN IV	IUCN VI
		Marine National Park Zone		Multiple Use Zone

<p>Depth of reserve below seabed</p>	<p>100 m</p>
<p>Total area</p>	<p>27 043 km² (2 704 300 ha)</p>
<p>Major conservation values</p>	<p>Examples of ecosystems, habitats and communities associated with:</p> <ul style="list-style-type: none"> • the Tasmania Province • the Tasmanian Shelf Province • the Southeast Transition • the Southeast Shelf Transition <p>And associated with sea-floor features:</p> <ul style="list-style-type: none"> • abyssal plain/deep ocean floor • canyon • plateau • seamount/guyot • shelf slope <p>Features with high biodiversity and productivity:</p> <ul style="list-style-type: none"> • east Tasmania subtropical convergence zone <p>Important foraging area for:</p> <ul style="list-style-type: none"> • wandering, black-browed, yellow-nosed and shy albatrosses, northern giant petrel, Gould’s petrel and cape petrel • killer whale • white shark • Harrison’s dogfish <p>Important migration area for:</p> <ul style="list-style-type: none"> • humpback whale
<p>Location</p>	<p>The Flinders Commonwealth Marine Reserve is east of the north-east tip of Tasmania and Flinders Island and extends over 400 km eastward.</p>
<p>General description of the reserve</p>	<p>The Flinders Commonwealth Marine Reserve covers a depth range from about 40 m on the shallow continental shelf to abyssal depths of 3000 m or more near the edge of Australia’s exclusive economic zone.</p> <p>Key features of this area are the continental shelf, and a long section of steep continental slope, incised by a series of deep submarine canyons. Sea bottom habitats include sheer rocky walls and large rocky outcrops that support a rich diversity of small seabed animals, such as lace corals and sponges. These and the large expanses of sandy and muddy sediments are habitats to a wide variety of fishes and to populations of the giant crab. Areas between 400 m and 600 m of the continental slope sea floor are habitat for dogfish and gulper sharks, and Harrison’s dogfish has been recently recorded in the reserve.</p> <p>The biodiversity of the reserve is influenced by summer incursions of the warm East Australian Current and associated large-scale eddies.</p> <p>Another prominent feature is a large offshore seamount believed to be too deep to have been fished. Seamounts are generally considered to be important centres of deep ocean biodiversity, offering a wide range of habitats at different depths and orientations to currents. The large seamounts to the east of Tasmania are believed to be individually important, providing habitat to species that may be unique to each seamount and to a range of more widely occurring species that make their homes only on their rocky slopes. Presently, little is known about the fauna of these seamounts, but based on information from other better known offshore seamounts, seabed animals are expected to include endemic species.</p>

4.6.2 Wetlands of International Importance

Australia currently has 64 Ramsar wetlands that cover around 8.1 million hectares (SEWPaC, 2012e). Ramsar wetlands are those that are representative, rare or unique wetlands, or are important for conserving biological diversity. These are included on the List of Wetlands of International Importance.

4.6.2.1 Ramsar Wetland Sites - Eastern Victorian Coast

Gippsland Lakes Ramsar Site

The nearest wetland of international significance to the project area is the Gippsland Lakes, located on the coast of the Ninety Mile Beach, 54 km northwest.

The Gippsland Lakes Ramsar site was listed in December 1982 and covers an area of 60,015 ha. The lakes are a series of large, shallow, coastal lagoons approximately 70 km in length and 10 km wide, separated from the sea by sand dunes (SEWPaC, 2012f).

The Gippsland Lakes form the largest navigable inland waterway in Australia and create a distinctive regional landscape of wetlands and flat coastal plains of considerable environmental significance. The Ramsar site contains three main habitat types: marine subtidal aquatic beds, coastal brackish or saline lagoons and fringing wetlands. A significant quantity of threatened, endangered, vulnerable or rare native fish communities, mammal, amphibian, and plant species exist within these habitats. The bird diversity of the Ramsar wetland is also high with 48 species of waterbirds being recorded, including the blue-billed duck, fairy tern, and magpie goose. A summary of critical components, processes and services/benefits of the Gippsland Lakes Ramsar Site is shown in Table 4-20 and the limits of acceptable change for the Ramsar site are described in Table 4-21.

Table 4-20 Gippsland Lakes Ramsar site: Summary of critical components, processes and services/benefits (SEWPaC. 2010)

Critical components	Critical processes	Critical services/benefits
<p>Wetland habitats: grouped as follows</p> <ul style="list-style-type: none"> (C1) marine subtidal aquatic beds (seagrass/aquatic plants). (C2) coastal brackish or saline lagoons (open water phytoplankton-dominated habitats). <p>fringing wetlands that can occur within the site as–</p> <ul style="list-style-type: none"> (C3) predominantly freshwater wetlands (C4) brackish wetlands (C5) saltmarsh/ hypersaline wetlands. <p>Wetland flora and fauna:</p> <ul style="list-style-type: none"> (C6) abundance and diversity of waterbirds. (C7) presence of threatened frog species (green and golden bell frog; growling grass frog). (C8) presence of threatened wetland flora species. 	<p>Hydrological regime: (P1) patterns of inundation and freshwater flows into the wetland system, groundwater influences and marine inflows that affect habitat structure and condition.</p> <p>Waterbird breeding functions: (P2) critical breeding habitats for a variety of waterbird species.</p>	<p>Threatened species: (S1) the site supports an assemblage of vulnerable or endangered wetland flora and fauna that contribute to biodiversity.</p> <p>Fisheries resource values: (S2) the site supports key fisheries habitats and stocks of commercial and recreational significance.</p>
Supporting Components	Supporting Processes	Supporting services/benefits
<p>Other wetland habitats: supported by the site (sand/pebble shores, estuarine waters, etc.).</p> <p>Other wetland fauna: supported by the site (for example, fish, aquatic invertebrates).</p>	<p>Climate: patterns of temperature, rainfall and evaporation.</p> <p>Geomorphology: key geomorphologic/topographic features of the site.</p> <p>Coastal and shoreline processes: hydrodynamic controls on coasts and shorelines through tides, currents, wind, erosion and accretion.</p> <p>Water quality: water quality influences aquatic ecosystem values, noting the key water quality variables for Gippsland Lakes are salinity, dissolved oxygen, nutrients and sediments.</p> <p>Nutrient cycling, sediment processes and algal blooms: primary productivity and the natural functioning of nutrient cycling/flux processes in waterbodies.</p> <p>Biological processes: important biological processes such as primary productivity.</p>	<p>Tourism and recreation: the site provides and supports a range of tourism and recreational activities that are significant to the regional economy.</p> <p>Scientific research: the site supports and contains features important for scientific research.</p>

Table 4-21 Gippsland Lakes Ramsar site: Limits of acceptable change (LAC) (SEWPaC. 2010)

Number	Indicator for Critical Component / Process/Service for the LAC	Relevant timescale ¹	Limit(s) of Acceptable Change	Spatial scale/temporal scale of measurements	Underpinning baseline data	Secondary critical C,P,S addressed through LAC
Critical components						
C1	Marine sub-tidal aquatic beds (for example, within Lake King, Lake Victoria, Lake Tyers, Bunga Arm and Lake Bunga)	Long Term	Total seagrass extent will not decline by greater than 50 per cent of the baseline value of Roob and Ball 1997 (that is, 50 per cent of 4330 hectares = 2165 hectares) in two successive decades at a whole of site scale. Total mapped extent of dense and moderate <i>Zostera</i> will not decline by greater than 80 per cent of the baseline values determined by Roob and Ball (1997) in two successive decades at any of the following locations: Fraser Island Point Fullerton, Lake King Point King, Raymond Island, Lake King Gorcrow Point – Steel Bay, Lake Victoria Waddy Island, Lake Victoria	Sampling to occur at least twice within the decade under consideration. Baseline mapping against which this LAC can be tested is within Roob and Ball 1997. Note that the seagrass assessment by Hindell (2008) did not produce mapping but did use similar sampling sites to Roob and Ball.	Level B – Recent quantitative data describes seagrass condition at various sites but over a limited timeframe. There is no available seagrass condition data prior to listing.	P1
C2	Coastal brackish or saline lagoons (for example, Lake King, Lake Victoria, Lake Wellington, Lake Tyers)	Long Term	No change in wetland typology from the 1980 classification of Corrick and Norman (1980), as presented in Figure 2-3.	To be determined based on expert review.	Level B – VMCS mapping data describes wetland extent. This is coarse scale mapping and should be considered as indicative only.	P1, S2

Number	Indicator for Critical Component / Process/Service for the LAC	Relevant timescale ¹	Limit(s) of Acceptable Change	Spatial scale/temporal scale of measurements	Underpinning baseline data	Secondary critical C,P,S addressed through LAC
		Long Term	A long-term change in ecosystem state at Lake King, Lake Victoria or Lake Tyers from relatively clear, seagrass- dominated estuarine lagoons to turbid, algae dominated system (characteristic of Lake Wellington) will represent a change in ecological character.	To be determined based on expert review.		
		Short Term	No single cyanobacteria algal bloom event will cover greater than 10 per cent of the combined area of coastal brackish/saline lagoons (that is, Lake King, Victoria, Wellington and Tyers) in two successive years.	Algal bloom extent (per cent lakes area and location) and number should be reported annually, but assessed on an ongoing basis.	Level A – The occurrence of cyanobacteria algal blooms are well documented. The extent of algal blooms historically has not been assessed, including at the time of site declaration.	
C3	Fringing wetlands – predominantly freshwater marsh at Macleod Morass and Sale Common	Long Term	No change in wetland typology from the 1980 classification (Corrick and Norman 1980; See Figure 2-3). In this regard, the conversion of vegetation communities at Sale Common and Macleod Morass from a predominantly freshwater character (for example, giant rush, common reed, cumbungi) to those of a brackish water character (brackish or swamp scrub/saltmarsh species) will represent a change in ecological character.	To be determined based on expert review.	Level B – VMCS mapping data describes wetland extent during 1980. This is coarse scale mapping and should be considered as indicative only. There is no available community data prior to listing.	P1, P2, C6, C7, C8
			The total mapped area of freshwater marshes (shrubs and reed wetland types) at Sale Common and Macleod Morass will not decline by greater than 50 per cent of the baseline value outlined in VMCS for 1980 (that is, 50 per cent of 402 hectares = 201 hectares) in two successive decades.	Sampling to occur at least twice within the decade under consideration.		

Number	Indicator for Critical Component / Process/Service for the LAC	Relevant timescale ¹	Limit(s) of Acceptable Change	Spatial scale/temporal scale of measurements	Underpinning baseline data	Secondary critical C,P,S addressed through LAC
		Short Term	In existing freshwater wetland areas, the annual median salinity should not be greater than one grams per litre in two successive years. Note that where ambient water quality characteristics fall outside the range of these baseline levels, and ecosystem health indicators shows no signs of impairment, the LAC may need to be adjusted accordingly.	Annual median based on at least eight sampling periods per year, encompassing wet and dry periods.	Level C – No available baseline data. Value based on species salinity tolerances.	
C4	Fringing wetlands – brackish marsh (for example, Dowd Morass; The Heart Morass; Clydebank Morass, Lake Coleman {Tucker Swamp})	Long Term	For all fringing brackish wetlands: No change in wetland typology from the 1980 classification (Corrick and Norman 1980).	To be determined based on expert review.	As for C3.	P1, P2, C6, C7, C8
		Medium Term	For Dowd Morass and the Heart Morass: The annual median salinity will be less than four grams per litre in five successive years. Note that where ambient water quality characteristics fall outside the range of these baseline levels, and ecosystem health indicators shows no signs of impairment, LAC may need to be adjusted accordingly.	Annual median based on at least eight sampling periods per year, encompassing wet and dry periods.	Level C – No available baseline data. This value is based on species tolerances and requirement for salinity to be less than four grams per litre to allow reproduction (refer Tilleard and Ladson 2010).	
		Long Term	The total area of common reed at Dowd Morass will not decline by greater than 50 per cent of the 1982 baseline value (that is, 50 per cent of 480 hectares = 245 hectares) outlined in Boon et al. (2007) in two successive decades.	Sampling to occur at least twice within the decade under consideration.	Level A – Boon et al. (2007) provides good quality mapping data relevant to time of listing.	
C5	Fringing wetlands – saltmarsh/hypersaline marsh (for example, Lake Reeve)	Medium Term	No change in wetland typology from the 1980 classification (Corrick and Norman 1980). The total mapped area of salt flat, saltpan and salt meadow habitat at Lake Reeve Reserve will not decline by greater than 50 per cent of the baseline value outlined in VMCS for 1980 (that is, 50 per cent of 5035 hectares = 2517 hectares) in two successive decades.	To be determined based on expert review. Sampling to occur at least twice within the decade under consideration.	As for C3.	P1, C6

Number	Indicator for Critical Component / Process/Service for the LAC	Relevant timescale ¹	Limit(s) of Acceptable Change	Spatial scale/temporal scale of measurements	Underpinning baseline data	Secondary critical C,P,S addressed through LAC
C6	Abundance and diversity of waterbirds	Medium Term	<p>The number of standard 20 minute searches (within any ten year period) where waterbird abundance is less than 50 individuals will not fall below 50 per cent of the 'baseline' value (based on Birds Australia count data – 1987-2010), for the following species:</p> <p>black swan = 15 per cent of surveys chestnut teal = 10 per cent of surveys Eurasian coot = 11 per cent of surveys.</p> <p>The absence of records in any of the following species in five successive years will represent a change in character: red-necked stint, sharp-tailed sandpiper, black swan, chestnut teal, fairy tern, little tern, musk duck, Australasian grebe, grey teal, Eurasian coot, great cormorant, red knot, curlew sandpiper.</p> <p>Median abundance (derived from at least three annual surveys {summer counts} over a 10-year period) falls below the 20th percentile baseline value. <i>Note: An adequate baseline will need to be established to assess this LAC (for example, at least three annual surveys (summer counts) over a 10-year period).</i></p>	<p>Sampling to be undertaken at least twice a year over any 10 year period at stations containing favourable habitat for these species (see Table E8 for locations). Surveys should consist of standardised 20 minute counts.</p> <p>Sampling to be undertaken at least twice a year (during summer) at stations containing favourable habitat for these species (see section 3.4.1 for important locations).</p> <p>Recommended baseline monitoring program should include:</p> <p>A combination of aerial and ground surveys.</p> <p>Representative coverage of primary habitats within the site.</p>	<p>Level A – Birds Australia data, while standardised in terms of sampling effort per site, is not standardised in terms of frequency of sampling events at any given sampling location. Data should be considered indicative only.</p> <p>Level A – Records for these species are reliable. Birds Australia and DSE data can be used to assess this qualitative LAC.</p> <p>There are no baseline data available for this LAC.</p>	P1, P2

Number	Indicator for Critical Component / Process/Service for the LAC	Relevant timescale ¹	Limit(s) of Acceptable Change	Spatial scale/temporal scale of measurements	Underpinning baseline data	Secondary critical C,P,S addressed through LAC
C7	Presence of threatened frogs	Medium Term	<p>The site will continue to support suitable habitat for growling grass frog and green and golden bell frog. In this regard, the LAC for Component 3 applies.</p> <p>There is insufficient data to develop a LAC relating directly to site usage by these species, which represents a critical information gap. Should baseline data become available in the future, the following LAC will apply: a significant reduction (greater than 25 per cent over a period of 5 years) in the local adult population within the site, especially for important local populations (for example, within Macleod Morass, Sale Common, Ewings Marsh, Roseneath wetlands (Morley Swamp and Victoria Lagoon), the Heart Morass and freshwater pools on Rotamah Island).</p>	Refer to C3. Recommended baseline monitoring program should comprise a minimum two annual sampling periods separated by at least one year (and within a 5 year period).	Level C – Surveys for these species have been opportunistic. The most recent record for growling grass frog is 2007, whereas the green and golden bell frog was recorded at the site in 1998. There are no empirical data describing abundances at the site.	P1
C8	Presence of threatened wetland flora species	Long Term	The three threatened flora species (<i>Rulingia prostrata</i> , <i>Thelymitra epipactoides</i> and <i>Xerochrysum palustre</i>) continue to be supported within the boundaries of the Gippsland Lakes Ramsar site.	Based on opportunistic searches.	Level C – Setting of empirical limits of acceptable change is not possible at present, given the absence of quantitative estimates of population size of threatened species within the site, and more importantly the viability of populations (and their key controls) within the site.	P1
Critical processes						
P1	Hydrological regime	Short Term – Medium Term	Wetland wetting frequency, flushing frequency and flushing volume are maintained as follows:	Refer to LAC for details. Values measured at existing gauging stations in the lower reaches of the Rivers or otherwise in the	LAC have been identified for these wetlands on the basis that they are the best indicators of freshwater flows into the broader Gippsland Lakes system.	C1 – C8 S1, S2

Number	Indicator for Critical Component / Process/Service for the LAC	Relevant timescale ¹	Limit(s) of Acceptable Change				Spatial scale/temporal scale of measurements	Underpinning baseline data	Secondary critical C,P,S addressed through LAC
			Wetland	Wetting Frequency	Flushing Frequency	Required Flushing Volume	wetlands themselves.	<p>Level C – LAC based on Tilleard and Ladson (2010) ‘Hydrological Analyses to Support Determination of Environmental Water Requirements in the Gippsland Lakes’. This is a threshold-based LAC that is based on modelling and ecological assessments. Note that these values should be considered as indicative only at this stage, and should be constantly reviewed.</p> <p>Tilleard and Ladson (2010) indicate no work has been done for wetlands on the Mitchell (Macleod Morass); McLennan Straits (Morley Swamp, Lake Betsy); or Jones Bay.</p>	
Sale Common	Annual with 100 per cent reliability	2-3 times/decade	4 GL						
Dowd Morass	5-7 times/decade	2-3 times/decade	15GL						
The Heart Morass	5-7 times/decade	2-3 times/decade	15GL						
<p>From Tilleard and Ladson (2010); note that larger flushing volumes (~20GL) are identified as being needed for Dowd and the Heart Morasses following saline flood events in the Lake Wellington system (for example, when the wetlands are filled with saline water from Lake Wellington and this corresponds with low flows in the Latrobe River).</p>									

Number	Indicator for Critical Component / Process/Service for the LAC	Relevant timescale ¹	Limit(s) of Acceptable Change	Spatial scale/temporal scale of measurements	Underpinning baseline data	Secondary critical C,P,S addressed through LAC
P2	Waterbird breeding	Short Term	Abandonment or significant decline (greater than 50 per cent) in the productivity of two or more representative breeding sites (based on two sampling episodes over a five year period) within any of the following site groupings: Lake Coleman, Tucker Swamp and Albifrons Island – Australian pelican. Bunga Arm and Lake Tyers – little tern and fairy tern. Macleod Morass, Sale Common and Dowd Morass – black swan, Australian white ibis, straw-necked ibis, and little black cormorant.	Recommended baseline monitoring program should comprise a minimum two annual sampling periods separated by at least one year (and within a 5 year period).	Level C – The use of the site by these species is well documented. However, there are no empirical data describing breeding rates. Baseline data will need to be collected to assess this LAC.	C6
Critical services/benefits						
S1	Threatened species	N/A	No LAC are proposed for painted snipe and Australasian bittern at the current time until greater information is available about patterns of usage and populations in the Ramsar site. Other threatened species are dealt with in the critical components above.	N/A	Level C – Site records are not recent, uncommon and the location within the Ramsar boundary not known.	P1, C3
		Long Term	Australian grayling continues to be supported in one or more of the catchments draining into the Gippsland Lakes.	Setting of more empirical limits of acceptable change not possible at present, given the absence of quantitative population data for this species for any of the rivers and creeks that drain into the site.	Level C – This species has been recorded in the major drainages that drain into the site. Juveniles have an apparent obligate estuarine phase, and therefore must use the site in order for this species to persist in these drainages. There are no data describing the population status of this species in these drainages.	P1, C1, C2

Number	Indicator for Critical Component / Process/Service for the LAC	Relevant timescale ¹	Limit(s) of Acceptable Change	Spatial scale/temporal scale of measurements	Underpinning baseline data	Secondary critical C,P,S addressed through LAC
S2	Fisheries resource values	Medium Term	Total annual black bream commercial fishing catch per unit effort will not fall below the 10 th percentile historical baseline value of 6.1 (see Section 3.8.2) in a five successive year period.	Median measured over five years.	Level B – While some commercial fish data has been accessed and reviewed as part of the current study, the abundance and usage of the Gippsland Lakes by key fish species of commercial and recreational significance is not well quantified. The baseline data used in this LAC has limited duration (five years), and is unlikely to be representative of patterns in abundance over longer timeframes. This LAC will need to reviewed and refined. Level C – based on conditions outlined in Tilleard (2009).	C1, C2, C3, C4, C5
			Sub-optimal black bream spawning conditions should not occur in any successive five year period within key spawning grounds (that is, mid-lower estuaries and adjacent waters of main lakes) during the peak spawning period (October to December). Based on Tilleard (2009), optimal conditions are as follows:	Annual median value for the period October to December.		
			Water column salinity is maintained in brackish condition (for example, between 17-21 grams per litre median value) in the middle of the water column in the mid-lower estuaries and adjacent waters of the main lakes	As above.		
			The salt wedge is located within the mid-lower section of the estuarine river reaches or just out into the main lakes as opposed to far upstream or well-out into the Lakes.			

C – component, P – process , S/B – service/benefit

Corner Inlet Ramsar Site

Corner inlet is located to the west of the EMBA, bounded by Wilsons Promontory to the west and a series of barrier islands and sandy splits to the east. Corner inlet valued for being a breeding habitat for many waterbirds, including threatened and listed species, for example the Curlew sandpiper and Eastern curlew. Corner inlet also contains the most extensive intertidal mudflats in Victoria. The critical components, processes and benefits of the wetland are provided in Table 4-22. The limits of acceptable change for the critical components /processes are described in Table 4-23.

Table 4-22 Corner Inlet summary of critical components, processes and benefits.

Critical Components	Critical Processes	Critical Services/Benefits
<p>Several key wetland mega-habitat types are present:</p> <ul style="list-style-type: none"> • seagrass • intertidal sand or mud flats • mangroves • saltmarshes • permanent shallow marine water (C2). Abundance and diversity of waterbirds 	<p>P1. Waterbird breeding is a key life history function in the context of maintaining the ecological character of the site, with important sites present on the sand barrier islands</p>	<p>S1. The site supports nationally threatened fauna species including:</p> <ul style="list-style-type: none"> • orange-bellied parrot • growling grass frog • fairy tern • Australian grayling <p>S2. The site supports outstanding fish habitat values that contribute to the health and sustainability of the bioregion</p>
Supporting Components	Supporting Processes	Supporting Services/Benefits
<p>Important geomorphological features that control habitat extent and types include:</p> <ul style="list-style-type: none"> • sand barrier island and associated tidal delta system • the extensive tidal channel network • mudflats and sandflats. <p>Invertebrate megafauna in seagrass beds and subtidal channels are important elements of biodiversity and control a range of ecosystem functions.</p> <p>The diverse fish communities underpin the biodiversity values of the site</p>	<p>Climate, particularly patterns in temperature and rainfall, control a range of physical processes and ecosystem functions</p> <p>Important hydraulic and hydrological processes that support the ecological character of the site includes:</p> <ul style="list-style-type: none"> • Fluvial hydrology. Patterns of inundation and freshwater flows to wetland systems • Physical coastal processes. • Hydrodynamic controls and marine inflows that affect habitats through tides, currents, wind, erosion and accretion. • Groundwater. For those wetlands influenced by groundwater interaction, the level of the groundwater table and groundwater quality. <p>Water quality underpins aquatic ecosystem values within wetland habitats. The key water quality parameters for the site are salinity, turbidity, dissolved oxygen and nutrients.</p> <p>Important biological processes include nutrient cycling and food webs.</p>	<p>The site supports recreation and tourism values (scenic values, boating, recreational fishing, camping, etc.) that have important flow-on economic effects for the region.</p> <p>The site provides a range of values important for scientific research, including a valuable reference site for future monitoring.</p>

Table 4-23 Corner Inlet limits of acceptable change for critical components

Number	Indicator for Critical Component / Process/Service for the LAC	Relevant timescale ³	Limit(s) of Acceptable Change	Spatial scale/temporal scale of measurements	Underpinning baseline data	Secondary critical C,P,S addressed through LAC
Critical Components						
C1	Seagrass extent	Long Term	<ul style="list-style-type: none"> Total mapped extent of dense Posidonia will not decline by greater than 10 percent of the baseline value outlined by Roob et al. (1998) at a whole of site scale (baseline = 3050 hectares; LAC = mapped area less than 2745 hectares) on any occasion. (Note: the small degree of allowable change recognises that this seagrass species is a critical habitat resource and generally shows low natural variability.) Total mapped extent of the dense and medium density Zosteraceae will not decline by greater than 25 percent of the baseline values outlined by Roob et al. (1998) at a whole of site scale on two sampling occasions within any decade. Dense Zostera - Baseline = 5743 hectares (LAC = mapped area less than 4307 hectares) Medium Zostera - Baseline = 1077 hectares (LAC = mapped area less than 807 hectares) <p>(Note: the moderate degree of allowable change recognises that these seagrass species generally show moderate degrees of natural variability)</p>	<p>Sampling to occur at least twice within the decade under consideration.</p> <p>Note that the seagrass assessment by Hindell (2008) did not produce mapping but did use similar sampling sites to Roob <i>et al.</i></p>	<p>Recent quantitative data describes seagrass condition at various sites but over a limited timeframe. It is thought that the Roob <i>et al.</i> (1998) study underestimated the total available seagrass habitat (J. Stevenson, Parks Victoria, pers. comm. February 2011), hence a 10 per cent change from this baseline value would represent a larger actual change from the true baseline.</p> <p>Note: Prior to declaration, <i>Posidonia</i> covered approximately 44 per cent (11,900 hectares) of the site (Poore 1978). Morgan (1986) estimated that <i>Posidonia</i> meadows covered 11,900 hectares in 1965 and 9,000 to 9,500 square kilometres in 1983–84. There is uncertainty regarding these mapping data and therefore empirical LACs have not been devel-</p>	S2

³ Short Term – measured in years; Medium Term – five to 10 year intervals; Long term – 10+ year intervals.

Number	Indicator for Critical Component / Process/Service for the LAC	Relevant timescale ³	Limit(s) of Acceptable Change	Spatial scale/temporal scale of measurements	Underpinning baseline data	Secondary critical C,P,S addressed through LAC
					oped from these data.	
	Mangrove forest extent	Long term	Based on EVC mapping, it is estimated that mangroves presently cover an area of 2137 hectares within the site (see Section 3.3.1). A 10 percent reduction in the total mapped mangrove area, observed on two sampling occasions within any decade, is an unacceptable change. (LAC – mapped area less than 1924 hectares). (Note: the small degree of allowable change recognises that mangroves are a critical habitat resource and generally shows low natural variability)	Sampling to occur at least twice within the decade under consideration.	No available data to determine changes in extent over time. It is unlikely that this has changed markedly since Ramsar listing. Note that there are uncertainties regarding the quality of existing mapping, and therefore the baseline value should be considered as indicative only.	S2
	Saltmarsh extent	Long term	Based on EVC mapping, it is estimated that intertidal saltmarsh presently covers an area of 6500 hectares within the site (see Section 3.3.1). A 10 percent reduction in the total mapped saltmarsh area, observed on two sampling occasions within any decade, is an unacceptable change (LAC – mapped area less than 5850 hectares). (Note: the small degree of allowable change recognises that saltmarsh is a critical habitat resource and generally show low natural variability)	Sampling to occur at least twice within the decade under consideration.	No available data to determine changes in extent over time. It is unlikely that this has changed markedly since Ramsar listing. The note regarding data quality for mangroves applies also to saltmarsh.	S2
	Shallow subtidal waters	Long term	A greater than 20 percent reduction in the extent of subtidal channel (areas mapped by NLWRA = 16 349 hectares), observed on two sampling occasions within any decade, will represent a change in ecological character (LAC – mapped area less than 13 079 hectares). (Note: the moderate degree of allowable change recognises that shallow subtidal waters represent a critical habitat resource, generally show low natural variability, but data reliability is low)	Sampling to occur at least twice within the decade under consideration.	NLWRA mapping data describes wetland extent. This is coarse scale mapping and should be considered as indicative only. Note: there is a need to develop a condition-based LAC for this critical component. While some water quality data exists, this is presently insufficient to derive a LAC (i.e. whether a change in water quality repre-	S2

Number	Indicator for Critical Component / Process/Service for the LAC	Relevant timescale ³	Limit(s) of Acceptable Change	Spatial scale/temporal scale of measurements	Underpinning baseline data	Secondary critical C,P,S addressed through LAC
					sents a true change in ecological character of the wetland)	
	Inlet waters (intertidal flats)	Long term	A greater than 20 percent reduction in the extent of permanent saline wetland – intertidal flats (areas mapped by DSE = 40 479 hectares, see Figure 3-1), observed on two sampling occasions within any decade, will represent a change in ecological character (LAC – mapped area less than 36 431 hectares). (Note: the moderate degree of allowable change recognises that intertidal flats represent a critical habitat resource and generally show low natural variability. A loss of intertidal flat would also result in changes in seagrass)	Sampling to occur at least twice within the decade under consideration.	VMCS mapping data describes wetland extent. This is coarse scale mapping and should be considered as indicative only. Note: there is a need to develop a condition-based LAC for this critical component. While some water quality data exists, this is presently insufficient to derive a LAC (i.e. whether a change in water quality represents a true change in ecological character of the wetland)	S2
C2	Abundance and of waterbirds	Short term (All species)	Mean annual abundance of migratory bird species - Birds Australia (2009c) notes that there is a maximum annual abundance of migratory species of 42 811 birds, with a mean annual abundance of migratory species being 31 487 birds (deriving from 28 years of data collection to September 2008). The annual abundance of migratory shorebirds will not decline by 50 per cent of the long-term annual mean value (that is, must not fall below 15 743 individuals) in three consecutive years. (Note: the large degree of allowable change recognises that these species can show high levels of natural variability, and that limitations of existing baseline data)change recognises that these species can show high levels of natural variability, and that limitations of existing baseline data)	At least four annual surveys (summer counts) within the decade under consideration.	Bird count data are available from a variety of programs, most notably Birds Australia monitoring programs	P2
		Short term (individual)	Mean annual abundance of migratory species that meet the one per cent criterion will not be less than 50 per cent of the long-term annual mean value in five years of any ten year	At least five annual surveys (summer counts) within the	Bird count data are available from a variety of programs, most notably Birds Australia	P2

Number	Indicator for Critical Component / Process/Service for the LAC	Relevant timescale ³	Limit(s) of Acceptable Change	Spatial scale/temporal scale of measurements	Underpinning baseline data	Secondary critical C,P,S addressed through LAC
		species)	period. These values are follows: <ul style="list-style-type: none"> • curlew sandpiper – baseline = 2588 birds, LAC = 1294 birds • bar tailed godwit – baseline = 9727 birds, LAC = 4863 birds • eastern curlew – baseline = 1971 birds, LAC = 985 birds • pied oystercatcher – baseline = 893 birds, LAC = 446 birds • sooty oystercatcher – baseline = 285 birds, LAC = 142 birds • double-banded plover– baseline = 523 birds, LAC = 261 birds There are insufficient baseline data to determine long-term average abundance of fairy tern and Pacific gull. (Note: the large degree of allowable change recognises that these species can show high levels of natural variability, and that limitations of existing baseline data)	decade under consideration.	monitoring programs	
Critical Processes						
P1	Waterbird breeding	Short Term	A greater than 50 per cent decrease in nest production at two or more monitoring stations (based on two sampling episodes over a five year period) within any of the following locations and species: <ul style="list-style-type: none"> • Clomel Island - fairy tern, hooded plover, Caspian tern, crested tern • Dream Island - fairy tern, hooded plover, crested tern • Snake Island and Little Snake Island - pied oystercatcher 	Recommended baseline monitoring program should comprise a minimum two annual sampling periods separated by at least one year (and within a five year period).	The use of the site by these species is well documented. However, there are no empirical data describing nest or egg production rates. Baseline data will need to be collected to assess this LAC.	C2
Critical Services/Benefits						

Number	Indicator for Critical Component / Process/Service for the LAC	Relevant timescale ³	Limit(s) of Acceptable Change	Spatial scale/temporal scale of measurements	Underpinning baseline data	Secondary critical C,P,S addressed through LAC
S1	Threatened Species	N/A	For orange-bellied parrot and growling grass frog, an unacceptable change will have occurred should the site no longer support these species.	Based on multiple targeted surveys at appropriate levels of spatial and temporal replication (at least four annual surveys in preferred habitats) over a 10 year period.	Most site records are based on opportunistic surveys	P1, C3
		Short Term	For Australian grayling, an unacceptable change will have occurred should all of the drainages that drain into Corner Inlet no longer support this species.	Based on four annual surveys in a 10 year period at multiple sites located in all major catchments.	This species has been recorded in the major drainages that drain into the site. There are no data describing the population status of this species in the site. Abundance data are available for drainages that discharge into the site (Ecowise 2007; O'Connor <i>et al.</i> 2009). O'Connor <i>et al.</i> (2009) notes that collection of this species is difficult and requires targeted survey techniques. Few targeted empirical surveys have been undertaken in the site's drainages to date	P1, C1, C2
S2	Fish abundance (using fish catch of key species as a surrogate)	Medium term	An unacceptable change will have occurred if the long term (greater than five years) median catch falls below the 20 th percentile historical baseline values in standardised abundance or catch-per unit effort of five or more commercially significant species (relative to baseline) due to altered habitat conditions within the site. The 25 th percentile pre-listing baseline commercial catch per unit effort values for the site are as follows (units are tonnes per annum per number of	Annual fish catch measured over a greater than five year period.	Commercial fish catch data. Note that there are presently no fisheries-independent baseline data (collected using empirical, systematic methods) describing patterns in the distribution and abundance of key species. Therefore, the limits of accepta-	S2

Number	Indicator for Critical Component / Process/Service for the LAC	Relevant timescale ³	Limit(s) of Acceptable Change	Spatial scale/temporal scale of measurements	Underpinning baseline data	Secondary critical C,P,S addressed through LAC
			boats): <ul style="list-style-type: none"> • Australian salmon 379 • rock flathead 316 • southern sand flathead 373 • greenback flounder 514 • southern garfish 1452 • yelloweye mullet 740 • gummy shark 167 • King George whiting 1347 		ble change should be treated with caution, noting socio-economic factors should be taken into account when assessing catch data underpinning this LAC.	

4.6.2.2 Ramsar Wetland Sites - Tasmania

The Logan Lagoon Ramsar site, on the southeast coast of Flinders Island, is outside of the EMBA, to the south west. It is low lying with the water table very close to the soil surface, and water flows into the lagoons mainly from groundwater. The site covers an area of 2,257 ha and includes dominant vegetation types such as saline aquatic herbland, saline sedgeland and rushland, succulent saline herbland, coastal grass and herbfield and coastal scrub. When full, the lagoon provides feeding and resting habitat for a number of migratory waders.

The critical components, processes benefits and limits of acceptable change for the wetland is described in Table 4-24

Table 4-24 Logan Lagoon summary of critical processes, benefits and limits of acceptable change

Critical Component/Process / Service	Baseline / supporting evidence	Limit of acceptable change
<p>Climate: Understanding the interactions between the physical conditions at the site and its subsequent use by flora and fauna is important. For example, waterbirds may use the site for breeding only in years when water levels are moderate and there is adequate area for nesting on the shores.</p>		
<p>Climate</p>	<p>The particular attributes of climate that are important in maintaining the ecological character of the site are rainfall, temperature, wind and evaporation.</p> <p>Climate predictions for north-eastern Tasmania suggest a generally warmer climate which is wetter in all seasons. Mean daily temperatures are projected to be warmer (both minimum and maximum temperatures) with increased solar radiation, relative humidity in summer, and increased evaporation (ACE CRC 2010).</p>	<p>The links between climatic conditions, the hydrological responses to such conditions, and their impact on the biological components are poorly understood and should be further investigated.</p> <p>No LAC can be determined due to a lack of understanding of the impact of climatic processes on other critical components, processes and services, such as, hydrology, geomorphology, flora and fauna.</p>
<p>Geomorphology: Protecting the geological features, including the integrity and structure of the dunes, is important for the purposes of geoconservation and maintaining the ecological character which contributes to the site's listing under Criterion 1.</p>		
<p>Holocene Shorelines and dune systems</p>	<p>There are approximately 54 hectares of shorelines, spits and dune systems that are important for maintaining the geoconservation value of the site under Criterion 1.</p> <p>The area of shorelines, spits and dunes defined in the TASVEG mapping layers require ground-truthing.</p>	<p>Currently there are 54 hectares of high quality shorelines, dune systems and spits mapped within the site. In the absence of studies detailing impacts from human disturbance, a common-sense approach has been adopted, setting a limit of acceptable change at not more than 3 hectares (2 percent) of the area of the Holocene shoreline and dune systems showing evidence of human disturbance through vehicle use or foot traffic. Because the wetland map was made without proper ground-truthing, verification of areas will be required.</p>
<p>Hydrology: The hydrological regime is a major driver in the vegetation communities at the site, particularly for wetland-dependent communities. The availability of water plays a key role in the attractiveness of the site for resting and breeding of resident and migratory fauna, especially birds.</p>		
<p>Surface water flow</p>	<p>Flow regimes are poorly understood: Historically, the lagoon mouth has been artificially breached by local landowners. Alterations to the natural hydrological regime impacts on other components such as geomorphology, water quality, vegetation and fauna.</p> <p>Surrounding farmland drains into the lagoon via a series of channels. High water levels in the lagoon have previously been blamed for inundated pasture on surrounding farms. The link between climate and hydrology is poorly understood. For example, the amount of rainfall required to maintain the natural hydrology.</p>	<p>No unnatural opening of the lagoon mouth.</p> <p>Site observations indicate that fluvial inflows are a significant input of surface water to the lagoon. Whilst this inflow is beneficial in maintaining water in the lagoon, poor water quality in inflow waters could offset this benefit. Site specific hydrology data and further water quality data is therefore required before LAC can be set that takes into account these factors.</p>

Critical Component/Process / Service	Baseline / supporting evidence	Limit of acceptable change
Tidal exchange	Historical information on lagoon mouth opening is anecdotal. Future monitoring should include the status of the lagoon entrance (open/closed) because parameters such as salinity may be highly variable when the lagoon is open to the ocean.	No unnatural opening of the lagoon mouth. The lagoon is rarely open to the ocean. However, when the hydrological regime shifts to a marine system, advice on appropriate parameters should be sought.
Water Quality: provides suitable water quality to support the persistence of wetland dependent flora and fauna. The ecological character of the site currently depends on the quality of water entering and being retained within the lagoon. Baselines need to be set before LAC can be set.		
Water quality	Only two water samples recorded from the site. <u>pH</u> : Limited data indicates pH of 7.2-7.7 in Logan Lagoon waters. Potential for acid sulphate soils to impact on pH of lagoon waters. <u>Salinity</u> : Limited data indicates salinity (as Total Dissolved Solids) ranging between 2,600-35,700 mg/L: Salinity highly variable depending on seasonal climatic and hydrological processes. <u>Dissolved Oxygen</u> : No data available. <u>Turbidity</u> : Limited data indicates range between 0.5 and 4.9 NTU: Turbidity varies with freshwater inflows, wind and tidal influences. <u>Nutrients</u> : Limited site data indicates Total P (0.09 – 0.2 mg/L and Total N (1.4-1.5 mg/L).	Cannot determine LAC due to insufficient data.
Vegetation: the hydrology, climate, water quality and soil quality of Logan Lagoon influence the vegetation that is supported at the site. The threatened wetland-dependent vegetation communities contribute to the regional biodiversity and selection of Criterion 1 and 3.		
Holocene Shorelines and dune systems	There are currently three threatened wetland-dependent plant species mapped at the site.	In the absence of accurate mapping, a common sense approach has been adopted, setting a limit of acceptable change as the persistence of the following threatened species within the Logan Lagoon boundary: Swamp fireweed (<i>Senecio psilocarpus</i>) Large-fruit seatassel (<i>Ruppia megacarpa</i>) Northern leek orchid (<i>Prasophyllum secutum</i>) These three species are cryptic and therefore seasonally specific surveying will be required to identify them. Species should be observed during two out of every three surveys.
Threatened plant communities	Poor quality information on the current distribution and abundance of threatened plant communities because maps based on TASVEG Mapping Layers have not been ground-truthed. The areas of threatened wet-	There are 14.22 hectares of threatened wetland-dependent vegetation communities at the site. Common sense would suggest no loss greater than 10 percent for each wetland type

Critical Component/Process / Service	Baseline / supporting evidence	Limit of acceptable change
	land-dependent vegetation communities are: Saline aquatic herbland = 9.23 hectares Freshwater aquatic herbland = 1.28 hectares Lacustrine herbland = 3.71 hectares.	based on TASVEG mapping layers. Because the wetland map was made without proper ground-truthing, verification of areas will be required. Based on current estimates made for this ECD, the maximum areas of threatened wetland vegetation that could be lost before causing unacceptable change to the site are: Saline aquatic herbland: 0.9 hectares Freshwater aquatic herbland: 0.5 hectares Lacustrine herbland: 4 hectares.
Fauna: Logan Lagoon supports and large number of birds, many with conservation significance locally, nationally, and internationally which justifies the selection of Ramsar criteria 3, 4 and 6.		
Number of waterbird species counted at the site annually	Annual counts of waterfowl carried out at Logan Lagoon during February 1985 - 2009, excluding 1987, 1989, 1994 and 2008. The area counted varied among years and data are not comparable, making it difficult to detect population trends.	No LAC can be determined due to insufficient data. To be defined once population trends for waterfowl are clear from systematic annual counts.
Number of shorebirds recorded in annual surveys	There has been no systematic, long term monitoring of shorebirds within the Ramsar site to enable a numerical baseline to be set, although Birds Tasmania conducted counts along the ocean coastline of the site in 2008 and 2010, and is planning future work.	No LAC can be determined due to insufficient data. To be defined once population trends for shorebirds are clear from systematic annual counts.
Threatened mammals, reptiles, amphibians	Very little systematic data. Poor information on the current distribution and abundance of threatened species.	No LAC can be determined due to insufficient data. To be defined once systematic surveys undertaken for a range of species.

4.6.3 Victorian Areas of Interest

In Victoria, the government has created a system of 13 Marine National Parks and 11 smaller Marine Sanctuaries. These parks and sanctuaries protect 5.3% of Victoria's coastal waters (DSE, 2011). Victoria's marine conservation reserves are managed by Parks Victoria under the *Parks Victoria Act 1998* and the *Victorian National Parks (Marine National Parks and Marine Sanctuaries) Act 2002*. Marine conservation reserves in Victoria are classified as:

- Marine National Park.
- Marine Sanctuary.
- Coastal Parks.

The marine conservation reserves closest to the project area are all located along the coast a significant distance away, as illustrated in Figure 4-9. Table 4-25 lists the Victorian marine conservation areas located within the EMBA, which are described below.

Table 4-25 Marine conservation areas located within the EMBA (Victoria)

Conservation category	Location	Distance from project area ¹ (km)
Marine National Park	Point Hicks	87
	Cape Howe	150
Marine Sanctuary	Beware Reef (Cape Conran)	40
Coastal Park*	Gippsland Lakes	54
Coastal Reserve*	Marlo	38
	Gabo Island	155
Special Management Area	Gabo Island Harbour	155
	Mallacoota Inlet	140
	The Skerries	112

Notes:

* The coastal parks and reserves are terrestrial conservation reserves and are not relevant to the project (except for the sandy beach sections of these reserves that are within the EMBA).

¹ Distance measured from the Longtom-3 subsea well surface location.

4.6.3.1 Point Hicks Marine National Park

Point Hicks Marine National Park is located approximately 40 km east of Cape Conran and 70 km northeast of the project area. The National Park is approximately 4,000 ha in size, with fauna including intertidal and shallow subtidal invertebrates, diverse sessile invertebrates living on subtidal reefs, kelps and sponges, and a high diversity of reef fish, such as butterfly perch, silver sweep, and banded morwongs. Point Hicks Marine National Park also contains the remains of two shipwrecks (the *SS Kerangie* and *SS Saros*), providing a drawcard for recreational divers (Parks Vic, 2012).

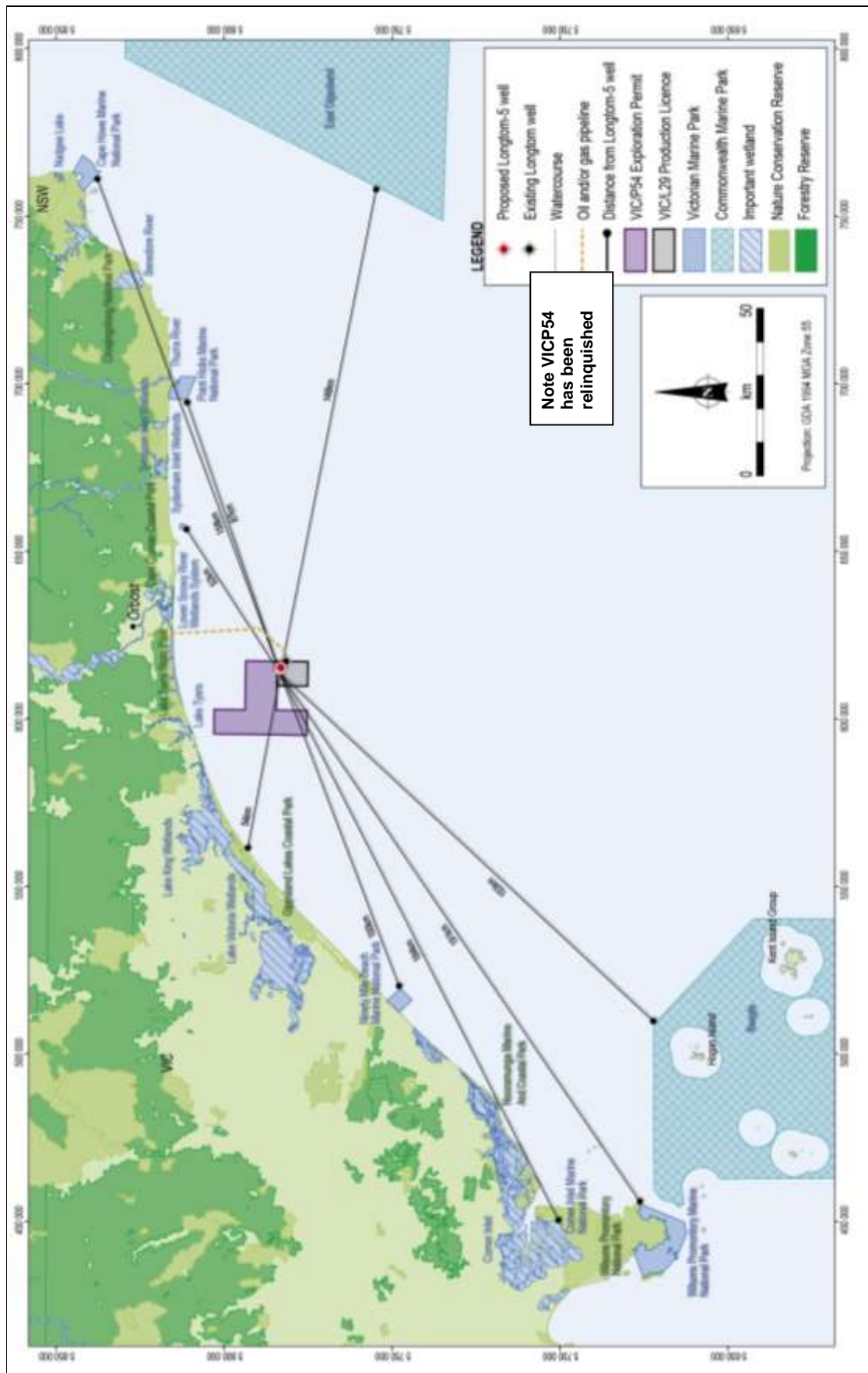


Figure 4-9 Commonwealth and Victorian marine reserves in relation to VICL29

4.6.3.2 Croajingolong Biosphere Reserve and National Park

The Croajingolong National Park is located alongside the Point Hicks Marine National Park in East Gippsland. The park covers 87,500 hectares and is a UNESCO World Biosphere Reserve. The park includes undisturbed forest foothills, a wilderness coastline and is home to more than 300 bird and animal species and over 1,000 native plant species.

Of the 52 mammal species recorded in the park, arboreal mammals such as possums, gliders and bats are common. Seals, whales and dolphins occur in coastal waters adjacent to the park.

4.6.3.3 Cape Howe Marine National Park

Cape Howe Marine National Park is located in the far east of Victoria alongside the border with New South Wales, covering 4,050 ha and established in November 2002. This park protects habitats that support a mixture of cool water southern marine species and warmer waters species more common in the north. These habitats include kelp forests, granite and sandstone reefs, sandy beaches and soft sediments. The reefs range from intertidal to sub-tidal, up to depths of approximately 50 m.

A dense canopy created of brown seaweed *Phyllospora* shelters sea squirts, coralline algae, sea tulips, sponges, seastars brittlestars and assorted crustaceans. In the deeper waters, there are dense sponge gardens composed of sponges, hydroids, gorgonian corals and sea whips, providing habitat for fish including wrasse, herring cale and sunfish. Little Penguins are known to forage at the rook on Gabo Island.

4.6.3.4 Beware Reef Marine Sanctuary

Beware Reef Marine Sanctuary, located approximately 5 km southeast of Cape Conran and 40 km northeast of the project area, comprises a granite outcrop covering an area of 220 ha and rises from a depth of approximately 28 m, and is 1 km long. It is exposed at low tide, providing a resting area for Australian fur seals. The reef is covered by outcrops of bull kelp (*Durvillaea* sp.) and supports a diverse range of marine life, including seahorses and leafy seadragons (Parks Vic, 2012). The reef is a popular location for recreational divers, with the remains of three shipwrecks adding interest to the many fish species hosted by the reef, including boarfish, morwongs, trumpeters and wrasses, with wobbegong and Port Jackson sharks also found in the sandy hollows.

4.6.3.5 Gippsland Lakes Coastal Park and Lakes National Park

The Gippsland Lakes Coastal Park is assigned the IUCN Category VI of the United Nations List. Category VI areas are predominantly unmodified natural systems managed to ensure long-term protection and maintenance of biodiversity. The park includes a unique combination of lakes, Ramsar wetlands (Refer 4.6.2.1), and marine and terrestrial environments. Gippsland Lakes Coastal Park is a narrow coastal reserve covering 17,600 ha along approximately 90km of Ninety Mile Beach from Seaspray to Lakes Entrance. It has

extensive coastal dune systems, woodlands and heathlands, as well as water bodies such as Lake Reeve and Bunga Arm.

The Lakes National Park covers 2390 ha bounded by Lake Victoria, Lake Reeve and the township of Loch Sport. The Lakes National Park contains large areas of diverse and relatively undisturbed flora and fauna communities representative of the inner barrier of the Gippsland Lakes system (ParksVic. 2019).

The parks are jointly managed by the Victorian State Government and the Gunaikurnai people under Native Title rights. The parks have multiple management zones ranging from conservation to special management, hunting and recreation (GKTOLMB. 2018).

Large parts of waters and shorelines of the Gippsland Lakes lie outside the Gippsland Lakes Coastal Park and The Lakes National Park, and are managed under various other land tenures and ownership.

4.6.4 Tasmanian and New South Wales Areas of Interest

The Tasmanian and New South Wales marine conservation areas located within the EMBA are given in Table 4-26.

Table 4-26 Marine conservation areas located within the EMBA (Tasmania and NSW)

Conservation category	Location	Distance from project area (km)
Tasmania		
Marine National Park & Reserve	Kent Group National Park and Kent Group Marine Reserve (Deal, Erith and Dover Islands). 2,374 ha of islands make up this park. They are surrounded by the Marine Reserve which covers 29,000 ha of marine habitat including shallow and deep reefs and sponge beds in deeper waters. A sanctuary zone is enforced by a Marine Protected Area. Judgement Rocks, an islet of the park, supports the largest of only five fur seal breeding sites in Tasmania. Two small islets, North East and South West islands, support large colonies of breeding seabirds including penguins, shearwater, fairy prion, Pacific gull, common diving petrel and sooty oystercatcher (Parks Tas. 2019). This park is unusually rich in fish species. Two shipwrecks exist within the park.	173
NSW		
National Park	Ben Boyd. This 10,485 ha park is located in southern NSW and spans three sections; a large southern section located south of Eden which intersects the EMBA and the central and northern sections beyond the EMBA located north of Eden and beyond the Pambula River. The park's vegetation reflects its location in the driest, windiest part of the state's coastline. Open forest and woodland cover most of the park. The park's varied habitat supports a highly diverse	175

Conservation category	Location	Distance from project area (km)
	bird population including the critically endangered hooded plover and the endangered Gould's petrel and about 50 species of mammal. Other values of the park include geological and geomorphical, aboriginal and historic heritage (DECCW. 2010).	
Nature Reserve and Wilderness Area	Nadgee. This park is located in the south eastern corner of NSW between Wonboyn Lake and the Victorian border and covers 20,671 ha. The park is adjacent to Ben Boyd National park to the north and Croajingalong National Park to the south. Dry open forest areas occur widely throughout this reserve with patches of rainforest occurring in creek catchments and low shrubby heaths being encountered at Mt Nadgee and along the coast. It contains the only declared coastal wilderness area in NSW and the most isolated beaches and undisturbed estuaries in NSW. The fresh and salt water wetlands and estuaries are important for the maintenance and populations of many fish species. The near-coastal areas are significant breeding and foraging habitat for various seabirds. Its isolation also provides value for scientific research as a control site providing a comparison against more disturbed environments (NSW NPWS. 2003).	157

4.7 Distances to Key Features

Table 4-27 summarises the distances to key features from the project area.

