INPEX

Ichthys Geotechnical and Geophysical Survey WA-50-L

Environment Plan

Environment plan summary

This environment plan summary has been prepared from material provided in this environment plan (EP). The summary consists of the following as required by Regulation 11(4) of the OPGGS (E) Regulations 2009:

EP summary and material requirement	Relevant section of EP containing EP summary material
The location of the activity	Section 3.1
A description of the receiving environment	Section 4
A description of the activity	Section 3
Details of the environmental impacts and risks	Sections 7 and 8
The control measures for the activity	Sections 7 and 8
The arrangements for ongoing monitoring of the titleholders environmental performance	Sections 9.11, 9.12 and 9.13
Response arrangements in the oil pollution emergency plan	Sections 8.4, 8.5 and Appendix D
Consultation already undertaken and plans for ongoing consultation	Sections 5, 9.8.3 and Appendix C
Details of the titleholders nominated liaison person for the activity	Section 1.5

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Terms, abbreviations and acronyms

Term, abbreviation or acronym	Meaning
°C	degrees Celsius
AFMA	Australian Fisheries Management Authority (Cwlth)
AHO	Australian Hydrographic Office
AIMS	Australian Institute of Marine Science
AIS	automatic identification system
ALARP	as low as reasonably practicable
AMOSC	Australian Marine Oil Spill Centre
AMP	Australian marine park
AMSA	Australian Maritime Safety Authority (Cwlth)
APASA	Asia-Pacific Applied Science Associates
APPEA	Australian Petroleum Production and Exploration Association
ARP	applied research program
AS/NZS	Australian/New Zealand Standard
BIA	Biologically Important Area
BoM	Bureau of Meteorology
BWM	ballast water management
CAMBA	China-Australia Migratory Bird Agreement
CASA	Civil Aviation Safety Authority
CMST	Centre for Marine Science and Technology
CMT	crisis management team
COLREGs	International Regulations for Preventing Collisions at Sea 1972
CPF	central processing facility
CW	cooling water
Cwlth	Commonwealth
DA	Department of Agriculture (Cwlth)
dB	decibel

Term, abbreviation or acronym	Meaning
DBCA	Department of Biodiversity, Conservation and Attractions (WA) formerly the Department of Parks and Wildlife (DPaW)
DEE	Department of the Environment and Energy (Cwlth)
DEWHA	Department of the Environment, Water, Heritage and the Arts
DMIRS	Department of Mines, Industry Regulation and Safety WA (formerly Department of Mines and Petroleum)
DP	dynamically positioned
DPIRD	Department of Primary Industries and Regional Development (WA)
EIAPP	Engine International Air Pollution Prevention
EIS	environmental impact statement
EMBA	environment that may be affected
EP	environment plan
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)
ERP	emergency response plan
ERT	emergency response team
ESD	ecological sustainable development
ESTB	electronic surface tracker buoys
FLNG	floating liquified natural gas
g/m^2	grams per square metre
g/m^3	grams per cubic metre
GT	gross tonnes
ha	hectare
HAZID	identification of operational risks and hazards
HSE	health, safety and environment
HSEQ-MS	health, safety, environment and quality management system
Hz	hertz
IAP	incident action plan

Term, abbreviation or acronym	Meaning
IAPP	International Air Pollution Prevention
IBA	important bird area
IMCRA	Integrated Marine and Coastal Regionalisation of Australia
IMO	International Maritime Organization
IMS	invasive marine species
IMT	incident management team
INPEX	INPEX Operations Australia Pty Ltd
INPEX Ichthys Pty Ltd	INPEX Ichthys Pty Ltd is one of the upstream titleholders and Joint venture partners of petroleum licence area WA-50-L
IOGP	International Association of Oil and Gas Producers
IOPP	International Oil Pollution Prevention
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature
KEF	key ecological feature
kHz	kilohertz
km	kilometre(s)
L	litre(s)
LAT	lowest astronomical tide
LC_{50}	Lethal concentration 50. Lethal concentration in which 50% of the population will be killed in a given period of time
LLR	lower limits of reporting
LNG	liquefied natural gas
m^2	square metres
m^3	cubic metres
m/s	metres per second
MARPOL 73/78	International Convention for the Prevention of Pollution from Ships, 1973/1978
MBES	multibeam echo sounder
mg/L	milligrams per litre

Term, abbreviation or acronym	Meaning
MNES	Matters of National Environmental Significance
MoC	management of change
MoU	memorandum of understanding
MP	marine park
MSI	Maritime Safety Information
NatPlan	National Plan for Maritime Environmental Emergencies
nm	nautical miles
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NOPTA	National Offshore Petroleum Titles Administrator
NOx	mono-nitrogen oxides
NWMR	north-west marine region
ODS(s)	ozone-depleting substance(s)
OEM	original equipment manufacturer
OPEP	oil pollution emergency plan
OPGGS Act	Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cwlth)
OPGGS (E) Regulations	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cwlth)
OSMP	operational and scientific monitoring program
OSPAR	The 1992 OSPAR Convention ("Convention for the protection of the marine environment of the north-east Atlantic")
OSRL	Oil Spill Response Limited
OSTM	oil spill trajectory modelling
OWD	oil-in-water dispersions
OWS	oil-water separator
PAH(s)	polycyclic aromatic hydrocarbon(s)
PEAR	people, environment, assets and reputation
licence area	Production licence WA-50-L
PDCA	plan, do check, act

Term, abbreviation or acronym	Meaning
PCPT	piezocone penetration tests
POLREP	(marine) pollution report
POTS Act	Protection of the Sea (Prevention of Pollution from Ships) Act 1983
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
ppt	parts per thousand
PPRR	prevention, preparedness, response, and recovery
PSZ	petroleum safety zone
PTW	permit to work
QA/QC	quality assurance and quality control
Ramsar Convention	The Convention on Wetlands of International Importance, especially as Waterfowl Habitat (the Ramsar Convention)
RCC	rescue coordination centre
RO	reverse osmosis
ROKAMBA	Republic of Korea- Australia Migratory Bird Agreement
ROV	remotely operated (underwater) vehicle
SBP	sub-bottom profiling
SEEMP	Ship Energy Efficiency Management Plan
SIMA	spill impact mitigation assessment
SIMOPs	simultaneous operations
SITREP	situation report
SME	subject matter expert
SOLAS	International Convention for the Safety of Life at Sea
SOPEP	shipboard oil pollution emergency plan
SPS	subsea production system
SSS	side-scan sonar
STP	sewage treatment plant

Term, abbreviation or acronym	Meaning
T	tonne
t/d	tonnes per day
UNEP	United Nations Environment Programme
VOC(s)	volatile organic compound(s)
WA	Western Australia
WA-50-L	Production licence area within the Browse Basin
WA DoT	Department of Transport (WA)
WA EPA	Western Australian Environmental Protection Authority
WAFIC	Western Australian Fishing Industry Council
WHO	World Health Organisation
WSF	water-soluble fraction
WTBF	western tuna and billfish fishery
μg/L	micrograms per litre
μPa	micropascal

1 INTRODUCTION

1.1 Overview

INPEX Ichthys Pty Ltd, on behalf of the Ichthys Upstream Unincorporated Joint Venture Participants, is developing the Ichthys Field in the Browse Basin off the north-west coast of Western Australia to produce condensate offshore for export to markets in Japan and elsewhere, and export gas for further processing at the Ichthys liquefied natural gas (LNG) plant in Darwin (Figure 1-1).

INPEX is preparing to expand capacity with further development of the Ichthys Field, as approved under the Ichthys LNG Project Commonwealth approval decision EPBC 4208/2008.

Initial development wells were drilled and the Ichthys LNG offshore facilities were installed and commissioned from 2014 through to 2018. The assets commenced production in July 2018 and now routinely ship cargoes of condensate from the FPSO to international customers and send gas to the Darwin plant via the Gas Export Pipeline.

The existing facilities consist of a subsea production system (SPS) (e.g. xmas trees (XT), manifolds, subsea control systems and umbilicals, risers and flowlines (URF), and the gas export riser base (GERB), which connect the wells to the Central Processing Platform (CPF Explorer) and Floating Production Storage Offtake – FPSO Venturer).

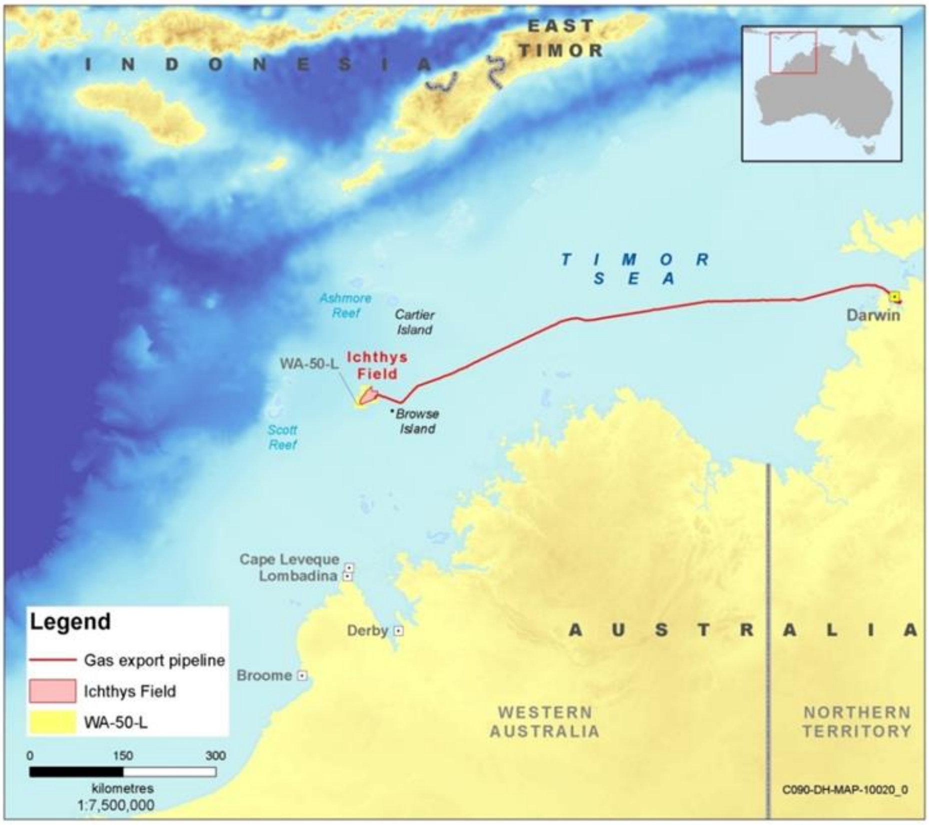

Figure 1-1: Location of the Ichthys LNG Project

The various scopes of work (or petroleum activities) occurring in WA-50-L under in force Environment Plans (EPs) or proposed future EPs are described in Table 1-1 which also details estimated schedules. The activities described in these other plans and potential future submissions, are out of the scope of this EP.

Table 1-1: INPEX Ichthys Project environment plans

Title	Activities	Indicative timing
Ichthys Project Offshore Facility (Operation) Environment Plan (X075-AH-PLN-100015) (Accepted)	Operation of the interlinked facility including: • CPF (*Ichthys Explorer*) which is used to separate the reservoir fluid received from the gathering systems into liquid and gaseous phases, and export gas onshore for further processing. • FPSO (*Ichthys Venturer*) which supports hydrocarbon processing systems and utilities by processing liquid hydrocarbons received from the CPF to produce a stabilised hydrocarbon condensate, which is then temporarily stored within the FPSO hull and, periodically, offloaded to tankers for export to market. • SPS infrastructure (e.g. XTs, manifolds, subsea control systems and umbilicals, risers and flowlines (URF), and the gas export riser base (GERB), which connect the wells to the CPF and FPSO).	Dec 2016 – Dec 2021
Ichthys Project Gas Export Pipeline (Operation) Environment Plan (F075-AH-PLN-10001) (Accepted)	• operation of the GEP from the GERB to the boundary of Commonwealth waters (NT) • IMR of GEP infrastructure during the Operations stage • deployment of a pipeline repair system during a repair scenario • post-repair discharges of residual hydrocarbon, air, nitrogen gas, filtered inhibited seawater (FIS) or monoethylene glycol (MEG) to the environment.	Jan 2017 – Jan 2022
Ichthys Development Drilling Campaign WA-50-L Environment Plan (D020-AD-PLN-10116) (Accepted)	• 20-well program using semisubmersible drilling rigs • installation of well infrastructure and xmas trees (XTs) • well clean-up and completions • support activities, including equipment transfers, refuelling, crew transfers, and transfer of waste and general supplies to and from logistics support vessels • Oil Pollution Emergency Plan (OPEP), including Operational and Scientific Monitoring Programs to address emergency response and monitoring arrangements in place for a loss of well containment (blowout scenario)	Nov 2015 – Nov 2020 *Note this plan will be replaced with a new development drilling EP that is currently under assessment.*

Title	Activities	Indicative timing
Ichthys Development Drilling Campaign WA-50-L Environment Plan (0000-AD-PLN- 60003) (Under assessment)	• continued drilling campaign (expected to be at least 12 – 15 development wells over the duration of the EP) using semisubmersible drilling rigs • installation of well infrastructure and xmas trees (XTs) • well clean-up and completions • inspection, maintenance and repair of proposed and existing wells in WA-50-L including well intervention and well work over activities • support activities, including equipment transfers, refuelling, crew transfers, and transfer of waste and general supplies to and from logistics support vessels • Oil Pollution Emergency Plan (OPEP), including Operational and Scientific Monitoring Programs to address emergency response and monitoring arrangements in place for a loss of well containment (blowout scenario)	Submitted for assessment in September 2019
Ichthys URF and SPS Installation Environment Plan (E075-AH-PLN-7000) (In preparation)	• Geophysical and geotechnical surveys • installation of an additional gathering system • installation of new infrastructure required to connect new production wells to the other existing gathering systems already operation • hydrotesting • pre-commissioning.	2021 – 2026 (In preparation)

1.2 Scope

INPEX is proposing to undertake pre-engineering survey activities in WA-50-L comprising of combined geotechnical and geophysical survey scopes associated with the Ichthys LNG Project. The survey activities will be undertaken between Q4 2019 and Q2 2020, noting that the exact timing for commencement and completion will be dependent upon approvals, vessel availability, operational efficiencies and weather conditions.

The scope of this EP does not include the movement of vessels or helicopters outside of the production licence area (e.g. travel to and from WA-50-L). These activities will be undertaken in accordance with other relevant maritime and aviation legislation; most notably, the *Navigation Act 2012* (Cwlth) and *Civil Aviation Act 1988* (Cwlth).

1.3 Objectives

The objectives of this EP are to:

- demonstrate that the environmental impacts and risks associated with the petroleum activity have been reduced to 'as low as reasonably practicable' (ALARP) and are of an acceptable level

- establish appropriate environmental performance outcomes, environmental performance standards and measurement criteria in relation to the operation of the facility
- define an appropriate implementation strategy and monitoring, recording and reporting arrangements, whereby compliance with this EP, the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations (OPGGS (E) Regulations), and other relevant legislative requirements, can be demonstrated
- demonstrate that INPEX has carried out the consultations required by the OPGGS (E) Regulations
- demonstrate that the measures adopted by INPEX, arising from the consultation process, are appropriate
- demonstrate that the petroleum activity complies with the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGS Act) and the OPGGS (E) Regulations.

1.4 Overview of activity description

Table 1-2 provides an overview of the survey activities to be undertaken under this EP.

Table 1-2: Overview of the activity description

Item	Description
Petroleum production licence area	WA-50-L
Basin	Browse
Gas field	Ichthys Field
Activity location	Wholly located within Commonwealth waters approximately 390 km north of Derby, Western Australia in the North West Marine Region (NWMR) of the Timor Sea.
Water depth	235–275 m at Lowest Astronomical Tide (LAT)
Vessel	Survey vessel
Activities	Geotechnical survey comprising of piston or vibro- coring /sampling, piezocone penetration tests (PCPTs) and box core sampling. Geophysical survey including multibeam echo sounder (MBES), side-scan sonar (SSS), sub-bottom profiling (SBP), and magnetometer.
Activity commencement	Q4 2019 – Q2 2020
Duration of the activity	7-10 days

1.5 Titleholder details

INPEX Ichthys Pty Ltd is a joint titleholder of production licence WA-50-L, but has been nominated as the single titleholder for the purposes of taking eligible voluntary actions under subsection 775B of the OPGGS Act, such as making submissions.

In accordance with Regulation 15(1) of the OPGGS (E) Regulations, details of the titleholder are described in Table 1-3. INPEX will be responsible for ensuring that activities covered in this EP are carried out in accordance with the OPGGS (E) Regulations, this EP and other applicable Australian legislation.

In accordance with Regulation 15(2) of the OPGGS (E) Regulations, details of the titleholder's nominated liaison person are provided in Table 1-4.

Table 1-3: Titleholder details

Name	INPEX Ichthys Pty Ltd (INPEX)
Business address	Level 22, 100 St Georges Tce, Perth, WA 6000
Telephone number	+61 8 6213 6000
Fax number	+61 8 6213 6455
Email address	enquiries@inpex.com.au
ABN	46 150 217 253

Table 1-4: Titleholder nominated liaison officer

Name	Jake Prout
Position	INPEX Offshore Environment Lead
Business address	Level 22, 100 St Georges Tce, Perth, WA 6000
Telephone number	+61 8 6213 6000
Email address	enquiries@inpex.com.au

1.5.1 Notification arrangements

In the event that the titleholder, nominated liaison person or contact details for the nominated liaison person change, INPEX will notify the regulator in accordance with Regulation 15(3) of the OPGGS (E) Regulations.

1.6 Financial assurance

Financial assurance for the titleholder's liabilities for cleaning up, remediating and monitoring the impact of a petroleum release has been calculated using the APPEA methodology for estimating levels of financial assurance (2018), based on the maximum credible loss scenario from a loss of well containment.

Declarations of financial assurance will be provided in relation to title WA-50-L prior to acceptance of the EP by NOPSEMA.

2 ENVIRONMENTAL MANAGEMENT FRAMEWORK

In accordance with Regulation 13(4) of the OPGGS (E) Regulations 2009, the requirements, including legislative requirements that apply to the activity and are relevant to environmental management, are described in this section with reference to demonstration of how those requirements will be met.

2.1 Corporate framework

The INPEX Australia health safety, environment and quality management system (HSEQ-MS) is part of the INPEX's Business Management System, an integrated framework of policies, standards and procedures that describe how business activities at INPEX are governed and managed.

The INPEX Environmental Policy sets the direction and minimum expectations for environmental performance, and is implemented through the standards and procedures of the HSEQ-MS. This system and policy are further described in Section 9 in accordance with Regulation 16(a) of the OPGGS (E) Regulations.

2.2 Legislative framework

In accordance with Regulation 13(4) of the OPGGS (E) Regulations, the legislative framework relevant to the petroleum activity is listed in Table 2-1. A summary of applicable industry standards and guidelines is also presented in Table 2-2. Ongoing management of legislative and other requirements is described further in in Section 9.8.1.

Table 2-1: Summary of applicable legislation

Legislation	Description	Requirements	Demonstration of how requirements are met in EP
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act; Cwlth) and Environment Protection and Biodiversity Conservation Regulations 2000 (EPBC Regulations)	Provides for the protection and management of nationally and internationally important flora, fauna, ecological communities, and heritage places.	The OPGGS (E) Regulations were revised in February 2014 to include the requirement that matters protected under Part 3 of the EPBC Act are considered and any impacts are at acceptable levels. Part 8 of the EPBC Regulations outlines requirements for vessel when interacting with cetaceans. In accordance with Regulation 9 of the OPGGS Regulations 2009, the activities described in this EP were approved by the Commonwealth Environment Minister under Part 9 of the EPBC Act (EPBC Approval Decision 2008/4208). The EPBC Act provides for protection of 'matters of national environmental significance' including not only listed species but also heritage properties and Ramsar wetlands. There are exemptions covering provisions of Part 3 and 13 of the EPBC Act, for the undertaking of activities when responding to maritime environmental emergencies, in accordance with the National Plan (NatPlan). Australian Marine Parks (AMPs) are proclaimed under this Act and associated management plans are enacted under this legislation.	Relevant approval conditions within approval decision EPBC 2008/4208 have been addressed in this EP and are summarised in Appendix A. Section 4.3 – Australian marine parks Section 7.5.2 Interaction with marine fauna. Section 8 – Emergency conditions. OPEP (Appendix D) A demonstration of how this EP addresses the relevant conservation management documents related to EPBC-listed species has been presented in Appendix B.
OPGGS Act and OPGGS (E) Regulations (Cwlth)	The OPGGS (E) Regulations under the OPGGS Act require a titleholder to have an accepted plan in place for a petroleum activity.	The OPGGS (E) Regulations require that the petroleum activity is undertaken in an ecologically sustainable manner, and in accordance with an accepted EP.	Throughout this EP. Implementation of the HSEQ-MS.

Legislation	Description	Requirements	Demonstration of how requirements are met in EP
Navigation Act 2012 (Cwlth)	The primary legislation that regulates ship and seafarer safety, shipboard aspects of protection of the marine environment, and employment conditions for Australian seafarers.	The *Navigation Act 2012* includes specific requirements for safe navigation, including systems, equipment and practices consistent with the International Convention for the Safety of Life at Sea (SOLAS) and the International Regulations for Preventing Collisions at Sea (COLREGS), as implemented as maritime law in Australia through a series of Marine Orders, including Marine Orders – Part 21 – Safety of navigation and emergency procedures and Marine Orders – Part 30 – Prevention of collisions. The *Navigation Act 2012*, in conjunction with the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* and through legislative Marine Orders, also requires vessels to have pollution prevention certificates (see below).	Section 7.7.1 – Physical presence – disruption to other marine users Section 8.2 - Vessel collision Implementation of the HSEQ-MS.
Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (POTS Act; Cwlth)	The POTS Act provides for the prevention of pollution from vessels, including pollution by oil, noxious liquid substances, packaged harmful substances, sewage, garbage, and air pollution. In conjunction with Chapter 4 of the *Navigation Act 2012*, the POTS Act gives effect to relevant requirements of the International Convention for the Prevention of Pollution from Ships, 1973/1978 (MARPOL 73/78) in Australia.	The requirements of the POTS Act and the *Navigation Act 2012* are implemented as maritime law in Australia through a series of Marine Orders and legislative instruments, made and administered by the Australian Maritime Safety Authority (AMSA). The requirements of each Marine Order made under the POTS Act and the *Navigation Act 2012* and their relevance to the activity are outlined separately below.	Section 7 and Section 8 Implementation of the HSEQ-MS.

Legislation	Description	Requirements	Demonstration of how requirements are met in EP
Marine Orders Part 91 – Marine pollution prevention — oil	Marine Orders Part 91 implements Part II of the POTS Act, Chapter 4 of the Navigation Act 2012, and Annex I of MARPOL 73/78 (oil pollution). The Marine Orders provide standards for the discharge of certain oily mixtures or oily residues and associated equipment and include duties to manage bunkering and transfers of oil between vessels; to maintain Oil Record Books and Shipboard Oil Pollution Emergency Plans (SOPEPs); and to report oil pollution.	Vessels ≥400 gross tonnes (GT) are required to maintain: • International Oil Pollution Prevention (IOPP) certificates to demonstrate that the vessel or facility and onboard equipment comply with the requirements of Annex I of MARPOL 73/78 (as applicable to vessel size, type and class). • Oil Record Books to record activities, such as fuel/oil bunkering and discharges of oil, oily water, mixtures and residues. • SOPEPs outlining the procedures to be followed during an oil pollution incident. • Discharges must also comply with Annex I of MARPOL 73/78, and oil pollution incidents must also be reported to AMSA.	Section 7.1.3 – Routine discharges Section 7.4.1 – Accidental release Section 8 - Emergency Conditions - Impact and Risk Evaluation OPEP (Appendix D) Implementation of the HSEQ-MS.
Marine Orders Part 94 – Marine pollution prevention — packaged harmful substances	Marine Orders Part 94, – Marine pollution prevention — packaged harmful substances, and the POTS Act relating to packaged harmful substances as defined by Annex III of MARPOL 73/78.	Vessel contractor will comply with the *Navigation Act 2012* – Marine Orders – Part 94: Marine Pollution Prevention– Packaged Harmful Substances (as appropriate to vessel class), through reporting the loss or discharge to sea of any harmful materials.	Section 7.2 – Waste management
Marine Orders Part 95 – Marine pollution prevention — garbage	Marine Orders Part 95 – Marine pollution prevention — garbage implements Part IIIC of the POTS Act, Chapter 4 of the Navigation Act 2012, and Annex V of MARPOL 73/78 (garbage).	Vessels ≥100 GT, or vessels certified to carry 15 persons or more, are required to maintain a Garbage Management Plan. Vessels ≥400 GT are required to maintain a Garbage Record Book. The requirements will apply to vessels (as appropriate to their size, type and class) at all times.	Section 7.2 – Waste Management. Implementation of the HSEQ-MS.

Legislation	Description	Requirements	Demonstration of how requirements are met in EP
	The Marine Orders provide for the discharge of certain types of garbage at sea, waste storage, waste incineration, and the comminution and discharge of food waste. They also set out requirements for garbage management and recording.		
Marine Orders Part 96 – Marine pollution prevention — sewage	Marine Orders Part 96 – Marine pollution prevention — sewage implements Part IIIB of the POTS Act, Chapter 4 of the Navigation Act 2012, and Annex IV of MARPOL 73/78 (sewage). The Marine Orders include requirements for the treatment, storage and discharge of sewage and associated sewage systems, and for an International Sewage Pollution Prevention (ISPP) certificate to be maintained on board.	Vessels ≥400 GT are required to maintain International Sewage Pollution Prevention (ISPP) certificates to demonstrate that vessels and their onboard sewage systems comply with the requirements of Annex IV of MARPOL 73/78. Discharges of sewage must also comply with Annex I of MARPOL 73/78, and oil pollution incidents must also be reported to AMSA.	Section 7.1.3 – Routine discharges Implementation of the HSEQ-MS.
Marine Orders Part 97 – Marine pollution prevention — air pollution	Marine Orders Part 97 – Marine pollution prevention — air pollution implements Part IIID of the POTS Act, Chapter 4 of the Navigation Act 2012, and Annex VI of MARPOL 73/78 (air pollution).	Vessels ≥400 GT are required to have International Air Pollution Prevention (IAPP) certificates and Engine International Air Pollution Prevention (EIAPP) certificates to demonstrate that the vessel or facility and onboard marine diesel engines comply with the requirements of Annex VI of MARPOL 73/78. Low-sulphur fuel oil / marine diesel with 0.5% mass-for-mass (m/m) sulphur content is required to be used in engines after 31 December 2019.	Section 7.1.2 – Atmospheric emissions. Implementation of the HSEQ-MS.

Legislation	**Description**	**Requirements**	**Demonstration of how requirements are met in EP**
	The Marine Orders set requirements for marine diesel engines and associated emissions, waste incineration on board vessels, engine fuel quality, and equipment and systems containing ozone-depleting substances (ODS).	Vessels ≥400 GT are required to have an International Maritime Organization (IMO)-approved waste incinerator, as confirmed by the IAPP certificate. The marine orders required vessels ≥400 GT with rechargeable systems containing ODS to maintain an ODS Record Book.	
Biosecurity Act 2015 (Cwlth)	The Act and its supporting legislation are the primary legislative means for managing risk of pests and diseases entering into Australian territory and causing harm to animal, plant and human health, the environment and/or the economy.	Of specific relevance to this EP, the Act requires that ballast is managed within Australian seas; as such the *Biosecurity Act* now defines Australian seas as: • for domestic and international vessels whose Flag State Administration is party to the BWM Convention – the waters (including the internal waters of Australia) that are within the outer limits of the exclusive economic zone (EEZ) of Australia (all waters within 200 nm) or • for all other international vessels – the Australian territorial seas (all waters within 12 nm).	Section 7.5.1 - Invasive marine species Implementation of the HSEQ-MS.
Biodiversity Conservation Act 2018 (WA) *Animal Welfare Act 2002* (WA)	Ensures the protection of biodiversity and humane treatment of native fauna. Ensures appropriate treatment and management of wildlife in the event of a potential hydrocarbon spill and response activities.	Consult with WA Department of Biodiversity, Conservation and Attractions (DBCA) and obtain relevant permit(s) before a wildlife hazing and post-contact wildlife response.	Section 8 – Emergency conditions OPEP (Appendix D)

Legislation	Description	Requirements	Demonstration of how requirements are met in EP
Fish Resources Management Act 1994 (WA)* * The *Aquatic Management Resources Act 2016* (ARMA) will supersede this Act as the primary legislation used to manage fishing, aquaculture, pearling and aquatic resources in WA. This EP will be updated to reflect this once the ARMA comes into effect, expected to occur in 2019.	The *Fish Resources Management Act* is administered by the WA Department of Primary Industry and Regional Development (WA DPIRD) that has powers to deal with incursions of marine pests.	INPEX will manage its operations in accordance with the Act and the associated Fish Resources Management Regulations (1995) with respect to managing potential invasive marine species (IMS) risks.	Section 7.5.1 - Invasive marine species Implementation of the HSEQ-MS.

Table 2-2: Summary of applicable industry standards and guidelines

Guideline	Description
Australian and New Zealand guidelines for fresh and marine water quality (ANZECC/ARMCANZ 2000)	These guidelines provide a framework for water resource management and state specific water quality guidelines for environmental values, and the context within which they should be applied.
International Convention for the Prevention of Pollution from Ships, 1973/1978 (MARPOL 73/78)	This convention is designed to reduce pollution of the seas, including dumping, oil and exhaust pollution. MARPOL 73/78 currently includes six technical annexes. Special areas with strict controls on operational discharges are included in most annexes.
International Convention on the Control of Harmful Anti-fouling Systems	This convention prohibits the use of harmful organotins in anti-fouling paints used on ships and establishes a mechanism to prevent the potential future use of other harmful substances in anti-fouling systems.
International Convention for the Safety of Life at Sea (SOLAS) 1974	In the event of an offshore emergency event that endangers the life of personnel, the International Convention for the Safety of Life at Sea (SOLAS) 1974 may take precedence over environmental management.
Bonn Agreement for Cooperation in Dealing with Pollution of the North Sea by Oil and other harmful substances (Bonn Agreement)	The Bonn Agreement is the mechanism by which the North Sea states, and the European Union (the Contracting Parties), work together to help each other in combating pollution in the North Sea area from maritime disasters and chronic pollution from ships and offshore installations; and to carry out surveillance as an aid to detecting and combating pollution at sea. The Bonn Agreement Oil Appearance Code may be used during spill response activities.
The Australian Petroleum Production and Exploration Association (APPEA) *Code of Environmental Practice* (APPEA 2008)	Recognising the need to avoid or minimise and manage impacts to the environment, this code of environmental practice includes four basic recommendations to APPEA members undertaking activities: • Assess the risks to, and impacts on, the environment as an integral part of the planning process. • Reduce the impact of operations on the environment, public health and safety to as low as reasonably practicable (ALARP) and to an acceptable level by using the best available technology and management practices. • Consult with stakeholders regarding industry activities. • Develop and maintain a corporate culture of environmental awareness and commitment that supports the necessary management practices and technology, and their continuous improvement.
Australian Ballast Water Requirements, Version 7 (DAWR 2017)	Australian Ballast Water Management Requirements outline the mandatory ballast water management requirements to reduce the risk of introducing harmful aquatic organisms into Australia’s marine environment through ballast water from international vessels. These requirements are enforceable under the *Biosecurity Act 2015*.

Guideline	Description
National Biofouling Management Guidelines for the Petroleum Production and Exploration Industry (Marine Pest Sectoral Committee 2018)	A voluntary biofouling management guidance document developed under the National System for the Prevention and management of Marine Pest Incursions. Its purpose is to provide tools to operators to minimise the amount of biofouling accumulating on their vessels, infrastructure and submersible equipment and thereby to minimise the risk of spreading marine pests.
International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention) (IMO 2009)	All vessels are required to manage their ballast water and sediments in accordance with the Convention and *Biosecurity Act 2015*. The convention came into force on 8 September 2017 and Australia's ballast water policy and legislation align with the convention.
Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species (IMO 2012)	The guidelines provide a globally consistent approach to the management of biofouling. They aim to reduce the risk of translocation of marine pests from biofouling present on immersed areas of vessels. It was adopted by IMO marine environment committee in the form of Resolution MEPC.207 (62) in 2011.

3 ACTIVITY DESCRIPTION

3.1 Location, timing and schedule

Production licence, WA-50-L, is located within the Browse Basin in Commonwealth waters within Western Australia (Figure 3-1). It is approximately 230 km north-west of the Kimberley coastline, at its closest point. Water depths in the licence area range between 235 m and 275 m at lowest astronomical tide (LAT). The closest major town is Derby, located approximately 390 km south of the southern boundary of the licence area.

INPEX is preparing to expand capacity with further development of the Ichthys Field. As part of this next stage of the Ichthys LNG Project, geotechnical and geophysical data is required to confirm pre-engineering studies associated with the detailed design and installation of additional flowlines, umbilicals and subsea infrastructure in WA-50-L.

The proposed geotechnical and geophysical survey activities will be undertaken in WA-50-L over a period of 7-10 days (24 hours per day), at some point between Q4 2019 and Q2 2020, noting that the exact timing for commencement and completion will be dependent upon approvals, vessel availability, operational efficiencies and weather conditions.

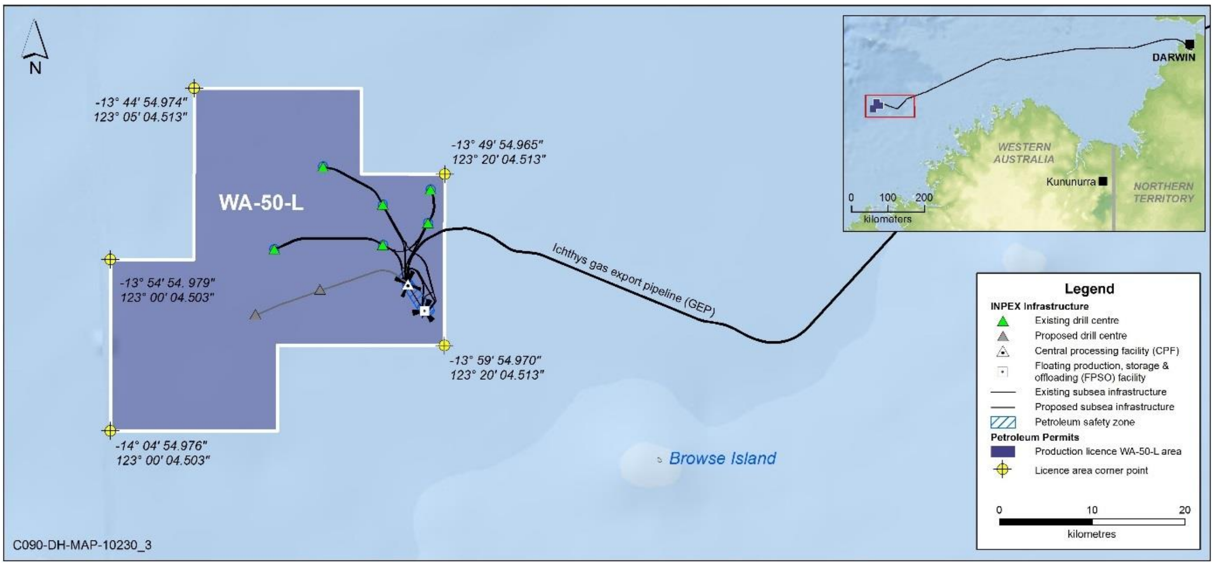

Figure 3-1: Location and coordinates of WA-50-L

3.2 Overview

The activities to be undertaken under this EP include the following:

- geotechnical survey scope comprising of:
    - piston or vibro-coring/sampling
    - piezocone penetration tests (PCPTs)
    - box core sampling
- geophysical survey scope comprising of:
    - multibeam echo sounder (MBES)
    - side scan sonar (SSS)
    - sub-bottom profiling (SBP)

  - magnetometer
- Ultra-Short Baseline Positioning (USBL):
  - USBL positioning system
  - mini transponders attached to geotechnical and geophysical equipment.

3.3 Geotechnical survey scope

The objective of the geotechnical survey scope is to provide relevant geotechnical data to enable the derivation of representative design values for the seabed properties to support the pre-engineering and detailed design of the flowlines, umbilical and subsea structures associated with the Ichthys Field development. The expected duration of the geotechnical component of the survey is approximately 5 days excluding transit time.

3.3.1 Piston coring/sampling

Piston core (or alternatively vibrocorer) sampling will occur at up to two locations within WA-50-L to characterise seabed properties. The system will use either a piston gravity coring technique or a vibrating corer technique targeting a depth of 6 m (refer to Figure 3-2). The coring/sampling system shall be deployed from the survey vessel typically using a winch or crane and shall be placed on the seabed.

Upon collection of the core, the sample and the equipment will be retrieved back to the vessel and nothing left on the seabed.

Figure 3-2: Piston corer and cradle

3.3.2 Piezocone penetration tests

The PCPT system, weighing approximately 7 tonnes, will be lowered to the seabed at approximately 35 locations within WA-50-L to assess the in-situ strength of the seabed soils (refer to Figure 3-3). The PCPTs will target depths between 15 – 20 m. The PCPT system consists of a seabed frame with an integrated wheel drive unit. The drive unit uses two silent hydraulic powered wheels which are pushed against a round small diameter solid rod (string) using hydraulic cylinders. The rod, equipped with a cone or probe, is pushed into the soil by the rotating wheels at a controlled rate to record the seabed properties. Electric power, data and real-time communication are transmitted via an underwater power cable connected to the vessel.

Upon completion of each PCPT, the system is retrieved back to the vessel, leaving nothing on the seabed and then prepared for deployment at the next location.

Figure 3-3: PCPT system

3.3.3 Box core sampling

Sampling of seabed sediments will enable the validation and ground-truthing of geophysical survey data. Samples will be collected from 15 locations within WA-50-L, with each sample disturbing approximately up to 1 m^2. The box core sampling equipment (refer to Figure 3-4) will be deployed using either a crane or winch on board the survey vessel. Once the sample has been collected it will be brought back to the vessel where it is logged and stored for further analysis. Nothing will be left on the seabed at the sampling locations.

Figure 3-4: Box core sampling equipment

3.4 Geophysical survey scope

The primary objective of the geophysical survey scope is to determine the suitability of the proposed flowline and umbilical route between the existing Ichthys subsea infrastructure and the proposed drill centres (BDC 2 and BDC 3) as part of the Ichthys gathering system 4. The survey will gather bathymetry and morphology data (using MBES and SSS), obtain vertical profiles of the shallow sediments (SBP), check for the presence of metal objects on the seafloor (magnetometer) and generally confirm the sediment quality and presence of any debris or obstructions along the proposed flowline/umbilical corridor. The survey will also include the physical identification of existing flowlines/cables to be crossed for consideration during the detailed engineering and design stage. The survey will consist of four lines along the length of the proposed flowline and umbilical routes/corridor (each line approximately 18 km in length). The survey also includes approximately 20 smaller lines each less than 1 km in length around the flowline crossings and for infill and wing lines.

The expected duration of the geophysical component of the survey is approximately 2 days excluding transit time, and the geophysical equipment will either be hull mounted or towed on a cable behind the vessel (towfish) at a distance of approximately 500 m and at a depth of approximately 15 m above the seabed.

3.4.1 Multibeam echo sounder

MBES surveys will enable the collection of bathymetry data and the correlation of depth information. This type of survey uses a sonar system to transmit short pulses of sound energy, analysing the return signal from the seafloor or other objects.

A MBES transmits at frequencies between 200 kHz and 400 kHz with pulse lengths from 10 to 500 µs. Indicative sound output at source is equipment dependent and may range from 163 to 190 dB re 1 µPa@1m.

3.4.2 Side-scan sonar

Use of SSS methods will enable the identification of seabed obstructions or features. This type of survey is a hydro-acoustic technique, comprising a set of transducers mounted on either side of a towed vehicle. The transducers produce high frequency pulses (either 120 kHz or 410 kHz) which reflect seabed features. Indicative sound output at source may range from 137 to 200 dB re 1 µPa@1m.

3.4.3 Sub-bottom profiling

The aim of SBP is to obtain data on the physical properties of the sea floor and to image and characterize the geological formations below the sea floor. A number of acoustic SBP systems may be used during the geophysical survey.

Typically towed behind the survey vessel, these SBP acoustic systems are low frequency (0.5-40 kHz) with indicative sound outputs at source ranging from 142 to 214 dB re 1 µPa@1m.

3.4.4 Magnetometer

To check for the presence of any metal objects on the seabed a magnetometer will be attached to the towfish. The magnetometer measures the earth's magnetic field and does not emit any sound pulses, therefore not presenting an environmental hazard or threat.

3.5 Ultra-Short Baseline Positioning

The USBL transceiver head is mounted on a pole and either deployed through the moonpool or lowered through a tube in the hull depending on the survey vessel used. The system emits a pulse (200 dB re 1 µPa@1m) which in turn is received by a mini transponder beacon which will be attached to the underwater device being positioned, which then transmits its own signal (185-190 dB re 1 µPa@1m) back to the transceiver head.

The mini transponders will be attached to the coring equipment, PCPT and towfish to provide accurate positioning.

3.6 Survey vessel

The specific vessel to undertake both the geotechnical and geophysical survey has not yet been confirmed. However, it is expected to be approximately 50 – 70 m in length, with an approximate complement of 40 personnel onboard.

The vessel will be powered by marine diesel, with a largest single fuel tank containing no more than 250 m^3. No bunkering or vessel to vessel transfer will occur during the activity.

The vessel will be dynamically positioned, and no anchoring will take place in WA-50-L unless in the event of an emergency. Vessel speeds during the survey will typically be very low, travelling at approximately 4 knots during geophysical data acquisition and maintaining position using DP during geotechnical sampling.

The vessel may be mobilised either from international waters or domestically from within Australia and will comply with the relevant maritime safety requirements and marine order requirements as appropriate for the vessel.

3.7 Summary of emissions, discharges and wastes

A summary of the emissions, discharges, and wastes resulting from the activity are described in Table 3-1.

Table 3-1: Emissions (E), discharges (D) and wastes (W) generated during the activity

Activity/system	E, D, W	Description	
Power generation	E	Vessel	Combustion emissions from vessel and diesel-powered generators onboard emitted to the atmosphere.
	E	Vessel	Acoustic emissions from vessel engines and propulsion systems (such as DP thrusters).
Cooling water	D	Vessel	Seawater used as heat-exchange medium for machinery engines. Return seawater containing residual heat and potentially residual sodium hypochlorite is returned to sea.
Vessel deck drainage	D	Vessel	Vessel deck drainage water will be discharged to sea.
Bilge system	D	Vessel	Treated contaminated bilge water with <15 ppm (v) OIW is discharged to sea.

Activity/system	E, D, W	Description	
Sewage, grey water and macerated food waste effluent	D	Vessel	Treated effluent produced by sewage treatment plants is discharged to sea.
Ballast system	D	Vessel	Return ballast is discharged to sea.
Desalination brine	D	Vessel	Brine produced from the Reverse Osmosis (RO) process will be diluted and discharged to sea.
Geophysical survey	E	Vessel	Acoustic emissions from survey vessel engines.
	E	Survey equipment	Acoustic emissions from MBES, SSS, SBP, and USBL.
Miscellaneous	E	Vessel	Light emissions from deck and navigation lights on the survey vessel.
	W		Solid and liquid wastes from general maintenance operations, equipment replacement, etc., and domestic wastes are transported to shore for disposal.

4 EXISTING ENVIRONMENT

4.1 Regional setting

Production licence area, WA-50-L is situated in the northern Browse Basin, approximately 390 km north of Derby, Western Australia. In the event of a worst-case unplanned oil spill, the environment that may be affected (EMBA) covers a considerably larger area than the licence area where planned activities will occur.

The spatial extent of the EMBA was determined using stochastic spill modelling. This considered the worst-case credible hydrocarbon scenarios identified for the activity (refer Table 7-9) in context of defined hydrocarbon exposure thresholds used to determine impacts to fauna and/or habitats (refer Table 8-1) for surface hydrocarbons, entrained oil and dissolved aromatic hydrocarbons.

The resulting EMBA is the sum of 300 overlaid modelling runs (100 per season) for worst-case spill scenarios, during all seasons (wet, transitional and dry) and under different hydrodynamic conditions (e.g. currents, winds, tides, etc.). As such, the actual area that may be affected from any single spill event would be considerably smaller than represented by the EMBA.

The EMBA has been used to identify relevant values and sensitivities that may be affected and has been used as the basis for the EPBC Act Protected Matters search (Appendix B).

4.1.1 Commonwealth waters

Australia's offshore waters have been divided into six marine regions in order to facilitate their management by the Australian Government under the EPBC Act. The production licence area and EMBA are located entirely within the North-west Marine Region (NWMR). The relevant key features of the NWMR in the context of WA-50-L and worst-case EMBA are further described in subsequent sections of this EP.

North-west Marine Region

The NWMR comprises Commonwealth waters, from the WA–NT border in the north, to Kalbarri in the south. The NWMR encompasses a number of regionally important marine communities and habitats which support a high biodiversity of marine life and feeding and breeding aggregations (DSEWPaC 2012).

4.2 Key ecological features

The Australian Government has identified parts of the marine ecosystem that are of importance for a marine region's biodiversity or ecosystem function and integrity, referred to as key ecological features (KEFs). The north western corner of WA-50-L overlaps one KEF, and a further three are located within the EMBA* (Figure 4-2) as follows:

WA-50-L:

- Continental slope demersal fish communities.

EMBA:

- Ancient coastline at 125 m depth contour
- Seringapatam Reef and Commonwealth waters in the Scott Reef complex
- Ashmore Reef and Cartier Island and surrounding Commonwealth waters (* although this KEF lies slightly outside the EMBA, based on its close proximity

(< 5 km) and given the scale of oceanic processes it has been included in this description of the existing environment).

4.2.1 Continental slope demersal fish communities

The north-western corner of WA-50-L overlaps a small portion of the continental slope demersal fish community KEF. The level of endemism of demersal fish species in this community is the highest among Australian continental slope environments.

The demersal fish species occupy two distinct demersal community types associated with the upper slope (water depth of 225–500 m) and the mid-slope (750–1,000 m) (DEE 2019a). Although poorly studied, it is suggested that the demersal-slope communities rely on bacteria and detritus-based systems comprised of infauna and epifauna, which in turn become prey for a range of teleost fish, molluscs and crustaceans (Brewer et al. 2007). Higher-order consumers may include carnivorous fish, deepwater sharks, large squid and toothed whales (Brewer et al. 2007). Pelagic production is phytoplankton based, with hot spots around oceanic reefs and islands (Brewer et al. 2007).

Bacteria and fauna present on the continental slope are the basis of the food web for demersal fish and higher-order consumers in this system. Therefore, loss of benthic habitat along the continental slope at depths known to support demersal fish communities could lead to a decline in species richness, diversity and endemism associated with this feature (DSEWPaC 2012). Other potential concerns with regard to pressure on this KEF include climate change (increasing sea temperature/ocean acidification), habitat modification due to fishing gear and commercial fishing by-catch resulting in the potential to diminish the species richness and diversity of these communities (DEE 2019a).

4.2.2 Ancient coastline at 125 m depth contour

The ancient coastline at 125 m depth contour KEF runs diagonally in a north-easterly direction, approximately 20 km south of WA-50-L, at its closest point. Parts of the ancient coastline, particularly where it exists as a rocky escarpment, are thought to provide biologically important habitats in areas otherwise dominated by soft sediments. The topographic complexity of the escarpments may facilitate vertical mixing of the water column, providing relatively nutrient-rich local environments. The ancient coastline is an area of enhanced productivity, attracting baitfish which, in turn, supplies food for migrating species (DSEWPaC 2012).

While there is little information available on the fauna associated with the hard substrate of the escarpment, it is likely to include sponges, corals, crinoids, molluscs, echinoderms and other benthic invertebrates representative of hard substrate fauna in the NWMR (DSEWPaC 2012).

4.2.3 Ashmore Reef and Cartier Island and surrounding Commonwealth waters

The Ashmore Reef and Cartier Island and surrounding Commonwealth waters KEF is located approximately 132 km north of WA-50-L, at its closest point. The KEF is recognised for its ecological functioning and integrity (high productivity), and biodiversity (aggregations of marine life) values, which apply to both the benthic and pelagic habitats within the feature.

Ashmore Reef is the largest of only three emergent oceanic reefs in the north-eastern Indian Ocean and is the only oceanic reef in the region with vegetated islands. The waters surrounding Ashmore Reef and Cartier Island are important because they are areas of enhanced productivity in relatively unproductive waters (DSEWPaC 2012).

Ashmore Reef is an atoll-like structure with low, vegetated islands, sand banks, lagoon areas, and surrounding reef. It is the largest of only three emergent oceanic reefs present in the north-eastern Indian Ocean and is the only oceanic reef in the region with vegetated islands. The reef exhibits a higher diversity of marine habitats compared with other North West Shelf (NWS) reefs, and supports an exceptionally diverse fauna, particularly for corals and molluscs (Director of National Parks 2018).

The reef and its surrounding Commonwealth waters are regionally important for feeding and breeding aggregations of birds. It has major significance as a staging point for wading birds migrating between Australia and the northern hemisphere, including 43 species listed on one or both of the China–Australia Migratory Bird Agreement (CAMBA) and the Japan–Australia Migratory Bird Agreement (JAMBA).

Ashmore Reef supports some of the most important seabird rookeries on the NWS, including colonies of bridled terns, common noddies, brown boobies, eastern reef egrets, frigatebirds, tropicbirds, red-footed boobies, roseate terns, crested terns and lesser crested terns. It provides important staging points/feeding areas for many migratory seabirds (Parks Australia 2019b; Director of National Parks 2018).

Cartier Island is an unvegetated sandy cay surrounded by a reef platform. The island and its surrounding waters support prolific seabird rookeries, many species of which are migratory and have their main breeding sites on the small isolated islands.

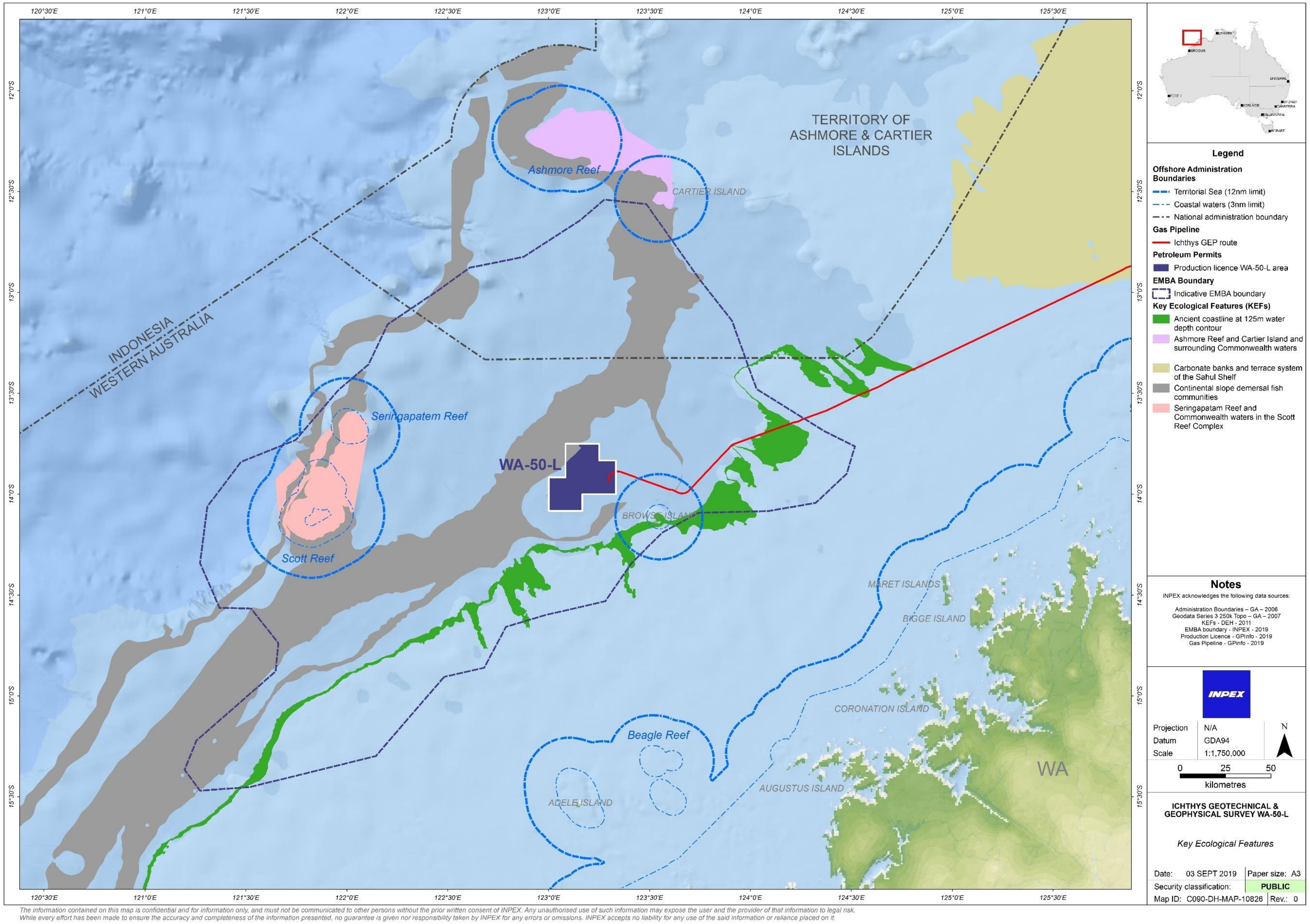

Figure 4-1: Key ecological features in north-west Australia (showing EMBA)

4.2.4 Seringapatam Reef and Commonwealth waters in the Scott Reef Complex

The Seringapatam Reef and Commonwealth waters in the Scott Reef Complex KEF is located approximately 101 km west of WA-50-L, at its closest point. This KEF comprises Seringapatam Reef, Scott Reef North and Scott Reef South. Scott and Seringapatam reefs are part of a series of submerged reef platforms that rise steeply from the seafloor. The total area of this KEF is approximately 2,400 km^2 (DSEWPaC 2012).

Seringapatam Reef is a small circular-shaped reef, the narrow rim of which encloses a relatively deep lagoon. Much of the reef becomes exposed at low tide. There are large boulders around its edges, with a few sandbanks, which rise about 1.8 m above the water, on the west side. The reef covers an area of 55 km^2 (including the central lagoon). Scott Reef North is a large circular-shaped reef composed of a narrow crest, backed by broad reef flats, and a deep central lagoon that is connected to the open sea by two channels. The reef and its lagoon cover an area of 106 km^2. Scott Reef South is a large crescent-shaped formation with a double reef crest. The reef and its lagoon cover an area of 144 km^2.

Scott and Seringapatam reefs are regionally significant because of their high representation of species not found in coastal waters off WA, and for the unusual nature of their fauna which has affinities with the oceanic reef habitats of the Indo-West Pacific, as well as the reefs of the Indonesian region.

The coral communities at Scott and Seringapatam reefs play a key role in maintaining the species richness and subsequent aggregations of marine life identified as conservation values for this KEF. Scott Reef is a particularly biologically diverse system and includes more than 300 species of reef-building corals, approximately 400 mollusc species, 118 crustacean species, 117 echinoderm species, and around 720 fish species (Woodside 2009).

Scott and Seringapatam reefs, and the waters surrounding them, attract aggregations of marine life, including humpback whales and other cetacean species, whale sharks and sea snakes (Donovan et al. 2008; Jenner et al. 2008; Woodside 2009). Two species of marine turtle, the green and hawksbill, nest during the summer months on Sandy Islet (a small sand cay), located on Scott Reef South. These species also internest and forage in the surrounding waters (Guinea 2006). The reef also provides foraging areas for seabird species, such as the lesser frigatebird, wedge-tailed shearwater, brown booby and roseate tern (Donovan et al. 2008).

4.3 Australian marine parks

Australian Marine Parks (AMPs) have been established around Australia as part of the National Representative System of Marine Protected Areas (NRSMPA). The primary goal of the NRSMPA is to establish and effectively manage a comprehensive, adequate and representative system of marine reserves to contribute to the long-term conservation of marine ecosystems and protect marine biodiversity.

AMPs under the EPBC Act, and any zones within them, must be assigned to an IUCN Category (Environment Australia 2002). The IUCN categories that are present within the AMPs intersected by the EMBA, as shown in Table 4-1, include:

- IUCN Category Ia – Strict nature reserve – Protected area managed mainly for science.
- IUCN Category II – National Park – Protected area managed mainly for ecosystem conservation and recreation.
- IUCN Category IV – Habitat/species management area – Protected area managed mainly for conservation through management intervention.

- IUCN Category VI – Managed resources protected areas – Protected area managed mainly for the sustainable use of natural ecosystems. Area containing predominantly unmodified natural systems, managed to ensure long term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.

The Director of National Parks may make, amend and revoke prohibitions, restrictions and determinations under regulations 12.23, 12.23A, 12.26, 12.56 and 12.58 of the EPBC Regulations where it is considered necessary to:

- protect and conserve biodiversity and other natural, cultural and heritage values; or
- to ensure human safety or visitor amenity; or
- where it is otherwise necessary to give effect to the management plan.

At commencement of the North-west Marine Parks Network Management Plan (Director of National Parks 2018) prohibitions made under regulation 12.23 of the EPBC Regulations are in place prohibiting entry to Cartier Island Marine Park due to the presence of unexploded ordnance. This has been in place for many years.

All visitors to Cartier Island require approval from the Commonwealth Department of the Environment and Energy (DEE). Undertaking other activities in these AMPs may also require approval from the Director of National Parks under Part 13 of the EPBC Act.

The Commonwealth Director of National Parks (DNP) has issued a general approval under Section 359B of the EPBC Act allowing a range of activities to occur within these AMPs. The activities approved including ‘mining operations’ which, as defined under the EPBC Act, also includes all petroleum activities, including associated emergency response activities. No other approvals relating to this activity are required from the DNP.

Actions to respond to oil pollution incidents (including environmental monitoring and remediation) in AMPs, can be undertaken without an authorisation issued by the DNP, provided that the actions are undertaken in accordance with an EP that has been accepted by NOPSEMA. However, the DNP is to be notified of the pollution event or proposed spill response actions within AMPs prior to the activity being undertaken where practicable. WA-50-L does not overlap any AMPs (Figure 4-2). The AMPs that overlap the EMBA and their IUCN categories are outlined in Table 4-1 with a further description provided in subsequent sections.

Table 4-1: AMP and IUCN categories

AMP	Sanctuary Zone (IUCN Ia)	(Marine) National Park Zone (IUCN II)	Habitat Protection Zone (IUCN IV)	Recreational Zone (IUCN IV)	Multiple Use Zone (IUCN VI)	Special Purpose Zone (IUCN VI)	Special Purpose Zone (Trawl) (IUCN VI)
Cartier Island	X						
Kimberley		X	X		X		

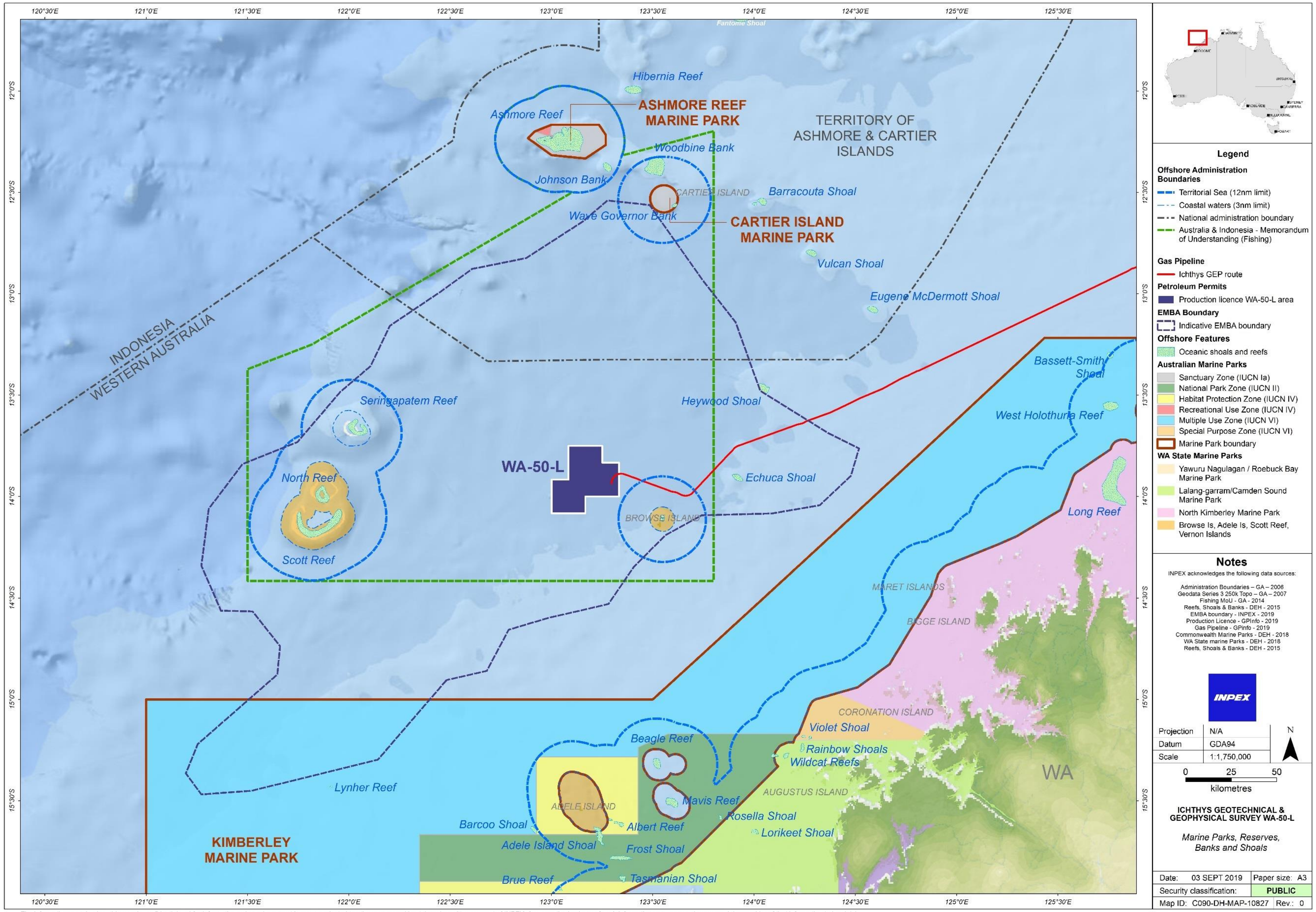

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Figure 4-2: Australian and state marine parks, reserves, banks and shoals

4.3.1 Cartier Island Marine Park

Cartier Island Marine Park is located in the NWMR approximately 132 km north of WA-50-L and covers an area of 172 km^2 (Parks Australia 2019a), although it does not overlap the EMBA it lies adjacent to it and therefore has been included in this description of the environment. The reserve includes Cartier Island and the area within a 4-nautical-mile-radius of the centre of the island, to a depth of 1 km below the seafloor. It is an IUCN Category Ia Sanctuary Zone with water depths from less than 15 m to 500 m (Director of National Parks 2018).

Cartier Island is an unvegetated sandy cay surrounded by a reef platform. The island and its surrounding waters support prolific seabird rookeries, many species of which are migratory and have their main breeding sites on the small isolated islands. Seabirds at Cartier Island include colonies of bridled terns, common noddies, brown boobies, eastern reef egrets, frigatebirds, tropicbirds, red-footed boobies, roseate terns, crested terns and lesser crested terns (Parks Australia 2019a). Cartier Island is an important staging point/feeding area for many migratory seabirds. The island also supports significant populations of feeding and nesting marine turtles and a high abundance and diversity of sea snakes (DSEWPaC 2012).

Cartier Island is part of the Ashmore Reef and Cartier Island and surrounding Commonwealth waters KEF (Section 4.2.3).