Table 4-27 Distances to key features in the region

Location	Distance
Environmental feature	
Nearest Victorian coastline	31 km to the north
Gippsland Lakes (entrance)	37 km to the northwest
Gippsland Lakes Coastal Park	54 km to the northwest
Point Hicks Marine National Park	87 km to the northeast
Croajingolong Biosphere Reserve and National Park	106 km to the northeast
Cape Howe Marine National Park	158 km to the east-northeast
Beware Reef Marine Sanctuary	52 km to the northeast
Ben Boyd National Park	175 km to the northeast
Nadgee Nature Reserve and Wilderness Area	157 km to the northeast
Gabo Island Harbour Special Management Area	155 km to the northeast
Mallacoota Inlet Special Management Area	140 km to the northeast
The Skerries Special Management Area	112 km to the northeast
Beagle Commonwealth Marine Reserve	153 km to the southwest
East Gippsland Commonwealth Marine Reserve	148 km to the east
Flinders Island	185 km to the south-southwest

Location	Distance
Kent Island Group (Deal, Dover & Erith islands)	173 km to the southwest
Towns	
Lakes Entrance	37 km to the northwest
Marlo	38 km to the northeast
Orbost	44 km to the northeast
Oil and gas production platforms	
Tuna	12 km to the southeast
West Tuna	13 km to the southeast
Marlin-A/-B	17 km to the south-southwest
Snapper	27 km to the southwest

Note: Distances measured from the Longtom-5 subsea well surface location.

Table 4-28 Marine conservation areas located within the EMBA (Tasmania and NSW)

Conservation category	Location	Distance from project area (km)
Tasmania		
Marine National Park	<p>Kent Group (Deal, Erith and Dover Islands).</p> <p>This park is the largest of only five fur seal breeding sites in Tasmania and covers 29,000 ha of marine habitat including shallow and deep reefs and sponge beds in deeper waters. This park is unusually rich in fish species. Two shipwrecks exist within the park.</p>	173
NSW		
National Park	<p>Ben Boyd.</p> <p>This park is located in southern NSW. The park's vegetation reflects its location in the driest, windiest part of the state's coastline. Open forest and woodland cover most of the park. The park's varied habitat supports a highly diverse bird population and about 50 species of mammal.</p>	175
Nature Reserve and Wilderness Area	<p>Nadgee.</p> <p>This park is located in the south eastern corner of NSW adjoining the Croajingolong National Park. Dry open forest areas occur widely throughout this reserve with patches of rainforest occurring in creek catchments and low shrubby heaths being encountered at Mt Nadgee and along the coast. The reserve also contains fresh and salt water wetlands. The near-coastal areas are significant breeding and foraging habitat for various seabirds.</p>	157

5 Environmental Risk Assessment Methodology

This section describes the process by which SGHE has identified and assessed impacts and risks and developed impact and risk reduction measures for preventing and mitigating these. Regulation 13 (3)(a) of the OPGGS (E) Regulations requires that an EP include the details of environmental impacts and risks for the activity.

Environmental risk assessment consists of four broad steps, as outlined in HB 203:2012 (Managing Environment-related risk) and AS/NZS 31000: 2009 (Risk management – Principals and guidelines). SGHE has used these guidelines as the basis for formulating its own risk assessment protocol (CORP-HSE-027). The key components of this protocol are summarised below.

5.1 Identifying the hazards, impacts and risks

All components of the petroleum activity were identified and described in Section 2 of this EP.

The aim of this first step is to compile a comprehensive list of risks based on the hazards (planned or unplanned) that could result in an environmental impact.

A hazard is an occurrence that can have an adverse impact on the environment and is associated with the proposed activity.

The outcome of the risk assessment process is summarised in Table 6-1, and each of the identified hazards are described in more detail in each of the summary tables in Section 6.

5.2 Analysing the risk

Risk analysis requires an assessment of the likelihood of a hazard occurring, and the consequences of that hazard on the environment. The likelihood of a hazard occurring has to be assessed considering the:

- Frequency of the event / occurrence expressed as the amount of times the event has occurred in a given time (i.e., infrequently in the industry); and / or
- Probability of a specific consequence expressed as a percentage measurement of the event happening in a given time (i.e. x% chance of occurrence).

5.2.1 Determining Likelihood

The likelihood category is determined based on the worst credible risk and is the likelihood of a specific consequence being realised. SGHE determines the likelihood with consideration of the existing controls and effectiveness of those controls that are in place, the nature of materials or substances that contribute to the impact and the frequency with which the activity or event may occur and the probability that the specific consequence eventuates.

Table 5-1 outlines the qualitative measures used to determine the likelihood of an impact occurring.

Table 5-1 Qualitative measures for determining likelihood of impact

Level	Description	Description	Guide Range
A	Almost Certain	The event is expected to occur once a year	Every year
B	Likely	The event will probably occur between once a year and once in ten years. Will happen at least once during the life of the facility.	Every 3 years
C	Moderate	The event will probably occur between once in ten years and once in a hundred years. Unlikely but may happen during the life of the facility.	Every 30 years
D	Unlikely	The event will probably occur between once a century and once every thousand years. Very unlikely to occur during the life of the facility. Scenario occurs occasionally world wide	Every 300 years
E	Rare	The event will probably occur less frequently than every thousand years. Virtually impossible. Remote occurrence worldwide.	Every 3,000 years

Note: Facility life is considered to be 20 years.

5.2.2 Determining Consequence

The consequence category is also determined based on the worst credible risk. For example the quantities, concentration and toxicity of the release, time scale of release and the sensitivity of the receiving environment all need to be considered. Consequence is the outcome of an event and it is important to note that there may be a range of outcomes.

The consequence category is expressed as a measure of the:

- Size of the impact and the timeframe for recovery (e.g., localised, rapid recovery within days to months); or
- Length of the impact and timeframe for recovery (e.g., long term impact, recovery measured in decades).

These parameters determine the consequence that the event poses and enable a qualitative measure from 'insignificant' to 'catastrophic' as shown in Table 5-3 to be selected.

5.2.3 Determining Risk Level

Risk evaluation helps to prioritise the risks (i.e. determine if the risk of an event or incident is acceptably low), or if management actions are required to further reduce the risk to as low as reasonably practicable (ALARP).

The SGHE risk matrix (Table 5-2) has been used to analyse the impacts arising from the project activities. The environmental risk ranking is determined by a combination of the expected frequency (or likelihood, as given in Table 5-1) of the impact (or consequence, as given in Table 5-3) leading to the worst case credible risk from the risk matrix provided in Table 5-2.

Management actions to treat the impacts and risks are incorporated into the individual risk assessments (Chapter 6). SGHE management actions aim to reduce the environmental impacts and risks of all its activities to ALARP and to an acceptable level.

Table 5-2 Qualitative risk analysis matrix – level of risk

		Consequence				
		1 Insignificant	2 Minor	3 Moderate	4 Major	5 Catastrophic
Likelihood	A: Almost certain	S	H	H	H	H
	B: Likely	M	S	H	H	H
	C: Moderate	L	M	S	H	H
	D: Unlikely	L	L	M	S	H
	E: Rare	L	L	L	M	S

For credible hazards SGHE has also determined the consequence and likelihood with no project specific controls in place to provide an inherent understanding of the issues. This allows the importance of the controls to be better understood and ensures that the ALARP effort is appropriate to the nature and scale of the impact.

Table 5-3 Qualitative measures for determining consequence

Consequence level/descriptor				
1 – Insignificant	2 – Minor	3 - Moderate	4 – Major	5 - Catastrophic
Environmental Effects				
No lasting effect. Low-level impacts on biological or physical environment. Limited damage to minimal area of low significance.	Minor effects on biological or physical environment. Minor short-medium term damage to small area of limited significance.	Moderate effects on biological or physical environment but not affecting ecosystem function. Moderate short-medium term widespread impacts (e.g. oil spill causing impacts on shoreline).	Serious environmental effects with some impairment of ecosystem function (e.g. displacement of a species). Relatively widespread medium-long term impacts.	Very serious environmental effects with impairment of ecosystem function. Long term, widespread effects on significant environment (e.g. unique habitat, National Park). Large clean-up costs.
Social / Cultural Heritage				
Low-level social or cultural impacts. Low-level repairable damage to commonplace structures.	Minor medium-term social impacts on local population. Minor damage to structures/ items of some significance. Minor infringement of cultural heritage. Mostly repairable.	Ongoing social issues. Permanent damage to structures/ items of cultural significance, or significant infringement of cultural heritage/ sacred locations.	On-going serious social issues. Significant damage to structures/ items of cultural significance, or significant infringement and disregard of cultural heritage.	Very serious widespread social impacts. Irreparable damage to highly valued structures/items/ locations of cultural significance. Highly offensive infringements of cultural heritage.
Public concern restricted to local complaints. Ongoing scrutiny/ attention from regulator.	Minor, adverse local public or media attention and complaints. Significant hardship from regulator. Reputation is adversely affected with a small number of site-focused people.	Attention from media and/or heightened concern by local community. Criticism by NGOs. Significant difficulties in gaining approvals. Environment credentials affected.	Significant adverse national media/ public/ NGO attention. May lose licence to operate or not gain approval. Environment/ management credentials are significantly tarnished.	Serious public or media outcry (international coverage). Damaging NGO campaign. Licence to operate threatened. Reputation severely tarnished. Share price may be affected.

5.3 HAZID Workshops

A series of hazard and risk identification workshops (HAZID) have been conducted over the life of the project. Environmental hazards relating to the scope of this EP are formally reviewed, re-assessed and re-ranked annually. The HAZID involving SGHE personnel and appropriate contractors is facilitated by the SGHE HSEC Manager. All current and planned Longtom operations and the associated hazards and risks have also been reviewed and re-assessed during the preparation of this EP 5-yearly revision.

Prior to the tie-in of Longtom-5, a further workshop will be held involving SGHE personnel and key contractors to again review the hazards identified in the preparation of this revision, to confirm the controls in place and to identify any additional risk reduction measures to ensure the risks are managed to ALARP and an acceptable level.

5.4 Demonstrating ALARP

In general, risk management and acceptance should be based around the ALARP Principle (Figure 5-1). The ALARP Principle is that at some point in the risk reduction process the cost involved in reducing the risk further will be grossly disproportionate to the benefit gained. The ALARP Principle makes note of the fact that infinite time, effort and money could be spent attempting to reduce an risk to zero and that this is not practical or appropriate.

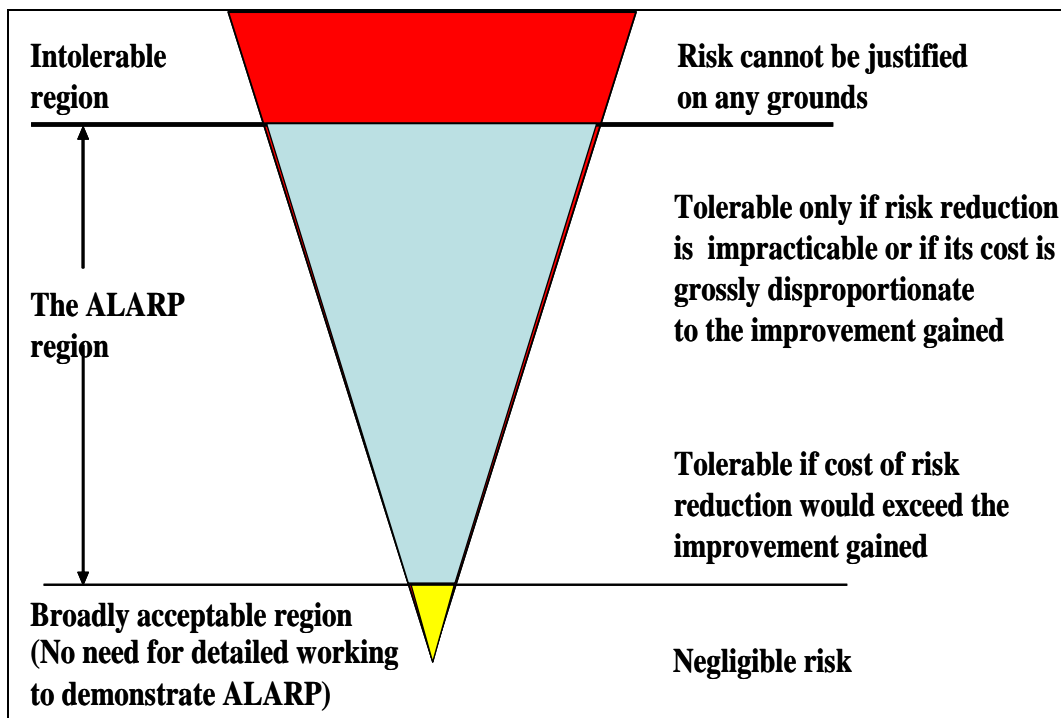


Figure 5-1 The ALARP Principle triangle

As part of the ALARP and acceptability assessment SGHE has examined the controls for effectiveness. Individual controls have been qualitatively assigned effectiveness's of Very High, High or Moderate. During the HAZID workshop and the review of ALARP the controls are also reviewed to ensure that the overall effectiveness is sufficient, that there are sufficient layers of protection and independence of the controls. Finally, as part of the ALARP assessment hazards are reviewed for potential additional risk reduction measures

Hazards that are deemed to be:

- Low risk - requires no special risk reduction effort but the principles of ALARP and continuous improvement still apply, such that obvious improvement opportunities should be taken where they are applicable and practicable. This level of risk equates to 'negligible' in the ALARP triangle. It is an expectation that effective planning and management system tools are used to manage tasks and operations at all levels of risk.
- Moderate or significant risk - requires additional preventative measures where possible and where the cost of the control does not disproportionately outweigh the benefit. This level of risk equates to 'tolerable' in the ALARP triangle. All reasonably practicable measures must be taken to reduce the risk.
- High risk - requires additional preventative measures to reduce the risk to an acceptable level (i.e., tolerable or negligible in the ALARP triangle). This level of risk is not considered justifiable under normal conditions. Additional preventative measures must be identified to reduce the risk to ALARP or lower.

The descriptions for the categories of risk presented in the ALARP triangle and the associated management requirements are also listed in Table 5-4.

Table 5-4 Definition of risk

ALARP Definition	Risk Level	Risk Definition
Broadly acceptable - no requirement for detailed working to demonstrate ALARP	Low	Generally acceptable – manage by routine procedures.
Tolerable risk - only if further risk reduction is impracticable or its cost is grossly disproportionate to improvement gained	Moderate	ALARP – management responsibility must be specified. Reduce risk where possible, monitor and review.
	Significant	ALARP – senior management attention and sign off needed, reduce risk as a priority, closely monitor and review.
Unacceptable risk	High	Unacceptable – detailed research and management planning required to reduce the level of risk.

Table 5-5 presents the ALARP ‘Hierarchy of Control’, which is the preferred order of control methods. This hierarchy is applied when considering additional safeguards/controls or improving existing safeguards/controls to ensure an risk is ALARP (i.e., applied to any residual risk that is not at Risk Level 1). Elimination is the first control method to be considered, with protective control methods considered last.

Table 5-5 ALARP hierarchy of control

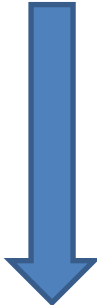
Control	Effectiveness	Example
Eliminate		Refueling of helicopters only carried out from onshore eliminates the risks of an aviation spill from offshore.
Substitute		The use of low-toxicity hydraulic fluids that perform the same task as a higher-toxicity additive.
Engineering		Designing the pipeline and subsea equipment to withstand impacts of trawl gear.
Isolation		Soundproofing of plant, erection of physical barriers, etc.
Administrative		The use of JHAs to assess and minimise the environmental risks of an activity.
Protective		The provision and use of personnel protective equipment (PPE).

Table 5.5 has been used to help demonstrate the ALARP Principle for each of the environmental hazards resulting from the petroleum activities, which are assessed in Section 6.

The level of effort involved with demonstrating and assessing whether the hazard is at ALARP has been commensurate with the level of risk, the inherent consequences of the hazard and a comparison with the impacts and actions from other marine users in the area. For example, low risk–low inherent consequence hazards that are also created by other marine users (such as commercial fishing and merchant vessel activities) and that are accepted by the community

have been subject to a lower level of assessment effort than a high risk–high consequence hazard from a non-routine marine activity.

In general, the ALARP process has been based on assessing the hazard, confirming the effectiveness of the controls and determining if there is anything additional that could be done to control the hazard. In identifying additional controls, the ‘Hierarchy of Control’ principle has been used.

Figure 5-2 summarises the risk assessment process.

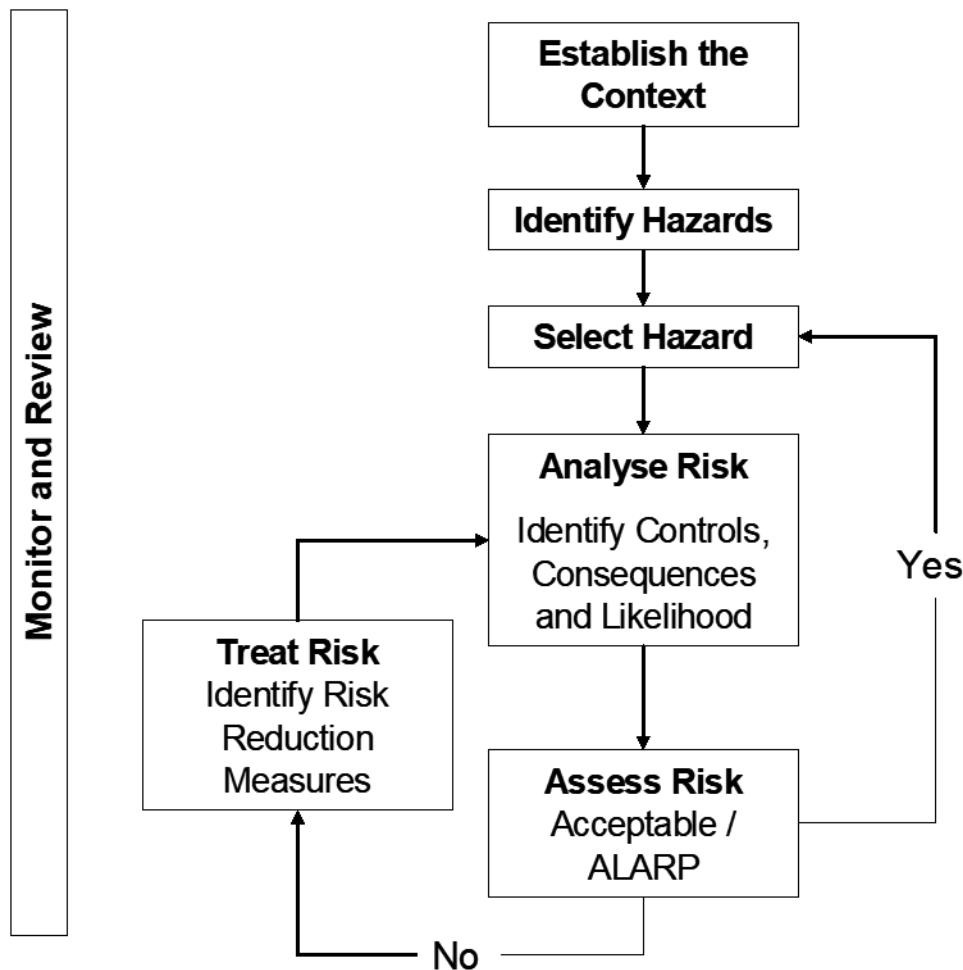


Figure 5-2 The risk assessment process

For a number of hazards, such as hydrocarbon release, the pipeline or vessel safety case will also be applicable to the demonstration of ALARP as these are generally considered Major Accidental Events. The project’s safety case addresses these hazards and demonstrates that the safety risks have been managed to ALARP for NOPSEMA acceptance. As the potential safety consequences of these events are likely to exceed the environmental consequences, (note multiple fatalities on the SGHE risk matrix are classed as a catastrophic consequence) the measures implemented and described in the safety case to manage the risk to ALARP will also help manage the environmental risks to ALARP. The safety case and compliance with the

safety case is one of the key controls in preventing some of the more significant hazards associated with Longtom operations. The safety case addresses the adequacy of the design, the operating procedures and systems and the training and competency of site personnel at Patricia Baleen.

Risk reduction measures (RRMs) identified during the risk assessment process generally have the following questions asked of them to determine if they are practicable and should be implemented:

1. Will they reduce the level of risk
2. Will they not introduce additional risks
3. Are they supported by industry codes, standards and practices
4. Will they be supported by personnel
5. Will they be cost effective.

If the answer is yes to all then the RRM should be implemented. Conversely if the answer is no to most of them then it should be rejected. Ones that are unclear may require additional assessment and review and should be kept for further consideration.

5.5 Demonstrating Acceptability

The risk assessment process must also demonstrate that that all identified environmental impacts and risks of the project are of an 'acceptable level'. This is done by comparing the impact and risks with defined acceptable levels. SGHE has defined what they consider to be broadly acceptable risks (low risk), tolerable risks (moderate and significant risk) and unacceptable risks (high risk) in Table 5-4.

SGHE assesses acceptability based on, but not limited to, the following factors:

- ALARP has been demonstrated.
- Consideration of the level of risk and the SGHE risk matrix (Table 5-2 and Table 5-4) i.e. Is the level of risk High? (If so, it is considered unacceptable)
- Consideration of the potential extent of the impact on the environment.
- Consideration of Legislative and other Requirements i.e. activities are compliant with Australian legislation and 'other requirements' including relevant EPBC Act listed species recovery plans or approved conservation advices.
- Consideration of SGHE policy, standards and procedures i.e. impacts and risks are consistent with SGHE systems and relevant internal requirements.
- Comparison with other oil and gas industry standards, best practices, environment plans and developments.
- Comparison with other activities/industries that are currently taking place in the area / or similar areas and which are accepted by the community (i.e. the fishing and shipping industries).

- Results from community consultation.

5.6 Monitor and Review

The final part of the risk assessment process is to monitor and review the performance of the controls, to ensure that the assessment is valid and that the controls have reduced the risk to ALARP and are of an acceptable level and continue to be so.

To this end, SGHE has defined and developed environmental performance standards for each of the identified credible hazards and their control measures. Environmental performance standards have been set at a level to ensure control measures perform at the level relied upon to demonstrate the related impact or risk is reduced to ALARP and at an acceptable level.

Similarly to the ALARP demonstration, a greater focus has been on the development of effective performance standards for the high risk/high consequence activities than for the low risk/low consequence activities. In all cases, the performance standards have been selected/reviewed for usefulness and have also been assessed against the SMART (Specific, Measureable, Achievable, Relevant, Time-based) principal. The environmental performance objectives, standards and measurement criteria for the project are detailed in Section 7.

5.7 Communicate and Consult

As described in Section 0 communication and consultation with external stakeholders is ongoing and will continue to be maintained for future activities. A copy of the key impacts / risks and controls was distributed to identified relevant stakeholders in February 2014 and in July 2019, details of the consultation is provided in the consultation log.

Consultation will be undertaken in accordance with the consultation log and the project's Implementation Strategy (Section 8).

6 Environmental Risk Assessment

This chapter outlines the environmental risk assessment (ERA) for the activities, using the methodology described in Chapter 5 and in accordance with Regulations 13 (3) and 13 (3A) of the OPGGS (E) Regulations.

The prevention and mitigation measures, as well as the ALARP and acceptability justifications for each hazard, have been developed using the combined experience of SGHE staff and environmental advisors to SGHE.

The hazards in Table 6-1 have been identified and assessed for impacts and risks.

Table 6-1 Summary of Longtom hazards inherent and residual risk rankings

Hazard		Inherent Risk	Residual Risk
Routine Activities			
1	Discharge of hydraulic fluid	Low	Low
2	Physical presence of offshore facilities – impact on marine fauna and seabed	Low	Low
3	Physical presence of offshore facilities – impact on other users	Low	Low
Non-routine Activities			
4	Loss of containment of hydrocarbons – subsea equipment damage	Moderate	Low
5	Loss of containment of hydraulic fluid, MEG and methanol – subsea equipment damage	Low	Low
Impacts from Inspection, Maintenance and Repair			
6	Vessel collisions with marine fauna	Low	Low
7	Noise emissions	Low	Low
8	Light emissions	Low	Low
9	Atmospheric emissions	Low	Low
10	Discharge of sewage and grey water	Low	Low
11	Discharge of putrescible waste	Low	Low
12	Discharge of contaminated deck/bilge water	Low	Low
13	Discharge of non-hazardous waste	Low	Low
14	Discharge of hazardous waste	Low	Low
15 & 16	Discharge of cooling and brine water	Low	Low
17	Introduction of invasive marine species	Moderate	Low
18	Vessel diesel spill	Moderate	Low
19	ROV discharges	Low	Low

SGHE has provided an inherent risk ranking for each of the hazards to comply with NOPSEMA’s guidance to present the risk pre-treatment. SGHE has considered the ‘inherent

risk' to mean the risk from the activity if the project specific controls were not in place. Removing all controls in the assessment of inherent risk is not considered practical or appropriate, for example, to avoid a vessel diesel spill, vessels must comply with marine legislation and have controls in place, as described in Section 6.3.13.2, if they are to operate. For this reason, SGHE has assessed the inherent risk of each hazard with the inherent controls or considerations in mind (see 'basis of inherent risk assessment' section in each of the risk assessment tables).

SGHE has used the boundary of the EMBA (see Figure 4.1) for the purposes of assessing the environmental impacts of the project.

6.1 Routine Activities

This section describes the project's impacts and risks from routine activities, including:

- Discharge of hydraulic fluid.
- Physical presence of offshore facilities - impact on marine fauna and seabed.
- Physical presence of offshore facilities - impact on other users.

6.1.1 Discharge of hydraulic fluid

6.1.1.1 Hazard

Hydraulic fluid is used to control subsea valves. The original selected hydraulic fluid was MacDermid Oceanic HW525. Oceanic HW525 is a water-based fluid, with 25% MEG and additional additives to provide a higher degree of protection against wear, corrosion and microbiological degradation and is the most commonly used hydraulic fluid in Bass Strait. The product was considered to be D ranked on the UK Offshore Chemical Notification Scheme (OCNS) ranking. Due to the biodegradability of the lubricant, a molybdenum-based chemical, the OCNS ranking was to an "A". In early 2015 the decision was made to replace HW525 with Transaqua HT2. HT2 is a D rated hydraulic fluid with no substitution warnings and is compatible with the Longtom facilities and HW525. The umbilical contains a significant quantity of liquid and based on normal operations the complete replacement of HW525 with HT2 will take some time. Options to expedite the change-out were assessed however no practicable method was identified, the risk of the umbilical containing HW525 and operations continuing to use HW525 until flushed with HT2 was assessed to be ALARP. During the current nonoperational phase there is no practical ability to flush the HW525 out with HT2. To flush the HW525 would require electrical continuity from the gas plant, agreement with the gas plant operator to operate the hydraulic pumps, agreement with the Patricia Baleen pipeline operator to use their umbilical and an offshore vessel campaign. Given there is no current discharge of HW525, it has been rejected as a practical option.

During operations, a small amount (between 1 and 7 litres) of hydraulic fluid is discharged from the wellhead or HIPPS each time a valve or choke is activated remotely via the umbilical control as described above. This is normal for subsea gas production facilities throughout the world. It is estimated that the monthly discharge is up to approximately 200 litres per month,

depending on the frequency of valve operations. When no valves are actuated, there is no hydraulic fluid discharged in this manner. In addition to the operational discharge of hydraulic fluid described above, some small amount of seepage across valves also takes place in these systems. This seepage rate is generally low and spread out across the subsea facilities. Cameron (now OneSubsea) are the designers and fabricators of the Longtom SCMs, of which there are 5, and undertake leak tests on their components as part of their QA checks. The specification for these SCMs allows for a leakage of up to 1.2 litres per day per SCM prior to offshore deployment.

A leak of hydraulic fluid to the marine environment was detected from the subsea facilities in 2009. A full description of the cause of the leak and remedial actions was provided in Incident Investigation Report (Document Number: LONG-HSE-051) to the then DPI now the DJPR.

A series of onshore tests were carried out in late June 2010 to try and identify the location of the leak. Tests indicated that the leakage was in one of the Subsea Control Modules (SCM). There are three SCMs, one at the HIPPS, one at the Longtom-3 well and another at the Longtom-4 well. Subsequent offshore investigations in 2012 confirmed the location and nature of the leak as being a leaking solenoid valve in the Longtom-4 SCM. Whilst the solenoid valve hasn't been replaced, software changes have significantly reduced or stopped this specific leak, during normal operations typically less than 200 litres of hydraulic fluid per month appears to be leaking and some to all of this may be the general seepage across all the various solenoid valves and the SCMs. The consumption of hydraulic fluid is monitored and recorded monthly to confirm the nature of the leak.

With the Longtom facilities currently shutdown there is no discharge of hydraulic fluid.

6.1.1.2 Description of OCNS, CHARM and the SGHE Chemical Selection Process

All products which are used in the North Sea offshore oil industry have to be evaluated under the requirements of international legislation established by the Oslo Paris (OSPAR) Convention in order to monitor their environmental impact. The OSPAR Convention has enabled the set-up of some of the most stringent chemical control legislation in the world. Under the Convention, a list of 'environmentally acceptable' substances has been published and are known as the 'PLONOR' list (OSPAR List of Substances/Preparations Used and Discharged Offshore which Are Considered to Pose Little or No Risk to the Environment (PLONOR) (Reference number: 2004-10)).

Under the Convention, organic based compounds are subject to the Chemical Hazard Assessment and Risk Management model known as CHARM. The CHARM model calculates the ratio of the Predicted Effect Concentration against the No Effect Concentration and is expressed as a Hazard Quotient (HQ), which is then used to rank the product. The HQ is converted to a colour banding (see Table 6-2), which is then published on the Definitive Ranked Lists of Approved Products (by the UK Offshore Chemical Notification Scheme - OCNS). The CHARM model requires the biodegradation, bioaccumulation and toxicity of the product to be calculated. Testing the effect of the product on three different species of aquatic organism is carried out including algae, crustaceans and fish.

Table 6-2 The OCNS HQ and Colour Bands

Minimum HQ Value	Maximum HQ Value	Colour Banding	Hazard
>0	<1	Gold	Lowest Hazard
>1	<30	Silver	
>30	<100	White	
>100	<300	Blue	
>300	<1000	Orange	
>1000		Purple	

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, with A being the greatest potential environmental hazard and E being the least (see Table 6.3). Products that only contain substances termed PLONORs (Pose Little or No Risk) are given the OCNS E grouping. Data used for the assessment includes toxicity, biodegradation and bioaccumulation.

SGHE selects new chemicals only after undertaking a thorough chemical selection process that includes a risk assessment process (CORP-HSE-0093) that considers the requirements of the OSPAR Convention (as described above) and the review of various alternatives.

Chemicals should be “D or E” or “Gold or Silver” rated and their potential impact and risk must be described and assessed. The risk assessment must be signed off by the SGHE HSEC Manager before use.

New chemicals will be added to an approved list of chemicals and this will be audited.

Table 6-3 The OCNS Environmental Ranking System for Inorganic Substances

OCNS Grouping	Result for Aquatic Toxicity (mg/l)	Result for Sediment Toxicity(mg/l)
A	<1	<10
B	>1 – 10	>10 – 100
C	>10 – 100	>100 – 1,000
D	>100 – 1,000	>1,000 – 10,000
E	>1,000	>10,000

6.1.1.3 Description of Environmental Impacts

In the original development of the Longtom Environment Plan HW 525 was taken to be a “D” rated chemical. The impacts from valve operations and from the ongoing leak were considered to be insignificant and that they posed little immediate or long term risk of impact to the marine environment. This was based on HW525 being “D” rated, of low toxicity, not bioaccumulating and that it would disperse rapidly.

Since this analysis was done the OCNS ranking of HW525 has changed to an “A” based on the toxicity of the molybdenum-based chemical used as the lubricant. The exact chemical is

the proprietary information of Macdermid but is likely to be molybdenum disulfide or similar and it constitutes less than 0.25% of the hydraulic fluid. The Molybdenum lubricant has an aquatic toxicity of 0.85 mg/l (EC50 72h Skeletonema). The chemical will not bioaccumulate and its primary degradation begins within days-weeks and it is ultimately biodegradable within months.

The largest release of hydraulic fluid occurs when a HIPPS valve is closed and this is approximately 7 litres in approximately 30 seconds. While the leak has an ongoing discharge rate of 0.3 litres per hour, based on a monthly discharge of 200 litres, note that this value includes the general seepage across the 5 SCMs.

ROV footage of the main Longtom-4 leak, prior to the logic change, showed the dyed fluid rapidly mixing and dispersing with the current and eddies generated around the subsea structures. Subsea currents of up to 1 knot or 0.5m/s can be experienced at the Longtom location but they are generally diurnal with a median bottom current of around 0.15m/s.

Dispersion modelling for the largest release rate from the HIPPS indicates that within 200 meters the concentration will be below the toxicity value given above for the lubricant and that the plume width is only a few meters. Whilst some impact might be experienced within the immediate vicinity of the leak, the chemical will be rapidly diluted and due to the nature of the release (intermittent and typically less than once a month for HIPPS valves) marine organisms will not be continuously exposed to any significant level. Note the aquatic toxicity of 0.85mg/l is based on 72 hours of exposure while the HIPPS release is only about 30 seconds. Based on the modelling for the HIPPS discharge the ongoing leak can also be considered to be rapidly dispersed to below levels that would pose any significant risk. Note that this dispersion modelling is relatively conservative as it has also not taken into account the turbulence generated around the subsea equipment, evident from the ROV footage and hence a greater level of dispersion is likely to occur.

6.1.1.4 Risk Assessment

Table 6-4 outlines the risk assessment for the discharge of hydraulic fluid.

Table 6-4 Discharge of hydraulic fluid risk assessment

Hazard duration	Valve releases and seepage will occur throughout the operation of the Longtom facilities as will the minor leak.
Extent of hazard	Limited to the immediate area around the release point.
Basis of Inherent Risk Assessment	
<ul style="list-style-type: none"> Hydraulic fluid is the only chemical that is routinely discharged to the marine environment. All other chemicals are contained within the subsea facilities. The monthly volume of hydraulic fluid discharged through valve operations is small (typically between 0 and 200 litres). The volume of hydraulic fluid lost via general seepage and the leak is also small (typically less than 200 litres) The hydraulic fluid does not bioaccumulate and will disperse rapidly to below significant levels. There are no known sensitive environments in the project area. 	
Inherent risk analysis and ranking	

Consequence	Likelihood	Inherent Risk
Insignificant (1)	Likely (B)	Low
Project specific environmental controls and checks that will take place	<p><u>Prevention</u></p> <ul style="list-style-type: none"> • Longtom Pipeline Safety Case including: <ul style="list-style-type: none"> - Equipment design and validation (both in terms of ensuring the design is appropriate and that releases are minimised) – effectiveness considered Very High - Process controls, alarms and trips – effectiveness considered Moderate. - Training and competency of personnel to operate and maintain the facilities appropriately, including 24 hour continuous monitoring of production parameters – effectiveness considered moderate. - Procedures for operating and maintenance activities– effectiveness considered moderate. • The original hydraulic fluid - HW525 does not bioaccumulate - effectiveness considered moderate. • HW525 will be progressively replaced with Transaqua HT2. <p><u>Mitigation</u></p> <ul style="list-style-type: none"> • Not applicable. 	
Residual risk analysis and ranking		
Consequence	Likelihood	Residual Risk
Insignificant (1)	Moderate (C)	Low
Demonstration of ALARP		
<p>The key preventative controls are the design of the facilities and the low toxicity of the selected chemical the effectiveness of both these controls are considered at least high in preventing environmental impact. In the event of failure there are additional controls such as the process control system, alarms and trip and the presence of operators who would identify the problem and take action to prevent or minimise the loss of containment, their combined effectiveness is also considered high. The controls are considered sufficient, suitably robust, independent and effective to ensure the residual risk is Low and ALARP.</p> <p>The following ALARP analysis also confirms that all reasonable risk treatment options have been / or are being considered to reduce the environmental impact of hydraulic fluid discharges. The risk is currently deemed to be ALARP, while further risk reduction measures are further assessed options. A 'Low' residual risk ranking is broadly acceptable according to the SGHE definition of risk.</p>		
Eliminate	<p>Hydraulic fluid cannot be eliminated. It is required to operate the subsea valves at the wellheads. The valves need to be regularly tested to ensure they remain operational, meet critical function testing requirements and to alter Longtom production. Minor leakage across all the solenoid valves and SCMs also occurs due to their design and specification. Cameron (now OneSubsea) is the manufacturer of the SCMs, and have an allowable leak of around 1 litre per SCM per day. This cannot be eliminated.</p> <p>The leak at LT4 has been largely eliminated by a software change and during the current shutdown phase there is no release.</p> <p>Undertaking an offshore campaign to specifically replace the solenoid valve has been examined as a risk reduction measure (RRM), Whilst this could stop the leak it wouldn't stop the general leakage and it has been rejected as the sole reason for an offshore campaign. The risk from the leaking hydraulic fluid is very low. Undertaking a campaign will in itself introduce additional risks that are considered to outweigh the benefit, these risks include all the</p>	

	<p>environmental risks associated with vessel operations, safety risks associated with the campaign potentially including diver related issues and the operations also pose a risk of damaging the existing facilities leading to a commercial risk of loss of production. Replacing subsea equipment due to a leak of this nature is not considered normal industry practise and is unlikely to be supported. The cost of bringing in an offshore support vessel to carry out the works is likely to be at least several million dollars and as such the RRM is not considered cost effective. If a dive campaign is required for Longtom-5 or a dive support vessel is in Bass Strait for another job then opportunities to replace the solenoid will be examined.</p> <p>Shutting down the leaking equipment was also considered and whilst it may reduce the hydraulic fluid leak it was rejected as not being practical. The leaking solenoid valve cannot be individually isolated from onshore; the only means would be to shut in the entire Longtom and Patricia Baleen fields until an offshore campaign could be organised. As has already discussed this itself has been rejected as not being practical. Shutting the Longtom field in would have a very significant impact on SGHE financially and would pose a High risk. Additionally, if hydraulic pressure was not maintained sea water ingress through the leak could occur resulting it significant subsea equipment damage. A shut in for this type of leak is not standard industry practice and would not be supported by SGHE personnel or the operators of the Patricia Baleen gas plant. It is not considered a cost effective option.</p>
Substitute	<p>Whilst the selected hydraulic fluid (HW525) was a category 'D' OCNS chemical with low environmental impact, it was revised to an 'A' rated chemical due to the biodegradability of the molybdenum based lubricant in 2014.</p> <p>SGHE have assessed alternatives and the plan is to progressively replace HW525 with Transaqua HT2, which is a D rated chemical, when production is restarted. During the current nonoperational phase there is no practical ability to flush the HW525 out with HT2. To flush the HW525 would require electrical continuity from the gas plant, agreement with the gas plant operator to operate the hydraulic pumps, agreement with the Patricia Baleen pipeline operator to use their umbilical and an offshore vessel campaign. Given there is no current discharge of HW525, it has been rejected as a practical option.</p>
Engineering	<p>The subsea valves and control system have been installed and there is no practical way to re-engineer the system. The design is standard and was based on the existing Patricia Baleen umbilical – there was no opportunity to install a closed hydraulic system.</p>
Isolation	<p>The onshore inventory can be isolated from the umbilical and the pumps stop on low discharge pressure. During major outages the pumps are also stopped to reduce/prevent the leak.</p>
Administrative	<p>The volumes of hydraulic fluid discharged are monitored, recorded and compared with that predicted monthly.</p>
Protective	<p>Not applicable.</p>
Demonstration of Acceptability	
<p>Discharged hydraulic fluid will rapidly mix and disperse in the marine environment to levels that are not expected to have any impact on the marine environment. The selected hydraulic fluid (HW525) was a category 'D' OCNS chemical, which was considered to have a low environmental impact. While the ranking has changed to an 'A', due to the biodegradability of the lubricant the impact on the environment is still considered low.</p> <p>The ocean currents and depth of operations (approximately 57 m) will cause all fluid to be dispersed quickly through the water column in the high energy environment of Bass Strait.</p>	

<p>Hydraulic fluid is commonly discharged by the oil and gas industry and subsea systems are generally designed as open systems. HW525 is still used by many other operators.</p> <p>All legislative and other requirements have been met and the activity is consistent with SGHE policy and meets relevant management standards and procedures.</p> <p>There have been no concerns raised regarding the discharge of hydraulic fluid during stakeholder consultation and the previous EP was accepted by the DSDBI.</p> <p>The leak at LT4 has been virtually eliminated by the software change and is probably significantly less than the general leakage across all the solenoid valves and SCMs that occurs.</p> <p>This risk is considered currently acceptable given the small volumes discharged, the insignificant consequence that could eventuate and that this fluid is used by other oil and gas operators.</p> <p>As has already been discussed HW525 will be progressively replaced with Transaqua HT2.</p>
<p>Monitoring</p>
<p>Currently there is no discharge and no monitoring. During operations the total volume of hydraulic fluid consumed and discharged is recorded every month.</p>

6.1.2 Physical presence of offshore facilities - impact on marine fauna and seabed

The physical presence of the operational offshore facilities is expected to have a minimal impact on the marine environment. However there are a number of actions / issues that have the potential to result in some impact or change to the marine fauna, these include:

- Erosion/sediment build up around existing infrastructure.
- Placement of subsea infrastructure.
- Maintenance activities (e.g. placement of materials/equipment on the seabed, minor excavation, lifting of umbilical and installation of sand bags / grout bags / concrete mattresses).

6.1.2.1 Description of Environmental Impacts

The known and potential environmental impacts relating to the presence of the offshore facilities are:

- Seabed infrastructure will act as an artificial habitat for benthic fauna colonization.
- Localised turbidity of the near-seabed water column, resulting in temporary disturbance to benthic habitats and fauna.
- Permanent displacement of a small area of seabed habitat caused during the:
 - Placement of the Longtom subsea facilities.
 - Placement of small structures and sand bags to stabilise equipment.
- The petroleum safety zone around the Longtom-3 and Longtom-4 wells will act as a marine reserve and protect the environment as commercial fishing is excluded.

Benthic fauna colonisation

The project's operational infrastructure provides an artificial environment for marine organisms, resulting in an increase in the abundance of benthic fauna. This increase in species diversity and abundance is considered a **positive** impact, given that there are no known sensitive seabed habitats or features in the project area. The wellheads and main structures are all

contained within a petroleum safety exclusion zone (gazetted around Longtom-3 and Longtom-4), which also means that they are protected from commercial fishing (i.e. the area will provide a haven for marine species that are susceptible to impacts from commercial fishing).

Localised turbidity resulting in temporary disturbance to benthic habitats

The project’s operational infrastructure, which sits above the sea floor, has the potential to cause localised alterations to the hydrodynamic regime directly around the infrastructure (i.e. localised erosion and the build-up of sediment). This impact is not considered significant and from ROV surveys the area appears to stable and to have been recolonised.

Additionally, minor leakage of grout (cement and water) may occur during the filling of grout bags and when the hose is flushed with seawater. While the release of grout may create localised turbidity of the water column, the volume to be released is expected to be very low and the cement is designed to set in the marine environment (i.e. minimal dispersion). Cement chemicals are also of low toxicity and chemically inert. Given the localised extent of effects, the small volumes expected to be released and the non-toxic nature of the grout, the consequence is considered insignificant.

The physical placement of the Longtom assets and the Longtom-5 facilities will displace / damage the benthic fauna that existed in these locations. The seabed in the project area may also be disturbed by minor excavation for access, the lifting of the umbilical for inspection and the placement of sand bags and mattresses to reduce the freespan of the pipeline.

There are no sensitive benthic habitats in this part of Bass Strait and the area has been and will be rapidly recolonised. Any impacts to epibenthos along the flowline will be both localised and short-lived. Surveys will be conducted following construction campaigns to check that no junk or debris is left on the seafloor.

6.1.2.2 Impact and Risk Assessment

Table 6-5 outlines the risk assessment for impacts on marine fauna and the seabed due to the presence of offshore facilities.

Table 6-5 Marine fauna and seabed disturbance assessment

Hazard duration	Permanent for subsea infrastructure, temporary for maintenance activities.	
Extent of hazard	Localised to immediate footprint and petroleum safety zones.	
Basis of Inherent Risk Assessment		
<ul style="list-style-type: none"> • There are no known sensitive seabed habitats in the project area. • There are no listed shipwrecks in the project area. • Operational infrastructure will act as an artificial habitat for benthic fauna colonisation. • The wellheads and key structures are all contained within petroleum safety exclusion zones thus helping protect the environment from commercial fishing activities. • The impact has already occurred for Longtom 3, 4 and the pipeline. 		
Inherent risk analysis and ranking		
Consequence	Likelihood	Inherent impact

Insignificant (1)	Moderate (C)	Low
Project specific environmental controls and checks that will take place	<p><u>Prevention</u></p> <ul style="list-style-type: none"> • Engineering design to ensure equipment is stable on the sea floor and the area of disturbance is minimised as far as practicable - effectiveness considered High. • Cement is selected in accordance with the Chemical Selection Process (see Section 6.1.1.2) - effectiveness considered Moderate. <p><u>Mitigation</u></p> <ul style="list-style-type: none"> • An ROV survey will be undertaken to ensure, where practicable, IMR debris is retrieved - effectiveness considered Moderate. 	
Residual risk analysis and ranking		
Consequence	Likelihood	Residual Impact
Insignificant (1)	Unlikely (D)	Low
Demonstration of ALARP		
<p>The key preventative controls are the design (particularly the small footprint) of the facilities and the low toxicity of the selected chemicals, the effectiveness of these controls is considered high in preventing environmental impact. The ROV surveys will help ensure that all IMR equipment is removed and that any issues are identified further prevent or minimise the impact. Given the low level of inherent impact the controls are considered sufficient, suitably robust, independent and effective to ensure the residual risk is Low and ALARP.</p> <p>The following ALARP analysis confirms that all reasonable risk treatment options have been considered to reduce the environmental impact of the offshore facilities on marine fauna/seabed, and the risk is deemed to be ALARP. There are no other feasible risk treatment options. A 'Low' residual risk ranking is broadly acceptable according to the SGHE definition of risk.</p> <p>The petroleum safety zones around the Longtom-3 and 4 wellheads will act as a marine reserve as these areas will be protected from commercial fishing activities – this may lead to an actual net benefit to the environment</p>		
Eliminate	Not applicable in terms of the Longtom facilities but damage from commercial fishing activities will be eliminated within the petroleum safety zones.	
Substitute	The cement and grout used in span rectification will be subject to a Chemical Selection Process (see Section 6.1.1.2).	
Engineering	Engineering design to ensure equipment is stable on the sea floor and the area of disturbance is minimised as far as practicable.	
Isolation	Not applicable.	
Administrative	Not applicable.	
Protective	Not applicable.	
Demonstration of Acceptability		
<p>The impact of the offshore facilities on marine fauna/seabed, particularly the lifting of the umbilical for inspection and the placement of small structures to reduce the freespan of the pipeline, is very low and significantly less than the impact from commercial fishing in the area which use scallop dredges and trawls.</p> <p>The potential disturbance to benthic communities and fauna in the water column is considered to be minimal, if any, and highly localised for the operations phase of the project. Benthic communities in Bass Strait are expected to rapidly recolonise any permanently displaced areas and settle on the new infrastructure. The zone affected is small, of low environmental sensitivity and is protected by the Longtom-3 and Longtom-4 petroleum safety exclusion zone.</p> <p>There are numerous other oil and gas developments in Bass Strait (20 production facilities). Longtom being a subsea development poses less of an impact than a conventional platform. Oil</p>		

<p>and gas infrastructure in the area has been accepted for the last 40 years.</p> <p>All legislative and other requirements have been met and the activity is consistent with SGHE policy and meets relevant management standards and procedures.</p> <p>There have been no concerns raised during stakeholder consultation regarding the impacts to marine fauna/seabed by the offshore facilities.</p> <p>This risk is considered acceptable given the insignificant consequence and as there are no known sensitive seabed habitats in the project area.</p>
<p>Monitoring</p>
<p>No physical seabed sampling or monitoring is necessary based on the absence of sensitive seabed habitats.</p>

6.1.3 Physical presence of offshore facilities - impact on other users

The physical presence of the offshore facilities may have an adverse effect on other users of the area, such as commercial fishing vessels. In order to assess and manage this risk, a consultation process with the relevant stakeholders was undertaken during the original design and construction of the Longtom facilities.

6.1.3.1 Description of Environmental Impacts

The known and potential environmental impacts relating to the presence of the offshore facilities are:

- Damage to fishing equipment (i.e., interference with demersal trawl gear).
- Reduction in fishing grounds by the safety exclusion zone around the Longtom-3 and Longtom-4 subsea wellheads.
- Localised disturbance to habitat for target commercial species.
- Impact on navigation – not considered credible given location within ATBA and the nature of the subsea development.

Damage to fishing equipment and reduction in fishing grounds

Fishing gear such as otter-board or Danish seine trawl nets and anchors have the highest potential for snagging on subsea equipment associated with the project. Squid and pelagic fishing involves no contact of gear with the seabed and therefore these will be largely unaffected.

Based on data supplied by AFMA, the project area is located in an area of low to moderate fishing activity, as defined by DNV Guidelines and Recommended Practices No. 13 (Interference between pipelines and trawl gear, September 1997). The highest level of fishing activity is from trawl and Danish seine fishermen, with otter-board trawl fishing accounting for approximately 10% of the total activity. Consultation with scallop fishermen indicates that the project area is not in an area of frequent scallop recruitment and previous scallop fishing.

To protect the offshore infrastructure from damage, a permanent 500-m safety exclusion zone has been established around Longtom-3 and Longtom 4, as is standard practice in offshore gas fields. This exclusion represents a very small percentage of the total fishing grounds in eastern Bass Strait.

Exclusion zones for fishing around pipelines are generally not practical. They are extremely difficult to enforce, particularly where applied to long, narrow corridors. Furthermore, as offshore production facilities increase in an already developed oil and gas basin, the network of pipelines results in a very complex maze of exclusion corridors if these were to be imposed. For example, there are now over 800 km of subsea pipelines linking production facilities and transferring oil and gas to shore in the offshore Gippsland Basin.

The entire subsea pipeline route is located over sandy seabed, where, over time these sections of pipeline may become partially buried by natural bed sediment transport (sand movements), especially during storm events. This in itself will decrease the likelihood of interference with gillnet or trawl gear.

The umbilical was trenched between Longtom-3 and Longtom-4, except for short sections adjacent to the tie-ins at each end. The trench has been naturally backfilled. In other areas the umbilical was installed on the sea floor and sections have self-buried.

Localised disturbance to habitat

The project is located in an area of low to medium trawl fishing activity. It is not expected that fish species will be exposed to harmful noise levels; however should behavioural changes to fish occur, they will be localised and temporary as the maintenance activities will be of short duration.

There is a large area of unrestricted fishing ground available to fishermen away from the wellheads that can be used during the short period of maintenance.

While the establishment of the petroleum safety zones may have had a minor negative impact to fishermen, they are likely to be a positive impact to the fish species themselves through the provision shelter and protection.

Navigation impacts

The construction of the Longtom facilities and the implementation of the Longtom-3 and Longtom-4 safety zones could lead to an impact on merchant vessels navigating through the area. However, the Longtom facilities are largely in the Bass Strait Area to be Avoided (ATBA) that prohibits vessels over 200 tonnes hence there is no real impact on the navigation of merchant shipping.

Most maintenance activities will occur within the existing exclusion safety zone. Vessels supporting maintenance activities will potentially impact other users of the marine environment such as fishermen however this will only be for a limited period. Stakeholders will be notified prior to maintenance activities commencing and the presence of vessels in the area.

All offshore vessels are equipped with navigation equipment and will display all required navigation lighting to minimise navigation hazards to passing vessels. Given the short duration of the maintenance activities and the existing ATBA and petroleum safety zones, the risk of significant disruption to other users is minimal.

6.1.3.2 Impact and Risk Assessment

Table 6-6 outlines the risk assessment for impacts on other users due to the presence of offshore facilities.

Table 6-6 Impacts on other users risk assessment

Hazard duration	Permanent for the petroleum safety exclusion zone, temporary for maintenance activities.	
Extent of hazard	Localised (within the petroleum safety zone and immediate vicinity of the IMR activity).	
Basis of Inherent Risk Assessment		
<ul style="list-style-type: none"> The project is located in an area of low to medium trawl fishing activity. Maintenance activities will be of short duration (approximately one week every 3 years). The pipeline is designed to be over trawlable. The Longtom-3 and Longtom-4 safety zones are within the Area to be Avoided – hence they have no significant impact on commercial shipping Provision of digital information to fishers and the government on the location of the Longtom wellheads and pipeline. Hydrographic charts have subsequently been updated with Longtom facilities. The area associated with the two petroleum safety zones is very small in relation to the rest of the available fishing grounds. 		
Inherent impact and risk analysis and ranking		
Consequence	Likelihood	Inherent impact
Insignificant (1)	Moderate (C)	Low
Project specific environmental controls and checks that will take place	<p><u>Prevention</u></p> <ul style="list-style-type: none"> Longtom-5 design - will be located within the existing Longtom-3 petroleum safety zone – effectiveness considered very High in terms of preventing any additional impact to marine users. Consultation will be maintained with commercial fishing groups regarding operations, and maintenance activities – effectiveness considered Moderate. <p><u>Mitigation</u></p> <ul style="list-style-type: none"> A survey will be undertaken following maintenance activities to ensure no junk or debris is left on the seabed – effectiveness considered Moderate. 	
Residual risk analysis and ranking		
Consequence	Likelihood	Residual Impact
Insignificant (1)	Unlikely (D)	Low
Demonstration of ALARP		
<p>The key preventative controls are the design (particularly that Longtom-5 will be within the existing Longtom-3 petroleum safety zone) and the consultation to date, the effectiveness of these controls is considered very high in preventing community impact. The ROV surveys will help ensure that all construction equipment is removed and that any issues are identified further prevent or minimise the impact. Given the low level of impact the controls are considered sufficient, suitably robust, independent and effective to ensure the residual risk is Low and ALARP.</p> <p>The following ALARP analysis confirms that all reasonable risk treatment options have been considered to reduce the environmental impact of the offshore facilities on marine fauna/seabed, and the risk is deemed to be ALARP. Adopting further risk reduction measures will incur costs that are grossly disproportionate to the benefits gained. A 'Low' residual risk ranking is broadly</p>		

acceptable according to the SGHE definition of risk.	
Eliminate	Not applicable.
Substitute	Not applicable.
Engineering	The subsea pipeline has been designed to be over trawled and to withstand impacts of trawl gear.
Isolation	A 500-m permanent petroleum safety exclusion zone has been gazetted around Longtom-3 and Longtom-4, whilst excluding commercial fishing activities in this area this reduces the risk of fishing equipment getting pinned on the Longtom facilities.
Administrative	A survey will also be undertaken following maintenance activities to ensure no junk is left on the seabed.
Protective	Not applicable.
Demonstration of Acceptability	
<p>The project area is located in an area of low to medium fishing activity. Fisheries consultation undertaken to date shows minimal direct impact on fishermen or access to grounds.</p> <p>The Longtom-3 and Longtom-4 safety zones are within the Area to be Avoided hence there is no impact on commercial shipping.</p> <p>There are numerous other oil and gas developments in Bass Strait. Longtom being a subsea development poses less of an impact than a conventional platform. Oil and gas infrastructure in the area has been accepted for the last 40 years.</p> <p>All legislative and other requirements have been met and the activity is consistent with SGHE policy and meets relevant management standards and procedures.</p> <p>This risk is considered acceptable given it will pose no real impact on commercial shipping and the impact to commercial fishing has already been made and any ongoing impact is expected to be insignificant.</p>	
Monitoring	
Consultation with key stakeholders prior to any offshore campaigns identified in the consultation log and complaints (if any) investigated.	

6.2 Non-Routine Impacts

This section describes the project's non-routine operational environmental impacts which can be categorised as follows:

- Loss of containment of hydrocarbons - subsea equipment damage / failure.
- Loss of containment of hydraulic fluid, MEG and methanol - subsea equipment damage / failure.

These non-routine events could only occur if there was some form of major equipment failure. The facilities have been specifically designed to minimise the likelihood of this as not only would it be an environmental risk but it will also pose a safety concern and would lead to major financial implications due to the subsequent loss of production

6.2.1 Loss of containment of hydrocarbons - subsea equipment damage

The Worst Case Discharge Scenario (WCDS) from production of the Longtom gas field is an uncontrolled well release (blowout) open hole release from the future Longtom-5 well. The three Longtom wells access different parts/pockets of the same reservoir and have very similar

hydrocarbon characteristics, see Section 6.2.1.2. Longtom 5 was selected for the modelling, as the pocket of the reservoir planned to be intersected may still be at a high / un-depleted pressure and as such would generate the highest discharge rate. The only mechanism that has been identified that could lead to a full bore blowout from an operational well is if a large vessel drags its anchor across one of the Longtom trees, ripping it off and the surface controlled subsea safety valve SCSSV fails to close. Given the location of the Longtom wells within the Bass Strait Area to be Avoided and the distance from a shipping lane anchor drag is an extremely unlikely event. The SCSSV has been designed and installed to prevent a full bore release in this instance and is subject to regular testing.

Blowouts generally occur during drilling or workover operations, rather than during production operations. The likelihood of a blowout occurring during production is significantly less likely than the risk of blowout during drilling. Data from SINTEF indicates that less than 5% of blowouts in the North Sea occur during operations and that the frequency of a blowout or release from an operational well (excluding external causes) is 5.5×10^{-6} /yr. External causes such as fishing impact are not a credible cause of failure of the Longtom well due to the designs snag resistance exceeding the capacity of the fishing vessels in the area.

In the event of a blowout, the loss of containment could continue until the well could be killed or a relief well could be drilled to plug the damaged well. Whilst a well kill may be possible from onshore, an offshore relief well could take several months to be completed. The use of a capping stack is not considered credible based on the water depth and that the blowout will be predominantly gas. However, this option would be re-assessed in the event of a subsea failure and as capping technology changes.

A pipeline failure or rupture could also lead to a loss of containment, however in this instance the wells would be shut-in and only the contents of the pipeline would be lost. A study into the total liquids inventory in the Longtom-Patricia Baleen pipeline concluded that volume of a spill from the pipeline would be in the range of 485-503 bbls, depending on production rates and times required for detection and to isolate the pipeline. During the non-production phase with the wells and HIPPs valve closed the loss of containment would be orders of magnitude less. The pipeline contents are significantly smaller than the loss that could result from a blowout and as the connection between the Longtom pipeline and Patricia Baleen pipeline is a similar distance offshore to the Longtom 5 well, separate oil spill modelling has not been considered necessary.

6.2.1.1 Environmental Impacts

A subsea release (Figure 6-1) would form a jet consisting of high velocity fluid confined to a narrow cone. The initial momentum of the jet phase would dissipate rapidly within about 1 m from the release point. By this time distinct droplets and bubbles form and the hydrocarbons start to rise as a plume—a collection of bubbles and droplets act in concert to drag significant volumes of the adjacent seawater upwards in the water column. The plume will reach the surface in a matter of minutes driven by the buoyancy of the oil droplets. The resulting surface slick will spread into a thin film due to the radial outflow of entrained water near the surface.

Gas and volatile hydrocarbon components will then be lost to the atmosphere through evaporation.

Cross-flowing currents can complicate the above process in several ways. First, the plume will tend to bend over, resulting in a horizontal offset in the surfaced oil slick. Second, the rising bubbles or droplets can be sieved downstream according to size, with the largest bubbles rising on the upstream side of the plume and the smallest rising on the downstream side. If the cross-flow current is strong enough, the sieving process will disrupt the establishment of the plume, in which case the oil or bubbles will rise individually. Both these effects of cross-currents will influence how long the oil/gas takes to rise to the surface and where it surfaces. The above processes act to reduce concentrations in the water column. The hydrocarbon gasses (mainly methane) may dissolve into the water column to saturation level, however, this would rapidly degrade to carbon dioxide and water through microbial activity.

The potential impacts associated the uncontrolled release of hydrocarbons to the marine environment (sea surface and water column) include physiological impacts to marine fauna species through smothering, ingestion and inhalation, as well as impacts on marine and coastal habitats.

Oil spill risk assessment modelling was undertaken to assess the impact and risk to environmentally sensitive receptors identified in Section 4.

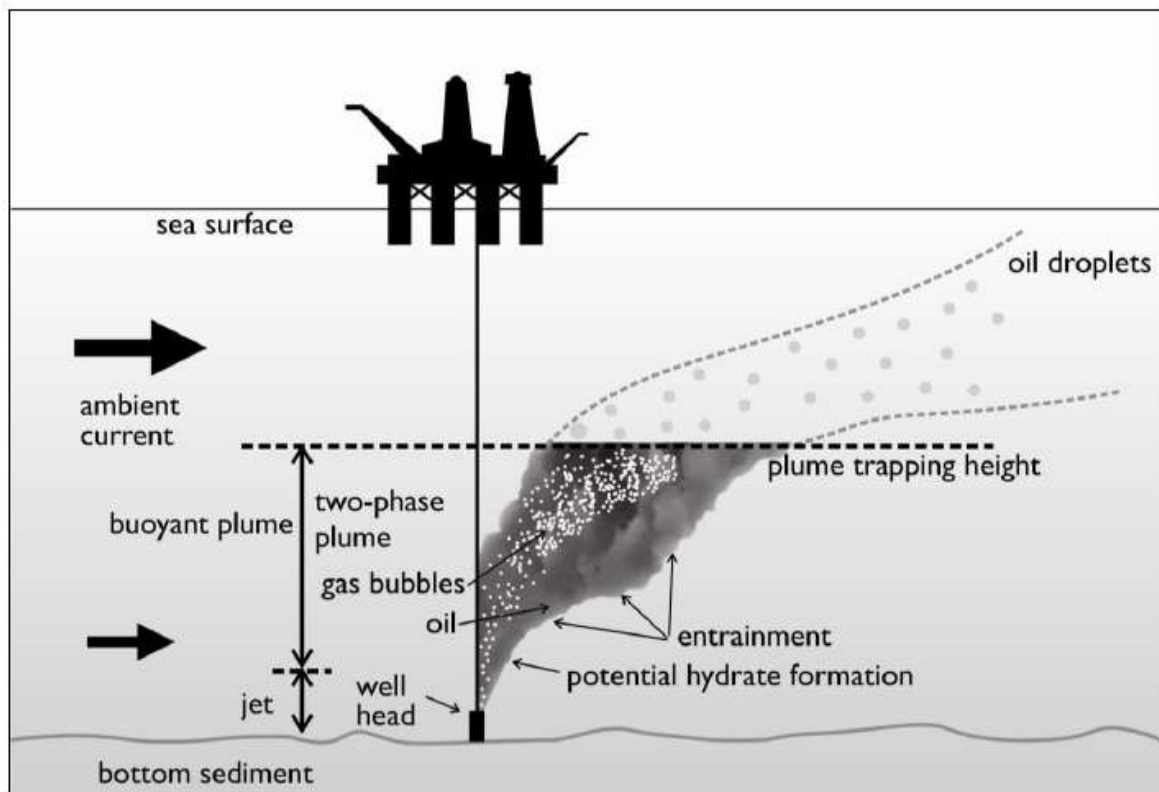


Figure 6-1 Illustration of how oil behaves when spilt to the marine environment

6.2.1.2 Gas Condensate Characteristics

Longtom Condensate was used for the loss of well control scenario. This condensate has an API of 51.2, density of 777.4 kg/m³ (at 15°C) with low viscosity (1.1 cP) (refer to Table 6-7), classifying it as a Group I oil according to the International Tankers Owners Pollution Federation (ITOPF, 2014) and USEPA/USCG classifications. The Longtom Condensate comprises a significant portion of volatiles and semi to low volatiles (75.8% total) with little residual components (3%) (refer to Table 6-8). This means that the Longtom Condensate will evaporate readily when on the water surface, with limited persistent components to remain on the water surface over time.

Figure 6-2 displays the weathering of the Longtom Condensate simulated under three static wind conditions (5, 10 and 15 knots). Results are based on a 900 bbl subsea release of Longtom Condensate over 24 hours, tracked for 30 days. Rapid evaporation occurs during the first 24 hours of the simulation with approximately 75% of the total volume lost to the atmosphere by end of day-1. The Longtom Condensate is predicted to readily entrain into the water column under wind speeds greater than 10 knots.

Table 6-7 Physical properties of Longtom Condensate

Characteristic	Longtom Condensate
Density (kg/m ³)	777.4
API	51.2
Dynamic viscosity (cP)	1.1
Pour Point (°C)	-9
Wax Content (%)	
Hydrocarbon property category	Group I
Hydrocarbon property classification	Non-persistent oil

Table 6-8 Boiling point ranges of the Longtom Condensate

Characteristic	Not Persistent			Persistent
	Volatile	Semi-volatile	Low volatility	Residual
Boiling point (°C)	< 180	180 - 265	265 - 380	>380
Condensate	61.5	14.3	21.2	3.0

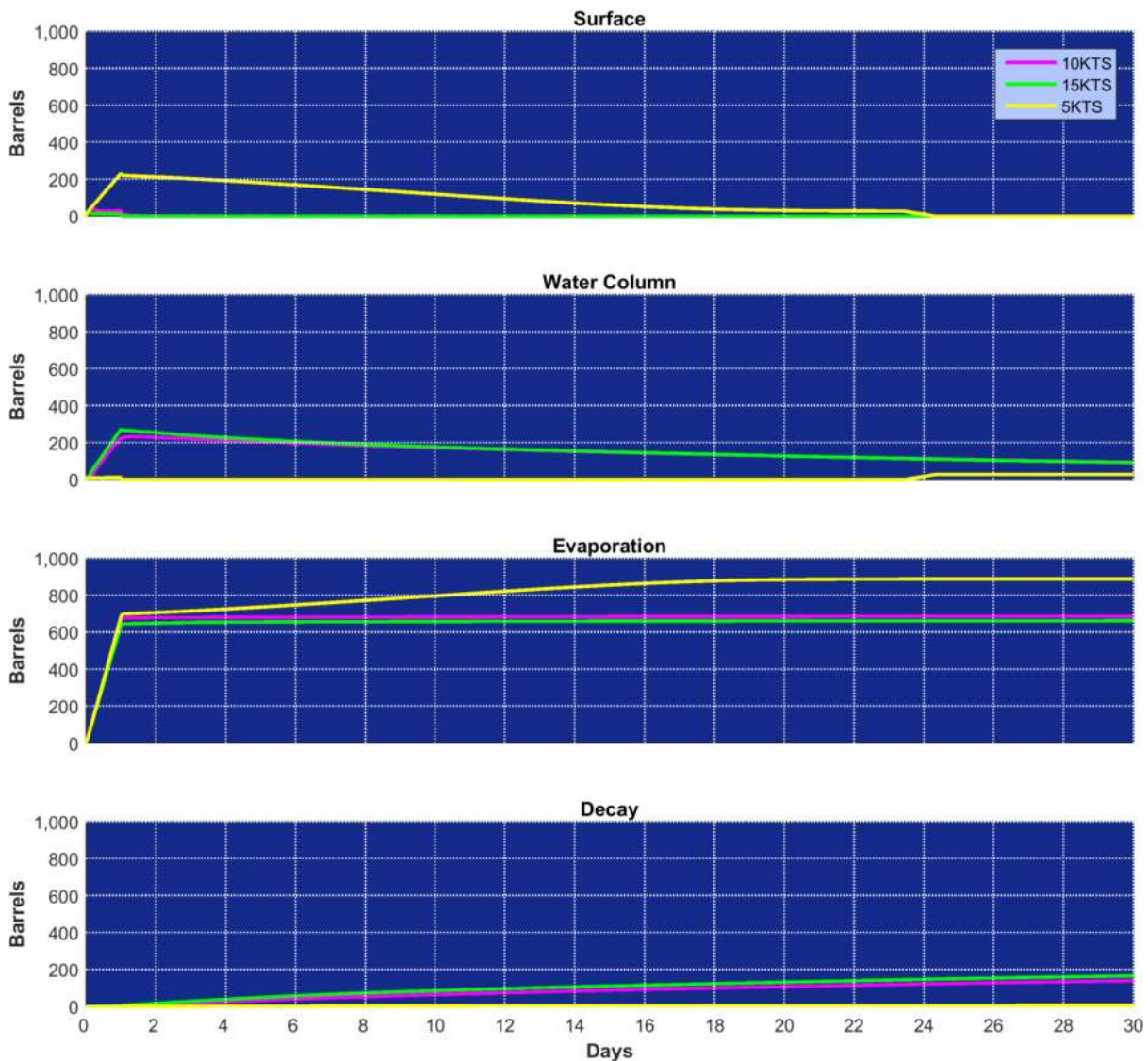


Figure 6-2 Predicted weathering and fates graph for a single spill trajectory

6.2.1.3 Sea surface, Shoreline and In-Water Thresholds

Oil spilt to the marine environment partitions into three distinct phases: surface, entrained and dissolved. Each of these phases behave independently and impact marine biota differently. Concentration thresholds for each phase have been defined (Table 6-9) based on best available scientific literature to assess the impact from each oil phase and to derive the environment that may be affected (EMBA).

Table 6-9: Concentration thresholds used in the modelling and for EMBA

Exposure Zone	Threshold	Justification
Surface		
Low exposure (1 g/m ² –10 g/m ²)	0.5 g/m ²	The 0.5 g/m ² threshold represents the practical limit of observing hydrocarbon sheens in the marine environment and therefore has been used to define the outer boundary of the low exposure zone. This threshold is considered below levels which would cause environmental harm and is more indicative of the areas perceived to be affected due to its visibility on the sea-surface. This exposure zone is not considered

		to be of significant biological impact but may be visible to the human eye. This exposure zone represents the area contacted by the spill and defines the conservative outer boundary of the area of influence from a hydrocarbon spill.
Adverse exposure zone: Moderate exposure (10 g/m ² –25 g/m ²)	10 g/m ²	Ecological impact has been estimated to occur at 10 g/m ² as this level of oiling has been observed to mortally impact birds and other wildlife associated with the water surface (French et al. 1996; French 2000). The 10 g/m ² threshold has been selected to define the moderate exposure zone. Contact within this exposure zone may result in impacts to the marine environment.
Adverse exposure zone: High exposure (> 25 g/m ²)	25 g/m ²	The 25 g/m ² threshold is above the minimum threshold observed to cause ecological impact. Studies have indicated that a concentration of surface oil 25 g/m ² or greater would be harmful for the majority of birds that contact the hydrocarbon at this concentration (Koops et al. 2004; Scholten et al. 1996). Exposure above this threshold is used to define the high exposure zone.
Shoreline accumulated hydrocarbon thresholds		
Low exposure (10 g/m ² –100 g/m ²)	10 g/m ²	A threshold of 10 g/m ² has been defined as the zone of potential 'low' exposure. This exposure zone represents the area visibly contacted by the spill and defines the outer boundary of the area of influence from a hydrocarbon spill.
Adverse exposure zone: Moderate exposure (100 g/m ² – 1,000 g/m ²)	100 g/m ²	French et al. (1996) and French-McCay (2009) have defined an oil exposure threshold of 100 g/m ² for shorebirds and wildlife (furbearing aquatic mammals and marine reptiles) on or along the shore, which is based on studies for sub-lethal and lethal impacts. The 100 g/m ² threshold has been used in previous environmental risk assessment studies (French et al. 2011; French-McCay 2004; French-McCay 2003; French-McCay et al. 2012; National Oceanic and Atmospheric Administration 2013). This threshold is also recommended in AMSA's foreshore assessment guide as the acceptable minimum thickness that does not inhibit the potential for recovery and is best remediated by natural coastal processes alone (AMSA 2015). Thresholds of 100 g/m ² and 1,000 g/m ² will define the zones of potential 'moderate' and 'high' exposure on shorelines, respectively. Contact within these exposure zones may result in impacts to the marine environment.
Adverse exposure zone: High exposure (> 1,000 g/m ²)	1,000 g/m ²	
Entrained Hydrocarbon Thresholds		
Low exposure (10 parts per billion (ppb)–100 ppb)	10 ppb instantaneous; and 10 ppb averaged over 48 hours ^(Note 1)	The 10 ppb threshold represents the lowest concentration and corresponds generally with the lowest trigger levels for chronic exposure for entrained hydrocarbons in the ANZECC & ARM CANZ (2000) water quality guidelines. Due to the requirement for relatively long exposure times (> 24 hours) for these concentrations to be significant, they are likely to be more meaningful for juvenile fish, larvae and planktonic organisms that might be entrained (or otherwise moving) within the entrained plumes, or when entrained hydrocarbons adhere to organisms or when an organism is trapped against a shoreline for periods of several days or more. This exposure zone is not considered to be of significant biological impact. This exposure zone represents the area contacted by the spill and conservatively defines the outer boundary of the area of influence from a hydrocarbon spill.
Adverse exposure zone: Moderate exposure (100 ppb–500 ppb)	100 ppb instantaneous; and 100 ppb averaged over 48 hours ^(Note 1)	The 100 ppb threshold is considered conservative in terms of potential for toxic effects leading to mortality for sensitive mature individuals and early life stages of species. This threshold has been defined to indicate a potential zone of acute exposure, which is more meaningful over shorter exposure durations. The 100 ppb threshold has been selected to define the moderate exposure zone. Contact within this exposure zone may result in impacts to the marine environment.
Adverse exposure zone: High exposure (> 500 ppb)	500 ppb instantaneous; and 500 ppb averaged over 48 hours ^(see Note 1)	The 500 ppb threshold is considered conservative high exposure level in terms of potential for toxic effects leading to mortality for more tolerant species or habitats. This threshold has been defined to indicate a potential zone of acute exposure, which is more meaningful over shorter exposure durations. The 500 ppb threshold has been selected to define the high exposure zone.

Dissolved Aromatic Hydrocarbon Thresholds		
Low exposure (6 ppb–50 ppb)	6 ppb instantaneous; and 6 ppb averaged over 48 hours ^(see Note 1)	The threshold value for species toxicity in the water column is based on global data from French et al. (1999) and FrenchMcCay (2003, 2002), which showed that species sensitivity (fish and invertebrates) to dissolved aromatics exposure > 4 days (96-hour LC50) under different environmental conditions varied from 6 ppb–400 ppb, with an average of 50 ppb. This range covered 95% of aquatic organisms tested, which included species during sensitive life stages (eggs and larvae). Based on scientific literature, a minimum threshold of 6 ppb used to define the low exposure zones (Clark 1984; Engelhardt 1983; Geraci and St Aubin 1988; Jenssen 1994; Tsvetnenko 1998). This exposure zone is not considered to be of significant biological impact. This exposure zone represents the area contacted by the spill and conservatively defines the outer boundary of the area of influence from a hydrocarbon spill.
Adverse exposure zone: Moderate exposure (50 ppb–400 ppb)	50 ppb instantaneous; and 50 ppb averaged over 48 hours ^(see Note 1)	A conservative threshold of 50 ppb was chosen as it is more likely to be indicative of potentially harmful exposure to fixed habitats over short exposure durations (French-McCay 2002). French-McCay (2002) indicates that an average 96-hour LC50 of 50 ppb could serve as an acute lethal threshold to 5% of biota. The 50 ppb threshold has been selected to define the moderate exposure zone. Contact within this exposure zone may result in impacts to the marine environment
Adverse exposure zone: High exposure (> 400 ppb)	400 ppb instantaneous; and 400 ppb averaged over 48 hours ^(see Note 1)	A conservative threshold of 400 ppb was chosen as it is more likely to be indicative of potentially harmful exposure to fixed habitats over short exposure durations (French-McCay 2002). French-McCay (2002) indicates that an average 96-hour LC50 of 400 ppb could serve as an acute lethal threshold to 50% of biota. The 400 ppb threshold has been selected to define the high exposure zone.

Notes: ¹ Exposure times of over 48 hours would provide a better comparison with ecotoxicology tests, which use exposure times of up to 10 days to determine and assess actual impacts rather than instantaneous values.

6.2.1.4 Oil Spill modelling

Overview

SGHE commissioned oil spill modelling for a worst-case blowout scenario (RPS-APASA, 2019). A five-year current dataset (2008–2012) that includes the combined influence of three-dimensional ocean and tidal currents was developed. The currents, spatial winds and then detailed hydrocarbon properties were used as inputs in the oil spill model to simulate the drift, spread, weathering and fate of the spilled hydrocarbons.

As spills can occur during any set of wind and current conditions, a total of 100 spill trajectories per hypothetical spill scenario were initiated at random times within a 5-year period (2008–2012) to enable a robust statistical analysis. Each simulation was configured with the same spill information (i.e. spill volume, duration and oil type). This approach ensures that the predicted transport and weathering of an oil slick is subject to a wide range of current and wind conditions. Model parameters used and their justification are summarised in Table 6-10.

During each spill trajectory, the model records the grid cells exposed to hydrocarbons, as well as the time elapsed. Once all the spill trajectories have been run, the model then combines the results from the individual simulations to determine the following:

- Maximum exposure (or load) observed on the sea surface;
- Minimum time before sea surface exposure;

- Probability of contact to any shorelines;
- Probability of contact to individual sections of shorelines;
- Maximum volume of oil that may contact shorelines from a single simulation;
- Maximum load that an individual shoreline may experience;
- Maximum exposure from entrained hydrocarbons observed in the water column; and
- Maximum exposure from dissolved aromatic hydrocarbons observed in the water column.

The stochastic model output does not represent the extent of any one spill trajectory (which would be significantly smaller) but rather provides a summary of all trajectories run for the scenarios.

Table 6-10: Summary of parameters used in blowout modelling

Parameter	Description
Number of spill simulations	100 simulations throughout the year
Hydrocarbon Type	Longtom condensate
Release Type	Subsurface release from one of the Longtom wells
Total spill volume	900 bbl/day (143 m ³ /day) for a period of 90 days
Spill volume justification	This scenario was based on a calculated blowout rate from the open hole of Longtom 5 during drilling. The calculated 90 MMscf/day of gas assumed open / unrestricted hole size (5 ½”) and maximum reservoir pressures, containing 10 bbl of condensate per MMscf of gas, which is the high-side condensate-gas-ratio of the Longtom gas. The Longtom-5 well will access the same geological reservoir and as such the condensate composition will be the same. In the case of ongoing production operations, the Longtom 3 and 4 wells have been progressively depressured and their blowout rates would be lower than the worst case drilling scenario that has been modelled. It is also assumed that the initial rate continues for the duration of the blowout and in reality the Longtom-3 and Longtom-4 wells may be unable to continue flowing at this rate for the duration of the blowout.
Release Depth	56 m below the sea surface.
Release Depth justification	Depth of water at field
Blowout release duration	90 days.
Release duration justification	The blowout duration of 90 days that has been used in the oil spill modelling is based on the estimated time it would take to source a rig and kill the well through the use of directional drilling. This assumption has been previously tested by examining the extent of the remaining oil after 90, 70 and 50 days. The plots showed that the extent of the oil spill effectively stabilised as there was little change between the 50 and 70 day blowout stochastic modelling and even less change between the 70 and 90 day case. All models utilised a conservative 3% decay rate for the condensate.

Parameter	Description
Simulation length	105 days.

Summary of Modelling Results

Deterministic Simulation Results

Figure 6-3 shows snapshots of spatial distribution of the surface oil concentrations from some previous deterministic modelling conducted at Longtom. The deterministic modelling demonstrates that the slick generally covers a small area, ambient currents are high and the area is extremely well flushed. Impact at any single point is intermittent with elevated concentrations lasting a short duration. With this in mind the stochastic simulation must be interpreted with caution.

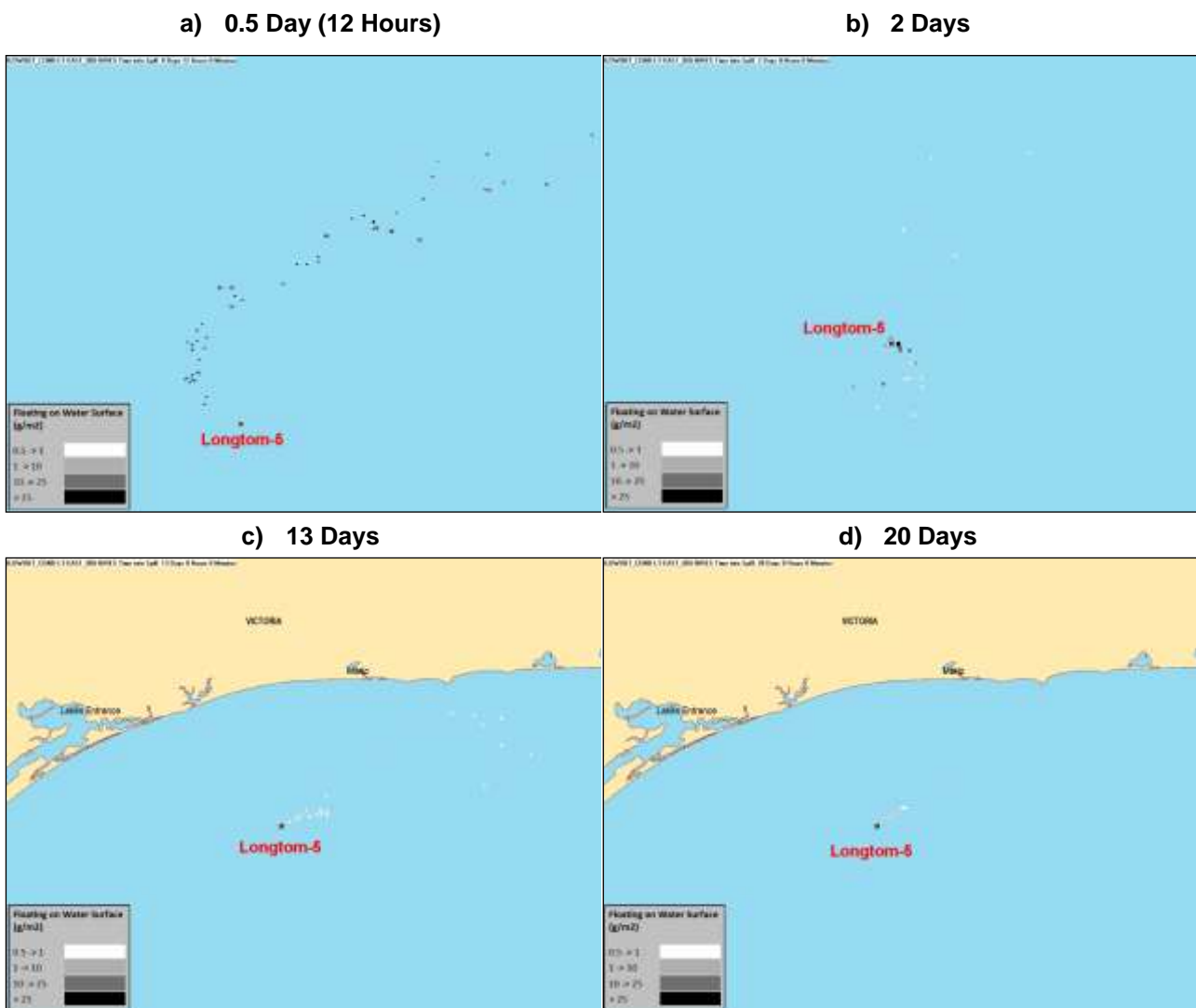


Figure 6-3 Deterministic plot of Surface oil from a well blowout

Stochastic

Key results from the stochastic modelling studies for a worst-case loss of well control showed:

- Potential low sea surface exposure zone (Figure 6-4) was predicted to remain within the Gippsland Basin with a low likelihood (<3%) of moderate exposure level predicted for surface waters adjacent to the release location;
- The maximum distance from the release location predicted for low ($>0.5 \text{ g/m}^2$) and moderate ($>10 \text{ g/m}^2$) exposure was 352 km (northeast) and 1 km (west-southwest) respectively while no exposure at the high threshold ($>25 \text{ g/m}^2$) was predicted. Note the 99th percentile maximum distance for low sea surface exposure remained within 147km of the release location;
- The overall probability of shoreline contact was 17% with hydrocarbons predicted to reach the shoreline of Croajingolong (West) a minimum of 6 days after the release.
- The shoreline of Croajingolong (West), Lake Tyers Beach and Lakes Entrance demonstrated up to 10% probability of low contact while the greatest length of shoreline impacted by a single spill trajectory was 18km, and 9km on average;
- The modelling demonstrated no time-averaged dissolved hydrocarbon exposure above 6ppb for any of the receptors assessed, however, instantaneous dissolved hydrocarbon exposure above 6ppb occurred for receptors situated within the Gippsland basin and in waters nearshore of Mallacoota and Eden and up to 10 km south of Tuross Head;
- Low (10ppb) time-averaged exposure zones for entrained hydrocarbons stretched to waters between Flinders Island and the mainland and crossed the NSW border to reach the nearshore waters of Ulladulla.
- Time average exposure to moderate levels (100ppb) was restricted to the immediate vicinity of the release.
- Potential instantaneous low (10ppb) entrained hydrocarbon exposure was predicted for Victorian, Tasmanian and NSW state waters and extending significantly offshore in commonwealth waters.
- Potential instantaneous moderate (100ppb) entrained hydrocarbon exposure was predicted for Victorian and NSW state waters and extended from around Lakes Entrance to Eden.

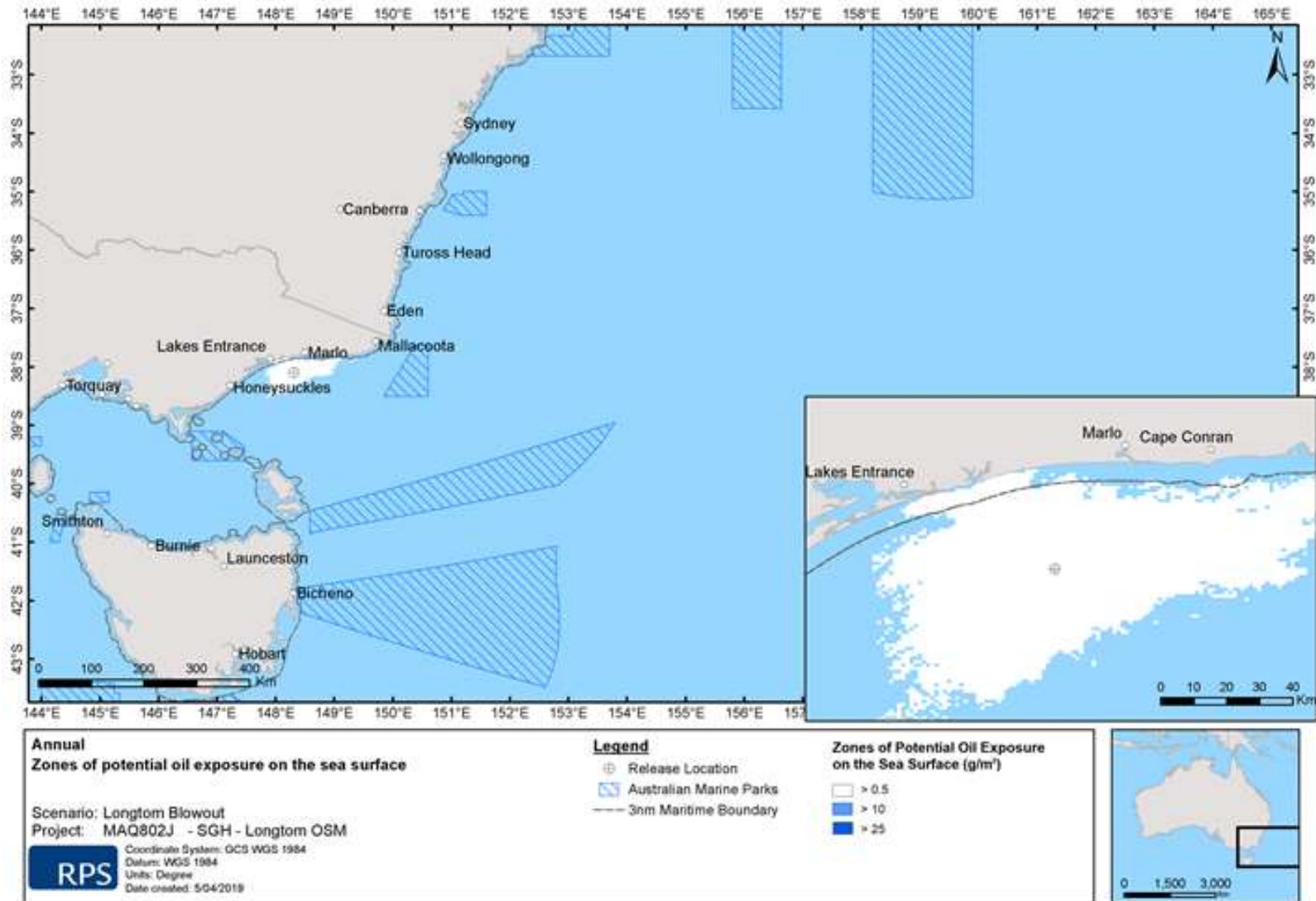


Figure 6-4 Zones of potential oil exposure on the sea surface, for a well blowout.

6.2.1.5 General - Impacts to Biological Species

Seabirds

Seabirds spend a considerable amount of time near the surface of the sea and are therefore at a higher risk of being in contact with a spill.

Seabirds that become coated in oil may suffer from hypothermia, which can result in death, as oil reduces the insulation properties of feathers. Embryo chicks in eggs may be prevented from receiving oxygen if their shells become coated with oil. It has been estimated that as little as four microlitres of petroleum contaminating a fertile egg can cause the embryo to die (AMSA, 2012).

Seabirds may also ingest the oil while feeding or preening, since several species of fish are able to survive beneath floating oil, resulting in toxic effects.

Mammals

Marine mammals are vulnerable to oil spills due to their amphibious habits and their dependence on air. Potential physiological effects of oil on marine mammals may include (AMSA, 2012):

- Hypothermia due to conductance changes in skin, resulting in metabolic shock (expected to be more problematic for non-cetaceans in colder waters).
- Toxic effects and secondary organ dysfunction due to ingestion of oil.
- Congested lungs.
- Damaged airways.
- Interstitial emphysema due to inhalation of oil droplets and vapour.
- Gastrointestinal ulceration and haemorrhaging due to ingestion of oil during grooming and feeding.
- Eye and skin lesions from continuous exposure to oil.
- Decreased body mass due to restricted diet.
- Stress due to oil exposure and behavioural changes.

Individual mammals oiled early in a spill may be exposed to the more toxic components of the oil by direct contact and ingestion and suffer greater toxicity per unit time and volume than those affected by more weathered oil.

By way of reference, aerial monitoring after the Montara oil spill (a light gas condensate) in August 2009 in the Timor Sea indicated there were no confirmed reports of oil-affected cetaceans (though there were 29 oil-affected birds, two oiled sea snakes and one oiled turtle) despite extensive aerial and water-based patrols in the area. There is no available evidence to suggest that the migratory or breeding patterns of any wildlife were affected (SEWPaC, 2012b).

Cetaceans

Cetaceans in particular have mostly smooth skins with limited areas of pelage (hair covered skin) or rough surfaces such as barnacled skin. Oil tends to adhere to rough surfaces, hair or calluses of animals, so contact with oil by whales and dolphins may cause only minor oil adherence.

Whales are pelagic (move freely in the oceans) and because of their migratory patterns may only be occasionally affected by oil spills. Several dolphin species are likely to move through the project area. Potential impacts from oil spills to dolphins are similar to that described for whales.

The way a whale consumes its food affects the likelihood of it ingesting oil. Baleen whales (such as humpbacks) skim the surface for krill and are more likely to ingest oil than 'gulp feeders' (toothed whales). Further, oil may stick to the baleen while they 'filter feed' near oil slicks. Sticky, tar-like residues are particularly likely to foul the baleen plates.

It has been stated that pelagic species will avoid oil, mainly because of its noxious odours, but this has not been proven. The strong attraction to specific areas for breeding or feeding

(e.g., Warrnambool calving grounds for southern right whales) may override any tendency for cetaceans to avoid the noxious presence of oil. So weathered or tar-like oil residues can still present a problem by fouling baleen whales feeding systems.

Researchers have also indicated that inhalation of oil droplets, vapours and fumes is a distinct possibility if whales surface in slicks to breathe. Exposure to oil in this way could damage mucous membranes, damage airways or even cause death.

Dolphins

Records indicate that dolphins are able to detect oil spills and avoid them, however there have been instances where this has not been done and the dolphin is exposed to floating oil.

Similar to cetaceans, dolphins are smooth skinned and oil tends not to stick to their skin. Dolphins can, however, inhale oil. This can damage their airways, lungs, ailments, mucous membrane and even cause death. A dolphin's eyesight may also be affected by oil (AMSA, 2012).

Seals

Seals are vulnerable to oil pollution as they spend a lot of their time on or near the surface of water. Seals need to surface every few minutes to breath and regularly haul out on beaches, which puts them at risk of coming in contact with the oil.

Fur seals are the most vulnerable, as the oil may adhere to their fur. Heavy oil coating can result in reduced swimming mobility and even death.

Seal pups are also vulnerable to oil. Their flippers may stick to their bodies, resulting in drowning. They also spend much of their time in rocky shore areas, compared to adults who swim in open water.

Seals may ingest oiled food or inhale oil droplets, which will attack their sensitive tissues causing abrasions and ulcers.

Turtles

When turtles surface in an oil slick to breathe, oil will affect their eyes and damage airways or lungs. Sea turtles will also be affected by oil through contamination of the food supply or by absorption through the skin.

Turtles are very vulnerable at beach nesting sites during the breeding season, note there are no breeding colonies present within the EMBA.

Fish

The eggs, larvae and young fish are the most vulnerable to oil, mainly because larger fish can take avoiding action.

Fish are associated with floating objects, as floating objects can reduce the light intensity (provide shade), provide food and provide shelter from diving birds. This can cause problems for seabirds, who are attracted to fish swimming under an oil slick.

Fish can become tainted if they encounter a spill. The worst tainting problems generally occur in aquaculture facilities.

Impacts of Response Strategies

Consultation with AMOSC and the DoT confirmed the proposed SGHE response strategy of allowing spilled diesel and gas condensate to naturally weather, while monitoring and evaluating the situation as appropriate.

The application of chemical dispersant for the condensate and diesel scenarios is not recommended by either AMOSC or the DoT, and as such is not a preferred response strategy for the defined scenarios. The application of dispersant has the potential to expose pelagic and benthic organisms to toxic components within the entrained mixture of hydrocarbons and dispersant. Avoiding the use of dispersant avoids these impacts. Condensate also rapidly weathers and a large proportion will evaporate from the sea surface.

There is the potential for deflection booms to be used closer to shore in a cleanup operation, however, attempting to collect semi-solid weathered oil residues such as the floating waxy flakes of paraffin residues predicted to develop from the Longtom gas condensate is not likely to be efficient or environmentally beneficial.

The Longtom condensate will rapidly evaporate and within 48 hrs the slick is expected to comprise of paraffin based waxy flakes. Paraffins have a high molecular weight, odourless and insoluble, and their direct toxicity is low. In summary, an intentional 'hands off' approach in terms of on-ground response, while monitoring and evaluating the spill primarily through aerial means (with some light foot traffic at some beaches and vessel deployment for water quality monitoring) in the event of a spill will result in little to no environmental impact from response activities.

6.2.1.6 Impacts on Environmental Sensitivities and Biological Values

Environmental sensitivities and biological values that may occur within the EMBA were described in Chapter 4. An assessment of the impact of a condensate spill on these sensitivities and values was undertaken and is summarised in Table 6-11.

Table 6-11 Impact of condensate spill on environmental sensitivities

Area of sensitivity	Potential impact of condensate spill	Potential Impact Evaluation
Australian Marine Parks		
Beagle	<p><u>Spill impact</u> No contact with surface oil > 1g/m², instantaneous entrained hydrocarbons > 100 ppb or dissolved hydrocarbons > 6ppb.</p> <p><u>Priority</u> LOW. Open marine environment.</p>	Negligible
East Gippsland	<p><u>Spill impact</u> No contact with surface oil > 1g/m², instantaneous entrained hydrocarbons > 100 ppb or dissolved hydrocarbons > 6ppb.</p> <p><u>Priority</u> LOW. Open marine environment, no shorelines.</p>	Negligible
Flinders	<p><u>Spill impact</u> No contact with surface oil > 1g/m², instantaneous entrained hydrocarbons > 100 ppb or dissolved hydrocarbons > 6ppb.</p> <p><u>Priority</u> LOW. Open marine environment, no shorelines.</p>	Negligible
RAMSAR WETLAND SITES – EASTERN VICTORIAN COAST		
Gippsland Lakes Ramsar Wetland	<p><u>Spill impact</u> No contact with surface oil > 1g/m², instantaneous entrained hydrocarbons > 100 ppb or dissolved hydrocarbons > 6ppb. Low probability of potential exposure to entrained hydrocarbons > 10ppb.</p> <p><u>Priority</u> HIGH (though potential for impact is limited due to only one entry point, Lakes Entrance). Freshwater body, high value tourism.</p>	Negligible
VICTORIAN COASTAL MARINE RESERVES		
Cape Howe Marine National Park and Gabo Island (includes Gabo Island Harbour Special Management Area)	<p><u>Spill impact</u> No contact with surface oil > 1g/m² or dissolved hydrocarbons >50ppb Low probability of dissolved hydrocarbons >6ppb instantaneous. Entrained hydrocarbons >10ppb instantaneous, low probability of >100ppb but no exposure to 100ppb and 48hrs.</p> <p><u>Priority</u> HIGH. Near-pristine sandy beaches backed by dense forest of the Croajingalong National Park.</p>	Low
Mallacoota Inlet Special Management Area /	<p><u>Spill impact</u> No contact with surface slick or entrained hydrocarbons. Low levels of dissolved aromatics.</p> <p><u>Priority</u> MODERATE.</p>	Negligible
The Skerries Special Management Area	<p><u>Spill impact</u> No contact with surface slick or entrained hydrocarbons. Low levels of dissolved aromatics.</p> <p><u>Priority</u> HIGH. Major seal-breeding colony.</p>	Negligible
Point Hicks	<p><u>Spill impact</u></p>	Moderate

Area of sensitivity	Potential impact of condensate spill	Potential Impact Evaluation
Marine National Park / Beware Reef Marine Sanctuary Croajingalong Biosphere Reserve and National Park	<p>Patches of very light surface oiling with no shoreline loading >10g/m².</p> <p>Entrained hydrocarbons >10ppb instantaneous, low probability of >100ppb and low potential exposure to 100ppb for 48hrs.</p> <p>Low probability of dissolved hydrocarbons >6ppb instantaneous.</p> <p><u>Priority</u> HIGH. Near-pristine sandy beaches backed by dense forest of the Croajingolong National Park.</p>	
Gippsland Lakes Coastal Park	<p><u>Spill impact</u> No contact with surface slick, entrained or dissolved hydrocarbons.</p> <p><u>Priority</u> MEDIUM. A popular tourist destination, but dominated by sandy beaches (with few marine sensitivities) that are easier to remediate compared to other shoreline types.</p>	Negligible
TASMANIAN COASTAL MARINE RESERVES		
Kent Group (Deal, Erith & Dover Islands) National Park (located between Flinders Island and Wilsons Promontory)	<p><u>Spill impact</u> No contact with surface oiling, or dissolved hydrocarbons. Potential for sparse patches of low instantaneous entrained hydrocarbons > 10ppb.</p> <p><u>Priority</u> HIGH. Mostly rocky, cliff shorelines, isolated small sandy beaches.</p>	Negligible
NSW COASTAL SENSITIVITIES		
Ben Boyd National Park / Nadgee Nature Reserve and Wilderness Area	<p><u>Spill impact</u> No contact with surface oiling.</p> <p>Low probability of concentrations of dissolved hydrocarbons > 6ppb.</p> <p>Potential for entrained hydrocarbons in water column around Green Cape, the eastern-most point of Ben Boyd National Park >100ppb instantaneous but no exposure to 100ppb for 48hrs.</p> <p><u>Priority</u> HIGH. Near-pristine coastline backing on to National Park.</p>	Low
ECONOMIC AND SOCIAL VALUES		
Commercial and Recreational Fisheries Includes open marine environment, coastal and inshore fish habitat and spawning areas	<p><u>Spill impact</u> Potential for contact with low levels of surface oil > 0.5 g/m² up to 352 kilometres from the well.</p> <p>Moderate surface oiling restricted to within 1km of release.</p> <p>Low likelihood of localised zones of moderate exposure to instantaneous dissolved aromatics along coastline. No exposure to time averaged low thresholds anticipated.</p> <p>Areas of Victorian and NSW waters exposed to instantaneous entrained hydrocarbons >100ppb.</p> <p>Potential for fish within Vic and NSW state waters to be affected by low levels of entrained hydrocarbons.</p> <p>Economic and social impacts associated with disruption to commercial and recreational fishing operations.</p> <p><u>Priority</u> HIGH. Valuable spawning and fishing area.</p>	Moderate

Area of sensitivity	Potential impact of condensate spill	Potential Impact Evaluation
<p>Tourism and Recreation</p>	<p><u>Spill impact</u> Earliest shoreline contact: 6 days. Predicted shoreline loading:</p> <ul style="list-style-type: none"> • Maximum 49 bbl • Average 2 bbl <p>Shoreline load anticipated to be mainly non-toxic waxy flakes between Lakes Entrance and Marlo. Potential for some shoreline loading >100g/m². Potential for contact with low levels of surface oil between Lakes Entrance and Marlo. No exposure to moderate surface oiling. Low probability exposure to dissolved hydrocarbons >6ppb instantaneous, Potential for low / moderate levels of entrained hydrocarbons along coastline that could impact primary and secondary recreation. Economic and social impacts of disruption to commercial operators relying on recreation and tourism industry.</p> <p><u>Priority</u> HIGH. Valuable spawning and fishing area.</p>	<p>Low</p>
<p>Cultural assets. Man-made structures e.g. Slipways, boatyards, ports, jetties</p>	<p><u>Spill impact</u> Earliest shoreline contact: 6 days. Predicted shoreline loading:</p> <ul style="list-style-type: none"> • Maximum 49 bbl • Average 2 bbl <p>Shoreline load anticipated to be mainly non-toxic waxy flakes between Lakes Entrance and Marlo. Potential for contact with low levels of surface oil between Lakes Entrance and Marlo. Localised zones of exposure to dissolved aromatics and entrained hydrocarbons along coastline. Minimal impact on cultural assets and man-made structures due to limited exposure to hydrocarbons. Limited economic and social impacts associated with disruption to commercial operators relying on boating industry.</p> <p><u>Priority</u> LOW. Potential for damage to man-made structures associated with the predicted exposure is not credible.</p>	<p>Negligible</p>
PARTICULAR BIOLOGICAL VALUES		
<p>Cetaceans</p>	<p><u>Spill impact</u> Potential exposure to low levels of sea surface oiling, entrained hydrocarbons and dissolved aromatics, or very localised moderate concentrations of dissolved aromatics nearshore. Predicted impact is minimal due to the transitory nature of cetaceans through Bass Strait and their limited ecologically significant activities (such as breeding, foraging and calving) while in the area.</p> <p><u>Priority</u> HIGH. All cetaceans are protected under the EPBC Act 1999 (Cwlth).</p>	<p>Low</p>
<p>Nesting shorebirds and seabirds</p>	<p><u>Spill impact</u> Potential exposure to low levels of sea surface oiling, entrained</p>	<p>Low</p>

Area of sensitivity	Potential impact of condensate spill	Potential Impact Evaluation
	<p>hydrocarbons and dissolved aromatics nearshore. Degree of impact depends on whether shorebirds and migratory species are feeding or nesting along shorelines at the time of the spill and in the direct path of low level sea surface oiling (less than fatal) and shoreline loading. <u>Priority</u> HIGH. Includes species protected under the EPBC Act 1999 (Cwlth) and/or FFG Act 1988 (Vic).</p>	
Little penguins	<p><u>Spill impact</u> Potential exposure to low levels of sea surface oiling, entrained hydrocarbons and dissolved aromatics. Degree of impact depends on whether little penguins are feeding or nesting along shorelines at the time of the spill and in the direct path of low level sea surface oiling (less than fatal) and shoreline loading. Little penguin colonies could be indirectly affected by impacts on fish populations as their food source. <u>Priority</u> MEDIUM. Little penguin is relatively common.</p>	Low
Fur seals	<p><u>Spill impact</u> Potential exposure to low levels of sea surface oiling, entrained hydrocarbons and dissolved aromatics. Degree of impact depends on whether seals are breeding, feeding or hauling out along shorelines at the time of the spill and in the direct path of low level sea surface oiling (less than fatal) and shoreline loading. Seal colonies could be indirectly affected by impacts on their food source. <u>Priority</u> HIGH. Unlike other marine mammals such as cetaceans and sea lions, fur seals depend on their fur rather than blubber for insulation and temperature regulation.</p>	Low
Reptiles – marine turtles	<p><u>Spill impact</u> Potential exposure to low levels of sea surface oiling, entrained hydrocarbons and dissolved aromatics. Predicted impact is minimal due to the transitory nature of turtles through Bass Strait and their limited ecologically significant activities (such as breeding, foraging and nesting) in the area. <u>Priority</u> HIGH. Includes species protected under the EPBC Act 1999 (Cth) and/or FFG Act 1988 (Vic).</p>	Low

This assessment has been used to determine the residual risk ranking given in Table 6-12.

6.2.1.7 Risk Assessment

Table 6-12 outlines the risk assessment for the loss of containment of hydrocarbons due to subsea equipment damage.

Table 6-12 Loss of containment of hydrocarbons risk assessment

Hazard duration	Throughout operations and the life of this EP.	
Extent of hazard	While the area and extent of the EMBA is significant, it should be noted that the predicted impact for a single spill trajectory is relatively narrow and that the EMBA has been based on instantaneous thresholds rather than time averaged ones.	
Basis of Inherent Risk Assessment		
<ul style="list-style-type: none"> The subsea infrastructure has been designed to withstand fishing activities, impact loads, corrosion, and pressures and temperatures from Longtom. The locations of the wellheads are remote from the shore and sensitive environments. Wellheads can be shutdown from onshore and are fail safe. The Longtom reservoir is a gas reservoir with relatively small quantities of condensate. The condensate will rapidly evaporate and the residue will be small waxy inert flakes with low environmental impact. Pipeline marked on navigation charts and Longtom facilities are within the Bass Strait Area to be Avoided. SGHE is an AMOSC member, giving it access to AMOSC response functions and industry Mutual Aid response capability in the unlikely event of a Tier 2 or 3 spill. A 500-m petroleum safety exclusion zone exists around Longtom-3 and Longtom 4. 		
Inherent risk analysis and ranking		
Consequence	Likelihood	Inherent Risk
Moderate (3)	Unlikely (D)	Moderate
Project specific environmental controls and checks that will take place	<p><u>Prevention</u></p> <ul style="list-style-type: none"> Compliance with the Longtom Pipeline Safety Case including: <ul style="list-style-type: none"> Equipment design and validation of the design. The design ensures that the hydrocarbons are contained and includes; Equipment pressure / temperature rating, Material suitability, Equipment stability under storm and seismic loading, Process controls, alarms and trips – effectiveness considered Very High. Training, competency and experience of personnel to operate and maintain the facilities appropriately, including 24 hour continuous monitoring of production parameters when in operation – effectiveness considered Moderate. Procedures for operating and maintenance activities. - effectiveness considered Moderate. Maintenance and testing of equipment including shutdown systems - effectiveness considered Moderate. Compliance with the Well Operations Management Plan (WOMP) including: <ul style="list-style-type: none"> Well design including shutdown systems (e.g., SCSSV) – effectiveness considered Very High. Operating procedures – effectiveness considered Moderate. Maintenance and testing of equipment including shutdown systems 	

	<p>– effectiveness considered Moderate</p> <ul style="list-style-type: none"> • Inspection, maintenance and repair campaigns subject to risk assessment – effectiveness considered Moderate. <p><u>Mitigation</u></p> <ul style="list-style-type: none"> • AMOSC membership and adherence to the following procedures - Effectiveness considered Moderate: <ul style="list-style-type: none"> - Oil Pollution Emergency Plan (OPEP). - Emergency Response Plan (ERP) • Source control - implementation of a Blow Out Contingency Plan (LT-HSE-PL-0007) and potentially the Longtom Relief Well Plan for a relief well to drill, intersect and kill a blowout – effectiveness considered High. Note that any relief well will need to be conducted in accordance with the legislation, a WOMP, safety case and EP will need to be developed and accepted. This would be done in parallel with the rig mobilisation and based on data from Montara this is considered achievable.
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Residual risk analysis and ranking

Consequence	Likelihood	Residual Risk
Moderate (3)	Rare (E)	Low

Demonstration of ALARP

The risk of a hydrocarbon spill prior to the implementation of the controls (inherent risk) was assessed as ‘moderate’ based on the possibility of a major consequence occurring without any controls. However, with the above listed controls and the controls listed in the NOPSEMA-accepted WOMP and Longtom Pipeline Safety Case, OPEP and ERP, the risk has been reduced to low (residual risk).