4.3.2 Kimberley Marine Park

The Kimberley Marine Park is located approximately 99 km to the south and east of WA-50-L and occupies an area of approximately 74,500 km^2 (Parks Australia 2019b). Only the southern-most extent of the EMBA overlaps the boundary of the AMP.

This AMP provides an important migration pathway and nursery areas for the protected humpback whale, and foraging areas for migratory seabirds, migratory dugongs, dolphins and threatened and migratory marine turtles (Director of National Parks 2018). It is adjacent to important foraging and pupping areas for sawfish and important nesting sites for green turtles (Parks Australia 2019b).

4.4 State reserves and marine parks

There are no State marine parks/reserves located within WA-50-L.

The EPBC Act Protected Matters search (Appendix B) identified two State reserves within the EMBA as listed below, all found within WA. Unnamed locations were identified using the Collaborative Australian Protected Areas Database (CAPAD 2016).

- Browse Island (WA)
- Unnamed WA41775 (WA) identified as Browse Island.

Browse Island Nature Reserve, the only State reserve within the EMBA is described below (Figure 4-2).

The EPBC Act Protected Matters search report (Appendix B) did not identify the Scott Reef Nature Reserve; however, as it falls within the EMBA it has been described in the following section. Should any new State marine park/reserve management plans come into effect, the impacts of these changes will be assessed in accordance with Section 9.8.1 and Section 9.7 of this EP.

4.4.1 Browse Island Nature Reserve

Browse Island is the nearest landform to WA-50-L (33 km away) and is a Class 'C' nature reserve. It is an isolated sand cay surrounded by an intertidal reef platform and shallow fringing reef. The purpose of this reserve (#41775) is conservation, navigation (a lighthouse is present on the island), communication, meteorology and survey.

The Browse Island reef complex is an outer shelf, biohermic structure rising from a depth of approximately 200 m. It is a flat-topped, oval-shaped, platform reef with the largest diameter being about 2.2 km. The island is a triangular, vegetated sandy cay, standing just a few metres above high-tide level. It measures approximately 700 m by 400 m.

Reef habitats at Browse Island are not diverse as confirmed by a study undertaken as part of the Applied Research Program (ARP) for INPEX and Shell. In the study, a low level of diversity in invertebrates was reported. Soft corals and sponges were noted but reported levels were not considered abundant (Olsen et al. 2018). Rocky shore habitat on the island is represented only by exposed beach rock, and there are no intertidal sand flats. The lagoon habitat is poorly developed, with poor water circulation, and it shows evidence of recent infill and high mortality. The reef platform, especially on the western side, is high and barren in many places. Only the reef crest and seaward ramp habitats around the edge of the reef support moderately rich assemblages of molluscs. The shallow subtidal zone is narrow and supports relatively small areas of well-developed coral assemblages (INPEX 2010).

Green and flatback turtle (*Chelonia mydas* and *Natator depressus*) nesting occurs during the summer months and Browse Island also provides habitat for seabirds and shorebirds (Section 4.7.4).

Further, the island (inclusive of a 20 km buffer) has been classified as critical habitat for green turtles from November to March under the Recovery Plan for Marine Turtles in Australia (DEE 2017a). It is thought that the Scott-Browse green turtles are a distinct genetic unit, nesting only at Scott Reef (Sandy Islet) and Browse Island.

It is not a regionally significant habitat for seabirds, with previous surveys finding a lack of diversity of seabirds breeding there (Clarke 2010). The DEE has not listed Browse Island as a marine avifauna biologically important area (BIA). However, colonies of nesting crested terns (*Thalasseus bergii*) were observed nesting on the north-western side of the island in a colony of approximately 1,000 birds (Olsen et al. 2018). Browse Island has also been recognised, through stakeholder consultation between INPEX and the DBCA, as an important location for seabirds and specifically green turtles, known to be part of a genetically distinct management unit.

4.4.2 Scott Reef Nature Reserve

Sandy Island is a C class nature reserve (under Western Australian legislation) for the purpose of conservation (No. 42749), declared to low water mark. It has an approximate area of 11,658 hectares. This encompasses much of the South Scott lagoon, and the south-western reef flat of North Scott Reef. The remainder of the South Scott Reef lagoon and North Scott Reef are Commonwealth waters and Commonwealth jurisdiction applies.

Scott Reef (including a 20 km buffer) has been classified as habitat critical to the survival of marine turtles in the Recovery Plan for Marine Turtles (DEE 2017a) as described in Section 4.7.4.

4.5 Wetlands of conservational significance

No wetlands of conservational significance were identified as overlapping WA-50-L or the EMBA (Appendix B).

4.6 Physical environment

4.6.1 Climate

Air temperature

Air temperatures recorded at Browse Island, the closest Bureau of Meteorology (BOM) climatological station to WA-50-L, shows a maximum temperature of 33.3 degrees Celsius (°C) and a minimum of 21.6 °C (BOM 2019). Air temperatures in the Browse Basin remain warm throughout the year with means and maxima ranging from 26–30 °C and 32–35 °C, respectively (INPEX 2010).

Winds

The climate of northern Australia shows two distinct seasons: winter, from April to September; and summer, from October to March. There are rapid transitional periods between the two main seasons, generally in April and September/October (RPS MetOcean Pty Ltd 2011).

The winter season is characterised by steady north-east to south-east winds of 5 metres per second (m/s) to 12 m/s, driven by south-east trade winds. The prevailing south-east winds bring predominantly fine conditions throughout the north of Australia. The summer season is the period of the predominant north-west monsoon. It is characterised by north-west to south-west winds of 5 m/s for periods of five to 10 days with surges in airflow of 8 m/s to 12 m/s for periods of one to three days.

During the summer season, the weather in the north is largely determined by the position of the monsoon trough, which can be in either an active or an inactive phase. The active phase is usually associated with broad areas of cloud and rain, with sustained moderate to fresh north-westerly winds on the north side of the trough. Widespread heavy rainfall can result if the trough is close to, or over, land. An inactive phase occurs when the monsoon trough is temporarily weakened or retreats north of Australia. It is characterised by light winds, isolated showers, and thunderstorm activity, sometimes with gusty squall lines.

Tropical cyclones can also develop off the coast in the northern wet season, usually forming within an active monsoon trough. Heavy rain and strong winds, sometimes of destructive strength, can be experienced along the coast within several hundred km of the centre of the cyclone. The Browse Basin is prone to tropical cyclones, mostly during the tropical wet season from December to March (INPEX 2010). Under extreme cyclone conditions, winds can reach 300 km/h.

Rainfall

The region has a pronounced monsoon season between December and March, which brings with it heavy rainfall. Heaviest rainfall is typically associated with tropical cyclones.

Troughton Island located on the Kimberley coastline is the closest location to WA-50-L with a historical rainfall record. Historical rainfall data shows the highest maximum (269.8 mm) and mean (>100 mm) monthly rainfalls occur from December to March (BOM 2019). Rainfall intensity at the Ichthys Field is expected to range from approximately 215 mm/h to 460 mm/h over a 5-minute interval (based on 1-year and 200-year average recurrence intervals) (AMEC Ltd. 2011).

Air quality

There is currently no air quality data recorded within the vicinity of WA-50-L. However, given the distance from land, air quality is expected to be relatively high. Potential sources of air pollution associated with anthropogenic influences are expected to be emissions generated by shipping, and oil and gas activities, and therefore considered to be localised in relation to the regional setting.

4.6.2 Oceanography

Currents

Broad-scale oceanography in the north-west Australian offshore area is complex, with major surface currents influencing the region, including the Indonesian Throughflow, the Leeuwin Current, the South Equatorial Current, and the Eastern Gyral Current (Figure 4-3). The Indonesian Throughflow current is generally strongest during the south-east monsoon from May to September (Qiu et al. 1999). The Indonesian Throughflow is a key link in the global exchange of water and heat between ocean basins. It brings warm, low-nutrient, low-salinity water from the western Pacific Ocean, through the Indonesian archipelago, to the Indian Ocean. It is the primary driver of the oceanographic and ecological processes in the region (DSEWPaC 2012).

Offshore regions with water depths exceeding 100-200 m tend to experience significant large-scale drift currents. These drift currents tend to be stronger than tidal currents and are the dominant driver of the long term (> several days) transport of effluent plumes. Drift currents in the location of the INPEX *Ichthys Venturer* FPSO within WA-50-L are expected to be directed towards the south-west during summer and winter. During the transitional period, drift currents will be variable, predominantly switching between the south-west and north-east directions. Typical drift current speeds range from zero to 0.3 m/s throughout the year (APASA 2015). Tidal current data, also from the FPSO location, indicate that tidal currents are likely to be directed along a north-west to south-east axis throughout the year. Typical tidal current speeds are in the range of 0.2–0.6 m/s (APASA 2015). Wind shear at the surface also generates local-scale currents.

Tides

The tides are semidiurnal, with two daily high tides and two daily low tides (McLoughlin et al. 1988). Both the semidiurnal and diurnal tides appear to travel north-eastwards in the deep water leading to the Timor Trough before propagation eastwards and southwards across the wide continental shelf. The NWMR experiences some of the largest tides along a coastline adjoining any open ocean in the world.

Mean sea level in the vicinity of WA-50-L is about 2.7 m above lowest astronomical tide (LAT), with a spring tidal range of about 5.0 m.

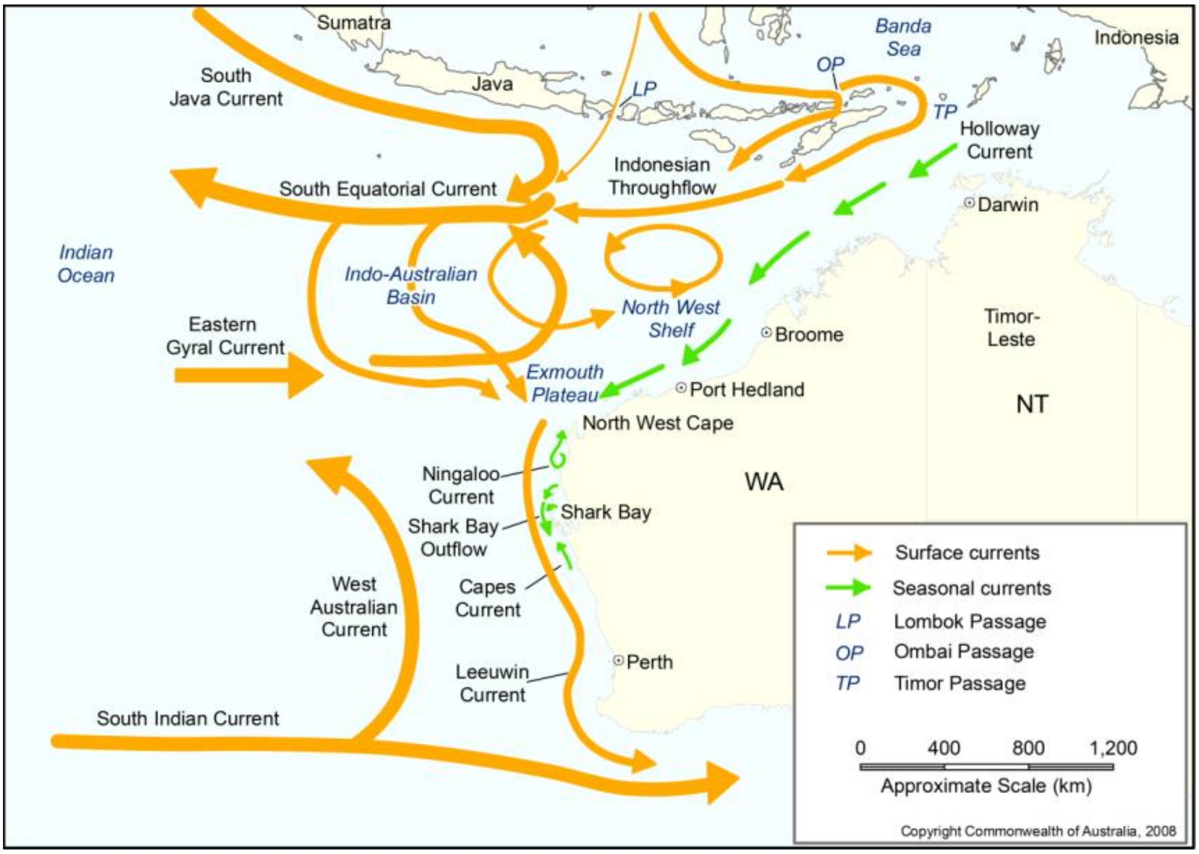

Figure 4-3: Surface currents for Western Australian waters

Waves

Summertime tropical cyclones generate waves propagating radially out from the storm centre. Depending upon the storm size, intensity, relative location and forward speed, tropical cyclones may generate swell with periods of 6–10 seconds (s) from any direction and with wave heights of 0.5–9.0 m. During severe tropical cyclones, which can generate major short-term fluctuations in current patterns and coastal sea levels (Fandry & Steedman 1994; Hearn & Holloway 1990), current speeds may reach 1.0 m/s and occasionally exceed 2.0 m/s in the near-surface water layer. Such events are likely to have significant impacts on sediment distributions and other aspects of the benthic habitat.

4.6.3 Bathymetry and seabed habitats

Water depth within WA-50-L ranges from 235 m to 275 m at LAT. Studies using SBP, MBES and SSS have been undertaken by INPEX at the Ichthys Field and in areas close to Heywood and Echuca shoals and south-east towards the Kimberley coast (INPEX 2010). These studies indicated that seabed topography is relatively flat and featureless and the geology is generally homogeneous through the region.

Soft substrates in the Browse Basin and continental shelf are typical of deep-sea, outer continental shelf and slope benthic habitats found along the length of the NWS (RPS 2007). This habitat generally supports a diverse infauna dominated by polychaetes and crustaceans typical of the broader region and this is reflected in survey results which indicate the epibenthic fauna is diverse but sparsely distributed (RPS 2008). Deep-sea infaunal assemblages of this kind are very poorly studied on the NSW but are likely to be widely distributed in the region (INPEX 2010).

Areas of mud and fine sand are widespread on the outer shelf and slope in the Browse Basin indicating that it is a depositional area where fine sediments and detritus accumulate. The distribution of seabed type shows some correlation with water depth, with sediments becoming coarser as water depth increases (INPEX 2010). However, there are also large sand waves in parts of the basin, showing that, locally, there are strong seabed currents. The sand waves are likely to move in response to seasonal changes in the currents and the substrate instability is expected to limit the development of infaunal communities in this habitat.

During surveys of the Ichthys Field, no obstructions were noted on the seafloor and no features such as boulders, reef pinnacles or outcropping hard layers were identified (INPEX 2010; Fugro Survey Pty Ltd 2005, 2015). A previous survey undertaken in WA-50-L at the approximate location of gathering system 4 reported some areas of well-developed sand waves, with the largest ranging from 0.5 m to 1.0 m high and with a maximum gradient on their northern lee side of approximately 20 degrees (Fugro Survey Pty Ltd 2015). In general, the seabed sediments grade from soft featureless sandy silts to gravelly sand suggestive of strong near-seabed currents and mobile sediments that do not favour the development of diverse epibenthic communities.

4.6.4 Water quality

Water quality has been measured by INPEX during numerous surveys in order to describe the natural water quality conditions in the Ichthys Field and in surrounding areas including WA-50-L. An overview of the water quality studies undertaken are as follows:

- water quality sampling was conducted at 27 offshore locations near the Ichthys Field, Echuca Shoal and their surrounds between March 2005 to June 2007 as a part of the INPEX Ichthys EIS studies
- near-seabed temperature and salinity profiles were obtained along the proposed pipeline route from the Ichthys Field to Darwin Harbour during geophysical and geotechnical surveys conducted between August and October 2008.

The results of these studies, as relevant to this EP, are summarised in Table 4-2.

Furthermore, as part of the ARP between INPEX and Shell in the Browse Basin, a significant amount of environmental baseline data has been collected. This included 66 water quality profiles and more than 1,300 water samples collected from 56 locations around the Ichthys Field in 2015.

Sampling locations were based on a gradient design away from a central point in the Ichthys Field and also included increased sampling around Browse Island, Echuca and Heywood shoals. Samples were analysed for metals and hydrocarbons. In addition to the May 2015 survey, ad hoc water quality samples have also been collected from sampling locations during other ARP field surveys to increase the dataset and knowledge. An interpretive report of all the aforementioned ARP water quality results was delivered in 2017 (Ross et al. 2017).

Offshore surface waters are typically oligotrophic. This has been confirmed by studies recording low nitrate concentrations and low phytoplankton abundance. In general, the region experiences an influx of comparatively nutrient-rich waters at depth in summer and a variety of processes, such as tidal currents, internal waves and cyclone mixing, are known to carry these nutrients into the bottom waters of the shelf (Hallegraeff 1995).

Inshore coastal waters tend to be more turbid than offshore open ocean waters due to suspension of sediments by wave action and sediment laden runoff from the land. Higher total suspended solids (TSS) concentrations tend to occur during spring tide conditions due to stronger tidal currents and meteorological perturbations, such as periods of strong winds.

Table 4-2: Summary of water quality parameters in the vicinity of WA-50-L

Parameter	Description
Surface-water temperature	The surface waters of the region are tropical year-round, with surface temperatures of ~26 °C in summer and ~22 °C in winter (DSEWPaC 2012). The baseline monitoring in the Ichthys Field area recorded surface water temperatures of ~30 °C in summer (March) and ~26–27 °C in winter (July) (INPEX 2010). Offshore waters in the region are typified by thermal stratification, with the start of the thermocline generally around 60 m below sea surface (but ranging from 30-80 m) (Ross et al 2017). Temperature decays rapidly through the water column to 14 °C at approximately 200 m and then decays more slowly to a minimum of circa 8 °C recorded at the deepest sites (Ross et al. 2017).
Salinity	Salinity was spatially and temporally consistent at 34 to 35 parts per thousand (ppt) across all sampling sites and can reasonably be expected to be similar within the wider area, given the distance from major freshwater discharges (INPEX 2010). Minor variations in the salinity profile were identified however data indicated lower salinity values were recorded in the top layer of the water column with higher salinity values corresponding to deeper within the water column (Ross et al. 2017).
Dissolved oxygen	Dissolved oxygen concentrations in the Ichthys Field mirrored water temperatures, with concentrations varying considerably between the surface and subsurface layers. The surface mixed layer was generally well oxygenated throughout; however, below the thermocline (starting at approximately 60 m through to 200 m water depth), the concentration of dissolved oxygen decreased consistently with depth (RPS 2007; Ross et al. 2017). Dissolved oxygen concentrations were recorded at constant levels of 6.0 to 6.5 ppm at or above the thermocline in both summer and winter. In the cooler waters below the thermocline, dissolved oxygen decreased with increasing depth, with levels as low as 4.5 to 5.0 ppm recorded at a depth of 93 m and 3 ppm at a depth of 250 m (INPEX 2010). This indicates that the strong thermal stratification at the offshore locations results in limited oxygen replenishment of subsurface waters due to the lack of regular mixing between water layers (RPS 2007).
pH	The average pH of waters was measured at approximately 8.4 (RPS 2007), which is slightly higher (more alkaline) than normally encountered in the marine environment and is above the default criteria given in the *Australian and New Zealand guidelines for fresh and marine water quality* (ANZECC/ARMCANZ 2000).
Turbidity and light attenuation	Turbidity is generally higher in the shallow waters of the continental shelf and towards the base of many of the deeper water column profiles. This has been attributed to re- suspension of fine sediments in these higher energy environments (Ross et al. 2017). The re-suspension of materials from the seafloor includes organic material which could comprise a pathway for hydrocarbon materials to become incorporated into sediments. Light attenuation coefficients calculated from photosynthetically active radiation (PAR) measurements ranged from 0.026 to 0.043 in October and December 2006, and 0.048 to 1.09 in June 2007. These were observed to be consistent with reported “typical” levels for the region (RPS 2007).
Petroleum hydrocarbons	Baseline sampling has indicated low levels of naturally occurring hydrocarbons released by organic matter decay or higher trophic level organisms. Shallow water sites showed a constant hydrocarbon concentration through the profile. Deep water sites showed a low and constant concentration above the thermocline, with a peak of 0.2-0.25 µg/L at the thermocline before slowly diminishing (Ross et al. 2017).

Parameter	Description
Radionuclides	Water-column sampling for radionuclides in the Ichthys Field area indicated concentrations of radium-226 ranging from below lower limits of reporting (LLR) to 0.034 (±0.012) becquerels per litre (Bq/L) and concentrations of radium-228 ranging from below LLR to 0.167 (±0.128) Bq/L. With the exception of one mid-depth sample, all samples returned gross alpha-particle and gross beta-particle radiation levels below the Australian Drinking Water Guidelines (ADWG) screening criterion of 0.5 Bq/L provided by the National Health and Medical Research Council (NHMRC) and the Natural Resource Management Ministerial Council (NRMMC).
Metals	Total metal concentrations in the offshore waters sampled were below the 99% species protection level for marine waters (ANZECC/ARMCANZ 2000), with the exception of zinc and cobalt at one site each. The reason for these two slightly elevated readings is unknown (INPEX 2010). Ultra-trace-level analysis methods were used to assess metal concentrations in surface waters because ANZECC/ARMCANZ (2000) guideline trigger values at the 99% species protection level are lower than the limits of standard laboratory methods. Mercury was the only metal not detected above the LLR, while cobalt was marginally above the LLR at only one site. Concentrations of arsenic, nickel, chromium and zinc were consistent across all sites, but the concentrations of cadmium, copper and lead showed greater variability (INPEX 2010).

4.6.5 Sediment quality

Similar to water quality, marine sediments have been sampled during numerous surveys in order to characterise the marine sediments in the Ichthys Field and surrounding areas. Overviews of the studies are listed below, with the results as relevant to this EP summarised in Table 4-3:

- Sampling and characterisation of marine sediments in the Ichthys development area was conducted at 10 sites in September 2005 and May 2007. This included five sites within 20 km of the Ichthys Venturer FPSO location and another five sites between 36 km and 134 km away. A further 10 sites were also sampled for particle size distribution (PSD) between 24 km and 66 km of the FPSO location in WA-50-L.
- Seabed sediment sampling along the proposed pipeline route from the Ichthys Field to Darwin Harbour was also conducted at approximately 10 km intervals during geophysical and geotechnical surveys between August and October 2008.

Furthermore, as a part of the ARP, a 133 sediment samples at 56 locations were collected around the Ichthys Field in May 2015. Sampling locations were based on a gradient design away from a central point in the Ichthys Field and also included increased sampling around Browse Island, Echuca and Heywood shoals. Samples have been analysed for metals and hydrocarbons. In addition to the May 2015 survey, ad hoc sediment samples have also been collected from sampling locations during other ARP field surveys to increase the dataset and knowledge. An interpretive report of all the aforementioned ARP sediment sample results was delivered in 2017 (Ross et al. 2017).

Table 4-3: Summary of sediment quality parameters in the vicinity of WA-50-L

Parameter	Description
Particle size distribution (PSD)	The seabed in offshore locations on the continental shelf is known to consist of generally flat, relatively featureless plains characterised by soft sandy-silt marine sediments that are easily resuspended. Similarly, the substrate of the Scott Reef – Rowley Shoals Platform, in water depths of 200–600 m, is considered to be a depositional area with predominantly fine and muddy sediments (INPEX 2010). The PSD of sediment at sites located within the Ichthys Field was primarily sand, with some silts.
Petroleum hydrocarbons	Concentrations of BTEX and PAH compounds in sediments in the vicinity of the sampling sites were very low (Ross et al. 2017, RPS 2007). The components of the more prevalent alkane compounds found indicated that the concentrations observed were likely to have originated from biogenic sources (Ross et al. 2017).
Radionuclides	Naturally occurring radioactive materials for the majority of results were below or close to LLR. Radium-226 was detected at one site but all other samples were below LLR for each radium isotope. The concentration of uranium and thorium was consistent across all sites (RPS 2007).
Metals	Concentrations of all metals were consistent across the sampling sites and well below the interim sediment quality guidelines (ISQG) low screening level (ANZECC/ARMCANZ 2000), with the majority also below their respective LLR (RPS 2007). Organometallics (i.e. tributyltin (TBT)) were below ANZECC/ARMCANZ (2000) guidelines and lower than the LLR at all sampling locations.

4.6.6 Underwater noise

The Centre for Marine Science and Technology (CMST) at Curtin University undertook a study on behalf of INPEX from September 2006 to August 2008 to assess ambient biological and anthropogenic sea noise sources in the Browse Basin. Ambient noise in the Ichthys Field was measured using a sea noise logger deployed at a depth of 240 m on the seabed 45 km north-west of Browse Island. The monitoring revealed an average ambient noise level of 90 dB re 1 μPa under low sea states, with inputs of low frequency energy from the Indian Ocean (INPEX 2010).

Biological noise sources recorded in the Ichthys Field included regular fish choruses (one at >1 kHz and another at around 200 Hz) and several whale calls from humpback whales, pygmy blue whales, minke whales and other unidentified species. Results from this survey are considered to be indicative of typical underwater noise levels and frequencies within the NWMR bioregion as a whole.

4.7 Biological environment

4.7.1 Planktonic communities

Plankton communities comprise phytoplankton and zooplankton, including fish eggs and larvae. Phytoplankton and zooplankton are a source of primary and secondary productivity, and key food sources for other organisms in the oceans (Brewer et al. 2007). Eggs and larvae may be dispersed throughout the water column and throughout the region, playing an important role in species recruitment.

Plankton abundance and distribution is patchy, dynamic and strongly linked to localised and seasonal productivity (Evans et al. 2016). The mixing of warm surface waters with deeper, more nutrient-rich waters (i.e. areas of upwelling) generates phytoplankton production and zooplankton blooms. In the offshore waters of north-western Australia, productivity typically follows a 'boom and bust' cycle. Productivity booms are thought to be triggered by seasonal changes to physical drivers or episodic events, which result in rapid increases in primary production over short periods, followed by extended periods of lower productivity.

The Indonesian Throughflow has an important effect on biological productivity in the northern areas of Australia and Indonesia. Generally, its deep, warm and low nutrient waters suppress upwelling of deeper, comparatively nutrient-rich waters, thereby forcing the highest rates of primary productivity to occur at depths associated with the thermocline (generally 70 – 100 m depth). When the Indonesian Throughflow is weaker, the thermocline lifts, and brings deeper, more nutrient-rich waters into the photic zone, which results in conditions favourable to increased productivity. Consequently, plankton populations have a high degree of temporal and spatial variability. In tropical regions, higher plankton concentrations generally occur during the winter months (June to August).

The waters of north-western Australia, encompassing the Ichthys Field (WA-50-L), are generally considered to be of low productivity in comparison with other global oceanic systems. This is largely due to the relatively low-nutrient, shallow water environment. Planktonic community densities recorded in the Ichthys Field are considered to be very sparse and are indicative of offshore waters where no significant nutrient sources exist. The most common plankton classes recorded from the sampling of the Ichthys Field development area were the Prasinophyceae (68%), followed by the Bacillariophyceae (30%), the Dinophyceae (1%) and the Cryptophyceae (<1%), all of which are common throughout the region (INPEX 2010).

4.7.2 Benthic communities

Banks and shoals

A number of banks, shoals and reefs exist within the Browse Basin (Figure 4-2). The closest bank/shoal within the EMBA is Echuca shoal, with Heywood shoal adjacent to the EMBA. They are located approximately 79 km and 96 km away from WA-50-L at their closest points respectively. Browse Island is the nearest intertidal habitat which is located 33 km away from WA-50-L (INPEX 2010).

A detailed study on Echuca and Heywood Shoals, the two closest submerged shoals to WA-50-L, was undertaken as part of the Shell/INPEX ARP comprising of annual field surveys conducted from 2014 to 2016 (Heyward et al. 2018). The focus of the study was the shoal benthic habitats and associated fish communities predominantly on the plateau areas, present as horizontal or gently sloping seabed in depths of 15m to 30 m. The outcome of the study by Heyward et al. (2018) reported that Echuca Shoal's oval shaped and slightly shallower 11 km^2 plateau had less unconsolidated substrate, such as sand or rubble, than Heywood Shoal's plateau of approximately 31 km^2. The benthic habitats and fish communities were similar, with many species in common. All epibenthic organisms on both shoals appeared normal and healthy throughout the study. Fish abundance and diversity was high but varied over time and between the shoals in a consistent manner. Species richness, abundance and fish community structure were influenced mainly by depth and the abundance of epibenthos, especially hard coral (Heyward et al. 2018). These results are comparable with other shoals throughout the region.

These submerged shoals within the EMBA can support diverse tropical ecosystems, including phototrophic benthos typical of tropical coral reefs. The shoals support a diverse biota, including algae, reef-building corals, hard corals and filter-feeders. In general, the flora and faunal assemblages are typical of the oceanic reefs of the Indo–West Pacific region (INPEX 2010), with many of the species in common with those found at the Ashmore, Cartier and Scott Reef complexes. The shoals and banks of the NWMR may therefore act as 'stepping stones' for enhanced biological connectivity between the reef systems of the region. Shoal and bank habitats are thought to provide additional regional habitat for marine fauna, including sharks and sea snakes (AIMS 2012).

The community structure of the banks and shoals is likely to be influenced by a number of processes, including disturbance resulting from storms and cyclones, and localised recruitment due to the limited larval dispersal of some invertebrate species (AIMS 2012). It is unknown how interconnected the individual banks and shoals are in regard to larval recruitment. The majority lie in the path of a south-westerly flowing current originating in the Indonesian Throughflow. However, seasonal reversals of current flow suggest larval recruitment can be supplied from outside this process. Seasonal current patterns, local effects within ocean currents (e.g. reversal of current direction against prevailing winds) and species lifecycle characteristics are all likely to exert an influence over the larval recruitment (and hence biodiversity) of the banks and shoals (INPEX 2010).

Coral reefs

Coral reefs within the region can be categorised into three general groups: fringing reefs, large platform reefs, and intertidal reefs. Corals are significant benthic primary producers that play a key ecosystem role in many reef environments and have an iconic status in the environments where they occur.

Coral reefs considered to have significant value within the EMBA include:

- Cartier Island
- Seringapatam Reef
- Scott Reef.

These reefs are recognised as having the highest richness and diversity of coral species in Western Australia (Mustoe & Edmunds 2008, cited in Department of State Development 2010). Scott Reef also supports very high coral species diversity, as discussed in Section 4.2 and Section 4.3. Coral reefs associated with Browse Island (the nearest coral reef to WA-50-L) are discussed in Section 4.4.1.

Observations throughout the world indicate that coral spawning on most reefs extends over a few months during the spawning period, typically between late spring and autumn (Stoddart & Gilmour 2005, cited in INPEX 2010). Spawning of corals in the Northern Territory Aquarium has been observed around the full moon period in October and November (TWP 2006, cited in INPEX 2010). In northern Queensland, captive corals have been observed to spawn at the same time as those in the adjacent waters. Coral spawning has been observed at Scott Reef during summer/autumn (March/April; main spawning event) and spring (October/November) (Gilmour et al. 2009). This has been confirmed by AIMS research at Scott Reef, which estimates that 60–75% of community reproductive output occurs in autumn, 15–25% in spring, and 5–15% in summer, with comparatively little reproductive output during winter (Gilmour et al. 2013). Research into coral larval dispersal (Gilmour et al. 2009, 2010, 2011; Underwood et al. 2009, 2017; Cook et al. 2017; Waples et al. 2019) has indicated that dispersal and recruitment is predominately local and limited to within a few kilometres to a few tens of kilometres from natal reef patches.

Seagrass

There is no seagrass within WA-50-L due to water depth (approximately 250 m) and lack of suitable habitat.

The largest known seagrass locations for the NWMR have been reported from around the Buccaneer Archipelago located north of the Dampier Peninsula (Wells et al. 1995). The closest important seagrass habitat to WA-50-L is associated with the dugong foraging BIA at Ashmore Reef. Other seagrass habitats within the EMBA itself include Browse Island, Scott Reef and Cartier Island.

Coastal shallow-water seagrass habitats are generally rare in the region, accounting for only 11.5 km or 0.2% of the total Australia coastline surveyed by Duke et al. (2010). The regionally dominant genera in Australia are *Halophila* and *Halodule*.

4.7.3 Shoreline habitats

There are no islands within WA-50-L, with the closest intertidal habitat located at Browse Island (33 km south-east of the licence area). In the offshore waters of the EMBA, Cartier Island and Browse island have an associated Commonwealth or State marine park/reserve status. The values and sensitivities associated with the shorelines of these islands are described in section 4.3.1 and 4.4.1.

Sandy beaches

Sandy beaches are the dominant shoreline habitat on all the offshore islands within the EMBA and provide significant habitat for turtles and seabird nesting above the high tide line (Section 4.7.4). Sandy beaches are present within the EMBA at the sandy cays of Cartier Island, Browse Island and Scott Reef as described in Sections 4.3 and 4.4.

Generally, sands are highly mobile and therefore do no support a high level of biodiversity. Fauna within sandy beach habitats usually consists of polychaete worms, crustaceans and bivalves. These fauna provide a valuable food source for resident and migratory sea and shorebirds (DEC/MPRA 2005). Natural processes tend to supply fresh sediments and larval stock (food source) with each tidal influx.

Mangroves

Mangroves play an important role in connecting the terrestrial and marine environments and reducing coastal erosion. They also play an important ecosystem role in nutrient cycling and carbon fixing (NOAA 2010). Mangrove communities occur in sheltered coastal areas, with none present within WA-50-L or in the offshore waters of the EMBA.

4.7.4 Marine fauna

Species of conservation significance

Species of conservation significance within the EMBA were identified through a search of the EPBC Act Protected Matters Database (including a 1 km buffer).

The search identified a total of 23 “listed threatened” species and 43 “listed migratory” species that potentially use or pass through the EMBA.

In addition, 81 “listed marine” species were identified, of which 26 are “whales and other cetaceans” that may occur at, or immediately adjacent to, the area. The full search results are contained in Appendix B.

Table 4-4 presents the marine species that are "listed threatened" species or "listed migratory species". Note that true terrestrial species have not been listed in Table 4-4 on the basis that the outer extent of the EMBA was defined by entrained and dissolved hydrocarbons in the water column (refer Section 8).

Table 4-4: Listed threatened and/or migratory species under the EPBC Act potentially occurring within the EMBA

Species	Common name	Conservation status	Migratory
Marine mammals			
Balaenoptera borealis	Sei whale	Vulnerable	Migratory
Balaenoptera edeni	Bryde's whale	N/A	Migratory
Balaenoptera musculus	Blue whale	Endangered	Migratory
Balaenoptera physalus	Fin whale	Vulnerable	Migratory
Megaptera novaeangliae	Humpback whale	Vulnerable	Migratory
Orcinus orca	Killer whale	N/A	Migratory
Physeter macrocephalus	Sperm whale	N/A	Migratory
Orcaella heinsohni	Australian snubfin dolphin	N/A	Migratory
Tursiops aduncus	Spotted bottlenose dolphin	N/A	Migratory
Marine reptiles			
Caretta caretta	Loggerhead turtle	Endangered	Migratory
Chelonia mydas	Green turtle	Vulnerable	Migratory
Dermochelys coriacea	Leatherback turtle	Endangered	Migratory
Eretmochelys imbricata	Hawksbill turtle	Vulnerable	Migratory
Lepidochelys olivacea	Olive Ridley turtle	Endangered	Migratory
Natator depressus	Flatback turtle	Vulnerable	Migratory
Crocodylus porosus	Saltwater crocodile	N/A	Migratory
Aipysurus apraefrontalis	Short-nosed sea snake	Critically Endangered	N/A
Sharks, fish and rays			
Rhincodon typus	Whale shark	Vulnerable	Migratory
Carcharodon carcharias	Great white shark	Vulnerable	Migratory
Glyphis garricki	Northern river shark	Endangered	N/A
Pristis clavata	Dwarf sawfish	Vulnerable	Migratory

Species	Common name	Conservation status	Migratory
Pristis pristis	Northern sawfish, Freshwater sawfish, Largetooth sawfish	Vulnerable	Migratory
Pristis zijsron	Green sawfish	Vulnerable	Migratory
Anoxypristis cuspidata	Narrow sawfish	N/A	Migratory
Isurus oxyrinchus	Shortfin mako	N/A	Migratory
Isurus paucus	Longfin mako	N/A	Migratory
Manta alfredi	Reef manta ray	N/A	Migratory
Manta birostris	Giant manta ray	N/A	Migratory
Marine avifauna			
Anous tenuirostris melanops	Australian lesser noddy	Vulnerable	N/A
Calidris canutus	Red Knot	Endangered	Migratory
Calidris ferruginea	Curlew Sandpiper	Critically Endangered	Migratory
Numenius madagascariensis	Eastern curlew	Critically Endangered	N/A
Papasula abbotti	Abbott's Booby	Endangered	Migratory
Rostratula australis	Australian Painted Snipe	Endangered	N/A
Anous stolidus	Common noddy	N/A	Migratory
Calonectris leucomelas	Streaked shearwater	N/A	Migratory
Fregata ariel	Lesser frigatebird	N/A	Migratory
Fregata minor	Great frigatebird	N/A	Migratory
Phaethon lepturus	White-tailed tropicbird	N/A	Migratory
Sternula albifrons	Little tern	N/A	Migratory
Sula leucogaster	Brown booby	N/A	Migratory
Sula sula	Red-footed booby	N/A	Migratory
Acrocephalus orientalis	Oriental Reed-Warbler	N/A	Migratory
Actitis hypoleucos	Common Sandpiper	N/A	Migratory
Calidris acuminata	Sharp-tailed Sandpiper	N/A	Migratory

Species	Common name	Conservation status	Migratory
Calidris melanotos	Pectoral Sandpiper	N/A	Migratory
Pandion haliaetus	Osprey	N/A	Migratory
Thalasseus bergii	Crested Tern	N/A	Migratory

Conservation management plans

In addition to species being identified as threatened or migratory and MNES, depending on the threat classification, the DEE has established management policies, guidelines, plans and other materials for threatened fauna, threatened flora (other than conservation-dependent species) and threatened ecological communities listed under the EPBC Act.

In particular, the objectives of DEE recovery plans and conservation advice, seek to support the long-term recovery of various species outlining research and management measures that must be undertaken to stop the decline of, and support the recovery of a species, including the management of threatening processes.

Species identified during the EPBC Act Protected Matters search that have a conservation advice or a recovery plan in place, as well as any particular relevant actions to assist their recovery and conservation, including threat abatement plans, are summarised in Appendix B.

Biological important areas

The DEE has, through the marine bioregional planning program, identified, described and mapped BIAs for protected species under the EPBC Act. BIAs spatially and temporally define areas where protected species display biologically important behaviours (including breeding, foraging, resting or migration), based on the best available scientific information. These areas are those parts of a marine region that are particularly important for the conservation of protected species.

Table 4-5 provides an overview of the EPBC-listed species, identified by the EPBC Act Protected Matters search, that are associated with a BIA in the EMBA. The locations of relevant BIAs for EPBC-listed species are shown in Figure 4-4 to Figure 4-7

Note, there are no BIAs that intersect the licence area, with the closest BIAs being a green turtle internesting buffer at Browse Island and the whale shark foraging BIA located approximately 15 km south east of WA-50-L at its closest point.

Table 4-5: BIAs intersecting the EMBA

Species	Migration route	Foraging	Internesting	Resting/breeding	Aggregation/calving	Pupping/ nursing
Pygmy blue whale	x	x				
Whale shark		x				
Avifauna		x				
Green turtle		x	x			
Hawksbill turtle			x			

Marine mammals

Noise logging surveys were undertaken by INPEX to determine the critical areas of use and to establish a baseline of abundance for cetaceans within the Kimberley region. Noise loggers were set on the sea floor at two sites: in the Browse Basin 45 km north west of Browse Island (in 240 m of water) and at an inshore site near the Maret Islands (in 45 m of water) between September 2006 and August 2008. The loggers detected anthropogenic noise signals from vessel activities and seismic surveys, as well as signals from pygmy blue whales, humpback whales, Antarctic and dwarf minke whales, a signal which is believed to be from Bryde's whales, and several unknown great whale signals, plus a plethora of fish signal types and choruses (McCauley 2009).

There are no identified BIAs for marine mammals within WA-50-L and only BIAs for one marine mammal (blue whale foraging and migration) overlap the EMBA as outlined in Table 4-5 and shown in Figure 4-4. Other marine mammal BIAs in the region that do not overlap the EMBA but have species identified in the EPBC Act Protected Matters search have also been described below.

Blue whale

There are two recognised subspecies of blue whale in the southern hemisphere, which are both recorded in Australian waters. They are the southern (or 'true') blue whale (*Balaenoptera musculus intermedia*) and the 'pygmy' blue whale (*Balaenoptera musculus brevicauda*) (DoE 2015). In general, southern blue whales occur in waters south of 60°S and pygmy blue whales occur in waters north of 55°S (i.e. not in the Antarctic) (DoE 2015). On this basis, any blue whales present within the licence area/EMBA would be expected to be pygmy blue whales.

The 2015 Conservation Management Plan for the Blue Whale (DoE 2015) outlines the distribution of blue whales in Australian waters, and associated BIAs (i.e. migratory corridor and foraging areas). The closest BIA present within the EMBA, is a migratory corridor, located approximately 60 km west of WA-50-L at its closest point, and a foraging BIA at Scott Reef, approximately 98 km west of WA-50-L (Figure 4-4).

Pygmy blue whale migration is thought to follow deep oceanic routes. More recently, the migration route has been defined as along the shelf edge at depths between 500 m to 1,000 m (DoE 2015). Observations suggest most pygmy blue whales pass along the shelf edge out to water depths of 1,000 m but centred near the 500 m depth contour (McCauley & Jenner 2010). Satellite tagging (2009–2011) confirmed that the general distribution of pygmy blue whales was offshore in water depths >200 m and commonly >1,000 m (Double et al. 2014).

Humpback whale

Although not overlapping the EMBA, there are two humpback whale (Megaptera novaeangliae) BIAs located along the WA coastline; a migratory corridor and a breeding and calving area, as shown in Figure 4-4. During their annual northern and southern migrations, transitory humpback whales will pass through the EMBA generally between June and October, with peak ingress during July. The population increases up to mid-August when whales begin to depart on their southern migration. Peak egress occurs around September and the final groups of whales tend to have departed by late October (Jenner et al. 2001; Thums et al. 2018).

The migratory habitat for the humpback whale around mainland Australia is primarily coastal waters less than 200 m in depth and generally within 20 km of the coast (Jenner et al. 2001). Breeding and calving generally occurs between the Lacepede Islands and Camden Sound. Camden Sound is considered the northern most limit and is considered an important calving and breeding area (Jenner et al. 2001). A recent study as part of the Kimberley Marine Research Project (Thums et al. 2018) analysed three decades of satellite, aerial, boat-based sightings and determined that abundance was greatest in nearshore waters in water depths of approximately 35 m. However, whales (including cows and calves) may also occur in lower abundance elsewhere within and further offshore from the BIAs, with whales having been recorded in offshore locations such as Browse Island and Scott Reef (e.g. McCauley 2009). Isolated observations of humpback whales and their calves have been noted within the Ichthys Field. The closest humpback whale BIA to WA-50-L relates to calving and resting and is located approximately 120 km south east of the licence area.

Dugongs

Although not overlapping the EMBA, there is a dugong foraging BIA at Ashmore Reef (Figure 4-4) which correlates with seagrass habitats (refer Section 4.7.2).

Dugongs are considered Specially Protected under Schedule 4 of the *Biodiversity Conservation Act 2018* (WA) and are listed as migratory species under the EPBC Act. A significant proportion of the world's dugong population occurs in the coastal waters of the west-Pilbara nearshore, as well as Ningaloo Reef and Exmouth Gulf (Marsh et al. 2011). Dugongs generally inhabit shallow waters (around 10 m depth) and are commonly found in mangrove channels of inshore islands and shallow areas near the seagrass habitats on which they feed.

Dolphins

Although not overlapping the EMBA, there are coastal dolphin BIAs for breeding, calving and foraging as shown in Figure 4-4. There are three species of coastal dolphin to which these BIAs relate with two species potentially transiting through the EMBA (Appendix B) although their presence is unlikely to be common given their preference for coastal waters. A recent study of snubfin and humpback dolphins in the Kimberley region (Waples et al. 2019) confirmed these species of dolphins are present at low densities and occur as relatively small populations across the Kimberley.

Spotted bottlenose dolphin

The spotted bottlenose dolphin (*Tursiops aduncus*) is generally considered to be a warm water subspecies of the common bottlenose dolphin (*Tursiops truncatus*). This species of dolphin appears to occupy inshore waters, often in depths of less than 10 m (Bannister et al. 1996). It is known to occur from Shark Bay, north to the western edge of the Gulf of Carpentaria and is regarded as a migratory species under the EPBC Act (DEE 2019b).

Australian snubfin dolphin

All available data on the distribution and habitat preferences of Australian snubfin dolphin (*Orcaella heinsohni*) indicate that they mainly occur in the shallow coastal and estuarine waters of the NT and north WA (Beasley et al. 2002). There are no data to estimate any past or potential future declines in the area of occupancy for snubfin dolphins in Australia; however, incidental catches in gillnets (albeit at unknown levels), in addition to habitat degradation, may lead to a reduction of area of occupancy over the next three generations for Australian snubfin dolphins. (DEE 2019c).

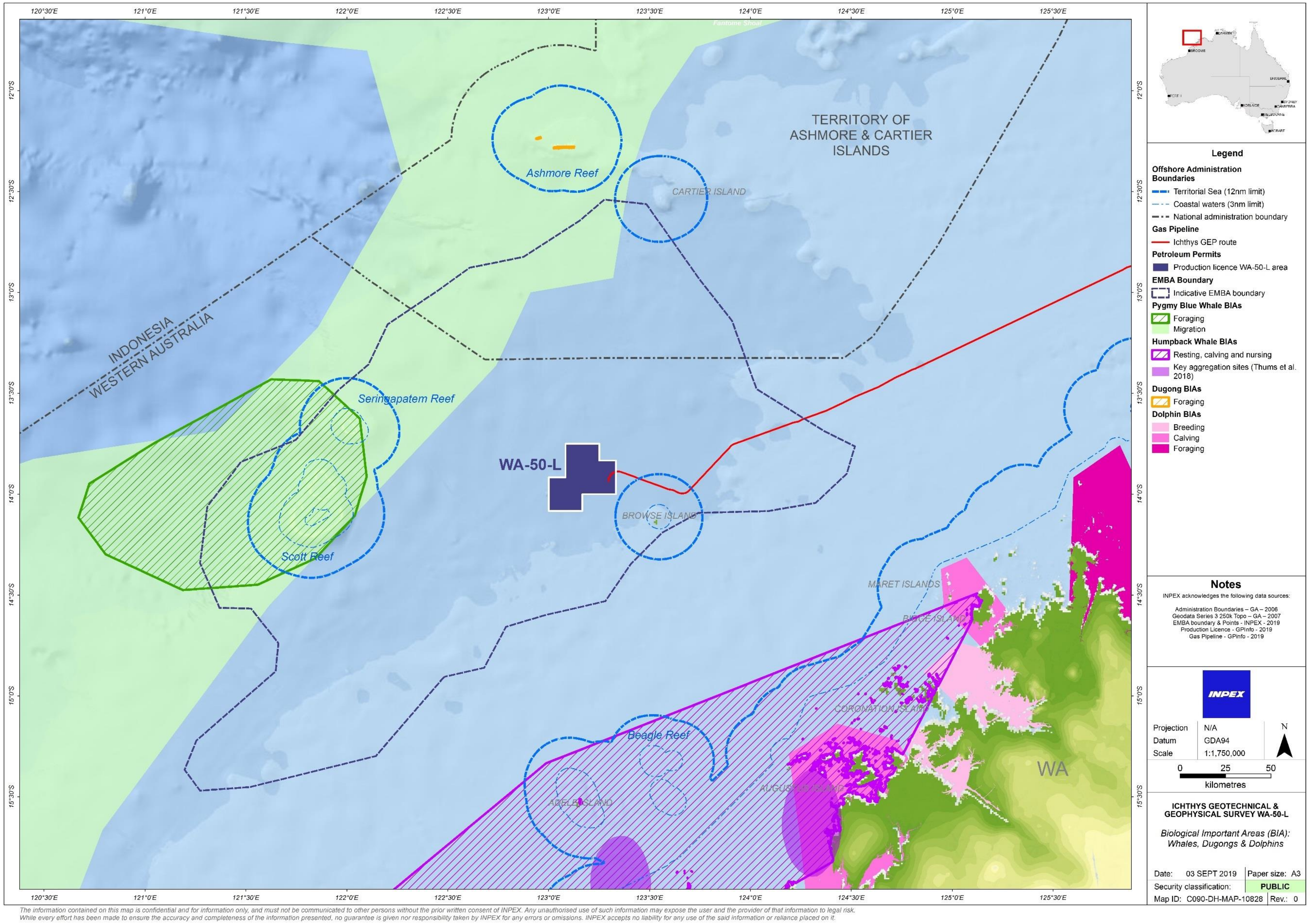

Figure 4-4: Biologically important areas associated with whales, dugongs and dolphins

Marine reptiles

Turtles

The EPBC Act Protected Matters search identified six species of marine turtle which may occur within the EMBA: the green turtle (*Chelonia mydas*), loggerhead turtle (*Caretta caretta*), leatherback turtle (*Dermochelys coriacea*), flatback turtle (*Natator depressus*), hawksbill turtle (*Eretmochelys imbricate*) and olive ridley turtle (*Lepidochelys olivacea*). While there are no known BIAs for marine turtles within WA-50-L, there are a range of BIAs and critical habitats for turtle foraging and internesting within the EMBA (Figure 4-5). Nesting rookeries within the EMBA include Browse Island, Cartier Island and Scott Reef as identified in the Recovery Plan for Marine Turtles in Australia (DEE 2017a). Peak nesting periods for all turtle species within these areas are generally between November and April. Further, a 20 km internesting buffer associated with green turtles have been identified for Browse Island and Scott Reef (Sandy Islet) between November and March (DEE 2017a). At Scott Reef there is also an interesting BIA (20 km buffer) for hawksbill turtles where internesting occurs in October – February each year, and peaks in December and January (DEE 2017a).

Satellite tagging of nesting female loggerhead turtles from the Ningaloo/Pilbara coast of Western Australia have shown dispersal north-west as far as Indonesia and southern Borneo, north-east as far as the Tiwi Islands and south as far as the Great Australian Bight (Waayers et al. 2015; Whiting et al. 2008). Flatback turtles are known to forage across the Australian continental shelf as far north as Indonesia and Papua New Guinea (DEE 2017a). There is limited tag recovery data for olive ridley turtles, but satellite tracking data indicates that they appear to remain on the Australian continental shelf (Waayers et al. 2015).

In summary, turtles are not expected to be present in high numbers in WA-50-L. However, individual green turtles may occasionally be present associated with the internesting buffer at Browse Island, and other marine turtle species are likely to be present in the waters of the EMBA as it encompasses a number of locations that support turtle foraging, nesting and internesting behaviours.

Sea snakes

The EPBC search identified 18 sea snakes within the EMBA. There are no reported BIAs for sea snakes. Most of the knowledge of sea snakes in Australian waters comes from trawler bycatch (Milton et al. 2009; Ward 1996). These studies indicate that sea snakes in northern regions of Australia tend to breed in shallow embayments and estuaries, which are only represented in the EMBA. Therefore, these species may be seen in the open waters of WA-50-L but their presence is unlikely to be common.

Crocodiles

The salt-water crocodile has a tropical distribution that extends across the northern coastline of Australia, where it can be found in coastal waters, estuaries, freshwater lakes, inland swamps and marshes, as well as far out to sea (Webb et al. 1987). There are no reported BIAs for crocodiles. Due to the species preference for estuaries and swamps and coastal waters it is unlikely to occur in the open waters of WA-50-L and the EMBA.

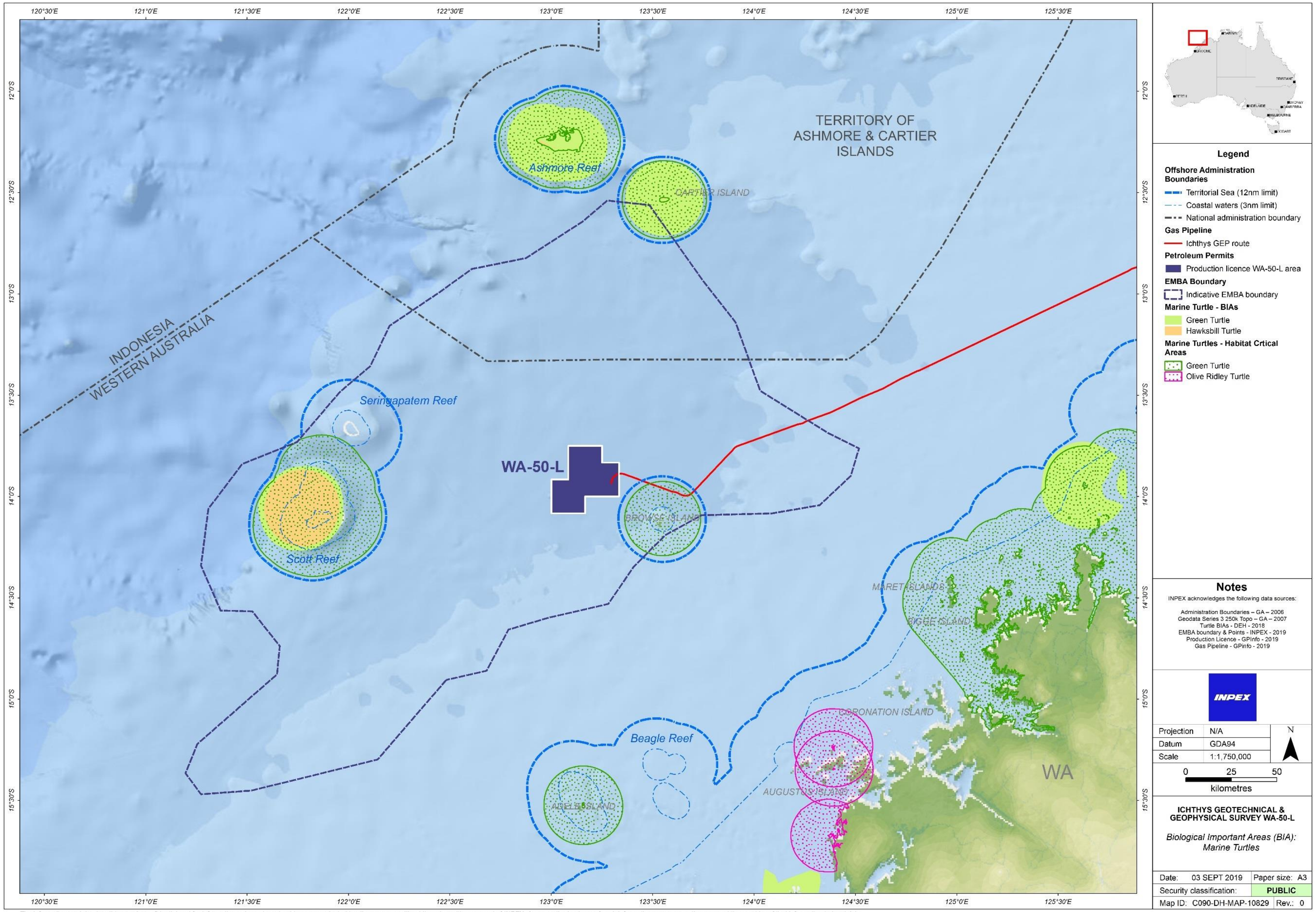

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Figure 4-5: Biologically important areas associated with marine turtles

Fishes and sharks

While there are no BIAs for fishes and sharks within WA-50-L, in the EMBA a BIA exists for whale sharks (foraging area) that largely follows the 125 m ancient coastline and at its closest point is approximately 15 km south east of WA-50-L as shown in Figure 4-6. There are also BIAs for sawfish (green, dwarf and freshwater) outside the EMBA located to the south-west and north-east of Broome.

Although not specifically identified as BIAs, several of the KEFs within the EMBA, as described in Section 4.2 are also known to provide important habitat for diverse fish assemblages.

Whale shark

The whale shark is a solitary planktivorous species that spends the greater part of its foraging time at water depths above 100 m, often near the surface (Brunnschweiler & Sims 2011; Wilson et al. 2006). However, whale sharks are also known to engage in mesopelagic and even bathypelagic diving when in bathymetrically unconstrained habitats (Brunnschweiler et al. 2009; Wilson et al. 2006).

Whale sharks appear to prefer different locations at different times of year, and despite a reasonable understanding of the various whale shark aggregation locations and timings, little is known about the large-scale transoceanic movements in response to seasonal abundance of planktonic prey species (Eckert & Stewart 2001).

It is however understood that whale sharks can travel over vast distances between aggregation sites. One whale shark tagged in the Seychelles was relocated after 42 days having travelled 3,000 km to south of Sri Lanka and then located again 4 months later, a further 5,000 km away in the waters of Thailand (Hsu et al. 2007). Therefore, it is possible that whale sharks may transit through the EMBA in both Australian and International waters.

Whale sharks are widely distributed in tropical Australian waters. Within WA, whale sharks aggregate seasonally (March–June) to feed in coastal waters off Ningaloo Reef (Wilson et al. 2006). Taylor (1996) and Rowat & Gore (2007) examined whale shark movements at Ningaloo Reef and observed that the sharks swim parallel to the reef but found no clear evidence of a north-south migration.

While Ningaloo is the nearest aggregation to the WA-50-L, it is located over 1,300 km to the south. Research on the migration patterns of whale sharks in the western Indian Ocean, indicates that a small number of the WA (Ningaloo) population migrate through the wider vicinity of the Browse Basin region (McKinnon et al. 2002; Wilson et al. 2006; Jenner et al. 2008; Meekan & Radford 2010). Whale sharks from Ningaloo Reef fitted with satellite trackers were observed to travel either north-east towards Timor Leste, or north-west towards the Indonesia islands of Sumatra and Java, with some individuals passing through the broad vicinity of Scott Reef (McKinnon et al. 2002, Wilson et al. 2006, Meekan & Radford 2010; Sleeman et al. 2010). Aerial (Jenner & Jenner 2009a; RPS Environment and Planning Pty Ltd 2010, 2011) and vessel (Jenner et al. 2008; Jenner & Jenner 2009b) surveys conducted in 2008 and 2009, involving over 1,000 hours of observer effort, recorded one whale shark in 2008 and two whale sharks in 2010 in the Browse Basin (Jenner et al. 2008 and RPS Environment and Planning Pty Ltd 2011 respectively).

Within the EMBA, the whale shark BIA largely follows the ancient coastline at 125 m depth contour KEF and at its closest point is located approximately 15 km south east of WA-50-L. However, based on the levels of whale shark abundance observed in the studies listed above, the likelihood of whale shark presence within this BIA is considered very low, with no specific seasonal pattern of migration.

Sawfish

Four species of sawfish (largetooth/freshwater/northern, narrow, dwarf and green sawfish) were identified in the EPBC search (Table 4-4). While sawfish are identified as being found within the EMBA due to their ecology (generally estuarine rather than open-ocean species) sawfish are not expected to occur within the open ocean location of WA-50-L and the EMBA.

Pipefish and seahorses

The EPBC search identified 31 species of the family Syngnathidae potentially present within the EMBA. Syngnathidae is a group of bony fishes that includes seahorses, pipefishes, pipehorses and sea dragons. Seahorses and pipefishes are a diverse group and occupy a wide range of habitats. However, the species identified in the EPBC search (Appendix B) generally display a preference for shallow water habitats such as seagrass and macroalgal beds, coral reefs, mangroves and sponge gardens that may be found in the shallower areas of the EMBA (Foster & Vincent 2004; Lourie et al. 1999; Scales 2010). In WA-50-L, water depths are approximately 250 m and preclude the presence of seagrass; and hard bottom substrates, which can potentially support coral and macroalgae sponge garden communities. Therefore, pipefish and seahorses are only expected to occur in the EMBA in areas where suitable habitats are present.

Sharks and rays

Five shark species (including whale shark described above) and two ray species were identified as having the potential to occur within the EMBA (Table 4-4; Appendix B).

It is considered possible that larger pelagic sharks such as the great white, whale and mako sharks may transit through the licence area. The likelihood of these species occurring in WA-50-L is expected to be very low as the licence area is not considered to provide habitat that is of breeding or feeding importance. As such, these species are unlikely to be common or resident within WA-50-L.

The majority of recorded great white shark movements in Australian waters are reported to occur between the coast and the 100 m depth contour (DEE 2019d).

Listed manta rays have been observed within the EMBA, but for the same reasons as the large pelagic sharks, are unlikely to be common or resident within WA-50-L.

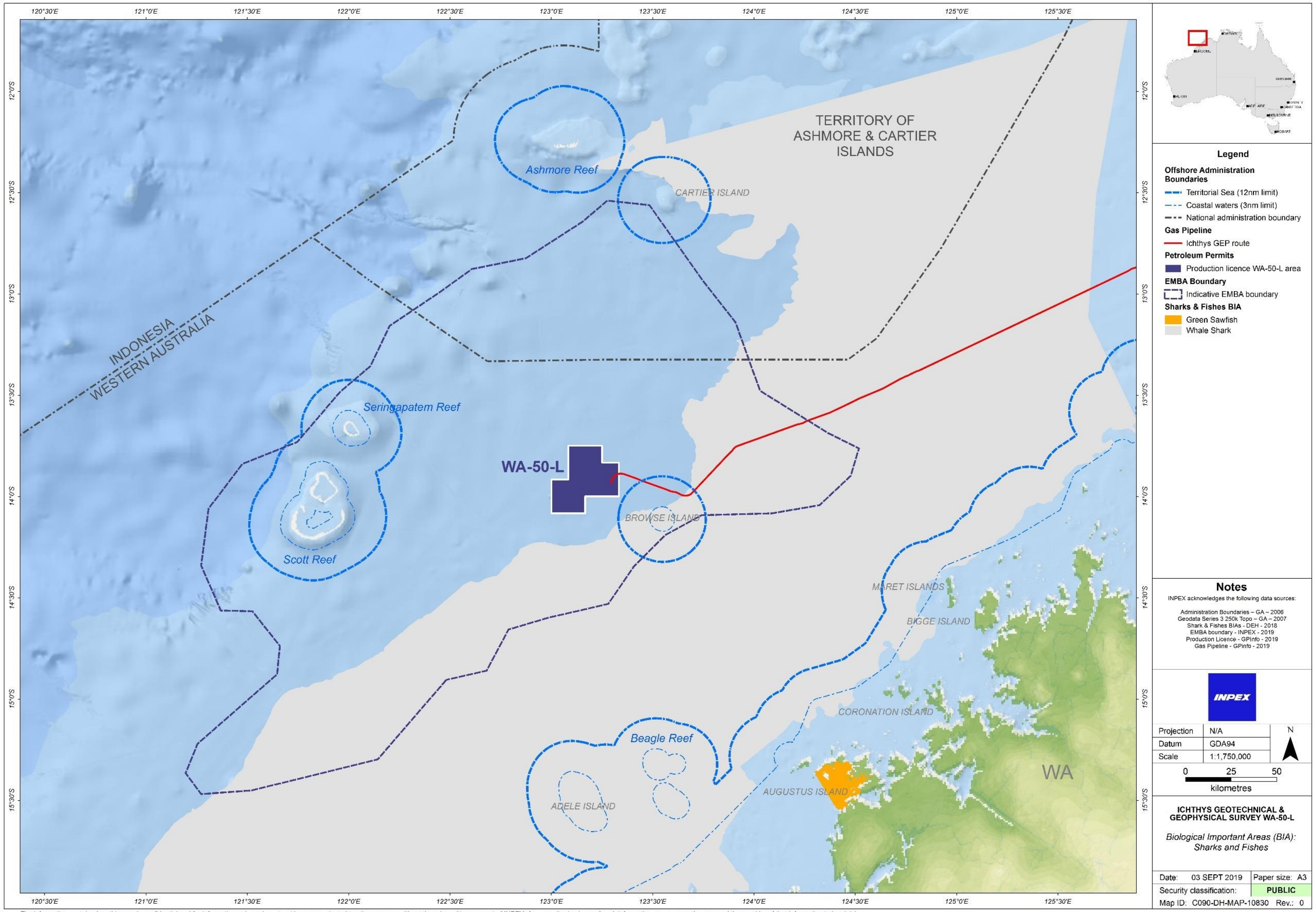

Figure 4-6: Biologically important areas associated with fishes and sharks

Marine avifauna

WA-50-L is located within what is known as the East Asian–Australasian Flyway an internationally recognised migratory bird pathway that covers the whole of Australia and its surrounding waters. 'Flyway' is the term used to describe a geographic region that supports a group of populations of migratory waterbirds throughout their annual cycle. There are 54 species of migratory shorebirds that are known to specifically follow migration paths within the EAA Flyway (Bamford et al. 2008). Migratory shorebird species are mostly present in Australia during the non-breeding period, from as early as August to as late as April/May each year. After arrival in Australia at the end of long migrations, they disperse throughout the country to a wide variety of habitats including coastal wetlands, mudflats, reefs and sandy beaches (DEE 2017b).