The key preventative controls are the design of the facilities to safely contain the hydrocarbons, the operating and maintenance systems, processes and procedures conducted in line with the NOPSEMA-accepted safety case and WOMP requirements, the overall effectiveness of these controls is considered very high in preventing environmental impact. Note that the design is critical in ensuring hydrocarbons are contained and is subject to independent validation as part of the safety case that specifically confirms the codes and standards are appropriate and that the safety risks are reduced to ALARP. In the event of a loss of containment these systems will also ensure that the leak is mitigated and minimised (particularly the shutdown systems), the oil spill response will also ensure that spills are monitored and where practicable action is taken to further reduce or prevent the impact. The controls are considered sufficient, suitably robust, independent and effective to ensure the residual risks are Low and ALARP.

The following ALARP analysis confirms that all reasonable risk treatment options have been considered to reduce the environmental impact of hydrocarbon spills, and the risk is deemed to be **ALARP**. Adopting further risk reduction measures will incur costs that are grossly disproportionate to the benefits gained. A ‘Low’ residual risk ranking is **broadly acceptable** according to the SGHE definition of risk.

Eliminate	Not applicable.
Substitute	Not applicable.
Engineering	The subsea infrastructure has been designed to withstand fishing activities, impact loads, corrosion, and pressures and temperatures from Longtom
Isolation	The pipeline and wells can be isolated from the reservoir.
Administrative	A 500-m petroleum safety zone exists around Longtom-3 and Longtom 4. Training and adherence to the OPEP and the ERP.
Protective	Not applicable.

Demonstration of Acceptability

<p>The operation of the offshore facilities is covered by a Longtom Pipeline Safety Case, WOMP and OPEP. All of these documents have to be reviewed and accepted by NOPSEMA prior to operations commencing.</p> <p>The design of the facilities takes account of pressure, temperature, fluid composition, erosion, external impact and fatigue. These parameters will be monitored by process equipment and actions will be taken if the parameters are outside of acceptable limits. A separate shutdown system, which is fail safe, will also monitor the facilities for abnormal situations. This means that valves can be closed and facilities can be isolated to prevent continued gas and condensate flow.</p> <p>There are numerous other oil and gas developments in Bass Strait (20 production facilities and a large number of pipelines). Oil and gas infrastructure in the area has been accepted for the last 40 years.</p> <p>All legislative and other requirements have been met and the activity is consistent with SGHE policy and meets relevant management standards and procedures.</p> <p>Concerns from relevant stakeholders have been addressed through the consultation process, any new relevant stakeholder objections, claims or issues will be considered in line with the ongoing consultation.</p> <p>The locations of the wellheads are remote from the shore. The likelihood of a failure of the subsea equipment or a well blow out is considered remote, therefore this risk is considered acceptable.</p>
<p>Monitoring</p>
<p>No ongoing monitoring is required. In the event of a spill monitoring will be undertaken as per the requirements set out in the OPEP and OSMP.</p>

6.2.2 Loss of containment of hydraulic fluid, MEG and methanol - subsea equipment damage

6.2.2.1 Hazards

The umbilical provides hydraulic fluid, MEG, potentially Low Dose Hydrate Inhibitor (LDHI) and methanol offshore. A failure of the umbilical, due to impact, fatigue or corrosion at the tie-ins, or subsea facilities may result in the accidental release of some or all of these and could be of an ongoing minor nature or terminal and result in total shutdown of the Longtom facilities. A loss of containment from the buried sections, protected from external damage (see Section 6.1.3), of the stainless steel umbilical is not considered credible and is not discussed further.

The uses of hydraulic fluid, MEG, LDHI and methanol are described below.

Hydraulic fluid

Details of the hydraulic fluid currently used for operations is given in Section 6.1.1.

MEG and LDHI

MEG is pumped offshore via the umbilical and injected at the subsea tree chokes to help prevent hydrate formation and subsequent potential blockage of the pipeline. During the detailed design of the pipeline and the development of the hydrate management plan, the addition of LDHI to the MEG was also considered.

LDHI could be added to the MEG at a concentration of approximately 1.5%, however to date this has not been necessary and is very unlikely to ever be required. The LDHI (Baker Hughes HIW 85574) was assessed by OCNS as having a Silver CHARM ranking, while the MEG is ranked as ‘E’ and is on the PLONOR list.

These chemicals are contained within the pipeline system and pumped from onshore. They would only be released in the event of umbilical or subsea equipment failure.

Methanol

Small amounts of methanol are injected via the control umbilical for start-ups and in the case of relieving hydrate blockage. Methanol is also included on the PLONOR list as a category ‘E’ chemical (CAS Ref: 67-56-1) and is therefore considered to have little or no environmental effect when discharged to the marine environment. Methanol is contained within the enclosed system and returned to shore. It could only be released in the event of umbilical or subsea equipment failure.

6.2.2.2 Description of Environmental Impacts

The known and potential environmental hazards for the loss of hydraulic fluid, MEG and methanol include:

- Localised and temporary decrease in water quality
- Localised impact on marine life.

Operations

In the event of an umbilical failure, the amount of hydraulic fluid, MEG and methanol that would be lost will be limited to approximately two thousand litres before process parameters onshore (i.e., low pressure alarms) would automatically shut down the chemical and hydraulic pumps. There will be no further leakage as the accumulated pressure (hydrostatic pressure) within the umbilical will be vented to sea.

Based on their OCNS rating their impact is considered minor.

Maintenance

The maintenance and repair of an umbilical may be undertaken by lifting the umbilical to the surface (using a vessel crane) and cutting into it to allow a repair to take place. This would result in the release of umbilical fluids however this would be contained on board the vessel. Even if the maximum volumes of fluids were released to the marine environment, the environmental consequence is minor, based on the low volumes, the dilution and dispersion that occur on release, and the low numbers of marine organisms likely to be present at the time of the release.

6.2.2.3 Risk Assessment

Table 6-13 outlines the risk assessment for the loss of containment of hydraulic fluid, MEG and methanol.

Table 6-13 Loss of containment of hydraulic fluid, MEG and methanol risk assessment

Hazard duration	Short term release.
Extent of hazard	Limited to the area around the release point.
Basis of inherent impact and risk Assessment	
<ul style="list-style-type: none"> • The umbilical was appropriately designed and has been pressure tested. 	

<ul style="list-style-type: none"> • There is no planned discharge of MEG or methanol. • There are no known sensitive environments in the project area. • The selected hydraulic fluid, MEG and methanol are water soluble and have low toxicity. 		
Inherent risk analysis and ranking		
Consequence	Likelihood	Inherent Risk
Minor (2)	Unlikely (D)	Low
Project specific environmental controls and checks that will take place	<u>Prevention</u> <ul style="list-style-type: none"> • Longtom Pipeline Safety Case including: <ul style="list-style-type: none"> - Equipment design and validation including process controls, alarms and trips – effectiveness considered Very High. - Training and competency of personnel to operate and maintain the facilities appropriately – effectiveness considered Moderate. - Procedures for operating and maintenance activities. – effectiveness considered Moderate. - Maintenance and Testing of equipment including shutdown systems – effectiveness considered Moderate. • The selected hydraulic fluid - HW525 was a category 'D' OCNS chemical with an assumed low environmental impact – effectiveness was considered High however it was subsequently changed to an A rated chemical. HW525 will therefore be progressively replaced with Transaqua HT2 which is a category 'D' OCNS chemical – see Section 6.1.1 Discharge of hydraulic fluid for more detail. • The MEG and methanol are category 'E' OCNS chemicals with low environmental impact – effectiveness considered High. 	
	<u>Mitigation</u> <ul style="list-style-type: none"> • Shut down of chemical and hydraulic pumps at the gas plant – effectiveness considered High. 	
Residual risk analysis and ranking		
Consequence	Likelihood	Residual Risk
Minor (2)	Rare (E)	Low
Demonstration of ALARP		
<p>The key preventative controls are the design of the facilities, the operating and maintenance systems, processes and procedures conducted in line with the safety case and WOMP requirements, the overall effectiveness of these controls is considered very high in preventing environmental impact. In the event of a loss of containment these systems will also ensure that the leak is mitigated and minimised (particularly the shutdown systems) and the low toxicity of the chemicals also ensures that any consequence is minor. The controls are considered sufficient, suitably robust, independent and effective to ensure the residual risks are Low and ALARP.</p> <p>The following ALARP analysis confirms that all reasonable risk treatment options have been considered to reduce the environmental impact of hydraulic fluid, MEG and methanol discharges, and the risk is deemed to be ALARP. There are no other feasible risk treatment options. A 'Low' residual risk ranking is broadly acceptable according to the SGHE definition of risk.</p>		
Eliminate	Not applicable. Hydraulic fluid, MEG and methanol cannot be eliminated.	
Substitute	SGHE have assessed alternatives and the plan is to progressively replace HW525 with Transaqua HT2, which is a D rated chemical, when production is restarted. During the current nonoperational phase there is no practical ability to flush the HW525 out with HT2. To flush the HW525 would require electrical continuity from the gas plant, agreement with the gas plant operator to operate the hydraulic pumps, agreement with the Patricia Baleen pipeline operator to use their umbilical and an offshore vessel campaign. Given that	

	failure of the umbilical offshore is very unlikely and given there is no additional pressure source in the hydraulic lines any release would be limited to a small volume and temporary, it has therefore been rejected as a practical option at this time.
Engineering	The subsea facilities have been installed and there is no practical way to re-engineer the system. The design has been checked and the system pressure tested.
Isolation	Shut down of chemical and hydraulic pumps at the gas plant.
Administrative	A 500-m petroleum safety exclusion zone exists around Longtom-3 and Longtom 4 to help prevent interference.
Protective	Not applicable.
Demonstration of Acceptability	
<p>The loss of containment of hydraulic fluid, MEG and methanol would not lead to a significant risk due to the localised nature of release and the rapid dilution of chemicals. The chemicals are category 'D' or 'E' OCNS chemicals, which are considered to have a low environmental impact. Hydraulic fluid, MEG and methanol are standard chemicals used in the control of subsea facilities and to control hydrates. It is common practice to inject them into subsea facilities and other operators in Bass Strait use similar products in this same manner. HW525 will be progressively replaced with Transaqua HT2.</p> <p>All legislative and other requirements have been met and the activity is consistent with SGHE policy and meets relevant management standards and procedures.</p> <p>There have been no concerns raised regarding the discharge of hydraulic fluid, MEG or methanol during stakeholder consultation.</p> <p>The volumes of fluids used are not expected to cause any significant environmental issues, and given the 'minor' consequences, this risk is considered acceptable.</p>	
Monitoring	
The total volume of MEG and methanol used is monitored at the gas plant.	

6.3 Impacts from Inspection, Maintenance and Repair

This section describes the environmental impacts resulting from inspection, maintenance, and repair activities utilising offshore vessels and ROV operations. Note that maintenance activities are infrequent (anticipated about once every 3 years) and are short term activities (typically one week). The risks and impacts from these activities should be considered in comparison to other marine activities in and around the Longtom, these include year round commercial fishing out of Lakes Entrance, the manned Esso oil and gas facilities in Bass Strait with year round vessel support and the presence to the south of one of the busiest shipping lanes in Australia with several thousand merchant vessels a year. The potential hazards or impacts that have been assessed include:

- Vessel collisions with marine fauna.
- Noise emissions.
- Light emissions.
- Atmospheric emissions.
- Discharge of sewage and grey water.
- Discharge of putrescible waste.

- Discharge of contaminated deck/bilge water.
- Discharge of non-hazardous waste.
- Discharge of hazardous waste.
- Discharge of cooling and desalination brine water.
- Introduction of invasive marine species.
- Diesel (MDO) spill.
- ROV discharges.

6.3.1 Vessel collisions with marine fauna

The movement of offshore vessels has the potential to result in a collision with marine fauna. Noise impacts from offshore vessel activities are addressed separately in Section 6.3.2.

The vessel-related activities required to support ongoing operations are conservatively expected to be approximately one week every 3 years. During either of these activities there is the potential for the vessels to strike marine fauna, however whilst conducting petroleum activities the vessels will be operating at low speeds (≤ 2 knots) or on DP.

6.3.1.1 Description of Environmental Impacts

Marine megafauna are at the most risk from this hazard and thus are the focus of this evaluation.

Several marine turtle species including species listed as either threatened and/or migratory under the EPBC Act may occur within the project area, however no critical habitat or BIAs for turtles have been identified. The presence of turtles in the project area is considered only remotely likely.

Several marine mammals (e.g. whales, dolphins, seals) including those listed as either threatened and/or migratory under the EPBC Act have the potential to occur within the project area. The Pygmy blue whale has possible foraging habitat (DoEE, 2015) overlapping the project area. The key foraging areas for Pygmy blue whales are in the Bonney upwelling off Portland Victoria and canyons off Kangaroo Island in South Australia, which are more than 600 km to the west. Sightings have occurred in southeast Victoria from February to March, but are reasonably rare in the Gippsland Basin (Bannister *et al.*, 1996). For the Southern right whale, while the project area is within a distribution BIA, it does not intersect with known aggregation areas. The only recognised aggregation ground for Southern right whales in eastern Australia is Logan's Beach in Warrnambool (SEWPaC, 2012d), which is over 600 km to the west. Southern right whales migrate from southern feeding grounds to the Australian coastline in the winter months between May and November, to breed, mate and rest, with peak abundance in August. The project area does not overlap the migration corridor however Southern right whales may be migrating through the area in low numbers during winter months.

Marine mammals travelling through the area are at less risk from vessel strike than those species that are resting or feeding. A vessel strike may lead to wounding and/or mortality. Vessel strikes generally occur when there is high vessel traffic operating at fast speeds. Speed appears to be a key issue affecting the frequency of incidents (Vanderlaan & Taggart, 2007), with 89% of ship

strikes examined involving vessels travelling in excess of 14 knots (Laist *et al.*, 2001). Vessels typically used to support these activities do not have the same limitations on manoeuvrability and would not be moving at these speeds when conducting activities inside the operational area. Their noise should alert marine mammals to their presence and they will have time to react and avoid a collision.

The Australian and New Zealand fur-seals are highly agile species that haul themselves onto rocks and oil and gas platform structures. As such, it is likely that they will avoid any collision with moving vessels.

Peel *et al.* (2016) reviewed vessel strike data (1997-2015) for marine species in Australian waters and identified the following:

- Whales including the Humpback, Pygmy blue, Antarctic blue, Southern right, Dwarf minke, Antarctic minke, Fin, Bryde's, Pygmy right, Sperm, Pygmy sperm and Pilot species were identified as having interacted with vessels. The Humpback whale exhibited the highest incidence of interaction followed by the Southern right whale. A number of these species may be observed in the waters within the vicinity of the operational area.
- Dolphins including the Australian humpback, Common bottlenose, Indo-Pacific bottlenose and Risso's dolphin species were also identified as interacting with vessels. The Common bottlenose dolphin exhibited the highest incidence of interaction. A number of these species may be observed within the vicinity of the operational area.
- There were no vessel interaction reports during the period for either the Australian or New Zealand fur seal. There have been incidents of seals being injured by boat propellers around areas where they rest or congregate including oil and gas platform structures, however all indications are rather than 'boat strike' these can be attributed to be the seal interacting/playing with a boat, with experts indicating the incidence of boat strike for seals is very low.

The duration of fauna exposure to support vessel strike is limited to the duration of works under this EP; expected to be approximately 30 days per well. If a fauna strike occurred and resulted in death, it is not expected that it would have a detrimental effect on the overall population. Consequently, the potential consequence level from fauna strike is considered to be minor as this type of event may result in a localised, short-term impact to species of recognised conservation value but is not expected to affect the population or local ecosystem function.

Due to restricted area of operation and the slow speed of support vessels when operating in this area, if contact is made with species, the impact due to vessel strike is expected to be non-life threatening and the likelihood of vessel strike and associated severe injury or death of an individual is considered rare during these activities.

No impacts to marine fauna from vessel collisions have occurred to date during Longtom activities. Vessels involved in inspection, maintenance and repair activities will only be required for a short duration and will adhere to the Australian National Guidelines for Whale and Dolphin Watching 2017 where practicable. However, in considering the potential for mammals to be playful /interactive with slow moving vessels or vessels in DP mode and the possibility of seals being in the area, the likelihood of vessel interaction with mammals and associated severe injury or death of an individual is considered unlikely during these activities.

6.3.1.2 Risk Assessment

Table 6-14 outlines the risk assessment for vessel collisions with marine fauna.

Table 6-14 Vessel collisions with marine fauna risk assessment

Hazard duration	Intermittent for short durations during inspection, maintenance and repair activities.	
Extent of hazard	Localised (the immediate area around the vessel).	
Basis of Inherent Risk Assessment		
<ul style="list-style-type: none"> • There are no known critical feeding, aggregation, breeding or migration areas for cetaceans or other marine megafauna in the project area. • Vessel-based activities will be of short duration (approximately one week every 3 years). • Whilst engaged in petroleum activities (i.e. within the 500m zone) vessels will be operating at low speed (≤ 2 knots) / on DP. 		
Inherent risk analysis and ranking		
Consequence	Likelihood	Inherent Risk
Minor (2)	Unlikely (D)	Low
Project specific environmental controls and checks that will take place	<u>Prevention</u> Vessels will comply with the EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans (and Australian National Guidelines for Whale and Dolphin Watching 2017), where practicable.	
Residual risk analysis and ranking		
Consequence	Likelihood	Residual Risk
Minor (2)	Rare (E)	Low
Demonstration of ALARP		
<p>The key preventative control relating to vessel interaction with cetaceans is the adherence to the Regulations and Australian National Guidelines for Whale and Dolphin Watching. These Guidelines were developed jointly by all state and territory governments through the Natural Resource Management Ministerial Council and, although more relevant for tourism activities, provide a list of requirements that are generally adopted by the oil and gas industry to minimise the risk of cetacean strike occurring. The overall effectiveness of this control is considered high in preventing environmental impact. Note: Both the lack of visibility of seals in the water and number of seals in close proximity to oil and gas offshore installations make applicability of these guidelines to seals impracticable. Furthermore fauna interaction management actions as described in the guidelines will not prevent seals approaching / playing with vessels.</p> <p>This control, together with the inherent nature of the vessel activity (i.e. slow moving or stationary) is considered sufficient, suitably robust, independent and effective to ensure the residual risk is Low and ALARP.</p> <p>The following ALARP analysis confirms that all reasonable risk treatment options have been considered to reduce the environmental impact of vessel collision and the risk is deemed to be ALARP. There are no other feasible risk treatment options. A ‘Low’ residual risk ranking is broadly acceptable according to the SGHE definition of risk.</p>		
Eliminate	Not applicable. The use of vessels for these activities cannot be eliminated.	
Substitute	Not applicable.	
Engineering	Not adopted. Grates on vessel tunnel thrusters would prevent entrapment of marine mammals, in particular seals which are known to approach / play with vessels while stationary on DP. Smaller support vessels (such as those used to deploy ROVs) do not	

	<p>generally have grates on tunnel thrusters however it is more common for larger platform supply vessels or installation vessels.</p> <p>Adding grates to bow thrusters can significantly impact efficiency of vessels leading to increased fuel usage and air emissions, particularly for small vessels. Further, grates lead to increased potential for marine growth (which further reduces efficiency of thrusters).</p> <p>Retrofitting of grates to vessels requires dry docking at significant cost.**</p>
Isolation	The Guidelines describe strategies to ensure whales and dolphins are not harmed during offshore interactions with people including designation of 'no approach' and 'caution' zones.
Administrative	Cetacean vessel strike incidents will be reported in the National Ship Strike Database in accordance with relevant conservation management plans / advices (see Section 8.7.2 Incident Recording and Reporting)..
Protective	Not applicable.
Demonstration of Acceptability	
<p>The potential impacts of a vessel collision are expected to be localised, short term in nature and minor in consequence. The residual risk was assessed as Low.</p> <p>All legislative and other requirements have been met. The potential for vessel collision has been assessed and appropriate mitigation measures implemented such that the risk from the activity is considered low and will not be inconsistent with the actions in the Conservation Management Plans for the Southern Right and Blue whales and the Approved Conservation Advice for Humpback whales (DoE, 2015).</p> <p>The activity is consistent with SGHE policy and meets relevant management standards and procedures.</p> <p>There have been no concerns raised regarding vessel collision during stakeholder consultation. Given that the activity is not taking place within biologically important habitat and vessel-based activities will be infrequent and of short duration, this risk is considered acceptable.</p>	
Monitoring	
It will be noted in the daily report when cetaceans were sighted in the 'caution' zone and the interaction management actions implemented.	

** Bow thruster guards are not a mandatory requirement for vessels on this activity. However, where a vessel without thruster guards is planned to be used for the activity and is required to dry dock for IMS inspection or cleaning, the additional fitment of thruster guards shall be considered as part of the docking process. As part of this consideration, a risk assessment will be completed to consider additional hazards that could be introduced to the vessel (including failure of the thruster guard and ingestion into the thruster, or hull damage due to guard failure). With the agreement of the vessel owner and where the assessment shows that there is no additional risk, the opportunity will be taken to install bow thruster guards whilst the vessel is in dry dock.

6.3.2 Noise emissions

The following activities have the potential to create underwater noise:

- Vessel thrusters
- Helicopter movements (very unlikely / infrequent)
- Geophysical survey sources.

Vessels

The main source of underwater noise from a vessel is through the use of dynamic positioning (DP) thrusters to maintain position. McCauley (1998) measured underwater noise from a support vessel holding its position using bow-thrusters as 182 dB re 1µPa @ 1 m and 137 dB re 1µPa at 405 m. Levels of 120 dB re 1µPa extended for a distance of approximately 3 - 5 km from the source. Under normal conditions (i.e. when vessels are idling or moving between sites), source levels would be between 165 - 180 dB re 1 µPa @ 1 m (OSPAR 2009).

Helicopters

Strong underwater sounds are detectable for only brief periods when a helicopter is directly overhead (Richardson *et al.* 1995). Sound emitted from helicopter operations is typically below 500Hz and sound pressure in the water directly below a helicopter is greatest at the surface but diminishes quickly with depth. Richardson *et al.* (1985) reports that helicopter sound was audible in air for four minutes before it passed over underwater hydrophones, but detectable underwater for only 38 seconds at 3 m depth and 11 seconds at 18 m depth.

Geophysical Survey Sources

The geophysical sources proposed for the activity, include:

- Sub bottom profiler (SBP)
- Side scan sonar (SSS)
- Single/Multi beam echo sounder (SBES/MBES)

Source levels of equipment proposed for use are outlined in Table 6-15 below.

Table 6-15 Source levels of equipment proposed for use

Acoustic Noise Source	Frequency Range (kHz)	Estimated Peak Sound Pressure Level (SPL) (dB re 1µPa @ 1 m)	Estimated Sound Exposure Level (SEL) (dB re 1 µPa ² s @ 1 m)
SSS	120-410	226	Unknown
SBES/MBES	200-300	220	Unknown
SBP (CHIRP)	1-12	205	190
SBP (Pinger)	2-12	214	196
SBP (Boomer)	0.3-5	212	172
SBP/UHR (Sparker)	0.05-4	222	183.3

6.3.2.1 Description of Environmental Impacts

Generally elevated underwater noise can affect marine organisms in three main ways (Richardson *et al.* 1995; Simmonds *et al.* 2004):

- By causing direct physical effects (injury) on hearing or other organs (Permanent Threshold Shift (PTS))
- By masking or interfering with other biologically important sounds (including vocal communication, echolocation, signals and sounds produced by predators or prey)
- Through disturbance leading to behavioural changes.

Several marine mammals (e.g. whales, dolphins, seals) including those listed as either threatened and/or migratory under the EPBC Act have the potential to occur within the project area. The Pygmy blue whale has possible foraging habitat (DoEE, 2015) overlapping the project area. The key foraging areas for Pygmy blue whales are in the Bonney upwelling off Portland Victoria and canyons off Kangaroo Island in South Australia, which are more than 600 km to the west. Sightings have occurred in southeast Victoria from February to March, but are reasonably rare in the Gippsland Basin (Bannister *et al.*, 1996). For the Southern right whale, while the project area is within a distribution BIA, it does not intersect with known aggregation areas. The only recognised aggregation ground for Southern right whales in eastern Australia is Logan's Beach in Warrnambool (SEWPaC, 2012d), which is over 600 km to the west. Southern right whales migrate from southern feeding grounds to the Australian coastline in the winter months between May and November, to breed, mate and rest, with peak abundance in August. The project area does not overlap the migration corridor however Southern right whales may be migrating through the area in low numbers during winter months. Although the project area is located within the westernmost extent of the KEF; Upwelling East of Eden the project area is distant from recognised whale feeding or aggregation areas.

In the project area, the marine fauna most at risk from acoustic disturbance from vessels are cetaceans, particularly baleen whales (including Blue and Southern right whales), as the auditory bandwidth of these whales (ranging from 7 Hz to 22 kHz (Southall *et al.* 2007)) overlaps with the low frequency broadband noise produced by thrusters during vessel positioning and movement. Underwater noise levels from vessels are above 120 dB re 1 μ Pa, the currently accepted noise threshold, for non-impulsive or continuous sounds, above which avoidance and or behavioural changes commence (NMFS 2016), but well below the proposed injury criteria for low frequency cetaceans (estimated at 230 dB re 1 μ Pa) (Southall *et al.* 2007).

Effects of overflights on whales appear transient and are not known to have long-term impacts on them (NMFS, 2001). When helicopters are flying below 150 m, whales may react to noise by diving, but resume normal feeding activity within minutes.

Only the frequency range of the SBP overlaps the hearing range of the low frequency cetaceans, the baleen whales. The higher frequency source levels from the SSS and MBES are outside the auditory range for baleen whales. All proposed geophysical sources are below the 230 dB re 1 μ Pa (peak) PTS (injury criteria) threshold (Southall *et al.* 2007) so any impact from SBP will be limited to behavioural disturbance. The behavioural criteria used by NMFS (2016) for impulsive sounds is a threshold of 160 dB re 1 μ Pa.

To date, no studies modelling or measuring the noise discharged from geophysical surveys have been conducted. However, much work has been done of the noise attenuation from seismic surveys. The intensity of sound emitted during a seismic survey drops rapidly with increasing distance and depending on local conditions, and can be reduced to background intensity within a few tens of kilometres (APPEA, 2013). Since the source levels of geophysical surveys are much lower than that of a seismic survey (the typical SPL of a seismic airgun array is ~230 dB re 1 μ Pa @1m), it is expected that the intensity of sound levels from the geophysical survey will also decrease rapidly, reaching ambient levels quicker than that of a seismic survey (due to a lower source level). Furthermore, the geophysical sources have a directionally focused beam platform

which predominantly points downwards at the seafloor. Therefore, it is expected that the loss due to absorption and spread will increase with increasing horizontal distance. Furthermore, surveys will be of short duration (1 – 2 days) in any one location within the project area.

It is possible that maintenance activity will occur during the Pygmy blue whale foraging period and/or the Southern right whale migration period, however due to the lack of sightings within Bass Strait and in the vicinity of the project area this is uncertain. The project area is also outside the main migration route for the Humpback whale, therefore any behavioural response will be limited to individuals transiting the area.

The parts of the Southern right whale migration BIA adjacent to the project area do not include defined coastal migration corridors or bottlenecks resulting from physical and other barriers. (SEWPaC, 2012d). Although the area affected by sound levels may cause behavioural responses, Southern right whales will be able to move through or around the location without any obstacles.

Sound levels may cause a Pygmy blue whale (if present) to deviate from its path however as this area is not within a recognised feeding area of the BIA and is so small compared to the overall area of the foraging BIA, the impact is considered insignificant.

The noise produced during any infrequent inspection, maintenance or repair activities is expected to be similar to the already existing noise in Bass Strait associated with vessels servicing petroleum facilities as well as from commercial fishing and shipping operations. This noise has existed for the past fifty years since the first development of offshore petroleum production facilities in the Gippsland Basin.

Anecdotal evidence from ongoing ExxonMobil operations in the Bass Strait observes that pinnipeds (seals) congregate and rest on the legs of offshore facilities, and at times on the sea deck of platforms; they do not appear to be impacted by sound emissions from the platform or supply vessel operations.

Whales may be present in the project area, however the interaction will not occur in a biologically important habitat for whale species, defined as breeding, calving, or resting areas, or confined migratory routes or feeding areas (DEWHA, 2008). Although within a possible foraging area for the Pygmy blue whale and distribution BIA for the Southern right whale these behaviours do not typically involve individuals remaining in one location for extended periods of time. It is likely that whales will avoid the immediate area due to an aversive response to the sound and this aversion is relied upon as a form of mitigation to prevent whales from approaching or being approached closely enough to cause acoustic injury from intense or prolonged sound exposure (DEWHA, 2008). The potential impacts of underwater noise on marine mammals is expected to be localised, short term in nature and minimal in impact.

6.3.2.2 Risk Assessment

Table 6-16 outlines the risk assessment for underwater noise.

Table 6-16 Underwater noise risk assessment

Hazard duration	Intermittent for short durations during inspection, maintenance and repair
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	activities.	
Extent of hazard	Localised (vicinity of the vessels/ROV/helicopters).	
Basis of Inherent Risk Assessment		
<ul style="list-style-type: none"> • Vessel-based activities will be of short duration (approximately one week every 3 years). • Whilst engaged in petroleum activities (i.e. within the 500m zone) vessels will be stationary or slow moving. 		
Inherent risk analysis and ranking		
Consequence	Likelihood	Inherent Risk
Minor (2)	Unlikely (D)	Low
Project specific environmental controls and checks that will take place	<p><u>Prevention</u></p> <p>Vessels and helicopters will comply with the EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans (and Australian National Guidelines for Whale and Dolphin Watching 2017), where practicable.</p> <p>A 500 m ‘shutdown zone’ will be maintained around the SBP, SSS and MBES, consistent with EPBC Act Policy Statement 2.1 Interaction between offshore seismic exploration and whales: Industry guidelines.</p>	
Residual risk analysis and ranking		
Consequence	Likelihood	Residual Risk
Minor (2)	Rare (E)	Low
Demonstration of ALARP		
<p>The key preventative control relating to vessel and helicopter noise is the adherence to the Regulations and Australian National Guidelines for Whale and Dolphin Watching. These Guidelines were developed jointly by all state and territory governments through the Natural Resource Management Ministerial Council and, although more relevant for tourism activities, provide a list of requirements that are generally adopted by the oil and gas industry to minimise the risk of cetacean strike occurring, this also has the effect of ensuring distance from vessel propellers and helicopter rotor blades that cause sound emissions. The overall effectiveness of this control is considered high in preventing environmental impact. This control, together with the inherent nature of the vessel activity (i.e. slow moving or stationary) and helicopter activity (i.e. no take-off or landing) is considered sufficient, suitably robust, independent and effective to ensure the residual risks are Low and ALARP.</p> <p>The 500 m shutdown zone defined in the Policy Statement assumes that noise levels from a seismic survey will have reduced to levels below which PTS in cetaceans can occur within that distance. Since the noise emissions from geophysical survey sources are lower than those from a seismic survey, this is considered a highly conservative measure which reduces the residual risk to Low and ALARP.</p> <p>The following ALARP analysis confirms that all reasonable risk treatment options have been considered to reduce the environmental impact of noise emissions and the risk is deemed to be ALARP. There are no other feasible risk treatment options. A ‘Low’ residual risk ranking is broadly acceptable according to the SGHE definition of risk.</p>		
Eliminate	Not applicable. The use of vessels and helicopters for inspection, maintenance or repair activities cannot be eliminated.	
Substitute	Not applicable.	
Engineering	Not applicable.	
Isolation	<p>The Guidelines describe strategies to ensure whales and dolphins are not harmed during offshore interactions with people including designation of ‘no approach’ and ‘caution’ zones.</p> <p>The Policy Statement defines standards and procedures to ensure seismic surveys do not interfere with whales including designation of precaution zones.</p>	

Administrative	Not applicable.
Protective	Not applicable.
Demonstration of Acceptability	
<p>The potential impacts of underwater noise on marine mammals is expected to be localised, short term in nature and minimal in impact. The residual risk was assessed as Low.</p> <p>All legislative and other requirements have been met. The potential noise levels generated by this activity have been evaluated and will not be inconsistent with the Conservation Management Plan for the Southern Right Whale and the Conservation Management Plan for the Blue Whale, specifically Action 3 of Action Area A.2: Anthropogenic noise in biologically important areas will be managed such that any Blue whale continues to utilise the area without injury, and is not displaced from a foraging area.”</p> <p>The activity is consistent with SGHE policy and meets relevant management standards and procedures.</p> <p>Significant anthropogenic activities have occurred within Bass Strait for at least the last 40 years, including commercial fishing, commercial shipping and oil and gas development and any cetaceans passing through the project area will have already been exposed to similar interactions. There have been no concerns raised regarding noise emissions during stakeholder consultation. Given that the activity is not taking place within biologically important habitat and vessel-based maintenance activities will be infrequent and of short duration, this risk is considered acceptable.</p>	
Monitoring	
<p>It will be noted in the daily report and over-flight report when cetaceans were sighted in the caution zone and interaction management actions implemented.</p> <p>It will be noted in the daily report when during geophysical surveys the shutdown zone was implemented.</p>	

6.3.3 Light emissions

Deck floodlights and maritime navigational lighting, kept on 24 hours a day for maritime safety purposes (Part 30 (Prevention of Collisions) of the Marine Orders made under the *Navigation Act 2012*) will result in some light emission during maintenance, inspection and repair activities. Lighting will typically consist of bright white (i.e. metal halide, halogen, fluorescent) lights, and are not dissimilar to other offshore activities in the region, including other oil and gas facilities, fishing and shipping.

6.3.3.1 Description of Environmental Impacts

Seabirds may be attracted to vessels at night due to the light glow. Bright lighting can disorientate birds, thereby increasing the likelihood of seabird injury or mortality through collision with facilities / infrastructure, or mortality from starvation due to disrupted foraging at sea (Wiese *et al.* 2001 in SEWPaC, 2011g). Bright lights can also impact on migrating birds.

Nesting birds may be disorientated where lighting is adjacent to rookeries. This is evident in young fledglings leaving breeding colonies for the first time, in particular Wedge-tailed shearwaters. Light pollution is a particular issue for Wedge-tailed shearwaters due to their nocturnal habits.

Other marine life may also be attracted to the vessels as a result of an attraction to light sources by prey items (e.g. worms, squid, plankton) that can aggregate directly under downward facing lights.

Whilst marine turtles may occur within the project area, there are no identified BIAs or nesting sites for marine turtles and therefore there is likely to be no impact to turtles from artificial light associated with the inspection, maintenance and repair activities.

There is no evidence to suggest that artificial light sources adversely affect the migratory, feeding or breeding behaviours of cetaceans. Cetaceans predominantly utilise acoustic senses to monitor their environment rather than visual sources (Simmonds *et al.*, 2004) so light is not considered to be a significant factor in cetacean behaviour or survival.

6.3.3.2 Risk Assessment

Table 6-17 outlines the risk assessment for lighting.

Table 6-17 Lighting inherent risk assessment

Hazard duration	During inspection, maintenance and repair activities (short-term).	
Extent of hazard	Localised (significant light glow not visible beyond several kilometres).	
Basis of Inherent Risk Assessment		
<ul style="list-style-type: none"> • The project area is located 30 km from shore and not near any sensitive seabird nesting grounds. • There are no turtle rookeries in Bass Strait. • Vessel-based activities will be of short duration (approximately one week in every 3 years). 		
Inherent risk analysis and ranking		
Consequence	Likelihood	Inherent Risk
Insignificant (1)	Unlikely (D)	Low
Project specific environmental controls and checks that will take place	<u>Prevention</u> <ul style="list-style-type: none"> • Not applicable <u>Mitigation</u> <ul style="list-style-type: none"> • Lighting will be limited to that required for safe work and navigation. 	
Residual risk analysis and ranking		
Consequence	Likelihood	Residual Risk
Insignificant (1)	Rare (E)	Low
Demonstration of ALARP		
<p>Although there are no guidelines for minimising lighting emissions, an environmental inspection can ensure that excessive lighting (not required for safety purposes) is minimised to reduce lighting exposure. Given the nature and scale of the activity and the low inherent consequence and risk this control is considered sufficiently effective to ensure the residual risk is Low and ALARP.</p> <p>The following ALARP analysis confirms that all reasonable risk treatment options have been considered to reduce the environmental impact of atmospheric emissions, and the risk is deemed to be ALARP. A 'Low' residual risk ranking is broadly acceptable according to the SGHE definition of risk.</p>		
Eliminate	The use of navigational lights and other lights to enable 24 hour operations to be undertaken cannot be eliminated.	

Substitute	Not applicable
Engineering	Not applicable
Isolation	The project area is located 30 km from shore, most significant impacts are associated with operating within close proximity of shorelines that support light sensitive species.
Administrative	Inspection ensures that excessive lighting not required for safety purposes is minimised.
Protective	Not applicable
Demonstration of Acceptability	
<p>The potential impacts of light emissions from a vessel within the project area are localised and short term in nature and insignificant in consequence. The residual risk was assessed as Low. There are numerous other permanent oil and gas installations in Bass Strait (20 production facilities) which generate light emissions. Commercial fishing activities and merchant vessels also use similar navigational lights or other lighting for safety purposes. There have been no indications to date of any significant impact on the environment from such activities in Bass Strait.</p> <p>All legislative and other requirements have been met and the activity is consistent with SGHE policy and meets relevant management standards and procedures.</p> <p>There have been no concerns raised during the consultation process regarding light emissions. Given that the project is located 30 km offshore and that vessel operations are infrequent and of short duration, this risk is considered acceptable.</p>	
Monitoring	
Inspection to confirm excessive lighting is minimised noted on pre-vessel inspection and/or in daily reports.	

6.3.4 Atmospheric emissions

The combustion of fossil fuels in vessel engines and on-board power generators will contribute to exhaust emissions including the generation of greenhouse gas (CO₂).

6.3.4.1 Description of Environmental Impacts

The use of fuel (specifically marine diesel) to power vessels and generators will result in gaseous emissions of greenhouse gases (GHG) such as carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O), along with non-GHG such as sulphur oxides (SOx) and nitrous oxides (NOx).

While these emissions add to the GHG load in the atmosphere, which adds to global warming potential, they are relatively small on a global scale, and temporary, representing an insignificant contribution to overall GHG emissions. Any exposure from the short duration vessel activity would be expected to be insignificant therefore no further evaluation has been undertaken.

The emission of non-GHG gases, such as NOx and SOx, can lead to a reduction in local air quality. The combustion of fuels in such a remote locality will not impact on the nearest coastal settlements, and is not out of the ordinary with other industrial combustion processes occurring at the oil and gas platforms of Bass Strait and their onshore processing facilities (e.g. the Patricia Baleen Gas Plant and Longford Plants oil and gas processing facility) or from commercial fishing and shipping activities. Offshore winds will disperse and dilute any gaseous emissions.

6.3.4.2 Risk Assessment

Table 6-18 outlines the risk assessment for atmospheric emissions.

Table 6-18 Atmospheric emissions risk assessment

Hazard duration	During inspection, maintenance and repair activities (short-term).	
Extent of hazard	Localised (local air shed).	
Basis of Inherent Risk Assessment		
<ul style="list-style-type: none"> • Use of Marine Diesel Oil (MDO) which has low sulphur content, hence minimising the generation of SOx. • Engines are maintained in accordance with the planned maintenance system (PMS) to ensure operation at maximum efficiency. • Vessel-based activities will be of short duration (approximately one week every 3 years). 		
Inherent risk analysis and ranking		
Consequence	Likelihood	Inherent Risk
Insignificant (1)	Unlikely (D)	Low
Project specific environmental controls and checks that will take place	<u>Prevention</u> <ul style="list-style-type: none"> • Not applicable <u>Mitigation</u> <ul style="list-style-type: none"> • Vessels will be required to comply with MARPOL Annex VI which requires (as appropriate to vessel class) a valid International Air Pollution Prevention (IAPP) Certificate and one Engine International Air Pollution Prevention (EIAPP) certificate for each diesel engine of ≥ 130 kW – effectiveness considered Moderate. 	
Residual risk analysis and ranking		
Consequence	Likelihood	Residual Risk
Insignificant (1)	Rare (E)	Low
Demonstration of ALARP		
<p>The key control is compliance with MARPOL Annex VI requirements, and this will ensure that emissions to air from fuel combustion are managed and treated to minimise environmental impact. Given the nature and scale of the activity and the low inherent consequence and risk this control is considered sufficiently effective to ensure the residual risk is Low and ALARP.</p> <p>The following ALARP analysis confirms that all reasonable risk treatment options have been considered to reduce the environmental impact of atmospheric emissions, and the risk is deemed to be ALARP. A 'Low' residual risk ranking is broadly acceptable according to the SGHE definition of risk.</p>		
Eliminate	The generation of air emissions from fuel combustion cannot be eliminated. Emissions will be as permitted under MARPOL Annex VI.	
Substitute	Low sulphur fuels will be utilised.	
Engineering	Engines are maintained in accordance with the planned maintenance system (PMS) to ensure operation at maximum efficiency.	
Isolation	The project area is located 30 km from shore.	
Administrative	Vessels will hold International Air Pollution Prevention (IAPP) Certificate and one Engine International Air Pollution Prevention (EIAPP) certificate for each diesel engine of ≥ 130 kW, as applicable.	
Protective	Not applicable.	

Demonstration of Acceptability
<p>In order to ensure marine pollution is kept to acceptable levels, offshore petroleum operations are required to comply with MARPOL. Offshore winds will disperse and dilute any gaseous emissions. The consequence of these emissions is expected to be insignificant and the residual risk assessed as Low.</p> <p>The combustion of fuels in such a remote locality will not impact on the nearest coastal settlements, and is not out of the ordinary with other industrial combustion processes occurring at the oil and gas platforms of Bass Strait and their onshore processing facilities or from commercial fishing and shipping activities.</p> <p>There have been no concerns raised during any consultation regarding atmospheric emissions. Given that the project is located some 40 km offshore and that vessel operations are of a short duration, the risk is considered acceptable.</p>
Monitoring
<p>Bunker receipts confirm low sulphur diesel used and fuel consumption included as line item on daily report.</p>

6.3.5 Discharge of sewage and grey water

Vessel activities will result in the discharge of sewage and grey water from the ablution and laundry facilities.

6.3.5.1 Description of Environmental Impacts

Sewage can contain hazardous pathogens and if released untreated to the marine environment, may cause contamination to the food chain. Similarly, grey water can contain a wide variety of pollutant substances at different strengths.

All maintenance vessels will come equipped with MARPOL-compliant sewage treatment systems and holding tanks, which will be confirmed during contract negotiations and pre mobilisation audits. For vessels without sewage treatment systems, they must have holding tanks that are capable of discharging their waste via port facilities.

The discharge of treated sewage will temporarily add to the nutrient load (particularly nitrogen and phosphorus) of the surrounding waters immediately around the vessels, though the discharge stream will be rapidly diluted and dispersed by currents.

The biological oxygen demand (BOD) of the treated effluent is unlikely to lead to oxygen depletion of the receiving waters (Black *et al.*, 1994), as it will be treated prior to release. Surface currents will also assist with oxygenation of the discharge once it is released. Given this high dilution and dispersal, low volumes and short discharge period, the risk of sewage and grey water having a significant impact on the marine environment is low.

6.3.5.2 Risk Assessment

Table 6-19 outlines the risk assessment for sewage and grey water discharges.

Table 6-19 Sewage and grey water risk assessment

Hazard duration	During inspection, maintenance and repair activities (short-term).	
Extent of hazard	Expected to be largely localised (50 m radius from the vessel, top 10 m of water column).	
Basis of Inherent Risk Assessment		
<ul style="list-style-type: none"> • MARPOL-approved sewage treatment plant (STP) fitted to vessels. • The Longtom facilities are located in approximately 57 m of water and 40 km offshore in a relatively high energy environment (current and waves) – sewage and grey water will be rapidly dispersed. • There are no known sensitive environments in the project area. • Vessel-based activities will be of short duration (approximately one week every 3 years). • There will be no discharge of sewage within 12 nm of any coastline. 		
Inherent risk analysis and ranking		
Consequence	Likelihood	Inherent impact
Insignificant (1)	Unlikely (D)	Low
Project specific environmental controls and checks that will take place	<u>Prevention</u> <ul style="list-style-type: none"> • Not applicable <u>Mitigation</u> <ul style="list-style-type: none"> • Vessels comply with MARPOL Annex IV which requires a valid International Sewage Pollution Prevention Certificate – effectiveness considered Moderate. 	
Residual risk analysis and ranking		
Consequence	Likelihood	Residual Impact
Insignificant (1)	Rare (E)	Low
Demonstration of ALARP		
<p>The key control is compliance with MARPOL Annex IV requirements and this will ensure that any sewage discharge is managed and treated to minimise environmental impact. Given the nature and scale of the activity and the low inherent consequence and risk this control is considered sufficiently effective to ensure the residual risk is Low and ALARP.</p> <p>The following ALARP analysis confirms that all reasonable risk treatment options have been considered to reduce the environmental impact of sewage and grey water, and the risk is deemed to be ALARP. A 'Low' residual risk ranking is broadly acceptable according to the SGHE definition of risk.</p>		
Eliminate	The generation of sewage and grey water by personnel on the vessel cannot be eliminated. This discharge is permitted under MARPOL Annex IV and is consistent with industry codes and standards.	
Substitute	Not applicable	
Engineering	STPs will be installed on the vessels. Bacteria in the waste stream will be killed in the treatment process, reducing the risk of sewage discharge overboard to ALARP.	
Isolation	The alternative to the treatment and discharge of sewage offshore would require the storage and transfer of sewage to shore for disposal. Typical offshore vessels are not designed to store sewage and grey water for extended durations and to do so would introduce a health and safety hazard to crew. Transfer to shore for treatment is not viable given the health and safety hazards associated with storage, transfer and disposal. This would involve undue logistics effort and costs given the minor impact of its offshore discharge. On this basis, the only viable option is to treat the sewage and discharge offshore.	

Administrative	Not applicable.
Protective	Not applicable.
Demonstration of Acceptability	
<p>In order to ensure marine pollution is kept to acceptable levels, offshore petroleum operations are required to comply with MARPOL. The ocean currents and depth of the operations will cause any increase in nutrient loading to be dispersed quickly through the water column.</p> <p>There are numerous other oil and gas developments in Bass Strait (20 production facilities) which generate sewage and grey water. Commercial fishing activities and merchant vessels also discharge sewage and grey water. There have been no indications to date of any significant impact on the environment from such activities in Bass Strait.</p> <p>All legislative and other requirements have been met and the activity is consistent with SGHE policy and meets relevant management standards and procedures.</p> <p>There have been no concerns raised during any consultation regarding sewage and grey water discharges.</p> <p>Given that the project is located some 40 km offshore in a high energy environment, and that vessel operations are of a short duration, this risk is considered acceptable.</p>	
Monitoring	
<p>The availability of the Sewage Treatment Plant will be checked daily during offshore campaigns, included as a line item on the daily report and will be recorded and included in the annual EP Compliance Report.</p>	

6.3.6 Discharge of putrescible waste

The generation of food waste from the galley during the inspection, maintenance and repair activities is likely to result in the discharge of putrescible waste to the ocean:

6.3.6.1 Description of Environmental Impacts

Food scraps generated in the galleys of the vessels will be macerated and discharged overboard. The overboard discharge of macerated food wastes results in a localised and temporary increase in the nutrient load of the surface waters. This may in turn act as a food source for scavenging marine fauna or seabirds, whose numbers will temporarily increase as a result. However, the rapid consumption of this food waste by scavenging fauna, and physical and microbial breakdown, ensures that the impacts of putrescible waste discharges are insignificant. In accordance with industry best practice, no food wasted of any type, ground or unground will be discharged from vessels within 12 nautical miles of land.

There are no nearby sensitive environments or biological communities that are at risk from the discharge of putrescibles wastes.

6.3.6.2 Risk Assessment

Table 6-20 outlines the risk assessment for putrescible waste discharges.

Table 6-20 Putrescible waste discharge risk assessment

Hazard duration	During inspection, maintenance and repair activities (short-term).
Extent of hazard	Localised (50 m radius from the vessel, top 10 m of water column).
Basis of Inherent Risk Assessment	

<ul style="list-style-type: none"> The Longtom facilities are located in approximately 57 m of water and 40 km offshore in a relatively high energy environment (current and waves). This will lead to rapid dispersion. There are no known sensitive environments or biological communities in the project area. Vessel-based activities will be of short duration (approximately one week in every 3 years). 		
Inherent risk analysis and ranking		
Consequence	Likelihood	Inherent impact
Insignificant (1)	Unlikely (D)	Low
Project specific environmental controls and checks that will take place	<p><u>Prevention</u></p> <ul style="list-style-type: none"> Vessels will comply with MARPOL Annex IV and V. Macerated food waste will not be discharged overboard within 12 nm of any coastline. Cooking oils and greases will be collected in containers and transported back to shore for disposal. All non-food galley wastes (e.g., packaging) will be transported back to shore for recycling or disposal. <p><u>Mitigation</u></p> <p>The galley macerator will macerate food scraps to a diameter of less than 25 mm before being disposed of overboard, in compliance with MARPOL Annexes IV and V. If the macerator fails, all food waste will be bagged and sent ashore for disposal.</p>	
Residual risk analysis and ranking		
Consequence	Likelihood	Residual Risk
Insignificant (1)	Rare (E)	Low
Demonstration of ALARP		
<p>The key control is compliance with MARPOL Annex IV and V requirements and this will ensure that any putrescibles wastes are managed and treated to minimise environmental impact. Given the low inherent consequence and risk this control is considered sufficiently effective to ensure the residual risk is Low and ALARP.</p> <p>The following ALARP analysis confirms that all reasonable risk treatment options have been considered to reduce the environmental impact of putrescible waste, and the risk is deemed to be ALARP. A 'Low' residual risk ranking is broadly acceptable according to the SGHE definition of risk.</p>		
Eliminate	The generation of putrescible waste by personnel cannot be eliminated. This discharge is permitted under MARPOL Annex V.	
Substitute	The substitute to discharging putrescible waste at location is to bag it and back-load for onshore disposal. This presents unacceptable health and hygiene for crews and onshore disposers due to rapid decomposition of organic matter in hot environments. This would also introduce a potential requirement for additional supply vessels to visit the offshore location, to back load the waste for disposal, thus introducing additional environmental risks during the campaign.	
Engineering	A MARPOL Annex V-compliant macerator is or will be installed on the vessels.	
Isolation	The project area is located > 12 nm from shore.	
Administrative	Not applicable.	
Protective	Regardless of the distance from shore, all food waste will be macerated prior to discharge. The macerators will be maintained in accordance with the PMS. In the event of macerator failure, all food waste will be bagged and shipped to shore for disposal.	
Demonstration of Acceptability		
In order to ensure marine pollution is kept to acceptable levels, offshore petroleum operations are		

<p>required to comply with MARPOL. The vessel will be required to have a macerator certified to MARPOL requirements. The ocean currents and depth of the operations will cause any increases in nutrient loading to be dispersed quickly through the water column.</p> <p>There are numerous other oil and gas developments in Bass Strait (20 production facilities) which generate putrescibles waste. Commercial fishing activities and merchant vessels also discharge putrescibles waste.</p> <p>All legislative and other requirements have been met and the activity is consistent with SGHE policy and meets relevant management standards and procedures.</p> <p>There have been no concerns raised during consultation regarding discharge of putrescible wastes.</p> <p>The risk of food/galley wastes having a significant negative impact on the marine environment is low. Given that the project is located some 40 km offshore in a relatively high energy environment, and that vessel operations are of a short duration, this risk is considered acceptable.</p>
<p>Monitoring</p>
<p>The availability of the macerator will be checked daily during offshore campaigns, included as a line item on the daily report and will be recorded and included in the annual EP Compliance Report.</p>

6.3.7 Discharge of contaminated deck/bilge water

The following activities have the potential to result in the discharge of contaminated deck or bilge water to the ocean:

- Deck washing, ocean spray (green water) and rain water that captures minor contaminants such as oil, grease and detergents on the deck prior to draining overboard.
- Malfunction of the oily water separator.

6.3.7.1 Description of Environmental Impacts

Chemicals discharged to the marine environment have the potential to temporarily reduce water quality and cause physiological damage to marine fauna that may ingest these chemicals or absorb them through their skin. The greatest risk at the project location will be to plankton and pelagic fish, given the absence of other habitat types in the project area. Given the very small volumes of such chemicals or hydrocarbons (oil, grease) that may be accidentally discharged overboard and the temporary presence of the vessels, it is not expected that marine fauna will be exposed to chemicals or hydrocarbons in quantities that would induce acute or chronic toxicity impacts.

Generally, drainage on most vessels is handled in the following manner:

- **Uncontaminated deck rainwater:** Directed overboard via open drains.
- **Main deck and hull machinery space:** Drains routed to waste water tank, then pumped to waste oil settling tank. Oil and water are separated, with the skimmer collecting oily residue, directed to a waste oil tank and sent ashore for disposal. Cleaned water is discharged overboard and continuously monitored by an oily-water monitor, ensuring no discharge over 15 ppm. Spills are mopped up.
- **Fuel transfer point:** Bunded area, drains blocked with scupper plugs, spills cleaned using absorbent materials. Note there will be no offshore refuelling and hence this source is not applicable to this EP.

6.3.7.2 Risk Assessment

Table 6-21 outlines the risk assessment for contaminated deck/bilge water.

Table 6-21 Contaminated deck/bilge water risk assessment

Hazard duration	During inspection, maintenance and repair activities (short-term).	
Extent of hazard	Localised.	
Basis of Inherent Risk Assessment		
<ul style="list-style-type: none"> The Longtom facilities are located in approximately 57 m of water and 40 km offshore in a relatively high energy environment (current and waves). This will lead to rapid dispersion. There are no sensitive environments or biological communities in the project area. Vessel-based activities will be of short duration (approximately one week in every 3 years). Vessels will comply with MARPOL Annex I and have an International Oil Pollution Prevention Certificates and accepted SOPEP. 		
Inherent risk analysis and ranking		
Consequence	Likelihood	Inherent Risk
Insignificant (1)	Moderate (C)	Low
Project specific environmental controls and checks that will take place	<u>Prevention</u> <ul style="list-style-type: none"> Vessels will comply with MARPOL Annex I and have an International Oil Pollution Prevention Certificates and accepted SOPEP – effectiveness considered High. Hydrocarbon and chemical storage areas are bunded and chemicals are stored in chemical storage lockers – effectiveness considered moderate. Areas where spills could occur are drained to a bilge tank and discharged via an oily water separator. Discharges are monitored via an oil in water meter and no discharge of >15 ppm oil in water is allowed. Fixed and mobile equipment is maintained in accordance with the PMS – effectiveness considered moderate. 	
	<u>Mitigation</u> <ul style="list-style-type: none"> SOPEP including. <ul style="list-style-type: none"> Vessel crew regularly undertake spill response training drills. Spills to deck will be cleaned up immediately using SOPEP kits. SOPEP kits will be stored in various locations around the vessel and will be maintained fully stocked. Scupper plugs will be readily available for use in the event of a deck spill to prevent contaminants draining directly overboard. Effectiveness considered moderate	
Residual risk analysis and ranking		
Consequence	Likelihood	Residual Risk
Insignificant (1)	Unlikely (D)	Low
Demonstration of ALARP		

<p>The key preventative controls are vessel in compliance with MARPOL Annex I, vessel to have, an International Oil Pollution Prevention Certificates and an accepted SOPEP. These controls, checked as part of the pre-mobilisation audit will ensure that the vessel is designed, managed and operated to minimise environmental impact. In addition the SOPEP and associated equipment and procedures will ensure that in the event of any spill it will be treated and captured to minimise the impact. Given the low inherent consequence and risk these controls are considered sufficiently effective to ensure the residual risk is Low and ALARP.</p> <p>The following ALARP analysis confirms that all reasonable risk treatment options have been considered to reduce the environmental impact of contaminated deck/bilge water, and the risk is deemed to be ALARP. No further reasonable mitigation measures exist. A 'Low' residual risk ranking is broadly acceptable according to the SGHE definition of risk.</p>	
Eliminate	The elimination of chemicals, oils, fuels and lubricants etc is not possible due the need to maintain safe operations. However, the chemicals and volumes stored on board should be managed and are expected to be relatively minor.
Substitute	Not applicable
Engineering	Engineering control in place such as the installation of a MARPOL-compliant oily water system on the vessels.
Isolation	Spills on decks are isolated through the use scupper plugs and SOPEP materials, such as absorbent 'sausages' and 'kitty litter'. Spills from fixed equipment, such as engines and generators, are enclosed and spills captured via bilges that drain via the oily water separator. Mobile equipment or chemicals will be stored and handled within temporary bunding.
Administrative	The vessels will have current and valid International Oil Pollution Prevention Certificates. Spill drills will be regularly undertaken by the vessel crew.
Protective	Fixed and mobile equipment is maintained in accordance with the PMS.
Demonstration of Acceptability	
<p>In order to ensure marine pollution is kept to acceptable levels, vessels must meet their MARPOL international and class requirements. Bass Strait currently has over 20 oil and gas production platforms and these have associated support vessels that also generate deck / bilge discharges. There have been no indications to date of any significant impact on the environment from such activities.</p> <p>All legislative and other requirements have been met and the activity is consistent with SGHE policy and meets relevant management standards and procedures.</p> <p>There have been no concerns raised during consultation regarding discharge of putrescible wastes.</p> <p>No significant environmental impacts are expected from the occasional release of contaminated deck /bilge water given the low level of contamination, low volumes and large dilution effects when entering the marine environment. This risk is therefore considered acceptable.</p>	
Monitoring	
<p>The availability of the oily water analyser will be checked daily during offshore campaigns, included as a line item on the daily report and will be recorded and included in the annual EP Compliance Report.</p>	

6.3.8 Discharge of non-hazardous waste

The following non-hazardous wastes have the potential to be deposited overboard or disposed of inappropriately:

- Paper and cardboard.
- Wooden pallets.
- Scrap steel, metal, aluminium and cans.
- Bottles and glass.
- Plastics.
- Rope.

Domestic sewage and food waste are addressed separately (discussed in Sections 6.3.5 and 6.3.6 respectively).

6.3.8.1 Description of Environmental Impacts

If accidentally discharged overboard (i.e., dropped object, storm that results in goods rolling off the deck, wind that blows rubbish overboard), solid wastes can injure or kill fish or marine birds through ingestion or contact (e.g. high-order fish mistaking plastics for jellyfish, rope getting caught around the necks of turtles and seabirds). It could also wash ashore contributing to shoreline litter.

6.3.8.2 Risk Assessment

Table 6-22 outlines the risk assessment for non-hazardous wastes.

Table 6-22 Non-hazardous waste discharge risk assessment

Hazard duration	Short to medium (litter may be present for many months).	
Extent of hazard	Localised (seabed near vessel) to far-reaching (ocean current-driven waste or windblown litter).	
Basis of Inherent Risk Assessment		
<ul style="list-style-type: none"> • No waste (other than sewage and putrescibles wastes) is planned to be discharged offshore. • The Longtom facilities are located in approximately 57 m of water and 40 km offshore in a relatively high energy environment (current and waves). This will lead to rapid dispersion. • There are no sensitive environments or biological communities in the project area. • Vessel-based activities will be of short duration (approximately one week in every 3 years). 		
Inherent risk analysis and ranking		
Consequence	Likelihood	Inherent Risk
Insignificant (1)	Moderate (C)	Low
Project specific environmental controls and checks that will take place	<u>Prevention</u> <ul style="list-style-type: none"> • Vessels will be required to comply with MARPOL Annex V (Garbage Certificate of Compliance) – effectiveness considered High. • The vessel will implement a Waste Management Plan, which at a minimum will specify: 	

	<ul style="list-style-type: none"> - The responsibilities of the Vessel Master, Offshore Manager, Waste Coordinator and crew with regard to waste management. - Waste will be segregated according to recyclability (e.g. timber, plastic, glass, cardboard, steel, batteries, fluorescent tubes). - Waste segregation units (bins, drums, sacks or skips) must be used, and must be fully secured, watertight, undamaged and rust-free, stored in a vertical position, and clearly labelled. Lids must be kept on at all times to prevent wind-blown debris from escaping, and liquid waste must be stored in drip trays. - Waste must be disposed of via a supply vessel only. - Waste Transfer Notes must be maintained. - A Garbage Record Book must be maintained (by the vessel). <p>Effectiveness considered High.</p> <p><u>Mitigation</u> An ROV survey of the seabed will check for (and retrieve) dropped objects following a construction campaign – effectiveness considered Moderate.</p>
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Residual risk analysis and ranking

Consequence	Likelihood	Residual Risk
Insignificant (1)	Unlikely (D)	Low

Demonstration of ALARP

The key preventative controls are vessel in compliance with MARPOL Annex V (Garbage Certificate of Compliance) and a Waste Management Plan. These will ensure that wastes are managed and treated to minimise environmental impact. In addition the ROV survey will ensure that any waste ending up on the sea bed is identified and where practicable removed to minimise the impact. Given the low inherent consequence and risk this control is considered sufficiently effective to ensure the residual risk is Low and ALARP.

The following ALARP analysis confirms that all reasonable risk treatment options have been considered to reduce the environmental impact of non-hazardous waste, and the risk is deemed to be **ALARP**. No further reasonable mitigation measures exist. A 'Low' residual risk ranking is **broadly acceptable** according to the SGHE definition of risk.

Eliminate	The elimination of consumable products onboard the vessel is not possible – waste will be generated. Any unused project consumables will be returned to suppliers or store for future use.
Substitute	Not applicable.
Engineering	Not applicable.
Isolation	Waste will be stored in suitable receptacles to minimise the potential for accidental loss overboard.
Administrative	Waste management and housekeeping.
Protective	Not applicable

Demonstration of Acceptability

Vessels must meet the requirements of MARPOL and their waste management plan. Non-hazardous wastes will not be discharged overboard. All waste will be transferred onshore. Oil and Gas supply vessels, merchant shipping and commercial fishing activities take place in Bass Strait and these could all potentially discharge waste to the marine environment, their

<p>activities are all currently accepted by the community.</p> <p>All legislative and other requirements have been met and the activity is consistent with SGHE policy and meets relevant management standards and procedures.</p> <p>No concerns have been raised to SGHE regarding inappropriate waste disposal during the consultation process.</p> <p>The risk to the environment from non-hazardous waste is low and considered to be acceptable, given the high energy environment, water depth and short duration of the activities.</p>
<p>Monitoring</p>
<p>Weight/volume of the various waste streams is measured, recorded and reported by the Logistics Coordinator in the waste manifest and daily logs.</p>

6.3.9 Discharge of hazardous waste

The following hazardous wastes may be generated through the use of consumable products on board the vessels and could be accidentally discharged overboard or disposed of inappropriately:

- Chemicals (e.g., biocides, corrosion inhibitors and hydrocarbon-based materials (e.g., pipe dope, lubricating oils)).
- Hydrocarbon-contaminated materials (e.g., oily rags, oil filters).
- Batteries, empty paint cans, aerosol cans, fluorescent tubes, printer cartridges.
- Acids and solvents.

6.3.9.1 Description of Environmental Impacts

Hazardous wastes accidentally released to the ocean causes pollution and contamination, with either direct or indirect effects on marine organisms. For example, chemical spills can impact on pelagic fish communities, causing physical damage through ingestion or absorption through the skin. These impacts would be temporary and small in scale if a chemical discharge was to occur.

Other solid items of wastes, such as paint cans containing paint residue, batteries and so forth, will settle on the seabed and over time, will result in the leaching of hazardous materials to the seabed, which is likely to result in a small area of substrate becoming toxic and unsuitable for colonisation by benthic fauna.

6.3.9.2 Risk Assessment

Table 6-23 outlines the risk assessment for hazardous wastes.

Table 6-23 Hazardous waste discharge risk assessment

Hazard duration	Short to medium (litter may be present for many months).
Extent of hazard	Localised (seabed near the vessel) to far-reaching (ocean current-driven waste or windblown litter).
Basis of Inherent Risk Assessment	
<ul style="list-style-type: none"> • No waste (other than sewage and putrescibles wastes) is planned to be discharged offshore. • The Longtom facilities are located in approximately 57 m of water and 40 km offshore in a relatively high energy environment (current and waves). This will lead to rapid dispersion. • There are no sensitive environments or biological communities in the project area. 	

<ul style="list-style-type: none"> Vessel-based activities will be of short duration (approximately one week in every 3 years). 		
Inherent risk analysis and ranking		
Consequence	Likelihood	Inherent Risk
Insignificant (1)	Moderate (C)	Low
Project specific environmental controls and checks that will take place	<p><u>Prevention</u></p> <ul style="list-style-type: none"> Vessels will be required to comply with MARPOL Annex V and hold an International Convention for the Prevention of Pollution from Ships Certificate – effectiveness considered High. Chemical drums and dry bagged chemicals will be stored in bunded areas– effectiveness considered Moderate. The vessel will implement a Waste Management Plan – effectiveness considered Moderate, which at a minimum will specify: <ul style="list-style-type: none"> The responsibilities of the Vessel Master, Offshore Manager, Waste Coordinator and crew with regard to waste management. Waste will be segregated according to recyclability (e.g., batteries, used oil filters, fluorescent tubes). Waste segregation units (bins, drums, sacks or skips) must be used, and must be fully secured, watertight, undamaged and rust-free, stored in a vertical position, and clearly labelled. Lids must be kept on at all times to prevent wind-blown debris from escaping, and liquid waste must be stored in drip trays. Waste Transfer Notes must be maintained. A Garbage Record Book must be maintained (by the vessel). <p><u>Mitigation</u></p> <ul style="list-style-type: none"> SOPEP response kits are located throughout the vessel in appropriate locations (e.g., sack room, main deck, refuelling station) and well stocked – effectiveness considered Moderate. An ROV survey of the seabed will check for (and retrieve) dropped objects – effectiveness considered Moderate. 	
	Residual risk analysis and ranking	
Consequence	Likelihood	Residual Risk
Insignificant (1)	Unlikely (D)	Low
Demonstration of ALARP		
<p>The key preventative controls are vessel in compliance with MARPOL Annex V, vessel to have an International Convention for the Prevention of Pollution from Ships Certificate and a Waste Management Plan. These will ensure that wastes are managed and treated to minimise environmental impact. In addition the SOPEP and ROV survey will ensure that any waste is contained, identified and where practicable removed to minimise the impact. Given the low inherent consequence and risk these controls are considered sufficiently effective, robust and independent to ensure the residual risk is Low and ALARP.</p> <p>The following ALARP analysis confirms that all reasonable risk treatment options have been considered to reduce the environmental impact of hazardous waste, and the risk is deemed to be ALARP. No further reasonable mitigation measures exist. A ‘Low’ residual risk ranking is broadly acceptable according to the SGHE definition of risk.</p>		
Eliminate	The elimination of consumable products onboard the vessel is not possible – waste will be generated. Any unused project consumables will be returned to suppliers or store for future use.	
Substitute	Some substances only become hazardous when inappropriately disposed of (such as batteries, fluorescent light tubes), and the use of these items cannot	

	be substituted (e.g. light fittings throughout the vessel would need to be switched to alternative lighting methods, which is not commensurate with the low risk of these use of these materials).
Engineering	Not applicable.
Isolation	Waste will be stored in suitable receptacles to minimise the potential for accidental loss overboard.
Administrative	Waste management and housekeeping.
Protective	Not applicable
Demonstration of Acceptability	
<p>In order to ensure marine pollution is kept to acceptable levels, vessels must meet the requirements of their waste management plan. Hazardous wastes will not be discharged overboard. All waste will be transferred onshore.</p> <p>Oil and Gas supply vessels, merchant shipping and commercial fishing activities take place in Bass Strait and these could all potentially discharge waste to the marine environment, their activities are all currently accepted by the community.</p> <p>All legislative and other requirements have been met and the activity is consistent with SGHE policy and meets relevant management standards and procedures.</p> <p>No concerns have been raised to SGHE regarding inappropriate waste disposal during the consultation process.</p> <p>The risk to the environment from hazardous waste is low and considered to be acceptable, given the nature and scale of the activities.</p>	
Monitoring	
Weight/volume of the various waste streams is measured, recorded and reported by the Logistics Coordinator in the waste manifest and daily logs.	

6.3.10 Discharge of cooling and brine water

Seawater is used as a heat exchange medium for cooling machinery engines and vessel activities will result in a discharge of warm sea water to the environment.

Brine water (hypersaline water) is created through the vessel’s desalination process that creates fresh water for drinking, showers, cooking and so forth. This is achieved through reverse osmosis (RO) or distillation resulting in the discharge of seawater with a slight elevated salinity (~10% higher than seawater). The freshwater produced is then stored on board and then discharged along with the sewage and grey water back to the environment.

6.3.10.1 Description of Environmental Impacts

Increased temperature

It is anticipated that low volumes of cooling water (varying with vessel size but estimated at approximately 50m³/day) will be discharged directly overboard during inspection, maintenance and repair activities, and will have an exit temperature several degrees higher than that of the receiving waters. Once in the water column, cooling water will remain in the surface layer, where turbulent mixing and heat transfer with surrounding waters will occur. The environmental receptors with the potential to be exposed to an increase in temperature include plankton and transient pelagic marine fauna including whales, sharks, fish, and reptiles.

Modelling undertaken for the BHP Petroleum Pyrenees FPSO Development in the Exmouth Basin (BHP, 2005) shows that based on a discharge of 100,000 m³/day at a water temperature of 25°C above that of the surrounding ocean, there is a 50% probability of the temperature of surface water within 25 to 50 m of the discharge point exceeding the ambient temperature by more than 2°C decreases to 1% within about 60 to 85 m of the discharge point, depending on seasonal variations in the water current.

Modelling of continuous waste water discharges (including cooling water) undertaken by Woodside for its Torosa South-1 drilling campaign in the Browse Basin found that discharge water temperature decreases quickly as it mixes with the receiving waters, with the discharge water temperature being less than 1°C above background levels within 100 m (horizontally) of the discharge point, and will be within background levels within 10 m vertically (Woodside, 2008). Note: These studies were undertaken for facilities and are therefore considered conservative. As such, impacts to most receptors are expected to be negligible even within the mixing zone.

Given the rapid dilution (and limited exposure to changes in temperature), direct impacts to transient marine fauna are not expected (Langford, 1990), with direct impacts limited to planktonic organisms that are unable to avoid or move through the discharge plume. Indirect impacts transient fauna may be experienced where those species rely on planktonic organisms as a food source. Plankton communities have a naturally patchy distribution in both space and time and have evolved to respond rapidly to such environmental perturbations (ITOPF 2011), and no particular values or sensitivities linked to planktonic foraging or increased planktonic abundance have been identified as having the potential to be affected by this discharge.

Increased salinity

It is estimated that the temperature of discharged brine water is only several degrees Celsius (1°C - 6°C) above background water temperature with a salinity of about 40,000 ppm (normal seawater is 35,000 ppm). Upon release, brine water will sink through the water column where it will be rapidly mixed with receiving waters and dispersed by ocean currents. Therefore, any potential impacts are expected to be limited to the area surrounding the source of the discharge where concentrations are highest.

Models developed by the US EPA for temporary brine discharges from vessels assuming no ocean current (i.e. 0 m/s) found that brine discharges from the surface dilute 40 fold at 4 m from the source (Woodside, 2014). Thus, brine discharges from a vessel within the operational area, where ocean currents range from 0.5 m/s to 1.0 m/s, are likely to dilute in a shorter distance.

Walker and MacComb (1990) found that most marine species are able to tolerate short-term fluctuations in water salinity in the order of 20-30%, and it is expected that most pelagic species passing through a denser saline plume would not suffer adverse impacts. As such, impacts to receptors are expected to be negligible.

Other than plankton, pelagic species are mobile and would be subject to slightly elevated salinity levels for a very short time as they swim through the plume. This release may cause localised impacts to plankton within proximity of the vessel, however no particular values or sensitivities linked to planktonic foraging or increased planktonic abundance have been identified as having the potential to be affected by this discharge.

Potential chemical toxicity

Scale inhibitors and biocide are likely to be used in the heat exchange and desalination process to avoid fouling of pipework. Scale inhibitors are low molecular weight phosphorous compounds that are water-soluble, and only have acute toxicity to marine organisms about two orders of magnitude higher than typically used in the water phase (Black *et al.*, 1994). The biocides typically used in the industry (such as sodium hypochlorite) are highly reactive and degrade rapidly and are very soluble in water (Black *et al.*, 1994). These chemicals are inherently safe at the low dosages used, as they are usually ‘consumed’ in the inhibition process, ensuring there is little or no residual chemical concentration remaining upon discharge (Xuejun *et al.* 2017).

Woodside’s wastewater discharge modelling (Woodside, 2008) also found that most of the discharged volume remains in the upper water column (in the upper 10 m) due to the neutral buoyancy of the discharge, but a small proportion penetrates below the water surface, where it rapidly dissipates through the water column. Results showed that a concentration of a component within the discharge stream is reduced to 1/100th of its original concentration at no less than 50 m from the discharge point under any condition (Woodside, 2008).

Larger transient species are mobile and at worst, are expected to be subjected to very low levels of chemicals for a very short time as they swim near the cooling water plume, and are not expected to remain long enough within the discharge plume to experience any adverse effects.

6.3.10.2 Risk Assessment

Table 6-24 outlines the risk assessment for cooling and brine water discharges.

Table 6-24 Cooling and brine water discharge risk assessment

Hazard duration	During inspection, maintenance and repair activities (short-term).	
Extent of hazard	Localised (100 m radius from the vessel, top 10 m of water column).	
Basis of Inherent Risk Assessment		
<ul style="list-style-type: none"> The Longtom facilities are located in approximately 57 m of water and 40 km offshore in a relatively high energy environment (current and waves). Temperature and salinity changes in the vicinity of the surface discharge will be quick to dissipate, and rapidly be restored to ambient water quality on completion of the activity. MARPOL Annex V Regulations for the Prevention of Pollution by Garbage from Ships requires vessels to use ‘cleaning agents and additives’ which are not a ‘harmful substance’ in accordance with criteria in Appendix to MARPOL Annex III nor contain a component that is carcinogenic, mutagenic or reprotoxic. There are no sensitive environments or biological communities in the project area. Vessel-based activities will be of short duration (approximately one week in every 3 years). 		
Inherent risk analysis and ranking		
Consequence	Likelihood	Inherent Risk
Insignificant (1)	Rare (E)	Low
Project specific environmental controls and	<u>Prevention</u> The cooling water and RO desalination systems will be maintained in accordance with the PMS.	

checks that will take place		
Residual risk analysis and ranking		
Consequence	Likelihood	Residual Risk
Insignificant (1)	Rare (E)	Low
Demonstration of ALARP		
<p>Maintenance of the cooling water and RO desalination systems was the only project specific control identified which could reduce the inherently low consequence and risk of cooling water and brine discharges. This control and the inherent conditions under which these discharges occur are considered sufficiently effective to ensure the residual risk is Low and ALARP.</p> <p>The following ALARP analysis confirms that all reasonable risk treatment options have been considered to reduce the environmental impact of hazardous waste, and the risk is deemed to be ALARP. No further reasonable mitigation measures exist. A 'Low' residual risk ranking is broadly acceptable according to the SGHE definition of risk.</p>		
Eliminate	These discharges are essential to the operation of the vessel and cannot be eliminated.	
Substitute	Not applicable	
Engineering	Not applicable	
Isolation	Not applicable	
Administrative	No specified treatment or discharge criteria for RO brine or machinery / engine cooling water under MARPOL.	
Protective	The cooling water and RO desalination systems will be maintained in accordance with the PMS.	
Demonstration of Acceptability		
<p>Maintenance of the cooling water and RO desalination systems was identified as the only control which could further reduce the inherently low consequence and risk of cooling water and brine discharges. Temperature and salinity changes in the vicinity of the surface discharge will be quick to dissipate, and rapidly be restored to ambient water quality on completion of the activity.</p> <p>There are numerous other oil and gas developments in Bass Strait (20 production facilities) which generate cooling and brine water discharges. Commercial fishing activities and merchant vessels also discharge cooling and brine water, and in considerably larger volumes, than a single offshore support vessel. There have been no indications to date of any significant impact on the environment from such activities in Bass Strait.</p> <p>All legislative and other requirements have been met and the activity is consistent with SGHE policy and meets relevant management standards and procedures.</p> <p>There have been no concerns raised during any consultation regarding cooling and brine water discharges.</p> <p>The potential impact to the environment from cooling and brine water discharge is low and considered to be acceptable, given the open-ocean nature of the receiving environment, low volumes discharged and intermittent nature of the vessel-based activities.</p>		
Monitoring		
The functionality of the cooling water and RO desalination systems will be checked daily during offshore campaigns, included as a line item on the daily report and will be recorded and included in the annual EP Compliance Report.		

6.3.11 Introduction of Invasive Marine Species

Vessel activities have the potential to result in the introduction of invasive marine species to the project area, through ballast water discharge containing foreign species and vessel hull and equipment biofouling.

6.3.11.1 Description of Environmental Impacts

Ballast Water

Vessels are not expected to take on, nor discharge, ballast water while working on Longtom infrastructure. Any ballast water exchange will comply with the Australian Ballast Water Management Requirements (DAWR, 2017) and if required, it will only be undertaken more than 12 nautical miles from land, given the Longtom location.

Any risk of introducing invasive marine species will likely be from attachment to vessel hulls and biofouling.

Biofouling

Biofouling is the accumulation of aquatic micro-organisms, algae, plants and animals on vessel hulls and submerged surfaces. Regular anti-fouling of the hull is required to prevent this build up. The main chemical used in the anti-fouling agent, tributyltin (TBT), persists in the environment by attaching itself to muds (accumulating in sediments) and in high concentrations can have toxic effects on marine organisms through bioaccumulation. The impact of TBT leaching off a single vessel in open waters has been found not to be detrimental to marine life (Fabris *et al.*, 1995) and remains under the ANZECC Guidelines for Fresh and Marine Water Quality (2000) TBT trigger value of 0.0004 µg/L for the protection of 99% of species in marine waters.

Standard procedures for minimising the introduction or translocation of invasive marine species into the waters of eastern Bass Strait include the treatment of vessels with anti-fouling paints and compliance with Australian Government biosecurity legislation.

Invasive Marine Species Invasion

Successful invasive marine species invasion requires the following three steps (AQIS, 2011):

1. Colonisation and establishment of the marine pest on a vector (e.g., vessel hull) in a donor region (e.g. home port).
2. Survival of the settled marine species on the vector during the voyage from the donor to the recipient region (e.g. project area).
3. Colonisation (e.g. dislodgement or reproduction) of the marine species in the recipient region, followed by successful establishment of a viable new local population.

Invasive marine species are likely to have little or no natural competition or predation, thus outcompeting native species for food or space, preying on native species or changing the nature of the environment. It is estimated that Australia has over 250 established marine pests, and it is estimated that approximately one in six introduced marine species becomes pests (AMSA, n.d.).

Marine pest species can also deplete fishing grounds and aquaculture stock, with between 10% and 40% of Australia's fishing industry being potentially vulnerable to marine pest incursion

(AMSA, n.d). For example, the introduction of the North Pacific Seastar in Victorian and Tasmanian waters was linked to a decline in scallop fisheries. Marine pests can also damage marine and industrial infrastructure, such as encrusting jetties and marinas or blocking industrial water intake pipes. The accumulation on vessel hulls can slow the vessels down and increase fuel consumption.

Successful invasive marine species invasion during project activities is highly unlikely to occur as:

1. **Colonisation and establishment of the marine pest on the vessel hull or in ballast water in a donor region:** SGHE will ensure that vessel hulls have been recently cleaned, with anti-fouling paint applied and has a valid Statement of Compliance issued under the *International Convention on the Control of Harmful Anti-Fouling Systems on Ships* (IMO, 2001). Where the vessel has relocated to Bass Strait, the vessel will be required to comply with all legislative requirements for the management of ballast water including the Australian Ballast Water Management Requirements. SGHE will ensure the vessel poses a Low level of biofouling risk by assessing the risk using their IMS risk assessment process and implementing additional controls as necessary prior to mobilisation.
2. **Survival of the settled marine species on/in the vessel during the voyage from the donor to the recipient region:** This is unlikely to occur as all contracted vessels undergo regular anti-fouling of the hull to prevent the build-up of barnacles and other organisms that increase the drag of the vessel, leading to increased fuel consumption.
3. **Colonisation of the marine species in the recipient region, followed by successful establishment of a viable new local population:** Successful colonisation in the recipient region would be difficult given the nature of the benthic habitats near the operational area (i.e. predominantly bare sands with patchy occurrences of hard substrate) and location outside of coastal waters where the risk of IMS establishment is considered greatest (BRS, 2007).

6.3.11.2 Risk Assessment

Table 6-25 outlines the risk assessment for invasive marine species.

Table 6-25 Invasive marine species risk assessment

Hazard duration	Long-term (in the event of IMS introduction and establishment).	
Extent of hazard	Localised (seabed near vessel) to far-reaching (driven by ocean currents and reproductive techniques).	
Basis of Inherent Risk Assessment		
<ul style="list-style-type: none"> • Ballast water discharge is not expected (however if required it will comply with the Australian Ballast Water Management (ABWM) Requirements, see below). • Vessel Master obtains biosecurity clearance to enter Australian territory through pre-arrival information reported through Maritime Arrivals Reporting System (MARS). • Vessel-based activities will be of short duration (approximately one week in every 3 years). 		
Inherent risk analysis and ranking		
Consequence	Likelihood	Inherent Risk
Moderate (3)	Unlikely (D)	Moderate
Project specific environmental	<u>Prevention</u> SGHE will ensure vessels pose a low biofouling risk by assessing the risk in	

controls and checks that will take place	<p>accordance with the National Biofouling Management Guidelines for the Petroleum Production and Exploration Industry (NBMG) (DAWR, 2009) and implementing control / mitigation measures as necessary in line with their IMS RA procedure. Immersible retrievable-equipment will also be managed in accordance with these Guidelines. – effectiveness considered High.</p> <p>Vessel will have a Biofouling Management Plan and record book or equivalent.</p> <p>Vessel holds Ballast Water Management Plan (BWMP) and Ballast Water Management Certificate (BWMC) and maintains a Ballast Water Record System, in accordance with the <i>International Convention for the Control and Management of Ships' Ballast Water and Sediments</i> (Ballast Water Management Convention) (IMO, 2004) – effectiveness considered High.</p> <p>Vessel Master will adhere to the ABWM Requirements for ballast water exchange – effectiveness considered High.</p> <p><u>Mitigation</u> Not applicable.</p>
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Residual risk analysis and ranking

Consequence	Likelihood	Residual Risk
Moderate (3)	Rare (E)	Low

Demonstration of ALARP

The key preventative control for biofouling risk is vessels will be assessed for biofouling risk in accordance with the NBMG. Biofouling risk is assessed and documented through the SGHE IMS RA procedure. Only vessels with low risk rankings will be permitted to work on the activity.

Consistent with the 'best practice' approach set out in the *IMO Guidelines for the Management of Ships Biofouling* (IMO Guidelines) (IMO, 2012) the risk assessment considers many parameters of the vessel including (where relevant):

- Transport method (dry verses wet haulage)
- Presence and age of antifouling coating
- Evidence of in-water inspection by divers or inspection in dry dock and cleaning of hull
- Presence and operation of internal seawater treatment systems if applicable
- Duration of stay in overseas or interstate coastal waters
- Location of activity/operations (operational area), timings and durations.

Where the initial indicative assessment results in 'Low Risk', the risk assessment is provided to the Principal Officer Invasive Marine Species, DJPR. If the Principal Officer is satisfied that no further action is necessary following this consultation the vessel is deemed acceptable for use.

If the risk assessment result is uncertain or high risk, or further action is recommended by the Principal Officer following the consultation, an IMS Expert is engaged to conduct a more detailed assessment and determine whether additional controls can be implemented to reduce the vessel risk status to 'Low Risk'.

Following implementation of these mitigation measures, the IMS Expert is consulted to reassess the level of risk for the activity and determine whether the level of risk for the activity is 'Low Risk'.

If this process still results in an uncertain or high risk then an alternative vessel must be sought for the activity.

Controls to prevent the introduction of IMS through contaminated ballast water are managed by regulatory requirements. The Ballast Water Management Convention requires signatory flag states to ensure that ships flagged by them comply with standards and procedures for the management and control of ships' ballast water and sediments. The Convention aims to prevent the spread of harmful aquatic organisms from one region to another and halt damage to the

<p>marine environment from ballast water discharge, by minimising the uptake and subsequent discharge of sediments and organisms.</p> <ul style="list-style-type: none"> • The Convention requires all vessels designed to carry ballast water to implement a ballast water management plan and to carry out ballast water management procedures in accordance with approved methods. Specifically these are: <ul style="list-style-type: none"> • Use of a ballast water management system • Ballast water exchange in an acceptable area (at least 12NM from land and in at least 50 m water depth) • Use of low risk ballast water • Retention of high risk ballast water on board • Discharge to an approved ballast water reception facility. <p>A management certificate is required for all vessels to which the Convention applies. This certificate verifies that the vessel has been surveyed to a standard compliant with the Convention. All vessels that carry ballast water must maintain a ballast water record system.</p> <p>The ABWM Requirements describe the obligations on vessel operators with regards to the management of ballast water and sediments when operating in Australian seas. The acceptable area for a ballast water exchange between an offshore oil and gas installation and an Australian port is in areas that are no closer than 500 m from the offshore installation and no closer than 12 NM from the nearest land.</p> <p>Compliance with regulatory requirements for the management of ballast water and ensuring all vessels are assessed as posing a low biofouling risk through the screening via the IMS RA procedure and in accordance with national guidelines is considered sufficiently effective to ensure the residual risk is Low and ALARP.</p> <p>The following ALARP analysis confirms that all reasonable risk treatment options have been considered to reduce the environmental impact of invasive marine species, and the risk is deemed to be ALARP. No further reasonable mitigation measures exist. A 'Low' residual risk ranking is broadly acceptable according to the SGHE definition of risk.</p>	
Eliminate	The use of a vessel that remains permanently or near-permanently partly submerged in water is unavoidable, and thus hull fouling and the uptake of marine organisms in ballast water cannot be eliminated. Use of local vessel will be preferred to eliminate the requirement for vessels to mobilise to and from Bass Strait.
Substitute	Not adopted. Use of a purpose built Longtom specific vessel is not practicable.
Engineering	Not applicable.
Isolation	No ballast water exchange will occur within 12 nautical miles of land and any ballast water exchange will comply with the ABWM Requirements.
Administrative	<p>SGHE will ensure that vessels selected have an approved BWMP and BWMC and maintain a Ballast Water Record System.</p> <p>Vessels to comply with Australian Government biosecurity legislation including the ABWM Requirements.</p> <p>Biofouling risk in accordance with NBMG is assessed and documented through the IMS RA Procedure and only vessels with low risk rankings will be permitted to work on the activity.</p> <p>A premobilisation audit will be undertaken to confirm vessel acceptability (see Section 8.9.1).</p>
Protective	Not applicable.
Demonstration of Acceptability	
<p>Ballast water discharge is not expected, however should it be required, it will comply with the ABWM Requirements. No discharge of ballast water at Longtom will be planned.</p> <p>Bass Strait currently has over 20 oil and gas production platforms with associated maintenance</p>	

<p>vessels, in addition to shipping traffic and commercial fishing all of which also pose a risk of introduction and establishment of invasive marine species. These are all currently accepted activities within Bass Strait.</p> <p>All legislative and other requirements have been met and the activity is consistent with SGHE policy and meets relevant management standards and procedures.</p> <p>Concerns from relevant stakeholders have been addressed through the consultation process, any new relevant stakeholder objections, claims or issues will be considered in line with the ongoing consultation. Victorian and commonwealth government agriculture departments will continue to be consulted with and notified of any vessel activities to ensure IMS risks are appropriately managed.</p> <p>The risk of the introduction or spread of invasive marine species to Bass Strait is low and considered to be acceptable.</p>
<p>Monitoring</p>
<p>Vessel ballast uptakes and discharges (if any) while in Australian waters will be recorded in the daily logs.</p>

6.3.12 Vessel diesel spill

Offshore vessel activity has the potential to result in a spill of marine diesel oil (MDO) if there is a major equipment failure or accident offshore. Vessels using HFO or IFO will not be utilised. No refuelling will take place during inspection, maintenance and repair activities and the worst case spill is assumed to be a typical tank volume.

6.3.12.1 Description of Environmental Impacts

General Impacts

The following information regarding the impacts of an MDO spill on the marine environment is sourced from APASA.

In many circumstances a spill of a similar quantity of MDO can be of greater environmental consequence than a spill of a similar quantity of light condensates.

MDOs usually have a very narrow boiling point range unless doctored with heavy fuel oil which in the trade is called 'dirty diesel'. Most commercial MDOs supplied to offshore vessels are kept within a tight technical specification and most operators refrain from using dirty diesel in the offshore industry.

Diesel fuel oils are dominated by n-alkane hydrocarbons that give diesel its unique compression ignition characteristics and usually consist of carbon chain C11-C28 but may vary depending upon specifications (e.g., winter vs. summer grades). Many MDOs can contain approximately 3-7% by volume of hydrocarbons that are classified as 'persistent' under IOPC Fund definition (i.e., greater than 5% boiling above 370°C). It is common for the residues of diesel spills after weathering to contain n-alkanes, iso-alkanes and naphthenic hydrocarbons. Minor quantities of PAHs will be present.

When spilt at sea, MDOs will spread and thin out quickly and more than half of the oil volume can be lost by evaporation within 12 hours depending upon sea temperature and winds. MDOs also have low viscosities and can result in hydrocarbons becoming physically dispersed as fine droplets into the water column when winds exceed 10 knots. Droplets of diesel oil that are naturally or chemically dispersed will be sub-surface and will behave quite differently to surface oil. Diesel droplets will now move 100% with the currents under water but on the surface are affected by both wind and currents. Natural dispersion of MDOs will reduce the hydrocarbons available to evaporate into the air.

Although evaporation reduces the level of hydrocarbons on the water surface, it increases the level of hydrocarbons able to be inhaled. This increased hydrocarbon vapour exposure can affect any air breathing animal including whales, dolphins, seals and turtles.

The different MDO product compositions, together with different environmental conditions during marine spills (sea temperature, wind and sea states) can vary the quantities of hydrocarbons lost to the atmosphere due to evaporation (but generally ranges between 40-65%). Dispersion into the sea by the action of wind and waves can result in 25 to 50% of the loss of hydrocarbons from

surface slicks and dissolution (solubility of hydrocarbons) can account for 1-10% loss from the surface.

The environmental effects of MDOs spills are not as visually obvious as those of heavier fuel oils or crude oils. MDOs are considered to have a higher aquatic toxicity in comparison to many other crude oils and condensates due to the types of hydrocarbons present and that dispersed droplets of diesel can be more bio-available to marine organisms. MDOs have a high potential to bio-accumulate in organisms and have high water solubility along with a higher potential to naturally entrain into the water column than HFOs.

Due to their higher solubility and ease of entrainment/dispersion into the water column, MDO spills can have a greater ecological impact in comparison to other floating oil slicks. MDOs are also known to taint seafood. According to the International Maritime Organisation (IMO) (ESPH 16/6/1 September 2010), diesel oil has a GESAMP (Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection) rating of 3 for acute toxicity (damage to living organisms) and 4 for bioaccumulation/tainting (4 = high potential to bioaccumulate, 5 is the highest).

Diesel oil in the water column can adhere to fine-grained suspended sediments that can settle out and result in oiled sediments being deposited on the seabed. MDO spills that reach shorelines are usually still mobile residues and will penetrate shoreline sediments due to the low viscosity of the oil and have direct consequences on in-faunal organisms.

The impacts of hydrocarbons on marine mammals and other marine species are discussed in Section 6.2.1.1.

Diesel Spill Modelling

SGHE commissioned APASA to conduct hydrocarbon spill modelling for the following scenario:

Vessel collision incident – a release of 80 m³ of MDO (80,000 litres/503 barrels) from a typical fuel tank over 6 hours and tracked until it reaches a minimum oil thickness threshold of 0.0001 mm) and 0.01 mm.

- It is unlikely that more than one tank would be ruptured in a vessel collision given the typical safety features of the vessels (e.g., double hulls and internal fuel tank configurations) and the fact that the vessels will be within the Bass Strait “Area to be Avoided” and the Longtom-3 and 4 safety zones when conducting the majority of the petroleum activity.
- SGHE has investigated the typical storage volumes and tank configurations of various offshore support vessel companies (e.g., Bass Trek, Silver Star, Bhagwan Dryden, Harvest Shine, Seven Eagle) (see Table 2-9) and concluded that 80 m³ would represent the contents of a typical fuel tank. In reality this volume of diesel is unlikely to be lost as the tanks can be managed and product pumped from one to another. In addition in the event of a tank failure, water will tend to flow in while diesel will flow out until an equilibrium is achieved (i.e., if the hole is half way up the tank then only half the contents would likely be lost). In recognition that larger quantities may occur in the tanks of larger vessels that may be involved in repair campaigns (such as the Seven Eagle) additional Adios modelling and

review of similar EPs has also been conducted to assess the potential impacts, see Figure 6-7.

- AMOSC has stated that a spill of 80 m³ of MDO is highly unlikely, and that spills are more likely going to be related to refuelling rather than collisions. A loss of containment during refuelling is considered to be less than 8 m³, see below.

Other scenarios considered, but discounted from diesel modelling, included:

- Refuelling incident – no offshore refuelling will take place at Longtom.
- Catastrophic vessel collision incident – a large release of about 1,000 m³ of MDO (1 million litres/6,289 barrels). This was not considered credible based on;
 - The location of the Longtom wells within the Bass Strait “Area to be Avoided”
 - The design and configuration of typical AHTS vessels.
 - AMOSC advice to SGHE (formerly Nexus) that spills of this size should not be considered credible given the low speed and nature of the work undertaken by the vessels.

Table 6-26: Summary of parameters used in stochastic vessel diesel spill modelling

Parameter	Description
Number of spill simulations	100 simulations throughout the year
Hydrocarbon Type	MDO
Release Type	Surface release
Total spill volume	80 m ³ of MDO over 6 hours
Release Depth	Surface
Release duration	6 hours
Simulation length	30 days

MDO Characteristics

The MDO is a light-persistent fuel oil used in the maritime industry. It has a density of 829.1 kg/m³ (API of 37.6) and a low pour point (-14 °C). The low viscosity (4 cP) indicates that this oil will spread quickly when released and will form a thin to low thickness film on the sea surface, increasing the rate of evaporation. Approximately, 5% (by mass) of the oil is categorised as a group II oil (light-persistent) based on categorisation and classification derived from AMSA (2015) guidelines. The classification is based on the specific gravity of hydrocarbons in combination with relevant boiling point ranges.

Table 6-27 details the physical properties of MDO, while Table 6-28 presents the boiling point ranges of the MDO used in this study. Figure 6-5 shows weathering graphs for an 80 m³ release of MDO over 6 hours (tracked for 30 days) during three static wind conditions.

The prevailing weather conditions will influence the weathering and fate of the MDO. Under lower wind-speeds (5 knots), the MDO will remain on the surface longer, spread quicker, and in turn increase the evaporative process. Conversely, sustained stronger winds (>15 knots) will generate

breaking waves at the surface, causing a higher amount of MDO to be entrained into the water column and reducing the amount available to evaporate.

Table 6-27 Physical properties of the Marine Diesel Oil

Characteristic	Marine Diesel Oil
Density (kg/m ³)	829.1
API	37.6
Dynamic viscosity (cP)	4.0
Pour Point (°C)	-14
Wax Content (%)	1
Hydrocarbon property category	Group II
Hydrocarbon property classification	Light – Persistent

Table 6-28 Boiling point ranges of the Marine Diesel Oil

Characteristic	Not Persistent			Persistent
	Volatile	Semi-volatile	Low volatility	Residual
Boiling point (°C)	< 180	180 - 265	265 - 380	>380
Marine Diesel Oil	6.0	34.6	54.4	5.0

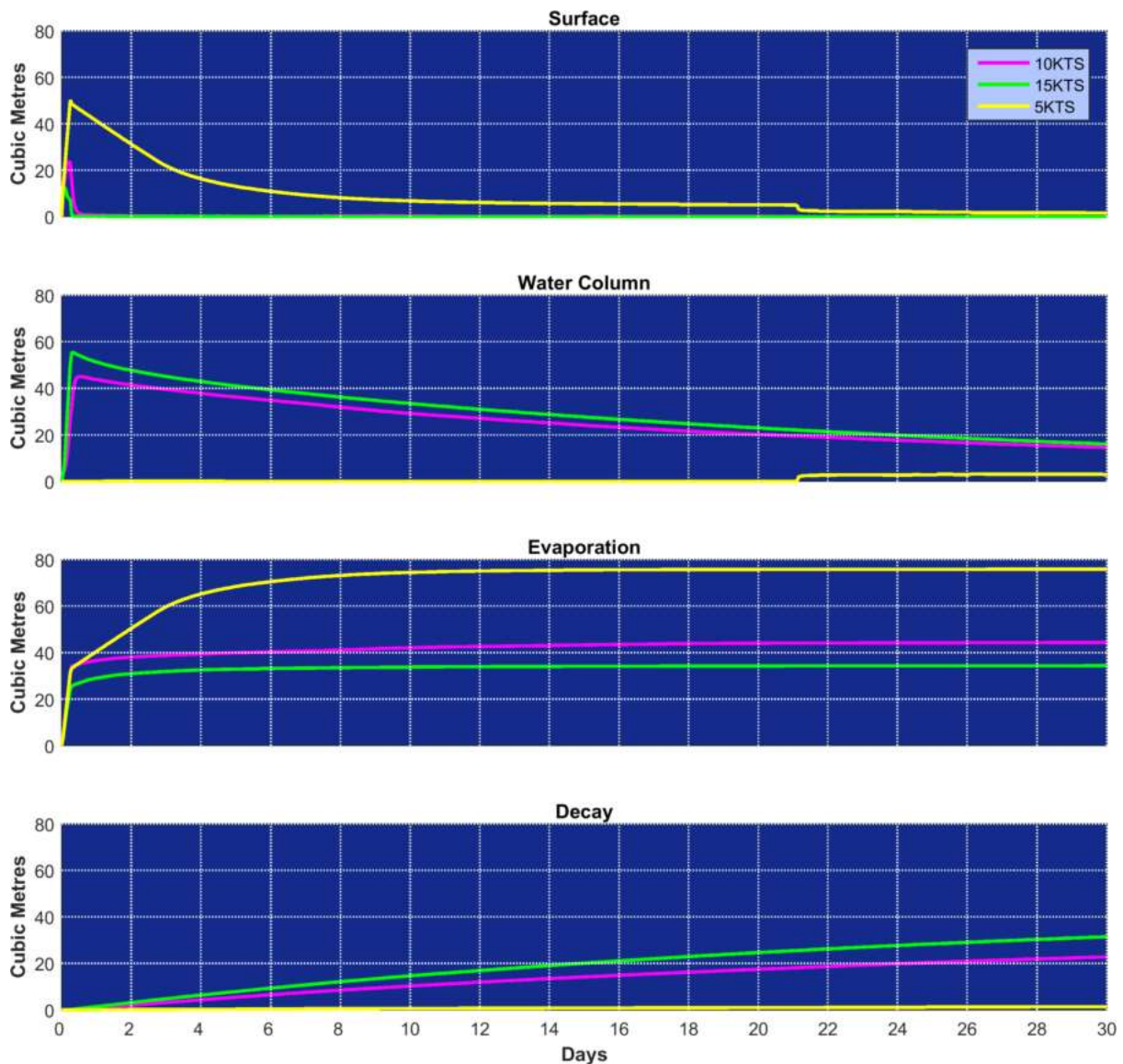


Figure 6-5 Predicted weathering and fates graph for Marine Diesel Oil

Model results

Key results from the stochastic modelling are:

- No shoreline contact was predicted for the scenario;
- The maximum distance from the release location predicted for low (> 0.5 g/m²) and moderate surface (> 10 g/m²) exposure was 52 km (east-northeast) and 6 km (east) respectively while no exposure at the high (>25 g/m²) threshold was observed (Figure 6-6);
- Zones of low and moderate potential surface exposure were shown to extend predominantly south-southwest and east-northeast of the release location;
- The Upwelling East of Eden KEF had the greatest predicted probability to experience surface oil at, or above, the low exposure threshold;
- The modelling demonstrated no time-averaged dissolved hydrocarbon exposure above 6ppb for any of the receptors assessed;

- Instantaneous dissolved hydrocarbon exposure was predicted to remain in offshore waters and the Key Ecological Feature – Upwelling East of Eden was the only sensitive receptor exposed to low dissolved hydrocarbon level. Note, the release location is situated within the boundaries of this receptor.
- Potential time-averaged entrained hydrocarbon exposure was indicated at low level except for the KEF – Upwelling East of Eden which demonstrated a 1% chance of moderate exposure and recorded the highest time-average and instantaneous exposure. The second highest record was predicted for Croajingolong (West) and East Gippsland for time-averaged exposure and New Zealand Star Bank and Point Hicks MNP for instantaneous exposure.
- Potential instantaneous entrained hydrocarbon exposure was predicted at low, moderate and high levels. While the extent of instantaneous exposure zones is significantly larger than time-averaged exposure zones, these results are provided to define a spatial boundary for the environment that may be exposed to oil contamination as per the requirements outlined in NOPSEMA (2019) and may not be representative of any adverse effect to the aquatic environment.

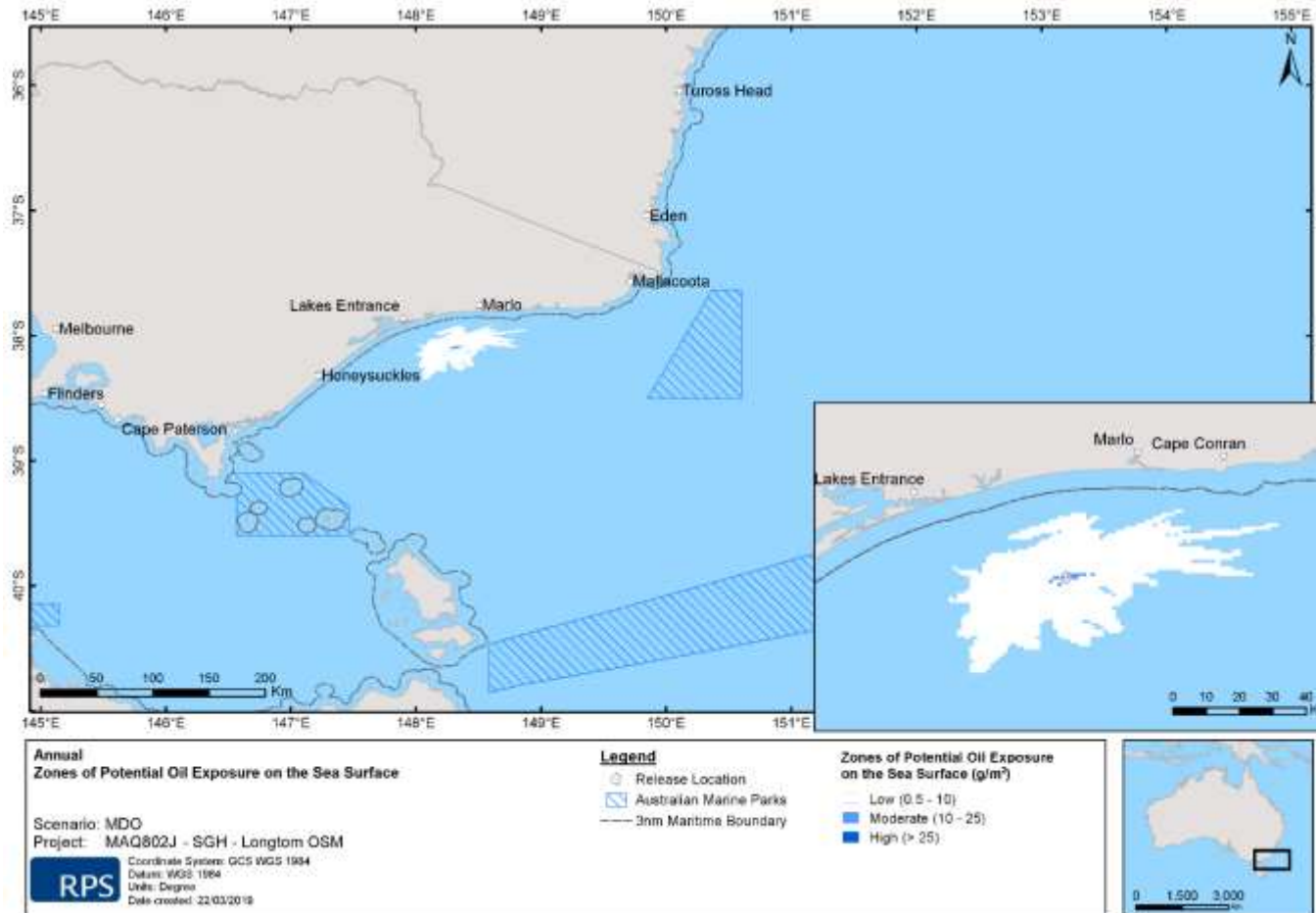


Figure 6-6 Zones of potential MDO exposure on the sea surface.

To assess the impact from potentially larger releases of diesel and consistent with other vessel related EPs ADIOS2 was utilised to assess oil budgets following the release. This shows, Figure 6.7, that under typical Bass Strait conditions releases of both 80m³ and 220m³ will tend to evaporate and disperse within 48hrs, leaving no remaining oil. Based on this and the stochastic modelling, no shoreline impact is therefore expected in the event of a larger (220m³) tank volume being released and the modelling for the 80m³ release as shown in Figure 6.6 is considered representative of the potential extent of an MDO spill.