There are no BIAs for marine avifauna within WA-50-L. However, the EMBA overlaps a BIAs for a number of different marine avifauna species (Figure 4-7). The closest BIAs for marine avifauna relate to foraging around Cartier Island and Scott Reef. A marine avifauna BIA associated with foraging around Adele Island also overlaps the south eastern boundary of the EMBA.

Vessel-based surveys conducted around the Ichthys gas field, Browse Island and to the west as far as Scott Reef were conducted by the Centre for Whale Research in 2008. Seabirds observed included frigatebirds, boobies, terns, noddies, tropicbirds, petrels, shearwaters and gulls, with the brown booby the most common species recorded. Of the species recorded during the vessel-based surveys, a number are migratory species listed under the EPBC Act, including the streaked shearwater, brown booby, lesser frigatebird, crested tern and little tern. These migratory species can be expected to be encountered in low numbers as they are likely to transit through the licence area and the EMBA.

In addition to seabirds, the search of the EPBC database identified 9 species of migratory wetland bird species potentially present within the EMBA. These species may migrate through the EMBA to wetland habitats on the mainland and/or larger coastal islands (DEE 2017b). It is considered unlikely that WA-50-L would provide any significant resources to support these species.

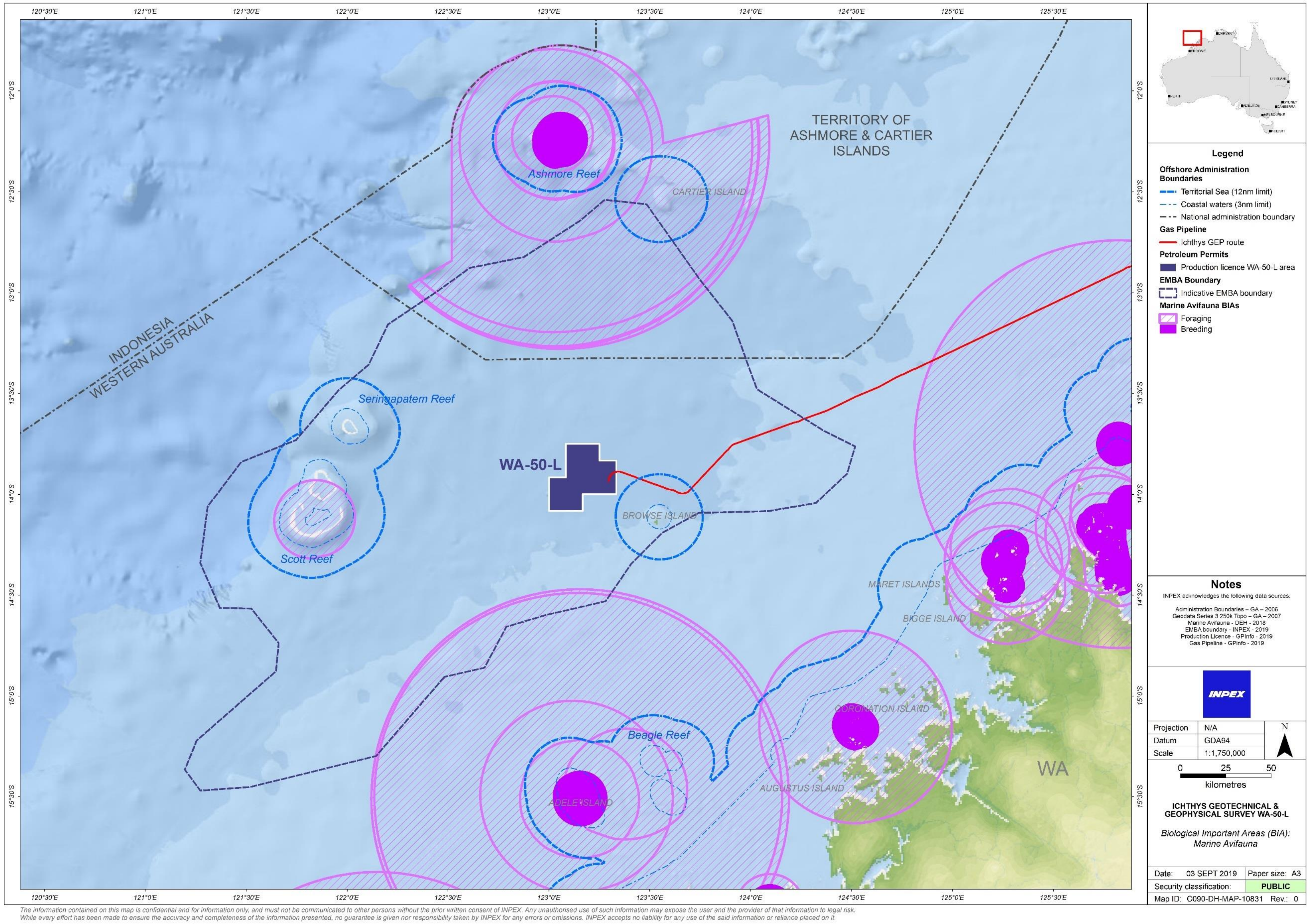

Figure 4-7: Biologically important areas associated with marine avifauna

4.8 Socioeconomic and cultural environment

4.8.1 World heritage areas

No world heritage areas were identified as overlapping WA-50-L or the EMBA.

4.8.2 National heritage places

No world heritage areas were identified as overlapping WA-50-L or the EMBA.

4.8.3 Fishing

Commercially significant fish stocks, considered to be key indicator species, that may be present in the licence area are shown in Table 4-6, including spawning and aggregation times. Although potentially present, given the water depth and absence of suitable habitats these species are considered not likely to spawn or aggregate in the deep waters of WA-50-L as their preferred spawning and aggregation areas are shallow coastal habitats, reefs and headlands and around estuaries.

Table 4-6: Commercially significant fish species

Key commercial fish species	Spawning/aggregation times
Goldband snapper	November to May (extended peak spawning period)
Spanish mackerel	September to January (peak spawning period)
Rankin cod	June to December and March (peak spawning period August to October
Red emperor	September to June (with bimodal peaks from September to November and January to March)
Bluespotted emperor	July to March (extended peak spawning period)

Commercial fisheries– Australian waters

Within the EMBA, four Commonwealth-managed fisheries have the potential to operate, with all four fishery boundaries overlapping WA-50-L as summarised in Table 4-7.

In addition to the Commonwealth-managed fisheries, 12 State-managed commercial fisheries have the potential to operate within the EMBA. Of these, five fishery boundaries overlap with WA-50-L (Table 4-8). Fisheries highlighted in bold have potential fishing grounds that overlap with WA-50-L, it does not indicate that they are currently active within the licence area; however, there is a potential that they may be in the future.

Table 4-7: Commonwealth-managed commercial fisheries

Commercial fishery (BOLD denotes overlap with WA-50-L)	Fishery summary
Western Tuna and Billfish Fishery	The Western Tuna and Billfish Fishery targets bigeye tuna (*Thunnus obesus*), yellowfin tuna (*Thunnus albacares*), broadbill swordfish (*Xiphias gladius*) and striped marlin (*Tetrapturus audax*). The fishery targets areas of reef which are present within the EMBA and mainly use longline fishing gear to catch the targeted species. The Billfish Fishery covers the sea area west from the tip of Cape York in Queensland, around Western Australia, to the border

Commercial fishery (BOLD denotes overlap with WA-50-L)	Fishery summary
	between Victoria and South Australia. Fishing occurs in both the Australian Fishing Zone and adjacent high seas. In the fishery there are currently 95 boats with statutory fishing rights (AFMA 2019a).
Western Skipjack Fishery	The Western Skipjack Fishery covers the entire sea around WA out to 200 nm from the coast. The fishery targets the skipjack tuna (*Katsuwonus pelamis*) and employs the purse seine, pole and line, and longline methods as its techniques. Although 14 permits are in place, the fishery is not currently active (AFMA 2019b).
North West Slope Trawl Fishery	The North West Slope Trawl Fishery targets scampi (*Metanephrops australiensis*) and deepwater prawn. The fishery is located in deep water from the coast of the Prince Regent National Park to Exmouth between the 200 m depth contour to the outer limit of the Australian Fishing Zone (AFMA 2019c). There are seven fishing permits (maximum number of vessels active at one time) each with a five year duration in the North West Slope Trawl Fishery. It is the only active fishery in the vicinity of WA-50-L, with reportedly low negligible trawl-fishing in the Ichthys Field; however, catch data is confidential for this fishery (AFMA 2019c).
Southern Bluefin Tuna Fishery	The Southern Bluefin Tuna Fishery covers the entire sea around Australia, out to 200 nm from the coast. There are 84 statutory fishing right owners in the fishery. This fishery is managed under a quota system to ensure the species is not subject to overfishing as has happened in the past. Commercial fishers mainly use the purse seine fishing method to catch southern bluefin tuna. With the fish being towed closer inshore and transferred to permanent floating pontoons. The major landing port is Port Lincoln in South Australia (AFMA 2019e) and therefore does not overlap the EMBA. No catch is taken from the NWS.

Table 4-8: State-managed commercial fisheries (WA DPIRD-managed)

Commercial fishery (BOLD denotes overlap with WA-50-L)	Fishery summary
Northern Demersal Scalefish Managed Fishery (WA) Area 2	The Northern Demersal Scalefish Managed Fishery is primarily a trap-based fishery which targets red emperor and gold band snapper. The fishery operates off the north-west coast of WA in the waters east of longitude 120°E and overlaps the EMBA. The typical catch is in the order of 3,000 tonnes annually, making these fisheries the most valuable finfish sector in the State, with an estimated annual value of at least $12 million (Gaughan & Santoro 2018).
Mackerel Managed Fishery (WA) Area 1	The Mackerel Managed Fishery uses near-surface trolling gear from vessels in coastal areas around reefs, shoals and headlands (WAFIC 2019a). The fishery targets Spanish mackerel (*Scomberomorus commerson*). There are currently 50 licences in the fishery with 15 active in the Kimberley area where the majority of the catch is taken (Gaughan & Santoro 2018).

Commercial fishery **(BOLD denotes overlap with WA-50-L)**	**Fishery summary**
North Coast Shark Fishery (Cwlth/WA)	The northern shark fisheries comprise the state-managed WA North Coast Shark Fishery in the Pilbara and western Kimberley, and the Joint Authority Northern Shark Fishery in the eastern Kimberley. Target species of the northern shark fisheries include the sandbar, hammerhead, blacktip and lemon sharks (AFMA 2019d). This fishery has not been active since 2008/2009 (AFMA 2019d).
Pearl Oyster Managed Fishery (WA) Zone 3	The Pearl Oyster Managed Fishery is the only remaining significant wild-stock fishery for pearl oysters. It is a quota-based, dive fishery operating in the shallow coastal waters along the NWS (WAFIC 2019b). The main fishing grounds are off Eighty Mile Beach, with smaller catches being taken around the Lacepede Islands (Gaughan & Santoro 2018). The catch for 2016 was reported to be 541,260 oysters harvested over 19,699 dive hours (Gaughan & Santoro 2018).
West Coast Deep Sea Crustacean Fishery (WA)	The West Coast Deep Sea Crustacean Fishery operates predominantly around the entrance to Shark Bay in water depths from 150-1,200 m (Gaughan & Santoro 2018). Catch in 2016 was 153 tonnes dominated by crystal crabs.
Kimberley Prawn Managed Fishery (WA)	The Kimberley Prawn Managed Fishery predominantly target banana prawns (*Penaeus merguiensis*) and catch also includes tiger prawns (*Penaeus esculentus*), endeavour prawns (*Metapenaeus endeavouri*) and western king prawns (*Penaeus latisulcatus*). The fishery operates from the north eastern boundary of the Exmouth Gulf Prawn Fishery to Cape Londonderry, in the EMBA (WAFIC 2019c).
Specimen Shell Managed Fishery (WA)	The Specimen Shell Managed Fishery is based on the collection of individual shells for the purposes of display, collection, cataloguing, classification and sale. Just over 200 different Specimen Shell species were collected in 2016, using a variety of methods. The main methods are by hand by a small group of divers operating from small boats in shallow coastal waters or by wading along coastal beaches below the high-water mark (Gaughan & Santoro 2018). While the fishery covers the entire WA coastline, there is some concentration of effort in areas adjacent to population centres such as Broome and Exmouth in the EMBA.
South West Coast Salmon Managed Fishery (WA)	South West Coast Salmon Managed Fishery targets Western Australian salmon (*Arripis truttaceus*). This fishery uses beach seine nets. In 2015 and 2016 very large schools of salmon were observed in south-western waters and as far north as Exmouth, which is further north than ever previously reported.
North Coast Crab Fishery (Including Kimberley Mud Crab) (WA)	The North Coast Crab Fishery is a trap-based fishery which targets mud crabs in the Kimberley (the Kimberley Developing Mud Crab Fishery) (WAFIC 2019d). Catch rates in these fisheries is very low.

Commercial fishery **(BOLD denotes overlap with WA-50-L)**	**Fishery summary**
Marine Aquarium Fish Fishery (WA)	This Marine Aquarium Fish Fishery is typically more active in coastal waters between Esperance and Broome with higher levels of effort around the Capes region, Perth, Geraldton, Exmouth and Dampier (Gaughan & Santoro 2018). More than 950 species of marine aquarium fishes may be accessed, with some operators also permitted to take coral, live rock, algae, seagrass and invertebrates.
Broome Prawn Fishery (WA)	The Broome Prawn Fishery predominantly targets banana prawns (*Penaeus merguiensis*), but also catches tiger prawns (*Penaeus esculentus*), endeavour prawns (*Metapenaeus endeavouri*) and western king prawns (*Penaeus latisulcatus*) (WAFIC 2019c).
Abalone Managed Fishery (WA)	The Abalone Managed Fishery includes the West Coast Roe's Abalone resource and the South Coast Greenlip / Brownlip Abalone resource. Roe's abalone is found in commercial quantities from the SA border to Shark Bay. The commercial fishery harvest method is a single diver working off a 'hookah' (surface-supplied breathing apparatus) using an abalone 'iron' to prise the shellfish off rocks (WAFIC 2019e). The fishery operates in shallow coastal waters coinciding with abalone distributions (Gaughan & Santoro 2018). Although the area of the fishery overlaps WA-50-L, no fishing effort occurs in the licence area given the water depth, water temperature and lack of suitable habitat.

Recreational fishing

A wide range of recreational activities occur within the NWMR. Recreational fishing activities peak in winter and are concentrated in coastal waters along the Kimberley and NT coastlines, generally around the population centres of Broome, Wyndham and Darwin. Some of the recreationally important species of the coastal areas include barramundi, mangrove jack, jewfish and bream.

Fishing methods typically involve rod and line gear and approximately three quarters of fish caught by fishing tour operators are released (NTG 2016). While the survivorship of released Barramundi is high, the same is not true for reef-associated species, such Golden Snapper and Black Jewfish. Both species are susceptible to pressure-induced injuries (barotrauma), with the rate of injury and post-release mortality proportional to capture depth. Concerns regarding the impacts of barotrauma on reef fishes (and other factors) have led to the development of new management controls on the harvest of these species (NTG 2016).

Offshore islands, coral reef systems and continental shelf waters are increasingly targeted by fishing-based charter vessels (Gaughan & Santoro 2018). Extended fishing charters are known to operate during certain times of the year to fishing spots off the WA coast, including Scott Reef. Generally, there is little recreational fishing that occurs within WA-50-L because of its distance from land, lack of features of interest and deep waters.

Traditional fishing

Aboriginal fishing

Traditional fishing occurs along the majority of the Kimberley coastline. The practice of traditional fishing includes taking turtles, dugong, fish and other marine life. The EPBC Act Protected Matters Search (Appendix B) did not identify any indigenous protected areas (IPAs); however, traditional aboriginal fishing activities may occur at non-designated areas along the WA coastline but not within the offshore waters of the EMBA.

The extraction of living resources via illegal, unregulated and unreported fishing along the northern edges of the NWMR is a pressure of potential concern for the carbonate bank and terrace system of the Sahul Shelf and the Commonwealth waters surrounding Ashmore Reef and Cartier Island (DSEWPaC 2012).

Indonesian fishing

The Australian and Indonesian governments signed a memorandum of understanding (MoU) in 1974 (DSEWPaC 2012) which permits fishing by Indonesian and Timorese fishers, using traditional fishing methods only, in an area of Australian waters in the Timor Sea. The MoU area, which has become known as the "MoU Box", covers Scott Reef and its surrounds, Seringapatam Reef, Browse Island, Ashmore Reef, Cartier Island and various banks and shoals (Figure 4-2).

The MoU requires fishers to use traditional sail-powered fishing vessels and non-motorised equipment, and prohibits them from taking protected species, such as turtles, dugongs and clams. Fishers target a range of animals, including trepang (bêche-de-mer), *trochus* (topshell), reef fish and sharks. Indonesian fishing effort is high at Scott Reef and also takes place at Browse Island.

Although WA-50-L falls within the MoU Box, due to the nature of traditional fishing activities, the actual fishing effort generally only occurs in the shallow subtidal / intertidal habitats of the reefs and islands within the EMBA.

Traditional Indonesian fishing effort is intense at Seringapatam Reef and Commonwealth waters in the Scott Reef complex. Depending on the intensity of effort and composition of catch, the extraction of living resources from these KEFs may affect trophic structures and ecological functioning (DSEWPaC 2012). Indigenous harvest of traditional marine resources (e.g. turtles, whale sharks and dugong) in international waters adjacent to the NWMR is also a pressure of potential concern (DSEWPaC 2012).

4.8.4 Aquaculture

There are no aquaculture operations in WA-50-L. Aquaculture development in the region is dominated by the production of pearls from the species *Pinctada maxima.* A large number of pearl oysters for seeding are obtained from wild stocks and supplemented by hatchery-produced oysters with major hatcheries operating at Broome and the Dampier Peninsular; however, these do not lie within the EMBA.

4.8.5 Shipping and ports

Vessel tracking data from AMSA's Craft Tracking System (CTS) for May 2019 is presented in Figure 4-8. CTS collects vessel traffic data from a variety of sources, including terrestrial and satellite shipborne Automatic Identification System (AIS) data sources. Figure 4-8 highlights the presence of commonly used transit routes in the vicinity of the licence area used by supply vessels routinely supporting offshore developments in the Browse Basin including the INPEX Ichthys within WA-50-L itself, and the nearby Shell Prelude FLNG facility. The major shipping lanes linking WA to Indonesia are situated over 180 km to the west of WA-50-L (Figure 4-8).

The closest ports to WA-50-L are Derby, Broome and Wyndham. These are small ports, exporting nickel, lead, zinc and cattle, and importing products to support their local communities. The Ports of Broome and Darwin typically provide supply facilities for the petroleum industry operating in the Browse Basin.

By comparison, the ports along the north-west and north coast, such as Onslow, Dampier, Cape Lambert, Port Hedland, and Darwin handle much larger tonnages of iron ore, and petroleum exports, with shipping routes throughout the region.

4.8.6 Oil and gas industry

The Browse Basin is subject to considerable exploration activity. The closest operational production facilities to WA-50-L, excluding the INPEX Ichthys facility, is the Shell Prelude FLNG facility located approximately 17 km to the north east. The next closest production facility is Jadestone Energy's Montara project in the Vulcan sub-basin, approximately 130 km from WA-50-L.

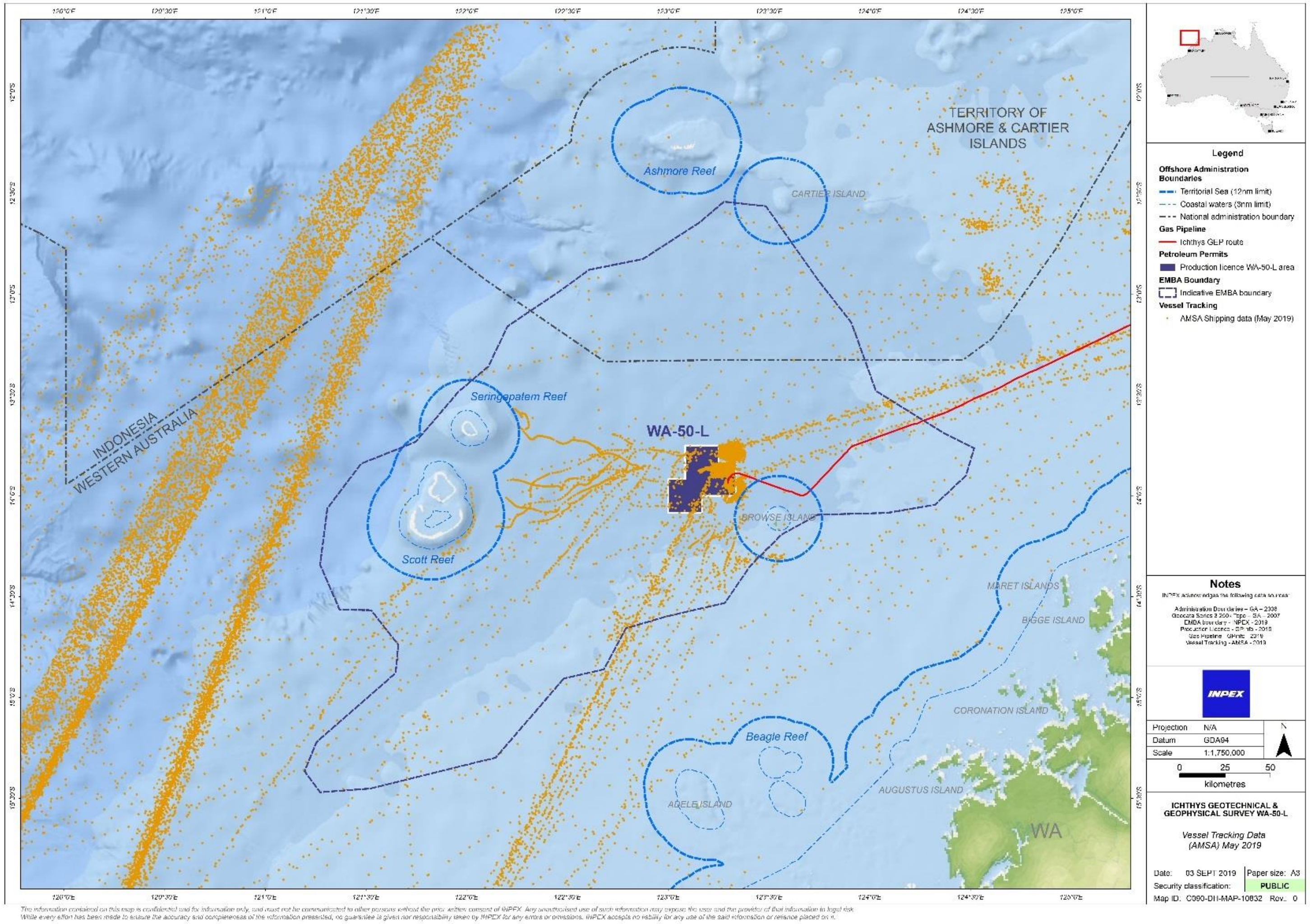

Figure 4-8: Vessel tracking data in the Browse Basin (May 2019)

4.9 Summary of values and sensitivities

4.9.1 WA-50-L

Table 4-9: Particular values and sensitivities potentially within WA-50-L

<table>
<tr><th colspan="2">Value and sensitivity</th><th>Description</th></tr>
<tr><td colspan="2">Receptors that are considered socially important as identified during stakeholder engagement (including social and cultural heritage).</td><td>Fisheries (traditional and commercial).</td></tr>
<tr><td colspan="2">Benthic primary producer habitat, defined by the Western Australian Environmental Protection Authority (WA EPA) Environmental Assessment Guideline No. 3 Environmental Assessment Guidelines for Protection of Benthic Primary Producer Habitat in Western Australia's Marine Environment as functional ecological communities that inhabit the seabed within which algae (e.g. macroalgae, turf and benthic microalgae), seagrass, mangroves, corals, or mixtures of these groups, are prominent components.</td><td>None identified within WA-50-L.</td></tr>
<tr><td colspan="2">Regionally important areas of high diversity (such as shoals and banks).</td><td>WA-50-L overlaps the continental slope demersal fish communities KEF</td></tr>
<tr><td colspan="2">World heritage values of a declared World Heritage property within the meaning of the EPBC Act.</td><td>None identified within WA-50-L.</td></tr>
<tr><td colspan="2">National heritage values of a National Heritage place within the meaning of the EPBC Act.</td><td>None identified within WA-50-L.</td></tr>
<tr><td colspan="2">Ecological character of a declared Ramsar wetland within the meaning of the EPBC Act.</td><td>None identified within WA-50-L.</td></tr>
<tr><td colspan="2">Presence of a listed threatened species or listed threatened ecological community within the meaning of the EPBC Act.</td><td rowspan="2">A number of threatened species or migratory species have been identified as having the potential to transit through WA-50-L.
These have been categorised as marine fauna:
• marine mammals
• marine reptiles
• fishes and sharks
• marine avifauna.
Also refer to Appendix B (EPBC Act Protected Matters Report).</td></tr>
<tr><td colspan="2">Presence of a listed migratory species within the meaning of the EPBC Act.</td></tr>
<tr><td rowspan="2">Any values and sensitivities that exist in, or in relation to, part or all of:</td><td>a Commonwealth marine area within the meaning of the EPBC Act.</td><td>Productivity and diversity associated with planktonic communities and benthic communities.</td></tr>
<tr><td>Commonwealth land within the meaning of the EPBC Act.</td><td>None identified within WA-50-L.</td></tr>
<tr><td colspan="2">BIAs associated with EPBC-listed species.</td><td>There are no known BIAs associated with listed threatened species or migratory species within WA-50-L.</td></tr>
</table>

4.9.2 EMBA

Table 4-10: Particular values and sensitivities potentially within the EMBA

Value and sensitivity	Description
Receptors that are considered socially important as identified during stakeholder engagement (including social and cultural heritage).	Fisheries (commercial, traditional and recreational).
Benthic primary producer habitat, defined by the Western Australian Environmental Protection Authority (WA EPA) Environmental Assessment Guideline No. 3 *Environmental Assessment Guidelines for Protection of Benthic Primary Producer Habitat in Western Australia's Marine Environment* as functional ecological communities that inhabit the seabed within which algae (e.g. macroalgae, turf and benthic microalgae), seagrass, mangroves, corals, or mixtures of these groups, are prominent components.	Benthic primary producer habitats are described in Section 4.7.2 and include the Commonwealth and state marine reserves and KEFs listed below.
Regionally important areas of high diversity (such as shoals and banks).	KEFs: • Continental slope demersal fish communities • Ancient coastline at 125 m depth contour • Seringapatam Reef and Commonwealth waters in the Scott Reef complex • Ashmore Reef and Cartier Island and surrounding Commonwealth waters. Benthic habitats: • Various banks and shoals, and coral reefs (Section 4.7.2) Shoreline habitats: • Islands and sandy beaches (Section 4.7.3).
World heritage values of a declared World Heritage property within the meaning of the EPBC Act.	None identified within this area.
National heritage values of a National Heritage place within the meaning of the EPBC Act.	None identified within this area.
Ecological character of a declared Ramsar wetland within the meaning of the EPBC Act.	None identified within this area.
Presence of a listed threatened species or listed threatened ecological community within the meaning of the EPBC Act.	A number of threatened species or migratory species have been identified as having the potential to transit through the EMBA. These have been categorised as marine fauna (Section 4.7.4): • marine mammals • marine reptiles • fishes and sharks • marine avifauna.
Presence of a listed migratory species within the meaning of the EPBC Act.	

Value and sensitivity		**Description**
		Also refer to Appendix B (EPBC Act Protected Matters Report).
Any values and sensitivities that exist in, or in relation to, part or all of:	a Commonwealth marine area within the meaning of the EPBC Act.	Productivity and diversity associated with planktonic communities and benthic communities.
	Commonwealth land within the meaning of the EPBC Act.	None identified within this area.
BIAs associated with EPBC-listed species.		A large number of BIAs are present within the EMBA including: Marine mammals • pygmy blue whale migration corridor • pygmy blue whale foraging at Scott Reef Marine reptiles • Turtle nesting, internesting and adjacent foraging areas including Browse Island, Cartier Island, and Sandy Islet (Scott Reef). Fish and sharks • whale shark foraging area • KEFs associated with increased species diversity and abundance (i.e. continental slope demersal fish communities and the ancient coastline at 125 m depth contour). Marine avifauna • a number of resting and breeding areas associated with shoreline habitats (e.g. Browse Island, Cartier Island, and Sandy Islet (Scott Reef).

5 STAKEHOLDER CONSULTATION

INPEX has been a member of the Australian business community since 1986 and during this time has engaged on a regular basis with stakeholders in WA and in federal jurisdictions on a broad range of activities. INPEX maintains a corporate webpage (http://www.inpex.com.au) to provide company and project-related information to the public. INPEX also participates in industry forums, conferences and community meetings in order to facilitate opportunities for meaningful engagement about current and future activities.

INPEX acknowledges the importance of consultation to ensure that persons who may be affected by a proposed petroleum activity ('relevant persons') are informed about the proposed activity and have the opportunity to advise INPEX of any functions, interests or activities that could be impacted by the proposed activity.

INPEX's awareness of the functions, interests or activities of relevant persons supports the development of management plans that consider and address any environmental, social or economic objections or claims about the proposed activity.

INPEX's process for stakeholder engagement (consultation) in the development and implementation of an EP and relevant management plans is shown in Figure 5-1 and further described in this section.

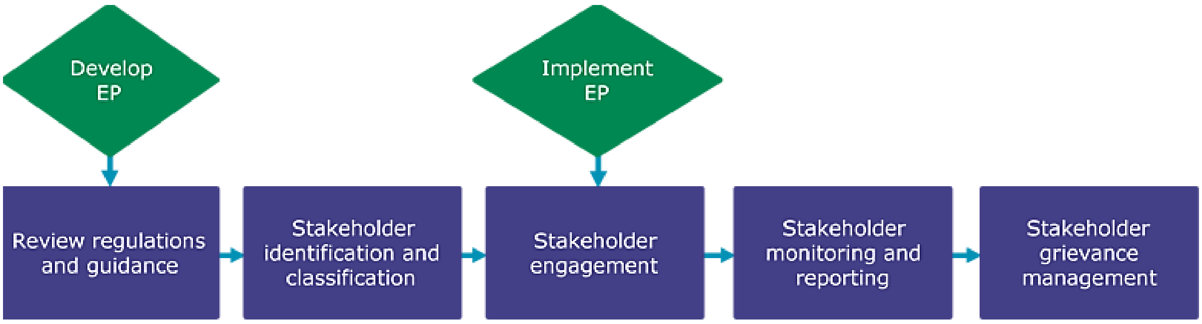

Figure 5-1: Process for stakeholder engagement (consultation) for development and implementation of an EP

5.1 Regulatory requirements and guidelines

As a first step in EP development, INPEX reviewed the following documents to prepare for stakeholder consultation on the proposed offshore petroleum activity:

- Offshore Petroleum Greenhouse Gas Storage (Environment) Regulations
- NOPSEMA policies, guidance and information papers related to environment plan development, including:
  - GL1721 - Environment plan decision making - Rev 5 - June 2018
  - GN1344 - Environment plan content requirements - Rev 4 - April 2019
  - GN1488 - Oil pollution risk management - Rev 2 - February 2018
  - IP1411 - Consultation requirements under the OPGGS Environment Regulations 2009 - Rev 2
  - GN1785 – Petroleum activities and Australian marine parks – Rev 0 – July 2018
- Guidance issued by relevant stakeholders (as known or provided to INPEX), including:

   - Australian Government Guidance: Offshore Petroleum and Greenhouse Gas Activities: Consultation with Australian Government agencies with responsibilities in the Commonwealth Marine Area
   - Australian Fisheries Management Authority (AFMA): Petroleum industry consultation with the commercial fishing industry
   - WA Department of Primary Industry and Regional Development (WA DPIRD): Guidance statement for oil and gas industry consultation with the Department of Fisheries
   - WA Department of Transport (WA DoT): Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements
- INPEX stakeholder engagement procedures and guidelines.

INPEX acknowledges its responsibility under the various legislative instruments and other guidance to ensure that relevant persons are appropriately identified and consulted in the development of its EPs and in the conduct of its offshore activities.

5.2 Stakeholder identification and classification

With an understanding of the general requirements and expectations for consultation, INPEX conducted stakeholder identification and classification activities.

As an initial exercise, 'relevant persons' were identified, then classified, to determine a suitable engagement priority and method. Key INPEX personnel met in a workshop to outline the requirement for engagement, established the context of the proposed activities, and identified relevant persons in accordance with Regulation 11A(1) of the OPPGS (E) Regulations and NOPSEMA's additional clarifications of Regulation 11A(1) as provided in Issues Paper IP1411 (NOPSEMA 2014).

INPEX treats stakeholder identification (and subsequent activities) as an iterative process whereby the company may become aware of relevant persons both during the process of consultation on, and also after the development and submission of, an EP. INPEX acknowledges that relevant persons may be identified during an EP assessment period and also in the lead up to and conduct of an accepted petroleum activity.

5.2.1 Definition of 'relevant persons'/relevant stakeholders

In identifying relevant persons to be consulted on the proposed petroleum activity, INPEX prescribes to the definition provided under Subregulation 11A(1) of the OPGGS (E) Regulations, being:

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.*

5.2.2 Relevant activity

In determining who is a relevant stakeholder, it was necessary for INPEX to determine what constitutes a relevant activity, and for which activities a stakeholder should be engaged.

Petroleum activity (planned activity)

The OPGGS (E) Regulations require that consultation be undertaken to ensure that persons who may be affected by a petroleum activity are given the opportunity to inform the titleholder how they may be affected and to allow the titleholder to assess and address any objections or claims about that activity in the preparation of environment submissions.

Regulation 4 of the OPGGS (E) Regulations defines a petroleum activity as *"any operations or works in an offshore area carried out for the purpose of:*

a. exercising a right conferred on a petroleum titleholder under the Act by a petroleum title; or

b. discharging an obligation imposed on a petroleum titleholder by the Act or a legislative instrument under the Act."

When identifying relevant persons, INPEX considers which stakeholders perform a function in the relation to – or have a function, activity or interest that may be impacted by – the planned, physical petroleum activity.

The planned activity for this EP is a geotechnical and geophysical survey to be undertaken in the Commonwealth waters of WA-50-L. Therefore, in determining who is a relevant person for engagement on the petroleum activity, INPEX sought to identify and engage with stakeholders whose functions, interests or activities could be affected by the survey activity.

Unplanned event/activity (emergency conditions)

INPEX undertakes a more targeted approach to consultation with stakeholders in relation to unplanned – and highly improbable – emergency conditions, e.g. a loss of containment of hydrocarbons during the survey activity.

Stakeholders who may perform a function in INPEX's planning for, or management of an unplanned activity, and whose information is integral to the development of those management plans, are engaged during the development of the EP and OPEP.

Stakeholders whose functions, interests or activities otherwise overlap the EMBA for the unplanned activity are not engaged during the development of those plans but may be engaged in the event of an unplanned emergency condition.

This approach has been adopted to reduce consultation fatigue for stakeholders who will not be impacted by the (physical) petroleum activity.

INPEX will engage contrary to this approach where a stakeholder has expressed a significant (high to very high) level of concern about loss of containment events and wishes to understand more about the potential impact and planned response activities.

INPEX maintains an extended stakeholder list which includes stakeholders who may have a function, activity or interest that falls within for the EMBA, but for the purpose of the development of these plans, engages with stakeholders as outlined in Table 5-1.

Table 5-1: Classification and method of engagement with stakeholders in relation to an unplanned oil spill event and oil spill response

Stakeholder category	Method of engagement	Stakeholders
Government departments, agencies or organisations with functions or roles directly relevant to emergency and oil spill preparedness and response	Involve / consult regarding the proposed activity and potential unplanned emergency conditions during the preparation of the EP and OPEP.	• Australian Maritime Safety Authority (AMSA) • WA Department of Transport (WA DoT) • WA Department of Primary Industries and Regional Development (WA DPIRD) • WA Department of Biodiversity, Conservation and Attractions (DBCA) • Australian Marine Oil Spill Centre (AMOSC)
Stakeholders where land access is required to be agreed prior to the activity commencing	Involve / consult regarding the proposed activity and potential unplanned emergency conditions during the preparation of the EP and OPEP.	• Landowners • Native title holders • Aboriginal and Torres Strait Islander communities
Stakeholders whose level of interest (or expectation) in relation to a potential oil spills and oil spill response for the planned activity is high or very high.	Inform regarding the proposed activity and potential unplanned emergency conditions during the preparation of the EP and OPEP.	As determined during stakeholder identification workshop.
Stakeholders whose level of interest (or expectation) in relation to a potential oil spills and oil spill response for the planned activity is low or medium.	To be informed only in the event of an unplanned emergency condition (i.e. oil spill) that has the potential to affect their functions, activities or interests.	As determined during stakeholder identification workshop.

5.2.3 Commercial fishery stakeholder identification and classification

In addition to the process outlined above for planned activities and unplanned events, identification of relevant commercial fishing stakeholders distinguishes between:

- fisheries that overlap the planned petroleum activity; and
- fisheries that overlap the EMBA but not the location of the planned petroleum activity.

INPEX used a variety of resources (e.g. data files and fishery reports) to identify and classify stakeholders according to these criteria.

With the view to minimise stakeholder fatigue, INPEX restricted engagement activities to licence holders in fisheries that overlap the area (location) of the planned petroleum activity. INPEX also considered if and where licence holders are active (or potentially active) within a fishery to assess whether that licence holder should be engaged.

In summary, identification of and engagement with commercial fishing stakeholders was conducted as follows:

- Government authorities (AFMA, Department of Agriculture and WA DPIRD) were engaged regarding the proposed activity and engagement with commercial fishing stakeholders. Materials made available by government authorities, e.g. WA FishCube (fishing effort) data files and fishing reports, were used in fisheries determinations.

- Fishing industry associations that represent fisheries with licence areas that overlap the proposed activity (e.g. WAFIC, Commonwealth Fisheries Association) were consulted regarding the proposed activity and engagement with their members.
- Licence holders in commercial fisheries were engaged/not engaged according to the following criteria:
  - Active or potentially active licence holders in commercial fisheries whose activities overlap or are very close to the proposed petroleum activity were considered to be relevant stakeholders, and were accordingly engaged during the development of the EP.
  - Licence holders in commercial fisheries that overlap or are close to the planned petroleum activity, but whose activities or interests are not expected to be affected by the planned petroleum activity are not considered to be relevant stakeholders. Such licence holders were not engaged during the development of the EP, but the industry associations representing these fisheries were informed. An example would be where the licence holder fishes in a distant part of that fishery, e.g. off the southern coast of Australia.
  - Licence holders in commercial fisheries that overlap the broader EMBA but not the area of the proposed petroleum activity are not considered affected parties/relevant stakeholders and were therefore not informed during the development of the EP.

Licence holders that are not considered to be relevant to the planned petroleum activity are included in the expanded list of stakeholders who would be informed in the event of an unplanned emergency condition.

Table 5-2 presents the commercial fisheries classified according to their relevance to the planned petroleum activity or an unplanned emergency condition. No commercial fishery has been active within WA-50-L within the last 4 years, though it is noted that the Northern Demersal Scalefish Fishery (WA) and the North West Slope Trawl Fishery (Cwth) fish in adjacent waters and so licence holders of these two fisheries were determined to be relevant stakeholders. No other commercial fisheries fish in or close to the proposed petroleum activity.

Table 5-2: Classification of commercial fishery licence holders

Fishery	Relevance and process of engagement
Commercial fisheries overlapping or close to the planned petroleum activity area and with licence holder activities or interests that may be affected by the planned petroleum activity.	
Northern Demersal Scalefish Fishery – Area 2 (WA)	Relevant. Licence holders directly consulted.
North West Slope Trawl Fishery (Cwth)	
Commercial fisheries overlapping the planned petroleum activity area, but licence holder activities or interests are not expected to be affected by the planned petroleum activity.	
Mackerel Managed Fishery – Area 1 (WA)	Not affected.
Pearl Oyster Managed Fishery - Zone 3 (WA)	
North Coast Shark Fishery (Northern Zone) (WA)	

Fishery	Relevance and process of engagement
Western Tuna and Billfish Fishery (Cwth)	Licence holders not consulted during the development of the EP; however, representative industry associations were informed, and each fishery's interests considered in the development of the EP. Licence holders to be informed in the event of an unplanned emergency condition.
Western Skipjack Fishery (Cwth)	
Southern Bluefin Tuna Fishery (Cwlth)	
West Coast Deep Sea Crustacean Managed Fishery (WA)	
Commercial fisheries overlapping the EMBA but not the proposed petroleum activity area.	
Kimberley Prawn Managed Fishery (WA)	Not affected. Licence holders not consulted during the development of the EP, but each fishery's interests considered in the development of the EP. Licence holders to be informed in the event of an unplanned emergency condition.
Specimen Shell Managed Fishery (WA)	
South West Coast Salmon Managed Fishery (WA)	
Kimberley Mud Crab Managed Fishery (WA)	
Marine Aquarium Fish Managed Fishery (WA)	
Broome Prawn Managed Fishery (WA)	
Abalone Managed Fishery – Area 8 (WA)	

5.2.4 Stakeholder classification

Stakeholders were then classified based on their level of interest in/potential impact by, and influence over, the proposed petroleum activity. The purpose of this activity was to determine a 'priority' for consultation that was appropriate to the classification. Priority levels are shown in Table 5-3.

Table 5-3: Engagement classification

Priority	Interest/potential impact level and/or Influence level	Stakeholder classification (engagement priority)
Level 1	(Both) High to very high	**Collaborate/empower**: partner with stakeholder on each aspect of the decision; allow stakeholder (regulatory or approvals bodies) to make the final decision
Level 2	(Either) High to very high	**Consult/involve**: ensure stakeholder concerns and expectations are consistently understood and considered, and obtain feedback from stakeholders on analysis, alternatives and/or decisions
Level 3	(Both) Low to medium	**Inform**: provide balanced, objective, timely and consistent information to stakeholder

Stakeholders who are relevant only in the event of unplanned emergency conditions were classified separately based on their role or function in relation to unplanned emergency conditions or based on their level of interest and influence in unplanned emergency conditions.

5.3 Stakeholder engagement

Following the stakeholder identification and classification exercise, an engagement plan was developed to register identified stakeholders and the following information:

- the activities (planned and unplanned) for which they have been identified as relevant
- the activities on which they should be engaged
- the function, activity or interest that may be affected by the relevant activity
- their assigned classification (priority for engagement)
- the proposed manner of engagement (i.e. modes, timing, and by whom).

Those INPEX personnel responsible for engagement were provided with a copy of the plan and instructions on how to carry out the necessary engagement.

INPEX prepared a consultation information sheet to provide relevant stakeholders with important details of the proposed petroleum activity. The document (Appendix C) includes the following information:

- description of the activity, including location and map
- schedule
- methodology (i.e. how the activity will be undertaken, as well as general logistics and safety information)
- environmental management approach
- enquiries and feedback information.

The accompanying email (or cover letter) may provide more information relevant to the functions, activities or interests of the stakeholder receiving the information sheet. Additional information was also sent to stakeholders in subsequent communications, as requested by the stakeholder and/or as the information became available.

5.4 Stakeholder monitoring and reporting

Using the stakeholder engagement plan as a guide, INPEX retains a record of all communications sent and received as part of the stakeholder engagement activity. This includes email correspondence, telephone call logs, letters and minutes of meetings.

All queries and feedback from stakeholders were logged, and where applicable, forwarded for follow up, where applicable. All responses provided to stakeholders were appropriate to the nature of their communication, e.g. technical queries were investigated by area experts and responses provided.

5.4.1 Relevant matters, objections and claims

During stakeholder consultation, each meeting, phone call or piece of correspondence received from a stakeholder was assessed by INPEX for relevant information or for objections, claims or concerns raised regarding the activity. The INPEX assessment of relevance and assessment of merit considered four broad categories:

- objection, claim or concern has merit – The objection, claim or concern raised is relevant to both the planned petroleum activity and the stakeholder's functions, activities or interests. The matter has merit if there is a reasonable / scientific basis for related effects or impacts to occur and/or there is reasonable basis for the matter to be addressed in the EP.
- objection, claim, or concern does not have merit – The objection, claim or concern raised may be relevant to the planned petroleum activity or the stakeholder's functions, activities or interests, however, the matter raised has no credible or scientific basis.
- relevant matter – The matter raised does not fit the criteria descriptions for objections, claims or concerns with/without merit. However, the matter raised is relevant to the planned petroleum activity, comprises a request to INPEX for further relevant information, or provides information to INPEX that is relevant to the petroleum activity or the EP.
- not a relevant matter – Correspondence does not relate to the planned petroleum activity or the stakeholder's functions; interests or activities being affected by the petroleum activity. Non-relevant matters may also be generic in nature with no specific issues raised (e.g. salutations, acknowledgements, meeting arrangements, etc.).

A summary of all stakeholder consultation undertaken, and the full assessment relevance and merit are provided in Appendix C. The actual records of correspondence are provided in a 'Sensitive Matters Report' that is submitted to the Regulator separately to this EP.

An overview of feedback received from stakeholders that resulted in material inputs to the EP is provided in Table 5-4.

Table 5-4: Summary of relevant matters, objections, claims or concerns from stakeholder consultation

Stakeholder	Summary of material stakeholder feedback	Summary of INPEX action
Australian Maritime Safety Authority (AMSA)	AMSA requested: • The Master notify AMSA's Joint Rescue Coordination Centre (JRCC) for promulgation of radio-navigation warnings at least 24-48 hours before operations commence. • The JRCC be advised when operations start and end. • The Australian Hydrographic Office (AHO) be contacted no less than four working weeks before operations to promulgate the appropriate Notice to Mariners (NTM).	The relevant notifications requested by AMSA have been adopted as controls in Section 7.7.1 of the EP.

Stakeholder	Summary of material stakeholder feedback	Summary of INPEX action
Department of Agriculture (DA) (previously Department of Agriculture and Water Resources)	DA advised that where domestic conveyances become exposed through interactions with persons, goods or conveyances outside of Australian Territorial Sea, they automatically become subject to biosecurity control upon their return. Advised that if the DA concludes that the level of biosecurity risk associated with the offshore installation is low, an exposed conveyance (the support vessels to the offshore installation) may be eligible for exemption from biosecurity control.	INPEX provided DA with a copy of INPEX's Domestic Biofouling risk assessment process and an example of a biosecurity risk assessment. It is acknowledged that the information provided to the DA in the example biosecurity risk assessment was primarily focussed on the longer-term activities planned for WA-50-L e.g. development drilling and installation of URF infrastructure; however, the assessment of impacts and risk and the controls to be implemented are also applicable for the geotechnical and geophysical survey in WA-50-L. The biosecurity matters raised by DA have been considered in Section 7.5.1 of the EP.
Department of Mines, Industry Regulation and Safety WA (DMIRS)	Requested INPEX send through activity commencement and cessation notifications.	DMIRS's request to be notified of the activity commencement has been incorporated into Section 9.8.3 of the EP (ongoing stakeholder consultation).
Office of the Director of National Parks (DNP)	DNP confirmed that the planned activities associated with the EP do not overlap any AMPs and therefore there no authorisation requirements from DNP. DNP do not require further notification of progress made in relation to this activity unless details regarding the activity changes and result in an overlap with a marine park or for emergency responses. In emergency situations, DNP requested to be made aware as soon as possible of oil/gas pollution incidences which occur within or are likely to impact on a marine park.	Information provided from the DNP with respect to the values associated with the closest AMPs have been described in Section 4 of the EP and considered in Sections 7 and 8 with respect to control measures that will ensure the activity is managed in accordance with AMP management plans. In the event of a spill, INPEX oil spill notifications are aligned with the DNP requirements as described in Section 4.3, Section 9.11.3 and Appendix D (OPEP – Section 2.4.3/Table 2-3).

5.5 Stakeholder grievance management

For the development of an EP or OPEP and subsequent performance of the activities described therein, a grievance is a complex stakeholder objection or claim ('relevant matter') which has progressed beyond management through the Stakeholder Monitoring and Reporting process.

In line with grievance management as described in the INPEX Community Grievance Management Procedure, a relevant matter that cannot be resolved with the concerned stakeholder (grievant) by the applicable contact person (supported by area experts where required) will be referred to the INPEX Community Relations Working Group (CRWG) for advice and resolution before a response is made to the grievant.

If the resolution proposed by the INPEX CRWG is unacceptable to the grievant, a third-party mediator may become involved to facilitate a resolution between the parties.

In relation to engagement activities for this EP, all stakeholder enquiries were either dealt with as outlined above or are ongoing due to the iterative process of engagement being applied.

5.6 Ongoing consultation

Ongoing consultation activities ensure that INPEX develops and maintains a current and comprehensive view of stakeholder functions, interests and activities, and provide a forum for enquiries, objections or claims by relevant persons in the lead up to and during the conduct of a petroleum activity.

Ongoing consultation for the proposed activity is outlined in the implementation strategy (Section 9.8.3).

6 ENVIRONMENTAL IMPACT AND RISK ASSESSMENT METHODOLOGY

In accordance with Division 2.3, Regulation 13(5) of the OPGGS (E) Regulations 2009, an environmental risk assessment was undertaken to evaluate impacts and risks arising from the activities described in Section 3. This section describes the process in which impacts and risks were identified. A summary of the outcomes from this process are included in Section 7 and Section 8.

An environmental hazard identification (HAZID) workshop was undertaken for the petroleum activity. The workshop involved environmental, engineering, compliance, health, safety, and emergency response personnel.

The workshop was undertaken in accordance with INPEX health, safety and environment (HSE) Risk Management processes. The approach generally aligned to the processes outlined in ISO 31000:2009 *Risk Management – Principles and guidelines* (Standards Australia/ Standards New Zealand, 2009) and Handbook 203:2012 *Managing environment-related risk* (Standards Australia/Standards New Zealand 2012).

The environmental impact and risk evaluation process has been undertaken in nine distinct stages:

1. the establishment of context
2. the identification of aspects, hazards and threats
3. the identification of potential consequences (severity)
4. the identification of existing design safeguards and control measures
5. proposal of additional safeguards (ALARP evaluation)
6. an assessment of the likelihood
7. an assessment of the residual risk
8. an assessment of the acceptability of the residual risk
9. the definition of environmental performance outcomes, standards and measurement criteria.

6.1 Establishment of context

The first stage in the process involved defining the activity, characterising the environment and identifying the particular values and sensitivities of that environment. The outcomes of these exercises are presented in Section 3 *Description of Activity* and Section 4 *Existing Environment*, of this EP.

6.2 Identification of aspects, hazards and threats

An assessment was undertaken to identify the aspects associated with the petroleum activity. An aspect is defined by ISO 14001: 2015 *Environmental Management Systems (EMS)* as:

"An element or characteristic of an activity, product, or service that interacts or can interact with the environment".

The aspects were grouped to align with the INPEX HSEQ-MS environment standards. A summary of the aspects identified for the petroleum activity were as follows:

- emissions and discharges
- waste management
- noise and vibration

- loss of containment
- biodiversity and conservation protection
- land disturbance (or seabed disturbance)
- social and cultural heritage protection.

Hazards are defined by the *INPEX HSE Hazard and Risk Management Standard* as:

"A physical situation with the potential to cause harm to people, damage to property, damage to the environment".

As the definition suggests, for an environmental risk or impact to be realised, there needs to be a chance of exposing an environmental value or sensitivity to a hazard.

Given the various receptors present in the environment, they have been refined to environmentally sensitive or biologically important receptors (values and sensitivities). They have been selected using regulations, government guidance and stakeholder feedback.

For the purposes of the evaluation, environmental values and sensitivities to be considered include the following:

- receptors that are considered socially important as identified during stakeholder engagement (including social and cultural heritage)
- benthic primary producer habitat, defined by the Western Australian Environmental Protection Authority (WA EPA) Environmental Assessment Guideline No. 3 *Environmental Assessment Guidelines for Protection of Benthic Primary Producer Habitat in Western Australia's Marine Environment* as functional ecological communities that inhabit the seabed within which algae (e.g. macroalgae, turf and benthic microalgae), seagrass, mangroves, corals, or mixtures of these groups, are prominent components
- regionally important areas of high diversity (such as shoals and banks)
- particular values and sensitivities as defined by Regulation 13(3) of the OPGGS(E) Regulations 2009:
  - the world heritage values of a declared World Heritage property within the meaning of the EPBC Act
  - the national heritage values of a National Heritage place within the meaning of the EPBC Act
  - the ecological character of a declared Ramsar wetland within the meaning of the EPBC Act
  - the presence of a listed threatened species or listed threatened ecological community within the meaning of the EPBC Act
  - the presence of a listed migratory species within the meaning of the EPBC Act
  - any values and sensitivities that exist in, or in relation to, part or all of:
    - a Commonwealth marine area within the meaning of the EPBC Act – Note that this value and sensitivity includes receptors (e.g. planktonic and benthic communities) that, when exposed, have the potential to affect regionally significant ecological diversity and productivity from benthic and planktonic communities
    - Commonwealth land within the meaning of the EPBC Act.
- biologically important areas associated with EPBC-listed species.

6.3 Identify potential consequence

In sections 7 and 8, for each aspect, the greatest consequence (or potential impact) of an activity, is evaluated with no additional safeguards or control measures in place. This allows the assessment to be made on the maximum foreseeable exposure of identified values and sensitivities to the hazard taking into account the extent and duration of potential exposure. The consequence is defined using the INPEX Risk Matrix (Figure 6-1).

Given that the receptors, identified as particular values and sensitivities are the most regionally significant or sensitive to exposure, these are considered to present a credible worst-case level of consequence to assess against.

6.4 Identify existing design safeguards/controls

Control measures associated with existing design are then identified to prevent or mitigate the threat and/or its consequence(s).

6.5 Propose additional safeguards (ALARP evaluation)

Where existing safeguards or controls have been judged as inadequate to manage the identified hazards (on the basis that the criteria for acceptability is not met as defined in Section 6.8), additional safeguards or controls are proposed.

The INPEX *HSE Hazard and Risk Management Standard* describes the process in which additional engineering and management control measures are identified, taking account of the principle of preferences illustrated in Figure 6-2. The options were then systematically evaluated in terms of risk reduction. Where the level of risk reduction achieved by their selection was determined to be grossly disproportionate to the “cost” of implementing the identified control measures, the control measure will not be implemented, and the risk is considered ALARP. Cost includes financial cost, time or duration, effort, occupational health and safety risks, or environmental impacts associated with implementing the control.

6.6 Assess the likelihood

The likelihood (or probability) of a consequence occurring was determined, taking into account the control measures in place. The likelihood of a particular consequence occurring was identified using one of the six likelihood categories shown in Figure 6-1.

6.7 Assess residual risk

Where additional controls/safeguards are identified, the residual risk is then evaluated and ranked.

INPEX

Risk Matrix

Refer to the Risk Management Guideline [0000-A0-GLN-60010] for guidance on how to apply the risk matrix.

LIKELIHOOD TABLE

Time Frame Could be experienced	100 year timeframe or less	50 year timeframe	10 - 20 year timeframe	5 year strategic planning time frame	1 -2 year budget timeframe	Once or more during the next year
Experience History of occurrence in Company or Industry	Unheard of in the industry or in Projects	Has occurred once or twice in the industry or rarely occurs in Projects	Has occurred many times in the industry but not in the company or in <1 out of 100 Projects	Has occurred once or twice in the company or in <1 out of 10 Projects	Has occurred frequently in the company or in many Projects	Has occurred frequently at the location or in every Project
Frequency Continuous Operation	Once every 10 000 – 100 000 years at location	Once every 1,000 – 10 000 years at location	Once every 100 - 1000 years at location	Once every 10 - 100 years at location	Once every 1 - 10 years at location	More than once a year at location or continuously
Probability Single activity	1 in 100 000 – 1 000 000	1 in 10 000 – 100 000	1 in 1000 – 10 000	1 in 100 - 1000	1 in 10 - 100	>1 in 10

CONSEQUENCE TABLE

Severity Level	CONSEQUENCES: Financial NPV	Financial A$	Health & Safety	Environment	Reputation	Cultural & Social Heritage	Legal
A	>$1B	> $5B **Project Schedule** >24 months	>20 fatalities or permanent total disabilities	Regional scale event, permanent impact on environment. Eradication of local populations of protected species	Prolonged international multi-NGO and media and by public protests. Loss of host government support and/ or social licence to operate. Company reputation severely tarnished	Permanent, long-term impact on social structure, and destruction of highly-valued heritage, aesthetic, economic or recreational items	Criminal prosecution, potential jail sentences for directors and senior officers. Civil prosecution, class actions. Heavy fines, threat to licence to operate or future approvals
B	$100M – $1B	$1B – $5B **Project Schedule** 12 – 24 months	2 – 20 fatalities or permanent total disabilities	Large scale event, long term impact on environment. Extensive impact on populations of protected species	International multi-NGO and media condemnation. Host government registers concerns. Prolonged large protests. Company reputation seriously impacted	Widespread disruption to a number of communities with damage to highly-valued heritage, aesthetic, economic or recreational items	Criminal prosecution for directors and senior officers. Civil prosecution and class actions. Heavy fines, threat to licence to operate
C	$10M – $100M	$100M – $1B **Project Schedule** 6 – 12 months	Single fatality or Permanent Total Disability	Medium to large scale event, medium term impact on environment. No threat to overall population viability of protected species	Serious public or national media outcry. Damaging NGO campaign. Large protests. Company reputation impacted	Significant impact to regional communities, and to heritage, aesthetic, economic or recreational items of significant value	Significant, multiple breaches of regulation or licence conditions. Significant litigation and fines
D	$1M – $10M	$10M – $100M **Project Schedule** 1 - 6 months	Major injury or illness, permanent partial disability, lost time injury	Local to medium scale event with short to medium term impact on environment. No threat to overall population viability of protected species	Major adverse national media, public or NGO attention. Significant protests. Asset reputation impacted	Regional community disruption with moderate impact on heritage, aesthetic, economic or recreational values	Serious breach of regulation. Investigation by regulatory authorities. Potential litigation and moderate fines
E	$100K– $1M	$1M – $10M **Project Schedule** 2 - 4 weeks	Minor injury or illness, alternative duties injury, medical treatment injury	Local scale event with short term impact on the environment. Minor and temporary impact on a small portion of the population of protected species	Attention from regional media with heightened concern with local community. Criticism by community or NGOs	Isolated community disruption with limited adverse impact on heritage, aesthetic, economic or recreational values	Minor legal issues. Report provided to regulatory authorities. Potential for minor fines
F	<$100K	<$1M **Project Schedule** <2 weeks	Slight injury or illness, first aid injury	Local scale event with temporary impact on environment. Behavioural responses inconsequential ecological significance to protected species	Short term local concern or complaints. Low level media or regulatory issue	Minor impact on heritage, aesthetic, economic or recreational values	Breach of internal standards. Potential scrutiny by regulatory authorities

Severity	Likelihood Level: 6 Remote	5 Highly Unlikely	4 Unlikely	3 Possible	2 Likely	1 Highly Likely
A Catastrophic	6	5	4	3	2	1
B Major	7	6	5	4	3	2
C Significant	8	7	6	5	4	3
D Moderate	9	8	7	6	5	4
E Minor	10	9	8	7	6	5
F Insignificant	10	10	9	8	7	6

Critical Risk

High Risk

Moderate Risk

Low Risk

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Figure 6-1: INPEX risk matrix

Most Preferred	**Elimination**		Removal of the hazard or sensitive receptor
	Substitution		Replacement of highly hazardous materials / approaches with less hazardous materials / approaches
	Engineering	**Prevention**	Design measures that reduce the likelihood of a hazardous event occuring
		Detection	Design measures that facilitate early detection of a hazardous event
		Control	Design measures that limit the extent/escalation potential of a hazardous event
		Mitigation	Design measures that protect the environment should a hazardous event occur
		Response Equipment	Design measures or safeguards that enable clean-up / response following the realisation of a hazardous event
	Procedures & Administration		Management systems and work instructions used to prevent or mitigate environmental exposure to hazards
Least Preferred	**Sensitive Receptor Protection**		The lowest level in the hazard management hierarchy which should only be considered when all higher controls in the hierarchy have been exhausted e.g. physical barriers located at the sensitive receptor

Figure 6-2: ALARP options preferences

6.8 Assess residual risk acceptability

Potential environmental impacts and risks are only deemed acceptable once all reasonably practicable alternatives and additional measures have been taken to reduce the potential impacts and risks to ALARP.

INPEX has determined that risks rated as "Critical" are considered too significant to proceed and are therefore, in general, unacceptable. In alignment with NOPSEMA's *Environment Plan Decision Making Guideline* (GL1721 Rev5 June 2018), INPEX considers that when a risk rating of "Low" or "Moderate" applies, where the consequence does not exceed "C" (Significant) and where it can be demonstrated that the risk has been reduced to ALARP, that this defines an acceptable level of impact.

Through implementation of this EP, impacts to the environment will be managed to ALARP and acceptable levels and will meet the requirements of Section 3A of the EPBC Act (principles of ecologically sustainable development) as shown in Table 6-1.

Table 6-1: Principles of ecological sustainable development (ESD)

Principles of ESD	Demonstration
a) decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;	The INPEX environmental policy (Figure 9-2), INPEX *HSE Hazard and Risk Management Standard* and the INPEX HSEQ-MS (Section 9.1) consider both long-term and short-term economic, environmental, social and equitable considerations.

Principles of ESD	Demonstration
b) if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;	No threat of serious or irreversible environmental damage is expected from the activity. Scientific knowledge is available to support this and processes are in place to ensure that INPEX remains up-to-date with scientific publications (Section 9.13).
c) the principle of inter-generational equity - that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;	The health, diversity and productivity of the environment shall be maintained and not impacted by the activity.
d) the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making;	Biological diversity and ecological integrity will not be compromised by the proposed activity.
e) improved valuation, pricing and incentive mechanisms should be promoted.	N/A

Consequently, the potential environmental impacts and risks associated with implementing the activity were determined to be acceptable if the activity:

- complies with relevant environmental legislation and corporate policies, standards, and procedures specific to the operational environment
- takes into consideration stakeholder feedback
- takes into consideration conservation management documents
- does not compromise the relevant principles of ESD; and
- the predicted level of impact does not exceed the defined acceptable level, in that the environmental risk has been assessed as "Low" or "Moderate", the consequence does not exceed "C – Significant" and the risk has been reduced to ALARP.

6.9 Definition of performance outcomes, standards and measurement criteria

As defined in Regulation 4 of the OPGGS (E) Regulations 2009, INPEX has used environmental performance outcomes and performance standards to address potential environmental impacts and risks identified during the risk assessment.

Environmental performance outcomes, standards, and measurement criteria that relate to the management of the identified environmental impacts and risks are defined as follows:

- environmental performance outcome means a measurable level of performance required for the management of environmental aspects of an activity to ensure that environmental impacts and risks will be of an acceptable level.
- environmental performance standard means a statement of the performance required of a control measure.
- measurement criteria are used to determine whether each environmental performance outcome and environmental performance standard has been met.

7 IMPACT AND RISK ASSESSMENT

Following the environmental impact and risk assessment methodology described in Section 6, the aspects, hazards and threats have been systematically identified. The aspects (and associated hazards) with the potential for impact or risk in relation to the relevant identified values and sensitivities are discussed in this section and in Section 8.

7.1 Emissions and discharges

7.1.1 Light emissions

Table 7-1: Impact and risk evaluation – change in ambient light levels from navigational lighting on the survey vessel

<table>
<tr><th colspan="2">Identify hazards and threats</th></tr>
<tr><td colspan="2">Light emissions will be generated from vessel lighting (necessary for navigational and safe working condition requirements). Light emissions have the potential to disturb light-sensitive marine fauna, specifically marine turtles, seabirds and migratory bird species, through localised attraction to light that may result in behavioural changes.</td></tr>
<tr><th>Potential consequence</th><th>Severity</th></tr>
<tr><td>The particular values and sensitivities identified as having the potential to be impacted by light emissions are:
• marine turtles (including the green turtle BIA at Browse Island)
• marine avifauna.

Behavioural changes reported in marine turtles exposed to increases in artificial lighting can include disorientation and interference during nesting (Pendoley 2005). Disorientation of adult marine turtles or hatchlings has been known to result in risks to the survival of some individuals through excess energy expenditure or increased likelihood of predation (Witherington & Martin 2000; Limpus et al. 2003). Browse Island (listed as a C-class reserve) is the closest turtle-nesting area (located approximately 33 km south east of WA-50-L) and is surrounded by a 20 km internesting buffer for green turtles between November and March (DEE 2017a) as described in Section 4.7.4.

Once turtle hatchlings have reached the ocean, they normally maintain seaward headings by using wave propagation direction as an orientation cue. This is because waves and swells generally reliably move towards shore in shallow coastal areas, therefore swimming into waves usually results in movement towards the open sea (Lohmann & Fittinghoff-Lohmann 1992). Although light emissions from the survey vessel may be visible within the internesting buffer at Browse Island, significant exposure or changes in ambient light levels are not expected to affect the behaviour of the marine turtle population in this area. This assessment was confirmed by the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC 2008) through the formal environmental assessment process, indicating that the risk of light spill adversely impacting any listed threatened species is low. The offshore light emissions generated from vessel lighting is not expected to have a discernible effect on adult turtles' or hatchlings' abilities to orientate to water at Browse Island and the potential for light from vessels to attract marine turtles once they are at sea is expected to be temporary with an inconsequential ecological significance (Insignificant F).</td><td>Insignificant (F)</td></tr>
</table>

It is stated in the Recovery Plan for Marine Turtles in Australia (DEE 2017a) that based on the long-life span and highly dispersed life history requirements of marine turtles it is acknowledged that they may be subject to multiple threats acting simultaneously across their entire life cycle, such as increases in background noise levels and vessel strike. In considering cumulative impacts of threats on small or vulnerable stocks of marine turtles, it is possible that light emissions may act as contributor to a stock level decline. As described in Section 4.7.4, WA-50-L is located within the East Asian–Australasian Flyway, an internationally recognised migratory bird pathway that covers the whole of Australia and its surrounding waters. The migration of marine avifauna through the EAA Flyway generally occurs at two times of year, northward between March and May and southward between August and November (Bamford et al. 2008; DEE 2017b). There are no BIAs for marine avifauna that overlap WA-50-L; however, BIAs for marine avifauna species are present within the region, the closest of which relates to foraging around Cartier Island (Figure 4-7). While not an identified BIA, the closest habitat for seabirds from the licence area is Browse Island. Browse Island is not a regionally significant habitat for seabirds, with previous surveys finding a lack of diversity of seabirds breeding there (Clarke 2010). Colonies of nesting crested terns (>1,000 birds) have been observed on Browse Island (Olsen et al. 2018). Browse Island has also been recognised, through previous INPEX stakeholder consultation with WA DBCA, as an important location for marine avifauna. Light emitted from offshore vessels has been found to attract seabirds, particularly those that are nocturnally active (BirdLife International 2012). Nocturnal birds are at much higher risk of impact (Wiese et al. 2001); however, there are no threatened nocturnal migratory seabirds that use the EEA Flyway (DEWHA 2010). A study by Poot et al. (2008) of offshore oil platforms in the North Sea, found that large flocks of migrating seabirds can be attracted to the lights of offshore oil platforms, particularly on cloudy nights and between the hours of midnight and dawn. Poot hypothesised that when such offshore platforms are located on long-distance bird migration routes, the impact of this attraction could be considered highly significant, as many birds cross the ocean with only small additional fat reserves than required for the transit (e.g. twelve hours of fat reserves for a ten-hour flight). Any delay (e.g. resting on a platform or circling around them) may decrease the bird's resilience and potential survival. Studies conducted in the North Sea indicate that migratory birds may be attracted to offshore lights when travelling within a radius of 3 to 5 km from the light source. Outside this area their migratory paths are likely to be unaffected (Marquenie et al. 2008). There is no published literature of these impacts occurring on the NWS of WA. Migratory shorebirds travelling the EAA Flyway may fly over the licence area, before moving on to the mainland (south) in the spring or Indonesia/Australian External Territories (north) in the autumn. It is possible that migratory birds may use offshore vessels in order to rest. However, the possibility of this occurring on the survey vessel associated with this activity in WA-50-L is considered to be low due to the short-term duration of the activity and presence of alternative habitat for resting and foraging at Browse Island and Cartier Island, resulting in minimal deviation from migratory pathways and limited potential for behavioural disruption. Therefore, any impact to seabirds or migratory birds from light emissions associated with vessel lighting is considered to be of inconsequential ecological significance (Insignificant F).	
Identify existing design and safeguards/controls measures	
None identified	

Propose additional safeguards/control measures (ALARP Evaluation)			
Hierarchy of control	Control measure	Used?	Justification
Elimination	Do not use lighting at night time.	No	Lighting is required by law for navigational and safety purposes.
Substitution	Exclude offshore lighting during key periods for bird migration.	No	In general, bird migrations occur over several months of the year: between March and May (northward) and between August and November (southward) (Bamford et al., 2008). Lighting of vessels is required year-round to ensure the safety of workers and the environment and cannot be eliminated for certain periods during the year.
Engineering	Reduce light intensity and/or frequencies which may attract turtles.	No	Lighting will be designed in accordance with the relevant Australian and international standards to ensure that worker and vessel safety is not compromised. The deployment of low-pressure sodium vapour lamps or other technologies which reduce / eliminate frequencies which have been shown to attract turtles (Witherington 1992) would not result in any significant benefit regarding turtle hatchling attraction from the closest nesting rookery on Browse Island, given the distance (approximately 33 km to Browse Island) and wave-front orientation cues (rather than light cues) of hatchlings once they are in the ocean.
Procedures & administration	None identified	N/A	N/A

Identify the likelihood
Although light may potentially be visible, given the distance from WA-50-L to the closest turtle nesting beaches (approximately 33 km to Browse Island), impacts to turtles from light emissions is Highly Unlikely (5). While impacts to seabirds from lighting of offshore vessels have been reported in the industry, they have only been recorded for facilities in the northern hemisphere. Although not directly related to vessel lighting, during the first 18 months of operation of the Ichthys Facility in WA-50-L (CPF and FPSO which are permanently lit) there have been no reports of unusual flocking or increased bird activity. Only the occasional individual bird has reported to have landed on the interlinked facility. Given the short-term duration of the activity (7-10 days), the presence of alternative resting/foraging habitat (Browse Island) and that there are several other permanently moored offshore installations in the vicinity of WA-50-L, with no records published on the attraction of seabirds or negative impacts to migratory seabirds from lighting, the likelihood of impact to these receptors from vessel lighting is considered Highly Unlikely (5).

Residual risk summary		
Based on a consequence of Insignificant (F) and a worst-case likelihood of Highly Unlikely (5) the residual risk is Low (10).		
Consequence	Likelihood	Residual risk

Insignificant (F)	Highly Unlikely (5)	Low (10)
Assess residual risk acceptability		

Legislative requirements

Navigational lighting is required by law for the safe operation of the survey vessel (*Navigation Act 2012* as appropriate to vessel class and AMSA's Marine Orders Part 30: Prevention of Collisions). Although there is no environmental legislation or guideline regarding the environmental management of light emissions from offshore facilities, the activity aligns with INPEX corporate policies through the reduction of environmental impacts and risks to ALARP levels.

Stakeholder consultation

During previous stakeholder consultation by INPEX for the Ichthys project, the DBCA confirmed to INPEX they have an interest in emissions of light that may affect DBCA managed lands or waters, or areas documented as likely to be important for wildlife conservation. INPEX have maintained ongoing consultation with DBCA as part of Ichthys operations and further information was provided to DBCA in relation to light emissions and seabirds in the Browse area. No other stakeholder concerns have been raised regarding potential impacts and risks from light emissions in WA-50-L.

Conservation management plans / threat abatement plans

Several conservation management plans have been consulted in the development of this EP (refer Appendix B). Light emissions have been identified as a threat for marine turtles and in accordance with the Recovery Plan for Marine Turtles in Australia (DEE 2017a) consideration has been given in the above assessment to the actions described in the plan to minimise light pollution.

ALARP summary

Although the level of environmental risk is assessed as Low, a detailed ALARP evaluation was undertaken to determine what additional control measures could be implemented to reduce the level of impacts and risks. No additional controls, beyond those identified during the detailed ALARP assessment can reasonably be implemented to further reduce the risk of impact.

Acceptability summary

Based on the above assessment, the risk of impacts is managed to acceptable levels because:

- the activity demonstrates compliance with legislative requirements/industry standards
- the activity takes into account stakeholder feedback
- the activity is managed in a manner that is consistent with the intent of conservation management documents
- the activity does not compromise the relevant principles of ESD
- the predicted level of impact does not exceed the defined acceptable level in that the environmental risk has been assessed as "low", the consequence does not exceed "C – significant" and the risk has been reduced to ALARP.

Environmental performance outcomes	Environmental performance standards	Measurement criteria	Responsibility

N/A no controls identified			

7.1.2 Atmospheric emissions

Table 7-2: Impact and risk evaluation – atmospheric emissions from the survey vessel

Identify hazards and threats	
Atmospheric emissions will be generated through the use of combustion engines and potentially ODS containing equipment on board the survey vessel (no waste incineration will occur during the activity). Such atmospheric emissions have the potential to result in localised changes in air quality and subsequent exposure of marine avifauna to air pollutants.	
Potential consequence	**Severity**
The particular values and sensitivities identified as having the potential to be impacted by atmospheric emissions are: • marine avifauna. As described in Section 4.7.4, WA-50-L is located within the East Asian–Australasian Flyway, an internationally recognised migratory bird pathway that covers the whole of Australia and its surrounding waters. The migration of marine avifauna through the EAA Flyway generally occurs at two times of year, northward between March and May and southward between August and November (Bamford et al. 2008; DEE 2017b). There are no BIAs for marine avifauna that overlap WA-50-L; however, BIAs for marine avifauna species are present within the region, the closest of which relates to foraging around Cartier Island (Figure 4-7). While not an identified BIA, the closest habitat for seabirds from the licence area is Browse Island. Browse Island is not a regionally significant habitat for seabirds, with previous surveys finding a lack of diversity of seabirds breeding there (Clarke 2010). Colonies of nesting crested terns (>1,000 birds) have been observed on Browse Island (Olsen et al. 2018). Browse Island has also been recognised, through previous INPEX stakeholder consultation with WA DBCA, as an important location for marine avifauna. In the absence of air quality standards or guidelines specifically for marine avifauna, human health air quality standards and guidelines have previously been used as a proxy for the assessment of atmospheric emissions from offshore production facilities and potential impacts to marine avifauna. The outcome of such assessments concluded that NO_2 concentrations may typically exceed long term (annual average) concentrations within a few kilometres of the emissions source and that short-term (1-hour average) exposure levels may be exceeded within a few hundred metres (i.e. 200-400 m) of the emission source (RPS APASA 2014). This assessment was undertaken for a production facility and therefore any changes in air quality resulting from the vessel and equipment emissions in WA-50-L are also predicted to be highly localised given the nature of the emissions are less than those from a production facility. If marine avifauna are exposed at all, they are only expected to be exposed to changes in air quality for short periods as they pass close to emissions sources. Chronic exposures are not considered plausible given that marine avifauna would move away (i.e. continue migration or undertake foraging activities elsewhere). Overall, the consequence of temporary, localised changes in air quality may result in short-term, sublethal effects to a small number of transient marine avifauna individuals and is therefore considered Insignificant (F).	Insignificant (F)

<table>
<tr><th colspan="4">Identify existing design and safeguards/controls measures</th></tr>
<tr><td colspan="4">The survey vessel will comply with the requirements of Marine Orders – Part 97: Marine Pollution Prevention – Air Pollution, the POTS Act, the Navigation Act 2012 and Annex VI of MARPOL 73/78 (as applicable to vessel and engine size, type and class), specifically:
marine diesel engines meet NO_X emission requirements and limits as set out by MARPOL 73/78, Annex VI, Regulation 13, and have an International Air Pollution Prevention (IAPP) certificate.
equipment and systems that contain ozone depleting substances (ODS) comply with MARPOL 73/78, Annex VI, Regulation 12, are identified in the vessels’ IAPP certificate and an ODS record book is maintained (where applicable).
vessels >400 GT have a Ship Energy Efficiency Management Plan (SEEMP).
vessel contractor will use marine diesel with a sulfur content <3.5% mass-for-mass (m/m) required by the POTS Act 1983 – Part IIID prior to 1 January 2020 (and 0.5% m/m sulfur content on and after 1 January 2020).</td></tr>
<tr><th colspan="4">Propose additional safeguards/control measures (ALARP Evaluation)</th></tr>
<tr><th>Hierarchy of control</th><th>Control measure</th><th>Used?</th><th>Justification</th></tr>
<tr><td>Elimination</td><td>Eliminate the use of survey vessel</td><td>No</td><td>The use of a vessel is the only way to undertake the activity and cannot be eliminated.</td></tr>
<tr><td>Substitution</td><td>None identified</td><td>N/A</td><td>N/A</td></tr>
<tr><td>Engineering</td><td>None identified</td><td>N/A</td><td>N/A</td></tr>
<tr><td>Procedures & administration</td><td>Preventative maintenance system</td><td>Yes</td><td>Vessel contractors have a preventative maintenance system in place to ensure diesel powered, power generation equipment is maintained and operated within original equipment manufacturers' (OEM) specification.</td></tr>
<tr><th colspan="4">Identify the likelihood</th></tr>
<tr><td colspan="4">The likelihood of marine avifauna approaching and/or resting on exhaust vents on the vessel during the short-term duration activity (7 – 10 days) and remaining in close enough proximity to be exposed to concentrations of air pollutants that result in symptoms such as irritation of eyes and respiratory tissues and breathing difficulties is considered Highly Unlikely. Marine avifauna that may pass by near the vessel during the activity are unlikely to be in close enough proximity to be exposed to the emissions sources and are therefore unlikely to have any discernible symptoms. It is considered likely that they would move away from any emissions source if they began to experience discomfort or symptoms. No marine avifauna BIAs or critical habitats are located in proximity or within WA-50-L.

Given the presence of alternative resting/foraging habitat (Browse Island) and with the control measures described above in place, the potential for changes to air quality and associated impacts to marine avifauna are reduced. Therefore, the likelihood of the described consequences to marine avifauna occurring is considered Highly Unlikely (5).</td></tr>
<tr><th colspan="4">Residual risk summary</th></tr>
<tr><td colspan="4">Based on a consequence of Insignificant (F) and a likelihood of Highly Unlikely (5) the residual risk is Low (10).</td></tr>
<tr><th colspan="2">Consequence</th><th>Likelihood</th><th>Residual risk</th></tr>
</table>

Insignificant (F)	Highly Unlikely (5)	Low (10)

Assess residual risk acceptability

Legislative requirements

The activities and proposed management measures are compliant with industry standards, relevant international conventions and Australian legislation, specifically AMSA Marine Orders – Part 97: Marine Pollution Prevention – Air Pollution, the POTS Act, the *Navigation Act* 2012, and MARPOL 73/78, Annex VI.

Stakeholder consultation

No specific stakeholder concerns have been raised regarding potential impacts and risks associated with atmospheric emissions in WA-50-L.

Conservation management plans / threat abatement plans

Several conservation management plans have been consulted in the development of this EP (refer Appendix B). None of the recovery plans or conservation advice documents have specific threats relating to atmospheric emissions from vessels operating offshore.

ALARP summary

Although the level of environmental risk is assessed as Low, a detailed ALARP evaluation was undertaken to determine what additional control measures could be implemented to reduce the level of impacts and risks. No additional controls, beyond those identified during the detailed ALARP assessment can reasonably be implemented to further reduce the risk of impact.

Acceptability summary

Based on the above assessment, the proposed controls are expected to effectively reduce the risk of impacts to acceptable levels because:
- the activity demonstrates compliance with legislative requirements/industry standards
- the activity takes into account stakeholder feedback
- the activity is managed in a manner that is consistent with the intent of conservation management documents
- the activity does not compromise the relevant principles of ESD
- the predicted level of impact does not exceed the defined acceptable level in that the environmental risk has been assessed as “low”, the consequence does not exceed “C – significant” and the risk has been reduced to ALARP.

Environmental performance outcomes	Environmental performance standards	Measurement criteria	Responsibility
Risks of impacts to marine avifauna from atmospheric emissions are reduced and maintained at acceptable levels through implementation of the environmental performance standards and the application of	Pre-mobilisation HSE inspections confirms the vessel contractor will comply with MARPOL 73/78 (Annex VI), *Navigation Act 2012* – Marine Orders – Part 97: Marine Pollution Prevention – Air Pollution, Annex VI (as appropriate to class of vessel), specifically:	Pre-mobilisation HSE inspection documentation demonstrates that that the survey vessel holds a valid IAPP Certificate and emission of NOx from engines is within specified limits, as appropriate to vessel class.	Environmental advisor

the environmental management implementation strategy.	• International Air Pollution Prevention (IAPP) certificate and emission of NOx (for vessels 400 GT or above).		
	Pre-mobilisation HSE inspections confirm the vessel contractor complies with MARPOL 73/78, Annex VI, Regulation 12 - Ozone-Depleting Substances from refrigerating plants and firefighting equipment, which includes: • Maintenance of an ODS Record Book (where applicable).	Pre-mobilisation HSE inspection documentation demonstrates that ODS Record Book (where applicable) is current and maintained, as per MARPOL 73/78, Annex VI, regulation 12.	Environmental advisor
	Pre-mobilisation HSE inspections confirms the survey vessel (>400 GT) will hold a valid International Energy Efficiency (IEE) certificate and a Ship Energy Efficiency Management Plan (SEEMP) compliant with the requirements of Marine Orders – Part 97, the POTS Act and MARPOL 73/78, Annex VI (as applicable to the vessel and engine size, type and class).	Premobilisation HSE inspection records confirms the survey vessel >400 GT has an IEE certificate and a SEEMP that meet the requirements of Marine Orders – Part 97, the POTS Act and MARPOL 73/78, Annex VI (as applicable to the vessel, engine/propulsion size, type and class).	Environmental advisor
	Marine diesel with 3.5% (m/m) sulfur content or less will be used in vessel engines prior to 1 January 2020 (and 0.5% m/m sulfur content on and after 1 January 2020).	Fuel delivery receipt indicates only low sulfur marine diesel is used.	Vessel master
	Vessel contractor has a preventative maintenance system to ensure diesel powered, power generation equipment is maintained and operated within OEM specification.	Records show diesel and power generation equipment is maintained in accordance with manufacturers' specifications.	Vessel master

7.1.3 Routine discharges to sea

Sewage, grey water and food waste

Table 7-3: Impact and evaluation –discharges of sewage, grey water and food waste from the survey vessel

<table>
<tr><td colspan="4">Identify hazards and threats</td></tr>
<tr><td colspan="4">Discharging treated sewage effluent, grey water and food waste has the potential to expose planktonic communities to changes in water quality from the introduction of nutrients. Such a decline in water quality has the potential to result in reduced ecosystem productivity or diversity. These intermittent discharges will occur in WA-50-L, which is located in the open ocean and more than 12 nm from the nearest land.</td></tr>
<tr><td colspan="3">Potential consequence</td><td>Severity</td></tr>
<tr><td colspan="3">The particular values and sensitivities identified as having the potential to be impacted by sewage, grey water and food waste discharges are:
• planktonic communities.

A study undertaken to assess the effects of nutrient enrichment from the discharge of sewage in the ocean found that the influence of nutrients in open marine areas is much less significant than that experienced in enclosed, poorly mixed water bodies. The study also found that zooplankton composition and distribution in areas associated with sewage dumping grounds were not affected (McIntyre & Johnston 1975).

When sewage effluent, grey water and food waste is discharged there is the potential for localised and temporary, changes in water quality within WA-50-L. The potential consequence on planktonic communities is a localised impact on plankton abundance in the vicinity of the point of discharge. Given the deep water (approximately 250 m) location, oceanic currents will result in the rapid dilution and dispersion of these discharges. Therefore, the consequence is considered to be of inconsequential ecological significance (Insignificant F).</td><td>Insignificant (F)</td></tr>
<tr><td colspan="4">Identify existing design and safeguards/controls measures</td></tr>
<tr><td colspan="4">The survey vessel will manage the discharge of sewage effluent and grey water in accordance with MARPOL 73/78 Annex IV, Marine Orders 96: Marine Pollution Prevention – Sewage (as appropriate to class), which is implemented through the POTS Act.
The survey vessel will manage the discharge of garbage in accordance with MARPOL 73/78 Annex V, Marine Orders 95: Marine Pollution Prevention – Garbage (as appropriate to class), which is implemented through the POTS Act.</td></tr>
<tr><td colspan="4">Propose additional safeguards/control measures (ALARP Evaluation)</td></tr>
<tr><td>Hierarchy of control</td><td>Control measure</td><td>Used?</td><td>Justification</td></tr>
<tr><td>Elimination</td><td>Eliminate discharges sewage, grey water and food waste from the survey</td><td>No</td><td>The significant financial cost and health risks associated with storing sewage, grey water and food waste on board the survey vessel and</td></tr>
</table>

	vessel by storing on board and shipping to the mainland for disposal.		transporting it to the mainland is grossly disproportionate to the low level of risk associated with this discharge, permitted under legislation. Additional environmental impacts would also be generated in terms of air emissions and onshore disposal.
Substitution	None identified	N/A	N/A
Engineering	None identified	N/A	N/A
Procedures & administration	Preventative maintenance system	Yes	Vessel contractor will have a preventative maintenance system in place to ensure sewage treatment plant (STP) and macerator equipment is maintained and operated within OEM specification.

Identify the likelihood		
Sewage and garbage discharges from the survey vessel will be in accordance with legislative requirements (MARPOL 73/78 Annex IV & V, Marine Orders 95 and 96). Maceration of sewage and food waste to a particle size <25 mm prior to disposal will increase the ability of the discharges to disperse rapidly. The effects of sewage discharged to the ocean have been relatively well studied (Gray et al. 1992; Weis et al. 1989) and toxic effects generally only occur where high volumes are discharged into a small and poorly mixed waterbody. The volumes discharged from the vessel during the 7-10 day survey within the licence area are unlikely to cause toxic effects, especially considering the rapid dilution provided by the deep water and ocean currents. Based on the expected high dispersion due to the open-ocean environment of WA-50-L, localised impacts to plankton at the point of the planned discharge are considered to be Unlikely (4).		
Residual risk summary		
Based on a consequence of Insignificant (F) and a likelihood of Unlikely (4) the residual risk is Low (9).		
Consequence	Likelihood	Residual risk
Insignificant (F)	Unlikely (4)	Low (9)
Assess residual risk acceptability		
Legislative requirements Sewage, grey water and food waste discharges are standard practice in the offshore environment and the disposal at sea is permitted under AMSA (2013) Marine Orders – Part 96: Marine Pollution Prevention – Sewage, which gives effect to MARPOL 73/78, Annex IV and Marine Orders – Part 95: Marine Pollution Prevention – Garbage, which gives effect to MARPOL 73/78, Annex V. Stakeholder consultation No stakeholder concerns have been raised regarding potential impacts and risks from planned discharges (sewage, grey water and food waste). Conservation management plans / threat abatement plans		

Several conservation management plans have been consulted in the development of this EP (refer Appendix B). Emissions and discharges are listed as threatening processes; however, none of the recovery plans or conservation advice documents has specific actions relating to discharges of sewage, grey water and food waste. The macerators will assist in reducing impacts from the discharge stream, consistent with the intent of the conservation management documents.

ALARP summary

Although the level of environmental risk is assessed as Low, a detailed ALARP evaluation was undertaken to determine what additional control measures could be implemented to reduce the level of impacts and risks. No additional controls, beyond those identified during the detailed ALARP assessment can reasonably be implemented to further reduce the risk of impact.

Acceptability summary

Based on the above assessment, the proposed controls are expected to effectively reduce the risk of impacts to acceptable levels because:

- the activity demonstrates compliance with legislative requirements/industry standards
- the activity takes into account stakeholder feedback
- the activity is managed in a manner that is consistent with the intent of conservation management documents
- the activity does not compromise the relevant principles of ESD
- the predicted level of impact does not exceed the defined acceptable level in that the environmental risk has been assessed as "low", the consequence does not exceed "C – significant" and the risk has been reduced to ALARP.

Environmental performance outcomes	Environmental performance standards	Measurement criteria	Responsibility
Zero discharges of untreated sewage and grey water or unmacerated putrescible waste to the marine environment for the duration of the activity.	Manage and dispose of sewage in accordance with: MARPOL 73/78 Annex IV, Marine Orders – Part 96: Marine Pollution Prevention – Sewage as enacted in the POTS Act 1983 – Part IIIB (as appropriate to vessel class), including: • Current International Sewage Pollution Prevention Certificate (ISPPC).	Pre-mobilisation HSE inspection confirms that the vessel holds a current ISPPC.	Environmental advisor
	Manage and dispose of garbage in accordance with: MARPOL 73/78 Annex III, Marine Orders – Part 95: Marine Pollution Prevention – Garbage, as enacted in the POTS Act 1983 – Parts IIIA and IIIC (as appropriate to vessel class), including:	Garbage disposal record book	Vessel master

	• Garbage that has been ground or comminuted to particles <25 mm: >3 nm from the nearest land. • Garbage disposal record book maintained in accordance with POTS Act 1983 – Part IIIC		
	Vessel contractor has a preventative maintenance system to ensure STP and macerator is maintained.	Pre-mobilisation inspection documentation demonstrate STP and macerator equipment is maintained.	Vessel master

Deck drainage and bilge

Table 7-4: Impact and evaluation –discharges of deck drainage and bilge from the survey vessel

<table>
<tr><th colspan="2">Identify hazards and threats</th></tr>
<tr><td colspan="2">Contaminated deck drainage and bilge discharges or failure to treat oily water to suitable OIW concentrations before discharge, have the potential to expose marine fauna to changes in water quality and/or result in impacts through direct toxicity. Deck drainage discharge volumes from the survey vessel will be intermittent and are dependent on weather conditions and frequency of deck washing. Volumes of bilge water from engines and other mechanical sources found throughout the machinery spaces will also vary over time.</td></tr>
<tr><th>Potential consequence</th><th>Severity</th></tr>
<tr><td>The particular values and sensitivities identified as having the potential to be impacted by deck drainage and bilge are:
• EPBC listed species
• fish (demersal fish communities KEF and commercial species)
• planktonic communities.

Discharges of oily water will be treated to <15 ppm (v) in accordance with MARPOL requirements. This could introduce hazardous substances (mixture of water, oily fluids, lubricants, cleaning fluids etc.) into the water column, albeit in low concentrations. In turn, this could result in a reduction in water quality, and impacts to transient, EPBC-listed species, plankton and other pelagic organisms such as fish species (demersal fish community KEF or those species targeted by commercial fisheries).

Given the highly mobile and transient nature of marine fauna and the absence of known BIAs in the licence area, the potential exposure is likely to be limited to individuals close to the discharge point at the time of the discharge. The closest BIA to WA-50-L relates to the 20 km green turtle internesting buffer at Browse Island (33 km away). Additionally, a whale shark foraging BIA is located approximately 15 km south east from the licence area at its closest point (Figure 4-6); however, based on the levels of whale shark abundance observed in numerous studies (as described in Section 4.7.4), the likelihood of whale shark presence within this BIA is considered very low, with no specific seasonal pattern of migration.

Worst case impacts to exposed marine fauna may include direct toxic effects, such as damage to lungs and airways, and eye and skin lesions from exposure to oil at the sea surface (Gubbay & Earll 2000). Considering the low concentrations of oil and the location of the discharges in the dispersive open ocean environment, a surface expression is not anticipated; therefore, impacts are considered to be of inconsequential ecological significance to transient, EPBC listed species and are therefore considered Insignificant (F).</td><td>Insignificant (F)</td></tr>
</table>

Planktonic communities in close proximity to the discharge point may be affected if exposed to oily water. Such exposure may result in lethal effects to plankton. The potential consequence on planktonic communities is a localised impact on plankton abundance in the vicinity of the point of discharge with inconsequential ecological significance (Insignificant F). There is the potential for individual fishes to be exposed to the discharge; however, this would be limited to those fish present at the sea surface rather than those associated with the demersal fish community KEF. Such exposure is not expected to result in any significant impacts to fishes based on the low toxicity, low volume and high dilution levels of the discharge, plus the highly mobile nature and ability of fishes to move away. The potential consequence on the demersal fish community KEF or commercially targeted fish species will be short-term and highly localised with inconsequential ecological significance (Insignificant F).	

Identify existing design and safeguards/controls measures
The survey vessel will be equipped with oil–water separators (OWS) which remove traces of oil from the bilge and drainage water prior to discharge to sea. Oily water is treated to a maximum concentration of 15 ppm (v) prior to discharge as specified in MARPOL 73/78, Annex I. The vessel may discharge oily water in accordance with MARPOL 73/78 Annex I, Marine Orders 91: Marine Pollution Prevention – Oil (as appropriate to class).

Propose additional safeguards/control measures (ALARP Evaluation)			
Hierarchy of control	Control measure	Used?	Justification
Elimination	No discharges of contaminated deck drainage or bilge to sea.	No	Discharge of deck drainage, stormwater runoff, or bilge discharges cannot be eliminated. There is not sufficient space on board the survey vessel for storage, and onshore disposal is not practicable given the distance to the mainland (24-hour transit time to the closest port facility). Further, the associated emissions and discharges associated with such frequent transfers would have a negative impact. Discharge of oil in water are permitted under legislation.
Substitution	None identified	N/A	N/A

Engineering	Reduce potential volumes of spilled chemicals/hydrocarbons reaching the marine environment by ensuring spill containment and recovery equipment, such as spill kits, are available for responding to minor spillage of hydrocarbons and chemicals on board.	Yes	The availability of spill kits on board the survey vessel (and trained personnel in the use of spill kits) will enable minor spills to be responded to in a timely manner to reduce the likelihood of spillages reaching the marine environment.
Procedures & administration	None identified	N/A	N/A

Identify the likelihood		
Deck drainage and bilge discharges are treated to a maximum concentration of 15 ppm (v) OIW prior to discharge as specified in MARPOL 73/78, Annex 1. Impacts to the abundance of plankton in the vicinity of the discharge (oily water) are not expected and are considered Unlikely (4) and will be ecologically insignificant based on the naturally high spatial and temporal variability of plankton distribution in Australian tropical waters. Due to the absence of any known BIAs for mobile, transient EPBC listed species in the licence area, the likelihood of impacts from the discharge after treatment by the OWS and subsequent dilution and dispersion is considered Unlikely (4) and is not expected to result in a threat to population viability of protected species.		
Residual risk summary		
Based on a consequence of Insignificant (F) and a worst-case likelihood of Unlikely (4) the residual risk is Low (9).		
Consequence	Likelihood	Residual risk
Insignificant (F)	Unlikely (4)	Low (9)
Assess residual risk acceptability		
Legislative requirements Vessel oil–water separators (OWS) meet relevant international regulatory requirements, including MARPOL 73/78, enacted by the POTS Act 1983 in Commonwealth waters. The discharge of oil in water of <15 ppm (v) is permitted under MARPOL 73/78. Stakeholder consultation		

No stakeholder concerns have been raised regarding potential impacts and risks from deck drainage or bilge.

Conservation management plans / threat abatement plans

Several conservation management plans have been consulted in the development of this EP (refer Appendix B). Emissions and discharges are listed as threatening processes; however, none of the recovery plans or conservation advice documents has specific actions relating to deck drainage or bilge. Managing oily water discharges in accordance with legislative requirements is consistent with the intent of the conservation management documents.

ALARP summary

Although the level of environmental risk is assessed as Low, a detailed ALARP evaluation was undertaken to determine what additional control measures could be implemented to reduce the level of impacts and risks. No additional controls, beyond those identified during the detailed ALARP assessment can reasonably be implemented to further reduce the risk of impact.

Acceptability summary

Based on the above assessment, the proposed controls are expected to effectively reduce the risk of impacts to acceptable levels because:

- the activity demonstrates compliance with legislative requirements/industry standards
- the activity takes into account stakeholder feedback
- the activity is managed in a manner that is consistent with the intent of conservation management documents
- the activity does not compromise the relevant principles of ESD
- the predicted level of impact does not exceed the defined acceptable level in that the environmental risk has been assessed as "low", the consequence does not exceed "C – significant" and the risk has been reduced to ALARP.

Environmental performance outcomes	Environmental performance standards	Measurement criteria	Responsibility
Zero discharges of deck drainage and bilge to the marine environment if oil in water content exceeds 15 ppm.	Survey vessel will comply with POTS Act 1983 – Part II (Section 9), as appropriate to the vessel class, including: • Liquids from drains will only be discharged if the oil in water content does not exceed 15 ppm.	Documented use of oil record book to record all oil disposal.	Vessel master

	Survey vessel will comply with the *Navigation Act 2012* – Marine Orders - Part 91: Marine Pollution Prevention – Oil, including: • Vessel to have International Oil Pollution Prevention (IOPP) certificate to show that the vessel has passed structural, equipment, systems, fittings, and arrangement and material conditions. • Oil water separators (OWS) tested and approved as per IMO resolutions MARPOL 73/78 (Annex I).	Record of current International Oil Pollution Prevention (IOPP) certificate. Calibration and maintenance records of the OWS.	Vessel master
Risks of impacts to marine fauna, fish and planktonic communities from deck drainage and bilge discharges are reduced and maintained at acceptable levels through implementation of the environmental performance standards and the application of the environmental management implementation strategy.	SOPEP equipment will be on board the survey vessel to allow clean-up of any deck spills	Inspection records confirm spill kits are available and stocked.	Vessel master
	Site personnel are made aware of deck spill response requirements.	Awareness materials on deck spill response requirements.	Vessel master

Cooling water

Table 7-5: Impact and evaluation – discharges of cooling water from the survey vessel

Identify hazards and threats	
Sea water will be used as a heat exchange medium for the cooling of machinery engines on the survey vessel. It is pumped aboard and may be treated with biocide (e.g. hypochlorite) before circulation through heat exchangers. It is subsequently discharged to the sea surface. Cooling water (CW) discharges to the marine environment will result in a localised and temporary increase in the ambient water temperature surrounding the discharge point. Elevated discharge temperatures may cause a variety of effects, including marine fauna behavioural changes and reduced ecosystem productivity or diversity through impacts to planktonic communities. The temperature of the CW discharge will be approximately 40 °C, in contrast to ambient surface-water temperatures of 26 °C to 30 °C as recorded in the Ichthys Field (Section 4.6.4).	
Potential consequence	Severity
The particular values and sensitivities identified as having the potential to be impacted by cooling water discharges are: • EPBC listed species • planktonic communities. Effects of elevation in seawater temperature may include a range of behavioural responses in transient, EPBC-listed species including attraction and avoidance behaviour. There are no known BIAs or aggregation areas that would result in sedentary behaviour in WA-50-L, and EPBC listed species with the potential to be present in the licence area (within close enough proximity to the discharge to be affected) are considered to be transient in nature (Section 4.7.4). The closest BIA to WA-50-L relates to the 20 km green turtle internesting buffer at Browse Island (33 km away) between November and March. Additionally, a whale shark foraging BIA is located approximately 15 km south-east from the licence area at its closest point (Figure 4-7); however, based on the levels of whale shark abundance observed in numerous studies (as described in Section 4.7.4), the likelihood of whale shark presence within this BIA is considered very low, with no specific seasonal pattern of migration. The activity will occur in a water depth of approximately 250 m in a dispersive, high current environment. Therefore, potential consequences to transient, EPBC listed species are potentially localised avoidance of thermally elevated water temperatures, with an inconsequential ecological significance to protected species (Insignificant F). Elevated seawater temperatures are known to cause alterations to the physiological (especially enzyme-mediated) processes of exposed biota (Wolanski 1994). These alterations may cause a variety of effects and potentially even mortality of plankton in cases of prolonged exposure. In view of the high level of natural mortality and the rapid replacement rate of many plankton species, UNEP (1985) indicates that there is no evidence to suggest that lethal effects to plankton from thermal discharges are ecologically significant. The potential consequence on planktonic communities is a localised impact on plankton abundance in the vicinity of the point of discharge with inconsequential ecological significance (Insignificant F).	Insignificant (F)

The use of biocide (hypochlorite) for the control of biofouling in considered an established and efficient technology for use in offshore environments and is used throughout the world (Khalanski 2002). The effects of chlorination on the marine environment have been summarised by Taylor (2006) who, based on a review of applications using hypochlorite as an antifoulant for the seawater cooling circuits, concluded that: • the chlorination procedure itself does cause the mortality of a proportion of planktonic organisms and the smaller organisms entrained through a cooling water system; however, only in very rare instances, where dilution and dispersion were constrained, were there any impacts beyond the point of discharge • long term exposure to chlorination residues on fish species did not impose any apparent ecotoxicological stress • studies of the impact of chlorination by-products on marine communities, population, physiological, metabolic and genetic levels, indicate that the practice of low-level chlorination on coastal receiving water is minor in ecotoxicological terms. These findings indicate that the toxicity of the CW discharge is negligible at the point of discharge, therefore impacts from CW discharges are limited to thermal effects only.			
Identify existing design and safeguards/controls measures			
None identified			
Propose additional safeguards/control measures (ALARP Evaluation)			
Hierarchy of control	Control measure	Used?	Justification
Elimination	No discharges of CW to sea	No	Engines and machinery require cooling to operate safely and efficiently, therefore CW cannot be eliminated. Storage and containment of CW to allow cooling on board the survey vessel prior to discharge is not considered practicable given the size/space requirements (i.e. large surface areas are required to sufficiently cool the water). Onshore disposal was also not considered practicable given the distance to the mainland, frequency of trips required, and the associated emissions and discharges generated by such transfers.
Substitution	None identified	N/A	N/A
Engineering	None identified	N/A	N/A
Procedures & administration	None identified	N/A	N/A
Identify the likelihood			
CW discharges are expected to rapidly disperse in the open-ocean environment of WA-50-L. These discharges may result in temporary, localised and ecologically insignificant avoidance behaviour in transient, EPBC-listed species in response to elevated water temperatures. However, given the short-term duration of the activity (7-10 days), relatively low volumes in comparison to larger vessels/offshore facilities, and in the absence of			

any known BIAs within the licence area the likelihood of CW discharges resulting in a threat to the population viability of protected species is considered to be Highly Unlikely (5). Localised impacts to the abundance of plankton within the vicinity of the CW discharges are considered to be Unlikely (4) based on the naturally high spatial and temporal variability of plankton distribution in Australian tropical waters.		
Residual risk summary		
Based on a consequence of Insignificant (F) and a worst-case likelihood of Unlikely (4) the residual risk is Low (9).		
Consequence	Likelihood	Residual risk
Insignificant (F)	Unlikely (4)	Low (9)
Assess residual risk acceptability		
Legislative requirements The discharge of return seawater from cooling water systems to the marine environment is considered to be standard practice in industry and there are no relevant Australian environmental legislative requirements that relate specifically to the discharge of CW. Ichthys offshore facility CW discharge modelling (using a higher discharge temperature and greater volumes of CW discharged) predicted a maximum 1.6 °C at 100 m from discharge point. Therefore, the CW discharge plume from the survey vessel is expected to be considerably lower than the International Finance Corporation (IFC 2015) requirement (no more than 3 °C above the ambient seawater temperature at 100 m from the discharge point) based on the lower CW temperature and volume discharged by the survey vessel. Stakeholder consultation No stakeholder concerns have been raised regarding potential impacts and risks from CW discharges. Conservation management plans / threat abatement plans Several conservation management plans have been consulted in the development of this EP (refer Appendix B), none of the recovery plans or conservation advice documents have specific threats or actions relating to discharges of cooling water in remote offshore waters. ALARP summary Although the level of environmental risk is assessed as Low, a detailed ALARP evaluation was undertaken to determine what additional control measures could be implemented to reduce the level of impacts and risks. No additional controls have been identified that can reasonably be implemented to further reduce the risk of impact. Acceptability summary Based on the above assessment, the risk of impacts is managed to acceptable levels because: • the activity demonstrates compliance with legislative requirements/industry standards • the activity takes into account stakeholder feedback • the activity is managed in a manner that is consistent with the intent of conservation management documents • the activity does not compromise the relevant principles of ESD		

• the predicted level of impact does not exceed the defined acceptable level in that the environmental risk has been assessed as "low", the consequence does not exceed "C – significant" and the risk has been reduced to ALARP.			
Environmental performance outcomes	Environmental performance standards	Measurement criteria	Responsibility
N/A no controls identified			

Desalination brine

Table 7-6: Impact and evaluation – discharges of desalination brine from the survey vessel

Identify hazards and threats			
Potable water will be generated on the survey vessel using a RO plant which is supplied with sea water. Potable water is primarily supplied to the vessel accommodation and domestic services areas. It is also supplied for other purposes such as the eyewash and safety shower systems and utilities water systems. Desalination brine produced from the RO process will be discharged to sea on a continuous basis. Discharging desalination brine has the potential to cause changes in water salinity. Typical desalination brine discharges have a salinity in the order 50 parts per thousand (ppt) in comparison to ambient seawater with a salinity of 34-35 ppt (Section 4.6.4).			
Potential consequence			Severity
The particular values and sensitivities identified as having the potential to be impacted by desalination brine discharges are: • planktonic communities. The discharge of desalination brine has the potential to result in increased salinity within the receiving environment. Exposure to increased levels of salinity has the potential to result in impacts to planktonic communities. Azis et al. (2003) reported that effects on planktonic communities in areas of high mixing and dispersion, such as those found in the licence area, are generally limited to the point of discharge only. Given the water depths in WA-50-L (approximately 250 m) and the dynamic marine environment (i.e. tides and currents) it is expected that the brine discharge would rapidly disperse relatively close to the point of discharge. Therefore, the effects of a temporary and highly localised increase in salinity are not expected to result in any significant ecological impacts to planktonic communities (Insignificant F).			Insignificant (F)
Identify existing design and safeguards/controls measures			
None identified			
Propose additional safeguards/control measures (ALARP Evaluation)			
Hierarchy of control	Control measure	Used?	Justification
Elimination	Eliminate brine discharges from the survey vessel.	No	The significant financial cost and health risks associated with providing fresh water to the survey vessel from the mainland via vessel transfer or transiting directly to port for resupply is grossly disproportionate to the low level of risk associated with this discharge. This would also generate additional environmental impacts in terms of air emissions and increased demands to the onshore supply.
Substitution	None identified	N/A	N/A

Engineering	Use of a diffuser on the survey vessel to increase mixing in the receiving environment.	No	Given the water depth and oceanic currents in WA-50-L and the small volumes of discharges, retrospective installation of a diffuser on the vessel is not considered practicable, given the insignificant consequence from brine discharges.
Procedures & administration	None identified	N/A	N/A

Identify the likelihood
Direct effects on plankton from desalination brine discharges may occur in WA-50-L near the point of discharge but are not expected to result in an ecological impact to planktonic communities in the wider region. Therefore, the likelihood of impact to planktonic communities from these planned discharges is considered Highly Unlikely (5).

Residual risk summary
Based on a consequence of Insignificant (F) and a likelihood of Highly Unlikely (5) the residual risk is Low (10).

Consequence	Likelihood	Residual risk
Insignificant (F)	Highly Unlikely (5)	Low (10)

Assess residual risk acceptability

Legislative requirements

The discharge of desalination brine to the marine environment is considered to be standard practice in industry and there are no relevant Australian environmental legislative requirements that relate specifically to the discharge of desalination brine.

Stakeholder consultation

No stakeholder concerns have been raised regarding potential impacts and risks from desalination brine discharges.

Conservation management plans / threat abatement plans

Several conservation management plans have been consulted in the development of this EP (refer Appendix B), none of the recovery plans or conservation advice documents have specific threats or actions relating to discharges of desalination brine in remote offshore waters.

ALARP summary

Although the level of environmental risk is assessed as Low, a detailed ALARP evaluation was undertaken to determine what additional control measures could be implemented to reduce the level of impacts and risks. No additional controls have been identified that can reasonably be implemented to further reduce the risk of impact.

Acceptability summary

Based on the above assessment, the risk of impacts is managed to acceptable levels because:

- the activity demonstrates compliance with legislative requirements/industry standards

• the activity takes into account stakeholder feedback • the activity is managed in a manner that is consistent with the intent of conservation management documents • the activity does not compromise the relevant principles of ESD • the predicted level of impact does not exceed the defined acceptable level in that the environmental risk has been assessed as “low”, the consequence does not exceed “C – significant” and the risk has been reduced to ALARP.			
Environmental performance outcomes	**Environmental performance standards**	**Measurement criteria**	**Responsibility**
N/A no controls identified			

7.2 Waste management

Table 7-7: Impact and evaluation – waste management

<table>
<tr><th colspan="2">Identify hazards and threats</th></tr>
<tr><td colspan="2">Unsecured or incorrectly stored waste may be windblown or displaced into the ocean where it has the potential to negatively affect marine ecosystems. Wastes can cause contamination of the ocean resulting in changes to water quality (e.g. through the leaching of chemicals from wastes that are displaced) which can cause changes to ecosystem productivity and diversity. Additionally, certain types of waste can cause injury to marine fauna through entanglement or may affect the health of marine fauna if waste materials are ingested.</td></tr>
<tr><th>Potential consequence</th><th>Severity</th></tr>
<tr><td>The particular values and sensitivities identified as having the potential to be impacted by improper waste management are:
• planktonic communities
• EPBC listed species.

Improper management of wastes on the survey vessel may result in pollution and contamination of the environment. There is also the potential for secondary impacts on marine fauna that may interact with wastes, such as packaging and binding, should these enter the ocean. These include physical injury or death of marine biota (as a result of ingestion, or entanglement of wastes).

A change to water quality has the potential to impact planktonic communities found at the sea surface. Impacts associated with the accidental loss of hazardous waste materials to the ocean as a result of leaching from waste would be localised and limited to the immediate area. These are further likely to be reduced due to the dispersive open ocean offshore environment. While plankton abundance in close proximity to the accidental loss location, or leaching waste items may be reduced, this is expected to be of insignificant ecological consequence (Insignificant F).

Marine fauna can become entangled in waste plastics, which can also be ingested when mistaken as prey (Ryan et al. 1988), potentially leading to injury or death. For example, due to indiscriminate foraging behaviour, marine turtles have been known to mistake plastic for jellyfish (Mrosovsky et al. 2009). Seabirds foraging on planktonic organisms, generally at, or near, the surface of the water column may eat floating plastic (DEE 2018). Other items (e.g. discarded rope) have also been found to entangle fauna, such as birds and marine mammals. The accidental loss of waste to the ocean may result in injury or even death to individual transient EPBC listed species, but this is not expected to result in a threat to population viability of a protected species (Insignificant F).</td><td>Insignificant (F)</td></tr>
<tr><th colspan="2">Identify existing design and safeguards/controls measures</th></tr>
<tr><td colspan="2">The survey vessel will manage waste in accordance with MARPOL 73/78 Annex V, which is implemented through the POTS Act (Cwlth) specifically the requirement to have a garbage management plan.</td></tr>
<tr><th colspan="2">Propose additional safeguards/control measures (ALARP Evaluation)</th></tr>
</table>

Hierarchy of control	Control measure	Used?	Justification
Elimination	None identified	N/A	N/A
Substitution	None identified	N/A	N/A
Engineering	None identified	N/A	N/A
Procedures & administration	HSE inspection of vessel	Yes	HSE inspection will confirm correct waste storage (including presence of netting to prevent windblown waste), labelling and handling practices are in place.
	Waste management processes communicated to personnel.	Yes	Waste management processes can be communicated to personnel through awareness materials such as inductions, posters, toolboxes and labelling.

Identify the likelihood

Given the proposed safeguards in place, the absence of any known BIAs and the dispersive open ocean environment in the licence area, impacts to transient EPBC-listed species and planktonic communities, while not expected, are considered Possible (3) in the event of an accidental loss of waste to the ocean.

Residual risk summary

Based on a consequence of Insignificant (F) and a worst-case likelihood of Possible (3) the residual risk is Low (8).

Consequence	Likelihood	Residual risk
Insignificant (F)	Possible (3)	Low (8)

Assess residual risk acceptability

Legislative requirements

The existing preventative and mitigation measures outlined to prevent accidental release of hazardous and non-hazardous wastes are consistent with, and typical of, good industry practice. Procedures for managing waste (i.e. handling, storage, transfer and disposal) will be outlined in the vessel garbage management plan, in accordance with MARPOL Annex V requirements.

Stakeholder consultation

No stakeholder concerns have been raised regarding potential impacts and risks from improper waste management.

Conservation management plans / threat abatement plans

Several conservation management plans have been consulted in the development of this EP (refer Appendix B). Injury and fatality to vertebrate marine life caused by ingestion of, or entanglement in, harmful marine debris was listed in August 2003 as a key threatening process under the EPBC Act as detailed in the 'Threat abatement plan for impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans' (DEE 2018). The entanglement and ingestion of marine debris is also identified as a threat in the "Recovery Plan for Marine Turtles in Australia" (DEE 2017a). Specific actions which contribute to the long-term prevention of marine debris (Objective 1 of the 'Threat abatement plan for marine debris on vertebrate marine life' (DEE 2018)) have been adopted including compliance with applicable legislation in relation to the improvement of waste management practices, such as MARPOL 73/78, Annex V,

ALARP summary

Although the level of environmental risk is assessed as Low, a detailed ALARP evaluation was undertaken to determine what additional control measures could be implemented to reduce the level of impacts and risks. No additional controls, beyond those identified during the detailed ALARP assessment can reasonably be implemented to further reduce the risk of impact.

Acceptability summary

Based on the above assessment, the proposed controls are expected to effectively reduce the risk of impacts to acceptable levels because:

- the activity demonstrates compliance with legislative requirements/industry standards
- the activity takes into account stakeholder feedback
- the activity is managed in a manner that is consistent with the intent of conservation management documents
- the activity does not compromise the relevant principles of ESD
- the predicted level of impact does not exceed the defined acceptable level in that the environmental risk has been assessed as "low", the consequence does not exceed "C – significant" and the risk has been reduced to ALARP.

Environmental performance outcomes	Environmental performance standards	Measurement criteria	Responsibility
Zero unplanned discharge of wastes into the marine environment.	Implementation of garbage management plan.	Incident reports of any waste lost overboard.	Vessel master
Risks of impacts to marine fauna and planktonic communities from unsecured, or incorrectly stored waste are reduced and maintained at acceptable levels through implementation of the environmental performance standards and the application of the environmental management implementation strategy.	Vessel waste management plans are in place and comply with MARPOL 73/78 (Annex II and III) requirements (as appropriate to vessel class) for waste management (including recording of amounts).	Garbage record book.	Vessel master
	Pre-mobilisation HSE inspection of vessel includes assessment of waste management practices.	Pre-mobilisation HSE inspection documentation.	Environmental Adviser
	Waste management awareness materials communicated to site personnel.	Awareness materials on waste management procedures.	Environmental Adviser

7.3 Noise and vibration

Table 7-8: Impact and risk evaluation – underwater noise

<table>
<tr><th colspan="2">Identify hazards and threats</th></tr>
<tr><td colspan="2">Marine fauna may be exposed to underwater noise emissions during the activity. Operating vessels have the potential to expose sound sensitive marine fauna to localised changes in underwater noise levels with vessel engines and dynamic positioning thrusters capable of generating sound at levels between 108 and 182 dB re 1 µPa at 1 m at dominant frequencies between 50 Hz and 7 kHz (Simmonds et al. 2004; McCauley 1998).
A range of surveys may be undertaken during the activity (Section 3.4) that will use underwater acoustic techniques including the use of MBES, SSS, SBP and USBL. These surveys have the potential to expose sound sensitive marine fauna to localised changes in underwater noise levels. The different survey devices shall emit various levels of sound at a range of frequencies. MBES and SSS transmit at high frequencies (approximately 100 – 400 Hz) and produce a highly focussed beam of sound towards the seabed, due to this there is very limited horizontal sound propagation and it is expected to rapidly attenuate. Indicative ranges of sound outputs at source are 163 - 190 dB re 1 µPa at 1 m and 137 - 200 dB re 1 µPa at 1 m, for MBES and SSS respectively. Sub-bottom profiling systems operate at low frequency (approximately 0.5 - 40 kHz) directing beans of sound towards the seabed and therefore horizontal sound propagation is limited. Sound outputs at source may range from 142 - 214 dB re 1 µPa at 1 m. The USBL positioning system is also low frequency (up to approximately 30 kHz), and will have sound outputs ranging from 185 - 200 dB re 1 µPa at 1 m.</td></tr>
<tr><th>Potential consequence</th><th>Severity</th></tr>
<tr><td>The particular values and sensitivities identified as having the potential to be impacted by underwater noise are:
• EPBC listed species
• fish (demersal fish community KEF and commercial species).

The generation of underwater sound from the proposed survey in WA-50-L has the potential to impact EPBC-listed marine fauna, specifically marine mammals and turtles. Sudden exposure to very high sound levels or exposure for prolonged periods can result in a permanent threshold shift (PTS) or temporary threshold shift (TTS) in hearing. Noise impact thresholds proposed by the U.S. National Oceanic and Atmospheric Administration and National Marine Fisheries Service (NMFS 2018) for cetaceans, suggest that, for the types of cetacean with the potential to occur in WA-50-L, PTS could occur as a result of peak sound pressure levels of 219 – 230 dB re 1 µPa or prolonged exposure to sound exposure levels of 198 – 199 dB re 1 µPa2·s. TTS could occur at peak sound pressure levels of 213 - 224 dB re 1 µPa or prolonged exposure to sound exposure levels of 168 - 170 dB re 1 µPa2·s (NMFS 2018). Popper et al. (2014) propose conservatively protective sound pressure thresholds of 207 - 213 dB re 1 µPa for potential injury to various types of fish and for marine turtles. With the exception of the upper range of potential SBP survey equipment, no sources of noise associated with the activity are expected to have the potential to result in PTS or TTS.</td><td>Insignificant (F)</td></tr>
</table>

However, a range of behavioural changes can occur in cetaceans in response to sound pressure levels as low as 120 dB re 1 µPa (Southall et al. 2007). This may include minor responses, such as a momentary pause in vocalisation or reorientation of an animal to the source of the sound, or avoidance responses (Southall et al. 2007). For cetaceans, NMFS (2013) propose a behavioural response threshold of 160 dB re 1 µPa for impulsive sound sources and 120 dB re 1 µPa for continuous sound sources. Marine turtles are not reported to use sound for communication; however, it is proposed that they may use sound for navigation, avoiding predators and finding prey (Dow Piniak 2012). For received sound pressure levels above 166 dB re 1 µPa, turtles have shown some increased swimming activity and above 175 dB re 1 µPa can become more agitated (McCauley et al. 2000). The 166 dB re 1 µPa level is used as the threshold level for a behavioural disturbance response by turtles (NSF 2011). Based on the expected noise emissions associated with the operation of vessels during the activity in WA-50-L, any noise emissions (ranging from 108 to 182 dB re 1 µPa at 1 m) are not expected to result in PTS or TTS impacts to marine fauna. Although not directly relevant to vessel engine noise, modelling for the Ichthys Project (INPEX 2010) indicated that low frequency noise generated from tanker offloading operations would abate to 120 dB re 1 µPa within 8 km of the source location with the area receiving 130–140 dB re 1 µPa predicted to be less than 1 km in radius. The sound levels produced by a smaller survey vessel is expected to be less than the levels modelled for offloading tankers, but the sound may be audible to marine fauna over several kilometres, with the likelihood of behavioural impacts increasing in close proximity to the vessel. Gradual exposure to continuous noise sources, such as vessel engines, are generally regarded as being less harmful and less likely to startle or stress marine fauna than rapid-onset impulsive noise sources (Hamernik et al. 1993; Hamernik et al. 2003; Southall et al. 2007). As such, exposure that would result in significant alteration of behaviour is not expected particularly in the absence of any known BIAs or important habitats in the licence area, and as such any impacts are considered to be Insignificant (F). MBES and SSS are high-frequency, low-energy geophysical survey instruments, which are significantly less intrusive than high-energy seismic survey instruments. As described in Section 3.4, sound source levels produced by these different instruments range from 137–200 dB re 1 µPa at 1 m. The high frequency pulses of sound are produced in highly directional and narrow beams, which rapidly attenuate outside of the beam (Zykov 2013). The high operating frequencies of MBES and SSS instruments place the dominant sound frequencies above the auditory range of most other marine fauna species, including cetaceans, turtles and fish, although some instruments may be audible to mid-frequency and high-frequency cetaceans such as some dolphin species (Zykov 2013). Given the short duration of the geophysical component of the survey (2 days), it is not expected that fauna would persist in close proximity to the instruments long enough for impacts to occur. Therefore, no impacts to these species' groups are expected and hearing impairment impacts to marine fauna from MBES and SSS have not been previously reported. Therefore, the consequence is considered to be Insignificant (F).	

The SBP and USBL systems used in the survey will operate at low frequencies (approximately 0.5 - 40 kHz). SBP systems produce directional beams of sound towards the seabed and therefore sound propagation tends to be downwards in the water column with limited horizontal propagation. The sound outputs at source for the USBL and SBP systems range from 142 - 214 dB re 1 µPa at 1 m. Underwater noise modelling of a range of SBP systems reported that sound levels may be audible over several kilometres (Zykov 2013). The upper range of SBP sound output potentially used in the survey (214 dB re 1 µPa at 1 m) is not expected to result in PTS for cetaceans given the short-term duration of the survey and therefore no prolonged exposure would occur. Given other marine fauna have less sensitive hearing than cetaceans, PTS impacts on other EPBC-listed species is also not expected to occur. It is possible that TTS effects could occur; however, in the unlikely event that TTS did occur to marine fauna, it would be limited to at most a few individuals and the effects will be temporary and recoverable. Based on the NSF (2011) behavioural response threshold of 166 dB re 1 µPa, turtles may actively swim to avoid the SBP within 1 – 2 km. Therefore, behavioural responses to the SBP systems may occur in marine fauna limited to within a few kilometres of the survey vessel depending on the hearing range of the receptors. In summary, it is possible that physical and behavioural impacts may occur from use of SBP systems at the upper range (214 dB re 1 µPa at 1 m). Potential behavioural responses for various groups of sound sensitive marine fauna are expected, at a worst case, to be limited to several kilometres from the source for the duration of the survey. Within the licence area, any marine fauna present are also expected to be transient and able to move away from noise sources. In the absence of any known marine fauna BIAs within the licence area and distances to the cetacean aggregation areas/migration corridors (blue whale migration/foraging BIAs approximately 60 km to the west at its closest point; humpback whale calving BIA approximately 120 km south east at its closest point) and the short duration of the geophysical survey (2 days), any impacts are considered to be Insignificant (F). A limited number of commercially significant fish stocks may be present in WA-50-L that may be exposed to underwater noise emissions (Section 4.8.3). Given the deep waters, commercially significant fish stocks in WA-50-L are primarily limited to highly mobile pelagic species such as tuna and billfish. The water depths and absence of suitable habitats mean the licence area is not considered to offer spawning or aggregation habitat for commercially targeted demersal species which occur in the shallower waters on the continental shelf (typically less than 200 m water depth) (Section 4.8.3). Deep water scampi (*Metanephrops australiensis*), targeted by the North West Slope Trawl Fishery, may occur on the continental slope in the water depths where WA-50-L is located. Scampi may be fished on the slope in water depths deeper than 200 m but are most commonly found at depths of 420 - 500 m (AFMA 2019f; Harte & Curtotti 2018). Timing of scampi spawning is uncertain, but studies of similar species suggest that spawning occurs in September-October (AFMA 2019f).	

The impact of sound on crustacean species similar to scampi, such as rock lobster, crabs and prawns has been studied with respect to commercial scale seismic surveys, which are significantly louder and of higher-energy than SBP systems. Many studies (e.g. Christian et al. 2003; Payne et al. 2008) found no acute or chronic mortality or stress impacts. Research undertaken by Day et al. (2016) on rock lobsters in Australian waters also found no mortality impacts and no impacts to the eggs or hatched larvae of berried females exposed to seismic sound at very close range. Some sub-lethal stress and pathological impacts were observed in these studies although this occurred while lobster were captive in cages and subject to repeat exposures within close proximity to an airgun. Therefore, the effect of SBP on scampi is not expected to result in any mortality or impacts to their eggs or larvae. If disturbed, it is likely that scampi will move to avoid the immediate proximity of the survey. The impacts will be highly localised (e.g. hundreds of metres) and limited to the duration of SBP (approximately 2 days). Therefore, the effects of sound to scampi will be negligible and are considered to be Insignificant (F). Pelagic fish species such as tuna and billfish may also be present in WA-50-L but these species are highly mobile and belong to a group of fish with limited sensitivity to sound (Popper et al. 2014). Fish may avoid waters immediately surrounding the survey vessel during the geophysical scope, but no impacts to these stocks are expected. Therefore, disturbance to commercially important fish species may occur; however, given the absence of any spawning or aggregation habitat within WA-50-L, any impact would be localised to individuals and would not result in any detrimental impacts in stock levels, and as such any impacts are considered to be Insignificant (F).	

Identify existing design and safeguards/controls measures
Implementation of EPBC Regulations 2000 – Part 8 Division 8.1.

Propose additional safeguards/control measures (ALARP Evaluation)			
Hierarchy of control	Control measure	Used?	Justification
Elimination	Eliminate the use of vessels	No	The use of vessels to undertake the activity cannot be eliminated. Survey durations kept to a minimum (2 days).
Substitution	None identified	N/A	N/A
Engineering	None identified	N/A	N/A
Procedures & administration	Implementation of environmental awareness program for site personnel	Yes	Before work commences, site personnel will be informed through an environmental awareness program of the need to avoid harm to marine fauna.
	Implement EPBC Act Policy Statement 2.1	No	Implementation of controls described in EPBC Act Policy Statement 2.1 – *Interaction between offshore seismic exploration and whales* is not considered appropriate given the nature of the geophysical surveys to be undertaken. The geophysical survey will utilise low energy equipment that is not comparable to commercial seismic survey equipment. However, as the SBP systems are capable of soft-starts, this practice will be implemented throughout the geophysical component of the survey. The separation distances associated with

			the EPBC Regulations 2000 – Part 8 Division 8.1. are also considered to be an effective control.