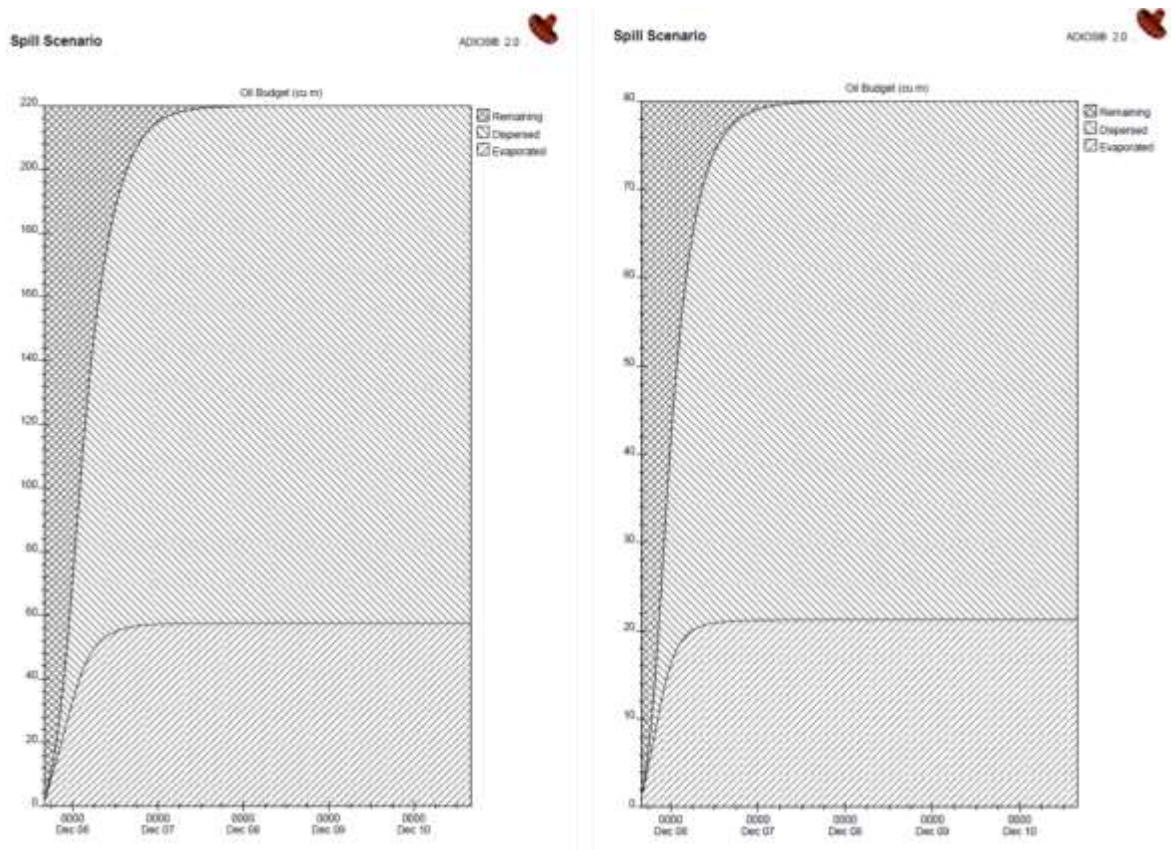


Figure 6-7 ADIOS Oil Budgets for marine diesel spills

In addition to the use of Adios, SGHE has examined the diesel spill modelling conducted by other operators in Bass Strait and their risk assessments as provided in the published EPs. EAPL modelled a 280m³ MDO release at their Kipper subsea facility in an adjacent production licence (EAPL, 2020). This modelling predicted no shoreline contact at either the moderate 100 g/m² or low 10 g/m² thresholds and a maximum distance from release location of 17 km for surface exposure at the moderate 10 g/m² threshold. Due to rapid weathering MDO sea surface exposure was predicted for only 4 – 5 days after release. The risk ranking was assessed as Level 4, the lowest level.

Cooper Energy modelled a 250m³ MDO release at a location within the Sole field at a similar distance from the east Gippsland coast to the Longtom wells (Cooper Energy, 2018). The modelling predicted no shoreline contact at the ‘environmental impact’ threshold of 100 g/m² and surface hydrocarbon exposure at greater than the environmental impact threshold 10 g/m² within 38km of the release location. Due to the evaporative nature of MDO oil exposure

was predicted to fall below visible levels within approximately 7 days. The risk was assessed as Low.

6.3.12.2 Risk Assessment

Table 6-29 outlines the risk assessment for MDO spills.

Table 6-29 MDO Spill risk assessment

Hazard duration	Temporary (duration of inspection, maintenance and repair activities).	
Extent of hazard	EMBA is relatively widespread, however it should be noted that the predicted impact for a single spill trajectory will be far smaller.	
Basis of Inherent Risk Assessment		
<ul style="list-style-type: none"> The subsea facilities are located within the Bass Strait shipping 'Area to be Avoided' and are not close to any shipping lane thus minimising interactions with third-party vessels. A 500-m petroleum safety exclusion zone exists around Longtom-3 and Longtom 4. The Longtom facilities are located in approximately 57 m of water and 40 km offshore – hence running aground is not credible during Longtom activities. Maintenance activities will be of short duration (approximately one week in every 1 years). Class certification and maintenance of fuel tanks. Vessels will maintain navigation watch 24hrs per day, bridge will be manned and petroleum activities only take place during appropriate weather windows. 		
Inherent risk analysis and ranking		
Consequence	Likelihood	Inherent risk
Moderate (3)	Unlikely (D)	Moderate
Project specific environmental controls and checks that will take place	<p><u>Prevention</u></p> <ul style="list-style-type: none"> Vessel design, class, certification and maintenance which will be confirmed for appropriateness during pre-mobilisation audit – effectiveness considered Very High. Vessel manned by competent, trained and experienced marine crew with appropriate qualifications, which will be confirmed during pre-mobilisation audit – effectiveness considered High. No refuelling at Longtom – effectiveness considered High. <p><u>Mitigation</u></p> <ul style="list-style-type: none"> SOPEP material is available on board and personnel are trained in its use – effectiveness considered Moderate. Utilisation of the SOPEP, OPEP and ERP in the event of a spill to sea – effectiveness considered Moderate. Source control e.g. pumping between tanks, ballasting and other vessel measures effectiveness considered moderate. 	
Residual risk analysis and ranking		
Consequence	Likelihood	Residual Risk
Minor (2)	Rare (E)	Low
Demonstration of ALARP		
<p>The key preventative control is that all vessels will be subject to a pre-mobilisation audit to confirm vessel acceptability, this will check vessel class, certification, that the systems and processes are in place and in use to prevent a diesel spill and the marine crew. In addition there will be no offshore refuelling. Mitigative controls include the vessel having a SOPEP with crew trained in its use and the SGHE Oil Pollution Emergency Plan. These controls are considered sufficiently effective, robust and independent to ensure the residual risk is Low and ALARP.</p>		

The following ALARP analysis also confirms that all reasonable risk treatment options have been considered to reduce the environmental impact of invasive marine species, and the risk is deemed to be **ALARP**. No further reasonable mitigation measures exist. A 'Low' residual risk ranking is **broadly acceptable** according to the SGHE definition of risk.

Eliminate	Not applicable – offshore vessels are required.
Substitute	Not applicable – offshore vessels must be powered, electric powered or wind powered vessels are not credible.
Engineering	Vessels are equipped with sophisticated navigation aids and competent marine crew, allowing them to avoid collisions with other vessels. Fuel tanks are designed to contain fuel and minimise the risk of loss of containment Fuel can also be transferred between tanks in the event of a spill from one tank.
Isolation	Tanks can be isolated from each other.
Administrative	The Longtom wells are located within safety exclusion zones and most of the Longtom facilities are within the Bass Strait Area to be Avoided. These both limit the risk of other vessels being in the vicinity.
Protective	Not applicable.
Demonstration of Acceptability	
<p>The subsea facilities are located within the Bass Strait shipping 'Area to be Avoided' and within a 500-m petroleum safety exclusion zone, thus minimising the likelihood of potential interaction with third-party vessels.</p> <p>Fishing, merchant vessel traffic and other oil and gas operations currently take place in Bass Strait that could also result in a diesel leak and these are all currently accepted by the community.</p> <p>All legislative and other requirements have been met and the activity is consistent with SGHE policy and meets relevant management standards and procedures.</p> <p>Concerns from relevant stakeholders have been addressed through the consultation process, any new relevant stakeholder objections, claims or issues will be considered in line with the ongoing consultation.</p> <p>The oil spill modelling has indicated that there is a low likelihood of the diesel reaching shore. Given that any maintenance vessels will be located approximately 40 km offshore, a small refuelling diesel spill or shipping accident is considered unlikely to pose a significant threat to the near-shore or coastal environment. Hydrocarbons lost in the unlikely event of a spill would consist of light hydrocarbons (diesel) that are highly evaporative. Potential impacts are likely to be short-lived, therefore this risk is considered acceptable.</p>	
Monitoring	
<ul style="list-style-type: none"> • The availability of the vessels navigation systems will be checked daily during offshore campaigns, included as a line item on the daily report and will be recorded and included in the annual EP Compliance Report. • Monitoring of the actual spill is discussed in the OPEP. 	

6.3.13 ROV discharges

There is the potential for a release of hydraulic fluid into the marine environment in the event of equipment failure or a hose rupture supplying the ROV. A limited amount of hydraulic fluid (approximately 10-20 litres) could be lost to the marine environment.

6.3.13.1 Description of Environmental Impacts

Small volumes, typically around 10-20 litres, of hydraulic fluid could be lost in the event of major equipment failure or hose damage. This could result in toxic impacts to marine fauna that are exposed to the hydraulic fluid or feed on contaminated food.

6.3.13.2 Risk Assessment

Table 6-30 outlines the risk assessment for the loss of hydraulic fluid supplying the ROV.

Table 6-30 Loss of hydraulic fluid supplying the ROV risk assessment

Hazard duration	During inspection, maintenance and repair activities involving an ROV (short-term).	
Extent of hazard	A few hundred metres down-wind/current of the ROV.	
Basis of Inherent risk Assessment		
ROVs are typically designed to prevent hydraulic fluid leaks, with the hoses and fittings all rated for the operating pressures to ensure their availability. The ROV hydraulic supply system would typically have a low pressure shutdown that would operate in the event of a major loss of containment shutting down the supply and limiting the volume of hydraulic fluid lost to the environment.		
Inherent risk analysis and ranking		
Consequence	Likelihood	Inherent Risk
Insignificant (1)	Moderate (C)	Low
Project specific environmental controls and checks that will take place	<p><u>Prevention</u></p> <ul style="list-style-type: none"> Design including, pressure rating of hoses, hydraulic fluid is stored and supply systems / maintenance areas located within bunded areas on board the vessel – effectiveness considered High. Pre-installation and pre-dive checks conducted – effectiveness considered Moderate. The ROV is maintained and tested in accordance with the PMS - effectiveness considered High. <p><u>Mitigation</u></p> <ul style="list-style-type: none"> ROV fluid to be selected / approved for use by SGHE- effectiveness considered Moderate. Design via isolation of feed supplies in the event of a major hydraulic leak - effectiveness considered High. SOPEP material is available on board and personnel are trained in its use – effectiveness considered Moderate. 	
Residual risk analysis and ranking		
Consequence	Likelihood	Residual Risk
Insignificant (1)	Unlikely (D)	Low
Demonstration of ALARP		
<p>The key preventative control is the design, operation and maintenance of the ROV system, these items will all be checked as part of the pre-mobilisation audit to confirm ROV acceptability. Mitigative controls include the SGHE chemical selection process, the design of the ROV system to isolate the hydraulic tanks and the vessel having a SOPEP. These controls are considered sufficiently effective, robust and independent to ensure the residual risk is Low and ALARP.</p> <p>The following ALARP analysis confirms that all reasonable risk treatment options have been considered to reduce the environmental impact of invasive marine species, and the risk is deemed to be ALARP. No further reasonable mitigation measures exist. A 'Low' residual risk ranking is broadly</p>		

acceptable according to the SGHE definition of risk.	
Eliminate	The use of ROVs is standard practice and essential to ensure safe operations. Hydraulic fluid is required for their operation.
Substitute	Substitution of the hydraulic fluids with a more environmentally sensitive fluid may be possible and will be examined once the ROV operator has been identified. However this may not be possible without extensive testing to ensure the ROV materials are compatible with the hydraulic fluid and hence may not be practicable.
Engineering	The ROV system is designed to prevent hydraulic fluid leaks. The hoses and fittings are all rated for the operating pressures.
Isolation	In the event of major equipment or hose failure, isolations will prevent continued loss of hydraulic fluid being fed from the pumps and supply system.
Administrative	The ROV will be subject to pre-dive checks to determine the status and readiness of commencing the dive, this will check for leaks. The ROV is subject to regular maintenance and inspections in accordance with the PMS.
Protective	Not applicable.
Demonstration of Acceptability	
<p>The ROV will be inspected and maintained routinely to ensure no discharges of hydraulic fluids. The relatively small amount of hydraulic fluid that would be lost in the event of hose or equipment damage will have a minimal impact to the marine environment.</p> <p>ROV campaigns are regularly conducted in Bass Strait and to SGHE’s understanding there have been no community concerns regarding their operation to date.</p> <p>Once the ROV operator has been identified, it is proposed that the ROV fluid is reviewed and approved in accordance with the SGHE Chemical Selection Process (see Section 6.1.1.2).</p> <p>All legislative and other requirements have been met and the activity is consistent with SGHE policy and meets relevant management standards and procedures.</p> <p>This risk is considered acceptable given that the use of ROVs is standard practice, only small volumes would be lost before isolation, and the expected low toxicity of the ROV fluid.</p>	
Monitoring	
<p>The operations of the ROV and its fluid levels will be checked daily during offshore campaigns, included as a line item on the daily report and will be recorded and included in the annual EP Compliance Report.</p>	

7 Environmental Performance Objectives, Standards and Measurement Criteria

This section presents the environmental performance objectives, environmental performance standards and measurement criteria required to manage the hazards identified for the Longtom Gas Project. These terms are defined below:

- *Environmental Performance Objective* – a statement of the objectives or goals for protecting the environment relevant to the given hazard.
- *Environmental Performance Standard* – a statement of performance required of a system, an item of equipment, a person or a procedure that is used as a basis for managing the environmental risk of a given hazard.
- *Measurement Criteria* – defines how performance will be measured to determine whether the environmental performance objectives and environmental performance standards have been met.

Table 7-1 details the performance objectives, standards and measurement criteria for Longtom operations, which ensure environmental risks are managed to ALARP.

Table 7-2 details the leading performance objectives, standards and measurement criteria for SGHE preferred oil spill response strategies. In the unlikely event of a hydrocarbon or diesel spill, the detailed environmental performance objectives, standards and measurement criteria provided in the OPEP will be used. To avoid repetition, these objectives, standards and measurement criteria have not been repeated herein.

Table 7-1 Environmental performance objectives, standards and measurement criteria

Risk Number	Hazard	Performance Objective	Performance Standard	Measurement Criteria
General				
All	Impacts to the environment from pipeline operations	The subsea facilities shall be designed and operated to prevent loss of containment and hence protect the environment.	<ul style="list-style-type: none"> • The subsea facilities have been, and any future modifications will be designed in line with standards and criteria contained in detail within the Longtom Pipeline Safety Case¹ and validated in accordance with the NOPSEMA scope of validation requirements. • PB Operations and maintenance shall be conducted in line with the Safety Case and APA EHS Management System including. <ol style="list-style-type: none"> 1. Use of company HSE standards 2. PB Personnel trained in line with the APA Training and Competency standard. 3. Compliance with procedures and work processes 4. Maintenance and testing conducted in line the Operation Integrity Standard EHSMS11 including the Asset Integrity Management System and the Integrity Management Plan. • Operations personnel are aware of the Environment Plan and its requirements 	<ul style="list-style-type: none"> • Design Validation certificate issued by a third party and safety case accepted • Annual audit to confirm: <ol style="list-style-type: none"> 1. Compliance with company EHS Management system standards 2. Training records demonstrate personnel directly associated with operations and maintenance are trained, certified and experienced 3. Operations carried out in accordance with approved processes and procedures. Maintenance activities carried out under a PTW system and subject to environmental assessment. 4. Records show that pipeline integrity inspections have been undertaken and equipment maintained and tested in line with the maintenance program and CFT schedule. • Log available of audit actions, verifying the status and close out of each.

Risk Number	Hazard	Performance Objective	Performance Standard	Measurement Criteria
All	Impacts to the environment from inspection, maintenance and repair campaigns	All offshore campaigns to be reviewed to prevent impacts to the environment.	Environmental risk assessment conducted and no risks identified greater than described within this EP	Pre campaign environmental risk assessment report.
Routine Impacts				
1	Discharge and use of chemicals (hydraulic fluid)	Lowest toxicity chemicals shall be selected for Longtom operations and maintenance purposes to prevent environmental impact.	<ul style="list-style-type: none"> Chemicals will have a minimum ranking of OCNS 'D', silver or better. The use of a chemicals not specifically described within this EP will be subject to the SGHE chemical selection process (see section 6.1.1.2) and approved by the SGHE HSEC Manager. 	<ul style="list-style-type: none"> Annual EP audit to confirm use in compliance; <ol style="list-style-type: none"> An approved list of chemicals is maintained. Chemicals selection sheet are used and approved (if chemicals are not specifically approved in the EP). All chemicals used are covered by either 1 or 2. All documentation associated with use and discharge of chemicals, including audits and checklists, are retained for reference.
		The volume of the hydraulic fluid used shall be monitored, to prevent unexpected losses damaging the environment.	<ul style="list-style-type: none"> The number of subsea valve operations is monitored and recorded across each month and the volume of hydraulic fluid discharged is calculated. The volume of hydraulic fluid leaking from the solenoid valve in the Longtom-4 SCM is estimated, monitored and recorded across each month to confirm the status of the leak, and actions taken when necessary to reduce the risk to an acceptable level. 	<ul style="list-style-type: none"> Measurements of hydraulic fluid consumption and discharges are recorded and kept in the Longtom Operations Discharge Log on at least a monthly basis during operations. Significant unexpected loss of hydraulic fluid is reported to SGHE management and NOPSEMA as required. Annual EP audit to check Operations Discharge Log and LT4 SCM records to ensure that they have been appropriately reported and responded to.

Risk Number	Hazard	Performance Objective	Performance Standard	Measurement Criteria
2	Physical presence of offshore facilities – impact on marine fauna and seabed	Impacts to marine fauna and the seabed as a result of maintenance shall be minimised.	<ul style="list-style-type: none"> • Routine inspections of the subsea facilities will be undertaken to identify and rectify possible areas of impact, e.g. potential erosion/scouring. • Inspections will take place during maintenance activities to ensure no unplanned disturbance occurs during conduct of maintenance. 	<ul style="list-style-type: none"> • Pipeline inspection report to provide details of any significant areas of erosion/scouring. • Daily reports and End of Campaign report show that no unplanned disturbance occurred.
		Unplanned disturbance to marine fauna and the seabed from Longtom activities shall be prevented through engineering design and inspection.	<ul style="list-style-type: none"> • The Longtom-5 flowline will be designed to be stable and the area of disturbance is minimised as far as practicable. • An ROV survey will be undertaken to ensure, where practicable, IMR debris is retrieved following a campaign. 	<ul style="list-style-type: none"> • Design validation certificate by a third party. • ROV survey report, including video footage, is available. • Records show that dropped objects have been retrieved, or their retrieval has been judged not practicable and the environmental risk has been assessed as acceptable.
		Lowest toxicity chemicals shall be selected for Longtom operations and maintenance purposes to prevent environmental impact.	Refer to Routine Impact Risk #1 chemical selection.	Refer to Routine Impact Risk #1 chemical selection
3	Physical presence of offshore facilities – impact on	Impacts to other users shall be prevented through infrastructure layout, design and	<ul style="list-style-type: none"> • Longtom-5 related facilities shall be located within the existing Longtom-3 petroleum safety zone. 	<ul style="list-style-type: none"> • As built layouts. • End of Campaign report includes final survey and records show that dropped objects have been retrieved, or their

Risk Number	Hazard	Performance Objective	Performance Standard	Measurement Criteria
	other users	inspection.	<ul style="list-style-type: none"> A survey will be undertaken following maintenance activities to retrieve any construction debris. 	retrieval has been judged not practical and the environmental risk has been assessed as acceptable.
		Impacts to other users shall be prevented through adequate consultation.	<ul style="list-style-type: none"> Consultation has taken place, as described in this EP. Ongoing consultation will be carried out in accordance with Regulation 11(A) (Schedule 2, Division 2.2A) of the OPGGS (E) Regulations 2009 and consultation log. All stakeholders as identified in the consultation log will be notified prior to the commencement of inspection, maintenance or repair activities. 	<ul style="list-style-type: none"> Ongoing consultation records (including records of notifications). Consultation report issued to NOPSEMA in accordance with Regulation 16 (B) of the OPGGS (E) Regulations 2009.
		Impacts to other users shall be prevented through vessel navigation.	<ul style="list-style-type: none"> Vessel navigation and communication equipment is functional and maintained in accordance with the planned maintenance system (or vessel operator's equivalent). 	<ul style="list-style-type: none"> Pre Mobilisation audit to confirm Navigational equipment is functional and that Vessel maintenance schedule is up to date and maintenance records are available. Daily report includes check of navigation equipment.
Non-Routine Impacts				
4	Loss of containment of hydrocarbons – subsea equipment damage	The subsea facilities shall be designed and operated to prevent the loss of containment and hence protect the environment.	<ul style="list-style-type: none"> Adherence to the NOPSEMA-accepted WOMP, including well design, shutdown systems and operating procedures. Regular maintenance and inspection of the subsea facilities in accordance with the NOPSEMA-accepted pipeline safety case and WOMP. 	Annual EP audit to confirm compliance with the NOPSEMA-accepted WOMP to include: <ol style="list-style-type: none"> Personnel trained and competent Operations carried out in accordance with approved processes and procedures, and maintenance activities carried out under a PTW system including an environmental assessment. Records show that equipment is maintained and tested

Risk Number	Hazard	Performance Objective	Performance Standard	Measurement Criteria
				in line with the maintenance program and CFT schedule.
		Implement a response to a hydrocarbon spill to minimise the impacts to the marine environment.	<ul style="list-style-type: none"> In the event of a hydrocarbon spill, the procedures in the OPEP² are followed, including: immediate actions, notifications, response actions and scientific monitoring as required. Adherence to the ERP. 	<ul style="list-style-type: none"> The OPEP and ERP are readily available and their contents have been communicated to all relevant personnel. Training records indicate personnel have appropriate competencies and training. Minimum expectations are that the Leader has IMO level 3 oil spill response training and the Planning and/or operations lead has IMO level 2 oil spill response training. This is checked quarterly. Spills, immediate actions, response actions and post-spill monitoring are recorded and reported. The close out of a spill is verified by the SGHE Development Manager and the designated authority. An ERP/OPEP exercise is undertaken annually.
		For a loss of well control event, to stop / control the source of release to limit the impact to the environment.	<p>A Longtom Relief Well Plan as per NOPSEMA – accepted WOMP is in place. Containing:</p> <ul style="list-style-type: none"> Plume modelling of gas release Relief well surface location, directional plan and point of intersection Relief well hole and casing design Dynamic kill modelling. 	Records show that a Longtom Relief Well Plan as per NOPSEMA-accepted WOMP is in place.
			Inventory of long-lead equipment available to drill a relief well maintained in accordance with the NOPSEMA-accepted WOMP.	Inventory of long lead equipment available to drill a relief well maintained.
			Specialist well control contractors and	Records show that specialist well control contractors and

Risk Number	Hazard	Performance Objective	Performance Standard	Measurement Criteria
			equipment identified in accordance with NOPSEMA-accepted WOMP.	equipment identified.
			Availability of rig to meet minimum requirements (as described in the NOPSEMA-accepted WOMP) to drill a relief well within 90 days confirmed annually during operations, and 30 days prior to spud and monthly thereafter during drilling.	Status and location of suitable rig (plus a heavy transport vessel if required) to drill relief well identified annually during operations, and 30 days prior to spud and on a monthly basis throughout drilling campaign.
			In the event of a blowout, the well is killed or a relief well is drilled to control the source within 90 days.	<ul style="list-style-type: none"> Well is killed or relief well drilled and source of release controlled. All key documentation, including OSRT Log, daily drilling reports, regarding well containment activities are retained in company records.
5	Loss of containment of hydraulic fluid, MEG and methanol – subsea equipment damage	Lowest toxicity chemicals shall be selected for Longtom operations and maintenance purposes to prevent environmental impact.	Refer to Routine Impact Risk #1 chemical selection	Refer to Routine Impact Risk #1 Chemical Selection.
Impacts from Vessels/ROV Operations				
All	Impacts to the environment from inspection, maintenance or repair	All offshore campaigns will be conducted in a manner that does not cause damage to the environment.	<ul style="list-style-type: none"> Environmental risk assessment conducted and no risks identified greater than described within this EP. Identified hazards are managed in accordance with specific standards and 	<ul style="list-style-type: none"> Pre campaign environmental risk assessment conducted and available. Project induction includes information on the Environment Plan and records show all personnel have undergone the training.

Risk Number	Hazard	Performance Objective	Performance Standard	Measurement Criteria
	campaigns		criteria described below. <ul style="list-style-type: none"> Any spill to the environment is managed in accordance with the OPEP. Vessel and project personnel are aware of the Environment Plan and its requirements. 	<ul style="list-style-type: none"> All key records and documentation regarding specific hazards are retained for compliance and reference, as per further details in remainder of table 7.1.
		Vessels are selected to prevent impact to the environment.	<ul style="list-style-type: none"> Pre-mobilisation audit conducted to confirm vessel acceptability and compliance with the requirements of this EP. Pre-mobilisation audit conducted to confirm vessel manned by competent and trained marine crew (Vessel Master, First Mate and Second Mate have a valid STCW qualification) 	<ul style="list-style-type: none"> Pre-mobilisation audit complete and available. No significant non compliances with the EP identified.
6	Vessel collisions with marine fauna	No injury or death of megafauna resulting from vessel strike.	Vessel Masters will implement interaction management actions consistent with the EPBC Regulations 2000 – Part 8 Division 8.1 <ul style="list-style-type: none"> Vessels will not knowingly travel faster than 6 knots within 300m of a whale or 150 m of a dolphin Vessels will not knowingly get closer than 100m of a whale or 50m of a dolphin If a cetacean approaches the vessel within the above zones, the vessel will avoid rapid changes in engine speed or direction. 	Daily operations reports note when cetaceans were sighted in the caution zone and interaction management actions implemented.
7	Noise emissions	Prevent injury or harm to cetaceans from sound emissions during vessel operations	Vessel masters will implement interaction management actions consistent with the EPBC Regulations 2000 – Part 8 Division 8.1 <ul style="list-style-type: none"> Vessels will not knowingly travel faster than 6 knots within 300m of a whale or 150 m of a 	Daily operations reports note when cetaceans were sighted in the caution zone and interaction management actions implemented.

Risk Number	Hazard	Performance Objective	Performance Standard	Measurement Criteria
			dolphin <ul style="list-style-type: none"> Vessels will not knowingly get closer than 100m of a whale or 50m of a dolphin If a cetacean approaches the vessel within the above zones, the vessel will avoid rapid changes in engine speed or direction. 	
		Prevent injury or harm to cetaceans from noise emissions during helicopter activities	Interaction between helicopters and cetaceans within the project area will be consistent with EPBC Regulations 2000 – Part 8 Division 8.1: <ul style="list-style-type: none"> Helicopters will not fly lower than 1650ft when within 500m horizontal distance of a cetacean (except when landing or taking off) and will not approach a cetacean from head on. 	Flight reports note when cetaceans were sighted in the caution zone and interaction management actions implemented.
		Prevent injury or harm to cetaceans from noise emissions during geophysical survey activities	<ul style="list-style-type: none"> If a whale is sighted within 500 m of the SBP, SSS or MBES prior to commencement of data acquisition the operation will be delayed until the whale has moved out of the 500 m shutdown zone or 10 minutes has passed since the last sighting. The SBP, SSS or MBES will be shut down if a whale is sighted within 500 m of the operating source. Data acquisition will recommence once the whale has moved out of the 500 m shutdown zone or 10 minutes has passed since the last sighting. The SBP, SSS or MBES will not be operated at night time if there have been three 	Daily report demonstrates the implementation of the 500 m shutdown zone and night time restrictions.

Risk Number	Hazard	Performance Objective	Performance Standard	Measurement Criteria
			incidences of whales sighted in the preceding 24 hour period.	
8	Light emissions	Lighting will be limited to that required for safe work and navigation.	Lighting will be limited to that required for safe work and navigation.	Inspection records verify no excessive light being used beyond that required for safe work and navigation.
9	Atmospheric emissions	Fuel combustion equipment complies with the requirements of MARPOL 73/78 Annex VI.	<ul style="list-style-type: none"> • Vessel to comply with the requirements of MARPOL 73/78 Annex VI and have a valid International Air Pollution Prevention (IAPP) certificate • The sulphur content of Marine Diesel Oil used on-board shall not exceed IMO regulated limits • Vessel engines shall meet prescribed NOx emission levels and have one Engine International Air Pollution Prevention (EIAPP) certificate for each diesel engine of ≥ 130 kW. 	<ul style="list-style-type: none"> • The IAPP certificate is readily available, current and is checked during the pre-mobilisation audit. • Bunker receipts verify the use of low-sulphur marine grade diesel. • The EIAPP certificates are readily available, current and are checked during the pre-mobilisation audit.
10	Discharge of sewage and grey water	Project vessels will manage sewage and grey water to prevent impact to the environment.	<ul style="list-style-type: none"> • Vessels to comply with MARPOL 73/78 Annex IV and have a valid International Sewage Pollution Prevention certificate in place. • No untreated sewage or grey water discharged overboard. • The sewage treatment plant will be maintained in accordance with the vessel's planned maintenance system. 	<ul style="list-style-type: none"> • The International Sewage Pollution Prevention certificate is readily available, current and is checked during the pre-mobilisation audit. • Vessel's waste management practices, including the adequacy of the sewage treatment plant - checked during the pre-mobilisation audit. • Maintenance records confirm equipment is maintained in accordance with manufacturer's specifications and is checked during the pre-mobilisation audit. • Daily report includes check of sewage treatment plant

Risk Number	Hazard	Performance Objective	Performance Standard	Measurement Criteria
				availability. <ul style="list-style-type: none"> Pre-mobilisation audit and daily reports are retained in hardcopy and electronic files for reference.
11	Discharge of putrescible waste	There will be no discharges of unmacerated food waste during project activities to prevent impact to the environment.	<ul style="list-style-type: none"> Vessels will comply with MARPOL 73/78 Annexes IV and V. A galley macerator will be installed which shall macerate good scraps to a diameter of 25 mm prior to disposal overboard, in accordance with MARPOL standards. Cooking oils and greases will be collected and transported back to shore for disposal. All non-food galley waste will be transported back to shore for recycling/disposal. The galley macerator will be maintained in accordance with the vessel's planned maintenance system. 	<ul style="list-style-type: none"> The vessel's compliance with MARPOL 73/78 Annexes IV and V, the waste management practices, including the adequacy of the macerator all checked during the pre-mobilisation audit. Garbage records are available describing the type of waste disposed/collected, location and quantity. Daily Report summarises waste transfers. Maintenance records confirm equipment is maintained in accordance with manufacturer's specifications - confirmed during the pre-mobilisation audit. Audit documentation and daily reports are retained in hardcopy and electronic files for reference.
12	Discharge of contaminated deck/bilge water	There will be no discharge of untreated bilge water to prevent impact to the environment.	<ul style="list-style-type: none"> Vessels will comply with MARPOL 73/78 Annex I. Oil or oily mixtures will be retained on board or disposed of if in accordance with MARPOL standards (i.e., if it is less than 15 parts per million oil-in-water). Fixed and mobile equipment will be maintained in accordance with the vessel's planned maintenance system. 	<ul style="list-style-type: none"> Vessel compliance with MARPOL 73/78 Annex I is checked during the pre-mobilisation audit. The International Oil Pollution Prevention certificate is readily available, current and valid and is checked during the pre-mobilisation audit. Maintenance records confirm equipment is maintained in accordance with manufacturer's specifications. Daily report includes check of oily water storage / disposal

Risk Number	Hazard	Performance Objective	Performance Standard	Measurement Criteria
		<p>Project vessels will have a SOPEP in place to address chemical and hydrocarbon spills on deck and avoid overboard discharges to prevent impact to the environment.</p>	<ul style="list-style-type: none"> • Vessels will have an approved SOPEP in place. Scupper plugs will be readily available, and any spills will be cleaned up immediately. • Vessel crew trained in SOPEP and SOPEP exercises conducted • Hydrocarbon and chemical storage areas will be bunded and chemicals will be stored in chemical storage lockers. 	<p>system.</p> <ul style="list-style-type: none"> • Audit documentation and daily reports are retained in hardcopy and electronic files for reference. • The SOPEP, vessel’s waste management practices, including the availability of SOPEP kits/scupper plugs and the adequacy of the bunded areas will be checked during the pre-mobilisation audit. • Training records confirm crew have appropriate competencies and training and SOPEP exercise records will be checked during the pre-mobilisation audit. • Audit documentation and daily reports are retained in hardcopy and electronic files for reference.
13 & 14	Discharge of non-hazardous & hazardous waste	Project vessels will not discharge solid waste to sea to prevent impact to the environment.	<ul style="list-style-type: none"> • Vessels to comply with MARPOL 73/78 Annex V (Garbage Certificate of Compliance). • Vessels to implement a Waste Management Plan. • An ROV survey undertaken to check for, and retrieve, dropped objects following a construction campaign. 	<ul style="list-style-type: none"> • The Garbage Certificate of Compliance is readily available, current and valid and checked during the pre-mobilisation audit. • The Waste Management Plan is readily available and its contents have been communicated to crew, confirmed during the pre-mobilisation audit. • Garbage records are available verifying that there are no discharges of waste to sea (other than food wastes). The records also detail the types and volumes of waste taken ashore. • Daily Report summarises waste transfers. • The end of campaign report to include results of the ROV survey. Records show that dropped objects have been retrieved, where practical.

Risk Number	Hazard	Performance Objective	Performance Standard	Measurement Criteria
				<ul style="list-style-type: none"> Audit documentation, waste management plan and associated records and daily reports are retained for reference.
15 &16	Discharge of cooling and brine water	Project vessels will manage cooling and brine water to prevent impact to the environment.	The cooling water and RO desalination systems will be maintained in accordance with the PMS.	<ul style="list-style-type: none"> Maintenance records confirm equipment is maintained in accordance with the PMS schedule – confirmed during the pre-mobilisation audit Daily report includes functionality check of cooling water and RO desalination systems
17	Introduction of invasive marine species	No introduction and establishment of IMS	Biofouling Management Plan and records maintained in accordance with IMO Guidelines for the Control and Management of Ships' Biofouling to Minimise the Transfer of Invasive Aquatic Species.	Biofouling records collected in order to conduct biofouling risk assessment confirm these are maintained.
			Biofouling risk assessment conducted in accordance with IMS RA procedure shows low risk.	Biofouling risk assessment record confirms vessel poses low risk of introducing IMS.
			All immersible retrievable -equipment has been cleaned and / or inspected in accordance with National Biofouling Management Guidance for the Petroleum Production and Exploration Industry prior to commencement of the activity.	Records document cleaning and / or inspection of immersible retrievable - equipment.

Risk Number	Hazard	Performance Objective	Performance Standard	Measurement Criteria
			<p>Ballast Water Management Plan approved in accordance with IMO Ballast Water Management Convention - Guidelines for Ballast Water Management and Development of Ballast Water Management Plans</p> <p>Ballast Water Management Certificate approved in accordance with the IMO Ballast Water Convention, including implementation of the D-2 standard per the agreed timeline.</p>	<p>Records show an approved BWMP and BWMC comply with the IMO Ballast Water Management Convention requirements, including the implementation of D-2 standard in accordance with the agreed timeline per the Class or flag state of the respective vessel.</p>
			<p>Ballast Water Record System is maintained in accordance with Regulation B-2 of the Annex to the IMO Ballast Water Management Convention including</p> <ul style="list-style-type: none"> • start and finish coordinates • actual pumping times • residual volume remaining in the tank at the end the empty cycle prior to refill (empty refill method only) 	<p>Ballast Water Records</p>
			<p>Vessel Master to adhere to Australian Ballast Water Management (ABWM) Requirements for ballast water exchange.</p>	<p>Ballast water records show location of ballast water uptake and discharge.</p>
18	Vessel diesel spill	Vessel and vessel equipment is operated and maintained to a standard that prevents	<ul style="list-style-type: none"> • Vessel navigation and communication equipment is functional and maintained in accordance with the planned maintenance system (or vessel operator's equivalent). 	<ul style="list-style-type: none"> • A pre-mobilisation vessel audit to confirm compliance, specifically the vessel's anti collision protocols and whether SOPEP kits are available and adequate. • Vessel maintenance schedule and up to date maintenance

Risk Number	Hazard	Performance Objective	Performance Standard	Measurement Criteria
		spill causing a damage to the environment.	<ul style="list-style-type: none"> • Vessel storage tanks functional and maintained in accordance with the planned maintenance system (or vessel operator's equivalent) • Inspection, maintenance and repair campaigns will be subject to risk assessment and controls will be implemented to manage the identified risks. • Only vessels using MDO engaged for Longtom activities. 	<p>records are available and is checked during the pre-mobilisation audit.</p> <ul style="list-style-type: none"> • Daily Report includes diesel volumes. • Audit documentation, logs and daily reports are retained for reference. • Pre-mobilisation inspection confirms that vessel uses MDO.
		For a loss of diesel, the source of release is controlled as soon as possible to minimise the scale of the spill and the impact on the environment	<ul style="list-style-type: none"> • In the event of a diesel spill the vessels ERP/SOPEP is implemented • Where possible diesel is transferred between tanks to minimise spill and the vessels ballast is also adjusted to minimise / control the source of the spill. 	<ul style="list-style-type: none"> • Source controlled within 24 hours • All key documentation regarding spill response activities are retained in company records.
		Implement a response to a diesel spill to minimise the impacts to the marine environment.	<ul style="list-style-type: none"> • In the event of a diesel spill, the procedures in the SOPEP and OPEP² are followed, including: immediate actions, notifications, response actions and scientific monitoring as required. • Adherence to the ERP. 	<ul style="list-style-type: none"> • The vessel SOPEP, OPEP and an ERP are readily available and their contents have been communicated to crew. • Pre-mobilisation audit to confirm crew have appropriate competencies and training. • Project specific training provided and confirmed via training records. • A campaign specific ERP/OPEP exercise is undertaken. • Audit documentation, ERP/OPEP exercise records and

Risk Number	Hazard	Performance Objective	Performance Standard	Measurement Criteria
				daily reports are retained for reference.
19	ROV discharges	ROV activities to not discharge hydraulic fluid into the marine environment.	<ul style="list-style-type: none"> The ROV is designed to prevent hydraulic fluid leaks, with the hoses and fittings all rated for the operating pressures. Compliance with maintenance and operating procedures, as they relate to ROV equipment, hose management and isolation/shutdown systems. ROV maintenance area, Hydraulic fluid and supply systems are arranged to prevent leaks to the environment, i.e. banded. 	<ul style="list-style-type: none"> Records/certificates show that ROV has been appropriately designed and is confirmed as part of pre-mobilisation audit. Maintenance records indicate ROV and hoses are maintained in accordance with their planned maintenance system and is confirmed as part of pre-mobilisation audit Adequacy of ROV maintenance area, Hydraulic fluid and supply systems, confirmed as part of pre-mobilisation audit. Training records confirm crew have appropriate competencies and training, confirmed as part of pre-mobilisation audit Pre-dive checklists completed and confirmed as part of pre-mobilisation audit. Audit documentation and associated records are retained for reference.
		Lowest toxicity chemicals shall be selected for Longtom maintenance purposes to prevent environmental impact.	Refer to Routine Impact Risk #1 chemical selection	Refer to Routine Impact Risk #1 chemical selection

- Notes:**
- The Longtom Pipeline Safety Case must demonstrate that the safety risks are managed to ALARP and must include performance standards. A large number of these safety performance standards, particularly those for preventative controls also provide control against potential environmental risks. For example, the controls in place to prevent a vessel collision or pipeline failure will protect personnel and will also protect the environment. In addition, the Safety Case requires a third party validation of safety related items. Listing all these individual controls separately in the table is not considered appropriate.
 - The OPEP and the NEBA provide additional performance objectives, standards and measurement criteria in the event of a spill to ensure that the risk to the environment is managed to ALARP.

Table 7-2 Leading environmental performance objectives, standards and measurement criteria for the OPEP preferred response strategies

Response Strategy	Objective	Standards	Measurement Criteria
Source Control	Suitable Source Control Manager identified and agreement in place with a third party service provider, e.g. Wild Well Control to plan and manage a relief well.	Flow from blowout curtailed in less than 90 days. Relief well designed and drilled in accordance with codes and standards as specified in the relevant safety case and WOMP.	<ul style="list-style-type: none"> • Quarterly ERP checks availability of a suitable Source Control Manager • Master Services Agreement in place with third party service provider, e.g. Wild Well Control to support SGHE.
Monitoring	Operational and scientific monitoring program (OSMP) specific to the Longtom Gas Project available and resources available to implement.	Longtom Gas Project OSMP is consistent with: <ul style="list-style-type: none"> • NOPSEMA IP1073 - Information paper - Operational Scientific Monitoring Programs- Revision 2 - March 2016 • AMSA Oil Spill Monitoring Handbook 2016. 	<ul style="list-style-type: none"> • Agreement in place with OSMP third party service provider e.g. GHD prior to an IMR activity or restart of operations. • Quarterly ERP check on third party service provider contacts and capability. • Annual EP Audit includes check of OSMP and availability of qualified personnel from the OSMP service providers to implement OSMP. • Annual EP Audit includes check that personnel could be mobilised within the required timeframe of the OSMP
Aerial surveillance	Aerial surveillance is deployed to monitor a spill and facilitate effective operational response to protect sensitive environments.	<ul style="list-style-type: none"> • Current contact details for AMOSC (for trained aerial observers) and local aviation service providers are included in Longtom Production Operations ERP Contacts directory. • Aerial surveillance is deployed within the next daylight shift after a spill greater than 10m³ is detected. 	<ul style="list-style-type: none"> • At least an annual review of Longtom Production Operations ERP Contacts directory and check that AMOSC have trained aerial observers. • Records of aerial surveillance demonstrate that aerial surveillance was commenced with the next daylight shift after the spill was detected and information regarding slick movement is available to OSRT.
Satellite monitoring	Satellite tracking buoys are deployed for significant spills within	<ul style="list-style-type: none"> • Satellite buoys are available for deployment. 	<ul style="list-style-type: none"> • Annual review of AMOSC equipment includes check of satellite buoys to support spill response for SGHE.

Response Strategy	Objective	Standards	Measurement Criteria
	<p>an appropriate timeframe to facilitate effective operational response to protect sensitive environments.</p>	<ul style="list-style-type: none"> • Satellite buoys are deployed within 24 hours for spills greater than 10m³. 	<ul style="list-style-type: none"> • Records demonstrate that satellite buoys were deployed within 24 hours of the initial detection of a spill and information regarding slick/plume movement is available to OSRT.
<p>Oil spill trajectory prediction</p>	<p>Trajectory of slick estimated via modelling to guide the selection of appropriate spill response strategies for minimising the impact on the environment and protection of sensitive areas.</p>	<ul style="list-style-type: none"> • Key project personnel are familiar with spill trajectory estimation techniques. • Arrangements are in place for initiating spill trajectory modelling. • Trajectory modelling is produced within 12 hours of a spill greater than 10m³. 	<ul style="list-style-type: none"> • Annual OPEP exercise includes requirement to estimate spill trajectory. • SGHE membership of AMOSC which provides for access to APASA for oil spill trajectory modelling. • Contract between AMOSC and APASA is checked as part of the annual review of AMOSC capabilities. • Production of trajectory model and information regarding slick/plume movement is available to OSRT and is documented as part of oil spill response, with records maintained.
<p>Deflection and recovery</p>	<p>Booms are available for deployment to protect sensitive environments such as inlets and estuaries identified in the OPEP.</p>	<ul style="list-style-type: none"> • 500 m of suitable deflection booms are available for deployment in the event of a spill. • Equipment can be relocated and available for deployment in East Gippsland within 24 hours. 	<ul style="list-style-type: none"> • Annual review of AMOSC equipment, resources and timing for deployment to East Gippsland, with documentation of this confirmation to be maintained.
	<p>Deflection booms and recovery equipment are relocated and deployed in East Gippsland within an appropriate timeframe to facilitate effective operational</p>	<ul style="list-style-type: none"> • Deflection booms and recovery equipment are deployed within 24 hours where defendable estuaries or shorelines are threatened by slick movement. 	<ul style="list-style-type: none"> • Threatened defendable estuaries or shorelines are protected within 24 hours of request initiated. • Records of communications and logistics regarding boom deployment are retained as part of the oil spill response documentation.

Response Strategy	Objective	Standards	Measurement Criteria
	response to protect sensitive environments.		

8 Implementation Strategy

8.1 Aim

This section describes the implementation strategy for the EP, specifically detailing the measures required to ensure the environmental performance objectives and environmental performance standards are met. The broad environmental objectives of the Longtom Gas Project are to:

- Achieve and demonstrate best practice environmental management of any aspect of the operations that may have an impact on the environment.
- Minimise and manage the damage where an impact is unavoidable.

The SGHE’ HSEC Policy serves as the key environmental management document for the project (Attachment 1). This policy guides the development and implementation of all other management system components. SGHE retains full and ultimate responsibility as the titleholder.

The following table presents a summary of the implementation strategy against the typical the “Plan, Do, Check, Review and Improve” requirements of a successful plan.

Table 8-1 Plan, Do, Check and Review Requirements

Stage	What we do	Who	Where described
Plan	Maintain an accepted EP	SGHE Development Manager or above	This document
	Maintain an OPEP and ERP	SGHE Development Manager or above	EP Section 8.10 and refer to OPEP
	Develop Project Execution Plans, conduct HAZIDs and Risk Assessments	SGHE Project Manager	SGHE Hazard and Risk Assessment Protocol CORP-HSE-027, and activity specific PEP’s and RA’s etc are filed in company records.
Do	Execute our Operations in line with our EP and Longtom safety case	SGHE Development Manager and all personnel working on Longtom.	This document and Longtom Pipeline Safety Case – Operations 05-HSEQ-GEN-PL-13
	Conduct Training in the EP	SGHE HSEC Manager	EP Section 8.4. Training records (including attendance sheets) maintained in company records.
	Conduct ERP and OPEP training, drills / exercises	SGHE HSEC Manager	EP Section 7 Table 7.1, Section 8.10, and refer to OPEP. Training records (including attendance sheets) maintained in company

Stage	What we do	Who	Where described
			records.
	Review acceptability of vessels and contractors	SGHE HSEC Manager	HSEC Category Assessments for Contracts CORP-HSE-021, and EP Section 7 Table 7.1.
	Conduct induction training for projects	SGHE HSEC Manager	EP Section 7 Table 7.1, and training records (including attendance sheets) maintained in company records.
	Report reportable and recordable incidents.	SGHE Development Manager or above	EP Table 8.3
	Monitor discharges and other items as identified within the risk assessments.	SGHE HSEC Manager	EP Section 8.8
	Report to Regulator annually on the performance of the EP. Report reportable and recordable incidents.	SGHE Development Manager or above	EP Table 8.3
	Consult with identified stakeholders prior to major activities	SGHE HSEC Manager	EP Section 3, 8.11 and Attachment 4.
Check	Routine monitoring and reporting of compliance with Performance Objectives, Standards and Criteria	SGHE HSEC Manager	EP Section 8.9
	Review changes to procedures, equipment and chemicals	SGHE Development Manager or above	EP Section 8.5, SGHE HSEC Management Standard 6 for Management of Change (MOC), SGHE MOC procedure and APA/Cooper MOC where relevant.
	Vessel inspections and checks during campaigns	SGHE Offshore Representative	EP Section 7 Table 7.1 and 8.9
	Daily reports during campaigns	SGHE Offshore Representative	EP Section 7 Table 7.1 and 8.9
	Quarterly check of ERP / OPEP contacts and phone numbers	SGHE HSEC Manager	EP Section 8.10
	Conduct vessel pre-mobilisation and annual EP compliance audits	SGHE HSEC Manager	EP Section 8.9
Review and Improve	Review Environmental Hazard Register, EP Risk and ALARP/Acceptability Assessment annually	SGHE HSEC Manager	EP Section 8.9
	Lesson Learnt workshop	SGHE Projects	EP Section 8.9

Stage	What we do	Who	Where described
	conducted for Offshore campaigns	Manager	
	Conduct annual environmental performance and EP implementation strategy review	SGHE Development Manager and SGHE HSEC Manager	EP Section 8.9
	Conduct annual ERP / OPEP Exercise	SGHE HSEC Manager	EP Section 8.10 and OPEP
	Reporting and investigation of incidents and non-conformance	SGHE HSEC Manager	SGHE Incident Management Procedure CORP-HSE-003

8.2 SGHE HSEC Management System

SGHE has a set of HSEC Management Standards that provide a systematic and consistent approach for the management of project and operational activities. This approach aims to achieve the following outcomes:

- Planned, systematic, verifiable and continually improving approach to achieving HSEC policies, plans, objectives and targets.
- Hazards are identified and controlled.
- Assets owned or managed by SGHE are designed and operated to accepted internal and external HSEC standards.

Each manager is responsible for ensuring full compliance within their area of responsibility and control and will be held accountable for the successful implementation of these standards. During operations a self-assessment against the HSEC Management Standards is undertaken each year by the SGHE HSEC Manager.

The SGHE HSEC Management Standards consist of 15 standards, each of which is supported by several procedures or protocols:

1. Policy, Leadership and Commitment.
2. Organisation, Responsibility and Resources.
3. Planning, Objectives and Targets.
4. Regulatory Requirements and Document Control.
5. Competence, Training and Behaviours.
6. Risk and Change Management.
7. Projects, Facility Design, Construction and Commissioning.
8. Operations and Maintenance.
9. Incident Management.
10. Contractors, Suppliers and Partners.

- 11. Performance Measurement, Reporting and Communication.
- 12. Crisis and Emergency Management.
- 13. Health and Fitness for Work.
- 14. Audits, Inspections and Reviews.
- 15. Community.

The HSEC Management Standards are the means by which the SGHE HSEC Policy is implemented. The hierarchy of the HSEC Management System is presented in Figure 8-1.

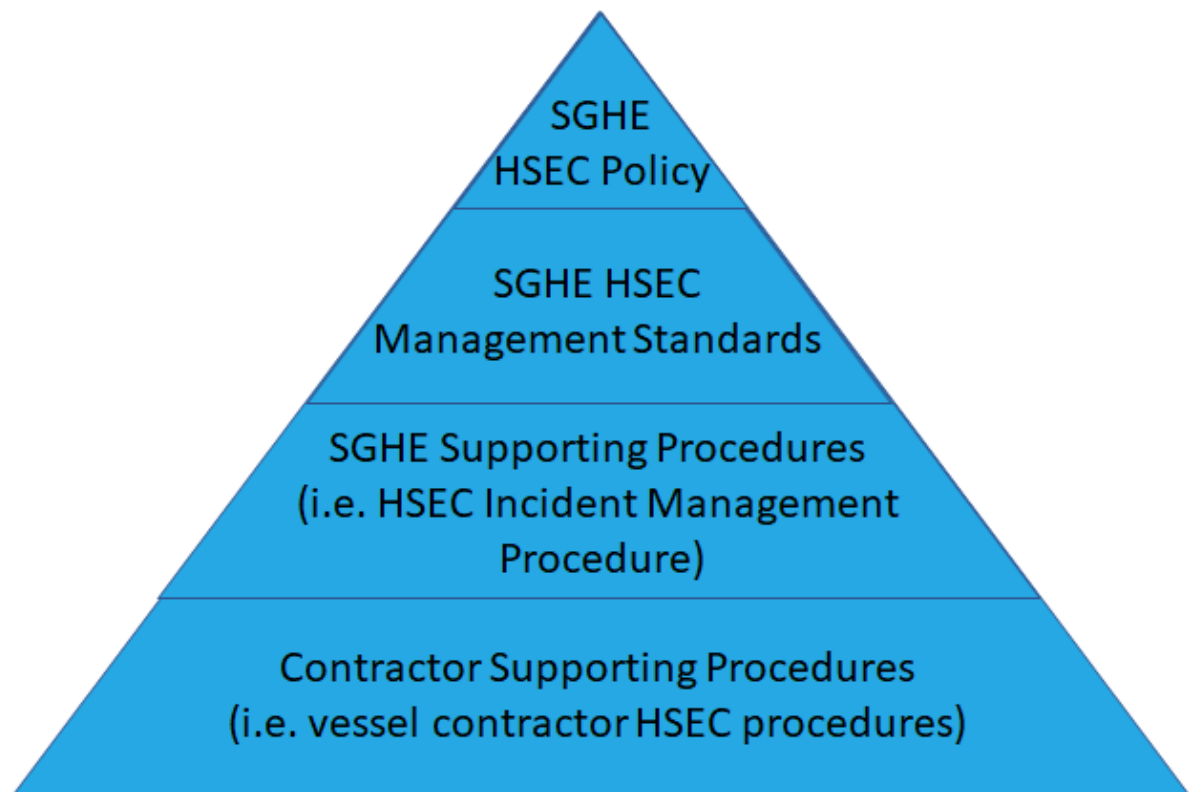


Figure 8-1 SGHE HSEC Management Hierarchy

APA as the operators of the PB gas plant also have an EHS management system, this is described in detail within the Longtom Safety Case.

8.3 Roles and Responsibilities

All SGHE and contractor personnel are required to comply with the Environment Plan and all relevant conditions of approval. Key environmental roles and responsibilities, and therefore chain-of-command, are identified in Table 8-2.

SGHE is responsible for ensuring that the project is managed in an environmentally responsible manner and in accordance with all regulatory requirements.

Table 8-2 Environmental Roles and Responsibilities

Role	Responsibilities
SGHE Development Manager	<ul style="list-style-type: none"> • Responsible for overall operation of the field. • Responsible for reporting to authorities (e.g., NOPSEMA). • Responsible for meeting regulatory requirements, including the Environment Plan. • Ensures compliance with the SGHE HSEC Policy. • Ensures all required plans, audits and reviews are undertaken in accordance with the regulatory requirements and as required by this EP.
SGHE Project Manager	<ul style="list-style-type: none"> • Responsible for the management of offshore campaigns including Longtom-5. • Responsible for ensuring offshore campaigns meet the regulatory requirements, including the Environment Plan. • Ensures campaigns comply with the SGHE HSEC Policy. • Ensures all campaign required plans, audits and reviews are undertaken in accordance with the regulatory requirements and as required by this EP.
SGHE HSEC Manager	<ul style="list-style-type: none"> • Coordinates the preparation of the environmental approvals documentation. • Ensures all personnel are inducted and are aware of their environmental responsibilities. Ensures overall compliance with the EP. • Responsible for coordinating emergency response preparedness. • Ensures inspection, maintenance and repair campaigns are subject to risk assessment and controls will be implemented to manage the identified risks. • Conducts (or delegates) a pre-mobilisation audit and annual EP compliance audits. • Reports environmental incidents to the SGHE Development Manager. • Ensures environmental incidents are reported to statutory authorities (see Section 8.7). • Ensures changes are assessed and approved by SGHE, in accordance with Section 8.5. • Ensures incident investigations are conducted. • Ensures corrective actions from environmental audits and incidents are completed. • Prepares and submits monthly reports to NOPSEMA.