Identify the likelihood		
With the above described controls in place and the absence of any BIAs or critical habitats in WA-50-L, the likelihood of impacts to marine fauna and fish from noise emissions generated from survey vessel engines are considered Unlikely (4). Despite the distances to important marine habitats, transient marine fauna individuals (particularly green turtles at Browse Island) may be present within the licence area. Due to the increased sound source levels and expected propagation distances associated with survey equipment (particularly the upper range of the SBP systems) noise emissions may be audible and impacts to marine fauna and fish are considered Possible (3) albeit for a short-term duration.		
Residual risk summary		
Based on a consequence of Insignificant (F) and a worst-case likelihood of Possible (3) the residual risk is Low (8).		
Consequence	Likelihood	Residual risk
Insignificant (F)	Possible (3)	Low (8)
Assess residual risk acceptability		
Legislative requirements As required by law the EPBC Regulations 2000 – Part 8, Division 8.1 will be implemented during the activity. Stakeholder consultation No stakeholder concerns have been raised regarding potential impacts and risks from underwater noise. Conservation management plans / threat abatement plans Several conservation management plans have been consulted in the development of this EP (Appendix B). Anthropogenic noise has been identified as a threat to pygmy blue whales in the Conservation Management Plan for the Blue Whale (DoE 2015). Noise interference has also been identified as a threat to marine turtles (DEE 2017a). The above listed controls to be adopted during the activity are in alignment with the actions identified in the various conservation management documents. ALARP summary Although the level of environmental risk is assessed as Low, a detailed ALARP evaluation was undertaken to determine what additional control measures could be implemented to reduce the level of impacts and risks. No additional controls, beyond those identified during the detailed ALARP assessment can reasonably be implemented to further reduce the risk of impact. Acceptability summary Based on the above assessment, the proposed controls are expected to effectively reduce the risk of impacts to acceptable levels because: • the activity demonstrates compliance with legislative requirements/industry standards		

• the activity takes into account stakeholder feedback • the activity is managed in a manner that is consistent with the intent of conservation management documents • the activity does not compromise the relevant principles of ESD • the predicted level of impact does not exceed the defined acceptable level in that the environmental risk has been assessed as "low", the consequence does not exceed "C – significant" and the risk has been reduced to ALARP.			
Environmental performance outcomes	Environmental performance standards	Measurement criteria	Responsibility
Risk of impacts to marine fauna and fish from planned noise emissions are reduced and maintained at acceptable levels through implementation of the environmental performance standards and the application of the environmental management implementation strategy.	Vessel contractors comply with relevant requirements of the EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, within the 500m exclusion zone including: • Vessels will not travel greater than 6 knots within 300 m of a whale (caution zone) • Vessels will not approach closer than 100 m of a whale.	• Records of breaches of vessel - cetacean interaction requirements outlined in the EBPC Regulations 2000 reported.	Vessel master
	Awareness materials for site personnel for avoiding harm to marine fauna.	Record of provision of awareness materials to site personnel.	INPEX Environmental Adviser

7.4 Loss of containment

Undertaking the activity introduces the potential for loss of containment events. These events may be classified as Level 1, Level 2 or Level 3 incidents, in accordance with Table 2.2 of the OPEP (Appendix D).

INPEX defines an emergency condition as:

"an unplanned or uncontrolled situation that harms or has the potential to harm people, the environment, assets, Company reputation or Company sustainability and which cannot, through the implementation of Company standard operating procedures, be contained or controlled."

An evaluation of the environmental impacts and risks associated with emergency conditions is included in Section 8 of this EP.

A summary of the potential sources/threats for loss of containment events (and emergency conditions) associated with this EP is presented in Table 7-9. Incident levels are indicative only and classifications have been assigned for the purposes of enabling the risk evaluation to be undertaken. In the event of a spill, the incident level will be classified as described in the OPEP (Appendix D).

Table 7-9: Representative loss of containment events and emergency conditions identified for the survey

Scenario		Basis of volume calculation	Type	Indicative incident level	Section addressed
Source	**Threat**				
Management of hydrocarbon products on board survey vessel	Minor spills onboard Failure of hydraulic hoses on lifting equipment (winches/ cranes)	Minor spills e.g. grease estimated to be in the order of < 1 m^3 Failure of hydraulic hoses estimated to be in the order of < 1 m^3	Various	1	Accidental release overboard – Table 7-10
Emergency conditions (refer to Section 8)					
Survey vessel	Collision	250 m^3 – based on capacity of largest single fuel tank (AMSA 2013)	Group II – diesel	2	Vessel collision – Section 8.2

7.4.1 Accidental release

Table 7-10: Impact and evaluation – loss of containment: accidental release overboard

Identify hazards and threats	
Loss of containment events were identified (Table 7-9), including minor spills on board (<1 m^3) and failure of hydraulic hoses (<1 m^3). No bunkering or vessel-to-vessel transfers will occur during the activity. An accidental release overboard resulting in a spill that reaches the marine environment has the potential to result in localised changes to water quality, resulting in impacts to marine fauna and planktonic communities at the sea surface, but no impact on deeper water communities/KEFs or benthic habitats are expected.	
Potential consequence	Severity
The particular values and sensitivities identified as having the potential to be impacted by an accidental release are: • EPBC listed species • Planktonic communities. Potential accidental releases overboard from loss of containment events may result in the exposure of marine fauna and plankton near the sea surface, to a range of chemicals and hydrocarbons (e.g. grease, hydraulic fluids with a hydrocarbon base). Foreseeable volumes that could reach the marine environment would be of small (<1 m^3), and impacts would generally be localised to the immediate point of discharge at the sea surface. Upon release to the marine environment hydrocarbons will disperse through natural physical oceanic processes, such as currents, tides and waves, and photochemical and biological degradation. Therefore, any surface expression is expected to weather and dissipate in a relatively short time with limited potential for exposure to surfacing marine fauna or plankton communities. In the absence of any known BIAs for marine fauna in the licence area, any individuals present are likely to be transiting the area for a short duration. The closest BIA to WA-50-L relates to the 20 km green turtle internesting buffer at Browse Island (33 km away). Additionally, a whale shark foraging BIA is located approximately 15 km south-east from the licence area at its closest point (Figure 4-6); however, based on the levels of whale shark abundance observed in numerous studies (as described in Section 4.7.4), the likelihood of whale shark presence within this BIA is considered very low, with no specific seasonal pattern of migration. Given the low volumes (< 1 m^3), limited duration of exposure due to expected weathering and dispersion in an open ocean environment, the level of consequence is expected to present a local scale event of inconsequential ecological significance (Insignificant F).	Insignificant (F)

As a consequence of their presence close to the water surface, plankton may be exposed to any chemicals or hydrocarbons spilled at the sea surface. The effects of oil on plankton have been well studied in controlled laboratory and field situations. The different life stages of a species often show widely different tolerances and reactions to oil pollution. Usually, eggs, larval and juvenile stages will be more susceptible than adults (Harrison 1999). Post-spill studies on plankton populations are few, but those that have been conducted, typically show either no effects or temporary minor effects (Kunhold 1978). Given the high temporal and spatial variability in plankton communities, low volumes (< 1 m^3) and the expected small size of the sea surface impacted by an accidental release, the potential consequence in regard to planktonic communities is considered to be Insignificant (F).	

Identify existing design and safeguards/controls measures			
The survey vessel (>400 GT) will carry a SOPEPs approved under MARPOL 73/78 Annex 1, Regulation 37.			
Propose additional safeguards/control measures (ALARP Evaluation)			
Hierarchy of control	Control measure	Used?	Justification
Elimination	Eliminate the use of chemicals and hydrocarbons on board.	No	Chemicals and hydrocarbons e.g. grease and hydraulic fluids are required for safe and efficient operation of equipment on board the survey vessel and cannot be eliminated.
Substitution	None identified	N/A	N/A
Engineering	Reduce potential volumes of spilled chemicals/hydrocarbons reaching the marine environment by ensuring spill containment and recovery equipment, such as spill kits, are available for responding to minor spillage of hydrocarbons and chemicals on board.	Yes	The availability of spill kits on board the survey vessel (and trained personnel in the use of spill kits) will enable minor spills to be responded to in a timely manner to reduce the likelihood of spillages reaching the marine environment.
Procedures & administration	Hydraulic equipment on board the survey vessel will be subject to routine servicing and inspection to ensure it is fit for purpose.	Yes	Routine servicing and inspection of hydraulic equipment will ensure it is fit for purpose and minimise the potential for leaks and spills to deck as a result of corrosion, and wear and tear of hydraulic hoses.
Identify the likelihood			
Based on the low volumes (<1 m^3) and expected weathering of spilled chemicals/hydrocarbons in conjunction with the controls in place, the likelihood of a loss of containment event causing harm to the identified receptors is considered to be Unlikely (4).			
Residual risk summary			
Based on a consequence of Insignificant (F) and a likelihood of Unlikely (4) the residual risk is Low (9).			

Consequence	Likelihood	Residual risk

Insignificant (F)	Unlikely (4)	Low (9)

Assess residual risk acceptability

Legislative requirements

The activities and proposed management measures are compliant with industry standards and relevant Australian legislation, specifically concerning prevention pollution, including the POTS Act.

Stakeholder consultation

No stakeholder concerns have been raised regarding potential impacts and risks from accidental release/loss of containment. Spill response activities and notifications to relevant stakeholders have been identified and included in INPEX spill response processes.

Conservation management plans / threat abatement plans

Several conservation management plans (Appendix B) identify oil or chemical spills as key threatening processes, through both direct/acute impacts, as well as indirect impacts through habitat degradation. The prevention of loss of containment events and reducing impacts to the marine environment through the preventative controls in place and spill response preparedness, demonstrates alignment with the various conservation management plans.

ALARP summary

Although the level of environmental risk is assessed as Low, a detailed ALARP evaluation was undertaken to determine what additional control measures could be implemented to reduce the level of impacts and risks. No additional controls, beyond those identified during the detailed ALARP assessment can reasonably be implemented to further reduce the risk of impact.

Acceptability summary

Based on the above assessment, the proposed controls are expected to effectively reduce the risk of impacts to acceptable levels because:

- the activity demonstrates compliance with legislative requirements/industry standards
- the activity takes into account stakeholder feedback
- the activity is managed in a manner that is consistent with the intent of conservation management documents
- the activity does not compromise the relevant principles of ESD
- the predicted level of impact does not exceed the defined acceptable level in that the environmental risk has been assessed as "low", the consequence does not exceed "C – significant" and the risk has been reduced to ALARP.

Environmental performance outcomes	Environmental performance standards	Measurement criteria	Responsibility
No incidents of spills reaching the marine environment during handling or storage of chemicals,	Survey vessel (>400 GT) has a SOPEP compliant with Marine Orders – Part 91, the POTS Act, and Annex I of MARPOL 73/78 (oil) on board.	Premobilisation HSE inspection documentation.	Vessel master

hydrocarbons and liquid waste products.	SOPEP equipment will be on board the survey vessel to allow clean-up of any deck spills	Inspection records confirm spill kits are available and stocked.	Vessel master
	Vessel crew are made aware of deck spill response requirements.	Awareness materials on deck spill response requirements.	Environmental adviser
	Preventive maintenance of hydraulic equipment to ensure its integrity.	Documentation of maintenance recorded in the preventive maintenance system.	Vessel master

7.5 Biodiversity and conservation protection

7.5.1 Introduction of invasive marine species (IMS)

Table 7-11: Impact and evaluation – Introduction of invasive marine species

Identify hazards and threats	
IMS are non-indigenous marine plants or animals that have been introduced into a region beyond their natural range and have the ability to survive, reproduce and establish founder populations. IMS are widely recognised as one of the most significant threats to marine ecosystems worldwide. Shallow coastal marine environments in particular, are thought to be amongst the most heavily invaded ecosystems, which largely reflects the accidental transport of IMS by international shipping to marinas and ports where the preferred artificial hard structures are commonly found. The vessel used for the survey may be mobilised either domestically or from overseas. This has the potential to act as a pathway for IMS to be translocated into offshore Commonwealth waters, if unmanaged, via the discharge of high-risk ballast water containing IMS (DAWR 2017) and/or via the presence of IMS within biofouling communities on the vessel and/or towed equipment. Vessels can, if unmanaged, act as a pathway through the uptake and subsequent discharge of high-risk ballast water containing IMS and/or IMS recruitment on submerged vessel hulls while in the vicinity of confirmed IMS sources. Such sources could include other offshore infrastructure i.e. other vessels or platforms; and artificial substrates such as jetties and wharves already colonised by mature IMS, such as in Broome Port or Darwin Port. The introduction and establishment of IMS into the marine environment may result in impacts to benthic communities and associated receptors dependent on these including fishing.	
Potential consequence	**Severity**
The particular values and sensitivities identified as having the potential to be impacted by the introduction of an invasive marine species are: • benthic communities • fisheries (commercial (including aquaculture)/traditional/recreational)). The introduction and subsequent establishment of IMS could result in changes to the structure of benthic communities leading to a change in ecological function due to predation of native marine organisms and/or competition for resources. Once IMS establish, spread and become abundant in coastal waters some species can have major ecological, economic, human health and social/cultural consequences (Carlton 1996, 2001; Pimental et al. 2000; Hewitt et al. 2011).	Moderate (D)

Benthic communities, shallow water coastal environments in WA marine parks and reserves (the closest of which is Browse Island) and fisheries (commercial (including aquaculture)/ traditional/recreational) all have the potential to be impacted by IMS.

Shallow water, coastal marine environments are susceptible to the establishment of invasive populations, with most IMS associated with artificial substrates in disturbed shallow water environments such as ports and harbours (e.g. Glasby et al. 2007; Dafforn et al. 2009a, 2009b). Aside from ports and harbours, other shallow water, pristine environments also at risk include offshore islands and shoals such aa Browse Island (Section 4.4.1) which contains sensitive benthic habitats with a potential to be impacted by invasive populations.

In order for an IMS to pose a biosecurity risk once present at a recipient location, viable IMS propagules and/or individuals must be able to transfer from the colonised area (e.g. a vessel hull), survive in the surrounding environment, find a suitable habitat, and establish a self-sustaining population.

Vessel operations are a mechanism for such transfer of IMS propagules either through the uptake and discharge of high-risk ballast water containing IMS and/or via the presence of IMS within biofouling communities on hulls or submerged equipment. IMS propagules may also be transferred via natural dispersion. Natural dispersal mechanisms could involve a mobile life-history stage (such as actively swimming adults or larval stages) with sufficient swimming capacity and/or larval durations to directly reach suitable habitats in coastal waters. Natural dispersal from offshore locations for IMS with shorter pelagic dispersal capabilities to coastal areas is also theoretically possible via intermediate steps (stepping stone dispersal), where intermediate populations establish in suitable habitats closer inshore, and subsequent generations then spread towards coastal regions.

With consideration of the habitat preferences of IMS (shallow water environments), the closest shallow water habitat to the licence area is Browse Island, located approximately 33 km away. However, it is neither disturbed nor contains artificial structures that IMS are reported to prefer.

During the geophysical survey, the vessel will continually be moving and not remain in one place for a prolonged period of time which in turn reduces the potential for IMS to settle in a location. While geotechnical sampling is undertaken the vessel will remain stationary, however this is expected to be for a short-term duration (approximately 5 days). The introduction/transfer of IMS propagules to sensitive benthic habitats in the wider region may result in local to medium scale impacts to benthic communities with a consequence rating of Moderate (D).

The successful introduction of IMS into fishing grounds/areas of aquaculture may result in changes to benthic habitats with the potential to alter faunal assemblages, resulting in decreased ecological diversity or ecosystem health. In turn this may result in an economic loss of revenue. Other fishing activities that may be impacted include traditional fishing known to occur along the Kimberley coastline (Section 4.8.3) and recreational fishing that is known to occur around Broome Port (Section 4.8.6). This may result in regional community disruption with a moderate impact on economic or recreational values with a consequence rating of Moderate (D).

Identify existing design and safeguards/controls measures

The survey vessel will have an anti-fouling coating applied that is in accordance with the prescriptions of the International Convention on the Control of Harmful Anti-fouling systems on ships, 2001, and the *Protection of the Sea (Harmful Antifouling Systems) Act 2006* (Cwlth) (as appropriate to vessel class).			
Propose additional safeguards/control measures (ALARP Evaluation)			
Hierarchy of control	Control measure	Used?	Justification
Elimination	Eliminate vessel use to avoid the spread of IMS.	No	A vessel is the only form of transport that can undertake the survey activity.
Substitution	Only use a local vessel already operating in Australian waters.	No	It is possible that a vessel currently operating in Australian waters will be contracted to undertake the activity. However, there are known locations within Australia which harbour IMS and could potentially act as a source for the further spread of IMS within Australian regions. Therefore, substituting to the use of a locally available vessel only will not provide a reduction in environmental risk.
Engineering	Survey vessel will have an approved ballast water treatment system installed.	No	The survey vessel will comply with the Australian Ballast Water Requirements, Version 7 (DAWR 2017) – see procedural control below. The INPEX vessel contracting process is outcomes focused and is not prescriptive in relation to how a vessel meets the DAWR requirements. This allows for commercial flexibility and still achieves the environmental outcome. A requirement for vessels to have approved ballast water treatment systems is unnecessary when it is possible to comply with the requirements of the Australian Ballast Water Requirements (Version 7) by alternative means, therefore fitting a treatment system is considered disproportionate to the level of risk.

Procedures & administration	Complete a biofouling risk assessment (including immersible equipment) for a survey vessel mobilised from international waters, and implement mitigation measures commensurate to the risk, as appropriate to ensure the mobilisation of the vessel poses a low risk of introducing IMS.	Yes	The completion of a biofouling risk assessment and the implementation of associated biofouling reduction and management measures reduce the likelihood of IMS translocation and subsequent potential for transfer and establishment. This approach is in accordance with the National Biofouling Management Guidelines for the Petroleum Production and Exploration Industry (Marine Pest Sectoral Committee 2018) A biofouling risk assessment is a desktop-based evaluation to determine the likelihood, and hence theoretical risk of a vessel acting as a vector for the transfer of marine pests. It does not attempt to identify whether or not a vessel is actually carrying a pest species, but rather ranks the vessel on a relative scale of High, Uncertain or Low/Acceptable risk, to identify if a vessel may require a further detailed investigation and/or management actions to reduce potential risk. The assessment, undertaken by an independent third-party IMS expert on behalf of INPEX, relies on the provision of accurate information from the vessel operator, which may include, but is not limited to, the following: • vessel specifications: vessel name, type, size and Flag State, etc. • movements: port of origin, voyage history, destination, transport method, evidence of recent dry-docking and/or inspection, etc. • anti-fouling coating: type (i.e. biocidal/non-biocidal), age, service life, application area, record of Antifouling Systems Certificate, etc. • inspection/cleaning: inspection and cleaning history including any relevant independent biofouling inspection reports, etc. • seawater systems: marine growth prevention systems present and functioning, maintenance records, evidence of chemically or manually cleaned seawater systems including last treatment date and chemicals used etc.

			• duration of stay: at overseas or interstate locations, and duration in WA coastal waters etc. Outcomes of the biofouling risk assessment may identify the need to implement mitigation measures such as limitations of time spent in coastal waters/or alongside and managing interactions with other vessels, through to inspection and cleaning of hulls and submerged areas.
	Complete a biofouling risk assessment for a survey vessel (including immersible equipment) mobilised domestically from other regions in Australia, and implement mitigation measures commensurate to the risk, as appropriate to ensure the mobilisation of the vessel poses a low risk of introducing IMS.	Yes	If a domestically sourced vessel is used, a biofouling risk assessment will be completed by INPEX with the process to be followed presented in Section 9.6.1 *. The assessment will include aspects of the vessels history with respect to IMS risk e.g. vessels origin from within Australian waters and previous locations of operation (including whether these Australian locations have reported IMS occurrences), periods out-of-water and inspections/cleaning undertaken, age of anti-fouling coatings, presence and condition of internal treatment systems etc. While undertaking the INPEX biofouling risk assessment for domestic movements, in any instances where potential risks are identified e.g. no anti-fouling coating or extended stays in Port, the process requires INPEX to engage an independent IMS expert and if required a further risk assessment (as described above for international vessels) may be undertaken. This control and implementation of any associated management measures will reduce the likelihood of IMS translocation and subsequent potential for transfer and establishment. * The process shown in Figure 9-4 in Section 9.6.1 was developed in conjunction with WA DPIRD.
	Survey vessel operating within Australian seas will manage ballast water discharge using one of the following approved methods of management including (DAWR 2017): • an approved ballast water management system	Yes	The discharge of high-risk ballast water has the potential to translocate IMS from a donor region to a recipient region. The survey vessel operating within Australian seas will comply with the Australian Ballast Water Requirements, Version 7 (DAWR 2017). Specifically, discharge of high-risk* ballast water into Australian seas is prohibited, unless it has been managed for discharge using one of the approved management methods as specified by DAWR (2017). The survey vessel will have documentation of DAWR release from biosecurity control or low risk status.

	• ballast water exchange conducted in an acceptable area * • use of low risk ballast water (e.g. fresh potable water, water taken up on the high seas, water taken up and discharged within the same place) • retention of high-risk ballast water on board the vessel • discharge to an approved ballast water reception facility **Acceptable area is as defined in the Biosecurity (Ballast Water and Sediment) Determination 2017. For high risk ballast water an acceptable area for ballast water exchange is defined as (DAWR 2017):* • Vessels servicing an offshore installation: at least 500 m from the facility, and no closer than 12 nm from the nearest land • All other vessel movements: at least 12 nm from the nearest land and in water at least 50 m deep; not within 12 nm of the Great Barrier Reef or Ningaloo Reef ballast water exchange exclusion areas.		Note ballast water exchange is being phased out, in favour of methods that are required to meet the Regulation D-2 standard. * DAWR (2017) defines high-risk ballast water as any ballast water that has not been managed in accordance with an approved method, and has been taken up: • within 12 nautical miles of any land mass or in water less than 50 metres deep • within 500 metres of an offshore installation, or • in an Australian port and then intended to be discharged in the Australian territorial seas.

	Survey vessel will have an approved ballast water management plan and valid ballast water management certificate, unless an exemption applies or is obtained.	Yes	Vessels operating in Australian seas that are designed or constructed to carry ballast water are required to carry and implement an approved vessel specific ballast water management plan. The format of the plan must be in accordance with Ballast Water Management Convention and Resolution MEPC.127 (53). The ballast water management plan outlines the duties of personnel on board for carrying out ballast operation and operational procedures for the vessel. A ballast water management certificate certifies that the vessel has an approved ballast water management plan.
	Survey vessel will have a biofouling management plan and maintain a biofouling record book.	No	A biofouling management plan provides operational guidance for the planning and actions required to manage vessel biofouling, in addition to outlining measures for the control and management of vessel biofouling in accordance with the IMO Guidelines for the Control and Management of Ship' Biofouling to Minimize the Transfer of Invasive Aquatic Species (2012 Edition). Biofouling on the survey vessel will be managed through vessel and equipment risk assessments and mitigation measures as described above. Based on the short-term duration of the survey (7-10 days) and that there will be no supply visits to mainland ports during the activity, the implementation of a biofouling management plan and biofouling record book is not considered to be commensurate with the level of risk. Currently, other INPEX vessels supporting the Ichthys LNG Project without biofouling management plans, are operating successfully under the specified vessel controls that are described in this EP. Therefore, the implementation of a biofouling management plan for the survey vessel is not considered to be warranted as an additional control at this stage given the confirmed low risk IMS status of the Ichthys facility in WA-50-L, the deep-water environment of the licence area, lack of visits to ports during the short-term duration activity and distance to sensitive benthic habitats.
Identify the likelihood			

A survey vessel mobilised from international waters or domestically is not considered a likely source for the introduction and establishment of IMS during due to the controls and procedures in place to manage ballast water exchange and biofouling risks. As such, there is a low potential for biofouling to occur and act as a potential inoculum for the establishment and subsequent spread of IMS. Adherence to the Australian ballast water management requirements including the use of an approved ballast water management method also reduces the potential for the spread of IMS (Highly Unlikely 5). Overall, the likelihood of introducing IMS is considered to be Highly Unlikely (5) due to the remote location of the WA-50-L (>12 nm from the nearest coastal waters), the short-term duration (7-10 days) and the inability of IMS to establish based on water depths within the licence area (approximately 250 m).
Residual risk summary
Based on a consequence of Moderate (D) and a worst-case likelihood of Highly Unlikely (5) the residual risk is Moderate (8).

Consequence	Likelihood	Residual risk
Moderate (D)	Highly Unlikely (5)	Moderate (8)

Assess residual risk acceptability
Legislative requirements Vessel ballast water will be managed in accordance with the intent of the *Australian Ballast Water Requirements Version 7* (DAWR 2017) and the *Biosecurity Act 2015.* Biofouling will be managed through vessel and equipment risk assessments and mitigation measures, in accordance with the *National Biofouling Management Guidelines for the Petroleum Production and Exploration Industry* (Marine Pest Sectoral Committee 2018). Stakeholder consultation Several recommendations with regards to minimising the risk of translocating marine pests into or within WA waters have previously been made to INPEX during the Ichthys LNG Project by WA DPIRD. These recommendations have been reflected in this EP through a series of controls (Table 7-11) and reporting requirements (Section 9.11.3). Conservation management plans / threat abatement plans Several conservation management plans have been consulted in the development of this EP (refer Appendix B). IMS have been identified as a threat in many conservation management plans, with actions focusing on the prevention of their introduction. The control measures described are consistent with the actions described in the conservation management documentation. ALARP summary The level of environmental risk is assessed as Moderate, therefore a detailed ALARP evaluation was undertaken to determine what additional control measures could be implemented to reduce the level of impacts and risks. No additional controls, beyond those identified during the detailed ALARP assessment can reasonably be implemented to further reduce the risk of impact. Acceptability summary Based on the above assessment, the proposed controls are expected to effectively reduce the risk of impacts to acceptable levels because:

- the activity demonstrates compliance with legislative requirements/industry standards
- the activity takes into account stakeholder feedback
- the activity is managed in a manner that is consistent with the intent of conservation management documents
- the activity does not compromise the relevant principles of ESD
- the predicted level of impact does not exceed the defined acceptable level in that the environmental risk has been assessed as "moderate", the consequence does not exceed "C – significant" and the risk has been reduced to ALARP.

Environmental performance outcomes	Environmental performance standards	Measurement criteria	Responsibility
Prevent introduction and establishment of IMS as a result of the petroleum activity (including through ballast water and biofouling from the survey vessel).	Survey vessel (of appropriate class) will have an antifouling coating applied in accordance with the prescriptions of the International Convention on the Control of Harmful Anti-fouling Systems on Ships (2001) and the *Protection of the Sea (Harmful Antifouling Systems) Act 2006* (Cwlth).	Anti-fouling Systems certificate or a Declaration on Anti-fouling Systems.	Vessel manager
	A biofouling risk assessment will be completed by an independent IMS expert for the survey vessel, including immersible equipment, prior to mobilisation from international waters. Where required, mitigation measures commensurate to the risk will be implemented to ensure the vessel mobilisation poses a low risk of introducing IMS.	Vessel-specific biofouling risk assessment and any records of mitigation measures implemented confirming the vessel presents a low risk.	Vessel manager
	A biofouling risk assessment will be completed for the survey vessel, including immersible equipment, prior to mobilisation from any Australian port. Where required, mitigation measures commensurate to the risk will be implemented to ensure the vessel mobilisation poses a low risk of introducing IMS.	Vessel-specific biofouling risk assessment and any records of mitigation measures implemented confirming the vessel presents a low risk.	Vessel manager
	Survey vessel operating within Australian seas will manage ballast water discharge	Premobilisation HSE inspection documentation and annual	Vessel master

	using one of the following approved methods of management including (DAWR 2017): • an approved ballast water management system or • exchange of ballast water exchange conducted in an acceptable area or • use of low risk ballast water (e.g. fresh potable water, water taken up on the high seas, water taken up and discharged within the same place) or • retention of high-risk ballast water on board the vessel or • discharge to an approved ballast water reception facility or • use of low risk ballast water (e.g. fresh potable water, water taken up on the high seas, water taken up and discharged within the same place).	verification reports confirm through ballast water records that an approved ballast water management option has been used. Documentation of DAWR release from biosecurity control or low risk status.	
	Survey vessel will have: • an approved ballast water management plan, unless an exemption applies or is obtained • a valid ballast water management certificate, unless an exemption applies or is obtained.	• Ballast water management plan or record of exemption (if not automatic exemption) • Valid ballast water management certificate or record of exemption (if not an automatic exemption).	Vessel master

7.5.2 Interaction with marine fauna

Table 7-12: Impact and risk evaluation – Physical presence of the survey vessel and interaction with marine fauna

<table>
<tr><th colspan="2">Identify hazards and threats</th></tr>
<tr><td colspan="2">The physical presence of the survey vessel and the use of towed geophysical survey equipment in the licence area has the potential to result in collision with marine fauna (vessel strike) or marine fauna entanglement respectively.</td></tr>
<tr><th>Potential consequence</th><th>Severity</th></tr>
<tr><td>The particular values and sensitivities identified as having the potential to be impacted by vessel strike or entanglement are:
• EPBC listed species.

The physical presence of the survey vessel in WA-50-L has a potential for interaction with transient, EPBC-listed species; specifically, marine mammals, whale sharks and turtles. A collision (vessel strike) with marine fauna may result in injury or death. Collisions between vessels and cetaceans occur more frequently where high vessel traffic and cetacean habitat overlap (Dolman & Williams Grey 2006). Vessel speed has been demonstrated as a key factor in collisions with marine fauna such as cetaceans and turtles, and it is reported that there is a higher likelihood of injury or mortality from vessel strikes on marine mammals when vessel speeds are greater than 14 knots (Laist et al. 2001; Vanderlaan & Taggart 2007). During the geophysical scope of the survey (lasting approximately 2 days), the vessel will be travel at speeds of approximately 4 knots and will remain stationary during all geotechnical sampling (lasting approximately 5 days).

The potential for vessel strike applies to all marine mammals, whale sharks and turtle species; however, humpback whales are considered to have a higher potential likelihood due to their extended surface time. The potential for collision during the survey is however reduced as the licence area is located hundreds of kilometres offshore, away from critical habitats such as humpback BIA areas (migration and calving) as shown in Figure 4-4 (located approximately 120 km south east from WA-50-L at its closest point). The reaction of whales to approaching ships is reported to be quite variable. Dolman and Williams Grey (2006) indicate that some cetacean species, such as humpback whales, can detect and change course to avoid a vessel. Humpback whales are subject to a DEE Conservation Advice (Appendix B) which requires the assessment of vessel strike on humpback whales and encourages the implementation of mitigation measures and vessel strike incident reporting to the National Ship Strike Database. As such, control measures are included within this EP, to align with the DEE Conservation Advice and address vessel strike on humpback whales.</td><td>Minor (E)</td></tr>
</table>

Another marine mammal with a BIA in the region (approximately 60 km to the west of WA-50-L (Figure 4-4)) is the blue whale, which is also subject to a DEE Conservation Management Plan (Appendix B). The Conservation Management Plan identifies that, since 2006, there have been two records of likely ship strikes of blue whales in Australia. In 2009 and 2010, there were blue whale strandings in Victoria, near the Bonney Upwelling with suspected ship strike injuries visible. Where blue whales are feeding at or near the surface, they are more susceptible to vessel strike. However, the open ocean environment allows for whales to invoke avoidance behaviour in threatening situations. The Blue Whale Conservation Management Plan highlights that minimising vessel collision is one of the top four priorities and requires assessment of vessel strike on blue whales, assures that incidents are reported in the National Ship Strike Database, and that control measures proposed will align with these priorities. Whale sharks do not breach the surface as cetaceans do, although they are known to swim near to the water surface; hence, are susceptible to vessel strike. The foraging area for whale sharks (BIA) is located approximately 15 km south-east of WA-50-L (Figure 4-6) and whale sharks are also subject to a DEE Conservation Advice (Appendix B) which notes that the threat to the recovery of the species includes strikes from vessels. Turtles transiting the region are also at risk from vessel strike when they periodically return to the surface to breathe and rest. Only a small portion (3–6%) of their time is spent at the surface, with routine dive times lasting anywhere between 15 and 20 minutes nearly every hour. The presence of vessels has the potential to alter the behaviour of individual turtles. Some turtles have been shown to be visually attracted to vessels, while others show strong avoidance behaviour (Milton et al. 2003). Following publication of the Recovery Plan for Marine Turtles in Australia (DEE 2017a), habitats critical for the survival of the genetically distinct, 'Scott Reef – Browse Island' green turtle population has been identified (Figure 4-5). The closest identified habitat to WA-50-L, relates to an internesting area consisting of a 20 km buffer around Browse Island between November and March each year. The BIA does not overlap the licence area which is located approximately 33 km from Browse Island. During the internesting periods studies have shown that green turtles tend to stay relatively close to their nesting beach, approximately 7 km as reported by Pendoley (2005) and generally within 10 km (Waayers et al. 2011). Therefore, any impacts are expected to be localised and of minor consequence at the population level for these mobile and broad-ranging species. Given the expansive open ocean environment of the licence area, the potential for the displacement of cetaceans by operational activities is considered to be low. Additionally, there are no recognised feeding or breeding grounds for cetaceans or turtles within WA-50-L. While there is potential for a small number of individual marine fauna to be impacted by the short-term presence (7-10 days) of the survey vessel in WA-50-L, any potential vessel strike to marine fauna is likely to be limited to isolated incidents. As reported by the DEE (2017a), although the outcome can be fatal for individual turtles, vessel strike (as a standalone threat) has not been shown to cause stock level declines. In the event of the death of an individual whale, whaleshark or turtle, it would not be expected to have a significant effect at the population level (Minor E).	

EPBC listed species may also be at risk of entanglement with towed geophysical survey equipment (towfish) which may lead to injury or death. The towfish (Section 3.4) is towed behind the survey vessel at a distance of approximately 500 m and is maintained in a position approximately 15 m above the seabed. Although this presents a potential for marine fauna entanglement, the distance is markedly shorter than seismic streamers or tail buoys that typically extend several kilometres behind the seismic vessel. Studies (Ketos Ecology 2009; Nelms et al 2016) have shown that turtles are more susceptible to entanglement than other species of marine fauna, mainly due to their repeated diving and resurfacing behavior. As the closest identified turtle critical habitat to WA-50-L, relates to an internesting area consisting of a 20 km buffer around Browse Island, and that green turtles tend to stay relatively close to their nesting beach (approximately between 7 km (Pendoley 2005) and 10 km (Waayers et al. 2011), any impacts are expected to be localised and of minor consequence (E). In the event of the death of an individual turtle due to entanglement, it would not be expected to have a significant effect at the population level (Minor E). With reference to the Recovery Plan for Marine Turtles in Australia (DEE 2017a) based on the long-life span and highly dispersed life history requirements of marine turtles it is acknowledged that they may be subject to multiple threats acting simultaneously across their entire life cycle, such as increases in background light and noise levels. In considering cumulative impacts of threats on small or vulnerable stocks of marine turtles, it is likely that vessel strike and entanglement may act as contributor to a stock level decline.	

Identify existing design and safeguards/controls measures
Implementation of EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.05).

Propose additional safeguards/control measures (ALARP Evaluation)

Hierarchy of control	Control measure	Used?	Justification
Elimination	Eliminate the use of survey vessel	No	A vessel is the only form of transport that can undertake the survey activity.
Substitution	None identified	N/A	N/A
Engineering	None identified	N/A	N/A
Procedures & administration	Vessel speed restrictions or separation distances maintained for turtles	No	It is reported that turtles generally stay close to their nesting beaches during the internesting period, so only individuals would be likely to be present in the licence area given the distance from Browse Island (33 km). Additionally, turtles reportedly spend a small portion (3–6%) of their time at the surface, this makes turtle observations by crew from the bridge of a vessel very difficult given that turtles are considerable smaller whales or whale sharks. On this basis, reducing vessel speeds and maintaining separation distances is not considered to be an effective control and will not be implemented.

	Vessel speed restrictions or separation distances maintained for whale sharks	Yes	As whale sharks swim near the sea surface, vessel strike is a possibility, given the closest BIA is located 30 km east of the licence area. In the absence of any current guidance for petroleum/commercial vessels, controls for vessel tour operators in Ningaloo (i.e. Whale Shark Wildlife Management Program No. 57) have been considered. Therefore, to be conservative, INPEX will adopt separation distances and vessel speed restrictions for whale sharks.
	Implementation of environmental awareness program for vessel crew.	Yes	Before work commences, vessel crew will be informed through an environmental awareness program of the need to avoid harm to marine fauna.

Identify the likelihood

Records from 2011 (most recently available data) showed that between six and nine vessel strikes with cetaceans, including non-fatal cases, had been reported in Australian waters in the previous three years, with only a minority occurring in WA (IWC 2011). This suggests that, despite the growing presence of oil & gas activities on the NWS/Timor Sea, and the steady increase (approximately 10% per year) in humpback whale numbers, whale populations have not been affected by collisions with oil & gas vessels.

The controls described above are commensurate with the level of risk and given the slow vessel speeds (4 knots), short-term duration of the survey (7-10 days) and the absence of any known BIAs or critical habitats in WA-50-L, the likelihood of a vessel strike or entanglement with towed equipment causing injury or death to a EPBC listed species is considered to be Highly Unlikely (5).

Residual risk summary

Based on a consequence of Minor (E) and a likelihood of Highly Unlikely (5) the residual risk is Low (9).

Consequence	Likelihood	Residual risk
Minor (E)	Highly Unlikely (5)	Low (9)

Assess residual risk acceptability

Legislative requirements

EPBC Regulations 2000 – Part 8, Division 8.1 (Regulation 8.05) will be implemented with regards to vessel speeds and separation distances.

Stakeholder consultation

No stakeholder concerns have been raised regarding potential impacts and risks from the physical presence of the survey vessel and potential for marine fauna vessel strike or entanglement.

Conservation management plans / threat abatement plans

Several conservation management plans have been consulted in the development of this EP (Appendix B). Actions identified in the Blue Whale Conservation Management Plan and DEE conservation advice documents for humpback whales and whale sharks regarding vessel strike incident reporting will be implemented.

ALARP summary Although the level of environmental risk is assessed as Low, a detailed ALARP evaluation was undertaken to determine what additional control measures could be implemented to reduce the level of impacts and risks. No additional controls, beyond those identified during the detailed ALARP assessment can reasonably be implemented to further reduce the risk of impact. Acceptability summary Based on the above assessment, the proposed controls are expected to effectively reduce the risk of impacts to acceptable levels because: • the activity demonstrates compliance with legislative requirements/industry standards • the activity takes into account stakeholder feedback • the activity is managed in a manner that is consistent with the intent of conservation management documents • the activity does not compromise the relevant principles of ESD • the predicted level of impact does not exceed the defined acceptable level in that the environmental risk has been assessed as "low", the consequence does not exceed "C – significant" and the risk has been reduced to ALARP.			
Environmental performance outcomes	Environmental performance standards	Measurement criteria	Responsibility
Zero incidents of injury/mortality of cetaceans, whale sharks or turtles from vessel collision or entanglement for the duration of the petroleum activity.	EPBC Regulations 2000 – Part 8 Division 1 Interacting with cetaceans, within the 500m exclusion zone including: • Vessel will not travel greater than 6 knots within 300 m of a cetacean (caution zone) • Vessel will not approach closer than 50 m to a dolphin and/or 100 m of a whale (with the exception of bow riding).	Records of any breaches of vessel/cetacean interaction requirements outlined in the EBPC Regulations 2000 reported.	Vessel master
	Vessel will not travel faster than 8 knots within 250 m of a whale shark and not approach closer than 30 m from ahead of a whale shark's direction of travel.	Records of any breaches.	Vessel master
	Awareness materials for vessel crew for avoiding harm to marine fauna.	Record of provision of awareness materials to vessel crew.	Environmental adviser

7.6 Seabed disturbance

Table 7-13: Impact and risk evaluation – Seabed disturbance

Identify hazards and threats	
As described in Section 3.3, a range of geotechnical survey techniques will be used to support the detailed engineering design of the proposed gathering system in WA-50-L. Sediment samples (2 piston core and 15 box core) will be collected from the seabed in WA-50-L. Each sample is expected to disturb approximately 1 - 2 m^2. In addition, thirty-one PCPTs will be completed to assess the in-situ strength of seabed soils in WA-50-L. No samples will be collected during the PCPTs; however, the PCPT seabed frame will be temporarily positioned on the seabed and therefore an expected footprint of approximately 2 – 3 m^2 will be disturbed during each deployment. Following completion of the geotechnical sampling no equipment will be left on the seabed. The survey vessel will not anchor during the activity (unless in an emergency) but will maintain position using DP. Therefore, the total planned seabed disturbance area is not expected to exceed 130 m^2. It is foreseeable that any dropped objects may also result in seabed disturbance. The largest piece of equipment that is to be lowered to the seabed is the PCPT system. Any disturbance to benthic habitats would be temporary given that all objects would be recovered. Physical disturbance of the seabed may cause temporary disturbance to benthic habitats and loss of associated infauna and epifauna. This loss has the potential to result in reduced ecosystem productivity or diversity.	
Potential consequence	**Severity**
The particular values and sensitivities identified as having the potential to be impacted by seabed disturbance are: • benthic communities. As described in Section 4.6.3, several seabed habitat surveys have been undertaken in the Ichthys Field in WA-50-L. The results of the surveys observed that seabed topography was relatively flat and featureless (INPEX 2010) with no obstructions or features on the seafloor, such as boulders, reef pinnacles or outcropping hard layers (Fugro Survey Pty Ltd. 2005, 2015; RPS 2007). The observed habitat generally supported a diverse infauna dominated by polychaetes and crustaceans typical of the broader region and this was reflected in survey results which indicated that the epibenthic fauna was diverse but sparsely distributed (RPS 2008). Benthic habitats within WA-50-L comprise of soft substrate, typical of deep continental shelf seabed habitats which are widely distributed in deeper parts of the Browse Basin (RPS 2007), and commonly found throughout the NWMR (Baker et al. 2008). Survey data also confirmed the seabed in WA-50-L has a lack of seabed features and identified heavily rippled sediments and sand waves suggestive of strong near seabed currents. The largest sand waves identified were reported to vary from 0.5 to 1.0 m in height with a maximum gradient on their northern lee side of approximately 20 degrees (Fugro Survey Pty Ltd 2015). In general, deep-sea infaunal assemblages are poorly studied on the NSW but are likely to be widely distributed in the region including WA-50-L (INPEX 2010).	Insignificant (F)

<table>
<tr><td colspan="3">The total disturbance footprint from the geotechnical survey scope is expected to be approximately 130 m^2 or 0.00013 km^2, which in the context of WA-50-L, that covers an area of approximately 570 km^2, is considered to represent a very small proportion of the production licence area. The activity may result in the mortality of sessile fauna within this footprint and potentially the mortality of benthic infauna associated with the habitat; however, it is considered that potentially impacted benthic habitats and associated biota are well represented in the region. Therefore, any temporary disturbance and losses will represent a very small fraction of the widespread available habitat. Following removal of the PCPT system and collection of the seabed samples, the soft sediments will be left disturbed; however, benthic habitats would remain viable and are expected to recolonise through the recruitment of new colonists from planktonic larvae and adjacent undisturbed areas.

The ancient coastline KEF, providing biologically important habitats in areas otherwise dominated by soft sediments (DSEWPaC 2012) is located, approximately 20 km south of WA-50-L at its closest point. Therefore, benthic communities associated with the KEF are not expected to be impacted by the geotechnical survey.

The potential consequence on benthic communities is a localised impact from physical disturbance within the footprint of the geotechnical sampling area, which is expected to be limited given the predicted sparse cover of benthic communities and expected recovery through recolonization. Therefore, it is assessed to be of inconsequential ecological significance (Insignificant F).</td><td></td></tr>
<tr><td colspan="4">Identify existing design and safeguards/controls measures</td></tr>
<tr><td colspan="4">INPEX lifting standard</td></tr>
<tr><td colspan="4">Propose additional safeguards/control measures (ALARP Evaluation)</td></tr>
<tr><td>Hierarchy of control</td><td>Control measure</td><td>Used?</td><td>Justification</td></tr>
<tr><td rowspan="2">Elimination</td><td>No anchoring by vessels</td><td>Yes</td><td>The survey vessel will not anchor in the licence area but will use DP to maintain position (with the exception of an emergency).</td></tr>
<tr><td>Take fewer geotechnical samples</td><td>No</td><td>In order to meet the technical objectives of the geotechnical survey and ground truth the results of the geophysical survey, a minimum number of samples need to be obtained. The number of samples proposed will enable the survey objectives to be met and sampling cannot be eliminated, nor numbers of samples reduced any further.</td></tr>
<tr><td>Substitution</td><td>None identified</td><td>N/A</td><td>N/A</td></tr>
</table>

Engineering	Dropped objects will be recovered	Yes	The use of the ultra-short base positioning system and the presence of mini transponders on deployed equipment (corer and PCPT system) will ensure that any objects dropped during deployment can be accurate located and recovered by to the vessel.
Procedures & administration	None identified	N/A	N/A

Identify the likelihood

Based on the geotechnical survey scope, the likelihood of impacting benthic communities located in WA-50-L is considered to be Possible (3). However, given the controls in place, any impacts will be of a temporary nature and are considered to be ecologically insignificant to the wider diversity and productivity of benthic communities in the region, based on the relatively small area potentially impacted i.e. total disturbance footprint relative to the widespread available habitat and expected recovery.

Residual risk summary

Based on a consequence of Insignificant (F) and a likelihood of Possible (3) the residual risk is Low (8).

Consequence	Likelihood	Residual risk
Insignificant (F)	Possible (3)	Low (8)

Assess residual risk acceptability

Legislative requirements

There are no specific environmental guidelines/legislation regarding geotechnical sampling of the seabed with respect to impacts on benthic communities.

Stakeholder consultation

No stakeholder concerns have been raised regarding potential impacts and risks from seabed disturbance associated with the survey.

Conservation management plans / threat abatement plans

Several conservation management plans have been consulted in the development of this EP (Appendix B). The recovery plan for sawfish and river sharks specifies habitat degradation and modification as a principle threat and details actions to reduce impacts on critical sawfish and river shark habitats. There are no critical habitats for sawfish or river sharks within WA-50-L and therefore no specific actions relating to seabed disturbance apply. ALARP summary Although the level of environmental risk is assessed as Low, a detailed ALARP evaluation was undertaken to determine what additional control measures could be implemented to reduce the level of impacts and risks. No additional controls, beyond those identified during the detailed ALARP assessment can reasonably be implemented to further reduce the risk of impact. Acceptability summary Based on the above assessment, the proposed controls are expected to effectively reduce the risk of impacts to acceptable levels because: • the activity demonstrates compliance with legislative requirements/industry standards • the activity takes into account stakeholder feedback • the activity is managed in a manner that is consistent with the intent of conservation management documents • the activity does not compromise the relevant principles of ESD • the predicted level of impact does not exceed the defined acceptable level in that the environmental risk has been assessed as "low", the consequence does not exceed "C – significant" and the risk has been reduced to ALARP.			
Environmental performance outcomes	Environmental performance standards	Measurement criteria	Responsibility
Risk of impacts to benthic communities from seabed disturbance are reduced and maintained at acceptable levels through implementation of the environmental performance standards and the application of the environmental management implementation strategy.	Any lifting of large infrastructure ('critical lifts') in WA-50-L will be managed under a permit to work issued in accordance with the INPEX *Lifting Standard*.	Records of permit to work for all critical lifts conducted in WA-50-L.	Field manager
	Vessels will not anchor in WA-50-L, unless in case of an emergency.	Incident reports	URF installation lead
	Dropped objects will be recovered.	Incident reports	URF installation lead

7.7 Social and cultural heritage protection

7.7.1 Physical presence - disruption to other marine users

Table 7-14: Impact and risk evaluation – Physical presence of vessels resulting in disruption to marine users

Identify hazards and threats	
The physical presence of the survey vessel and towed equipment (extending approximately 500 m behind the vessel) in WA-50-L has the potential to cause disruption to other marine users, including shipping operators and fisheries through the reduction of space available to conduct shipping and fisheries activities in the licence area. The potential, albeit temporary, interference with and/or exclusion of other users may result in a loss of revenue for commercial users including fisheries.	
Potential consequence	**Severity**
The particular values and sensitivities identified as having the potential to be impacted by disruption from the physical presence of vessels are: • Shipping operators and commercial, traditional, and recreational fisheries. Other marine users in the vicinity of WA-50-L may be impacted by the presence of the survey vessel and towed equipment through the loss of navigable space available to conduct their activities. The implications of such disruptions include changes to sailing routes and journey times, or reduced ability to fish in an area. The worst-case consequence from a loss of access to an area could result in economic losses and/or potential reduction in employment levels. A review of AMSA's vessel traffic data for the Browse Basin in May 2019 confirmed the absence of any major shipping lanes within the licence area (Figure 4-8). A large proportion of the high-density vessel traffic in and around WA-50-L is related to supply vessels supporting the offshore developments (INPEX Ichthys facility and Shell Prelude FLNG facility) that routinely transit between the offshore facilities and the ports of Darwin and Broome on the mainland. Therefore, in some areas of WA-50-L heavy vessel traffic will occur. In addition to vessel traffic, INPEX's Ichthys offshore facility (CPF and FPSO) are permanently moored within WA-50-L, with 500 m exclusion zones in place, also contributing to a loss of navigable space in the licence area. Individual vessels may have to slightly alter their sailing routes to avoid the survey in WA-50-L, potentially leading to longer journey times; however, given the short-term duration of the activity (7-10 days) and the presence of the permanently moored facilities in the licence area that other marine users are aware of, any disruption is expected to cause minor impact and not result in any economic losses. Therefore, the consequence is considered to be insignificant (F).	Insignificant (F)

Several Commonwealth and State managed fisheries overlap the licence area and the EMBA (Section 4.8.3). In many instances, although the area of the fishery overlaps WA-50-L, no fishing effort actually occurs in the licence area based on the water depth, water temperature and lack of suitable habitat. Of the fisheries overlapping WA-50-L, the North West Slope Trawl Fishery is the only active fishery, however it reportedly fishes at low levels, with only negligible trawl fishing occurring in the Ichthys Field (AFMA 2019d). Based on the low level of identified commercial fishing activity, the short-term duration of the survey (7-10 days) and the presence of the existing permanently moored facilities in WA-50-L that fishers are aware of, the potential loss of navigable space in which a fishing operator could conduct their activities is considered to be insignificant (F). WA-50-P is situated within the MoU box for Indonesian traditional fishing (DSEWPaC 2012) as shown on Figure 4-2. Therefore, Indonesian fishing vessels may be present in the area when transiting between fishing grounds at Scott Reef and Browse Island; however, transit routes are not expected to overlap WA-50-L as Scott Reef and Browse Island are located south of the licence area. Therefore, interference and disruption are not expected, and impacts are expected to be insignificant (F). Recreational fishing may also operate off the WA coast during certain times of the year. Generally, there is little recreational fishing that occurs within WA-50-L because of its distance from land, lack of features of interest and deep waters. Therefore, the potential for loss of access to the recreational fishing industry as a result of the presence of the survey vessel is considered to be of Insignificant consequence (F).	

Identify existing design and safeguards/controls measures
Stakeholder consultation with relevant stakeholders Survey vessel fitted with lights, signals, an automatic identification system (AIS) transponders and navigation equipment as required by the *Navigation Act 2012*.
Propose additional safeguards/control measures (ALARP Evaluation)

Hierarchy of control	Control measure	Used?	Justification
Elimination	Eliminate the use of survey vessel	No	A vessel is the only form of transport that can undertake the survey activity.
Substitution	Alter timing of the survey to avoid peak fishing periods	No	The level of potential disruption from a loss of navigable space for a limited duration (7-10 days) is considered to be very low when compared to the area available to other marine users. In conjunction with low fishing activity in the area, as confirmed through stakeholder consultation, altering the timing of the activity is not deemed necessary or considered an effective control.

Engineering	None identified	N/A	N/A
Procedures & administration	Australian Hydrographic Office (AHO) will be informed of the proposed survey location prior to the activity commencing.	Yes	By informing AHO start date of the activity, information will be included in the promulgation of fortnightly Notice to Mariners. Notice to Mariners provide commercial shipping operators with information regarding activities or hazards in the region and will include details of the survey vessel.
	Notification to AMSA's Joint Rescue Coordination Centre (JRCC) of the survey details (survey vessel, location, timing etc.) prior to mobilisation to ensure NAVAREA X and AUSCOAST warnings can be issued and kept up to date.	Yes	The AMSA JRCC will be advised of the survey details for promulgation of radio-navigation warnings 24-48 hours before operations commence and upon completion of the survey.

Identify the likelihood
The survey vessel and towed equipment operating in WA-50-L will have an insignificant impact in reducing the navigable space available to shipping and fishing operators. The likelihood of loss of access/space in the open ocean resulting in an economic loss or reduction in employment levels is considered to be Highly Unlikely (5). During stakeholder engagement for the EP, shipping operators were not considered as relevant stakeholders to be consulted, as the petroleum activity is outside of any shipping routes/channels. Relevant stakeholders, including fisheries, were consulted throughout the development of this EP. Commercial fisheries will continue to be informed and updated on operational activities being undertaken by INPEX. On this basis, with the controls in place and short-term duration of the survey, impacts to economic values from loss of revenue for fisheries due to lack of access to fishing grounds with potential reduction in employment levels is considered Highly Unlikely (5).
Residual risk summary
Based on a consequence of Insignificant (F) and a likelihood of Highly Unlikely (5) the residual risk is Low (10).

Consequence	Likelihood	Residual risk
Insignificant (F)	Highly Unlikely (5)	Low (10)

Assess residual risk acceptability

Legislative requirements All requirements under the *Navigation Act* 2012 and associated Marine Orders for navigation and avoidance of collision for the survey vessel are identified as control measures. Stakeholder consultation No stakeholder concerns have been raised regarding potential impacts and risks from the physical presence of the survey vessel and towed equipment in WA-50-L during the survey. Conservation management plans / threat abatement plans Several conservation management plans have been consulted in the development of this EP (Appendix B). None of the recovery plans or conservation advice documents are relevant to the physical presence of vessels disrupting shipping or fishing operators. ALARP summary Although the level of environmental risk is assessed as Low, a detailed ALARP evaluation was undertaken to determine what additional control measures could be implemented to reduce the level of impacts and risks. No additional controls, beyond those identified during the detailed ALARP assessment can reasonably be implemented to further reduce the risk of impact. Acceptability summary Based on the above assessment, the proposed controls are expected to effectively reduce the risk of impacts to acceptable levels because: • the activity demonstrates compliance with legislative requirements/industry standards • the activity takes into account stakeholder feedback • the activity is managed in a manner that is consistent with the intent of conservation management documents • the activity does not compromise the relevant principles of ESD • the predicted level of impact does not exceed the defined acceptable level in that the environmental risk has been assessed as "low", the consequence does not exceed "C – significant" and the risk has been reduced to ALARP.			
Environmental performance outcomes	Environmental performance standards	Measurement criteria	Responsibility
Relevant persons (i.e. shipping operators and commercial, traditional, and recreational fisheries) will be identified and any	Disruption to fishing/shipping and other marine users will be managed by identifying and conducting ongoing stakeholder consultation on an as required basis during the activity.	Stakeholder engagement records demonstrating assessment of stakeholder feedback received and INPEX response (or resolution).	Environmental adviser

concerns raised will be assessed and those of merit resolved.	Survey vessel will be fitted with lights, signals, AIS transponders and navigation and communications equipment, as required by the *Navigation Act 2012.*	Records confirm that required navigation equipment is fitted to the survey vessel to ensure compliance with the *Navigation Act 2012.*	Environmental adviser
	The Australian Hydrographic Service (AHO) will be notified no less than four working weeks before operations commence for the promulgation of related notices to mariners (via datacentre@hydro.gov.au).	Records of document transmittal to AHO.	Environmental adviser
	Notification will be provided to AMSA's Joint Rescue Coordination Centre (JRCC) for promulgation of radio-navigation warnings 24-48 hours before operations commence, including following information (via rccaus@amsa.gov.au, ph: 1800 641 792 or +61 2 6230 6811): • Vessel details, including name, call sign and Maritime Mobile Service Identity (MMSI) • Satellite communications details, including INMARSAT-C and satellite telephone • Area of operation • Requested clearance from other vessels Notification of operations start and end.	Records of document transmittal to AMSA JRCC.	Environmental adviser

8 EMERGENCY CONDITIONS

An evaluation of potential spill sources was identified during the environmental hazard identification (HAZID) workshop (Table 7-9). In addition, the HAZID workshop also considered the following potential emergency condition scenarios:

- dropped object resulting in damage to the SPS and a loss of containment
- towed survey equipment snagging on the SPS resulting in damage and a loss of containment
- vessel collision resulting in a loss of containment.

The potential for a loss of containment from the SPS due to a dropped object associated with the survey was not deemed credible. The heaviest item that could be dropped would be the PCPT unit frame while it is being deployed over the side of the vessel during the geotechnical survey scope. Using the weight of the PCPT unit (7 tonnes), the water depths and current data, a drop cone was calculated to be in the order of 40 metres. The survey vessel will maintain position using DP and no lifts will occur over live infrastructure. The geotechnical sampling procedure for the survey specifies minimum separation distances (100 m offset) that must be maintained between geotechnical sampling locations and the SPS. Therefore, with the offset, use of a DP vessel and no lifts over the SPS it was considered that damage or rupture of the SPS due to a dropped object was not credible.

The potential for towed geophysical survey equipment (towfish) to become snagged on the SPS resulting in a loss of containment was also considered. During the geophysical survey, the towfish will be deployed on a cable approximately 500 m behind the vessel and will be maintained at a distance of approximately 15 m above the seabed. The towfish will weigh approximately 30 - 40 kg and although it was considered possible that it may snag on any features on the seabed (> 15 m in height) the towfish cable has a failsafe release mechanism and therefore no damage to the SPS was considered credible.

Therefore, the only emergency condition scenario that was considered credible, was as follows:

- source – survey vessel
- threat – vessel collision
- hydrocarbon type – Group II – marine diesel
- release type – surface spill, up to a 6-hour release
- release location – within WA-50-L (approximately 46 km NW of Browse Island).

8.1 EMBA based on oil spill modelling

Hydrocarbon exposure has the potential to result in both acute and chronic impacts to marine flora and fauna, depending on the sensitivity of organisms exposed and the concentration of exposure. A summary of the range of concentrations of different hydrocarbon exposure thresholds adopted to conservatively identify an area with potential environmental impacts is described in Table 8-1. These thresholds include surface, entrained, dissolved and shoreline accumulation thresholds to account for the different partitioning and fate of oils released. These thresholds have been used in stochastic modelling to define the EMBA as described in Section 4, for oil spill planning purposes.

Table 8-1: Hydrocarbon exposure threshold for impact and risk evaluation

Threshold	Description
Surface hydrocarbon exposure: 1–10 g/m^2.	Certain socioeconomic receptors, such as oil & gas industry and fishing activities may be affected by safety concerns associated with a light surface expression. Therefore, a surface exposure threshold of 1 g/m^2 is included, for information purposes. However, it is considered too low for ecological impact assessment purposes. The surface oil threshold of 10 g/m^2 to assess environmental impacts is based on research by French-McCay (2009) who has reviewed the minimum oil thickness (0.01 mm) required to impact on thermoregulation of marine species, predominantly seabirds and furred mammals. Seabirds are particularly vulnerable to oil spills because their feathers easily become coated and they feed in the upper water column. Other tropical marine megafauna species are unlikely to suffer from comparable physical oil coating because they have smooth skin. Applying the threshold for the scenarios outlined for this EP therefore, represents a conservative measure to define the EMBA. This threshold has been applied to various industry oil spill impact assessments by French-McCay (2002; 2003) and is recommended in the AMSA guidelines (AMSA 2015).
Dissolved and entrained hydrocarbon exposure: 500 ppb.	The biological impact of entrained oil cannot be determined directly using available ecotoxicity; however, it can be derived from tests using either water-soluble fraction (WSF) of oil or oil-in-water dispersions (OWD). OWD are prepared by highly turbulent shaking of oil in water, which are allowed to separate before use, so that the test organisms are exposed to the dissolved fractions, as well as any very fine entrained oil droplets that remain in suspension. However, results are conservative because entrained droplets are less biologically available to organisms through tissue absorption than the dissolved fraction (Tsvetnenko 1998). To provide an estimate of the magnitude of toxicity effects from oil exposure to marine biota across a wide taxonomic range, a review was undertaken of global ecotoxicology data for numerous species (115 for fish, 129 for crustaceans, and 34 for other invertebrates) by French-McCay (2002). These were based on both WSF and OWD tests. Under low-turbulence conditions, the total polycyclic aromatic hydrocarbon (PAH) LC_{50} for species of average sensitivity ranges from about 300–1,000 ppb. Under higher turbulence, such as a subsea release, the total PAH LC_{50} decreased to about 64 ppb (French-McCay, 2002). This is close to the 99% species protection threshold of 50 ppb for PAH in the Australian and New Zealand *Guidelines for Fresh and Marine Water Quality* (ANZECC/ARMCANZ 2000). Comparatively, the lowest no observed effect concentration (NOEC) level for unweathered Browse condensate from the north-west region was found to be 20 ppm, based on a fish imbalance and tiger-prawn toxicity test (Woodside 2014).

Threshold	Description
	For marine diesel, the surface release of the hydrocarbon tends to reduce its potential for solubility, so the toxicity decreases and a threshold up to 1,000 ppb is recommended (French-McCay 2009). To be conservative a 500 ppb entrained/dissolved threshold is proposed for a surface release of marine diesel to account for any ecological impacts in the EMBA.
Shoreline accumulation: 100 g/m^2 (where threshold for surface or entrained/dissolved hydrocarbon exposure at that shoreline is also exceeded).	A shoreline accumulation threshold of 100 g/m^2 is also recommended from the review by French-McCay (2009) based on exposure to birds and smothering of invertebrates in intertidal habitats.

As described in Section 4 the spatial extent of the EMBA, used as the basis for the EPBC Protected Matters Database search (Appendix B) was determined using stochastic spill modelling. The modelled scenario was a vessel collision scenario, involving an instantaneous spill of 250 m^3 of marine diesel (MGO) within WA-50-L.

Based on the defined hydrocarbon exposure thresholds, the resulting EMBA is the sum of 300 overlaid modelling runs from the selected location (100 runs per season) during summer, winter and transitional and under different hydrodynamic conditions (e.g. currents, winds, tides, etc.).

This technique has been used to provide a highly conservative representation of the EMBA from the potential loss of containment event, to ensure that the EPBC Protected Matters Database search includes all potential receptors. This technique also ensures that the modelling outputs regarding concentrations of floating, entrained, dissolved and shoreline accumulated oil and time to contact are conservative. As such, the actual area that may be affected from any single spill event would be considerably smaller than the area represented by the EMBA. However, these scenarios provide sufficient information to inform spill response planning commensurate with the risk of the activity.

As presented in Table 8-3, the EMBA based on the vessel collision scenario may extend up to 277 km (1 g/m^2 - visible surface sheen) or up to 159 km (above environmental impact threshold – 10 g/m^2) from the release location (RPS 2019). The maximum entrained oil concentration at or greater than the impact threshold concentration (500 ppb) may travel up to approximately 188 km from the release location. The dissolved oil threshold was not exceeded at any sensitive receptor location. Shoreline accumulation was predicted as <1 m^3 at all shoreline receptors.

The impacts and risks associated with the vessel collision scenario are presented in Table 8-4.

8.2 Vessel collision

8.2.1 Location

Spill modelling (RPS 2019) was undertaken for a Group II hydrocarbon surface release of marine diesel in the licence area, WA-50-L, at a location approximately 46 km northwest of Browse Island. The release point provides indicative information only as an exact location for a vessel collision cannot be predicted.

8.2.2 Volume and duration

AMSA guidance (AMSA 2015) recommends that the maximum credible volume spill for a vessel collision scenario be based on the volume of the largest single fuel tank. As the specific vessel to undertake the survey has yet to be finalised, a review of the expected fuel tank sizes associated with potentially available survey vessels has indicated the largest single fuel tanks to be typically be approximately 50 m^3. Conservatively, existing modelling of a 250 m^3 spill volume (RPS 2019) has been used in this EP in case only a larger vessel is available to complete the survey. The spill was modelled as an instantaneous spill, with spill trajectory and fate tracked for 21 days (RPS 2019).

8.2.3 Hydrocarbon properties

Hydrocarbon properties associated with the Group II marine diesel used for the modelling study are presented in Table 8-2.

Table 8-2: Group II diesel properties

Hydrocarbon type	**Density at 15 ˚C (g/cm³)**	**Viscosity – centipoise (cP) – at 40 ˚C**	**Characteristic**	**Volatile (%)**	**Semi-volatile (%)**	**Low volatility (%)**	**Residual (%)**
			Boiling point (˚C)	<180	180–265	265–380	>380
Marine Gas Oil	0.8291	4.0	% of total	6	34.6	54.4	5

8.2.4 Modelling results

Stochastic modelling results are summarised in Table 8-3 and include results taken for three modelled seasons throughout the year; October to March (summer), May to August, (winter) and combined April and September (transition). For each season, 100 modelled replicates were run and therefore the results summarised represent 300 possible spill scenarios.