Role	Responsibilities
<p>SGHE Offshore Representative (when applicable)</p>	<ul style="list-style-type: none"> • Responsible offshore for day to day conduct of the project. • Responsible for checking that the contractor implements all relevant environmental requirements (including inductions and training). • Responsible for reporting results of environmental matters to the SGHE HSEC Manager and Project Manager. • Responsible for monitoring the performance/compliance of the Offshore Longtom-5 Installation Contractor with regards to the requirements of the EP and all conditions of approval. • Conducts HSE inductions for crew arriving on the vessels. • Attends daily meetings, reviews JSAs and ensures general adherence to vessel specific procedures and project specific procedures, including the WOMP, OPEP, ERP and Safety Case. Undertakes periodic HSE inspections to check for compliance with EP commitments. • Reports on vessel performance to the SGHE HSEC • Collates whale sightings and forwards on to the SGHE HSEC Manager • Liaises closely with the SGHE HSEC Manager on performance and incidents. • Ensures training requirements are fully implemented.
<p>Vessel Masters and/or Plant Superintendent</p>	<ul style="list-style-type: none"> • Responsible for the safe operation of the vessel / site. • Overall responsibility for HSE management. • Implements and ensures adherence to all relevant environmental legislative requirements, commitments, conditions and procedures on-board the vessel. • In the event that the Offshore Representative or SGHE HSEC Manager is not available, reports reportable incidents to NOPSEMA within 2 hours of an incident occurring. • Communicates hazards and risks to the workforce and the importance of following good work practices. • Maintains the site / vessel in a state of preparedness for emergency response. • Reports environmental incidents within the 500-m radius safety zone to the SGHE Offshore Representative. • Reports environmental incidents to the SGHE Offshore Representative and the SGHE HSEC Manager when they occur outside the 500-m safety radius safety zone but within the SGHE permit area. • Applies appropriate enforcement mechanisms to prevent breaches of the EP.
<p>SGHE CEO</p>	<ul style="list-style-type: none"> • Ensures sufficient resources are available to implement the SGHE HSEC Policy and environmental commitments. • Ensures all incidents are investigated and reported in line with the SGHE HSEC Policy.
<p>All vessel personnel</p>	<ul style="list-style-type: none"> • Adhere to this EP. • Follow good housekeeping procedures and work practices. • Encourage improvement wherever possible. • Report incidents to the SGHE Offshore Representative and Vessel Masters.

8.4 Competence, Training and Awareness

The SGHE HSEC Management Standard No. 5 (Competence, Training and Behaviours) defines the training and competency expectations for SGHE staff and contractors. APA as the operator of the PB gas plant also has an EHS management standard for training and competency (EHSMS06). This defines the training and competency requirements and supporting management system to ensure employees, contractors and visitors to the gas plant have the necessary knowledge and skills to enable them to conduct their activities:

- safely
- in an environmentally responsible manner; and
- without damaging plant and equipment.

Following acceptance of the EP in 2014, Nexus worked with Santos to include a specific requirement for all PB gas plant operators to attend an EP induction training session. This session highlighted the specific requirements of the EP on PB operations, defined what constituted an incident and the subsequent actions to be taken in the event of an incident. Prior to restart this training will be re-provided to PB operations personnel and other parties involved in managing any Longtom production.

In the event of an offshore campaign SGHE ensures compliance with the EP requirements by way of pre-mobilisation audits, induction training, regular HSE meetings and checks and by having SGHE representation offshore. This will ensure each crew member is aware of their responsibilities and have the necessary skills to complete the required tasks and meet project objectives and targets.

Each contracting party involved with the project is required to have its own matrix that defines required skills, competencies and organisational compliance levels.

The vessel pre-mobilisation induction training aims to ensure personnel are aware of their roles and responsibilities in ensuring compliance with the EP and minimal impact to the environment during project activities. The information presented at the induction will include:

- An overview of the EP and its key commitments.
- Regulatory and procedural requirements.
- The SGHE and vessel environmental policies.
- Environmental sensitivities of the area.
- Environmental management procedures (e.g., waste management).
- Emergency and oil spill response procedures.
- Observation and notification procedures in the event of detrimental effects to marine flora or fauna.

- Recording and reporting of information to SGHE and the regulators.

All personnel are required to sign an attendance sheet to confirm their participation in, and understanding of, the pre-mobilisation induction.

8.5 Management of Change

The SGHE HSEC Management Standard No. 6 (Risk and Change Management) defines how SGHE manage change. The SGH MOC procedure (CORP-PM-PR-0001) and associated forms (CORP-PM-FO-0001) provide further guidance on how change is managed. The standard and procedure ensures that when changes are made to the project, to control systems, to an organisational structure or to personnel, the HSE risks and other impacts of such changes are identified and appropriately managed.

A risk assessment is undertaken which considers the impact of the proposed change on the project's environmental risks and on the environmental performance objectives (Section 7).

In the event that the proposed change introduces a significant new environmental impact or risk or results in a significant increase to an existing risk, this EP will be revised for resubmission.

Where the proposed change can be managed such that environmental performance objectives are met, this will be documented without the requirement for a formal revision to this EP. In the event that the proposed change results in non-compliance with a performance objective, this EP will be revised for resubmission.

All changes to the onshore facilities and their operation should also be controlled and managed under the Onshore Gas Plants MOC system. The SGHE audit / inspections of the gas plant operator will confirm that change is appropriately managed.

8.6 Notifications

SGHE will formally notify NOPSEMA:

- at least 10 days prior to recommencing production;
- at least 10 days prior to commencement of Longtom -5 tie in activities and within 10 days of completion of Longtom-5 tie in activities; and
- within 10 days of cessation of Longtom operations.

8.7 Incident Recording and Reporting

SGHE has an Incident Management Procedure (CORP-HSE-003) that details the actions to be undertaken in the event of a safety or environmental incident, with all incidents reported to the SGHE Development Manager.

During an offshore campaign all environmental incidents will be reported in the first instance to the SGHE Offshore Representative, who will then report to the SGHE HSEC Manager and the SGHE Development Manager.

The SGHE Development Manager and the SGHE HSEC Manager will determine whether the incident is a reportable or recordable incident and notify NOPSEMA accordingly. If these personnel are unavailable the SGHE Offshore Representative will notify NOPSEMA. If the reporting requirement is in doubt the SGHE recommendation is to report the incident.

On the vessels, the Vessel Master is responsible for maintaining an onsite copy of internal records and reports, which are filed using standard office protocols.

8.7.1 Management of EP Non-conformance

All breaches of this EP will be treated as non-compliances. Breaches may be identified during an audit or as a consequence of an incident.

All non-compliance issues must be communicated immediately to the Offshore Representative during an offshore campaign and to the SGHE Development Manager and SGHE HSEC Manager. This expectation is reinforced at inductions and regularly throughout the project. All non-compliance incidents will be investigated as per the SGHE HSEC Management Standard No. 9 (Incident Management). Following an investigation, remedial actions are developed to prevent recurrence and tracked to completion.

Significant non-compliances are communicated to the offshore crew during standard forums such as daily tool-box talks, pre-tour meetings, and weekly safety meetings on board the respective vessels. Non-conformances will be reported as per Section 8.7.2.

8.7.2 Incident Recording and Reporting

The processes for recording and reporting recordable and reportable environmental incidents to external authorities in line with the OPGGS (E) Regulations 2009 are described in Table 8-3. Figure 8-2 provides an illustration of reporting requirements.

Table 8-3 Routine and incident reporting requirements

Requirements	Timing
Routine Reporting	
<p>Submit an EP Compliance Report to NOPSEMA annually during the life of the project. The EP Compliance Report will include the results of performance reviews, audits, any incidents, and details of any maintenance activities.</p>	<p>Submit an annual report by April 15th to NOPSEMA for the previous calendar year during the life of the project.</p>
Recordable Incident Reporting	
<p><u>Legislative Definition:</u> <i>“for an operator of an activity, means an incident arising from the activity that:</i> (a) <i>breaches a performance objective or standard in the Environment Plan that applies to the activity; and</i> (b) <i>is not a reportable incident.”</i></p>	<p>Submit NOPSEMA Recordable Environmental Incident Monthly Report to NOPSEMA by 15th of every month if there has been an incident in that month. A nil incident report will not be submitted.</p>
Reportable Incident Notification	
<p><u>Legislative Definition:</u> <i>‘for an operator of an activity, means an incident relating to an activity that has caused, or has the potential to cause, moderate to significant environmental damage.’</i></p>	<p>Report verbally (or by email if phone contact is not possible) to NOPSEMA within 2 hours or as soon as practicable.</p> <p>Include summary in a monthly report to NOPSEMA by 15th of following month.</p> <p>Ph: 1300 674 472 Email: submissions@nopsema.gov.au</p>
<p>Incidents classified as reportable using the equivalent SGHE risk assessment process (i.e., having a potential consequence rating of ‘moderate (3)’, ‘major (4)’ or ‘catastrophic (5)’ are:</p> <ul style="list-style-type: none"> • A well blowout. • The introduction of invasive marine species. • A vessel diesel spill. • Hydraulic fluid release of 500 litres / day or greater than 50000 litres in a month 	

Requirements	Timing
<p>The verbal notification must include the following information:</p> <ul style="list-style-type: none"> • The incident and all material facts and circumstances concerning the incident that is known at the time. • Any actions taken to avoid or mitigate any adverse environmental impacts. • Any corrective actions that have been taken, or may be taken, to prevent a repeat of similar incidents occurring. • In addition, oil spills must be reported immediately to AMSA. • Any spills that could impact Victorian State waters should be reported to the Department of Transport (DOT) SREC State Duty Officer (SDO). <p>Written confirmation of the notification must be provided to NOPSEMA, NOPTA and DJPR ERR (see below) as soon as practicable after the verbal notification.</p>	<p>Oil spill only (within 1 hr) to AMSA: Ph: 1800 641 792 Email: mdo@amsa.gov.au Any emergency notifications to also go to the DOT SREC SDO with contact details as 0409 858 715. Any incident notifications including POLREPS and SITREPS should also go to the sendincidentroom@ecodev.vic.gov.au</p>
Reportable Incident Reporting	
<p>The initial notification to NOPSEMA must be followed up by a written report. As a minimum, the written incident report will include:</p> <ul style="list-style-type: none"> • The incident and all material facts and circumstances concerning the incident. • Root cause analysis. • Actions taken to avoid or mitigate any adverse environmental impacts. • Any corrective actions that have been taken, or may be taken, to prevent a recurrence of the incident. • Completion date. <p>The written incident report must be provided to NOPSEMA within 3 days, and the National Offshore Petroleum Titles Authority (NOPTA) and the Victorian DJPR Earth Resources Regulation (as the Department of the responsible State Minister) within 7 days of giving the written report to NOPSEMA.</p> <p>If the initial notification of the reportable incident was only verbal, any information that was not included in the verbal notification must be included in the written report.</p>	<p>As soon as practicable, and not later than 3 days following the incident</p> <p>Email (NOPSEMA): submissions@nopsma.gov.au Email (NOPTA): reporting@nopta.gov.au Email (DJPR ERR): licensing.err@ecodev.vic.gov.au or Compliance Duty Officer (24 hours) 0419597010 Department State Duty Officer 0428863564</p>
Other Reporting Requirements	
<p>Notification of activities affecting listed species or ecological communities in</p>	<p>Within 7 days</p>

Requirements	Timing
or on a Commonwealth area (specifically unintentional injury or death of a cetacean or listed threatened / migratory / marine species caused by, or suspected to have been caused by petroleum activity)	DAWE – 1800 803 772 EPBC.Permits@environment.gov.au
The Director of National Parks should be made aware of spills which occur within an Australian Marine Park, or are likely to impact marine parks. The notification should include: <ul style="list-style-type: none"> • titleholder details • time and location of the incident • proposed response arrangements and locations as per the OPEP (e.g. dispersant, containment, etc.) • contact details for the response coordinator. 	As soon as possible Marine Park Compliance Duty Officer - 0419293465
Cetacean vessel strike	Within 3 days DAWE – https://data.marine.mam-mals.gov.au/report/shipstrike
Suspected or known IMS introduction	Immediately Report a pest (as per marinepests.gov.au website): DELWP – 136 186

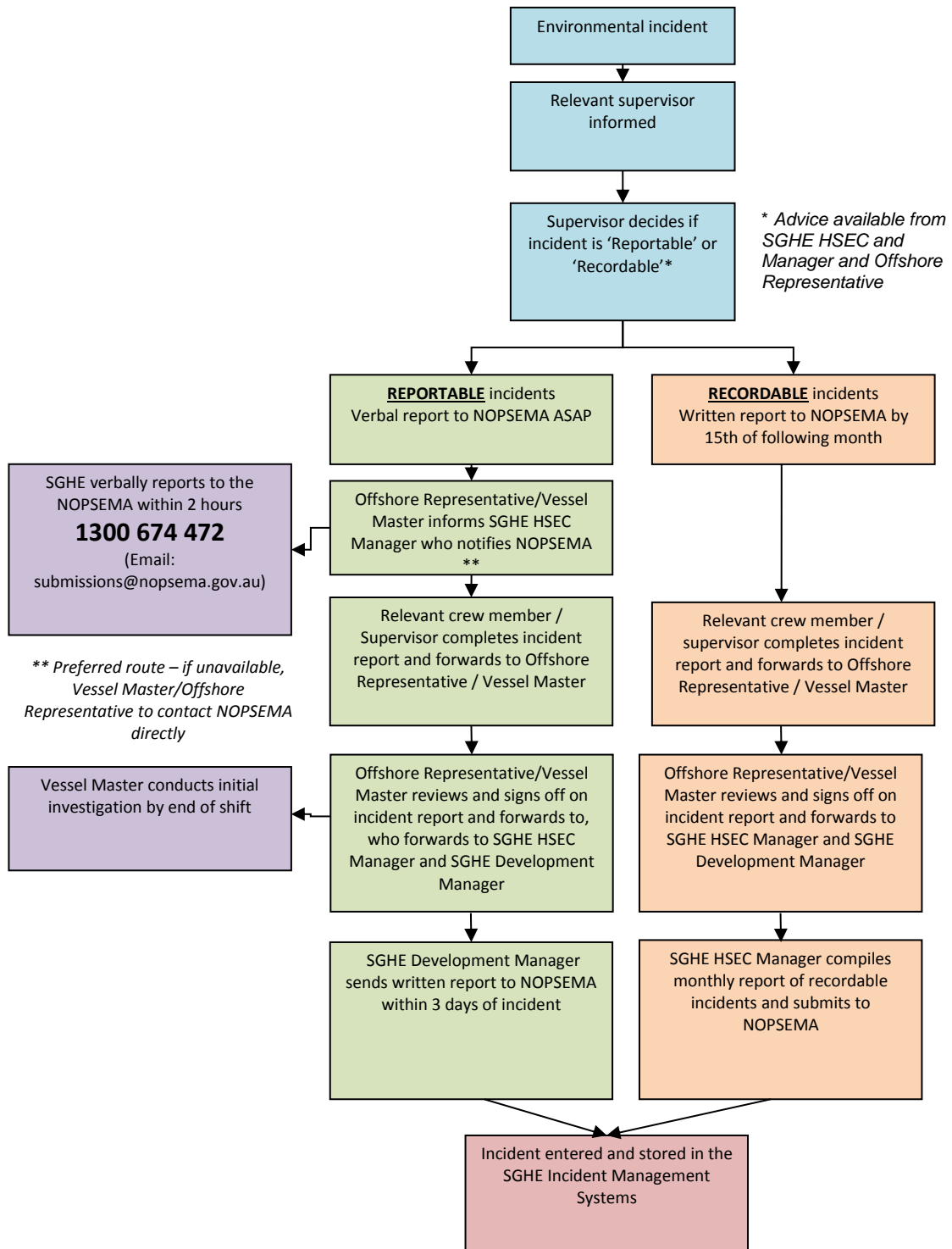


Figure 8-2 Summary of incident reporting and recording requirements

8.8 Monitoring

The SGHE HSEC Management Standard No. 11 (Performance Measurement, Reporting and Communication) guides how monitoring is to be undertaken and reported.

A summary of the environmental monitoring requirements provided in Chapter 6 is outlined in Table 8-4. Results of this monitoring will be included in the annual EP Compliance Reports, and included in monthly recordable incident reports as necessary (e.g., where a breach of EP commitments, objectives, standards or measurement criteria has been identified).

Table 8-4 Environmental monitoring and reporting summary

Aspect	Monitoring	Frequency	Reporting
Various	Process parameters (pressure, temperature, flow)	Continuous	<ul style="list-style-type: none"> Incident reports and non-compliance contained in monthly report to NOPSEMA. Results included in Annual EP Compliance Report.
Various	Critical Function Testing of SCSSV, tree valves and HIPPS.	As required by the Pipeline Integrity Management Plan	<ul style="list-style-type: none"> Incident reports and non-compliance contained in monthly report to NOPSEMA. Results included in Annual EP Compliance Report.
Operational discharge of hydraulic fluid	Volumetric monitoring of the hydraulic fluid used and discharged.	Monthly.	<ul style="list-style-type: none"> Results included in Annual EP Compliance Report.
Impacts on other stakeholders	Stakeholder issues and complaints	Annual and prior to any offshore campaign	<ul style="list-style-type: none"> Results included in Annual EP Compliance Report.
Following Condensate spill	Inspection of subsea facilities.	As required following spill event.	<ul style="list-style-type: none"> Inspection Report. Incident reports and non-compliance contained in monthly report to NOPSEMA. Results included in Annual EP Compliance Report.
	Visual observations from any crew members.	Continuous following spill event.	<ul style="list-style-type: none"> Incident reports and monthly report to NOPSEMA. Results included in Annual EP Compliance Report.
	Post-spill monitoring.	Following the spill.	<ul style="list-style-type: none"> As per the NEBA and the Operational and Scientific Monitoring Program (OSMP).

Aspect	Monitoring	Frequency	Reporting
Discharge of hydraulic fluid, MEG and methanol	Volumetric monitoring of the hydraulic fluid used and discharged.	Monitored by the gas plant continuously, Routinely monitored by SGHE and recorded monthly or following a spill.	<ul style="list-style-type: none"> • Incident reports and non-compliance contained in monthly report to NOPSEMA. • Results included in Annual EP Compliance Report.
Lighting	Inspection to confirm excessive lighting minimised.	Daily check during IMR activities.	<ul style="list-style-type: none"> • Daily Report • Incident reports and non-compliance contained in monthly report to NOPSEMA. • Results included in Annual EP Compliance Report.
Fuel consumption	Volumetric monitoring of fuel consumption by Vessel	During IMR activities	<ul style="list-style-type: none"> • Daily Report • Results included in Annual EP Compliance Report.
Cetaceans	Visual observations from any crew members	At all times during IMR activities.	<ul style="list-style-type: none"> • Cetacean sighting forms completed and sent to SGHE HSEC Manager.
Sewage/ Putrescible waste discharges	Availability of the sewage treatment plant and macerator.	Daily check during IMR activities.	<ul style="list-style-type: none"> • Daily Report • Incident reports and non-compliance contained in monthly report to NOPSEMA. • Results included in Annual EP Compliance Report.
Deck/oily water discharges	Availability of the of the oil-in-water analyser.	Daily check during IMR activities.	<ul style="list-style-type: none"> • Daily Report • Incident reports and non-compliance contained in monthly report to NOPSEMA. • Results included in Annual EP Compliance Report.
Cooling and brine water discharges	Functionality of the cooling water and RO desalination systems	Daily check during IMR activities.	<ul style="list-style-type: none"> • Daily Report • Incident reports and non-compliance contained in monthly report to NOPSEMA. • Results included in Annual EP Compliance Report.
Non-hazardous and hazardous	Volumetric monitoring of various waste streams.	Daily check during IMR activities.	<ul style="list-style-type: none"> • Daily Report • Recorded in waste manifest. • Incident reports and non-compliance

Aspect	Monitoring	Frequency	Reporting
waste discharges	Waste manifest maintained by Vessel		contained in monthly report to NOPSEMA. <ul style="list-style-type: none"> Results included in Annual EP Compliance Report.
Various	Availability of vessels navigation equipment.	Daily check during IMR activities.	<ul style="list-style-type: none"> Daily Report Incident reports and non-compliance contained in monthly report to NOPSEMA. Results included in Annual EP Compliance Report.
Vessel diesel spill	Visual observations from any crew members.	Continuous following spill event.	<ul style="list-style-type: none"> Incident reports and non-compliance contained in monthly report to NOPSEMA. Results included in Annual EP Compliance Report.
	Post-spill monitoring.	Following spill event.	<ul style="list-style-type: none"> As per the OPEP, NEBA and the OSMP
ROV discharges	Inspection of ROV systems.	Daily check during IMR activities.	<ul style="list-style-type: none"> Daily Report Incident reports and non-compliance contained in monthly report to NOPSEMA. Results included in Annual EP Compliance Report.

In addition to the above monitoring and reporting requirements for NOPSEMA the following items will be reported to the Victorian DJPR State Duty Officer by SGHE as soon as practical.

- A spill or non-routine discharge of hydrocarbons or chemicals that creates a sheen visible to other stakeholders on the ocean and likely to have impact on state waters, which includes the simple fact of entering state waters or creating media interest. Visibility is the key issue here, not the size of the spill (e.g. litre limit).
- The death or injury of any fauna species such as fish (en masse), seals or cetaceans occurring during any operation (whether caused by that operation or not).
- Excessive flaring, planned or otherwise, that increases the environmental impact of the individual activity, is highly visible and distinguishable from routine flaring.
- Acrimonious interaction with other ocean users, such as fishers (recreational or commercial), shipping, recreational vessels etc.
- Collision with other ocean users, including between SGH' contracted (or otherwise) activity vessels or machinery, fishers, shipping, recreational vessels etc.

- Well blow out or other significant well integrity mishap during exploration or production.
- Occupational accident causing the significant injury or death of any person(s).
- Loss of equipment that poses a risk to other ocean users or that may wash up on a beach at any time in the future (past examples include ROVs or part thereof, CSEM/seismic receivers or sources).
- Any issue that is likely to receive wide coverage in the media, either positive or negative.
- Any activity that is likely to have shore-based impact, whether through support activities or through provision of essential services.
- A pipeline leak that is considered a recordable incident that is likely to be ongoing for any period over 4 weeks (until repaired or stopped).
- Any interruptions to oil, condensate or gas supplies, planned or otherwise, that are critical to normal societal functioning.
- Any significant company related changes that may be notable to our Minister, such as the appointment of new Corporate Officers in Australia.
- Any changes to officer level contacts for EP matters.

8.9 Auditing and Review

The SGHE HSEC Management Standard No. 14 (Audits, Inspections and Reviews) guides how audits and review are to be undertaken and reported.

8.9.1 Formal Audit

SGHE will arrange for vessel pre-mobilisation and annual EP compliance audits. The vessel audit will be carried out prior to the work commencing to verify that procedures and equipment for managing routine discharges and emissions are in place (as described in pre-qualification material) to enable compliance with the EP. During both these audits compliance with EPOs and EPSs will be verified to ensure that environmental performance is maintained. Audit findings will be recorded and communicated to affected parties. Corrective actions will be tracked to closure.

The findings and recommendations of the audit will be documented and distributed to relevant personnel for review. It is almost certain that an audit is likely to result in recommendations for improvement opportunities and, occasionally, breaches of EP commitments may be identified. Any non-compliance is noted and communicated immediately to the SGHE HSEC Manager, as well as being documented in the audit report, where applicable these will be communicated to NOPSEMA.

Non-compliances identified during a vessel audit will be communicated to the offshore crew during daily pre-tour meetings before each shift and at weekly safety meetings on board the vessel.

The EP compliance audit results will be included in the annual EP Compliance Report submitted to NOPSEMA.

8.9.2 Routine Inspections

On a day-to-day basis, relevant SGHE and offshore contractor personnel will undertake inspections of operations and equipment to ensure EP commitments are being met. For example, the SGHE Offshore Representative will continually review environmental compliance and conformance as part of their routine activities and this will be supplemented by the use of formal HSE checklists to ensure compliance with the EP.

Non-compliances identified during routine inspections are communicated to the offshore crew during daily pre-tour meetings before each shift and at weekly safety meetings on board the vessels.

8.9.3 Reviews

While everyone is responsible for complying with the EP, the SGHE HSEC Manager specifically reviews compliance with the EP as part of their general activities. In the event of non-compliance an incident report is generated in line with the SGHE Incident Management Procedure and this will then be reported in line with section 8.6.

Projects and offshore campaigns will be subject to a lessons learnt review at the end of the campaign to determine:

- The effectiveness of control measures; and
- Improvements in procedures or processes for future campaigns.

A review of environmental performance and the effectiveness of the implementation strategy will be conducted annually by the SGHE Development Manager and SGHE HSEC Manager. The review will consider audit findings, incident reports (including spills), regulatory compliance, operational-discharge monitoring data and project / campaign vessel-related monitoring data such as types / volumes of waste disposed to ensure that the EPOs and EPSs are being met.

Furthermore, an annual review of the environmental hazard register involving SGHE personnel and appropriate contractors will be facilitated by the SGHE HSEC Manager in the form of a HAZID workshop (Section 5.3), information from reviews, audits, NOPSEMA publications and offshore industry related information will feed into this annual review of the hazards.

8.10 Emergency Preparedness and Response

SGHE has a Crisis Management Plan (CMP) (including a Longtom asset specific Emergency Response Plan (ERP)) and an OPEP in place for this activity.

The details of the emergency response team structure, roles and responsibilities and emergency contacts are described in both the CMP and OPEP. Performance objectives, standards and measurement criteria for a spill response are outlined in the OPEP.

8.10.1 Testing Emergency (Oil Spill) Response Arrangements

The CMP and OPEP will be subject to an annual test or exercise involving an external organisation such as AMOSC. This exercise shall test the ability of SGHE to adequately respond to an incident and shall test the knowledge of the key personnel with the OPEP and its requirements. Additional tests shall be conducted in the event of a significant change to the OPEP, i.e. before Longtom-5 is installed and in conjunction with the drill rig – Note drilling of Longtom-5 is subject to a separate EP. The CMP, OPEP and OSMP will also be formally checked on a quarterly basis to ensure contacts and phone numbers are still valid. Testing of response arrangements will be in accordance with the schedule outlined in Table 8-5.

Table 8-5 Testing of oil spill response arrangements

Test	Objective	Parties Involved	Schedule
Emergency Response contact lists	To ensure contacts and phone numbers are valid.	SGHE and third party agencies / service providers	Quarterly
Incident Management Team (OSRT) availability	To test the availability of trained and competent personnel to staff the OSRT.	SGHE OSRT	Quarterly
Source Control Team availability	To check the availability of trained and competent personnel to staff the Source Control Team.	SGHE and third party agencies / service providers	Quarterly
OSMP Team availability	To check the availability of trained and competent personnel to staff the OSMP.	SGHE and third party agencies / service providers	Quarterly
Level II/III response arrangements	Exercise to test Level II/III response arrangements included within the OPEP including activation of external service providers and OSROs To test interface and communication/reporting	SGHE OSRT State govt. agencies AMOSC Drill rig and/or support vessels, as applicable	Annual

Test	Objective	Parties Involved	Schedule
	arrangements with regulatory authorities and Control Agencies		
Relief Well Readiness	To assess the availability of suitable* drill rigs capable of meeting the timelines defined in the source control EPS (in total well completed in 90 days) for relief well drilling.	SGHE Development Manager	Annual during operations, 30 days prior to spud and monthly thereafter during drilling
OSMP	Exercise to test the availability of qualified personnel to implement OSMP and develop understanding of SGHE requirements.	SGHE and third party OSMP service provider	Annual
	To test ability to implement OSMP and response times.	SGHE and third party OSMP service provider	2 yearly

* Parameters assessed include current Australian Safety Case or a rig that has previously worked in Australian waters and the contractor is familiar with the Australian safety case regulations, current working location (preferably in Australian waters, otherwise nearest location), compatibility with well location (depth, working pressures etc.), contractual arrangements and time to mobilise to site. A check is also conducted to see if identified rigs have been contracted through members party to the APPEA Mutual assistance Agreement (MAA), for the purposes of rendering assistance where needed in case of a catastrophic event.

Tests will be documented and any remedial actions/recommendations arising from the tests will be managed in accordance with the SGHE HSEC Management Standard 14 Audits, Inspections and Reviews.

Where changes are required to the OPEP, resulting from testing / exercise outcomes, altered contractual arrangements, remedial actions, routine information updates (e.g. contact detail change), or other items; the SGHE HSEC Manager is responsible for ensuring changes are assessed against OPGGS(E)R 17 revision criteria and where necessary, the EP and / or OPEP is submitted to NOPSEMA as a formal revision, in accordance with the Management of Change (MOC) process (SGHE MOC procedure: CORP-PM-PR-0001). For changes which do not trigger a formal revision, internal revisions to the OPEP will also be in accordance with the MOC process with any change justified.

8.10.2 Hydrocarbon Release Contingency Planning

An OPEP has been developed for the project. The OPEP is a live document and is regularly updated, as required (see also 8.10 above).

The OPEP contains the following information:

- Oil spill response priorities.
- Integration with other plans and regulations.

- Responsibilities of SGHE and contractor personnel.
- Tiered response arrangements.
- Reporting requirements.
- Incident control.
- Spill monitoring.
- Response strategies – offshore and onshore.
- Waste management.
- Training requirements.

Hydrocarbon spill response strategies are focused on sensitive environmental resources within the EMBA, as outlined in the NEBA section of the OPEP.

8.10.2.1 Hydrocarbon Release Monitoring

SGHE has in place an Operational and Scientific Monitoring Program (OSMP) that could be deployed in the event of a spill, to advise on the monitoring activities that would be conducted in the event of a spill.

The OSMP is applicable for the life of the project and details the systems, practices and procedures to be used to carry out post-spill environmental monitoring. Roles, responsibilities and arrangements for implementation of the OSMP are also defined.

8.10.3 Oil Spill Response Competency and Training

In accordance with Regulations 14 (6) of the OPGGS(E) Regulations the implementation strategy must ensure personnel have the appropriate competencies and training to undertake their roles and responsibilities in emergency situations.

Relevant competency standards for personnel undertaking oil spill response within SGHE are provided in Table 8-6. These competencies are refreshed via annual exercises (see Table 8-5).

Table 8-6 SGHE OSRT – Training and Competency Standards

Role	Competency
Incident Controller	IMO3
Planning Section Chief	IMO2
Environment Coordinator	IMO2
Operations Section Chief	IMO2

Logistics Section Chief	IMO2
Finance & Administration Section Chief	Internal Competency
Corporate Communications Section Chief	Internal Competency
Scientific Monitoring Manager	Environmental degree and experienced provider of OSMP services
Source Control Manager	Experienced offshore Drilling Manager / Drilling Supervisor

Oil spill response training and competency records will be maintained in accordance with SGHE HSEC Management Standard No. 5 (Competence, Training and Behaviours).

As an initial action the Operations Section Chief will initiate Type I monitoring under the OSMP and will notify the third party OSMP service provider to stand-by. The Planning Section Chief with support from the Environment Coordinator will initiate the Type II monitoring under the OSMP. The Environment Coordinator and Operations Section Chief will monitor the implementation, for large spills where significant OSMP activities are taking place a Scientific Monitoring Manager will be appointed to manage the OSMP and to report back to the Environment Coordinator.

SGHE has a training package that contains a matrix of positions and their required training and a register with identified oil spill response personnel and their training with expiry dates. This matrix and register is monitored and checked quarterly as per Table 8-5.

External resources utilised to fill any oil spill response positions on the OSRT including Scientific Monitoring Manager and Source Control Manager positions must have the appropriate levels of competency. Competency requirements for monitoring personnel are defined in the OSMP. The third party OSMP services provider also maintains a training register of available personnel and this is updated and provided to SGHE on a quarterly basis.

8.11 Ongoing Stakeholder Consultation

SGHE will continue to consult with stakeholders to keep them informed of activities as necessary as part of Longtom operations. This will be done via ongoing consultation including commencement and cessation notifications and updates in relation to the any offshore campaigns including Longtom-5 tie-in activities via mail-outs, SMS alerts and one-on-one communications. Table 8-7 details the ongoing stakeholder consultation requirements. Stakeholders are able to contact SGHE directly through the SGHE HSEC Manager, whose contact details appear on all outgoing consultation correspondence.

SGHE will ensure that the time allowed for consultation is sufficient to permit consideration of this information and provision of feedback.

Records of consultation will be maintained in the Consultation Log as described in Section 3.5.

8.11.1 Ongoing Identification of Relevant Persons

New or changes to relevant persons will be identified through ongoing consultation with stakeholders including peak industry bodies and the environment plan review process detailed in Section 8.9.3. Should new relevant persons be identified they will be contacted and provided information about the activity relevant to their functions, interests or activities. Any objections or claims raised will be managed as per Section 8.11.2.

8.11.2 Management of Objections and Claims

If any objections or claims are raised during ongoing consultation these will be substantiated via evidence such as publicly available credible information and/or scientific or fishing data. Where the objection or claim is substantiated it will be assessed as per the risk assessment process and controls applied where appropriate to manage impacts and risks to ALARP and an acceptable level. Stakeholders will be provided with feedback as to whether their objection or claim was substantiated, and if not why, and if it was substantiated how it was assessed and what additional controls if any were put in place to manage the impact or risk to ALARP and an acceptable level. If the objection or claim triggers a revision of the EP this will be managed and communicated to the stakeholder.

Table 8-7 Ongoing stakeholder consultation requirements

Stakeholder	Ongoing stakeholder requirement	Timing
Relevant stakeholders	Ongoing engagement including: <ul style="list-style-type: none"> • Stakeholder communication of information and addressing queries and concerns via email, phone or meeting. 	As required
Relevant stakeholders	Confirmation of stakeholder contact details and plans for the up-coming year including both planned and un-planned campaigns that could take place.	Once a year to confirm contact details unless otherwise contacted
DJPR Biosecurity and agricultural services	Principal Officer Invasive Marine Species to be notified of future vessel movement onto title area and consulted on IMS RA result.	4 weeks prior to an offshore campaign commencing
AHO	Vessel Contractor to issue notification of activity for publication of Notice to Mariners.	4 weeks prior to an offshore campaign commencing
AMSA JRCC	Vessel Contractor to issue notification of activity for publication of AusCoast warning.	48 – 24 hrs prior to an offshore campaign commencing
South East Fishing Fleet	SMS message on campaign sent out by SETFIA to their distribution list of South East fishers, details will include; <ul style="list-style-type: none"> • dates/duration, • vessel details and • co-ordinates of campaign. 	10 days prior to an offshore campaign

9 References

1. AFMA. 2011. Commonwealth Fisheries. A WWW database accessed in November 2011 at <http://www.afma.gov.au/managing-our-fisheries/fisheries-a-to-z-index/>. Australian Fisheries Management Authority. Canberra.
2. AMSA. 2012. The effects of maritime oil spills on wildlife including non-avian marine life. A WWW page accessed in January 2012 at: http://www.amsa.gov.au/Marine_Environment_Protection/National_plan/General_Information/Oiled_Wildlife/Oil_Spill_Effects_on_Wildlife_and_Non-Avian_Marine_Life.asp. Australian Maritime Safety Authority. Canberra.
3. AMSA. No date. Fact Sheet 1 – introduced Marine Pests. A WWW publication accessed at <http://www.daff.gov.au>. Department of Agriculture, Fisheries and Forestry. Canberra.
4. ANZECC & ARMCANZ. 2000. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand.
5. APASA. 2012. Quantitative oil and diesel spill modelling study for Longtom-5 production well, in Permit VIC/L29. Prepared for Nexus Energy by Asia-Pacific ASA Pty Ltd.
6. APASA. 2007. Quantitative Oil Spill Exposure Assessment for the Gippsland Drilling Program. Prepared for Coffey Natural Systems and Australian Drilling Associates by Asia-Pacific ASA Pty Ltd.
7. APPEA. 2013. Seismic and the Marine Environment. Australian Petroleum and Production Exploration Association. Canberra.
8. APPEA. 2008. Code of Environmental Practice. Australian Petroleum Production and Exploration Association. Canberra.
9. AQIS. 2011. Australian Ballast Water Management Requirements. Version 5. Australian Quarantine Inspection Service, Department of Agriculture, Fisheries and Forestry. Canberra.
10. Bannister, J.L., Kemper, C.M. and Warneke, R.M. 1996. The Action Plan for Australian Cetaceans. Department of Environment and Water Resources. Canberra.
11. BHP Billiton. 2005. Pyrenees Development Draft Environmental Impact Statement (EIS). BHP Billiton. Perth.
12. Black, K.P., Brand, G.W., Grynberg, H., Gwyther, D., Hammond, L.S., Mourtikas, S., Richardson, B.J., and Wardrop, J.A. 1994. Production facilities. In: Environmental implications of offshore oil and gas development in Australia – the findings of an independent scientific review. Swan, J.M., Neff, J.M. and Young, P.C. (eds) Australian Petroleum Exploration Association. Sydney. Pp 209-407.
13. BoM. 2011. Climate statistics for Lakes Entrance Climate. A WWW database accessed in November 2011 at <http://www.bom.gov.au/climate/data/>. Bureau of Meteorology.

14. BRS, 2007. Designated Exchange Areas Project – Providing Informed Decision on the Discharge of Ballast Water in Australia (Phase II). By Emma Knight, Simon Barry, Rupert Summerson, Scott Cameron and Rebecca Darbyshire. Australian Bureau of Rural Sciences.
15. Cooper Energy (Sole) Pty Ltd, 2018. Sole Pipeline and Subsea Infrastructure Environment Plan. Accessed at https://info.nopsema.gov.au/activities/24/show_public
16. DAFF. 2002. Shipping lanes DAFF. 2002. Shipping routes and traffic 1999-2000. A WWW publication accessed at www.daff.gov.au. Department of Agriculture, Fisheries and Forestry. Canberra.
17. DAWR, 2009. National biofouling management guidelines for the petroleum production and exploration industry. Accessed at <https://www.marinepests.gov.au/sites/default/files/Documents/petroleum-exploration-biofouling-guidelines.pdf>
18. DAWR, 2017. Australian Ballast Water Management Requirements, Version 7. Accessed at <http://www.agriculture.gov.au/biosecurity/avm/vessels/ballast/australian-ballast-water-management-requirements>.
19. DEH. 2004a. Blue, Fin and Sei Whale Recovery Plan 2005-2010. Department of the Environment and Heritage. Canberra.
20. DEH. 2004b. Humpback Whale Recovery Plan 2005-2010. Department of the Environment and Heritage. Canberra.
21. DEWHA. 2008. EPBC Act Policy Statement 2.1 – Interaction between offshore seismic exploration and whales. Department of the Environment, Water, Heritage and the Arts. Canberra.
22. Di Toro, D.M., Mcgrath, J.A., and Stubblefield, W.A., 2007. Predicting the toxicity of neat and weathered crude oil: Toxic potential and the toxicity of saturated mixtures. *Environmental Toxicology and Chemistry* 26, 24–36.
23. DNV. 2011. Assessment of the Risk of Pollution from Marine Oil Spills in Australian Ports and Waters. Final Report. Report No PP002916, Rev 4. Report for Australian Maritime Safety Authority. Det Norske Veritas. London.
24. DoE, 2015 Conservation Advice *Megaptera novaeangliae* humpback whale. Canberra: Department of the Environment. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/38-conservation-advice-10102015.pdf>.
25. DoEE, 2017 Australian National Guidelines for Whale and Dolphin Watching. Department of Energy and Environment. Canberra.
26. DoEE, 2015. Conservation Management Plan for the Blue Whale, 2015-2025. Department of Energy and Environment. Canberra.
27. DPI. 2012. Fisheries Status Reports. A WWW database accessed in 2012 at <http://www.dpi.vic.gov.au/fisheries/commercial-fishing/fishery-status-report>. Victorian Department of Primary Industries. Melbourne.
28. DPIWE. 2011. New Zealand Fur Seal. A WWW database accessed in November 2011 at <http://www.dpiw.tas.gov.au/inter/nsf/WebPages/BHAN-53K7C8?open>.

- Department of Primary Industries, Parks, Water and the Environment. Hobart, Tasmania.
29. DSE. 2012. Northern Pacific Seastar. A WWW database accessed in 2012 at <http://www.dse.vic.gov.au/coasts-and-marine/marine/marine-pests/northern-pacific-seastar>. Department of Sustainability and Environment. Melbourne.
 30. DSE. 2011. Marine National Parks and Sanctuaries. A WWW database accessed in 2011 at <http://www.dse.vic.gov.au/coasts-and-marine/marine/marine-national-parks-and-sanctuaries>. Department of Sustainability and Environment. Melbourne.
 31. DSE. 2009. Action Statement Flora and Fauna Guarantee Act 1988 No. 250.
 32. DSE. 2008. Background and Implementation Information for the Australian Grayling *Prototroctes maraena* National Recovery Plan. Victorian Government Department of Sustainability and Environment. Melbourne.
 33. East Gippsland Shire. 2011. Shire statistics. A WWW database accessed in November 2011 at <http://profile.id.com.au/Default.aspx?id=330>. East Gippsland Shire. Lakes Entrance, Victoria.
 34. Environment Australia. 2001. Southern right whale migration and recognised aggregation areas mapping. Environment Australia. Canberra.
 35. Esso Australia Resources Pty Ltd. 2020. JUR Drilling Environment Plan. Accessed at https://info.nopsema.gov.au/activities/355/show_public
 36. French, D.P., Schuttenberg, H.Z., and Isaji, T., 1999. Probabilities of oil exceeding thresholds of concern: example from an evaluation for the Florida power and light. In: proceedings: AMOP 99 Technical Seminar, June 2nd–4th 1999, Calgary, Alberta, Canada, pp. 243-260
 37. French-McCay, D.P., 2002. Development and application of an oil toxicity and exposure model, OilToxEx. *Environmental Toxicology and Chemistry* 21, 2080-2094.
 38. French McCay, D., 2003. Development and application of damage assessment modelling: example assessment for the North Cape oil spill. *Marine Pollution Bulletin* 47, 341–359.
 39. Fugro, 2005. Longtom to Patricia Baleen Pipeline Route Survey and Culverin Site Survey. Report prepared for Nexus Energy Australia NL by Fugro Survey Pty Ltd, April 2005.
 40. GEMS. 2005. Nexus Petroleum. Oil Spill Risk Assessment Longtom-3 Bass Strait VIC. Global Environmental Modelling Systems.
 41. Gill. P. 2002. A blue whale (*Balaenoptera musculus*) feeding ground in a southern Australia coastal upwelling zone. *Journal of Cetacean Research and Management*. 4:179-184.
 42. Harris, M.P. and Norman, F.I. 1981. Distribution and status of coastal colonies of seabirds in Victoria. *Memoires of the Museum of Victoria*. 42: 89–106.
 43. Heislars, S. and Parry, G. D. 2007. Species diversity and composition of benthic infaunal communities found in Marine National Parks along the outer Victorian coast. Parks Victoria Technical Paper Series No. 53. Fisheries Victoria, Department of Primary Industries. Queenscliff.

44. Holliday, I. 2003. Great White Shark (*Carcharodon carcharias*) Action Statement No. 185. Department of Sustainability and Environment. Melbourne.
45. Hobbs, Ian. 2005. Personal communications. Phone and email communications between Ian Hobbs (Geophysicist, Fugro Survey Pty Ltd) and Giulio Pinzone (Environmental Scientist, Apache Energy Ltd). 28 October 2005.
46. IMO, 2001. International Convention on the Control of Harmful Anti-fouling Systems on Ships. Accessed at <http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-on-the-Control-of-Harmful-Anti-fouling-Systems-on-Ships-%28AFS%29.aspx>
47. IMO 2004 IMO International Convention for the Control and Management of Ships' Ballast Water and Sediments. Available at [http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships'-Ballast-Water-and-Sediments-\(BWM\).aspx](http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships'-Ballast-Water-and-Sediments-(BWM).aspx)
48. IMO, 2012. Guidelines for the Control and Management of Ships' Biofouling to Minimise the Transfer of Invasive Aquatic Species. Accessed at <http://www.imo.org/en/OurWork/Environment/Biofouling/Pages/default.aspx>
49. ITOPF 2011. Effects of Oil Pollution on the Marine Environment. Technical Information Paper No. 13. The International Tanker Owners Pollution Federation Ltd.
50. Kemper, C.M., J.Mole, R.M.Warneke, J.K.Ling, D.J.Needham & J.E.Wapstra.1997. Southern Right Whales in south-eastern Australia - aerial surveys during 1991-93 and incidental information from 1904 in Marine Mammal Research in the Southern Hemisphere.
51. Kimmerer, W. J. and McKinnon, A. D. 1984. Zooplankton abundances in Bass Strait and western Victorian shelf waters, March 1983. Proceedings of the Royal Society of Victoria 96: 161–167.
52. Last, P. R. and Stevens, J. D. 1994. Sharks and Rays of Australia. CSIRO Australia.
53. Laist, D.W., Knowlton, A.R., Collet, A.S., Podesta, M., 2001. Collisions between ships and whales. January 2001. Society of Marine Mammalogy.
54. Langford, T.E.L., 1990. Ecological effects of thermal discharges. Elsevier Applied Sciences, New York City. 468p.
55. LCC. 1993. Marine and coastal descriptive report. (special investigation). June 1993. Land Conservation Council. Melbourne.
56. McCauley, R.D., Duncan, A.J., Fewtrell, J., Jenner, C., Jenner, M., Penrose, J.D., Prince, R.I.T., Adhitya, A., Murdoch, J., McCabe, K. 2003. Marine Seismic Survey Analysis and Propagation of Air-gun Signals; and Effects of Air-gun Exposure on Humpback Whales, Sea Turtles, fishes and Squid. In Environmental Implications of Offshore Oil and Gas Development in Australia: Further Research. APPEA. , 2003, pp.364-370, 381-385, 498-521.
57. McCauley, R.D. 1998. Radiated underwater noise measured from the drilling rig ocean general, rig tenders Pacific Ariki and Pacific Frontier, fishing vessel Reef Venture and natural sources in the Timor Sea, Northern Australia. A WWW

- publication accessed at: <http://www.cmst.curtin.edu.au/publicat/1998-19.pdf#search=%22Radiated%20underwater%20noise%20measured%20from%20drilling%20rig%22>. Prepared by Rob McCauley for Shell Australia.
58. McCauley, R.D. and Jenner, C. 2001. Underwater acoustic environment in the vicinity of Vincent and Enfield petroleum leases, North West Cape, Exmouth, WA. Report prepared for Woodside Energy Ltd, Perth by The Centre for Marine Science and Technology. CMST Research Report #2001-22.
 59. MCMPR. 2005. Principles for Engagement with Communities and Stakeholders. Ministerial Council on Mineral and Petroleum Resources. Canberra.
 60. Metocean Design Criteria, 2006. Longtom Development, Metocean Engineers, J5211-R1270
 61. NMFS. 2001. National Marine Fisheries Service - Fisheries Statistics and Economics Division, Silver Spring, MD.
 62. NMFS. 2016 Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-OPR-55, 178 pp.
 63. NOO. 2002. Ecosystems - Nature's Diversity. The South-east Regional Marine Plan Assessment Reports. National Oceans Office, Hobart, Tasmania.
 64. NOO. 2004. National Marine Atlas. Non-Fisheries Uses in Australia's Marine Jurisdiction. National Oceans Office. Tasmania.
 65. National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) Guidance Notes, Guidelines, Bulletin and Information Papers, including:
 - N-04750-GN 1344, Rev 4, 17/04/2019, Environment plan content requirements
 - N-04750-IP 1764, Rev 0, 01/2018, Information Paper , Considerations for five-year environment plan revisions
 - N-04750-GN 1785, Rev 0, 16/07/2018, Petroleum activities and Australian marine parks
 - Bulletin #1, April 2019, Oil Spill Modelling
 66. Norris, K.C. & Mansergh, I.M. 1981. Sites of zoological significance in east Gippsland. Ministry for Conservation, Victoria, Environmental Studies Paper 321 315 pp.
 67. OGP. 2010. Risk Assessment Data Directory. Report No. 434-2. Blowout Frequencies. International Association of Oil and Gas Producers.
 68. OSPAR. 2009. Overview of the impacts of anthropogenic underwater sound in the marine environment. Biodiversity Series. OSPAR Commission.
 69. Parks Victoria. 2009. Parks Victoria: Abalone Virus page. A WWW publication accessed in 2012 at http://www.parkweb.vic.gov.au/1process_content.cfm?section=183&page=3
 70. Parks Victoria. 2012. Parks. A WWW publication accessed in 2012 at <http://www.parkweb.vic.gov.au/explore/parks>.

71. Parry, G.D., Campbell, S.J., and Hobday, D.K. 1990. Marine resources off East Gippsland, Southeastern Australia. Technical Report No. 72, Marine Science Laboratories, Queenscliff, Victoria, Australia.
72. PBEES 2001. Patricia Baleen Gas Field Development - Environmental Effects Statement. Report prepared by Maunsell McIntyre Pty Ltd for Basin Oil Pty Ltd. Melbourne. March 2001.
73. Peel, D., Smith, J.N. and Childerhouse, S., 2016. Historical data on Australian whale vessel strikes. IWC June 2016 (SC/66b/HIM/05 Rev1). <https://www.nespmarine.edu.au/document/historical-data-australian-whale-vessel-strikes-international-whaling-commission-june-2016>.
74. Poore, G.C.B. et al. 1985. Museum of Victoria Bass Strait Survey, 1979-1984. Museum of Victoria, Melbourne, Australia.
75. Richardson W. J., Greene Jr. C. R., Malme C. I. and Thomson D. H. 1995. Marine Mammals and Noise. Academic Press, California.
76. Richardson W.J., Fraker, M.A., Wursig, B. & Wills, R.S. 1985. 'Behaviour of bowhead whales (*Balaena mysticetus*), summering in the Beaufort Sea: Reactions to industrial activities.' *Biological Conservation* 32: 195-230.
77. RPS. 2019. SGH Longtom Field, Oil Spill Modelling, MAQ0802J
78. SEWPaC. 2011a. Protected Matters Search Tool for the Longtom-5 drill site. A WWW database accessed in November 2011 at <http://www.environment.gov.au/coasts/mbp/about/index.html>. Department of Sustainability, Environment, Water, Population and Communities.
79. SEWPaC. 2011b. The Australian National Shipwreck Database. A WWW database accessed in October 2011 at <http://www.environment.gov.au/heritage/shipwrecks/protected-zones.html>. Department of Sustainability, Environment, Water, Population and Communities. Canberra.
80. SEWPaC. 2011c. Historic Shipwreck Protected Zones. A WWW database accessed in October 2011 at <http://www.environment.gov.au/heritage/shipwrecks/protected-zones.html>. Department of Sustainability, Environment, Water, Population and Communities. Canberra.
81. SEWPaC. 2011d. Beagle Commonwealth Marine Reserve. A WWW database accessed in November 2011 at <http://www.environment.gov.au/coasts/mpa/southeast/beagle/index.html>. Department of Sustainability, Environment, Water, Population and Communities.
82. SEWPaC. 2011e. The Ramsar Convention on Wetlands. A WWW database accessed in November 2011 at <http://www.environment.gov.au/water/topics/wetlands/ramsar-convention/index.html>. Department of Sustainability, Environment, Water, Population and Communities.
83. SEWPaC. 2011f. Gippsland Lakes. A WWW database accessed in November 2011 at <http://www.environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=21>. Department of Sustainability, Environment, Water, Population and Communities.
84. SEWPaC. 2012a. Commonwealth Heritage List. A WWW database accessed in October 2011 at <http://www.environment.gov.au/heritage/shipwrecks/>

- protected-zones.html. Department of Sustainability, Environment, Water, Population and Communities. Canberra.
85. SEWPaC. 2012b. Montara Oil Spill. A WWW page accessed in January 2012 at <http://www.environment.gov.au/coasts/oilspill.html>. Department of Sustainability, Environment, Water, Population and Communities. Canberra.
 86. SEWPaC. 2012c. Fact Sheet on the Giant Kelp Marine Forests of South East Australia Ecological Community. A WWW publication accessed at <http://www.environment.gov.au/epbc/publications/pubs/giant-kelp-marine-forests-fact-sheet.pdf>. August. Department of Sustainability, Environment, Water, Population and Communities. Canberra.
 87. SEWPaC, 2012d. Conservation Management Plan for the Southern Right Whale 2011 – 2021. A Recovery Plan under the Environment Protection and Biodiversity Conservation Act 1999. Department of Sustainability, Environment, Water and Communities. Canberra
 88. SEWPaC. 2013a. Protected Matters Search Tool for the ZPI (including a 1 km radius). A WWW publication accessed in June 2013 at <http://www.environment.gov.au/coasts/mbp/about/index.html>. Department of Sustainability, Environment, Water, Population and Communities.
 89. SEWPaC. 2013b. East Gippsland Commonwealth Marine Reserve. A WWW page accessed in July 2013 at <http://www.environment.gov.au/marinereserves/south-east/east-gippsland/index.html>. Department of Sustainability, Environment, Water, Population and Communities. Canberra.
 90. Shaughnessy, P.D. 1999. The Action Plan for Australian Seals. Environment Australia, Canberra.
 91. Simmonds, M., Dolman, S and Weilgart, L (eds.) 2004. Oceans of Noise. A Whale and Dolphin Conservation Society Science Report, Wiltshire.
 92. SIV. 2011. Fisheries. A WWW publication accessed in November 2011 at <http://www.siv.com.au/page/fisheries.html>.
 93. Southall, B.L., Bowles, A.E., Ellison, W.T., Finneran, J.J., Gentry, R.L., Greene Jr C.R., Kastak, D., Ketten, D.R., Miller, J.H., Nachtigall, P.E., Richardson, W.J., Thomas, J.A and Tyack, P.L. 2007. Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. *Aquatic Mammals* 33 (4):411–414.
 94. Stockin, K.A. and Burgess, E.A. 2005. Opportunistic Feeding of an Adult Humpback Whale (*Megaptera novaeangliae*) Migrating Along the Coast of Southeastern Queensland, Australia. *Aquatic Mammals* 31(1): 120-123.
 95. 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.
 96. VicL29 (Longtom) Oil Pollution Emergency Plan, LT-OPS-PL-0026
 97. Walker, T. I., Taylor, B. L., and Hudon, R. J. 2001. Southern shark catch and effort 1970–2000. Report to Australian Fisheries Management Authority. July 2001. Marine and Freshwater Resources Institute.
 98. Walker, D.I. and McComb, A.J. 1990. Salinity response of the seagrass *Amphibolus antarctica*: an experimental validation of field results. *Aquatic Botany* 36:359-366.

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99. Watson, G. F., and Chaloupka, M. Y. 1982. Zooplankton of Bass Strait: Species composition, systematics and artificial key to species. Victorian Institute of Marine Science Technical Report No. 1. 1–128
 100. Wilson, R.S. and Poore, G.C.B. 1987. The Bass Strait Survey: biological sampling stations, 1979-1984. Occ. Papers Museum of Victoria 3: 1-14.
 101. Woodside. 2003. Environmental Impact Statement/Environmental Effects Statement. Otway Gas Project. Woodside Energy Ltd. Perth.
 102. Woodside. 2008. Browse LNG Development. Torosa South-1 Pilot Appraisal Well Environment Plan. Woodside Energy Ltd. Perth
 103. Woodside 2014. Browse FLNG Development, Draft Environmental Impact Statement. EPBC 2013/7079. November 2014. Woodside Energy Ltd, Perth
 104. Xuejun Xie, Yuan-lin Zhang, Yu Zhang, Hao Fu, Mao-cai Gong, Lin Tian and Qiang Fu, 2017. Study on the Application of Biocides in the Seawater Cooling System and Their killing Effect in the Laboratory. International Conference on Manufacturing Engineering and Intelligent Materials (ICMEIM 2017). Available at <https://www.semanticscholar.org/paper/Study-on-the-Application-of-Biocides-in-the-Cooling-Xie-Zhang/5f69b782ba6762a5428dd9d9932fc23903cae642>

ATTACHMENTS

- 1 - SGHE HSEC Policy**
- 2 - EPBC Referrals**
- 3 - EPBC Search for EMBA**
- 4 - Stakeholder Consultation Summary**
- 5 - Oil Pollution Emergency Plan**
- 6 – Longtom Equipment List**

Attachment 1 – SGHE HSEC Policy

SGH Energy Health, Safety, Environment, Quality and Community Policy

Policy Objectives

SGH Energy is an Australian based oil and gas exploration and production company, with a portfolio of operated and non-operated assets. One of the pillars of corporate success for SGH Energy is a commitment to and achievement of high standards of health, safety, environment, quality and community (HSEQC) performance, and fostering a culture of continuous improvement in all of these areas.

Strategies

To implement this Policy we will:

- As a minimum, comply with all applicable laws and regulations, while aspiring to higher standards.
- Apply responsible standards where laws and regulations do not exist.
- Document, set and apply standards that relate to HSEQC in the workplace and also with regards to their effect on employees, customers, contractors and the public.
- Apply a systematic approach to the identification of all hazards and HSEQC risks in order to manage the risk to as low as reasonably practical.
- Maintain and continuously improve the HSEQC Management System across the organisation.
- Provide the necessary resources to achieve the requirements of this HSEQC Policy.
- Provide adequate HSEQC training to all SGH Energy personnel and consultants in order to fulfil their responsibilities.
- Require that companies providing contract services to SGH Energy manage their HSEQC performance in line with the specific requirements in this Policy.
- Empower all employees and contractors with the right and responsibility to stop work in a situation that may cause a HSEQC impact.
- Foster a culture that empowers and rewards everyone to act in accordance with this Policy.
- Communicate openly with the community regarding SGH Energy activities.

Application

The Chief Executive Officer of SGH Energy is accountable to the Board of Directors for ensuring that this Policy is implemented.

This Policy applies to all personnel, contractors and joint venturers engaged in activities under SGH Energy's operational control.



Margaret Hall
Chief Executive Officer
SGH Energy

July 2018

Attachment 2 – EPBC Referrals

COMMONWEALTH OF AUSTRALIA

ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

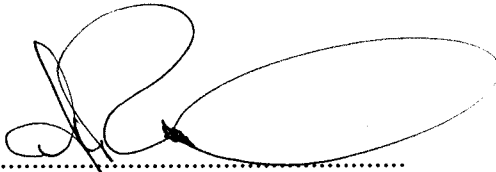
DECISION THAT ACTION IS NOT A CONTROLLED ACTION

I, ALEX RANKIN, Assistant Secretary, Environment Assessment Branch, Department of the Environment and Heritage, a delegate of the Minister for the Environment and Heritage for the purposes of section 75 of the *Environment Protection and Biodiversity Conservation Act 1999*, decide that the proposed action, set out in the Schedule, is not a controlled action.

SCHEDULE

The proposed action to drill the Longtom-3 gas appraisal well in permit area VIC/P54 located off the Victorian coast, and as described in the referral received under the Act on 20 December 2005 (EPBC 2005/2494).

Dated this 20th day of JANUARY 2006



ASSISTANT SECRETARY
ENVIRONMENT ASSESSMENT BRANCH
DEPARTMENT OF THE ENVIRONMENT AND HERITAGE



Australian Government

Department of the Environment and Heritage

RECEIVED

27 OCT 2006

Ms Michelle Zaunbrecher
Health, Safety, Environment and Community Manager
Nexus Energy Limited
134 Little Lonsdale Street
MELBOURNE VIC 3000

Dear Ms Zaunbrecher

Nexus Energy Limited/Energy generation and supply (non-renewable)/Bass Strait/Commonwealth Marine/Longtom Gas Pipeline Development, VIC/P54 (EPBC Reference: 2006/3072)

Thank you for the above referral, received on 26 September 2006, for a decision on whether or not approval is needed under Chapter 4 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The referral has now been considered under the EPBC Act and I have decided that the action is not a controlled action. Approval is therefore not needed under Part 9 of the Act before the action can proceed.

A copy of the document recording my decision is attached for your information. I have written separately to Mr Graham Bunn to advise of my decision.

Chapter 5 of the EPBC Act states that it is an offence to take, kill, injure, move, trade or keep a member of a listed migratory species, listed threatened species or ecological community, listed marine species, or a cetacean, in a Commonwealth area (terrestrial or marine). It is necessary to make a separate application for a permit if the above circumstances are likely to apply to a proposed action. Further information may be obtained by calling 1800 803 772 or visiting the Department of the Environment and Heritage web site (<http://www.deh.gov.au/epbc/>).

Yours sincerely

Ms Alex Rankin
Assistant Secretary
Environment Assessment Branch

23 October 2006

RECEIVED
27 OCT 2006

COMMONWEALTH OF AUSTRALIA

ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

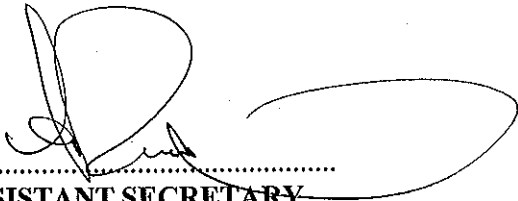
DECISION THAT ACTION IS NOT A CONTROLLED ACTION

I, ALEX RANKIN, Assistant Secretary, Environment Assessment Branch, Department of the Environment and Heritage, a delegate of the Minister for the Environment and Heritage for the purposes of section 75 of the *Environment Protection and Biodiversity Conservation Act 1999*, decide that the proposed action, set out in the Schedule, is not a controlled action.

SCHEDULE

The proposed action to develop the Longtom gas pipeline, within Petroleum Exploration Permit VIC/P54, Bass Strait, and as described in the referral received under the Act on 26 September 2006 (EPBC 2006/3072).

Dated this 23RD day of OCTOBER 2006



.....
**ASSISTANT SECRETARY
ENVIRONMENT ASSESSMENT BRANCH
DEPARTMENT OF THE ENVIRONMENT AND HERITAGE**



Australian Government

Department of the Environment, Water, Heritage and the Arts

Notification of REFERRAL DECISION – not controlled action

West Triton Drilling Program, Gippsland Basin, Victoria, EPBC 2007/3915

This decision is made under Section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Proposed action

person named in the referral Apache Energy Ltd, Stuart Petroleum Limited, 3D Oil Limited and Nexus Oil Limited

proposed action To undertake an offshore drilling program across several permit areas within the Gippsland Basin as outlined in the referral received on 17 December 2007.

Referral decision: Not a controlled action

status of proposed action The proposed action is not a controlled action.

Person authorised to make decision

Name and position Ms Vicki Middleton
Assistant Secretary
Environment Assessment Branch

signature

Vicki Middleton

date of decision

17 January 2008



Notification of

REFERRAL DECISION – not controlled action if undertaken in a particular manner

Nexus Energy Ltd Longtom-5 Development, Victoria, VIC/L29 (EPBC 2012/6498)

This decision is made under sections 75 and 77A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Proposed action

person named in the referral	Nexus Energy Ltd
ABN:	64 058 818 278

proposed action	To drill and tie in the Longtom-5 production well in permit area VIC/L29 in Bass Strait [See EPBC Act referral 2012/6498].
------------------------	--

Referral decision: Not a controlled action if undertaken in a particular manner

status of proposed action	The proposed action is not a controlled action provided it is undertaken in the manner set out in this decision.
----------------------------------	--

Person authorised to make decision

Name and position	Barbara Jones Assistant Secretary Environment Assessment Branch
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signature

date of decision	5 September 2012
-------------------------	-------------------------

manner in which proposed action must be taken	<p>The following measures must be taken to avoid significant impacts on</p> <ul style="list-style-type: none">• Wetlands of international importance (sections 16 & 17B)• Listed threatened species and ecological communities (sections 18 & 18A)• Listed migratory species (sections 20 & 20A)• Commonwealth marine areas (sections 23 & 24A) <p>1. The drilling and tie-in must be undertaken in accordance with the Environment Plan (inclusive of an Oil Spill Contingency Plan), as described in the referral, accepted by the National Offshore Petroleum Safety and Environmental Management Authority prior to the proposed action commencing.</p>
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-
2. Oil spill protection priorities must be implemented as stated in Attachment 3 to the referral.
 3. The drilling and tie-in must be undertaken in accordance with the Well Operations Management Plan, as described in the referral, accepted by the National Offshore Petroleum Safety and Environmental Management Authority prior to the proposed action **commencing**.

Commencing : as described in the referral EPBC 2012/6498. The action will have commenced once drilling has started.

National Offshore Petroleum Safety and Environmental Management Authority : is the Commonwealth Statutory Agency regulating the health and safety, structural integrity and environmental management of all offshore petroleum facilities in Commonwealth waters, and in coastal waters where State powers have been conferred.

Attachment 3 – EPBC Search for EMBA



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: 16/07/19 18:43:13

[Summary](#)

[Details](#)

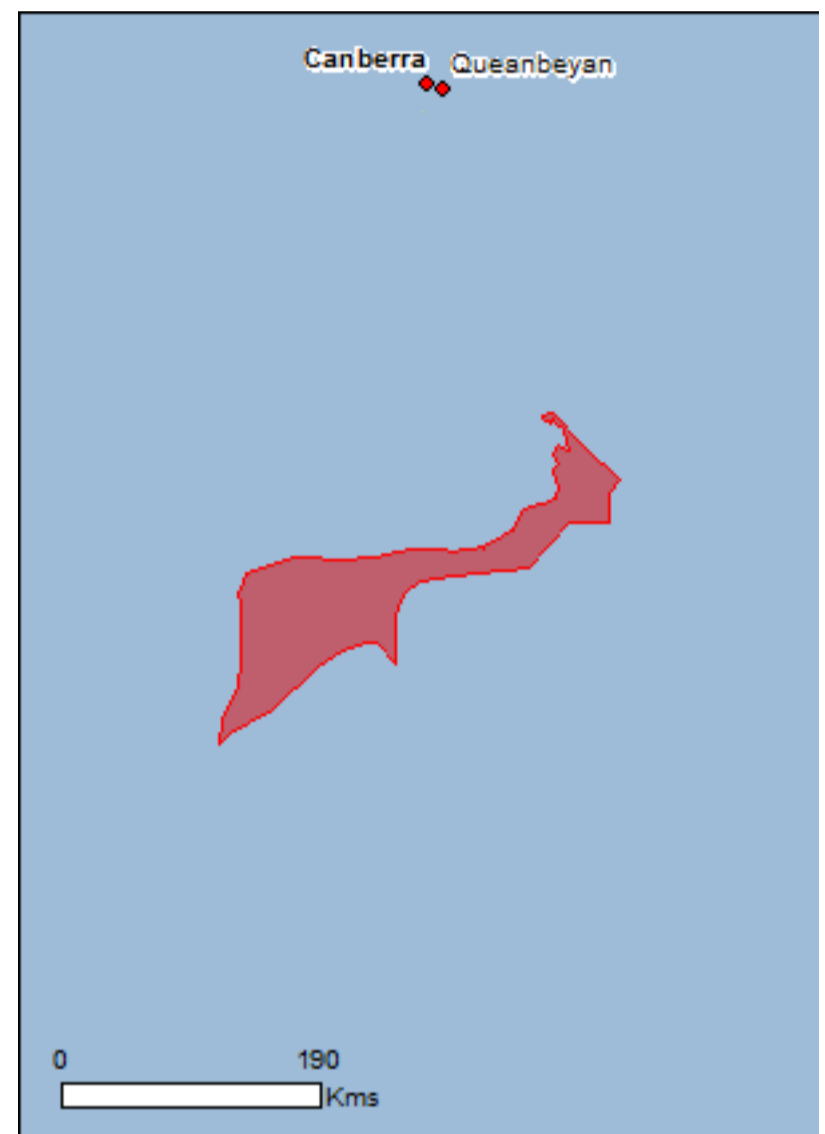
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

[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:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	6
Listed Threatened Species:	83
Listed Migratory Species:	64

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:	1
Commonwealth Heritage Places:	1
Listed Marine Species:	98
Whales and Other Cetaceans:	30
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:	17
Regional Forest Agreements:	3
Invasive Species:	49
Nationally Important Wetlands:	10
Key Ecological Features (Marine)	1

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)

[\[Resource Information \]](#)

Name

[Gippsland lakes](#)

Proximity

Within Ramsar site

Commonwealth Marine Area

[\[Resource Information \]](#)

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside 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

[Giant Kelp Marine Forests of South East Australia](#)

Status

Endangered

Type of Presence

Community may occur within area

[Gippsland Red Gum \(*Eucalyptus tereticornis* subsp. *mediana*\) Grassy Woodland and Associated Native Grassland](#)

Critically Endangered

Community likely to occur within area

[Littoral Rainforest and Coastal Vine Thickets of Eastern Australia](#)

Critically Endangered

Community likely to occur within area

[Lowland Grassy Woodland in the South East Corner Bioregion](#)

Critically Endangered

Community likely to occur within area

[Natural Damp Grassland of the Victorian Coastal Plains](#)

Critically Endangered

Community may occur within area

[Subtropical and Temperate Coastal Saltmarsh](#)

Vulnerable

Community likely to occur within area

Listed Threatened Species

[\[Resource Information \]](#)

Name

Status

Type of Presence

Birds

[Anthochaera phrygia](#)

Regent Honeyeater [82338]

Critically Endangered

Foraging, feeding or related behaviour likely to occur within area

[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 known to occur within area

[Calidris ferruginea](#)

Curlew Sandpiper [856]

Critically Endangered

Species or species habitat known to occur

Name	Status	Type of Presence within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	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
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Breeding known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to 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	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species

Name	Status	Type of Presence
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	habitat known to occur within area Species or species habitat may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding known 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 eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to 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
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat known to occur within area
Fish		
Epinephelus daemeli Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat may occur within area
Galaxiella pusilla Eastern Dwarf Galaxias, Dwarf Galaxias [56790]	Vulnerable	Species or species habitat likely to occur within area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat known to occur within area
Frogs		
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species

Name	Status	Type of Presence
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	habitat likely to occur within area Species or species habitat known to occur within area
Litoria littlejohni Littlejohn's Tree Frog, Heath Frog [64733]	Vulnerable	Species or species habitat likely to occur within area
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	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Isodon obesulus obesulus Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern) [68050]	Endangered	Species or species habitat known to occur within area
Mastacomys fuscus mordicus Broad-toothed Rat (mainland), Tooarrana [87617]	Vulnerable	Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat likely to occur within area
Potorous longipes Long-footed Potoroo [217]	Endangered	Species or species habitat may occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE Mainland) [66645]	Vulnerable	Species or species habitat known to occur within area
Pseudomys fumeus Smoky Mouse, Konoom [88]	Endangered	Species or species habitat likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Plants		

Name	Status	Type of Presence
Acacia caerulescens Limestone Blue Wattle, Buchan Blue, Buchan Blue Wattle [21883]	Vulnerable	Species or species habitat likely to occur within area
Acacia constablei Narrabarba Wattle [10798]	Vulnerable	Species or species habitat known to occur within area
Amphibromus fluitans River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat likely to occur within area
Caladenia tessellata Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat known to occur within area
Commersonia prostrata Dwarf Kerrawang [87152]	Endangered	Species or species habitat likely to occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat known to occur within area
Dianella amoena Matted Flax-lily [64886]	Endangered	Species or species habitat may occur within area
Glycine latrobeana Clover Glycine, Purple Clover [13910]	Vulnerable	Species or species habitat likely to occur within area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area
Pomaderris parrisiae Parris' Pomaderris [22119]	Vulnerable	Species or species habitat likely to occur within area
Prasophyllum frenchii Maroon Leek-orchid, Slaty Leek-orchid, Stout Leek-orchid, French's Leek-orchid, Swamp Leek-orchid [9704]	Endangered	Species or species habitat likely to occur within area
Prasophyllum spicatum Dense Leek-orchid [55146]	Vulnerable	Species or species habitat known to occur within area
Pterostylis chlorogramma Green-striped Greenhood [56510]	Vulnerable	Species or species habitat likely to occur within area
Senecio psilocarpus Swamp Fireweed, Smooth-fruited Groundsel [64976]	Vulnerable	Species or species habitat likely to occur within area
Thelymitra epipactoides Metallic Sun-orchid [11896]	Endangered	Species or species habitat likely to occur within area
Thelymitra matthewsii Spiral Sun-orchid [4168]	Vulnerable	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
Xerochrysum palustre Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat likely to occur within area

Reptiles

Name	Status	Type of Presence
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sharks		
Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Breeding known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
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
Ardenna tenuirostris Short-tailed Shearwater [82652]		Breeding known 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
Hydroprogne caspia Caspian Tern [808]		Breeding 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 area
Phoebastria fusca Sooty Albatross [1075]	Vulnerable	Species or species

Name	Threatened	Type of Presence
Sternula albifrons Little Tern [82849]		habitat may occur within area Breeding known 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 eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to 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 bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Breeding known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area

Name	Threatened	Type of Presence
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat likely to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area

Name	Threatened	Type of Presence
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting may occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
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 known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Thalasseus bergii Crested Tern [83000]		Breeding known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [\[Resource Information \]](#)

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -

Commonwealth Heritage Places [\[Resource Information \]](#)

Name	State	Status
Historic		
Gabo Island Lighthouse	VIC	Listed place

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
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Birds

Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
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Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
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Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
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Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
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Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
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Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
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Calidris alba Sanderling [875]		Roosting known to occur within area
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Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
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Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
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Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
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Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
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Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
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Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
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Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
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Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
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Name	Threatened	Type of Presence
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 gibsoni Gibson's Albatross [64466]	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
Eudyptula minor Little Penguin [1085]		Breeding known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting may occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to 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 area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur

Name	Threatened	Type of Presence within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to 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 known to occur within area
Pelagodroma marina White-faced Storm-Petrel [1016]		Breeding known to occur within area
Phoebastria fusca Sooty Albatross [1075]	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
Puffinus tenuirostris Short-tailed Shearwater [1029]		Breeding known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna albifrons Little Tern [813]		Breeding known to occur within area
Sterna bergii Crested Tern [816]		Breeding known to occur within area
Sterna caspia Caspian Tern [59467]		Breeding known to occur within area
Sterna fuscata Sooty Tern [794]		Breeding known to occur within area
Sterna nereis Fairy Tern [796]		Breeding known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
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 eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to 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
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat known to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known 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
Hippocampus minotaur Bullneck Seahorse [66705]		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

Name	Threatened	Type of Presence
Kaupus costatus Deepbody Pipefish, Deep-bodied Pipefish [66246]		Species or species habitat may occur within area
Kimblaeus bassensis Trawl Pipefish, Bass Strait Pipefish [66247]		Species or species habitat may occur within area
Leptoichthys fistularius Brushtail Pipefish [66248]		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
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		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
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		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

Name	Threatened	Type of Presence
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]		Breeding known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known 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 bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Berardius arnuxii Arnoux's Beaked Whale [70]		Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour likely to 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

Name	Status	Type of Presence
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Globicephala melas Long-finned Pilot Whale [59282]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia simus Dwarf Sperm Whale [58]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat likely to occur within area
Lissodelphis peronii Southern Right Whale Dolphin [44]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Mesoplodon bowdoini Andrew's Beaked Whale [73]		Species or species habitat may occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Mesoplodon grayi Gray's Beaked Whale, Scamperdown Whale [75]		Species or species habitat may occur within area
Mesoplodon hectori Hector's Beaked Whale [76]		Species or species habitat may occur within area
Mesoplodon layardii Strap-toothed Beaked Whale, Strap-toothed Whale, Layard's Beaked Whale [25556]		Species or species habitat may occur within area
Mesoplodon mirus True's Beaked Whale [54]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [\[Resource Information \]](#)

Name	State
Baawang	VIC
Bemm, Goolengook, Arte and Errinundra Rivers	VIC
Ben Boyd	NSW
Cape Conran Coastal Park	VIC
Cape Howe	VIC
Croajingolong National Park	VIC
Eagles Claw	NSW
East Gippsland Coastal streams	VIC
Ewing Morass W.R	VIC
Gippsland Lakes Coastal Park	VIC
Lake Tyers	VIC
Mortimers Paddock B.R.	VIC
Nadgee	NSW
Rame Head	VIC
Rigby Island G.L.R.	VIC
Sandpatch	VIC
Seal Creek	VIC

Regional Forest Agreements [\[Resource Information \]](#)

Note that all areas with completed RFAs have been included.

Name	State
East Gippsland RFA	Victoria
Eden RFA	New South Wales
Gippsland RFA	Victoria

Invasive Species [\[Resource Information \]](#)

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Turdus philomelos Song Thrush [597]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Asparagus scandens Asparagus Fern, Climbing Asparagus Fern [23255]		Species or species habitat likely to occur within area
Carrichtera annua Ward's Weed [9511]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Nationally Important Wetlands [\[Resource Information \]](#)

Name	State
Benedore River	VIC
Ewing's Marsh (Morass)	VIC
Lake Bunga	VIC
Lake King Wetlands	VIC
Lake Tyers	VIC
Mallacoota Inlet Wetlands	VIC
Nadgee Lake and tributary wetlands	NSW
Sydenham Inlet Wetlands	VIC
Tamboon Inlet Wetlands	VIC
Twofold Bay	NSW

Key Ecological Features (Marine) [\[Resource Information \]](#)

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Upwelling East of Eden	South-east

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

-37.101214 149.946318,-37.103405 149.924345,-37.118737 149.924345,-37.099023 149.87216,-37.079305 149.8804,-37.066156 149.940825,-37.422546 150.388518,-37.494494 150.319853,-37.644705 150.325346,-37.63818 150.053435,-37.87921 149.78427,-37.920388 149.298125,-37.955047 149.067412,-38.00484 148.985014,-38.093518 148.927336,-38.132416 148.913603,-38.380442 148.905363,-38.274938 148.776063,-38.274938 148.704652,-38.309429 148.556337,-38.386974 148.402528,-38.610525 148.100404,-38.743466 147.820253,-38.794861 147.743348,-38.674882 147.765321,-38.584766 147.820253,-38.503135 147.875184,-38.348212 147.891664,-38.080622 147.880678,-38.00275 147.869691,-37.963783 147.908143,-37.90522 147.92758,-37.820653 148.243437,-37.827162 148.325834,-37.83367 148.542814,-37.829331 148.770781,-37.785931 149.006987,-37.78159 149.2377,-37.801124 149.270659,-37.78159 149.380522,-37.779419 149.42996,-37.775077 149.465666,-37.78159 149.487639,-37.751193 149.512358,-37.727301 149.597502,-37.707747 149.613981,-37.690361 149.674406,-37.583786 149.740324,-37.575079 149.75955,-37.555485 149.798002,-37.546775 149.885893,-37.551131 149.902373,-37.527174 149.929838,-37.518461 149.973784,-37.448717 149.97653,-37.42909 149.957304,-37.363629 149.954558,-37.328693 149.979277,-37.304665 149.971037,-37.285 149.946318,-37.243469 149.98477,-37.263145 150.047941,-37.149392 150.009489,-37.105595 149.946318,-37.103405 149.940825,-37.101214 149.946318

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.

Attachment 4 – Stakeholder Consultation Summary

SGHE - Longtom Consultation Summary Log - post 2010

Organisation or Department	Date Consulted	Method	Key Points	Assessment of Merit / Response
AFMA	5/01/15	Email Gen 05 Jan 15	Provision of VIC/L29 flyer and invitation to comment sent	
AFMA	23/02/15	Email from AFMA	Email from stakeholder requesting that all future correspondence be directed through the petroleum inbox - petroleum@afma.gov.au	No objections, claims or issues raised
AFMA	24/07/19	Email	Consultation flyer Rev 5 July 19	
AFMA	18/11/19	Email Nov 19 Longtom Environment Plan Consultation Check	Resent Email of 24 July to check if stakeholder has any issues to address NOPSEMA RFFWI.	
AFMA	25/11/19	Email from AFMA	<p>Due to limited resources AFMA is unable to comment on individual proposals, however, it is important to consult with all fishers who have entitlements to fish within the proposed area. This can be done through the relevant fishing industry associations or directly with fishers who hold entitlements in the area.</p> <p>Details for these associations can be found on AFMA's website at: http://www.afma.gov.au/sustainability-environment/petroleum-industry-consultation/</p> <p>Lists of Commonwealth Concession holders in each fishery can be found on the AFMA website at: http://www.afma.gov.au/fisheries-services/concession-holders-conditions/</p> <p>Once you have identified relevant operators you can request their individual contact details through licensing@afma.gov.au. There is a cost associated with this service and the total price will depend on the complexity of the request.</p>	<p>Request to check relevant fishing stakeholders to ensure consultation undertaken with all fishers who have entitlements to fish within the proposed area has merit.</p> <p>List of associations checked and consistent with the EP and already included in the Longtom stakeholder list.</p> <p>SETFIA, LEFCOL and SIV already consulted with and SETFIA have SMS'd the eastern fishing fleet. There has been no request for additional information - contacting individual concession holders has not led to any previous response and is not considered necessary for this revision.</p>
AMSA	5/01/15	Email Gen 05 Jan 15	Provision of VIC/L29 Drilling Campaign flyer and invitation to comment	
AMSA	5/01/15	Email Gen 05 Jan 15	Provision of Longtom-5 flyer and invitation to comment sent	
AMSA	13/06/19	Email - Longtom EP 13 Jun	Update on oil spill modelling and NOPSEMA thresholds. Commencement of consultation on OPEP.	
AMSA	19/07/19	Email from AMSA	No consultation required on EPs. Provided contact details (JRCC and AHO) to be notified in the event of an offshore campaign and details of marine traffic information options.	No objections, claims or issues raised. These details have been added to ongoing consultation requirements.
AMSA	6/01/15	Email AMSA 06 Jan	Emailed Stakeholder contact to determine if he was still the OSCP contact at AMSA.	
AMSA	6/01/15	Email AMSA 06 Jan_2	Emailed new Stakeholder contact re OSCP.	
AMSA	8/01/15	Post	Revision 3 of the OSCP sent to AMSA	
AMSA	15/02/15	Post	Revision 4 of the OSCP sent to AMSA	
AMSA	13/06/19	Email - Longtom EP 13 Jun	Update on oil spill modelling and NOPSEMA thresholds. Commencement of consultation on OPEP.	
AMSA	13/06/19	Email from AMSA	Thanks for email of intent to revise and submit EP. Noted that well shut-in, if things change and you require vessels in the area take note to contact AMSAs Joint RCC 026230 6811 or rccaus@amsa.gov.au and the AHO datacentre@hydro.gov.au	Request for action has merit. Requirements to contact/notify AMSA JRCC and AHO added to ongoing consultation table in the event of a vessel campaign.
AMSA	8/08/19	via AMSA web page	Email enquiring about MOU.	
AMSA	22/08/19	Email from AMSA 23 Aug	Email in response to question regarding MOU with AMSA. Call to discuss.	
AMSA	23/08/19	Phone call	AMSA are no longer recommending an MOU it simply restates what is already in the National Plan. If this causes a problem AMSA can send the MOU but it is non negotiable and contains no new information from that contained in the National Plan.	No objections, claims or issues raised. MOU provides no benefit and is not required.
DAWE	25/10/19	Email pestsmarine 25 Oct	Copy of Longtom flyer rev 5 and opening email consulting on Longtom activities, use of offshore vessels IMS and biosecurity.	
DPI	5/01/15	Email Gen 05 Jan 15	Provision of VIC/L29 flyer and Invitation to Comment sent	
Earth Resources Regulation	5/01/15	Email Gen 05 Jan 15	Provision of VIC/L29 flyer and Invitation to Comment sent	
Earth Resources Regulation	12/01/15	Email DSDBI 12 Jan	Sent email requesting postal address to send Longtom Operations OSCP and EP to	
Earth Resources Regulation	19/01/15	Post	Revision 3 of the OSCP and copy of Longtom Operations EP sent	
Earth Resources Regulation	15/02/15	Post	Copy of Revision 4 of the OSCP sent	Stakeholder acknowledged receipt
DEDJTR	7/12/17	Email	Looking to update OSCP with latest oil spill response atlas - transpires that a new web based system has been developed. SGHE applied for access and Stakeholder offered support and provision of info as required.	

DEDJTR	9/01/18	Email	Still looking for access to Emcop the Victorian oil spill response atlas.	
DEDJTR	23/04/18	Email	Still looking for access to Emcop the Victorian oil spill response atlas. Also raised that we were updating our OPEP / ESCP and were keen to consult / discuss with key stakeholders.	
DEDJTR	11/05/18	Emails from DEDJTR	Oil spill response atlas maps provided by stakeholder	No objections claims or issues raised. OPEP files updated
DEDJTR	13/09/18	Email from DEDJTR	Stakeholder contact is off on maternity leave till July 2019 - alternate contact provided.	No objections, claims or issues raised. Consultation register updated with new contact at DEDJTR.
DEDJTR	13/09/18	Email	Introduction of SGHE and offer for consultation / discussion on Longtom and interaction with State departments	
DEDJTR	17/10/18	Emails	Arranging a meeting with Ecodev to raise awareness of SGH and OSCP arrangements	
DEDJTR	22/10/18	Emails	Arranging a meeting with Ecodev to raise awareness of SGH and OSCP arrangements	
DEDJTR	26/10/18	Emails	Arranging a meeting with Ecodev to raise awareness of SGH and OSCP arrangements	
DEDJTR	28/11/18	Meeting	Overview of SGHE facilities and operations	No objections, claims or issues raised.
DJPR	30/01/19	Email DJPR 30 Jan	Discussion on thresholds and if DJPR have any preference	
DJPR	31/01/19	Email from DJPR 31 Jan	DJPR understand NOPSEMA will be providing an update on thresholds. Question on OPEP timelines.	No objections, claims or issues raised. Response on timelines provided.
DJPR	7/02/19	Email DJPR 7 Feb	Response to email of 31/01/19. SGHE looking to agree thresholds Feb. Oil spill results end March and OPEP draft for review with stakeholders May / June. Happy to discuss modelling results earlier	
DJPR	12/02/19	Email from DJPR 12 Feb	Presentation on modelling results would be useful.	No objections, claims or issues raised. Meeting to be convened.
DJPR	4/06/19	Meeting with DJPR - see Powerpoint SGHE DJPR Presentation 2019.	Presentation of oil spill modelling results from a diesel spill and a Longtom blowout provided - see presentation DJPR 4 June for more info. OPEP will be available for DJPR review in July. DJPR are the central point of contact / consultation with Vic state departments and organisations.	Discussion on the Longtom oil spill modelling and impacts on state waters - risk of a blowout is very low and impact on state water considered similar / or smaller than other Bass Strait operations. Source control would be managed by SGH and in the event of a blowout would require a relief well to be drilled. Discussion on gas reserves, gas supplies to Victoria and potential timing of recommencement of production also took place.
DJPR	4/06/19	Email from DJPR	Names and details of attendees at presentation. Presentation to be fwd by DJPR to DELWP and Parks Victoria	No objections claims or issues raised.
DJPR	17/07/19	Email 17 Jul	Provision of OPEP for DJPR and Vic State review and input	
DJPR	19/07/19	Email from DJPR 19 Jul	OPEP passed to Vic State departments, contact will coordinate the feedback and notification of change in responsibility to DoT	No objections, claims or issues raised. Contact details updated
DOT	30/07/19	Email from DoT 30 Jul	Clarifications on VIC oil spill response arrangements	No objections, claims or issues raised. Victorian oil spill response arrangements incorporated into OPEP
DOT	9/08/19	Email from DoT 9 Aug	Contact is leaving the Marine Pollution Team - emails to go to Marine.Pollution@ecodev.vic.gov.au	No objections, claims or issues raised. Contact details updated.
DOT	28/10/19	Email from DOT FW Victorian Joint Industry	Forwarded copy of proposed guidance note on State Oil Pollution Response and Consultation Arrangements. Requested any comments to be provided back to AMOSC by 23 Dec	No objections, claims or issues raised.
DOT	18/11/19	Email Ecodev 18 Nov	Email acknowledging receipt of guidance note on oil spill response arrangements (the crux of which had already been provided by stakeholder in email dated 30/07/19 and incorporated into the OPEP) and checking if there had been any feedback from the gov departments and stakeholders that Nancy Wong had offered to coordinate the consultation with as per section 7.2 of the Note.	
DOT	22/11/19	Email from DOT	Assume that there was no feedback from the group. Offer to recirculate anything if SGH would like.	No objections, claims or issues raised.
DJPR Biosecurity and agricultural services	25/10/19	Email	Copy of Longtom flyer rev 5 and opening email consulting on Longtom activities, use of offshore vessels IMS and biosecurity.	

DJPR Biosecurity and agricultural services	28/10/19	Email from ** IMS and Biosecurity Matters (DJPR Biosecurity and agricultural services)	Notes that the risk of IMS establishment at Longtom is highly unlikely. Would like to be kept informed of any vessels coming from WA or overseas and offered to look at relevant sections of the EP.	Request to be kept informed of vessels coming from WA or overseas has merit to mitigate risk of vessels introducing marine pests to Victorian waters. Request that ABWM Requirements, National Biofouling Management Guidelines and Anti fouling and in-water cleaning guidelines are followed has merit to mitigate risk of introduction of IMS through ballast water and biofouling. SGH will contact in advance of any offshore campaign to confirm latest state requirements and the best way in which we should assess IMS risk and what information they would like to see. Little benefit in doing so at this time as there is no offshore campaign currently planned and it is known that the regulatory arrangements for this are currently being further worked. EP commits to compliance with current requirements as recommended. Stakeholder recontacted in April 2020 (see below) to advise of this process and that we would keep them informed of any offshore campaign.
DJPR Biosecurity and agricultural services	23/04/20	Email DJPR O 23 Apr	Response to email on the 28/10/19 to address issues raised. To present SGHE proposed IMS risk assessment process and how we will keep the department informed of any vessels contracted by SGHE, their IMS status and that the revised procedure will be provided once developed and prior to vessel use.	
DJPR Biosecurity and agricultural services	28/04/20	Email DJPR I 28 Apr	Stakeholder provided further details of Vessel Check Portal and offered to review documentation, will keep SGHE informed of biosecurity changes.	Issue surrounding use of Vessel Check has merit and details will be added to a revised IMS RA procedure. The new IMS RA procedure will be developed prior to any vessel campaign and will be provided to stakeholder for input.
EPA	12/01/15	Email EPA 12 Jan	Sent copy of VIC/L29 flyer and queried if he was still the most appropriate contact. Out of office received, on leave until 19th Jan	
EPA	4/06/19	Meeting with DJPR - see Powerpoint SGHE DJPR Presentation 2019.	Presentation of oil spill modelling results from a diesel spill and a Longtom blowout provided - see presentation DJPR 4 June for more info. OPEP will be available for DJPR review in July. DJPR are the central point of contact / consultation with Vic state departments and organisations.	No objections, claims or issues raised.
DPI - Fisheries	5/01/15	Email Gen 05 Jan 15	Provision of VIC/L29 flyer and Invitation to Comment sent	
DSE	5/01/15	Email Gen 05 Jan 15	Provision of VIC/L29 flyer and invitation to comment sent	
Parks Victoria	5/01/15	Email Gen 05 Jan 15	Provision of VIC/L29 flyer and invitation to comment sent	
DPIPWE	13/06/19	Email - Longtom Environment Plan - Consultation 13 June	Update on oil spill modelling and NOPSEMA thresholds. Commencement of consultation on OPEP.	
DPIPWE	24/07/19	Email	Consultation flyer Rev 5 July 19	
DPIPWE	18/11/19	Email Nov 19 Longtom Environment Plan Consultation Check	Resent Email of 24 July to check if stakeholder has any issues to address NOPSEMA RFFWI.	
Transport for NSW	13/06/19	Email - Longtom Environment Plan - Consultation 13 June	Update on oil spill modelling and NOPSEMA thresholds. Commencement of consultation on OPEP.	
Transport for NSW	24/07/19	Email	Consultation flyer Rev 5 July 19	
Transport for NSW	18/11/19	Email Nov 19 Longtom Environment Plan Consultation Check	Resent Email of 24 July to check if stakeholder has any issues to address NOPSEMA RFFWI.	
Parks Australia	13/06/19	Email - Longtom Environment Plan - Consultation 13 June	Update on oil spill modelling and NOPSEMA thresholds. Commencement of consultation on OPEP.	
Parks Australia	12/09/19	Email from Parks Australia	Response to consultation email 13 June. No further consultation required on EP revision. Points raised included; - No overlap with Australian Marine Parks - Details of the guidance note that they have developed with NOPSEMA that should be used in preparing the EP and assessing impacts to Marine Parks - Links to marine park management Plans - Emergency response arrangement and contact details provided in the event of a spill impacting a marine national park	Comments from Parks Australia noted. Request to use guidance note has merit to ensure all impacts and risks to Australian Marine Parks are assessed. Guidance note was utilised in the development of the EP. The potential impacts have been assessed with consideration of park management plans. Emergency response arrangements and contact details added to OPEP / CMP.
Commonwealth Fisheries Association (CFA)	5/01/15	Email Gen 05 Jan 15	Provision of VIC/L29 flyer and Invitation to Comment sent	
Commonwealth Fisheries Association (CFA)	24/07/19	Email	Consultation Flyer Rev 5 July 2019	
Commonwealth Fisheries Association (CFA)	18/11/19	Email Nov 19 Longtom Environment Plan Consultation Check	Resent Email of 24 July to check if stakeholder has any issues to address NOPSEMA RFFWI.	
Lakes Entrance Fishermans Cooperative (LEFCOL)	5/01/15	Email Gen 05 Jan 15	Provision of VIC/L29 flyer and Invitation to Comment sent	
Lakes Entrance Fishermans Cooperative (LEFCOL)	5/01/15	Email LEFCOL SETFIA 05 Jan 15	Email sent with further information on drilling campaign as previously requested	

Lakes Entrance Fishermans Cooperative (LEFCOL)	15/01/15	Phone call, summarised in en	They received the information. No issue with LTS given existing safety zone. Gemfish not in a high fishing area so should also not be an issue. No issue with NADF, more interested in cumulative impacts given 6 wells being drilled nearby. Accepted there was no evidence of toxic rock in area. Offer was made to have a meeting at the end of January, he declined as he is busy but suggested SETFIA may be available.	No objections, claims or issues raised.
Lakes Entrance Fishermans Cooperative (LEFCOL)	1/12/16	Email LEFCOL and SETFIA	Email and phone calls regarding the Skandi Hercules campaign in Jan 2017	No objections, claims or issues raised.
Lakes Entrance Fishermans Cooperative (LEFCOL)	24/07/19	Email	Consultation Flyer Rev 5 July 2019	
Lakes Entrance Fishermans Cooperative (LEFCOL)	18/11/19	Email Nov 19 Longtom Environment Plan Consultation Check	Resent Email of 24 July to check if stakeholder has any issues to address NOPSEMA RFFWI.	
Lakes Entrance Scallop Fishing Industry Association	5/01/15	Email Gen 05 Jan 15	Provision of VIC/L29 flyer and invitation to comment	
Lakes Entrance Scallop Fishing Industry Association	24/07/19	Email	Consultation Flyer Rev 5 July 2019	
Seafood Industry Victoria	5/01/15	Email Gen 05 Jan 15	Provision of VIC/L29 flyer and invitation to Comment sent	Email returned unknown.
Seafood Industry Victoria	24/07/19	Email	Consultation Flyer Rev 5 July 2020	
Seafood Industry Victoria	18/11/19	Email Nov 19 Longtom Environment Plan Consultation Check	Resent Email of 24 July to check if stakeholder has any issues to address NOPSEMA RFFWI.	
Victorian Recreational Fishing	5/01/15	Email Gen 05 Jan 15	Provision of VIC/L29 flyer and Invitation to Comment sent	
Victorian Recreational Fishing	24/07/19	Email	Consultation Flyer Rev 5 July 2019	
Tasmanian Seafood Industry Council	5/01/15	Email Gen 05 Jan 15	Provision of VIC/L29 flyer and Invitation to Comment	Email returned unknown.
Tasmanian Seafood Industry Council	24/07/19	Email	Consultation Flyer Rev 5 July 2019	Email address no longer valid. Use SETFIA SMS to disseminate info. in future
Victorian Scallop Fishermen's Association	5/01/15	Email Gen 05 Jan 15	Provision of VIC/L29 flyer and invitation to comment	
Victorian Scallop Fishermen's Association	24/07/19	Email	Consultation Flyer Rev 5 July 2019	
Victorian Scallop Fishermen's Association	18/11/19	Email Nov 19 Longtom Environment Plan Consultation Check	Resent Email of 24 July to check if stakeholder has any issues to address NOPSEMA RFFWI.	
SETFIA	5/01/15	Email LEFCOL SETFIA 05 Jan 15	Email sent with further information on drilling campaign as previously requested	
SETFIA	Dec 2017 - Jan 2018	Email, phone calls and text m	Email and phone calls regarding the Skandi Hercules campaign in Jan 2017. Text messages sent to SE Australian commercial fishers by Stakeholder to notify them of proposed activities and details of the Skandi Hercules	No objections, claims or issues raised.
SETFIA	14/06/19	Meeting	Discussion with Stakeholder on EP consultation with fishing industry.	Issue raised has merit to ensure required consultation is undertaken in an efficient manner. There is a lot of consultation occurring and SETFIA contact was spending too much time on oil and gas consultation. SETFIA are proposing to move to fee recovery structure. SGHE acknowledged the issues but the oil and gas industry is required to demonstrate consultation. SGHE will work with SETFIA to minimise unnecessary consultation and look to participate in any industry led initiatives.
SETFIA	24/06/19	Email SETFIA 24 Jun	Request for details / costs of SETFIA consultation	
SETFIA	25/06/19	Email from SETFIA	Proposal from SETFIA on consultation costs and arrangements	Proposal has merit to ensure required consultation is undertaken in an efficient manner. SGHE will pay for SMSs and SETFIA consultation as required.
SETFIA	24/07/19	Email	Consultation Flyer Rev 5 July 2019	
SETFIA	24/07/19	Email and SMS (via SETFIA) 25	SETFIA have issued an SMS with details of Longtom and a link to the flyer on their facebook page.	
Southern Squid Jig Fishery	5/01/15	Email Gen 05 Jan 15	Provision of VIC/L29 flyer and Invitation to Comment sent	
Southern Squid Jig Fishery	24/07/19	Email	Consultation Flyer Rev 5 July 2019	
Southern Squid Jig Fishery	18/11/19	Email Nov 19 Longtom Environment Plan Consultation Check	Resent Email of 24 July to check if stakeholder has any issues to address NOPSEMA RFFWI.	
	5/01/15	Email Gen 05 Jan 15	Provision of VIC/L29 flyer and Invitation to Comment sent	Email returned unknown
	24/07/19	Email	Consultation Flyer Rev 5 July 2019	Email returned unknown. Removed from list.
Tasmanian Scallop Fishermen's Association	5/01/15	Email Gen 05 Jan 15	Provision of VIC/L29 flyer and Invitation to Comment sent	
Tasmanian Scallop Fishermen's Association	24/07/19	Email	Consultation Flyer Rev 5 July 2019	
Tasmanian Scallop Fishermen's Association	18/11/19	Email Nov 19 Longtom Environment Plan Consultation Check	Resent Email of 24 July to check if stakeholder has any issues to address NOPSEMA RFFWI.	
	5/01/15	Email Gen 05 Jan 15	Provision of VIC/L29 flyer and Invitation to Comment sent	Email returned unknown.
	24/07/19	Email	Consultation Flyer Rev 5 July 2019	Email address no longer valid. Removed from list (SETFIA SMS contacts relevant fishermen)
Victorian Abalone Divers Association Inc, (VADA)	8/01/15	Email VADA 06 Jan 15	Email providing further information on VIC/L29 drilling campaign sent via VADA website	

	24/07/19	Email	Consultation Flyer Rev 5 July 2019	
	18/11/19	Email Nov 19 Longtom Environment Plan Consultation Check	Resent Email of 24 July to check if stakeholder has any issues to address NOPSEMA RFFWI.	
Origin	5/01/15	Email Gen 06 Jan 15	Sent VIC/L29 flyer and Invitation to Comment	
Origin	5/01/15	Email from Origin 05 Jan 15	Reply from stakeholder indicating he sent on to another contact	No objections, claims or issues raised.
Origin	7/01/15	Email from Origin	Reply from stakeholder (Origin External Affairs) indicating Origin have no operation in the vicinity and therefore no issues	No objections, claims or issues raised. Origin are no longer considered a relevant stakeholder - replaced by Beach.
ExxonMobil	1/10/17	Email from EAPL	EAPL provided info on their upcoming projects	No objections, claims or issues raised. SGHE requested to remain on EAPL consultation list. Stakeholder has taken over from previous contact.
ExxonMobil	4/04/14	Phone call from EAPL	Requested that in the event of a leak EAPL are informed Requested that when drilling occurs EAPL are notified of major events such as well testing etc.	No objections, claims or issues raised. Request for notification has merit as EAPL title areas are adjacent to those of SGHE.. SGHE confirmed that this would be done and further consultation will take place when the timing of the drilling campaign is known.
ExxonMobil	5/01/15	Email Gen 05 Jan 15	Provision of VIC/L29 flyer and invitation to comment	
ExxonMobil	1/12/16	Emails	Notification of inspection campaign and confirmation of ERP numbers	
ExxonMobil	21/12/17	Email from EAPL	Offshore fact sheet	No objections, claims or issues raised.
ExxonMobil	19/02/18	Email from EAPL	Consultation re MV Offshore Guardian	No objections, claims or issues raised.
ExxonMobil	17/06/18	Email from EAPL	Consultation re MV Dryden	No objections, claims or issues raised.
ExxonMobil	26/06/18	Email from EAPL	Completion of survey	No objections, claims or issues raised.
ExxonMobil	24/07/19	Email from EAPL	Consultation Flyer Rev 5 July 2019	No objections, claims or issues raised.
ExxonMobil	14/08/18	Email from EAPL	Offshore Fact Sheet	No objections, claims or issues raised.
ExxonMobil	27/08/18	Email from EAPL	Update to EAPL switchboard telephone number	No objections, claims or issues raised. CMP updated.
ExxonMobil	24/07/19	Email	Consultation Flyer Rev 5 July 2019	
ExxonMobil	13/09/18	Email from EAPL	Introduction and contact details	No objections, claims or issues raised.
ExxonMobil	24/07/19	Email	Consultation Flyer Rev 5 July 2019	
Hibiscus / 3D Oil	24/02/14	Letter	Provision of Longtom operations flyer and invitation to comment.	
Santos	Ongoing		Due to the connection with Santos and the PB facilities Nexus maintains a close relationship with Santos.	
Santos	1/12/16	Emails and phone calls	Discussion on the Inspection campaign and ERP numbers / arrangements	
Santos				Santos have sold PB facilities to Cooper - Santos as a stakeholder is no longer relevant
APPEA	5/01/15	Email Gen 05 Jan 15	Provision of VIC/L29 flyer and invitation to comment	
APA Group	1/12/17	Email from APA	Stakeholder sent a copy of the APA Orbest ERP and welcomed being involved in ERP exercises.	No objections, claims or issues raised. Details added to CMP
APA Group	24/07/19	Email	Consultation Flyer Rev 5 July 2019	
Cooper Energy	21/12/17	Email	Seeking confirmation of Cooper ERP details	
Cooper Energy	24/07/19	Email	Consultation Flyer Rev 5 July 2019	Email address no longer valid.
Cooper Energy	24/07/19	Email	Consultation Flyer Rev 5 July 2019	
Cooper Energy	24/07/19	Email from Cooper	Please can you copy alt contacts Glavas (as per the emails above) on future stakeholder communications from SGH.	No objections claims raised. Issue regarding change in contacts has merit and changes have been added to SGH consultation register
Beach	24/07/19	Email	Consultation Flyer Rev 5 July 2019	

Attachment 5 – Oil Pollution Emergency Plan

Attachment 6 – Longtom Equipment

Longtom Equipment / Inventory List	
Item and description	Status
Longtom-1 well	Plugged and Abandoned
Longtom-2 well	Plugged and Abandoned
Longtom-3 (LT3) well and LT3 subsea production tree	Operational but shut-in
Longtom-3 rigid tie in spool / flowline from well to LT3 Tee.	Operational
LT3 HFL and 3xEFLs - Hydraulic Flying Lead and three Electrical Flying Leads from LT3 Subsea Control Unit (SCU) to LT3-Tree	Operational
2 x concrete mattresses at Longtom-3	Operational
Longtom-4 (LT4) well and LT4 subsea production tree	Operational but shut-in
Longtom-4 flexible flowline from well to pipeline skid	Operational
LT4 HFL and 2xEFLs - Hydraulic Flying Lead and two Electrical Flying Leads from LT4 Subsea Control Module (SCM) to LT4-Tree	Operational
6 x concrete mattresses at Longtom-4	Operational
Longtom-5 well and subsea production tree	Not drilled or installed - for future campaign
Longtom-5 flexible flowline from well to Pipeline End Manifold (PLEM)	Not installed - for future campaign
LT5 HFL and EFLs - Hydraulic Flying Lead and Electrical Flying Leads from LT5 SCM to LT5-Tree	Not installed - for future campaign
LT5 SCM - controls the Longtom-5 production tree	Not installed - for future campaign
Longtom-3 PLEM skid - protection frame and valving arrangement at the start of the Longtom pipeline, includes Longtom-3 tie in Tee.	Operational
LT4 Protection Frame - Longtom-4 tie in to Longtom pipeline.	Operational
Tie in Flange - isolation valve	Operational
HIPPS tie in spool	Operational
HIPPS (Longtom High Integrity Pressure Protection Skid) - protection frame, valve and shutdown system to protect downstream pipeline.	Operational but shut-in
HIPPS tie in spool	Operational
Tie in Flange - isolation valve	Operational
Tie in Flange	Operational
Removable spool connecting the Longtom pipeline to the PB PLEM.	Operational
PB PLEM (Patricia Baleen Pipeline End Manifold) skid - protection frame and valving arrangement at the end of the Longtom pipeline	Operational
Removable spool connecting the PB PLEM to the PB pipeline.	Operational
PB End Flange - Cooper Energy item	Operational
PB MUTA (Patricia Baleen Main Umbilical Termination Assembly) - Cooper Energy item - start of the Longtom umbilical near Balleen-4 well.	Operational
EHU-1 - First section of the Longtom umbilical from the PB MUTA to EHU-1/EHU-2 Joint - provides power, communications, hydraulic fluid and chemicals.	Operational
3 x mattresses at PB MUTA	Operational
EHU-1/EHU-2 Umbilical Joint Rocking Horse - Umbilical connection point	Operational
2 x mattresses at EHU-1 to EHU-2 connection (Rocking Horse)	Operational
Grout Bag 4m x 1m x 0.5m placed over pipeline for EHU-1 crossing	Operational

EHU-2 - Second section of the Longtom umbilical from Rocking Horse to Longtom-4 SCM - provides power, communications, hydraulic fluid and chemicals.	Operational
SCM - Longtom-4 Subsea Control Module (SCM) - controls the Longtom-4 production tree and the HIPPs.	Operational
EHU-3 - Third section of the Longtom umbilical from the Longtom-4 SCM to Longtom-3 SCU provides hydraulic fluid and chemicals (earth fault in the power / communications lines).	Operational
EU-3A - provides power and communications from the UTA-1 to UTA-2 to repair the earth fault in the EHU-3.	Operational
SCU - Subsea Control Unit at Longtom-3 - controls the Longtom-3 production tree and potential future Longtom-5.	Operational
UTA-1 - Umbilical Termination Assembly (UTA) at Longtom-4 for the EU-3A umbilical	Operational
UTA-2 - Umbilical Termination Assembly (UTA) at Longtom-3 for the EU-3A umbilical	Operational