Diesel is a mixture of volatile and persistent hydrocarbons with low percentages of highly volatile and residual components. When exposed to the atmosphere, around 41% of the mass would be expected to evaporate in around 24 hours, another 54% within a few days, and the remaining 5% would be expected to persist in the marine environment until decayed. The influence of entrainment will regulate the degree of mass retention in the environment, with increasing wind speed resulting in increased entrainment (RPS 2019). Considering the spill volume, there is a low potential for dissolution of soluble aromatic compounds.

Table 8-3: Vessel collision stochastic modelling results summary

Hydrocarbon exposure	Surface instantaneous release of 250 m^3 (RPS 2019)
Surface	The maximum distance of floating hydrocarbons on the sea surface, at concentrations greater than 1 g/m^2 (visible sheen), travelled by a single spill trajectory (out of 300 simulations) was approximately 277 km. At a concentration of >10 g/m^2 (environmental impact threshold), the maximum distance travelled by a single spill trajectory (out of 300 simulations) was approximately 159 km.
Entrained and dissolved	The maximum distance of entrained hydrocarbon, at concentrations greater than 500 ppb, travelled by a single spill trajectory (out of 300 simulations) was approximately 188 km. The worst-case instantaneous entrained oil concentration at any receptor is predicted at the North-West Slope Trawl Fishery, Western Skipjack Fishery and Western Tuna and Billfish Fishery as 43,207 ppb. Browse Island is predicted to have a worst-case entrained oil concentration of 679 ppb in summer. No other receptors were predicted to be exposed >500 ppb in any season. The worst-case dissolved oil concentration was 490 ppb, which is below the impact threshold, and therefore contact above the 500 ppb impact threshold was never exceeded for any receptor. The majority of concentrations predicted were below 200 ppb. RPS (2019) produced cross-sections to provide an understanding of the depth of entrained/dissolved concentrations through the water column (refer to Figure 8-1 and Figure 8-2). Modelling results indicate that entrained oil will not exceed the 500 ppb threshold deeper than 25 m below sea surface for all seasons.
Shoreline	Shoreline accumulation was predicted as <1 m^3 at all shoreline receptors. The worst-case replicate was 0.07 m^3 predicted to accumulate along 1.6 km of shoreline at Cartier Island MP. The worst-case local accumulated concentration was calculated at 11 g/m^2 at Scott Reef - Sandy Islet and Ashmore Reef (summer).

In addition to the stochastic modelling, a further deterministic assessment was made on the worst-case individual run from the stochastic modelling study. The worst-case was based on the maximum volume on shoreline and the maximum length of shoreline oiled. This was predicted to occur in the transitional season where 0.07 m^3 of oil was forecast to accumulate along 1.6 km of shoreline at Cartier Island MP.

Figure 8-3 shows a time-series (1-day, 3-days, 5-days and 1-week following commencement of the spill) of predicted concentrations of surface, entrained and dissolved, and shoreline hydrocarbons during the worst-case run (transitional season).

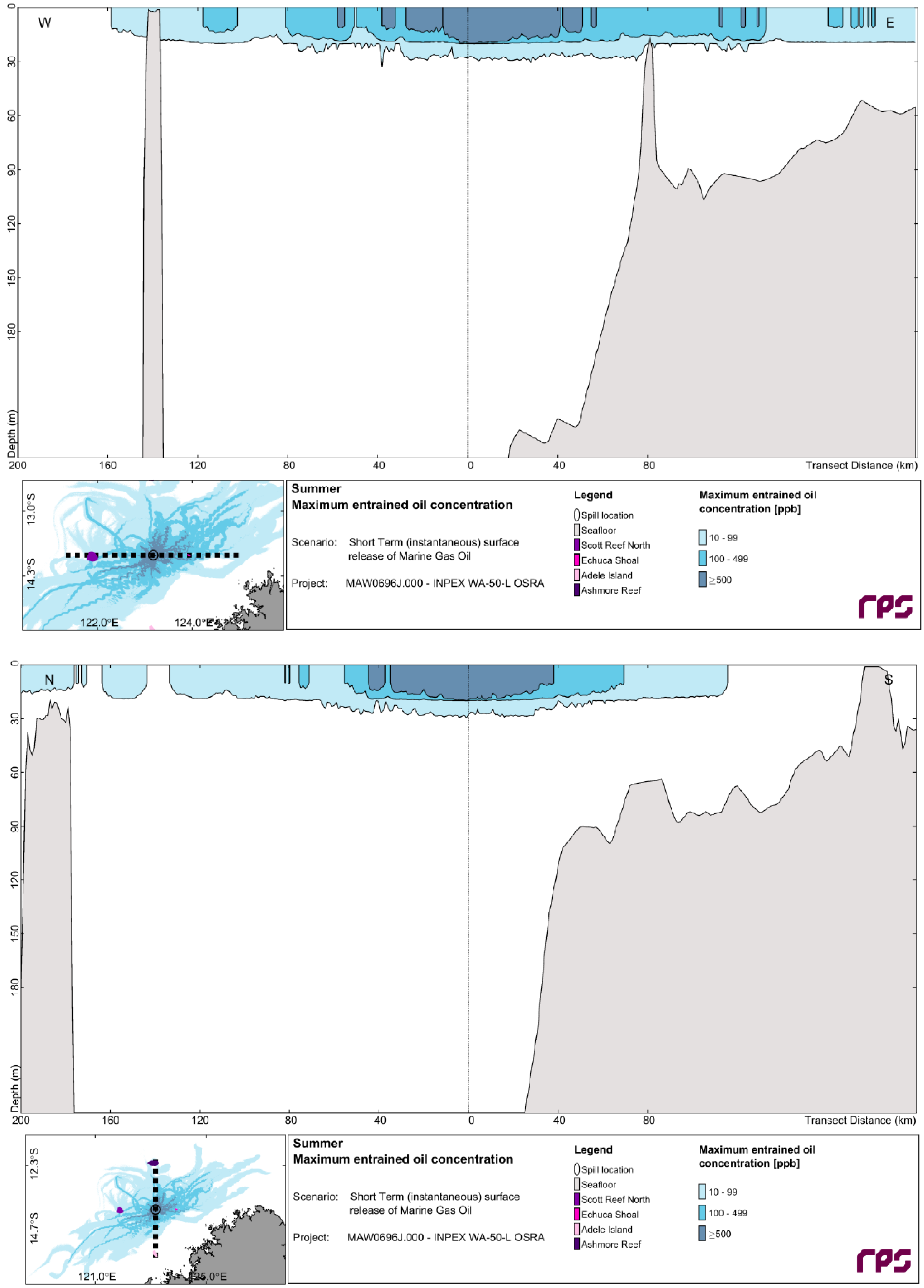
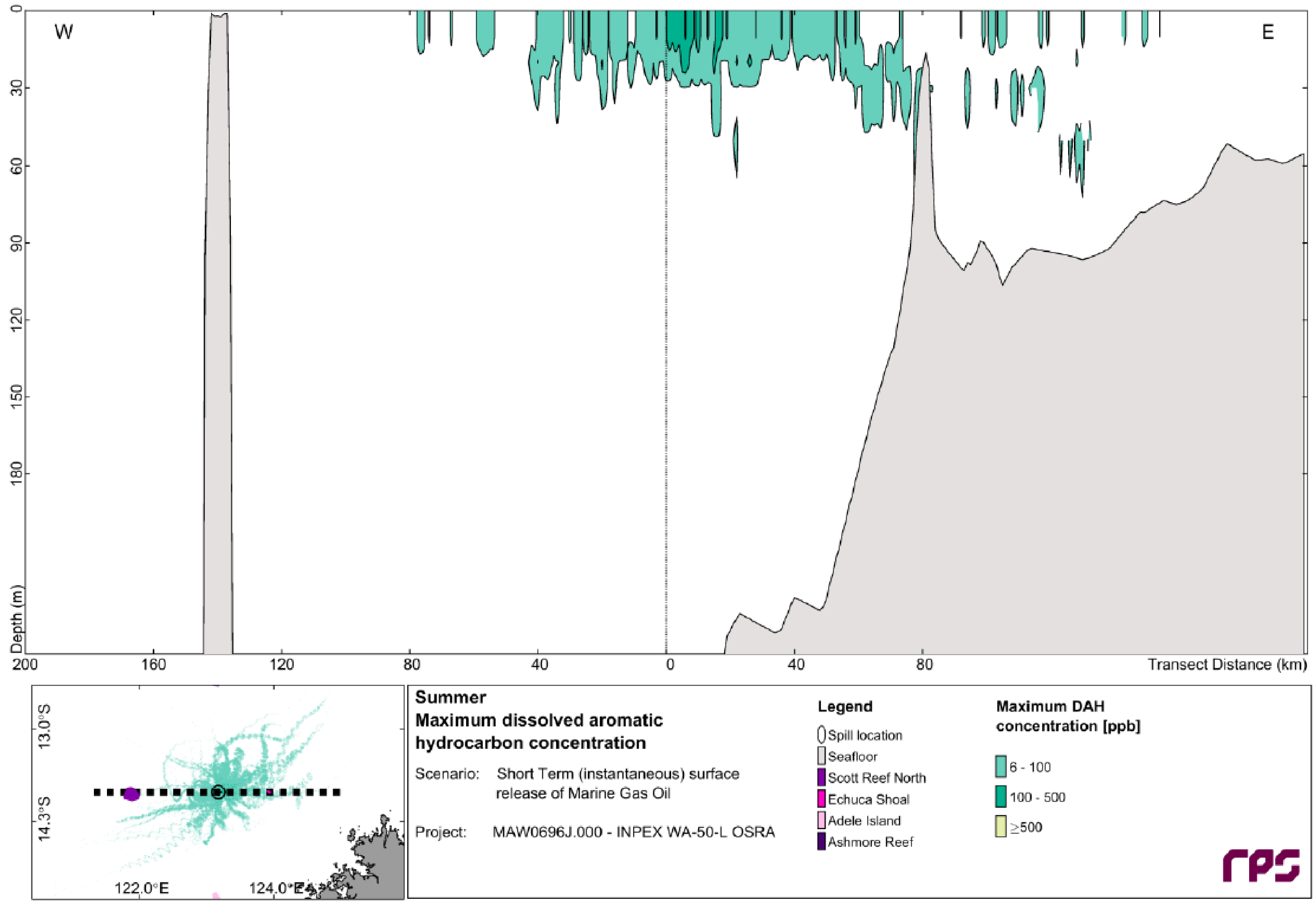


Figure 8-1: Cross-section transects of predicted maximum entrained hydrocarbon concentration for 100 replicates (summer) from a surface release of diesel. (RPS 2019).



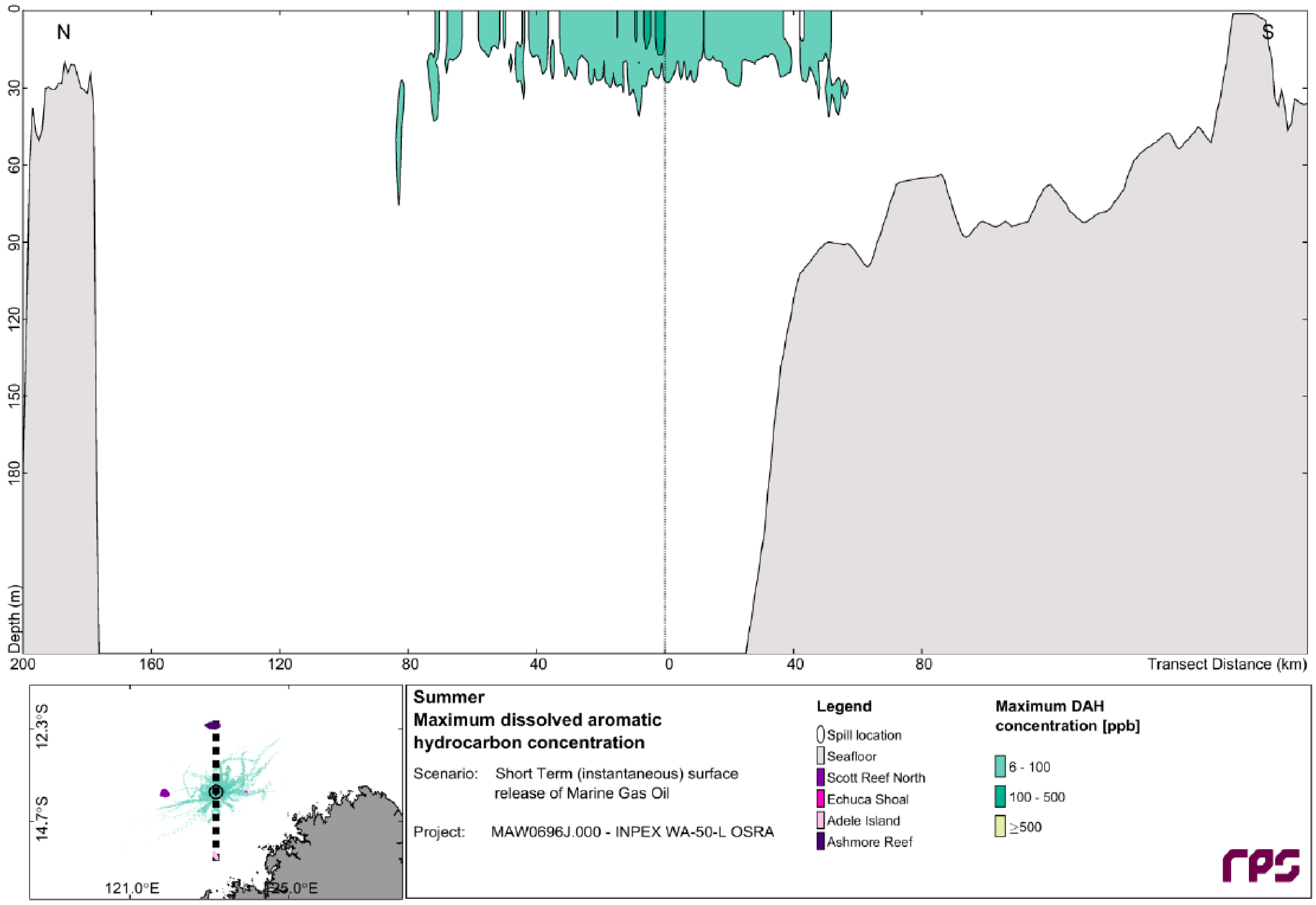


Figure 8-2: Cross-section transects of predicted maximum dissolved aromatic hydrocarbon concentration for 100 replicates (summer) from a surface release of diesel. (RPS 2019).

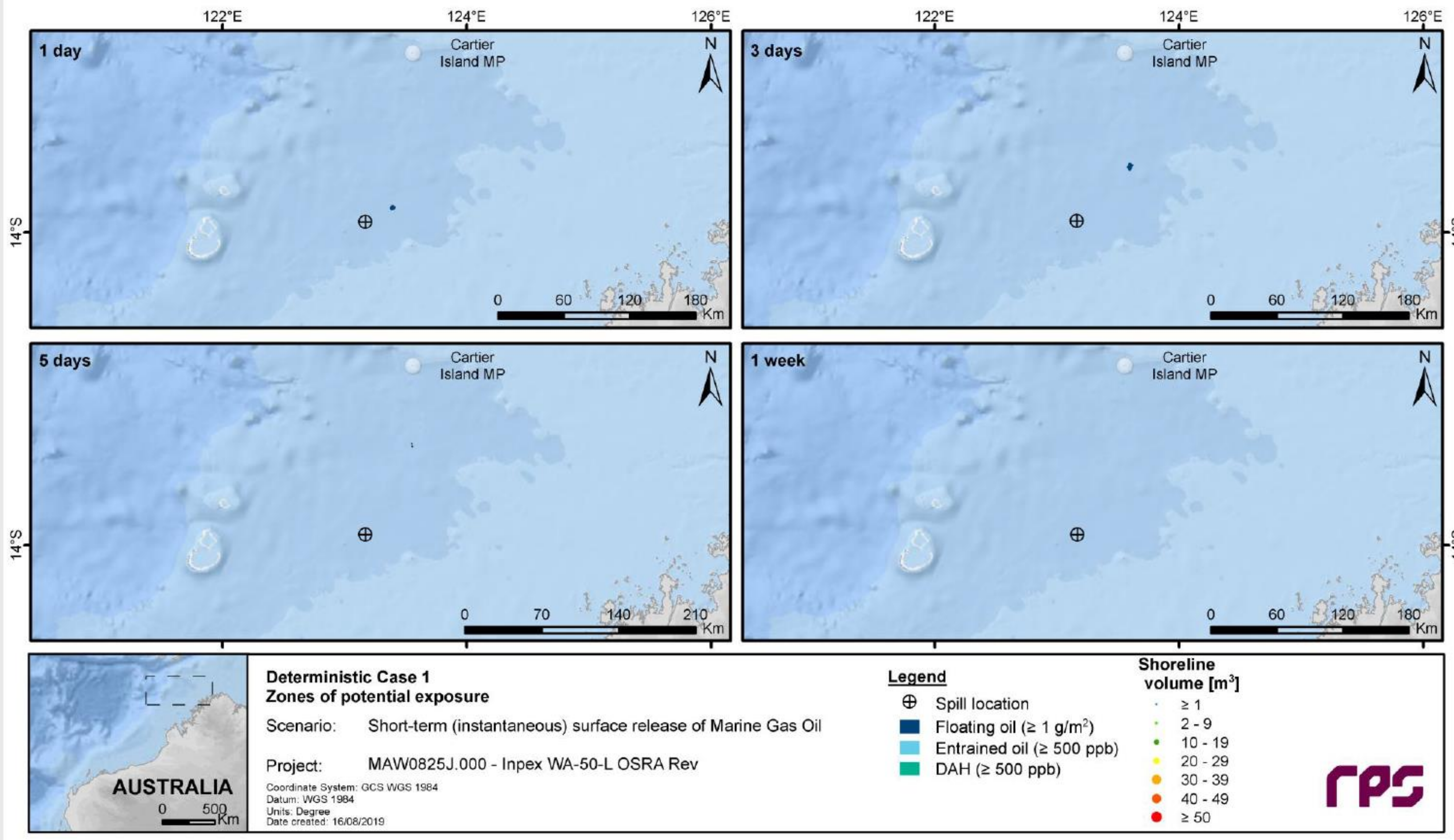


Figure 8-3: Example of time-series of oil exposure for floating oil (≥ 1 g/m²), entrained / dissolved oil (≥ 500 ppb) and shoreline oil (≥ 100 g/m²) for a replicate in transitional season (RPS 2019).

8.2.5 Impact and risk evaluation

Table 8-4: Impact and evaluation – Vessel collision resulting in a Group II (diesel) spill

Identify hazards and threats	
A surface release of Group II hydrocarbons has the potential to result in changes to water quality through surface and shoreline hydrocarbon exposure. The thresholds for impacts associated with surface, entrained/dissolved, and shoreline, hydrocarbon exposures are described in Table 8-1. The results of the predictive modelling for the vessel collision scenario are presented in Table 8-3, Figure 8-1, Figure 8-2, and Figure 8-3.	
Potential consequence – surface hydrocarbons	**Severity**
The values and sensitivities with the potential to be affected by surface hydrocarbon exposure resulting from a vessel collision include: • commercial, recreational and traditional fisheries including aquaculture (within 277 km from the release location based on 1 g/m^2 visible sheen threshold) • transient, EPBC-listed species (within 159 km from the release location based on 10 g/m^2 impact threshold) • planktonic communities (within 159 km from the release location based on 10 g/m^2 impact threshold). Commercial, recreational and traditional fisheries including aquaculture may be impacted by the presence of exclusion zones and the oiling of nets and lines. The potential extent of the visible sheen associated with the vessel collision scenario is up to 277 km from the spill location. There are low levels of recreational and traditional fishing activities in WA-50-L and the EMBA, and no aquaculture (refer to Sections 4.8.3 and 4.8.4). Based on the low level of reported commercial fishing in the licence area, any socioeconomic impacts are expected to be localised to within 227 km of the release location and temporary in nature given the expected evaporation and rapid dispersion of Group II hydrocarbons at the sea surface. Therefore, the consequence is considered to be Insignificant (F) There are no known BIAs or aggregation areas within WA-50-L. However, there are several marine fauna BIAs located in areas predicted to be exposed to surface expressions above the 10 g/m^2 exposure threshold (within 159 km of the release location in WA-50-L). These include a 20 km internesting buffer at Browse Island for green turtles, a whale shark foraging BIA located approximately 15 km south east of WA-50-L, blue whale foraging/migration located approximately 60 km west of WA-50-L and the humpback whale migration corridor located 120 km south-east from WA-50-L. A range of other marine fauna may also be present within this area albeit on a transient basis.	Minor (E)

As air-breathers, marine mammals, if they surface, are vulnerable to exposure to hydrocarbon spill impacts through the inhalation of evaporated volatiles. Effects include toxic effects, such as damage to lungs and airways, and eye and skin lesions from exposure to oil (WA DoT 2018a). Vapours from the spill are considered the most significant risk to cetacean health, as their exposure can be significant. Vapours, if inhaled, have the potential to damage the mucous membranes of the airways and the eyes. Inhaled volatile hydrocarbons are transferred rapidly to the bloodstream and may accumulate in tissues, such as in the brain and liver, resulting in neurological disorders and liver damage (Gubbay & Earll 2000). Blue whales and humpback whales (baleen whales), that may filter feed near the surface, would be more likely to ingest oil than gulp-feeders, or toothed-whales and dolphins. Spilled hydrocarbons may also foul the baleen fibres of baleen whales, thereby impairing food-gathering efficiency, or resulting in the ingestion of hydrocarbons, or prey that has been contaminated with hydrocarbons (Geraci & St. Aubin 1988). Browse Island (listed as a C-class reserve) is the closest turtle nesting area (located approximately 33 km south-east of WA-50-L) and is surrounded by a 20 km internesting buffer for green turtles between November and March (DEE 2017a) as described in Section 4.7.4. Turtles can be exposed to hydrocarbons if they surface within the spill, resulting in direct contact with the skin, eyes, and other membranes, as well as the inhalation of vapours or ingestion (Milton et al. 2003). Floating oil is considered to have more of an effect on reptiles than entrained/dissolved oil because reptiles hold their breath underwater and are unlikely to directly ingest dissolved oil (WA DoT 2018a). Other aspects of turtle behaviour, including a lack of avoidance behaviour, indiscriminate feeding in convergence zones, and large, pre-dive inhalations, make them vulnerable (Milton et al. 2003; WA DoT 2018a). In addition, hatchlings spend more time on the surface than older turtles, thus increasing the potential for contact with oil slicks (Milton et al. 2003). As described in Section 4.7.4, WA-50-L is located within the East Asian–Australasian Flyway. The migration of marine avifauna through the EAA Flyway generally occurs at two times of year, northward between March and May and southward between August and November (Bamford et al. 2008; DEE 2017b). There are no BIAs for marine avifauna that overlap WA-50-L. However, several foraging BIAs for many marine avifauna species are present within the region (Figure 4-7). Marine avifauna have the potential to directly interact with hydrocarbons on the sea surface, in the course of normal foraging activities. Direct contact with surface hydrocarbons may result in dehydration, drowning and starvation and is likely to foul feathers, which may result in hypothermia (Matcott et al. 2019). Birds resting at the sea surface and surface-plunging birds are considered particularly vulnerable to surface hydrocarbons. Impacts may include damage to external tissues, including skin and eyes, and internal tissue irritation in lungs and stomachs (WA DoT 2018a). Toxic effects may also result where hydrocarbons are ingested, as birds attempt to preen their feathers (Jenssen 1994; Matcott et al. 2019). Based on the predicted limited extent of the surface hydrocarbons (within 159 km where concentrations are > 10 g/m^2), limited surface area affected at any time (Figure 8-3) the rapid evaporation of volatile components and expected weathering resulting in reduced levels of toxicity, any impacts to transient EPBC-listed species are expected to be on a local scale, with short-term impacts on a small portion of the population of a protected species (Minor E). Plankton may potentially be exposed to hydrocarbons on the sea surface. However, the majority of impacts would be toxicity related, associated with entrained/dissolved hydrocarbons exposure. As such, these impacts are discussed below.	
Potential consequence – entrained/dissolved hydrocarbons	**Severity**

As summarised in Table 8-3, it was predicted that the dissolved threshold (>500 ppb) would not be exceeded at any time, and that only fauna present in the top 25 m of the water column would be exposed above the 500 ppb entrained oil impact threshold (refer Figure 8-1 and Figure 8-2). No benthic habitats were contacted above impact thresholds, except Browse Island, at 679 ppb (entrained oil), in summer only. The values and sensitivities with the potential to be exposed above the entrained hydrocarbon impact threshold (>500 ppb; within 188 km from the release location) from a surface release due to a vessel collision include; • commercial, traditional and recreational fisheries • KEFs and associated biodiversity (fish communities, whale shark foraging BIA) • benthic primary producer habitats / benthic habitats (coral reef/macro algae at Browse Island only) • planktonic communities • transient, EPBC-listed species (BIAs - marine mammals, turtles and avifauna). The values and sensitivities associated with commercial, traditional and recreational fisheries (seafood quality and employment) could be impacted due to entrained/dissolved oil. The impact to fish communities from exposure to entrained and dissolved hydrocarbons above threshold values is primarily associated with toxicity, which is typically associated with dissolved hydrocarbons. Note, the dissolved oil impact threshold (500 ppb) was not exceeded at any location during the modelling (RPS 2019c) with the majority of predicted concentrations of dissolved hydrocarbons below 200 ppb (Figure 8-2). Adult fish exposed to entrained hydrocarbons are likely to metabolise the hydrocarbons and excrete the derivatives, with studies showing that fish have the ability to metabolise petroleum hydrocarbons. These accumulated hydrocarbons are then released from tissues when fish are returned to hydrocarbon free seawater (Reiersen & Fugelli 1987). Chronic impacts to juvenile fish, larvae, and planktonic organisms may occur if exposed to entrained/dissolved hydrocarbon plumes potentially resulting in lethal or sub-lethal effects or impairment of cellular functions (WA DoT 2018a). Juvenile fish and larvae may experience increased toxicity upon such exposure to plumes, because of the sensitivity of these life stages, with the worst impacts predicted to occur in smaller species (WA DoT 2018a). Pelagic fish and sharks are highly mobile in nature, and therefore they are not expected to remain within entrained hydrocarbon plumes for extended periods, limiting acute impacts or risks associated with entrained hydrocarbons. Within the EMBA there is a whale shark foraging BIA (approximately 15 km south-east of WA-50-L). Potential effects to whale sharks include damage to the liver and lining of the stomach and intestines, as well as toxic effects on embryos (Lee 2011). As whale sharks are filter-feeders they are expected to be highly vulnerable to entrained hydrocarbons (Campagna et al. 2011). Site attached fish on shallow coral reefs, such as at Browse Island have the potential to be exposed to entrained/dissolved hydrocarbons above the 500 ppb threshold. Due to the limited depth of entrained/dissolved hydrocarbon exposure (limited to the top 20 m), demersal fish communities (such as the continental slope demersal fish community KEF described in Section 4.2.1) and fish associated with other deeper benthic habitats and KEFs will not be exposed above impact thresholds.	Minor (E)

In summary, no receptors are predicated to be exposed above the 500 ppb dissolved impact threshold. The entrained plume is expected to be spatially and temporally limited (Figure 8-3), and limited to the top 20 m of the water column (Figure 8-1 and Figure 8-2). Therefore, the values and sensitivities associated with the fisheries, fish and shark BIAs and KEFs are highly unlikely to be exposed to any significant impacts. As such, the consequence of entrained/dissolved hydrocarbons is considered to be Minor (E). Benthic communities in the EMBA include shallow coral reefs at Browse Island that may be exposed to entrained hydrocarbons above the impact threshold. Shallow-water communities are generally at greater risk of exposure than deep-water communities (NRC 1985; WA DoT 2018). Exposure of entrained and dissolved hydrocarbons to shallow subtidal corals has the potential to result in lethal or sublethal toxic effects, resulting in acute impacts or death at moderate-to-high exposure thresholds (Loya & Rinkevich 1980; Shigenaka 2001; WA DoT 2018a), including increased mucus production, decreased growth rates, changes in feeding behaviours and expulsion of zooxanthellae (Peters et al. 1981; Knap et al. 1985). Toxicity impacts are primarily linked to dissolved, not entrained hydrocarbons. Given RPS (2019) modelling predicted dissolved hydrocarbons would not exceed the 500 ppb threshold, any impacts are considered to be limited based on the small temporal and geographical extent, and rapid weathering, potential impacts to coral reefs are therefore considered to be Minor (E). Entrained and dissolved hydrocarbons also have the potential to affect seagrasses and macroalgae through toxicity impacts. The hydrophobic nature of hydrocarbon molecules allows them to concentrate in membranes of aquatic plants. Hence the thylakoid membrane (an integral component of the photosynthetic apparatus) is susceptible to oil accumulation, potentially resulting in reduced photosynthetic activity (Runcie & Riddle 2006). Although seagrass and macroalgae may be subject to lethal or sublethal toxic effects, including mortality, reduced growth rates, and impacts to seagrass flowering, several studies have indicated rapid recovery rates may occur even in cases of heavy oil contamination (Connell et al 1981; Burns et al. 1993; Dean et al. 1998; Runcie & Riddle 2006). For algae, this could be attributed to new growth being produced from near the base of the plant while the distal parts (which would be exposed to the oil contamination) are lost. Browse Island is the only location that would support macro-algae/seagrass which was predicted to be impacted above the 500 ppb entrained threshold. Based on the above impact assessment and expected recovery, the consequence is considered to be Insignificant (F). As a consequence of their presence close to the water surface, planktonic communities may be exposed to entrained/dissolved hydrocarbon plumes, especially in high-energy seas where the vertical mixing of oil through the water column would be enhanced. The effects of oil on plankton have been well studied in controlled laboratory and field situations. The different life stages of a species often show widely different tolerances and reactions to oil pollution. Usually, eggs, larval and juvenile stages will be more susceptible than adults (Harrison 1999). Post-spill studies on plankton populations are few, but those that have been conducted typically show either no effects, or temporary minor effects (Kunhold 1978). The lack of observed effects may be accounted for by the fact that many marine species produce very large numbers of eggs, and therefore larvae, to overcome natural losses (such as through predation by other animals; adverse hydrographical and climatic conditions; or failure to find a suitable habitat and adequate food). Impacts on plankton from a surface diesel spill is expected to be localised, with short-term impacts, especially given the dissolved threshold is not predicted to be exceeded (RPS 2019). However, if a shallow entrained/dissolved plume reached a coral-spawning location, such as Browse Island or Scott Reef, during a spawning event, localised short-to-medium term impacts could occur. Therefore, the consequence is considered to be Minor (E).	

Marine mammals, marine reptiles and marine avifauna could also be impacted through entrained and dissolved hydrocarbon exposure, primarily through ingestion during foraging activities (WA DoT 2018a). There are no known BIAs or aggregation areas within WA-50-L. However, the EMBA overlaps a large number of BIAs for a number of different marine fauna species (Section 4.7.4). Modelling predicted no exceedance of the 500 ppb dissolved threshold, exposure limited to the top 20 m of the water column, and a limited temporal and spatial extent of any entrained plume (Figure 8-3). As such, impacts to EPBC-listed species are expected to be on a local scale, with short-term temporary impacts on a small portion of the population of a protected species, with the consequence considered to be Minor (E).			
Potential consequence – shoreline hydrocarbons			**Severity**
As summarised in Table 8-3, no shorelines were predicted to exceed the 100 g/m^2 threshold (highest predicted shoreline accumulation concentration of 11 g/m^2), and shoreline accumulation was predicted at <1 m^3 at all shorelines. As the modelling predicts that worst-case hydrocarbon shoreline concentrations would be an order of magnitude less than the shoreline impact threshold, and the model predicts extremely low volumetric accumulations at all shoreline receptors (worst-case 0.07 m^3 accumulating along 1.6 km of shoreline at Cartier Island MP), the consequence from shoreline hydrocarbons is considered to be Insignificant (F).			Insignificant (F)
Identify existing design and safeguards/controls measures			
Marine vessels >400 tonne (t) will carry SOPEPs approved under MARPOL 73/78 Annex 1, Regulation 37. Vessels fitted with lights, signals, an automatic identification system (AIS) transponders and navigation equipment as required by the *Navigation Act 2012*.			
Propose additional safeguards/control measures (ALARP Evaluation)			
Hierarchy of control	Control measure	Used?	Justification
Elimination	Eliminate the use of survey vessel	No	A vessel is the only form of transport that can undertake the survey activity.
	No bunkering during the survey	Yes	By eliminating bunkering for the duration of the survey the risk of a spill occurring as a result of vessel collision is significantly reduced.
Substitution	None identified	N/A	N/A
Engineering	Survey vessel used will have dynamic positioning equipment.	Yes	The use of a DP survey vessel will reduce the potential for vessel collisions (survey vessel will be DP1 or greater).
Procedures & administration	Australian Hydrographic Office (AHO) will be informed of the proposed survey activity location prior to the activity commencing.	Yes	By informing AHO of the location of the survey activity, information will be included in the promulgation of fortnightly Notice to Mariners.

			Notice to Mariners provide other vessel operators with information regarding activities or hazards in the region and will include details of the survey vessel. Therefore, reducing the risk of accidental third-party interactions with areas of increased vessel activity around the survey in WA-50-L.
	Notification to AMSA's Joint Rescue Coordination Centre (JRCC)	Yes	The AMSA JRCC will be advised of the survey details for promulgation of radio-navigation warnings 24-48 hours before operations commence and upon completion of the activity.
	Incident management, and emergency response plans in place.	Yes	To ensure the INPEX IMT are prepared and informed, an INPEX Australia Incident Management Plan (0000-AH-PLN-60005), INPEX Australia Crisis Management Plan (0000-AH- PLN-60004) and Contractor Emergency Response Plan (ERP) will be in place and implemented, and personnel trained in their relevant plans.
	Emergency response preparedness will be maintained.	Yes	To ensure that INPEX is prepared to respond to a marine diesel spill originating from a vessel collision event, oil spill and source control response preparedness will be maintained in accordance with Section 8.4, 8.5 and 9.10 of this EP.
	INPEX will provide all available support to AMSA and WA DoT in their performance of their control agency responsibilities for vessel-based spill events.	Yes	INPEX has signed a memorandum of understanding with AMSA for oil spill preparedness and response (AMSA/INPEX 2013). This MoU acknowledged AMSA's responsibility under the National Plan (AMSA 2019b) as the control agency for vessel-based spill scenarios, and INPEX has acknowledged that it will support AMSA to implement the NatPlan. Under the State Hazard Plan – Marine Environmental Emergencies (WA DoT 2018b), WA DoT is the control agency for all spills entering WA waters. While modelling indicates that there is no credible risk of a shoreline impact, INPEX still acknowledges and would provide any requested support to WA DoT as Control Agency for Browse Island. Therefore, for vessel-based spill events, INPEX will provide support in undertake spill response activities as directed by the control agency – AMSA or WA DoT. Refer to Section 4 of the OPEP (Appendix D) for details of the INPEX oil spill response capability, which it can provide to AMSA and WA DoT in support of a vessel-based spill scenario.
Identify the likelihood			

Reported industry statistics indicate vessel failures are considered rare with 37 collisions reported out of a total of 1200 marine incidents in Australian waters between 2005 and 2012 (most recent data) (ATSB 2013). A ship collision risk assessment was undertaken to support the INPEX Ichthys Project. The study determined collision frequencies and impact energies for passing (third-party) vessels, infield vessels and offloading tankers. The annual frequency of a collision with a passing vessel – i.e. one not within the control of INPEX – imparting at least 150 MJ (sufficient impact energy) is 3.5×10^{-7}, or once every 2.9 million years. On this basis and given the controls that have been identified to minimise the potential for vessel collision and subsequent loss of containment, the likelihood of the consequence occurring is considered Remote (6).		
Residual risk summary		
Based on the worst-case consequence for all applicable hydrocarbon exposure mechanisms (surface/entrained/dissolved/shoreline) Minor (E) and a likelihood of Remote (6) the residual risk is ranked as Low (10).		
Consequence	Likelihood	Residual risk
Minor (E)	Remote (6)	Low (10)
Assess residual risk acceptability		
Legislative requirements The activities and proposed management measures are compliant with industry standards and with relevant Australian legislation, specifically concerning navigational safety requirements, including AMSA *Marine Orders – Part 30: Prevention of Collisions, Issue 8* (Order No. 5 of 2009). Stakeholder consultation Stakeholders have been engaged throughout the development of the EP and OPEP. Where relevant, the controls in place have been developed in consultation with relevant stakeholders (e.g. WA DoT). The controls in place are considered to manage risks associated with a vessel collision to ALARP. Conservation management plans / threat abatement plans Several conservation management plans (refer Appendix B) identify oil spills as a key threatening process, through both direct/acute impacts of oil, as well as indirect impacts through habitat degradation (which is a potential consequence of an oil spill). The prevention of vessel collisions and reducing impacts to the marine environment through oil spill response preparedness and response (refer OPEP, Appendix D), demonstrates alignment with the various conservation management plans. ALARP summary Although the level of environmental risk is assessed as Low, a detailed ALARP evaluation was undertaken to determine what additional control measures could be implemented to reduce the level of impacts and risks. No additional controls, beyond those identified during the detailed ALARP assessment can reasonably be implemented to further reduce the risk of impact. Acceptability summary Based on the above assessment, the proposed controls are expected to effectively reduce the risk of impacts to acceptable levels because:		

• the activity demonstrates compliance with legislative requirements/industry standards • the activity takes into account stakeholder feedback • the activity is managed in a manner that is consistent with the intent of conservation management documents • the activity does not compromise the relevant principles of ESD • the predicted level of impact does not exceed the defined acceptable level in that the environmental risk has been assessed as "low", the consequence does not exceed "C – significant" and the risk has been reduced to ALARP.			
Environmental performance outcomes	**Environmental performance standards**	**Measurement criteria**	**Responsibility**
No incidents of loss of hydrocarbons to the marine environment as a result of a vessel collision.	Survey vessel will be fitted with lights, signals, AIS transponders and navigation and communications equipment, as required by the *Navigation Act 2012*.	Records confirm that required navigation equipment is fitted to vessels to ensure compliance with the *Navigation Act 2012*.	Vessel master
	Survey vessel will have dynamic positioning equipment.	Records confirm that survey vessel has DP equipment.	Vessel master
	Australian Hydrographic Office (AHO) will be informed of the proposed survey location prior to the activity commencing. Notification will be made no less than four working weeks before operations commence for the promulgation of related notices to mariners (via datacentre@hydro.gov.au).	Records of document transmittal to AHO.	Company site representative
	Notification will be provided to AMSA's Joint Rescue Coordination Centre (JRCC) for promulgation of radio-navigation warnings 24-48 hours before operations commence, including following information (via rccaus@amsa.gov.au, ph: 1800 641 792 or +61 2 6230 6811): • Vessel details, including name, call sign and Maritime Mobile Service Identity (MMSI) • Satellite communications details, including INMARSAT-C and satellite telephone • Area of operation	Records of document transmittal to AMSA JRCC.	Company site representative

	• Requested clearance from other vessels • Notification of operations start and end.		
	No bunkering undertaken during the survey	Oil record book confirms no bunkering occurred for the duration of the survey.	Vessel master
Risks of impacts to commercial, traditional and recreational fisheries, emergent benthic primary producer habitats, BIAs, transient EPBC-listed species and planktonic communities from Group II hydrocarbon spills are reduced and maintained at acceptable levels through implementation of the environmental performance standards and the application of the environmental management implementation strategy.	Survey vessel (>400 GT) will have a SOPEP compliant with Marine Orders – Part 91, the POTS Act, and Annex I of MARPOL 73/78 (oil) on board.	Valid vessel SOPEP	Vessel master
	Emergency response preparedness will be maintained through implementing Sections 8.5 and 9.10 of this EP.	Records demonstrate response preparedness is maintained in accordance with Section 8.5 and 9.10 of this EP.	Environmental adviser
	INPEX Australia Incident Management Plan (0000-AH-PLN-60005) and INPEX Australia Crisis Management Plan (0000-AH- PLN-60004) and will be implemented in the event of a vessel collision.	Records demonstrate Incident and Crisis Management Plans and were implemented following a vessel collision.	IMT Leader
	In the event of a vessel collision, INPEX will provide all available support to AMSA and/or WA DoT in their performance as Control agency.	In the event of a vessel collision, records confirm INPEX provided support, as requested by AMSA and WA DoT.	IMT Leader

8.3 Spill Impact Mitigation Assessment

INPEX has developed a series of strategic Spill Impact Mitigation Assessments (SIMA) for each maximum credible spill scenario relevant to INPEX Australia's exploration and production activities in the Browse Basin.

The strategic SIMAs are:

- condensate/gas well blowout – long duration subsea release
- condensate spill – instantaneous surface release
- MGO/marine diesel spill – instantaneous surface release
- intermediate/heavy fuel oil spill – instantaneous surface release.

The SIMA process has been developed as a pre-spill planning tool for all INPEX EPs, to facilitate response option selection and support the development of the overall response strategies by identifying and comparing the potential effectiveness and impacts of oil spill response options (IPIECA 2017a). The strategic SIMA assists in the assessment of the impact mitigation potential and in making a transparent determination of response strategies that are considered most effective at minimising oil spill impacts (IPIECA 2017a). The framework includes environmental considerations as well as a range of shared values such as ecological, socio-economic and cultural aspects (IPIECA 2017a).

8.3.1 SIMA process

The SIMA process as outlined in the "Guidelines on implementing spill impact mitigation assessment (SIMA)" (IPIECA 2017a) has four stages:

1. Compile and evaluate data relevant for relevant oil spill scenarios including fate and trajectory modelling, identification of resources at risk and determination of safe and feasible response options.
2. Predict outcomes/impacts for the "No Intervention" (or "natural attenuation") option as well as the effectiveness (i.e. relative mitigation potential) of the feasible response strategy for each scenario.
3. Balance trade-offs by weighing and comparing the range of benefits and drawbacks associated with each response strategy, compared to 'No Intervention', for the spill scenario.
4. Select the best response strategies to form the response plan for the scenario, based on which best combination of response strategies will minimise the overall spill impacts and promote rapid recovery.

INPEX have generated strategic SIMAs, which includes a Group II (marine diesel) surface release from a vessel collision in the Browse Basin/NW WA region [X060-AH-LIS-60032] presented in Appendix E.

Predictive oil spill modelling (e.g. outputs from various INPEX Browse Basin oil spill modelling reports) have been used to support the strategic SIMAs through defining generic oil weathering characteristics for each broad type of spill scenario.

The resource compartments presented in the SIMA reflects the values and sensitivities described in Section 4 of this EP. The resource compartments have been defined as broad habitat types which support protected species, rather than focusing on individual protected species. This approach is recommended by IPIECA (2017a).

For each generic spill scenario, a relative impact score has been assigned to each resource compartment, for the 'no intervention' option. A supporting justification for each relative impact score for each resource compartment is also presented in the SIMA.

For the SIMA, eight oil spill response strategies were considered, including operational monitor and evaluation, containment and recovery, protect and deflect, shoreline clean-up, chemical dispersant, pre-contact wildlife response, post-contact oiled wildlife response (OWR) and in-situ burn.

For each response strategy, the impact mitigation potential was assessed against each resource compartment and given a score on a scale of '-3' to '+3', where a negative score reflects additional impact and a positive score reflects mitigation of impact (balance trade-offs). A supporting justification for each impact modification score for each response strategy against each resource compartment is also presented in the SIMA.

Each impact mitigation score was evaluated with no timing or resource limitations or weather constraints on the response strategy effectiveness (these factors are further considered in the oil spill response arrangements and capability evaluation, provided in the relevant EP, as related to the EP specific spill scenario).

Those response strategies with an overall positive score, and therefore represent a mitigation of impact from the spill, are then selected for further assessment in the relevant EP. Those response options with an overall negative score have been discounted and are not further evaluated in this EP.

It should be noted that it is unlikely that a single response strategy will be completely effective in a large spill scenario, hence it is expected that multiple response strategies may be utilised in the event of a Level 2/3 spill.

In order to select appropriate oil spill response strategies applicable to the vessel collision spill scenario described in this EP (Section 8.2) INPEX's strategic SIMA for an MGO/marine diesel surface spill have been reviewed and assessed in Section 8.4.

8.4 Oil spill response arrangements and capability evaluation

The response techniques that demonstrated a positive impact mitigation potential in the SIMA for a surface MGO/marine diesel spill are:

- operational monitoring and evaluation
- contain and recover
- protect and deflect
- shoreline clean-up
- pre-contact wildlife response (hazing and translocation)
- post-contact wildlife response.

The following response techniques have been excluded from this EP based on the outcome of the SIMA (Appendix E):

- in-situ burn
- chemical dispersion (surface application).

Table 8-5 presents the response strategy applicability evaluation. In this evaluation, the response strategies which were selected via the strategic SIMA have been further evaluated for their applicability and suitability, by taking into account the expected resource and logistical limitations specific to the activity described in this EP. Spill scenario specific oil spill modelling data, including stochastic and deterministic modelling (as relevant), is also evaluated. Depending on the outcome of this evaluation, some response strategies may be excluded from further evaluation, as they have been assessed as not appropriate for the EP specific spill scenario.

Following the response strategy applicability evaluation, a response strategy element identification evaluation is undertaken, to define the resources required to successfully implement the selected response strategies, under a worst-case spill scenario. This evaluation is presented in Table 8-6.

Following the response strategy element identification evaluation, the response strategy arrangements and capability evaluation is undertaken. This process examines the merits of improving the capability or timeliness of response strategy elements. The response strategy arrangements and capability evaluation are presented in Table 8-7.

The response strategy arrangements and capability evaluation provide the justification that the spill response arrangements in place are effective in reducing environmental risks to ALARP and provides the reasoning and justification of the selected controls presented in Table 8-8.

Table 8-5: Evaluation of the applicability of spill response strategies identified in the SIMA

Oil spill response technique	Likelihood of success	Considered for implementation
Operational monitoring and evaluation	The SIMA evaluation found that operational monitoring and evaluation should always be implemented in the event of a level 2/3 spill. To implement this response strategy, the following capabilities are available: • oil spill trajectory modelling • aerial and vessel surveillance • electronic spill tracker buoys (ESTB) • satellite surveillance capability. A detailed assessment of the logistical resources required to implement this response strategy are described in Table 8-6.	Yes
Contain and recover	The SIMA evaluation found that contain and recover was potentially appropriate for Group II/diesel spills. Generally, oil needs to be >100 g/m^2 (O'Brien 2002) to feasibly corral oil with a boom and achieve any significant level of oil recovery with the skimmers. The initial, gravity-dominated release and spreading is generally complete within minutes to hours after a release (O'Brien 2002). In the context of the Browse Basin, with high sea surface and air temperatures in all seasons, the spreading of any diesel spill would be very rapid. INPEX currently do not maintain any offshore containment and recovery equipment (booms and skimmers) offshore in the Browse Basin area. However, INPEX do have access (via AMOSC) to a Level 2 stockpile of equipment in Broome, including offshore boom and skimmers. The practical deployment of offshore booms and skimmers from Broome to the licence area is expected to take approximately 24 hours using a Platform Supply Vessel (PSV) or small vessel (based on 6 hours loading in port and 18-24 hours steaming time to WA-50-L). Even if boom was stored on offshore facilities/vessels within the licence area, it would take crews several hours to physically deploy lengths of offshore boom. A minimum of two vessels would be required at the time of the slick to create a boom configuration that would attempt to recover oil.	No

	In addition, in the early stages of a diesel spill, in locations where concentrations are expected to be >100 g/m^2, vessel access to the immediate spill area is likely to be restricted due to the presence of VOCs in excess of safe exposure thresholds, and potential for a flammable atmosphere. Given the very short time following a diesel spill in which the slick would have spread to <100 g/m^2, and the associated atmospheric safety risks, it would not be considered ALARP to store booms offshore, or commence the mobilisation of booms from Broome, to attempt offshore containment and recovery. Therefore, this response strategy is not considered an appropriate strategy for implementation.	
Protect and deflect	The SIMA evaluation found that protection and deflection was potentially appropriate for Group II/marine diesel spills. Generally, oil needs to be >100 g/m^2 (O'Brien 2002) to feasibly deflect oil with a boom to achieve any significant level of oil deflection away from a sensitive location, or to achieve oil deflection into a collection area on a shoreline. As discussed in Table 8-3, surface oil concentrations of >10 g/m^2 (environmental impact threshold) were predicted out to 159 km from the release location. However, oil films are not predicted to arrive at shorelines with concentrations >100g/m^2, and therefore this response strategy is not considered an appropriate strategy for implementation.	No
Shoreline clean-up	The SIMA evaluation found that shoreline clean-up was potentially appropriate for Group II / diesel spills. The outcome of the spill modelling (Table 8-3) indicates that for a vessel collision, <1 m^3 of weathered diesel is predicted to accumulate on all shorelines within the EMBA. Therefore, the likelihood of requiring physical shoreline clean-up is considered extremely remote, however a SCAT assessment to confirm that no/insignificant oil has arrived on shoreline may be required, (pending modelling/aerial surveillance data). As such, in the event of a spill resulting in potential shoreline contact, or in the extremely unlikely case that some recoverable oil was detected, the IMT would consider shoreline clean-up as a response strategy based on the outcome of real-time operational monitoring and evaluation data. To implement this response strategy, the following capabilities are available to INPEX: • Aircraft • Vessels • Shoreline clean-up equipment • Shoreline clean-up personnel (trained and general labour) • Waste management resources.	Yes

	A detailed assessment of the logistical resources required to implement this response strategy are described in Table 8-6. It should also be noted that for shorelines, the WA Department of Transport would make the ultimate decision on the response strategies to be implemented, with support provided by INPEX.	
Pre-contact wildlife response (hazing)	Wildlife hazing is most suitable when used near sensitive shoreline habitats against persistent oily slicks, such as heavy fuel oil or crude oil spills. It is generally not appropriate in an open water environment. In the case of a subsea condensate release or diesel spill, surface oil slicks are thin and not considered particularly adhesive, therefore reducing the likelihood and severity of impacts on wildlife. Additionally, hazing isn't considered an effective measure against volatile spills which rapidly evaporate. In the event of a Group II spill, the IMT would consider pre-contact wildlife response (hazing) as a response strategy based on the outcome of real-time operational monitoring and evaluation data received, and whether indications were that a significant number of individuals of a protected species would be likely to benefit from the response strategy. To implement this response strategy, the following capabilities are available to INPEX: • vessels. A detailed assessment of the logistical resources required to implement this response strategy are described in Table 8-6. It should also be noted that for WA shorelines and wildlife response, the relevant Department of Transport would make the ultimate decision on the response strategies to be implemented, with support provided by INPEX. For Ashmore and Cartier, INPEX may be the control agency.	Yes
Post-contact wildlife response	Capture, relocation, assessment, cleaning, rehabilitation of oiled wildlife does have the ability to increase the survival of individuals. The scale of oil impacts on wildlife is dependent on factors such as timing, location, oceanographic and weather patterns, and the movements of species that forage, feed, nest and inhabit that area (IPIECA 2014). Given the predicted weathering of a diesel spill, most wildlife exposure is expected to be to weathered hydrocarbons, with lower associated levels of toxicity (Stout et al. 2016). Diesel slicks are relatively non-adhesive compared to crude oils, and generally not considered an oil product that would 'coat' the feathers of birds, requiring a full wildlife cleaning response on a shoreline. They are also not likely to generate a thick surface barrier on a shoreline which would coat adult nesting turtles or turtle hatchlings as they transit to the ocean.	Yes

	Any seabirds captured, cleaned and released would likely fly back to the shoreline from which they originally were captured and may be repeatedly affected. Therefore, long term veterinary care (rehabilitation, feeding, etc.) would be required for any successfully captured birds, until spill weathering or remediation had occurred, and it was safe to release the seabirds. Once oiled, it is generally agreed that birds have a very low survival rate with many studies reporting the probability of dying near to 100%. The reported high success rates of seabird cleaning are typically associated with cleaning pelicans and penguins which are not present within the Browse Basin. IPIECA (2014) advise working with live or dead animals has health and safety issues including potential injuries (bites, scratches) or zoonotic diseases. The outcome of the spill modelling (Table 8-3) indicates that for a vessel collision, <1 m^3 of weathered diesel is predicted to accumulate on all shorelines within the EMBA, and therefore post-contact wildlife response is not anticipated to be required. However, in the event of a diesel spill, the IMT would consider post-contact wildlife response as a response strategy based on the outcome of real-time operational monitoring and evaluation data received, and whether indications were that a significant number of individuals of a protected species would be likely to benefit from the response strategy. To implement this response strategy, the following capabilities are available to INPEX: • Aircraft • Vessels • Wildlife response equipment • Wildlife response personnel (trained and general labour) • Waste management resources. A detailed assessment of the logistical resources required to implement this response strategy are described in Table 8-6. It should also be noted that for shorelines and wildlife response, the WA Department of Transport would make the ultimate decision on the response strategies to be implemented, with support provided by INPEX.	

As described in Table 8-4, the worst credible spill scenario could involve:

- floating oil above impact thresholds on the open ocean
- extremely remote risk to shorelines, with modelling (RPS 2019) predicting maximum accumulated oil concentration of 11 g/m^2 and volume ashore of <1 m^3 on all shorelines.

Whilst modelling indicates there is extremely low likelihood of requiring a wildlife response or shoreline clean-up, INPEX has presented the individual elements required to successfully undertake a typical shoreline clean-up and wildlife response from a diesel spill at a remote location (such as Browse Island) in Table 8-6.

These wildlife response and shoreline clean-up capabilities are INPEX's existing spill response capabilities for all activities in WA-50-L, and have not been developed specifically for this petroleum activity.

Table 8-6: Response strategy element identification

Response Strategy	Response Strategy Purpose	Response Strategy Element
Operational monitoring and evaluation	Provide up to date information to the IMT, to enable the IMT to make timely and informed decisions	Oil spill trajectory modelling (OSTM) • OSTM will provide predictions of the trajectory and fate of the oil spill. For the worst credible spill response, only a single OSTM provider is anticipated to be required.
		Aerial surveillance aircraft and trained spotters • aerial surveillance will assist with validating the OSTM predictions, through visual confirmation of the location and type of slick • personnel trained in aerial observation. For a worst credible spill response, up to two flights per day over the spill area is anticipated to be required.
		Vessel surveillance • vessel surveillance will assist with validating the OSTM predictions, through visual confirmation of the location and type of slick. For a worst credible spill response, only a single vessel conducting surveillance may be required, if at all (aerial surveillance only may be appropriate).
		Electronic surface tracker buoys (ESTBs) • ESTBs will assist with validating the OSTM predictions • ESTBs will assist with aerial surveillance flight planning. For the worst credible spill response, deployment of multiple ESTBs is anticipated to be required, to accurately validate the OSTM and assist with aerial surveillance flight planning.
		Satellite imagery • satellite imagery will assist with validating the OSTM predictions. For a worst credible spill response, only a single satellite imagery provider is anticipated to be required.

Response Strategy	Response Strategy Purpose	Response Strategy Element
Shoreline Clean-up	Remove oil from the shoreline to minimise impacts to biota and accelerate natural recovery of the shoreline	Shoreline clean-up personnel • experienced personnel, such as AMOSC core-group operations team personnel, who can lead a shoreline clean-up team • labour hire personnel, who would receive on the job training from the team lead, and carry out the shoreline clean-up activities. For a diesel spill which reaches a remote/offshore island shoreline in the Browse Basin, up to a maximum of 20 shoreline response personnel is anticipated. Refer Table 8-7 for further details.
		Shoreline clean-up equipment • manual tools such as rakes and shovels, used to manually recover oil and oily debris from the shoreline For a diesel spill which reaches a remote/offshore island shoreline in the Browse Basin, a single shoreline clean-up kit is anticipated to be required.
Pre and postcontact wildlife response	Prevent or minimise harm associated with the oiling of marine fauna	Wildlife response personnel • experienced personnel, such as AMOSC oiled wildlife response team personnel, who can lead a wildlife response team • wildlife handlers, trained in oiled wildlife response, such as the WA Oiled Wildlife Rehabilitators Network, and Phillip Island Nature Park personnel • labour hire personnel, who would receive on the job training from the team leads, to assist with oiled wildlife response activities. For a diesel spill which reaches a remote/offshore island shoreline in the Browse Basin, up to a maximum of 20 wildlife response personnel is anticipated. Refer Table 8-7 for further details.
		Wildlife response equipment • wildlife response kits – used for the safe capture and transport of oiled wildlife • wildlife response containers – used for triage, washing and rehabilitating wildlife (wildlife response containers can be mounted on the deck of a suitable accommodation support vessel). For a diesel spill which reaches a remote/offshore island shoreline in the Browse Basin, only a single wildlife response kit and wildlife response container (mounted on an ASV) is anticipated to be required.

Response Strategy	Response Strategy Purpose	Response Strategy Element
		Wildlife hazing equipment • wildlife hazing equipment typically only includes vessel air-horns, vessel water cannons, etc. • acoustic bird scaring devices/buoy can also be deployed onshore or from a vessel. For a worst credible spill response, up to two small vessels and/or a bird-scaring device/buoy could be deployed for wildlife hazing at a remote shoreline.
Logistical Support (common to all response strategies)	Provide logistical support to enable response strategies to be undertaken	Accommodation support vessel (ASV) • to act as the Forward Operating Base, coordinating the shoreline response activity, including daily activity planning and communications back to the IMT • provide accommodation and logistical support to the field response personnel • provide a platform to support waste management and oiled wildlife response, if required. For a diesel spill which reaches a remote/offshore island shoreline in the Browse Basin, only a single ASV is anticipated to be required.
		Small support vessels (resupply vessels, tenders and landing barges) • tenders used to transport personnel and light-weight equipment to and from shorelines • landing barges used to transport heavier equipment and backload waste from shorelines • small support vessels (20-40m) used to resupply the ASV. For a diesel spill which reaches a remote/offshore island shoreline in the Browse Basin, two tenders, a landing barge and logistic supply vessel is anticipated to be required (total of 4 small support vessels)
		Crew change helicopter • provide for routine crew change of response personnel between the mainland and the accommodation support vessel. For a diesel spill which reaches a remote/offshore island shoreline in the Browse Basin, only a single crew change helicopter is anticipated to be required.

Response Strategy	Response Strategy Purpose	Response Strategy Element
		Light utility helicopter • provide an alternative mechanism to land personnel and light equipment onto a shoreline, in the event that sea conditions are prohibitive to marine vessel access • using a sling, provide an alternative mechanism to move heavier equipment and backload waste between a shoreline and a support vessel, in the event that sea conditions are prohibitive to marine vessel access. For a diesel spill which reaches a remote/offshore island shoreline in the Browse Basin, only a single light utility helicopter is anticipated to be required.
Waste management (common to all response strategies)	Prevent secondary contamination from recovered oil/oily waste	Oily waste collection containers • provision of containers to recover waste on location, such as buckets, drums, IBCs, plastic lined bulka-bags • provision of containers to transport bulk recovered oily waste, such as half-height containers and tote-tanks/ISO tanks • container types will depend on the type of oil/oily contaminated material being recovered (solid, liquid, debris etc). Oily waste transportation and receipt facilities • licenced waste contractor, required for the transportation, receipt, treatment and/or disposal of recovered oils/oily wastes at an onshore location. For a diesel spill which reaches a remote/offshore island shoreline in the Browse Basin, based on 1 m^3 oil onshore, and 10x bulking factor, up to 10 m^3 oily waste recovery capability would to be required (noting modelling (RPS 2019) predicts <1 m^3 oil ashore).

Table 8-7: Oil spill response arrangements and capability evaluation

Oil spill response control [minimum implementation time]	Can a greater response effort be implemented?	Can the time to respond be improved?	Environmental benefit of increased response effort/reduced response time
Oil spill trajectory modelling (OSTM) contractor [oil spill trajectory forecast available to the IMT within 2 hours of IMT activation of the OSTM contractor]	OSTM will be used to forecast the trajectory and fate of oil plumes resulting from surface or subsurface releases, to enable the IMT to develop incident action plans (IAPs) and commence implementing secondary spill response activities which would be implemented in the days after the initial response. OSTM is an iterative process using real-time field-based observations to refine modelling predictions. No alternatives have been identified that could result in a greater level of performance from this response strategy element.	OSTM requires access to real-time field-based information (provided to the OSTM contractor by the IMT) and then time for computers to process the data. Consequently, no alternatives have been identified to implement this service in less than 2 hours after the IMT activates and provides the data to the OSTM contractor. Even if it were possible, reducing the activation timeframe of OSTM would not provide any benefit in relation to 'first strike' activities. Therefore, there is no benefit in reducing the activation timeframes.	No additional environmental benefit could be identified though a greater or faster OSTM capability.
Aerial surveillance with aircraft of opportunity* using untrained observers will be available and may involve using any of the following: • crew change helicopters that can be mobilised or diverted with two pilots (second pilot can act as a spotter and record observations) • search and rescue helicopter [within 5 hours of IMT activation]	Aerial surveillance is used to provide situational awareness of the slick size, type and location back to the IMT. Aerial surveillance can only be undertaken during daylight hours. There is a dedicated full-time Search and Rescue helicopter, plus a minimum of 4 crew change helicopters available in Broome at all times. The INPEX crew change helicopters are also available at all times.	It may be possible to mobilise aerial surveillance in a shorter period as a crew change helicopter could be cancelled and diverted to the spill location immediately if safe to do so, and not required for higher priority safety/evacuation related tasks.	The quality of information provided by a faster or greater response is not expected to be improved to a level that would result in substantial environmental benefits. Other techniques, such as OSTM will be implemented in parallel with aerial and/or vessel observations. This combination of data is considered sufficient to inform the IMTs situational awareness during the early stages of a spill response.

Oil spill response control [minimum implementation time]	Can a greater response effort be implemented?	Can the time to respond be improved?	Environmental benefit of increased response effort/reduced response time
• Fixed-wing aircraft available on a best endeavours basis, via call-off contract, and will provide long term aerial surveillance capability, typically providing two overflights of the affected area per day. [24 hours (best endeavours)]	These resources can be mobilised to the Operational Area within 5 hours (daylight only), if not tasked with other Search and Rescue or other emergency/safety critical duties. Fixed wing aircraft on call-off contracts for rapid mobilisation are only available during the cyclone-season. During the dry-season, fixed wing aircraft are utilised by the tourism industry, and therefore these fixed wing aircraft service providers will not guarantee mobilisation within specified timeframes during the dry season, however will provide services on a best-endeavours basis. The fixed wing aircraft response could be improved by having an additional dedicated fixed wing aircraft available for 12 months of the year at $100,000 per month. The cost for this is not considered reasonable based on the availability of alternative means of aerial surveillance (helicopter surveillance available all year).	To guarantee a faster response time, additional dedicated fixed wing aircraft at cost $100,000 per month could be positioned at Broome. The cost for this is not considered reasonable, as the current arrangements enable aerial surveillance of the licence area within 5 hours (daylight only), and the vessel can provide some initial information regarding slick size and trajectory.	

Oil spill response control [minimum implementation time]	Can a greater response effort be implemented?	Can the time to respond be improved?	Environmental benefit of increased response effort/reduced response time
Aerial surveillance using 1 x trained aerial observer [within 48 hours]	Personnel formally trained through the AMOSC aerial observer course could be used, to increase the quality of aerial observer data received by the IMT during the spill response. However, the quality of data that would be received by the IMT, from personnel such as a helicopter co-pilot using the INPEX oil spill observation guide, and data from other operational and monitoring evaluation techniques, should still provide adequate information for the INPEX IMT to conduct its role, especially during the first 24 hours of a spill, where the slick is expected to remain close to the release location (RPS 2019). It should be noted that the crew-change helicopter pilots are familiar with observing the natural colours and shades of the ocean in the Browse Basin / Timor Sea area, and therefore less likely to mis-interpret natural phenomenon such as cloud-shadow or algal bloom for oil slicks. Also, without additional oil spill observation aircraft, additional trained personnel do not provide additional value.	To implement aerial surveillance sooner using trained aerial observers, the only identified method would be to have observers on a stand-by contract, located in Broome. However, this additional standby cost is not considered reasonable, given INPEX has crew-change/SAR helicopter pilots available in Broome, equipped with the INPEX oil spill observation guide, which should provide adequate initial visual observation information to the IMT for planning purposes during the initial stage of the spill response. Therefore, a faster response time for trained aerial observers is not considered ALARP	No additional environmental benefit could be identified though a greater or faster aerial observer capability.

Oil spill response control [minimum implementation time]	Can a greater response effort be implemented?	Can the time to respond be improved?	Environmental benefit of increased response effort/reduced response time
Vessel surveillance [within 48 hours for large PSV; within 24 hours for small support vessel]	A typical platform support vessel bridge is 10 m to 20 m above sea level. A small support vessel bridge may only be 3 m to 5 m above sea level. Due to this low visual elevation (compared to aerial surveillance platforms) and vessel speed (~14 knots), the observational data a vessel of any size can provide is significantly limited, compared to the observation data able to be obtained by aerial observers. Therefore, additional vessels could be mobilised, however a greater level and quality of information will be obtained by focusing resources on mobilising aerial observation platforms instead.	It should be noted that in the event of a vessel collision, the damaged vessel would not be able to conduct vessel surveillance activities, and other vessels may be prioritised to complete tasks that are not directly related to the oil spill response, such as transfer of injured personnel to nearby facilities or to shore, supporting the damages vessels involved in the collision, or search and rescue operations. The time to mobilise a large support vessel, purely dedicated to conduct vessel surveillance, from Darwin or Broome wharf, loaded with crew and provisions and sail to location cannot be improved to less than 48 hours. There are less berth spaces available on wharfs in Broome and Darwin for these larger vessels. Therefore, immediate access to wharf space cannot be guaranteed. Additional time alongside the wharf is also required for bunkering and provisioning a large vessel. Therefore, at least 24 hours is required for mobilisation activities in Broome or Darwin. The vessel also requires on average another 24 hours to transit to the spill location.	No additional environmental benefit could be identified though a greater or faster vessel surveillance capability.

Oil spill response control [minimum implementation time]	Can a greater response effort be implemented?	Can the time to respond be improved?	Environmental benefit of increased response effort/reduced response time
		Smaller support vessels are available in Broome and Darwin. These smaller vessels, in an emergency, could be along-side a smaller wharf to load marine crew, spill and supplies within 6 hours, and then transit to the spill location within approximately 24 hours from the time they were activated (assuming vessel speed of 14 knots). While small support vessels can be mobilised to the location of the spill faster than larger support vessels, small vessel bridges are much closer to the sea surface, and therefore are of limited value as an oil spill observation platform. Aerial surveillance is considerably faster than any vessel surveillance platform. Therefore, resources will be focused on aerial surveillance, rather than vessel surveillance.	
Electronic surface tracking buoy will be available for deployment from the survey vessel. [immediate]	The primary purpose of the tracking buoys is to assist with situational awareness of the IMT during periods when aerial surveillance isn’t available (e.g. night-time), and for the longer-term validation of the OSTM. INPEX maintain a total of ten tracker buoys, which are positioned at different locations, depending on the activities underway.	Sufficient provision has been made for deployment of multiple tracker buoys as quickly as possible, and data will be received by the IMT via web-link. No additional environmental benefits can be achieved through improving the number or location of additional tracker buoys.	No additional environmental benefit could be identified though a greater or faster response ESTB capability.

Oil spill response control [minimum implementation time]	Can a greater response effort be implemented?	Can the time to respond be improved?	Environmental benefit of increased response effort/reduced response time
	During the survey, one tracker buoy will be on the survey vessel, with other tracker buoys available on the Ichthys CPF and FPSO (within WA-50-L). Additional tracker buoys could be mobilised from Broome or Darwin, if required. More tracker buoys are available via AMOSC, if required. Therefore, many tracker buoys can be mobilised to the location and deployed during the early stages of a spill occurring.		
Satellite imagery analysis - obtain satellite imagery providers. [within 48 hours]	Information gained from satellite imagery would be used in combination with other controls such as aerial/vessel surveillance and OSTM, to improve the IMT's situational awareness. No greater response effort has been identified.	This service cannot be provided faster as access to satellite imagery is limited due to the continuous movement and orbit of satellites around the globe. This results in up to 48-hour delays to obtain satellite imagery from service providers.	No additional environmental benefit could be identified though a greater or faster satellite imagery capability.
Vessel response - spill response vessel equipped with wildlife hazing, oiled wildlife response, shoreline clean–up. [available to mobilise and depart from Broome within 48 hours for large support vessels; within 24 hours for small support vessel]	Vessels will be mobilised as required under the existing call-off contracts. These contracts provide access to larger vessels (such as ASVs), and many medium to small support vessels (<~30m length). Larger vessels could be used for activities such as ASVs to support shoreline response activities.	INPEX can mobilise any available large support vessel (e.g. a PSV) from the Ichthys Field to Broome, load with supplies and personnel, and return to WA-50-L within 48 hours. Transit each way takes 18 hours, and up to 12 hours is required for loading in Broome.	No additional environmental benefit could be identified though a greater or faster vessel capability.

Oil spill response control [minimum implementation time]	Can a greater response effort be implemented?	Can the time to respond be improved?	Environmental benefit of increased response effort/reduced response time
	Small support vessels can be used for supporting shallow water response activities and wildlife hazing. The very small support vessels (<10m in length) can be used for shoreline landings and intertidal access for activities such as shallow water wildlife hazing. Each vessel can be loaded with different spill response equipment as relevant to the response activity and location. Therefore, a suitable response capacity is deemed to have been provided in this regard. It should be noted that strong winds and elevated sea-states will limit the effectiveness of most vessel-based response activities and there is no additional vessel capability that can overcome this limitation. However, if poor weather conditions are limiting vessel based responses, these same weather conditions would also be significantly increasing oil entrainment, reducing surface floating oil, reducing volumes of oil arriving on the shoreline and increasing the natural weathering of any oil on shorelines.	Similar timeframes are also required to mobilise, load the vessel and transit to the spill location for other large support vessels/equipment departing from Broome or Darwin. The timeframe, for mobilising vessels already on hire, cannot be guaranteed to be less than 48 hours. Other large PSVs are also potentially available in Dampier and would require approximately 48 hours to transit to Broome and commence mobilisation. 12 hours is required at the wharf to load provisions, equipment and conduct bunkering activities. Additionally, there is no guarantee that wharf space will be available for large vessels at short notice.	

Oil spill response control [minimum implementation time]	Can a greater response effort be implemented?	Can the time to respond be improved?	Environmental benefit of increased response effort/reduced response time
		To improve the response time for large vessels, it would be necessary to maintain a large vessel on stand-by in Broome or Darwin. This would incur stand by costs of approximately $20,000 per vessel per day. Any vessel would still need to wait for wharf space to become available, to load the relevant response equipment, then depart for the spill location. The additional cost is not considered reasonable, given that the response time would only be reduced by perhaps 12 to 24 hours. It should be noted that the relocation of equipment stockpiles from their storage facilities in Broome / Darwin to the wharf will not result in any additional time, as the positioning of this equipment on the wharf would occur whilst the support vessel is in transit to Broome/Darwin wharf.	

Oil spill response control [minimum implementation time]	Can a greater response effort be implemented?	Can the time to respond be improved?	Environmental benefit of increased response effort/reduced response time
		Smaller support vessels (<~30 m) are available in Broome and Darwin. These smaller vessels, in an emergency, could be along-side a smaller wharf to load marine crew, spill response equipment and supplies within 6 hours, and then transit to the required offshore location within approximately 24 hours from the time they were activated (assuming a vessel speed of 14 knots). It should be noted that the duration of the small support vessel to reach the spill location, will be dependent on weather and vessel speed. In addition, if a small support vessel is towing a tender, (for shoreline access), vessel speeds will be limited to 10 knots, resulting approximately 30% additional transit time to the spill location. These smaller vessels can support most other spill response activities, including wildlife hazing and shoreline response activities. The only identified method to further improve the speed of a vessel-based response would be to have additional vessels on stand-by pre-loaded with spill response equipment.	

Oil spill response control [minimum implementation time]	Can a greater response effort be implemented?	Can the time to respond be improved?	Environmental benefit of increased response effort/reduced response time
		The various spill response equipment stockpiles in Darwin and Broome require regular maintenance, testing and checking and therefore can't be permanently stored and maintained on board a vessel. In addition, there may be an operational requirement to have specific equipment from the stockpiles mobilised to different locations on different types of vessels, depending on the nature of the spill, receptors at risk and weather conditions at the time. It is not possible (space and weight limitations) to store and maintain all potentially required types of equipment offshore at all times.	
Vessel-based wildlife hazing equipment including vessels and vessel fog horns / water cannons Acoustic bird hazing buoy (available through AMOSC). [Within 48 hours]	Increasing the number of vessels may result in greater effectiveness of wildlife hazing, if a geographically appropriate location for hazing was identified (appropriate meaning a location where-by locally dispersing fauna from one location doesn't risk just moving the wildlife to another location of the slick). INPEX has a range of vessels it can mobilise for the purpose via vessel call-off contracts.	Response times are dependent on the spill location, vessel mobilisation times and vessel transit times, as described above in vessel response.	No additional environmental benefit could be identified though a greater or faster wildlife hazing capability.

Oil spill response control [minimum implementation time]	Can a greater response effort be implemented?	Can the time to respond be improved?	Environmental benefit of increased response effort/reduced response time
	No additional response capability is determined to be required.	Implementing a faster wildlife hazing response may assist in preventing oiling of wildlife. However, given there are many limitations to the success of wildlife hazing, detailed in Strategic SIMA, more rapid or provision of vessel numbers or mobilisation timeframes compared to that provided is not considered ALARP.	
Light utility helicopter – use of a light utility helicopter suitable for landing on remote shorelines for OWR and/or shoreline clean-up. Available under INPEX aviation call-off arrangements. [mobilisation to Broome within 7 days]	Using a BK-117, H-135 or H-145 light utility helicopter, the helicopter's maximum capacity is two pilots transporting six passengers. The use of additional utility helicopters would enable more responders to access the affected location. However, this will require additional helicopter landing pads/locations to accommodate the helicopter overnight. To mobilise and maintain a second light utility helicopter offshore, a very large support vessel equipped with a helicopter pad would be required. The costs associated with this large support vessel and second helicopter would be in excess of $100,000 per day.	If a light utility helicopter was determined to be required, the minimum requirements for a helicopter to support oil spill response activities at remote shoreline locations are: • capacity to carry at least 6 personnel and their equipment • ability to be fitted with cargo hooks for the ability to sling loads (i.e. equipment/waste) between the shoreline and nearby support vessels. • long range fuel tanks due to the potential travel distances offshore • twin engines • life raft, satellite tracking and other safety systems	No additional environmental benefit could be identified though a greater or faster helicopter capability.

Oil spill response control [minimum implementation time]	Can a greater response effort be implemented?	Can the time to respond be improved?	Environmental benefit of increased response effort/reduced response time
	Under a worst credible scenario, only a single remote shoreline or set of adjacent shorelines requiring the use of a light utility helicopter is anticipated.	Under the International Civil Aviation Organization (ICAO) Annex 6 Civil Aviation Safety Regulation (CASR) 133, transport category helicopters with a seating capacity of >19 must be operated under Performance Class 1 or Category A. Therefore, INPEX's crew transfer helicopters, including the INPEX search and rescue (SAR) helicopter, are not available for shoreline oil spill response support activities. In addition, whilst the Sikorsky S-92s used for INPEX crew changes meet some of the criteria e.g. personnel capacity, twin engines and long-range fuel tanks required to access remote areas, they do not have the capability to sling equipment as they cannot be configured with cargo hooks. In addition, because of the size of the helicopter the downwash generated is in excess of 125 km/h and landing on unprepared sites can cause "brownout" conditions which can restrict the pilot's visibility due to the recirculation effect of the rotor downwash. Therefore, these helicopters are not deemed suitable for remote shoreline operations.	

Oil spill response control [minimum implementation time]	Can a greater response effort be implemented?	Can the time to respond be improved?	Environmental benefit of increased response effort/reduced response time
		Smaller helicopters can be operated under Performance Class 2 or 3 (Category B) and under ICAO Annex 6 CASR 133 and the Civil Aviation Safety Authority (CASA) regulations may be able to land at remote shoreline locations with extreme caution. Under the International Association of Oil and Gas Producers *Aircraft Management Guidelines Document 390*, INPEX risk assessments, the INPEX *Refuelling Handbook* and CASA Civil Aviation Advisory Publication (CAAP) 234-1 (2) Para 5.4.2 recommends all aircraft operating under charter should have sufficient fuel to fly to an alternate aerodrome which is not a remote island. For example, for a response at Scott Reef, the closest usable airport would be Lombardina Airbase. The remoteness of other potential shoreline response locations along the WA coastline presents similar challenges. An ASV with a helicopter deck could however be considered an alternative landing location to the remote island, assisting in redundancy landing locations for remote helicopter activities.	

Oil spill response control [minimum implementation time]	Can a greater response effort be implemented?	Can the time to respond be improved?	Environmental benefit of increased response effort/reduced response time
		Based on the types of distances and the requirements for smaller helicopter types that can land at remote islands, the most suitable twin-engine helicopter types identified were the MBB Kawasaki BK-117 and the Airbus H-135 or H-145 (if fitted with a long-range fuel tank). Small helicopters such as BELL 206, AS350B and EC120 are capable of landing on remote islands with difficult access. However, they have single engines and were ruled out as they do not meet INPEX's aviation standards for safety, fuel range or have the ability to transport enough people/equipment to implement an effective response. Small helicopters, such as the BK-117 and Airbus H-135 or H-145, are generally working under contract with many configured in an air ambulance role or a surf rescue role. The market for surplus available aircraft around Australia is therefore limited and the response time cannot be guaranteed.	

Oil spill response control [minimum implementation time]	Can a greater response effort be implemented?	Can the time to respond be improved?	Environmental benefit of increased response effort/reduced response time
		The response implementation time could be improved to <7 days if a BK-117, H-135 or a long-range H-145 helicopter was positioned, on standby in Broome or Darwin on a permanent basis. The high cost (estimated at AUD $1.5–2.0 million per year) of maintaining this capability, including the hire of the aircraft, pilots on standby, reoccurring training and maintenance of the aircraft, is considered to be grossly disproportionate to the environmental benefit gained and is not considered to be ALARP, even if the costs were shared with another near-by operator. This is because the spill (and resulting offshore impacts) has already occurred, and pre-contact wildlife hazing or translocation at a shoreline has low likelihood of significant impact reduction. It is not expected that a significant improvement for the environment would be achieved if post-contact wildlife response or shoreline clean-up commenced within the first 7 days or whether it occurs from day 7 onwards.	

Oil spill response control [minimum implementation time]	**Can a greater response effort be implemented?**	**Can the time to respond be improved?**	**Environmental benefit of increased response effort/reduced response time**
		Other arrangements to position people and equipment on to remote shorelines to undertake oil spill response activities without the use of a helicopter have been considered. Vessel access to remote shorelines such as at Lacepede Islands/Adele Island can be achieved (noting some weather/met-ocean potential limitations). Vessel based response timings are discussed above. It should be noted that if heavy sea conditions were restricting vessel access, this same wave action would be increasing the natural break-up and weathering of oil at sea and on shorelines.	
Oiled wildlife response personnel – The Oiled Wildlife Division Coordinator and Oiled Wildlife Advisor roles, within the Incident Management Team (IMT), would be provided by the WA DBCA for WA shoreline responses. If, however the response was at an Australian Commonwealth island such as Ashmore or Cartier, the AMOSC core-group OWR trained personnel could undertake this role within the IMT.	There is an appropriate limit to the number of personnel that should be put ashore during shoreline response in a sensitive location, to avoid additional impacts, e.g. trampling of turtle nests and disturbance to bird feeding/roosting/nesting behaviours. In general, to reduce wildlife disturbance on small, offshore remote locations, a longer duration response with minimum numbers is desired.	As oiled wildlife response will most likely be undertaken on a shoreline, the Control Agency will most likely be the WA DoT. The key oiled wildlife specialists (i.e. WA DBCA oiled wildlife advisers and associated field responders, acting on behalf of WA DoT) are likely to mobilise with an oiled wildlife response activity. Personnel from these government agencies are living/working in northern WA, and therefore their mobilisation should not limit mobilisation timeframes.	No additional environmental benefit could be identified though a greater or faster wildlife response personnel capability.

Oil spill response control [minimum implementation time]	Can a greater response effort be implemented?	Can the time to respond be improved?	Environmental benefit of increased response effort/reduced response time
In the field, the OWR team would be led by the relevant personnel from WA DBCA/NT PaWC, supported by the AMOSC OWR Team. Trained OWR personnel are available through the Oiled Wildlife Rehabilitators Network (approximately 100 personnel), and Philip Island Nature Park (approximately 100 personnel). INPEX could provide additional personnel via INPEX Master Service Agreement with Environmental Service Providers, or other labour hire companies. A minimum of 20 personnel could be ready to mobilise from Broome/Darwin. [Within 24 hours]	The areas of potential shoreline impacted are remote and therefore, numbers of responders are also limited by accommodation and logistics support. For offshore islands with the ability for helicopters to safely land, it is estimated that up to 24 personnel could work onshore on a single day, based on one utility helicopter conducting the daily transits to and from shore. Similar numbers would be expected using small boats for shoreline access. However, it should be noted that personnel numbers are not constrained, as INPEX's arrangements with contracted labour hire and other industry capability (e.g. AMOSC) provides access to additional personnel if required. Whilst multiple shorelines may be assessed (to confirm presence/absence of shoreline oiling/oiled wildlife), only a single offshore remote island/shoreline, or set of adjacent shorelines is envisaged requiring a large oiled wildlife response, even for a worst credible spill scenario.	Additional trained OWR trained personnel could be positioned on stand-by in Broome/Darwin. However, as personnel can be mobilised from around Australia to Broome/Darwin in a similar timeframe as which vessels can be mobilised to these ports, this is not considered to be reasonable given the high cost and low likelihood of needing to implement an oiled wildlife response.	

Oil spill response control [minimum implementation time]	**Can a greater response effort be implemented?**	**Can the time to respond be improved?**	**Environmental benefit of increased response effort/reduced response time**
Oiled wildlife response kit available for use provided by AMOSC in Broome [Immediate] Oiled wildlife response containers available for use provided by AMOSC, from Tier 3 stockpiles around Australia [48 hours]	INPEX could purchase additional OWR kits however as response planning indicates that OWR centres are most likely to be set up 'on-water', the number of centres is limited to the number of shorelines requiring the OWR centre. Only a single 'on water' OWR centre is envisaged, even for a worst credible spill scenario with multiple adjacent shorelines oiled. Additional OWR kits and containers are available around Australia, accessed via the Nat Plan. In addition, the types of equipment contained in the OWR kits are equipment that is easily re-supplied from Broome. Therefore, resupply of stocks of OWR equipment should not present a limitation to the response capability.	AMOSC OWR kit is present in Broome and is available to be deployed. This response cannot be implemented faster, without maintaining an OWR kit and associated trained personnel onboard a support vessel, offshore at all times. This is not considered reasonable given the high cost and impracticality compared to the low likelihood of needing an oiled wildlife response.	No additional environmental benefit could be identified though a greater or faster wildlife response equipment capability.

Oil spill response control [minimum implementation time]	Can a greater response effort be implemented?	Can the time to respond be improved?	Environmental benefit of increased response effort/reduced response time
Shoreline clean-up trained personnel - Response experts would be provided by AMOSC core-group. Additional labour would be provided by INPEX. A minimum of 20 personnel would be ready to mobilise from Broome/Darwin. [Within 24 hours]	Increasing the number of shoreline clean-up personnel can increase the rate at which oil is removed from a shoreline. Personnel numbers can be increased as required to respond to the specific spill scenario and therefore numbers are not constrained. However, personnel numbers onshore will be limited by a range of external factors. There is an appropriate limit to the number of personnel that should be put ashore during shoreline response in a sensitive location, to avoid additional impacts, e.g. trampling of turtle nests and disturbance to bird feeding/roosting/nesting behaviours. In general, to reduce wildlife disturbance on small, offshore remote locations, a longer duration response with minimum numbers is desired. If vessels are used for access, sea-state and tides can prevent shore-landings. However, if sea-state and tides are forecast to be good for shore-landings, larger groups can mobilise.	Additional trained shoreline clean-up personnel could be positioned on stand-by in Broome/Darwin. However, as personnel can be mobilised from around Australia to Broome/Darwin in a similar timeframe as which vessels can be mobilised to these ports, this is not considered to be reasonable given the high cost and low likelihood of needing to implement a shoreline clean-up response.	No additional environmental benefit could be identified though a greater or faster shoreline clean-up personnel capability.

Oil spill response control [minimum implementation time]	Can a greater response effort be implemented?	Can the time to respond be improved?	Environmental benefit of increased response effort/reduced response time
	If a light utility helicopter is used for shoreline clean-up, sea-state and tidal access issues are eliminated and up to 24 personnel could work ashore in any single day (based on helicopter pilot duty hour limitations). Additional personnel could be transferred using small vessels (sea-state permitting). Whilst multiple shorelines may be assessed (to confirm presence/absence of shoreline oiling), only a single remote island/shoreline (or set of adjacent oiled shorelines) is envisaged requiring a large shoreline response, even for a worst credible spill scenario.		

Oil spill response control [minimum implementation time]	Can a greater response effort be implemented?	Can the time to respond be improved?	Environmental benefit of increased response effort/reduced response time
Shoreline clean-up manual cleaning equipment can be mobilised from the Broome/ Darwin stockpiles to a support vessel alongside in Broome/Darwin Port or to other remote mainland locations. [6 hours]	Machinery such as graders could be used to potentially assist with shoreline clean-up, however this often creates a larger volume of oily contaminated sands to be removed. In addition, heavy machinery could damage sensitive turtle nesting habitat, disturb other wildlife and may not be accessible for remote offshore islands. Therefore, response equipment will almost certainly be limited to hand-held equipment, which results in less disturbance when conducting a clean-up operation. The only 'machinery' potentially used for remote shoreline clean-up would be a tracked 'bob-cat' or 'dingo', operated above the high tide line, to assist in moving collected oily waste to staging areas. Consequently, increasing response effort is limited to increasing numbers of personnel and manual cleaning equipment (shovels etc.). Sufficient equipment is considered available within existing stockpiles. Additional manual clean-up equipment can be purchased at hardware stores, as required in Broome or Darwin.	Manual cleaning equipment can be mobilised to the wharf from the Broome/Darwin stockpiles in 6 hours. Any improvement on this is not warranted as the vessels will not be ready in a shorter duration of time.	No additional environmental benefit could be identified though a greater or faster shoreline clean-up response equipment capability.

Oil spill response control [minimum implementation time]	Can a greater response effort be implemented?	Can the time to respond be improved?	Environmental benefit of increased response effort/reduced response time
Waste management contract enables access to sufficient waste containers to be provided to meet the first response needs. AMOSC stockpiles also include wide range of purpose-built waste containers. [Immediate]	No greater response effort can be obtained as the waste contract allows for immediate delivery of waste containers to be mobilised offshore, when requested by INPEX. Based on the estimated worst-case volume of oil accumulated on shorelines (<1 m^3) and a bulking factor for waste created of 10:1 it is estimated that approximately 10 m^3 of waste could be generated. Shoreline clean-up waste would likely be captured in plastic buckets, drums, plastic lined bulka-bags and 1 m^3 Intermediate Bulk Containers (IBCs). Therefore approximately 10 m^3 of these types of oily waste containers would be required, over the full duration (weeks) of any shoreline clean-up. There are no limitations to obtaining this waste storage capacity and no benefit obtained by accessing additional waste storage capacity.	As shoreline clean-up at a remote shoreline will be a long duration activity, and based on the anticipated worst credible waste volumes, no timing issues with provision and backload of waste containers are anticipated. The types of waste containers required are readily available via INPEX waste management contractor and AMOSC.	No additional environmental benefit could be identified though a greater or faster waste management capability.

* All timings are based on the assumption that the spill occurs, and response is implemented in daylight hours where visibility is critical for successful implementation.

8.5 Oil spill response strategies

As identified in the SIMA (Appendix E) not all response strategies are appropriate for every hydrocarbon spill, and as discussed in Table 8-5, not all response strategies are appropriate for the specific spill scenarios associated with the activity. Different types of hydrocarbon, spill locations and spill volumes require different response strategies, or combinations of techniques, to implement an effective response.

Based on the SIMA and subsequent evaluations (Table 8-5, Table 8-7 and Table 8-7), INPEX has identified a set of primary and secondary response strategies to reduce the impacts and risks of hydrocarbon spills from the petroleum activity to ALARP. However, the deployment of response strategies has the potential to introduce further impacts and risks.

8.5.1 Primary response strategy

Operational monitoring and evaluation has been determined as the only appropriate primary (first strike) response measure for all hydrocarbon spills. This involves surveillance and reconnaissance, using an appropriate combination of OSTM, vessels and aircraft surveillance, satellite imagery and satellite tracking buoys to monitor the size, trajectory, weathering and fate of the hydrocarbon spill.

The information obtained through the operational monitoring and evaluation program will inform the development of IAPs, which will include consideration of the use of secondary response strategies, as identified in the SIMA.

An impact and risk evaluation for the implementation of the primary response strategy is presented in Table 8-8.

8.5.2 Secondary response strategy

Pre-contact wildlife response (hazing) has been identified as a potentially applicable secondary response strategy. An impact and risk evaluation for the implementation of these response strategies is presented in Table 8-8.

Table 8-8: Impact and risk evaluation – implementation of response strategies

Identify hazards and threats
Primary response strategy – monitoring and evaluation. Routine sewage effluent, grey water and food waste discharges from vessels used in oil spill response, when located close to shorelines (such as turtle and marine avifauna breeding rookeries), could result in the exposure of EPBC-listed species to untreated/non-macerated discharges. Accidental release of waste overboard as a result of inappropriate management may result in impacts to marine fauna through entanglement or ingestion of waste material, with the potential to result in injury. Inappropriate waste management also has the potential to expose marine flora and fauna to changes in water quality and may result in reduced ecosystem productivity or diversity. The physical presence of vessels used in the response strategy has the potential for vessel-to-vessel collisions. **Secondary response strategy – pre-contact wildlife response.** Routine sewage effluent, grey water and food waste discharges from vessels used in oil spill response, when located close to shorelines (such as turtle and marine avifauna breeding rookeries), could result in the exposure of EPBC-listed species to untreated/non-macerated discharges. Accidental release of waste overboard as a result of inappropriate management may result in impacts to marine fauna through entanglement or ingestion of waste material, with the potential to result in injury. Inappropriate waste management also has the potential to expose marine flora and fauna to changes in water quality and may result in reduced ecosystem productivity or diversity. The physical presence of vessels used in the response strategy has the potential for vessel-to-vessel collisions. Poorly implemented wildlife response has the potential to cause stress or suffering to wildlife impacted by a spill. **Secondary response strategies –post-contact wildlife response.** Routine sewage effluent, grey water and food waste discharges from vessels used in oil spill response, when located close to shorelines (such as turtle and marine avifauna breeding rookeries), could result in the exposure of EPBC-listed species to untreated/non-macerated discharges. Accidental release of waste overboard as a result of inappropriate management may result in impacts to marine fauna through entanglement or ingestion of waste material, with the potential to result in injury. Inappropriate waste management also has the potential to expose marine flora and fauna to changes in water quality and may result in reduced ecosystem productivity or diversity. The physical presence of vessels used in the response strategy has the potential for vessel-to-vessel collisions. Capture, cleaning and rehabilitation of oiled wildlife has the potential to create additional stress to animals. The movement of equipment and personnel onto offshore islands has the potential to introduce terrestrial exotic pests, including rats. The movement of personnel and equipment onto offshore islands has the potential to disturb turtle nests and turtle-nesting activities. **Secondary response strategy – shoreline clean-up.** Routine sewage effluent, grey water and food waste discharges from vessels used in oil spill response, when located close to shorelines (such as turtle and marine avifauna breeding rookeries), could result in the exposure of EPBC-listed species to untreated/non-macerated discharges.

Accidental release of waste overboard as a result of inappropriate management may result in impacts to marine fauna through entanglement or ingestion of waste material, with the potential to result in injury. Inappropriate waste management also has the potential to expose marine flora and fauna to changes in water quality and may result in reduced ecosystem productivity or diversity. The physical presence of vessels used in the response strategy has the potential for vessel-to-vessel collisions. The movement of equipment and personnel onto offshore islands has the potential to introduce terrestrial exotic pests, including rats. The movement of personnel and equipment onto offshore islands has the potential to disturb turtle nests and turtle-nesting activities. Incorrect management of hydrocarbon-contaminated wastes generated during shoreline clean-up has the potential to create additional contamination of the shoreline.	
Potential consequence: Primary response strategy – monitoring and evaluation	**Severity**
The values and sensitivities with the potential to be impacted are transient, EPBC-listed species (marine fauna including foraging BIAs). Monitoring and evaluation does not provide any material changes to the trajectory of the spill. Instead, it provides critical information on the fate, nature and weathering of the spill, as a result of exposure to natural biological and physical degradation processes. The strategy can be used to inform other response strategies and emergency response priorities. Since this strategy does not provide any material changes to the trajectory of the spill, the inherent impacts of the hydrocarbon on marine fauna in the trajectory of the spill will remain until natural degradation/weathering reduces the impacts of the spill. Due to the types of small vessels which may support an oil spill response, all vessels may not be fitted with sewage disinfection systems, sewage macerators or food macerators. Therefore, EPBC-listed species, such as marine turtles and marine avifauna may be exposed to untreated sewage, grey water and food scraps, particularly when response vessels are conducting activities near breeding rookeries, such as Browse Island, Cartier Island and Scott Reef. The duration of any exposure is likely to be limited to between a few days and a number of weeks, depending on the duration of the oil spill response activity. Due to the local currents and deep offshore waters surrounding these offshore islands, and higher currents around nearshore waters of WA coastlines, any temporary changes to water quality that may occur are expected to be short term and localised and are therefore considered to be Insignificant (F). Various conservation management plans (refer to Appendix B) identify inappropriate waste management as a key threatening process to the recovery of EPBC-listed species. Inappropriate storage and handling of solid and liquid wastes generated through routine operations during an oil spill response could result in impacts to individuals of transient, EPBC-listed species, resulting in isolated and localised impacts only. Therefore, the consequence is considered to be Insignificant (F). The physical presence of vessels during the implementation of this response strategy has the potential to increase the risk of a vessel-to-vessel collision. The consequences of a vessel collision are discussed in Table 8-4.	Insignificant (F)
Potential consequence: Secondary response strategy – pre-contact (translocation) and post-contact wildlife response	**Severity**

The values and sensitivities with the potential to be impacted are transient, EPBC-listed species (turtles and marine avifauna). Due to the types of small vessels which may support an oil spill response, all vessels may not be fitted with sewage disinfection systems, sewage macerators and/or food macerators. Therefore, EPBC-listed species, such as marine turtles and marine avifauna may be exposed to untreated sewage, grey water and food scraps, particularly when response vessels are conducting activities near breeding rookeries, such as Browse Island, Adele Island etc. The duration of any exposure is likely to be limited to between a few days and a number of weeks, depending on the duration of the oil spill response activity. Due to the local currents and deep offshore waters surrounding these offshore islands, and higher currents around nearshore waters of the WA coastlines, any temporary changes to water quality that may occur are expected to be short term and localised and are therefore considered to be Insignificant (F). Various conservation management plans (refer to Appendix B) identify inappropriate waste management as a key threatening process to the recovery of EPBC-listed species. Inappropriate storage and handling of solid and liquid wastes generated through routine operations during an oil spill response could result in impacts to individuals of transient, EPBC-listed species, resulting in isolated and localised impacts only. Therefore, the consequence is considered to be Insignificant (F). The physical presence of vessels during implementation of this response strategy has the potential to increase the risk of a vessel-to-vessel collision. The consequences of a vessel collision are discussed in Table 8-4. Pre-contact and post-contact wildlife response (capture, cleaning, relocation and rehabilitation of wildlife) can increase the survival rates of wildlife which may be, or has become, oiled at sea or onshore. There may be a potential for increased stress to some animals during capture, cleaning, relocation and/or rehabilitation (IPICEA 2017b). However, any potential impacts are considered to be of inconsequential ecological significance to protected species, as the capture, relocation cleaning, relocation and/or rehabilitation is conducted to increase survival rates of individuals (Insignificant F). The Threat abatement plan to reduce the impacts of exotic rodents on biodiversity on Australian offshore islands of less than 100 000 hectares (DEWHA 2009) identifies that exotic rodents (such as rats) have been a major cause of extinction and decline of island biodiversity. Introduction of rodents to any of the offshore islands in the EMBA could result in a medium-term impact on a population of protected species (Moderate D). Physical presence and movement of personnel across turtle-nesting beaches could potentially cause damage to buried turtle eggs, reducing turtle-nesting success. Artificial light is known to disorientate marine turtles, particularly hatchlings and female adults returning to the sea from nesting areas on the shore (Pendoley 2005). Incorrect management of personnel and equipment on turtle-nesting beaches could result in a minor impact on a small proportion of a turtle-nesting population (Minor E).	Moderate (D)
Potential consequence: Secondary response strategy – shoreline clean-up	**Severity**
The values and sensitivities with the potential to be impacted are transient, EPBC-listed species (marine fauna) and marine fauna BIAs in the EMBA (turtles and marine avifauna nesting).	Moderate (D)

Due to the types of small vessels which may support an oil spill response, all vessels may not be fitted with sewage disinfection systems, sewage macerators and/or food macerators. Therefore, EPBC-listed species, such as marine turtles and marine avifauna may be exposed to untreated sewage, grey water and food scraps, particularly when response vessels are conducting activities near breeding rookeries, such as Browse Island, Adele Island etc. The duration of any exposure is likely to be limited to between a few days and a number of weeks, depending on the duration of the oil spill response activity. Due to the local currents and deep offshore waters surrounding these offshore islands, and higher currents around nearshore waters of the WA coastlines, any temporary changes to water quality that may occur are expected to be short term and localised and are therefore considered to be Insignificant (F).

Various conservation management plans (refer to Appendix B) identify inappropriate waste management as a key threatening process to the recovery of EPBC-listed species. Inappropriate storage and handling of solid and liquid wastes generated through routine operations during an oil spill response could result in impacts to individuals of transient, EPBC-listed species, resulting in isolated and localised impacts only. Therefore, the consequence is considered to be Insignificant (F).

The physical presence of vessels during implementation of this response strategy has the potential to increase the risk of a vessel-to-vessel collision. The consequences of a vessel collision are discussed in Table 8-4.

The Threat abatement plan to reduce the impacts of exotic rodents on biodiversity on Australian offshore islands of less than 100 000 hectares (DEWHA 2009) identifies that exotic rodents (such as rats) have been a major cause of extinction and decline of island biodiversity. Introduction of rodents to any of the offshore islands in the EMBA could result in a medium-term impact on a population of protected species (Moderate D).

Physical presence and movement of personnel across turtle-nesting beaches could potentially cause damage to buried turtle eggs, reducing turtle-nesting success. Artificial light is known to disorientate marine turtles, particularly hatchlings and female adults returning to the sea from nesting areas on the shore (Pendoley 2005). Incorrect management of personnel and equipment on turtle-nesting beaches could result in a minor impact on a small proportion of a turtle-nesting population (Minor E).

A shoreline clean-up response will generate a significant quantity of hydrocarbon-contaminated solid waste. Contaminated solids will include personal protective equipment (PPE), spill clean-up equipment (shovels, rakes, etc.) and the oil-contaminated sediments collected from shorelines (IPICEA 2015a). Inappropriate management of oil-contaminated waste could result in localised contamination of shoreline sediments and harm to individuals of protected species (Minor E).

Identify existing design safeguards/controls

Vessels fitted with lights, signals, an automatic identification system (AIS) transponders and navigation equipment as required by the *Navigation Act 2012*.

Due to the nature of call-off vessels that may be used during an oil spill response, not all vessels can be confirmed to be equipped with onboard sewage treatment plants compliant with MARPOL 73/78 (depending on the sewage treatment plant installation date) or an approved sewage comminuting and disinfecting system. However, all vessels will comply with the requirements of MARPOL 73/78, Annex IV for sewage discharges and Annex V for food scrap discharges during oil spill response activities.

Propose additional safeguards/control measures (ALARP evaluation)			
Hierarchy of control	Control measure	Used?	Justification
Elimination	No response strategies implemented.	No	Not responding to a spill which could result in harm to wildlife populations and leaving the spill without understanding its fate and trajectory is not considered to be ALARP. The spill could harm wildlife populations or pose an operational risk to response personnel; therefore, INPEX will deliver monitoring and evaluation and other appropriate secondary response strategies to reduce impacts to ALARP.
	Eliminate use of vessels (collision risk and associated discharges) during a spill response.	No	Vessels are critical assets for monitoring and implementing the identified oil spill response activities.
Substitution	None identified.	N/A	N/A
Engineering	None identified.	N/A	N/A
Procedures and administration	Maintain and implement an appropriate Operational Monitoring and Evaluation capability, as described, and within the timeframes specified in Table 8-7, for any Level 2/3 spill event.	Yes	Operational Monitoring and Evaluation will be implemented for any Level 2/3 oil spill response activity, to provide real-time situational awareness to the IMT. This capability involves the mobilisation/activation of • oil spill trajectory modelling • aerial surveillance • trained aerial observers • vessel surveillance • electronic surface tracking buoys • satellite imagery Justification for the level of capability and mobilisation timeframes are provided in Table 8-7.
	Maintain and implement equipment, personnel and logistics capability, as described and within the timeframes specified in Table 8-7, for any shoreline clean-up and/or oiled wildlife response, if selected for activation under the IAP.	Yes	If specified in the Operational SIMA/IAP, shoreline clean-up and/or oiled wildlife response strategies would involve the mobilisation of: • small vessel and large larger support vessels • light utility helicopter • shoreline clean-up and oiled wildlife response equipment • shoreline clean-up and oiled wildlife response personnel

			Justification for the level of capability and mobilisation timeframes are provided in Table 8-7.
	Maintain a waste management contract, to receive and treat/dispose of oily contaminated wastes.	Yes	In the event that an oiled wildlife or shoreline clean-up response is activated, oily wastes will be generated and will therefore require appropriate onshore disposal.
	Develop an Operational SIMA in accordance with Section 3 of the OPEP to confirm effectiveness of response strategies before including the selected strategies into the IAP.	Yes	To ensure that response strategies will be effective, the INPEX IMT will use the Operational SIMA template (Appendix D – OPEP Section 3) and operational and monitoring data generated, to develop an Operational SIMA, before selecting the response strategies for inclusion in the IAP. The OPEP details all the response strategies, capabilities, and considerations that need to be undertaken to implement an effective response to a hydrocarbon spill. The IMT will consider all relevant information at the time of the spill, and using the OPEP for guidance, develop the IAPs. The IAPs demonstrate how the OPEP was effectively implemented during a spill event.
	Emergency response preparedness will be maintained by implementing Section 9.10 of this EP.	Yes	To ensure that INPEX is prepared to respond to a spill, response preparedness will be tested in accordance with Section 9.10 of this EP.
	Spill response strategy effectiveness will be monitored and terminated appropriately.	Yes	During response implementation, it is appropriate to monitor the ongoing effectiveness of the response strategy, to ensure the response continues to effectively reduce or mitigate the impacts of the spill and prevent/minimise additional harm. Ongoing monitoring of the effectiveness of the response strategy also ensures an appropriate termination point is reached.
	Visual inspections to prevent introduction of terrestrial exotic pests to offshore islands.	Yes	Visual inspections of helicopters and equipment mobilising to remote shorelines as part of any shoreline response activity will significantly reduce the risk of any introductions of terrestrial exotic pests. While the DEWHA threat abatement plan (DEWHA 2009) is focused on vessel-based vectors for introductions, this control is consistent with the intent of the actions described within that plan.
	Vessel sewage and food scrap discharges, and waste management will be conducted in accordance with MARPOL 73/78 requirements.	Yes	All vessels involved in oil spill response will have the capability to ensure sewage and food scraps discharges and waste management are compliant with MARPOL 73/78 requirements.

	Shoreline response activity HSE plan prepared and implemented which incorporates consideration of impacts to turtle nesting.	Yes	A site-specific HSE plan for any shoreline response activity will be developed to address any risks to turtle nesting associated with personnel and equipment movement on offshore islands / mainland turtle-nesting beaches. The plan will address specific issues including: • personnel and equipment movement on turtle-nesting beaches • light-spill (if night-time activities are required). The section of the relevant HSE plan will be prepared in consultation with AMOSC wildlife experts, DEE (Cwlth), and WA DoT/DBCA for responses on WA state lands.
	A waste management plan will be prepared and implemented for any shoreline response operations, in consultation with AMOSC and WA DoT.	Yes	A waste management plan to manage all hydrocarbon-contaminated solid/liquid waste is necessary to prevent accidental additional contamination of sediments and reduce the risks to wildlife.
	Obtain permits, in consultation with the relevant government agencies, before commencing wildlife hazing activities.	Yes	Consultation and obtaining the required permits from relevant government agencies before conducting any wildlife response activities will limit the likelihood of undue stress or harm to wildlife during the response activity.

Identify the likelihood	
Likelihood	Hydrocarbon spills of a Level 2 or Level 3 nature that are likely to trigger response strategies, thereby introducing the impacts and risks from implementing response strategies, are evaluated in Table 8-5. The use of secondary response strategies may increase the likelihood of impact occurring in comparison to just employing monitoring and evaluation techniques alone. However, based on the controls described, the likelihood of response activities resulting in the consequences described is considered Highly Unlikely (5).
Residual risk	Based on a worst-case consequence of Moderate (D) and likelihood of Highly Unlikely (5) the residual risk is Moderate (8).

Residual risk summary		
Consequence	Likelihood	Residual risk
Moderate (D)	Highly Unlikely (5)	Moderate (8)

Assess residual risk acceptability

Legislative requirements

The activities and proposed management measures are compliant with industry standards and relevant Australian legislation/guidance, e.g. the NatPlan (AMSA 2019); the Western Australian State Hazard Plan – Maritime Environmental Emergencies (WA DoT 2018b), specifically concerning implementation of oil pollution emergency plans; and MARPOL 73/78 for vessel discharges and garbage management.

Stakeholder consultation

Stakeholders have been engaged and issues/feedback have been incorporated in to the OPEP regarding potential impacts and risks associated with implementation of response strategies for Group II hydrocarbons. Stakeholder engagement is an ongoing process.

Conservation management plans / threat abatement plans

Several conservation management plans (refer to Appendix B) identify marine debris as a key threatening process to recovery. Also, the relevant action from the *Threat abatement plan for the impacts of marine debris on vertebrate marine life* (DEWHA 2009) is to "contribute to the long-term prevention of the incidence of harmful marine debris". The prevention of garbage entering the marine environment and the appropriate management of sewage and food wastes reduces the risk of impacts to the marine environment and demonstrates alignment with the various conservation management plans and threat abatement plans.

ALARP summary

As the level of environmental risk is assessed as Moderate, a detailed ALARP evaluation was undertaken to determine what additional control measures could be implemented to reduce the level of impacts and risks. No additional controls, beyond those identified during the detailed ALARP assessment can reasonably be implemented to further reduce the risk of impact.

Acceptability summary

Based on the above assessment, the proposed controls are expected to effectively reduce the risk of impacts to acceptable levels because:

- the controls demonstrate compliance with legislative requirements
- the controls meet stakeholder expectations
- management of the activity is aligned with the relevant conservation management plans / threat abatement plans and demonstrates a contribution to the long-term prevention of the incidence of harmful marine debris
- the level of residual risk is 'moderate' and impacts and risks are ALARP, and no further controls can reasonably be implemented to further reduce the risk of impact.

Environmental performance outcomes	**Environmental performance standards**	**Measurement criteria**	**Responsibility**
Oil spill response logistics, personnel and equipment capability will be maintained at acceptable levels through implementation of the environmental performance standards and the application of the environmental	Operational monitoring and evaluation capability which can meet the mobilisation timeframes specified in Table 8-7 will be maintained including: • oil spill trajectory modelling • aerial surveillance • trained aerial observers • vessel surveillance • electronic surface tracking buoys • satellite imagery.	Records confirm operational monitoring and evaluation capability maintained including: • oil spill trajectory modelling contract in place • aircraft contacts / call-off agreements • AMOSC contract • vessel contracts / call-off agreements • electronic surface tracking buoy locations (tracked via INPEX Oil Spill Preparedness and Response Register) • satellite imagery provider contract.	IMT Leader/ Environmental advisor

management implementation strategy.	Oil spill response capability for shoreline and pre/post contact oiled wildlife response, which can meet the mobilisation timeframes specified in Table 8-7 will be maintained including: • access to AMOSC and OSRL equipment and personnel, including shoreline clean-up and oiled wildlife response personnel and equipment. • access to small and large support vessel capability • access to light utility and crew change helicopters • access to additional support personnel through Environmental Service Providers general labour hire.	Records confirm oil spill response capability is maintained including: • AMOSC contract • OSRL contract • framework agreements.	IMT Leader
IMT will evaluate operational monitoring and evaluation data for the full duration of the spill event, to determine if additional response strategies are required.	The IMT will activate and evaluate real-time operational monitoring and evaluation data for any Level 2/3 spill event. The operational monitoring and evaluation data and the OPEP's Operational SIMA template will be used for the development of the Operational SIMA and IAP.	Records confirm real-time operational monitoring and evaluation data was received and evaluated by the IMT. Records confirm operational monitoring and evaluation data and the OPEP's Operational SIMA template were used for the development of the Operational SIMA and IAP.	IMT Leader
Risks of impacts to transient, EPBC-listed species, i.e. marine turtles, marine mammals	To monitor response strategy effectiveness, daily reports from field response activities will be provided to the IMT, in accordance with Section 4 of the OPEP. Effectiveness of the oil spill response will be monitored until: • the source of the spill has been stopped • the objectives of the IAPs have been met or • there are no further practicable steps that can be taken to respond to a spill.	Daily field activity reports, in accordance with Section 4 of the OPEP. Daily reports or other data confirms oil spill response termination criteria have been met.	IMT Leader/ Environmental advisor

and marine avifauna (receptors) from a Level 2 or Level 3 spill (impactors) are reduced and maintained at acceptable levels through implementation of the environmental performance standards and the application of the environmental management implementation strategy.	Emergency response preparedness will be maintained by implementing Section 9.10 of this EP.	Records confirm emergency response preparedness, as detailed in Section 9.10 of this EP, is maintained.	Environmental advisor
Risks of impacts to transient, EPBC-listed species, i.e. marine turtles, marine mammals and marine avifauna, and benthic communities which support them (receptors) from vessel discharges during oil spill response activities (impactors) are reduced and maintained at acceptable levels through implementation of the environmental performance standards and the application of the environmental management implementation strategy.	All vessels involved in oil spill response activities will conduct sewage disposal activities in accordance with MARPOL 73/78, Annex IV. All vessels involved in oil spill response activities will conduct food scrap disposal activities in accordance with MARPOL 73/78, Annex V. No de-ballasting within marine parks during oil spill response activities.	Records of sewage discharge locations are maintained in a sewage disposal record book that complies with MARPOL 73/78, Annex IV. Records of food scrap discharges are maintained in a garbage record book that complies with MARPOL 73/78, Annex V. Records of de-ballasting.	Vessel master
No inappropriate disposal of garbage.	All vessels involved in oil spill response activities will conduct garbage management in accordance with MARPOL 73/78, Annex V.	Records of garbage disposals are maintained in a garbage record book that complies with MARPOL 73/78, Annex V.	Vessel master

No incidents of loss of hydrocarbons to the marine environment as a result of a vessel collision during oil spill response.	Vessels will be fitted with lights, signals, AIS transponders and navigation equipment as required by the *Navigation Act 2012*.	A premobilisation report confirms that required navigation equipment is fitted to all vessels to ensure compliance with the *Navigation Act 2012.*	Environmental advisor
Risks of impacts to transient, EPBC-listed species, i.e. marine turtles, marine mammals and marine avifauna (receptors) from wildlife response activities (impactors) are reduced and maintained at acceptable levels through implementation of the environmental performance standards and the application of the environmental management implementation strategy.	Permits will be obtained in consultation with DEE (Cwlth) before any wildlife hazing activities take place in Commonwealth waters. Permits, including launching and landing aviation assets, will be obtained in consultation with DBCA (via WA DoT) before any pre and post-contact wildlife response or shoreline clean-up activities take place in WA waters or lands.	Records demonstrate response activities with the potential to affect wildlife were conducted in consultation with, and under permits issued by DEE (Cwlth) and DBCA. Records are kept of response activities demonstrating compliance with any controls defined in the permits.	Environmental advisor
Risks of impacts to transient, EPBC-listed species, i.e. marine turtles, (receptors) from a shoreline response (impactors) are reduced and maintained at acceptable levels through implementation of the environmental performance standards and the application of the environmental management implementation strategy.	In the event of a shoreline response, an HSE plan will be prepared, in consultation with AMOSC and DBCA (via WA DoT) which addresses potential impacts to turtle nesting, including: • personnel and equipment movement on turtle-nesting beaches • light-spill (if night-time activities are required).	Records of correspondence with AMOSC and WA DoT/DBCA regarding turtle-nesting considerations. HSE plan documentation demonstrates controls regarding turtle nesting. Records demonstrate compliance with controls described in the HSE Plan.	Environmental Advisor

No introduction of terrestrial exotic pests to offshore islands.	Pre-flight visual inspections of helicopters conducted. Premobilisation visual inspections of vessels and equipment before mobilisation onto an offshore island and recorded on quarantine inspection checklists.	All aircraft technical logs confirm that pre-flight visual inspections have been conducted. Quarantine inspection checklists confirm vessel and equipment premobilisation inspections have been conducted.	Environmental Advisor
No secondary ocean or shoreline contamination due to inappropriate waste management during a shoreline response activity.	A contract will be maintained with a licenced waste management contractor, capability of receiving, treating and disposing of solid and liquid oily contaminated wastes.	Records confirm contract in place with a licenced waste management contractor.	Environment advisor
	In consultation with WA DoT and AMOSC, a response waste management plan, including decontamination stations and waste storage, transport and disposal arrangements, will be prepared and implemented for any shoreline response activity.	Records demonstrate that a waste management plan was prepared and implemented, in consultation with WA DoT and AMOSC, for any shoreline response activity.	IMT Leader

9 ENVIRONMENTAL MANAGEMENT IMPLEMENTATION STRATEGY

This section provides a description of the INPEX health, safety, environment and quality management system (HSEQ-MS) as it applies to the implementation of this EP and its associated performance outcomes and standards.

9.1 Overview

The HSEQ-MS includes standards and procedures from other business areas for its completeness. It is based on the principle of a "plan, do, check, act" (PDCA) continual improvement cycle, and has been developed in accordance with the following Australian standards:

- AS/NZS 4801:2001, *Occupational health and safety management systems—Specification with guidance for use*
- AS/NZS ISO 14001:2004, *Environmental management systems—Requirements with guidance for use*.

It provides mandatory rules and processes for the systematic and consistent management of HSEQ risks, demonstration of compliance, and facilitation of continual improvement. In the context of this EP, the HSEQ-MS enables INPEX to ensure that:

- environmental risks of activities are identified and communicated
- organisational structures and resources are provided to ensure that control measures remain effective in reducing environmental risks to levels that are acceptable and ALARP
- performance outcomes and standards are being met
- continual improvement is achieved through application of lessons learned.

The 13 external elements that influence the HSEQ-MS reflect key aspects of INPEX activities requiring process safety and HSEQ controls (Figure 9-1). These elements have to be managed and implemented properly in order to achieve the desired HSEQ performance and reflect a PDCA cycle, which is applied to every aspect of the 13 elements.

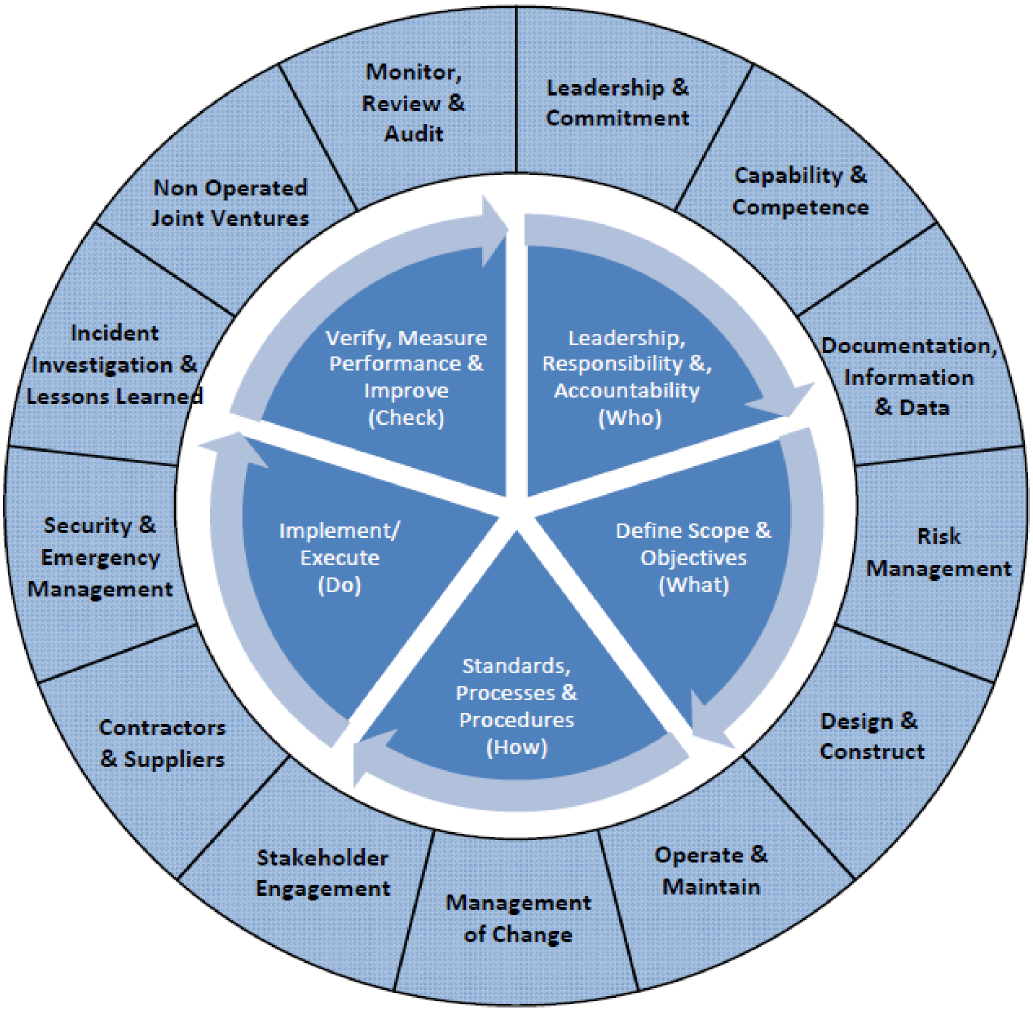


Figure 9-1: The INPEX health, safety, environment and quality management system

9.2 Leadership and commitment

INPEX environmental performance is achieved through strong visible leadership, commitment and accountability at all levels of the organisation. Leadership includes defining performance targets and providing structures and resources to meet them.

The INPEX Environmental Policy (Figure 9-2) solidifies this commitment and states the minimum expectations for environmental performance. The policy applies to all INPEX-controlled activities in Australia including WA-50-L. All personnel, including contractors, are required to comply with the policy.

The policy is available on the INPEX intranet and displayed at all INPEX workplaces, including all contractor vessels in the licence area. It will be communicated to personnel involved in the activities, including contractors, through inductions.

INPEX

Environmental Policy

Objective

INPEX is a worldwide oil and gas exploration, development and production company committed to conducting each of its activities in a manner that is environmentally responsible.

Our objective is to develop an environment culture that is recognised as amongst "best in industry" that will exceed the performance expectations of our stakeholders.

We recognise our responsibility to adhere to the principles of sustainable development and we acknowledge that we owe a duty of care to both the natural environment and the communities in which we operate.

Strategy

To accomplish this, INPEX will:

- comply with applicable laws and regulations, environmental plans and commitments and apply appropriate INPEX standards
- maintain a culture where people are empowered to intervene to prevent environmental harm
- set, measure and review environmental performance objectives and targets and ensure appropriate management of change processes are followed
- ensure our personnel have the necessary awareness, training, knowledge, resources and support, to meet environmental objectives and targets
- identify, manage and review environmental hazards and risks associated with our current and future business activities and manage these to levels that are 'as low as reasonably practicable' (ALARP)
- implement, maintain and regularly test control measures associated with major environmental events
- maintain and regularly test emergency management processes and procedures, including with industry and government emergency response partners
- engage with and communicate openly on environmental issues with internal and external stakeholders
- provide clearly defined environmental performance expectations for our contractors and suppliers, and work collaboratively with them to attain these
- endeavour to prevent pollution and seek continual improvement with respect to emissions, discharges, wastes, energy efficiency and resource consumption
- actively promote the reduction of greenhouse gas emissions across our operations in a safe, technically and commercially viable manner
- endeavour to protect biodiversity and to contribute to increased understanding of our natural environment
- drive continual improvement in environmental performance through monitoring, auditing and reviews.

Application

This policy applies to all INPEX controlled activities in Australia and related project locations. It will be displayed at all company workplaces and on the company's intranet and it will be reviewed regularly.

Hitoshi Okawa
President Director, Australia

Rev: 3
April 2019

Figure 9-2: INPEX environmental policy

9.3 Capability and competence

INPEX appoints and maintains competent personnel to manage environmental risks and provide assurance that the INPEX Environmental Policy, objectives and performance expectations will be achieved. This applies to both individual competencies and the overall capability of the organisation.

9.3.1 Organisation

Figure 9-3 illustrates the organisational structure for onshore and offshore during the geotechnical and geophysical survey activity.

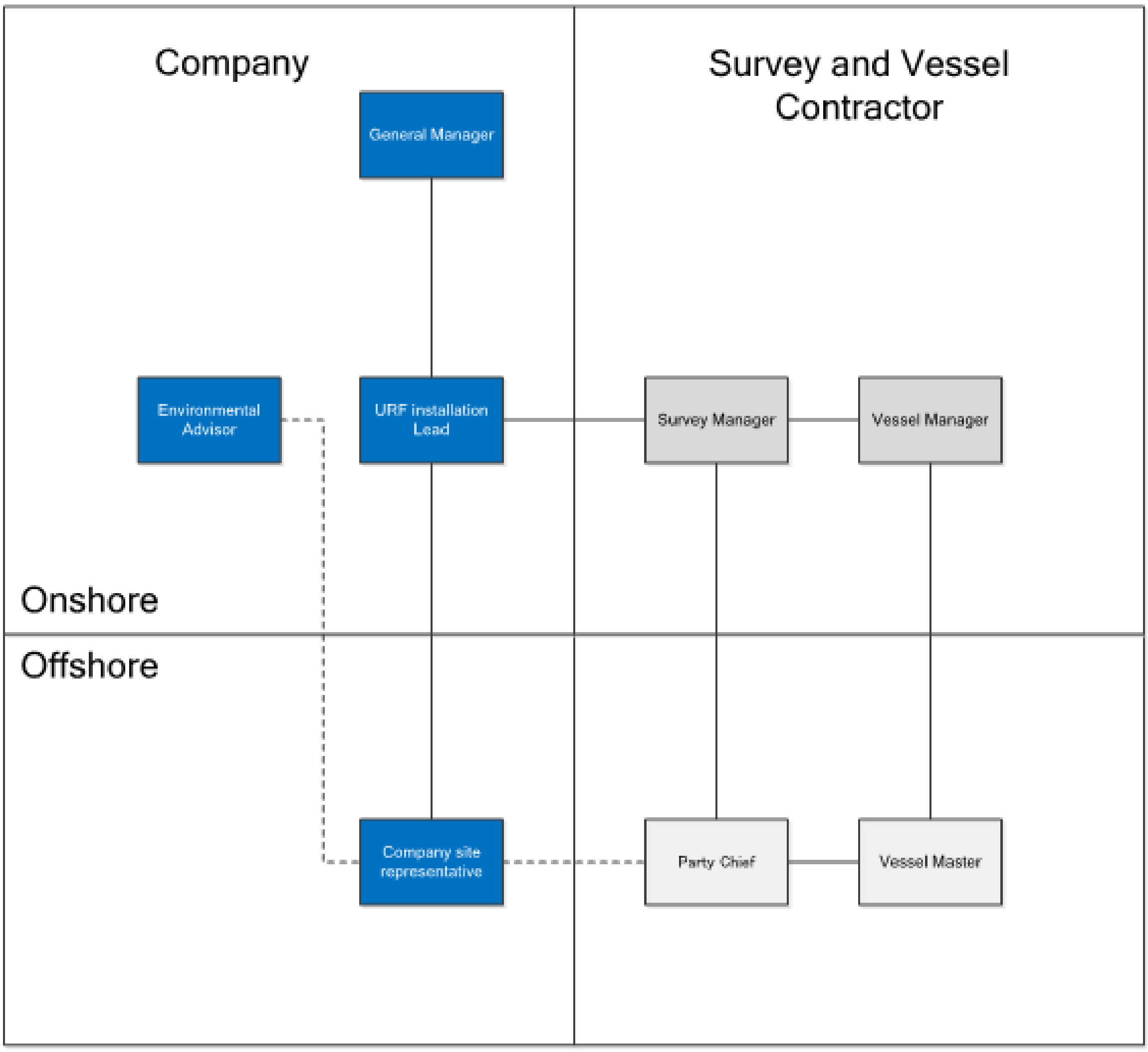


Figure 9-3: Organisational structure

9.3.2 Roles and responsibilities

INPEX has established and implements standards, procedures and systems to build and maintain a trained and competent workforce capable of fulfilling its assigned roles and responsibilities, as well as meeting its legislative and regulatory requirements. The selection process for the key INPEX personnel identified in Table 9-1 includes consideration of their previous work experience and recognised qualifications when compared with the INPEX minimum competency standards.

The key roles are responsible for collecting and maintaining the required evidence and monitoring data as specified in the environmental performance standards detailed in sections 7, 8 and 9 of this EP. Additional supporting roles and responsibilities related to HSEQ-MS implementation are also listed in Table 9-1.

Prior to mobilisation of personnel, those in key roles (Table 9-1) will be informed of their respective responsibilities in relation to this EP. This information will be disseminated by INPEX (e.g. through workshops, one-on-one sessions or by email) to ensure EP/OPEP awareness and that appropriate competencies and training requirements are met.

INPEX conducts training-needs analysis for each of the key roles listed in Table 9-1 to define minimum training requirements. The analysis is used to develop training plans which document, schedule and record completion of specific HSEQ training for individuals.

Table 9-1: Key personnel and support roles and responsibilities

Key role	Responsibilities
General Manager	Ensures overall compliance with the INPEX HSEQ-MS including environmental performance outcomes and standards.
URF installation lead	Ensures activities are undertaken in accordance with this EP. Ensures any changes to the activity that may affect the performance outcomes and environmental management procedures detailed in this EP are communicated to the INPEX HSEQ team. Ensures vessel master is provided with the resources required to ensure that the commitments in this EP are undertaken. Ensures the INPEX rep is provided with the resources required to ensure that the commitments in this EP are undertaken. Ensures reporting of environmental incidents meets external reporting requirements and INPEX incident reporting requirements. Ensures corrective actions raised from environmental audits are tracked and closed out.
Company site representative	Ensures contractors perform operations in a manner consistent with the performance outcomes and environmental management procedures detailed in this EP. Ensures the implementation of the INPEX Environment Policy, through application of this EP. Ensures the vessel master and all crews adhere to the requirements of this EP. Alerts the URF installation lead to any changes in activities that could have a negative impact on environmental performance. Reports incidents to the URF installation lead.

Environmental adviser	Ensures that environmental audits/pre-mobilisation inspections are undertaken. Ensures that the vessel master has been provided copies of personnel responsibilities as set out in this EP. Ensure that any changes to the survey that may affect EP mitigation and management measures are captured via the management of change process.
Vessel manager	Ensures vessel mobilised for the survey meets the required standard specified in this EP.
Survey manager	Ensures the vessel management systems and procedures are implemented. Ensures personnel starting work on the survey vessel receive an induction that meets the requirements specified in this EP. Ensures personnel are competent to undertake the work they have been assigned.
Vessel master	Conduct vessel operations in accordance with this EP. Implement the vessel's SOPEP/SMPEP in an emergency. Ensure that environmental incidents or breaches of performance outcomes, standards or criteria on vessels, are reported in line with INPEX's HSEQ performance reporting requirements for contractors.
Party chief	Implements the survey and records data
Support role	**Responsibilities**
All crew (Offshore)	Work in accordance with accepted vessel HSE systems and procedures. Comply with EP requirements as applicable to assigned role. Report any hazardous condition, near miss, unsafe act, accident or environmental incident immediately to supervisors. Attend HSE meetings and training when required.

9.3.3 Inductions

Inductions are conducted for all personnel (including INPEX representatives, contractors, subcontractors and visitors) before they start work on the vessels described in this EP. Inductions cover the health, safety and environment requirements under the INPEX HSEQ-MS, including information about the commitments contained in this EP.

The environmental content of these inductions includes the following:

- the INPEX Environmental Policy
- a general description of the activity location
- the ecological and socioeconomic values of WA-50-L and the surrounding areas
- legislative requirements, standards and procedures
- adherence to standards and procedures; the use of job hazard analyses (JHAs) and permits to work (PTWs); hazard identification and management process

- oil spill management, including prevention, response and clean-up, location of spill kits and reporting requirements
- waste management requirements and process (segregation of non-hazardous i.e. landfill, recyclable, non-recyclable and hazardous wastes) and location of bins
- reporting of incidents
- chemical management requirements – chemicals to be approved and safety datasheets on board
- direction to contact an HSE representative if personnel believe their actions may have an impact on the environment.

9.4 Documentation, information and data

INPEX implements and maintains document and records management procedures and systems. These are in place to ensure that the information required to support safe and reliable operations, is current, reliable and available to those who need it.

Documents and records are stored electronically in INPEX document management systems and databases.

This EP and associated documentation are maintained within a database, with current versions also available via the controlled document repository.

Records to demonstrate implementation of the HSEQ-MS and compliance with legislative requirements and other obligations are identified and maintained for at least five years. These records will include:

- written reports – including risk assessment reports and registers, monitoring reports, audit and review reports – about environmental performance or implementation strategies
- records relating to environmental performance or the implementation strategies
- records of environmental emissions and discharges
- modification and changes authorised by INPEX and/or contractor
- incident and/or near miss investigation reports
- improvement plans (corrective actions, key performance indicators)
- records relating to training and competency in accordance with this EP.

9.5 Risk Management

The risks and impacts associated with the petroleum activity are detailed in Section 7 and Section 8. Additional risk assessments will be undertaken on an ongoing basis when triggered by any of the following circumstances:

- when there is a proposed change to the activity, as identified by an INPEX management of change (MoC) request
- when identified as necessary following the investigation of an event
- when additional information about environmental impacts or risks becomes available (e.g. through better knowledge of the receptors present within the EMBA, new scientific information/papers, results of monitoring, other industry events or studies)
- if there is a change in regulations, as necessary
- during scheduled reviews of the documentation associated with this EP.

The risk assessment will be carried out in line with the assessment process described in Section 6 and is aligned to INPEX's HSE Hazard and Risk Management Standard, to ensure hazards related to the activity are systematically identified, assessed, evaluated and controlled. An environmental risk register for the activity is reviewed and updated quarterly. The review includes assessment of any new information and other changes that have been recorded on an ongoing basis in the previous quarter. Where this review results in a change, the changes are documented and communicated.

9.6 Operate and maintain

9.6.1 Biofouling risk assessment for domestic movements

The biofouling risk assessment process for domestic vessel movements includes aspects of the vessels history with respect to IMS risk e.g. vessels origin from within Australian waters and previous locations of operation (including whether these Australian locations have reported IMS occurrences), periods out-of-water and inspections/cleaning undertaken, age of anti-fouling coatings, presence and condition of internal treatment systems etc.

While undertaking the INPEX biofouling risk assessment for domestic movements (Figure 9-4), in any instances where potential risks are identified e.g. no anti-fouling coating or extended stays in Port, the process requires INPEX to engage an independent IMS expert and if required a further risk assessment may be undertaken.

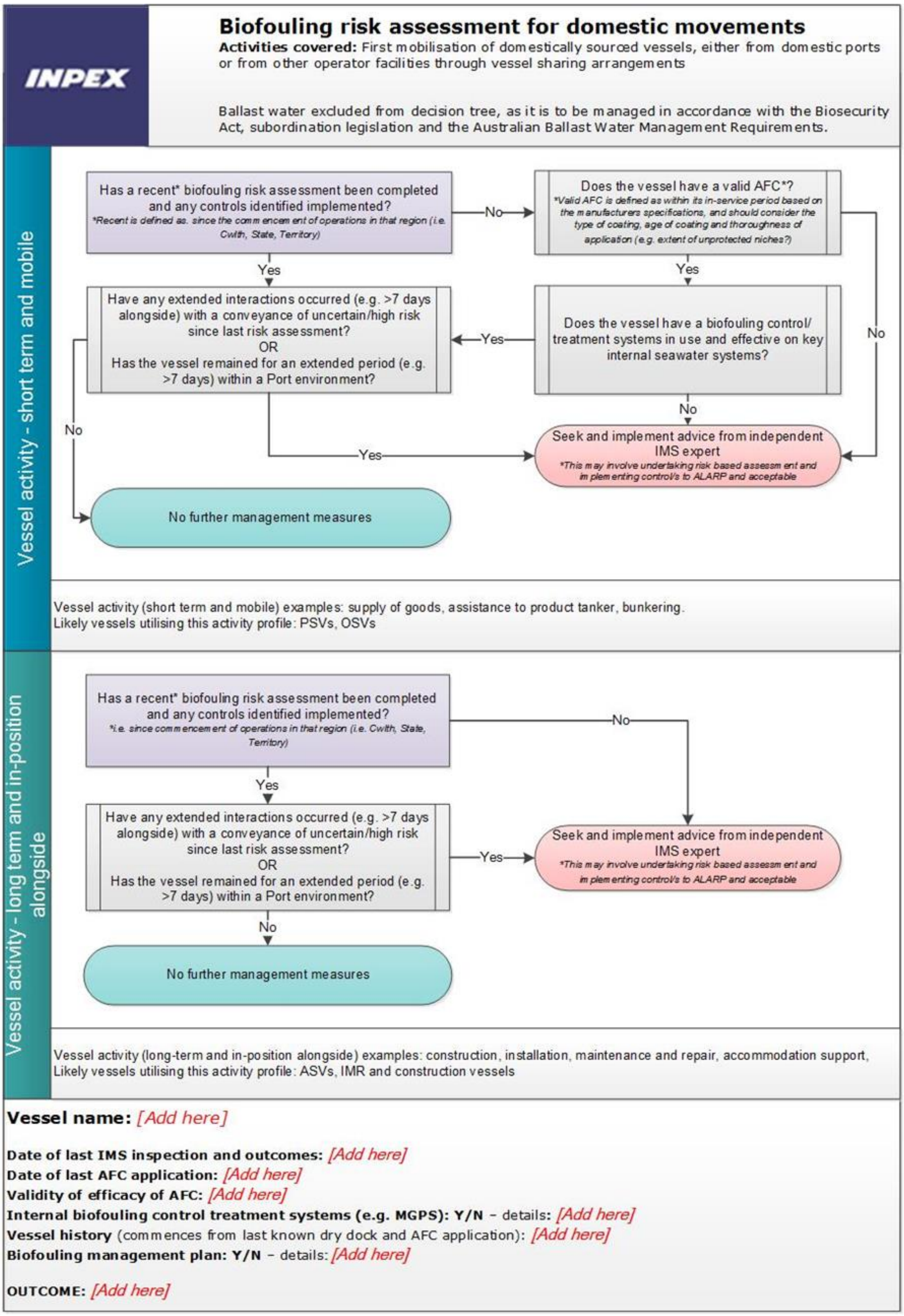


Figure 9-4: INPEX biofouling risk assessment for domestic movements

9.7 Management of change

Changes to this EP will be managed in accordance with a business-wide standard, and related procedures and guidelines. Where a change to management of an activity is proposed, it will be logged. Internal notification will be communicated via a management of change (MoC) request. The request will identify the proposed change(s) along with the underlying reasons and highlight potential areas of risk or impact. In accordance with the INPEX business rules, it is mandatory to undertake an environmental risk assessment in every case for changes that could affect the environment. The MoC request will be managed by an environmental adviser who will then determine the necessary approval/endorsement pathway, in consultation with the environmental approvals coordinator. Minor changes (such as updating a document or process) that do not invoke a revision trigger are made in document reviews from time to time.

In accordance with Regulation 17 of the OPGGS (E) Regulations 2009, a revision of this EP will be submitted to NOPSEMA where:

- a change is considered to represent a new activity
- a change is considered to represent a significant modification to, or a new stage of, an existing activity
- a change will create a significant new environmental impact or risk that is not provided for in the current EP
- a change will result in a series of new (or increased) environmental impacts or risks that, together, will result in a significant new environmental impact or risk, or a significant increase in an existing environmental impact or risk.

The MoC request process will be periodically checked against NOPSEMA guidance to ensure ongoing compliance and will be undertaken as part of the management review process described in Section 9.13.

9.8 Stakeholder engagement

9.8.1 Legislative and other requirements

INPEX maintains an approvals and compliance tracking system which identifies future approval requirements and when they must be in place, as well as compliance with existing approvals. Through this system, responsible persons are provided with alerts for required actions and time frames to avoid non-compliance and ensure there are no gaps in approvals.

In addition, INPEX personnel participate in industry and regulator forums, as well as maintain up-to-date knowledge of industry practices and proposed regulatory changes. Changes to legislative and other requirements are reviewed for potential impacts to business operations and communicated, as required, to personnel managing potentially affected activities.

Updates to matters relating to the EPBC Act, including policy statements and conservation management documentation will be achieved through subscription to automated email notifications provided by the DEE. Where required, updates to this EP will be conducted in accordance with the MoC process described in Section 9.7.

9.8.2 Communication

The requirements of the INPEX HSEQ-MS are communicated throughout the organisation. This facilitates the cascading and implementation of business policies and standards through the business, and on to contractors who work on behalf of INPEX.

INPEX and its contractors adopt a number of methods to ensure that information relating to HSEQ risks and impacts are communicated to personnel, including:

- daily toolbox meetings
- vessel HSE meetings
- use of noticeboards, intranet, HSE alerts and newsflashes e.g. environmental aspects and events
- internal and external reporting.

9.8.3 Ongoing stakeholder consultation

In relation to an EP Implementation Strategy, Regulation 14(9) of the OPPGS (E) Regulations 2009 specifies a requirement for consultation with relevant authorities of the Commonwealth, a state or territory, and other relevant interested persons or organisations. Any objections or claims received from stakeholders while the activity is ongoing will be considered and assessed as detailed in Section 5, using the same process and criteria described for the stakeholder consultation undertaken during the development of this EP. Mechanisms that provide ongoing opportunities for consultation with stakeholders, in relation to the implementation of this EP, are summarised in Table 9-3.

Table 9-2: Ongoing stakeholder consultation

Stakeholder	Information supplied	Frequency
Australian Hydrographic Office (Cwlth)	The AHO will be notified of the activity commencement and cessation via datacentre@hydro.gov.au, for promulgation of fortnightly Notice to Mariners.	4 weeks prior to commencement and upon completion
Australian Maritime Safety Authority (AMSA; Cwlth) Joint Rescue Coordination Centre (JRCC)	INPEX to notify AMSA JRCC for promulgation of radio-navigation warnings 24-48 hours before operations commence and upon completion of the survey (Email: rccaus@amsa.gov.au; Phone: 1800 641 792 or +61 2 6230 6811). AMSA's JRCC require the vessel names, IMO vessel numbers and call signs, and Maritime Mobile Service Identity (MMSI) numbers.	24-48 hours before operations commence and upon completion
NOPSEMA (Cwlth)	NOPSEMA will be notified of the activity commencement and cessation, using the Regulation 29 Notification Form available at https://www.nopsema.gov.au/environmental management/notification-and-reporting/	At least 10 days prior to commencement and within 10 days of completion
NOPTA (Cwlth)	NOPTA will be notified of the activity commencement and cessation via reporting@nopta.gov.au	48 hours prior to commencement and upon completion
Department of Mines, Industry Regulation and Safety (WA)	DMIRS will be notified of the activity commencement and cessation.	As required

9.9 Contractors and suppliers

Selection and management processes are in place to ensure that contractors working for, or on behalf of, INPEX are able and willing to meet the minimum business expectations of INPEX, including those related to HSEQ and risk management.

The implementation of the INPEX contractor management requirements are achieved via the following processes:

- Contractors undergo an HSE assessment before receipt of an invitation to tender. As part of this process, INPEX carries out an assessment of the suitability of each contractor's management system.
- During the tender evaluation process, each contractor's management system is reviewed, assessed and ranked according to its robustness and ability to meet INPEX performance expectations as relevant to the tender work scope.
- All contractors and their subcontractors are required to meet INPEX HSEQ minimum requirements. These requirements are communicated to the contractors as part of the *Contract HSEQ Exhibits*, *Specifications* and *Terms and Conditions* documents.
- Key contractor and subcontractor personnel must be approved by INPEX under the *Contract HSEQ Exhibits*, *Specifications* and *Terms and Conditions* documents.
- INPEX maintains contract-specific management teams which are responsible for the day–to-day supervision and review of contractor compliance with INPEX requirements.
- Contract compliance audits, and quality control and assurance checks, are conducted throughout the life of the contract as appropriate to the scope of work and risks involved. Contractors are required to provide regular reports to communicate their HSEQ performance and compliance status.
- HSEQ performance of contractors is monitored through regular engagement between INPEX and contractor personnel, and through regular audits of compliance against the contractor HSE management plans.
- Periodic checks and reviews are conducted by INPEX representatives.
- Contractor documents, including environmental certification, procedures, emergency response and HSEQ management plans, need to be reviewed and accepted by INPEX before any work commences.

9.10 Security and emergency management

Regulation 14(8) of the OPGGS (E) Regulations 2009 requires the implementation strategy to contain an OPEP and the provision for the OPEP to be updated. The OPEP is designed to be an operational document. As such, some of the content requirements of the regulations are included in this EP. A summary of the regulatory requirements and a reference to where the obligations are met is provided below. The OPEP is presented in Appendix D.

In accordance with Regulation 14 (8AA) of the OPGGS (E) Regulations 2009, the OPEP must include arrangements to respond to and monitor oil pollution, including:

- the control measures necessary for a timely response to an oil pollution emergency (Table 2-1 of the OPEP, and the controls provided in Table 8-4 of this EP)
- the arrangements and response capability to implement a timely implementation of those controls, including ongoing maintenance of that capability (Sections 9.10.1, 9.10.3 and 9.10.4 of this EP)

- the arrangements and capability for monitoring the effectiveness of the controls and ensuring that performance standards for those controls are met (Table 8-4 of this EP)
- the arrangements and capability for monitoring oil pollution to inform response activities (refer to OPEP (Appendix D) and Section 4.6.2 *Scientific Monitoring*)
- the provision for the OPEP to be updated (Section 9.10.4).

9.10.1 Arrangements and capability

INPEX adopts the emergency management principles of prevention, preparedness, response, recovery (PPRR). The aim of PPRR is to ensure that risks are identified and minimised; plans to respond are developed and practised; and recovery plans are in place.

Preparedness also includes ensuring that there are competent personnel available to respond to and manage emergency events and that their competence is maintained through regular training. INPEX achieves this through its adoption of competency-based training and annual 'crisis and emergency' exercise plans.

Onshore

INPEX maintains a trained and ready incident management team (IMT) and crisis management team (CMT) to execute the emergency response plans (ERPs) and crisis management plans.

The IMT and CMT will utilise the INPEX Australia Incident Management Plan (0000-AH-PLN-60005), INPEX Australia Crisis Management Plan (0000-AH- PLN-60004) respectively, to respond to the event.

The IMT provides operational management support, and the CMT provides strategic direction with respect to management of reputational damage and impacts to business continuity.

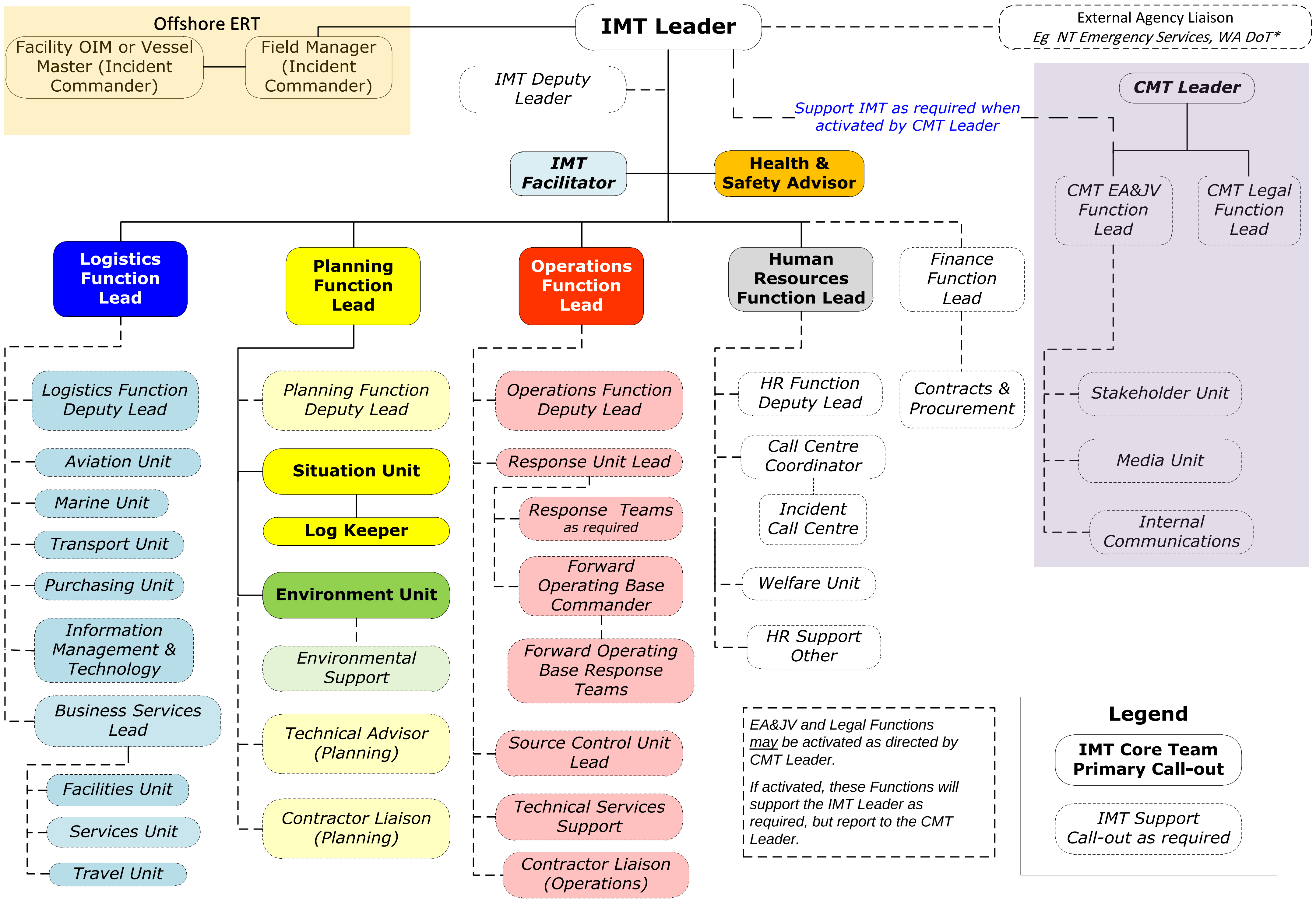
The IMT and CMT teams are large enough so that, during an emergency event, a roster can be operated to avoid fatigue and maintain staff health and well-being.

Offshore

There are ERPs for all contractor vessels that are implemented by an emergency response team (ERT). INPEX and contractors nominate and train workplace personnel to form facility and vessel-based ERTs. These will be coordinated by the relevant person in charge (Party Chief or Vessel Master) to ensure that there is adequate emergency service cover on board at all times.

The Party Chief or Vessel Master will be the point of contact between assets within the licence area and the INPEX IMT. The INPEX IMT leader is the point of contact between the INPEX IMT and the CMT. Contractors are required to notify the INPEX Offshore representative of any emergency.

The emergency response structure is presented in Figure 9-5.



* Department of Transport (WA or NT) have legal right to transfer Control Agency from Titleholder to DoT for level 2/3 oil spills impacting within State or Territory waters. WA DoT will appoint a DoT IMT Leader responsible for managing an oil spill impacting WA state waters in accordance with the State Hazard Plan Maritime Environmental Emergencies (MEE). INPEX resources will be made available to support the WA DoT 'cross jurisdictional arrangements', as specified under the MEE (WA DoT, 2018), if requested by WA DoT. NT DIPL will appoint a DoT Incident controller (in accordance with the NT OSCP cross jurisdiction 'interim arrangements') to interface with the INPEX IMT where NT waters may be impacted by a spill. NT IC will become the control agency, supported by the INPEX IMT, if a spill reaches NT shorelines. Note that the IMT structure presented is flexible and is to be collapsed or expanded at the discretion of the IMT Leader depending on the nature and scale of an emergency.

Figure 9-5: INPEX emergency response structure

Environmental performance outcomes, standards and measurement criteria relating to the maintenance of emergency response arrangements and capability are presented in Table 9-3.

Table 9-3: Environmental performance outcome, standards and measurement criteria for maintenance of emergency response arrangements and capability

Environmental performance outcome	Performance standards	Measurement criteria	Responsibility
OPEP preparedness is maintained through implementation of the environmental performance standards.	The INPEX Emergency Contacts Directory is maintained with current and relevant contact details for OPEPs on an annual basis.	Records demonstrate that electronic and hard copies of the INPEX Emergency Contacts Directory are updated at least annually.	Environmental adviser
	The INPEX Oil Spill Forms List is reviewed annually and maintained with current and relevant forms for INPEX OPEPs.	Records demonstrate that electronic and hard copies of the relevant forms list are updated at least annually.	Environmental adviser
	The Oil Spill Equipment Tracking Register is reviewed on an annual basis, to ensure the capabilities stated in this EP are maintained. Specifically, this includes reviewing the status of: • aviation mobilisation capability • vessel call-off contracts • contracts for additional personnel as general field responders • INPEX personnel oil spill response training • AMOSC capabilities • Oiled wildlife response kit locations • location of containment and recovery spill response equipment • spill tracker buoy batteries and servicing	Records demonstrate that the Oil Spill Equipment Tracking Register is updated at least annually.	Environmental adviser

9.10.2 Emergency response training

This section describes the training that will be provided to the INPEX IMT and relevant offshore personnel (survey vessel) in support of the *ichthys Geotechnical and Geophysical Survey WA-50-L OPEP*. Environmental performance outcomes, standards and measurement criteria relating to emergency response training are presented in Table 9-4.

INPEX incident and crisis management teams

Specific functions identified within the incident management team (IMT) receive nationally accredited training in line with the Australian Quality Training Framework. In addition to this, certain identified functions, along with some key support members receive specific oil spill response training. This approach ensures that INPEX always has the capability to respond to an oil spill event.

The minimum training provision for an IMT leader is PMAOMIR418 – *Coordinate incident response,* with the course material tailored to align with the INPEX Australia Incident Management Plan (0000-AH-PLN-60005). In addition, there will be at least four IMT Leaders with IMO III – oil spill command & control aligned competency to supplement the minimum IMT leader training requirement.

The minimum training provision for the IMT Core Team (positions as defined in Figure 9-5) is PMAOMIR320 - *Manage Incident Response Information*, with the course material tailored to align with the INPEX Australia Incident Management Plan (0000-AH-PLN-60005). In addition, a minimum of 15 IMT Core Team personnel will have completed an IMO II – oil spill response management aligned competency, to supplement the minimum IMT Core Team personnel training requirement.

The INPEX Crisis Management Team all receive an in-house training package, which is tailored to align with the requirements of the INPEX Australia Crisis Management Plan (0000-AH- PLN-60004).

Offshore emergency response team

The survey vessel ERT will maintain its own training in oil spill response, commensurate with the risks and responses required. The Vessel Master and Party Chief will complete mandatory minimum requirements under the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978 (STCW) which includes oil spill response training.

Vessel Masters will also ensure vessel ERTs complete drills as scheduled in their relevant Contractor ERP, including SOPEP drills.

Table 9-4: Environmental performance outcome, standards and measurement criteria for emergency response training

Environmental performance outcome	Performance standards	Measurement criteria	Responsibility
INPEX IMT and vessel ERTs maintain oil spill response training as described in the performance standard.	INPEX IMT and vessel ERTs will maintain training in accordance with Section 9.10.2 and Party Chief / Vessel Masters will complete mandatory minimum requirements under the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978 (STCW) which includes oil spill response training.	Records of training.	Environmental adviser
	Vessel ERTs - conduct routine drills in accordance with the Vessel Contractor ERPs, including SOPEP drills.	Records of training	Environmental adviser
	All INPEX CMT personnel will receive INPEX in-house CMT training, which is tailored to align with the requirements of the INPEX Australia Crisis Management Plan (0000-AH- PLN-60004).	Records of training	Environmental adviser
	INPEX IMT Leaders (all) will have completed the INPEX tailored, nationally accredited course - PMAOMIR418 – *Coordinate incident response*.	Records of training	Environmental adviser
	INPEX IMT Leader (minimum of 4) will be trained in IMO-3 aligned oil spill response training.	Records of training	Environmental adviser
	INPEX IMT Core Functions (minimum of 15) will be trained in IMO-2 aligned oil spill response training.	Records of training	Environmental adviser

Environmental performance outcome	Performance standards	Measurement criteria	Responsibility
	INPEX IMT Core Team personnel (all) will have completed the INPEX tailored, nationally accredited course - PMAOMIR320 - *Manage Incident Response Information.*	Records of training	Environmental adviser

9.10.3 Testing, drills and exercises

INPEX oil spill response arrangements shall be tested by the IMT:

- before the activity commences
- when the arrangements for an activity are significantly amended
- not later than 12 months following the most recent test.

Notification and call-out drills, that test communications channels and the ability to contact key individuals, shall be conducted at least annually.

Environmental performance outcomes, standards and measurement criteria relating to testing of response arrangements are presented in Table 9-5.

Table 9-5: Environmental performance outcome, standards and measurement criteria for testing response arrangements

Environmental performance outcome	Performance standards	Measurement criteria	Responsibility
OPEP preparedness is maintained through the implementation of the performance standards.	The INPEX IMT will conduct a minimum of two oil spill exercises per year, using NOPSEMA-accepted OPEPs.	Exercise records demonstrate that the INPEX IMT tested a NOPSEMA-accepted OPEP at least twice yearly.	Environmental adviser
	The Operational SIMA Templates (from the OPEP) and the environmental sensitivities maps from Section 4 - Existing Environment, will be maintained in hard copy in the Perth IMT room	Records demonstrate the Operational SIMA Templates (from the OPEP) and the environmental sensitivities maps from Section 4 - Existing Environment, will be maintained in hard copy in the Perth IMT room	Environmental adviser

Environmental performance outcome	Performance standards	Measurement criteria	Responsibility
	IMT exercises will test the IMT's ability to develop an Operational SIMA and IAP.	Exercise records will contain copies of completed Operational SIMAs and IAPs.	Environmental adviser
	Desktop validation exercises will be conducted to test notifications processes, contracted service provider activations, and logistics assumptions, annually.	Desktop validation exercise records demonstrate that notifications processes, contracted service provider activations, and logistics assumptions were tested annually.	Environmental adviser

9.10.4 Updating the OPEP

The OPEP will be reviewed following events requiring its activation, in order to identify any lessons learned. OPEPs will be updated accordingly, and the INPEX Emergency Contacts Directory is reviewed as part of this process.

Environmental performance outcomes, standards and measurement criteria relating to updating the OPEP are presented in Table 9-6.

Table 9-6: Environmental performance outcome, standards and measurement criteria for updating the OPEP

Environmental performance outcome	Performance standards	Measurement criteria	Responsibility
The OPEP is reviewed and updated, as needed, with relevant lessons learned.	The OPEP will be reviewed and updated following any INPEX IMT exercise or incident in which the OPEP was used, or with any significant lessons learned from other INPEX OPEPs, as relevant to this OPEP (Appendix D).	Records demonstrate a review and update (if necessary) of the OPEP.	Environmental adviser

9.11 Incident investigation and lessons learned

9.11.1 HSEQ performance measurement and reporting

HSEQ performance data is monitored in accordance with the INPEX HSEQ Performance Measurement and Reporting Standard. This enables the status of conformance with HSEQ obligations and goals to be determined, and also ensures HSEQ risks are being effectively managed to support continuous improvement. HSEQ is regularly reviewed by senior management.

9.11.2 Environmental incident reporting – internal

INPEX refers to environmental incidents and hazards as "environmental events", which all personnel, including contractors, are required to report as soon as is reasonably practicable. Reporting must be in accordance with the INPEX *Event Reporting and Investigation Standard* and associated procedure.

All events will be documented and reviewed for their actual and potential consequence severity levels and investigated as appropriate. Corrective or preventative actions will be identified and documented, and their completion verified in an action register. These actions may include changes to the risk registers, standards, or procedures, or the need for training, different tools or equipment. Any actions will be recorded and tracked.

9.11.3 Environmental incident reporting – external

For the purposes of regulatory reporting to NOPSEMA, an incident is classified as either "Reportable" or "Recordable" based on the definitions contained in Regulation 4 of the OPGGS (E) Regulations 2009.

A "Reportable" incident is defined as "an incident relating to the activity that has caused, or has the potential to cause, moderate to significant environmental damage." Environmental damage (or the potential to cause damage) includes social, economic and cultural features of the environment. For the purposes of this EP, such an incident is considered to have an environmental consequence level of Moderate (D) to Catastrophic (A) as defined in the INPEX Risk Matrix (Figure 6-1).

Based on the consequence assessments described in sections 7 and 8 of this EP, incidents identified as having the potential to be "Reportable" (i.e. Moderate (D) or above on the INPEX Risk Matrix) include:

- the introduction of IMS.

A "Recordable" incident is defined as "a breach of an environmental performance outcome or environmental performance standard … that is not a reportable incident." In terms of the activities within the scope of this EP, it is a breach of the performance standards and outcomes listed in Section 7, Section 8 or Section 9 of this EP.

For the purposes of regulatory reporting to DEE, any significant impact to matters of national environmental significance (MNES), as classified using the INPEX Risk Matrix, will be reported to DEE. The DNP will be notified of any oil/gas pollution incidences within or likely to impact a marine park as soon as possible (refer to OPEP Section 2.4.3/Table 2-3.

Reportable incidents

Initial verbal notification

In the event of a reportable incident, INPEX will give NOPSEMA an initial verbal notification of the occurrence as soon as is practicable; and in any case, not later than two hours after the first occurrence of the reportable incident; or if it is not detected at the time of the first occurrence, within two hours of the time that INPEX becomes aware of the incident.

The initial verbal notification will contain:

- all material facts and circumstances concerning the reportable incident that are known or can, by reasonable search or enquiry, be found out
- any action taken to avoid or mitigate any adverse environmental impacts of the reportable incident
- the corrective action that has been taken, or is proposed to be taken, to stop, control or remedy the reportable incident.

Written notification

As soon as possible after an initial verbal notification of a reportable incident, INPEX will provide a written record of the notification to:

- NOPSEMA
- the National Offshore Petroleum Titles Authority (Cwlth)
- the Department of Mines, Industry Regulation and Safety (WA).

In the event of a significant impact to MNES, INPEX will provide an initial notification to DEE within 24 hours of becoming aware of the event.

In the event of a reportable incident, INPEX will provide a written report to NOPSEMA as soon as is practicable; and in any case, not later than three days after the first occurrence of the incident. If, within the three-day period, NOPSEMA specifies an alternative reporting period, INPEX will report accordingly. The report will contain:

- all material facts and circumstances concerning the reportable incident that are known or can, by reasonable search or enquiry, be found out
- any action taken to avoid or mitigate any adverse environmental impacts of the reportable incident
- the corrective action that has been taken, or is proposed to be taken, to stop, control or remedy the reportable incident
- the action that has been taken, or is proposed to be taken, to prevent a similar incident occurring in the future.

Within seven days of giving a written report of a reportable incident to NOPSEMA, INPEX will provide a copy of the report to:

- the National Offshore Petroleum Titles Authority (Cwlth)
- the Department of Mines, Industry Regulation and Safety (WA) or Department of Mines and Energy (NT), depending on the jurisdiction.

Following submission of the above, NOPSEMA may, by notice in writing, request INPEX to submit an additional report(s) of the incident. Where this is the case, NOPSEMA will identify the information to be contained in the report(s) or the matters to be addressed and will specify the submission date for the report(s). INPEX will prepare and submit the report(s) in accordance with the notice given.

In the event of a significant impact to MNES, INPEX will provide a written notification to DEE (Cwlth) within three days of becoming aware of the event, and provide additional information as available, if requested by DoE.

This includes reporting any vessel strike incidents to the National Ship Strike Database at <https://data.marinemammals.gov.au/report/shipstrike>.

Suspected or confirmed presence of any marine pest or disease will be reported to DPIRD within 24 hours by email (biosecurity@fish.wa.gov.au) or telephone. This includes any organism listed in the WA prevention list for introduced marine pests and any other non-indigenous organism that demonstrates invasive characteristics.

Recordable incidents

Reporting

In the event of a recordable incident, INPEX will report the occurrence to NOPSEMA as soon as is practicable after the end of the calendar month in which it occurs; and in any case, not later than 15 days after the end of the calendar month. The report will contain:

- a record of all the recordable incidents that occurred during the calendar month
- all material facts and circumstances concerning the recordable incidents that are known or can, by reasonable search or enquiry, be found out
- any action taken to avoid or mitigate any adverse environmental impacts of the recordable incidents
- the corrective action that has been taken, or is proposed to be taken, to stop, control or remedy the recordable incident
- the action that has been taken, or is proposed to be taken, to prevent a similar incident occurring in the future.

9.11.4 Annual performance reporting – external

In accordance with Regulation 14(2) of the OPGGS (E) Regulations 2009, INPEX will undertake a review of its compliance with the environmental performance outcomes and standards set out in this EP and will provide a written report of its findings for the reporting period to NOPSEMA on an annual basis, as agreed with NOPSEMA. The annual submission date for the environmental performance report will be 12 months after the start of the activity.

9.12 Monitor, review and audit

9.12.1 Management system audit

Given the short duration of the activity (approximately 7-10 days) a management system audit will not be conducted. Unscheduled audits may be initiated by INPEX in the event of an incident, non-compliance or for other valid reasons.

Audit teams will be appropriately qualified, experienced and competent in auditing techniques. They will include relevant technical expertise, as required, and the audit team structure will be commensurate with the scope of the audit. HSEQ audit and inspection findings will be summarised in a report. Non-conformances, actions and improvement plans resulting from audits will be managed in an action tracking system.

9.12.2 Vessel inspections

Inspections will be undertaken to ensure that the environmental performance outcomes and standards documented in this EP can be achieved.

A pre-mobilisation vessel inspection will be conducted prior to the survey commencing.

Non-conformances and relevant findings during the inspections will be converted into actions that will be tracked within an action tracking database until closed.

9.13 Management review

Through a process of adaptive management, lessons from management outcomes will be used for continual improvement. Formal reviews of the effectiveness and appropriateness of the INPEX HSEQ-MS are performed by senior management on a periodic basis. The things learned from this process and iterative decision-making will then be used as feedback to improve future management.

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Appendix A-
EPBC MINISTERIAL CONDITIONS

On 27 May 2015, INPEX received revised conditions for Approval Decision EPBC 2008/4208 from DoE, to reflect the outcomes of the Commonwealth Government's regulatory streamlining process. Condition 19 was added as a new condition and it requires INPEX to ensure elements of conditions which are no longer required to be implemented are included in Environment Plans submitted to NOPSEMA for assessment. This Appendix demonstrates how Condition 19 has been met.

Relevant EPBC 2008/4208 Ministerial Conditions	**Location in Environment Plan submission**
19. A plan, strategy or program (however described) required by conditions 1, 2, 5, 7, 8, 9 or 15 is automatically deemed to have been submitted to, and approved by, the Minister if the measures (as specified in the relevant condition) are included in an environment plan (or environment plans) relating to the taking of the action that: a) was submitted to NOPSEMA after 27 February 2014; and b) either: i. is in force under the OPGGS Environment Regulations; or ii. has ended in accordance with Regulation 25A of the OPGGS Environment Regulations.	This EP includes the elements of relevant conditions, as cross-referenced below.
19B. Where an environment plan which includes measures specified in the conditions referred to in conditions 19 and 19A above, is in force under the OPGGS Environment Regulations that relates to the taking of the action, the person taking the action must comply with those measures as specified in that environment plan.	This EP
1. Oil Spill Contingency Plan The person taking the action must develop and submit to the Minister for approval, an Oil Spill Contingency Plan that demonstrates the response preparedness of the person taking the action for any hydrocarbon spills, including the capacity to respond to a spill and mitigate the environmental impacts on the Commonwealth marine area and listed species habitat within offshore areas and Darwin Harbour. The Plan must include, but is not limited to:	This EP
a) Oil spill trajectory modelling for potential spills from the action. This should include consideration of a well blow out or uncontrolled release. The modelling should be specific to the characteristics of the hydrocarbons contained in the Ichthys gas field, the likely volumes released in a worst case scenario spill, and the potential time over which the oil may be released in a worst case scenario spill, including a scenario of a minimum eleven (11) week uncontained spill;	Section 8.1 and Section 8.2 Table 8-3, Table 8-4, Figure 8-1, Figure 8-2 and Figure 8-3.

Relevant EPBC 2008/4208 Ministerial Conditions	Location in Environment Plan submission
b) A description of resources available for use in containing and minimising impacts in the event of a spill and arrangements for accessing them;	Section 8.2.5, Section 8.4 and Section 9.10 and Appendix D (OPEP) of this EP
c) A demonstrated capacity to respond to a spill at the site, including application of dispersants, if required and appropriate, and measures that can feasibly be applied within the first 12 hours of a spill occurring;	Section 8.2.5, Section 8.4 and Section 9.10 and Appendix D (OPEP) of this EP
d) Identification of sensitive areas that may be impacted by a potential spill, in particular, Browse Island, specific response measures for those areas and prioritisation of those areas during a response;	Section 4 in particular Section 4.4.1 and Section 8.2.5 of this EP and Appendix D (OPEP)
e) Details of the insurance arrangements that have been made in respect of paying the costs associated with operational and scientific monitoring, as outlined in the Operational and Scientific Monitoring Program required under condition 2 and repairing any environmental damage arising from potential oil spills, as determined necessary from the results of the Operational and Scientific Monitoring Program;	Section 1.5 of this EP
f) Training of staff in spill response measures and identifying roles and responsibilities of personnel during a spill response; and	Sections 9.3, 9.10.2 and 9.10.3 of this EP
g) Procedures for reporting oil spill incidents to the Department.	Section 9.11.3 and Appendix D (OPEP) of this EP
The person taking the action must not commence drilling activities until the Oil Spill Contingency Plan is approved. The approved Oil Spill Contingency Plan must be implemented.	INPEX will not commence activities until this EP is Accepted by NOPSEMA and a commencement notification has been made. The Accepted EP will be implemented as required under the OPGGS Act and OPGGS(E) Regulations.
2. Operational and Scientific Monitoring Program The person taking the action must develop and submit to the Minister for approval, an Operational and Scientific Monitoring Program that will be implemented in the event of an oil spill to determine the potential extent and ecosystem consequences of such a spill, including, but not limited to:	This EP

Relevant EPBC 2008/4208 Ministerial Conditions	**Location in Environment Plan submission**
a) Triggers for the initiation and termination of the Operational and Scientific Monitoring Program, including, but not limited to, spill volume, composition, extent, duration and detection of impacts;	Section 4.6 of Appendix D (OPEP)
b) A description of the studies that will be undertaken to determine the operational response, potential extent of impacts, ecosystem consequences and potential environmental reparations required as a result of the oil spill.	Section 4.6 and Appendix A of the OPEP
c) Details of the insurance arrangements that have been made in respect of paying the costs associated with operational and scientific monitoring, as outlined in the Operational and Scientific Monitoring Program, and repairing any environmental damage arising from potential oil spills, as determined necessary from the results of the Operational and Scientific Monitoring Program;	Section 1.5 of this EP
d) Inclusion of sufficient baseline information on the biota and the environment that may be impacted by a potential hydrocarbon spill, to enable an assessment of the impacts of such a spill;	Section 4, Section 8 particularly Table 8-4, and Table 8-8 and Appendix D (OPEP) of this EP
e) A strategy to implement the Operational and Scientific Monitoring Program, including timelines for delivery of results and mechanisms for the timely peer review of studies;	Section 4.6 of Appendix D (OPEP)
f) In the event of an oil spill the person taking the action must pay all costs associated with all operational and scientific monitoring undertaken in response to the spill, as outlined in the approved Operational and Scientific Monitoring Program and any environmental remediation determined necessary by the results of the approved Operational and Scientific Monitoring Program; and	Section 1.5 of this EP
g) Provision for periodic review of the program.	Section 9.13 of this EP
The Operational and Scientific Monitoring Program must be submitted at least three months prior to the commencement of drilling activities. The person taking the action must not commence drilling activities until the Operational and Scientific Monitoring Program is approved. The approved Operational and Scientific Monitoring Program must be implemented.	INPEX will not commence activities until this EP is Accepted by NOPSEMA and a commencement notification has been made. The Accepted EP will be implemented as required under the OPGGS Act and OPGGS (E) Regulations.

Relevant EPBC 2008/4208 Ministerial Conditions	Location in Environment Plan submission
7. Offshore Waste Management Plan The person taking the action must submit for the Minister's approval an Offshore Waste Management Plan or plans to mitigate the environmental effects of any wastes generated from the proposal within the Commonwealth marine area. The Offshore Waste Management Plan(s) must address the following:	
a) identify all sources of waste;	Table 3-1 and Section 7.2 of this EP
b) describe any impacts associated with disposal of these wastes;	Table 7-7 of this EP
c) clearly articulate the objectives of the plan and set measurable targets to demonstrate achievement of these;	Table 7-7 of this EP
d) outline measures to avoid impacts;	Table 7-7 of this EP
e) where impacts are unavoidable describe why they are unavoidable and measures to minimise impacts;	Section 7.2 of this EP
f) identify all regulatory requirements relating to the disposal of waste and how these will be met;	Table 2-1 and Table 7-7 of this EP
g) include a monitoring regime to determine achievement of objectives and success of measures used;	Table 7-7 and Section 9.12 of this EP
h) outline reporting and auditing arrangements; and	Section 9.11 and Section 9.12 of this EP
i) describe how the plan will apply the principles of adaptive management.	Section 9.13 of this EP
The plan(s) must be submitted prior to the commencement of the relevant activity to which they apply. The relevant activity may not commence until the plan is approved. The approved plan(s) must be implemented.	INPEX will not commence activities until this EP is Accepted by NOPSEMA and a commencement notification has been made. The Accepted EP will be implemented as required under the OPGGS Act and OPGGS (E) Regulations.
8. Liquid Discharge Management Plan	This EP

Relevant EPBC 2008/4208 Ministerial Conditions	**Location in Environment Plan submission**
The person taking the action must submit for the Minister's approval a Liquid Discharge Management Plan or plans to mitigate the environmental effects of any liquid discharge from the proposal, including sewerage and surface water runoff. The Liquid Discharge Management Plan(s) must be for the protection of the Commonwealth marine area and habitat for listed species in Darwin Harbour and must:	
a) identify all sources of liquid discharge;	Table 3-1 and Section 7.1.3 of this EP
b) describe any impacts associated with the discharge of liquids, including the cumulative impacts associated with the discharge of sewerage;	Section 7.1.3 of this EP
c) clearly articulate the objectives of the plan and set measurable targets to demonstrate achievement of these;	Section 7.1.3 of this EP
d) outline measures to avoid impacts;	
e) where impacts are unavoidable describe why they are unavoidable and measures to minimise impacts;	
f) demonstrate how any discharges into Darwin Harbour are consistent with the guidelines for discharges, and the water quality objectives for Darwin Harbour, developed under the National Water Quality Management Strategy;	N/A
g) identify all regulatory requirements relating to the discharge of liquids and how these will be met;	Table 2-1 and Section 7.1.3 of this EP
h) include a monitoring regime to determine achievement of objectives and success of measures used;	Section 7.1.3 and Sections 9.12 of this EP
i) outline reporting and auditing arrangements; and	Section 9.11 and Section 9.12 of this EP
j) describe how the plan will apply the principles of adaptive management.	Section 9.13 of this EP
The plan(s) must be submitted prior to the commencement of the relevant activity to which they apply. The relevant activity may not commence until the plan is approved. Separate Liquid Discharge Management plans can be submitted for the management of liquid discharges in the Commonwealth Marine Area and Darwin Harbour. The approved plan(s) must be implemented.	The Accepted EP will be implemented as required under the OPGGS Act and OPGGS(E) Regulations.

APPENDIX B: EPBC ACT PROTECTED MATTERS REPORT AND SPECIES RISK EVALUATION

B.1 EPBC Act protected matters report

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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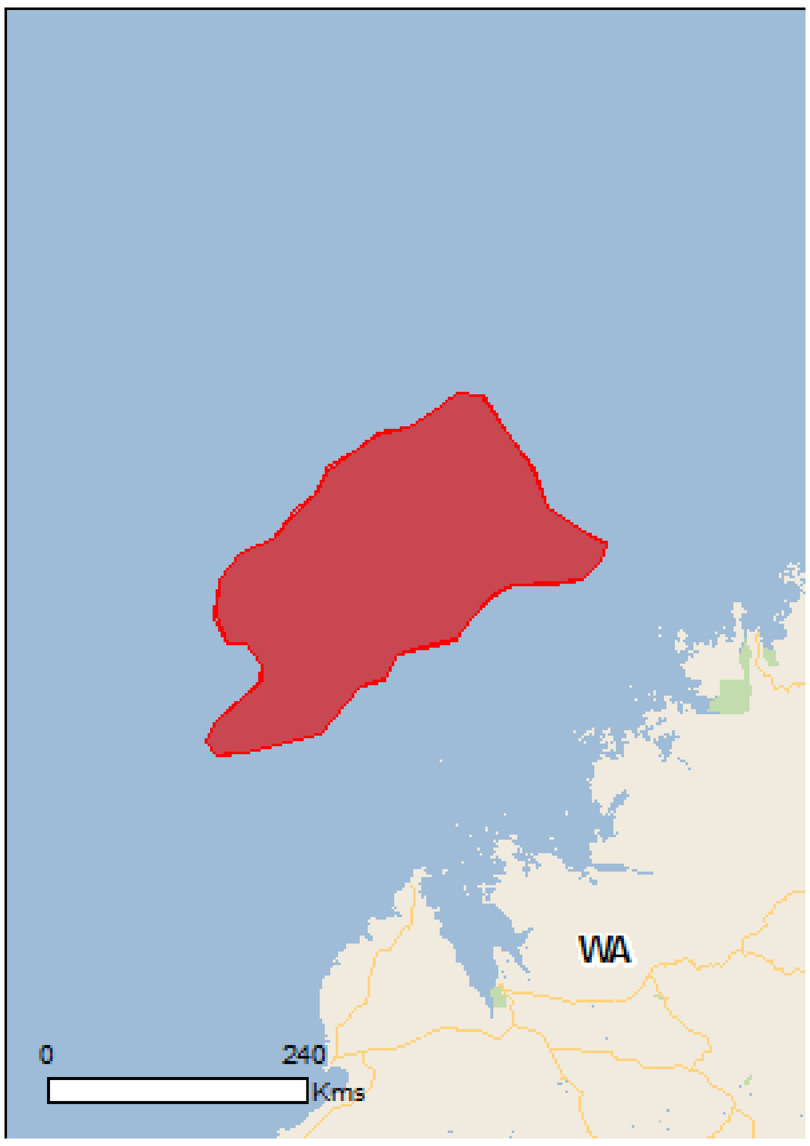

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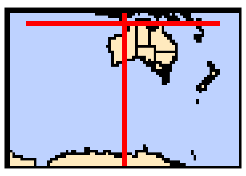

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	23
Listed Migratory Species:	47

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	1
Listed Marine Species:	81
Whales and Other Cetaceans:	26
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	2

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	2
Regional Forest Agreements:	None
Invasive Species:	1
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	4

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
North-west

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops		
Australian Lesser Noddy [26000]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Papasula abbotti		
Abbott's Booby [59297]	Endangered	Species or species habitat may occur within area
Rostratula australis		
Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Mammals		
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely

Name	Status	Type of Presence
		to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known 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 likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Glyphis garricki Northern River Shark, New Guinea River Shark [82454]	Endangered	Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Foraging, feeding or related behaviour likely to occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Foraging, feeding or related behaviour likely to occur within area
Sternula albifrons Little Tern [82849]		Congregation or aggregation known to occur within area
Sula leucogaster Brown Booby [1022]		Breeding known to occur within area
Sula sula Red-footed Booby [1023]		Breeding known to occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour likely 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
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur

Name	Threatened	Type of Presence
		within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat known to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cecropis daurica Red-rumped Swallow [80610]		Species or species habitat may occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat known to occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Acrocephalus orientalis Oriental Reed-Warbler [59570]		Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Thalasseus bergii Crested Tern [83000]		Breeding known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Natural		
Scott Reef and Surrounds - Commonwealth Area	EXT	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
Birds		
Acrocephalus orientalis Oriental Reed-Warbler [59570]		Species or species habitat known to occur within area
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Foraging, feeding or related behaviour likely to occur within area
Hirundo daurica Red-rumped Swallow [59480]		Species or species habitat may occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat known to occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Papasula abbotti Abbott's Booby [59297]	Endangered	Species or species habitat may occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Foraging, feeding or related behaviour likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Sterna albifrons Little Tern [813]		Congregation or aggregation known to occur within area
Sterna bergii Crested Tern [816]		Breeding known to occur within area
Sula leucogaster Brown Booby [1022]		Breeding known to occur within area
Sula sula Red-footed Booby [1023]		Breeding known to occur within area
Fish		
Bhanotia fasciolata Corrugated Pipefish, Barbed Pipefish [66188]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Corythoichthys intestinalis Australian Messmate Pipefish, Banded Pipefish [66202]		Species or species habitat may occur within area
Corythoichthys schultzi Schultz's Pipefish [66205]		Species or species habitat may occur within area
Cosmocampus banneri Roughridge Pipefish [66206]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus dunckeri Red-hair Pipefish, Duncker's Pipefish [66220]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		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
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus fuscus Dusky Seasnake [1119]		Species or species habitat known to occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Aipysurus tenuis Brown-lined Seasnake [1121]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
Enhydrina schistosa Beaked Seasnake [1126]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Hydrelaps darwiniensis Black-ringed Seasnake [1100]		Species or species habitat may occur within area
Hydrophis coggeri Slender-necked Seasnake [25925]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Lapemis hardwickii Spine-bellied Seasnake [1113]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	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
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		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
Lagenodelphis hosei Fraser's Dolphin, Sarawak Dolphin [41]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Orcaella brevirostris Irrawaddy Dolphin [45]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Peponocephala electra Melon-headed Whale [47]		Species or species

Name	Status	Type of Presence
		habitat may 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
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat likely to occur within area
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

Australian Marine Parks [Resource Information]

Name	Label
Cartier Island	Sanctuary Zone (IUCN Ia)
Kimberley	Multiple Use Zone (IUCN VI)

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Browse Island	WA
Unnamed WA41775	WA

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 Resouces Audit, 2001.

Name	Status	Type of Presence
Mammals		
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area

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
Ancient coastline at 125 m depth contour	North-west
Ashmore Reef and Cartier Island and surrounding	North-west
Continental Slope Demersal Fish Communities	North-west
Seringapatam Reef and Commonwealth waters in	North-west

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

-15.3645 121.1962,-15.2201 121.2549,-14.877 121.6476,-14.7371 121.6611,-14.5656 121.5257,-14.5623 121.369,-14.3399 121.2729,-14.06 121.3091,-13.8389 121.4761,-13.7305 121.7469,-13.4823 121.959,-13.3559 122.108,-13.1573 122.2028,-12.9903 122.451,-12.8767 122.6084,-12.8232 122.8753,-12.6427 123.1552,-12.5389 123.2771,-12.5614 123.4847,-12.9316 123.7465,-13.1392 123.909,-13.4777 124.0309,-13.6854 124.3649,-13.7621 124.5184,-13.8975 124.4777,-14.042 124.3243,-14.0826 124.0896,-14.0916 123.742,-14.1909 123.5614,-14.3444 123.408,-14.5295 123.2816,-14.5972 122.9882,-14.6559 122.7896,-14.859 122.6813,-14.9041 122.4826,-15.2968 122.1441,-15.4503 121.5212,-15.4683 121.2729,-15.3645 121.1962

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.

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B.2 EPBC listed species risk evaluation table

This table was developed by:

- Searching the Species Profile and Threats Database (SPRAT) (http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl) for every species identified in the EPBC search related to this EP.
- Through the SPRAT database, identifying the relevant conservation management documents.
- Determining the relevant aspects / threats from the conservation management documents related to the activity
- Listing where the aspect / threat has been addressed in the EP

Fauna Type	Conservation management documents	Summary of relevant aspects/threats identified from conservation management documents	Summary of relevant actions from conservation management documents	Relevant exposure / risk evaluation section of EP
EPBC-listed fishes and sharks	Whale shark management. 2013 Wildlife management program no. 57. Department of Parks and Wildlife. State of Western Australia. Threatened Species Scientific Committee. 2015. Approved Conservation Advice for Rhincodon typus (whale shark). Commonwealth of Australia. Department of Sustainability, Environment, Water, Population and Communities. 2013. Recovery Plan for the White Shark (Carcharodon carcharias). Commonwealth of Australia. Threatened Species Scientific Committee. 2014. Approved Conservation Advice for Glyphis garricki (northern river shark). Commonwealth of Australia. Threatened Species Scientific Committee. 2009. Commonwealth Conservation Advice on Pristis clavata (Dwarf Sawfish). Commonwealth of Australia. Threatened Species Scientific Committee. 2008. Approved Conservation Advice for Pristis zijsron (Green Sawfish). Commonwealth of Australia. Department of the Environment. 2015. Sawfish and River Sharks - Multispecies Recovery Plan. Commonwealth of Australia. Department of Environment and Energy. 2018. Threat abatement plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans. Commonwealth of Australia. Department of Sustainability, Environment, Water, Population and Communities (DSEWPac). 2012. Marine bioregional plan for the North-west Marine Region. DSEWPac, Canberra, ACT. Department of Sustainability, Environment, Water, Population and Communities (DSEWPac). 2012. Marine bioregional plan for the North Marine Region. DSEWPac, Canberra, ACT.	• Waste / marine debris • Noise and vibration • Introduced Marine Species • Vessel strike • Benthic habitat degradation / seabed disturbance • Emissions and discharges • Oil spill	• Identify populations and areas of high conservation priority (sawfishes). • Ensure there is no anthropogenic disturbance / implement measures to reduce adverse impacts of habitat degradation and/or modification (northern river shark). • Ensure all future developments will not significantly impact upon sawfish and river shark habitats critical to the survival of the species or impede upon the migration of individual sawfish or river sharks. Implement measures to reduce adverse impacts of habitat degradation and/or modification. • Review and assess the potential threat of introduced species, pathogens and pollutants. • Minimise offshore developments and transit time of large vessels in areas close to marine features likely to correlate with whale shark aggregations (Ningaloo Reef,) and along the northward migration route that follows the northern WA coastline along the 200 m isobath. • Contribute to the long-term prevention of the incidence of harmful marine debris.	• EP Section 7.2. – Waste management, • EP Section 7.3 - Noise and vibration • EP Section 7.5.1 - Introduction of invasive marine species • EP Section 7.5.2 - Interaction with marine fauna • EP Section 7.6 - Seabed disturbance • EP Section 7.1.3 - Routine discharges • EP Section 8 - Emergency condition (oil spills)
EPBC-listed marine reptiles	Department of the Environment and Energy 2017. Recovery Plan for Marine Turtles in Australia, Commonwealth of Australia 2017. Threatened Species Scientific Committee. 2011. Commonwealth Conservation Advice on	• Waste / marine debris • Noise and vibration • Introduced Marine Species • Vessel strike	• Manage artificial light from onshore and offshore sources to ensure biologically important behaviours of nesting adults and dispersing hatchlings can continue.	• EP Section 7.2. – Waste management, • EP Section 7.3 - Noise and vibration • EP Section 7.5.1 - Introduction of invasive marine species

Fauna Type	Conservation management documents	Summary of relevant aspects/threats identified from conservation management documents	Summary of relevant actions from conservation management documents	Relevant exposure / risk evaluation section of EP
	Aipysurus apraefrontalis (Short-nosed Seasnake). Commonwealth of Australia. Threatened Species Scientific Committee. 2011. Commonwealth Conservation Advice on Aipysurus foliosquama (Leaf-scaled Seasnake). Commonwealth of Australia. Department of Environment and Energy. 2018. Threat abatement plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans. Commonwealth of Australia. Department of Sustainability, Environment, Water, Population and Communities (DSEWPac). 2012. Marine bioregional plan for the North-west Marine Region. DSEWPac, Canberra, ACT. Department of Sustainability, Environment, Water, Population and Communities (DSEWPac). 2012. Marine bioregional plan for the North Marine Region. DSEWPac, Canberra, ACT.	• Benthic habitat degradation / seabed disturbance • Emissions and discharges • Oil spill • Light emissions	• Artificial light within or adjacent to habitat critical to the survival of marine turtles will be managed such that marine turtles are not displaced from these habitats and implementation of best practice light management guidelines for developments adjacent to marine turtle nesting beaches. • Identify the cumulative impact on turtles from multiple sources of onshore and offshore light pollution. • Support retrofitting of lighting at coastal communities and industrial developments, including imposing restrictions around nesting seasons. • Manage anthropogenic activities to ensure marine turtles are not displaced from identified habitat critical for survival. • Contribute to the reduction in the source of marine debris. • Ensure that spill risk strategies and response programs include management for turtles and their habitats, particularly in reference to slow to recover habitats, e.g. seagrass meadows or corals. • Implement best practices to minimise impacts to turtle health and habitats from chemical discharges. • Identify populations and areas of high conservation priority (sea snakes). • Ensure there is no anthropogenic disturbance / implement measures to reduce adverse impacts of habitat degradation and/or modification (sea snakes).	• EP Section 7.5.2 - Interaction with marine fauna • EP Section 7.6 - Seabed disturbance • EP Section 7.1.3 - Routine discharges • EP Section 8 - Emergency condition (oil spills) • EP Section 7.1.1 - Light emissions
EPBC-listed seabirds and shorebirds	Department of the Environment. 2015. EPBC Act Policy Statement 3.21 - Industry guidelines for avoiding, assessing and mitigating impacts on EPBC listed migratory shorebird species. Department of the Environment. 2015. Wildlife conservation plan for migratory shorebirds. Commonwealth of Australia. Department of the Environment. 2015. Draft referral guideline for 14 birds listed as migratory under the EPBC Act. Commonwealth of Australia.	• Waste / marine debris • Noise and vibration • Introduced Marine Species • Introduced Terrestrial Pests (rodents) • Benthic habitat degradation / seabed disturbance • Emissions and discharges • Oil spill	• Reduce risk of rodents gaining access to key vessels at key ports • Contribute to the long-term prevention of the incidence of harmful marine debris • Identify threats to important (migratory shorebird) habitat and develop conservation measures for managing them.	• EP Section 7.2. – Waste management, • EP Section 7.3 - Noise and vibration • EP Section 7.5.1 - Introduction of invasive marine species • EP Section 8 - Emergency conditions (oil spills) • EP Section 7.1.3 - Routine discharges • EP Section 7.1.1 - Light emissions

Fauna Type	Conservation management documents	Summary of relevant aspects/threats identified from conservation management documents	Summary of relevant actions from conservation management documents	Relevant exposure / risk evaluation section of EP
	Department of Sustainability, Environment, Water, Population and Communities. 2012. Species group report card - seabirds and migratory shorebirds. Supporting the marine bioregional plan for the North-west Marine Region. Prepared under the Environment Protection and Biodiversity Conservation Act 1999. Commonwealth of Australia. Department of the Environment, Water, Heritage and the Arts. 2009. Threat abatement plan to reduce the impacts of exotic rodents on biodiversity on Australian offshore islands of less than 100 000 hectares. Commonwealth of Australia. Department of Environment and Energy. 2018. Threat abatement plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans. Commonwealth of Australia. Department of Sustainability, Environment, Water, Population and Communities (DSEWPac). 2012. Marine bioregional plan for the North-west Marine Region. DSEWPac, Canberra, ACT. Department of Sustainability, Environment, Water, Population and Communities (DSEWPac). 2012. Marine bioregional plan for the North Marine Region. DSEWPac, Canberra, ACT. Threatened Species Scientific Committee. 2016. Calidris tenuirostris (Great Knot) Approved Conservation Advice. Commonwealth of Australia. Threatened Species Scientific Committee. 2016. Calidris canutus (Red Knot) Approved Conservation Advice. Commonwealth of Australia. Threatened Species Scientific Committee. 2016. Charadrius leschenaultii (Greater Sand Plover) Approved Conservation Advice. Commonwealth of Australia. Threatened Species Scientific Committee. 2016. Charadrius mongolus (Lesser Sand Plover) Approved Conservation Advice. Commonwealth of Australia. Threatened Species Scientific Committee. 2015. Calidris ferruginea (Curlew Sandpiper) Approved Conservation Advice. Commonwealth of Australia.	• Light emissions	• Avoid degradation of migratory shorebird habitat that may occur through the introduction of exotic species, changes to hydrology or water quality (including toxic inflows), fragmentation of habitat or exposure to litter, pollutants and acid sulphate soils. Minimise human disturbance, a major threat to migratory shorebirds • Best practice waste management should be implemented.	

Fauna Type	Conservation management documents	Summary of relevant aspects/threats identified from conservation management documents	Summary of relevant actions from conservation management documents	Relevant exposure / risk evaluation section of EP
	Threatened Species Scientific Committee. 2001. Commonwealth listing advice on Macronectes giganteus. Commonwealth of Australia. Threatened Species Scientific Committee. 2015. Papasula abbotti — Abbott's Booby. Approved Conservation Advice. Commonwealth of Australia. Department of the Environment. 2015. Conservation advice Numenius madagascariensis (eastern curlew). Commonwealth of Australia. Threatened Species Scientific Committee. 2015. Approved Conservation Advice for Anous tenuirostris melanops (Australian lesser noddy). Commonwealth of Australia. Threatened Species Scientific Committee. 2002. Commonwealth Listing Advice on Sterna albifrons sinensis (Little Tern (western Pacific)). Commonwealth of Australia.			
EPBC-listed cetaceans	Department of the Environment. 2015. Conservation Management Plan for the Blue Whales - A Recovery Plan under the Environment Protection and Biodiversity Conservation Act 1999 (2015-2025). Commonwealth of Australia. Threatened Species Scientific Committee. 2015. Balaenoptera borealis (Sei Whale) Conservation Advice. Commonwealth of Australia. Threatened Species Scientific Committee. 2015. Approved Conservation Advice for Megaptera novaeangliae (humpback whale). Commonwealth of Australia. Threatened Species Scientific Committee. 2015. Approved Conservation Advice for Balaenoptera physalus — Fin Whale. Commonwealth of Australia. EPBC Act Regulations 2000. Part 8 Interacting with cetaceans and whale watching. Division 8.1 Interacting with cetaceans. Commonwealth of Australia. Department of the Environment and Heritage, 2005. Australian National Guidelines for Whale and Dolphin Watching - Information Sheet. Commonwealth of Australia.	• Waste / marine debris • Noise and vibration • Introduced Marine Species • Vessel strike • Benthic habitat degradation / seabed disturbance • Emissions and discharges • Oil spill	• Ensure all vessel strike incidents are reported in the National Ship Strike Database. • Ensure the risk of vessel strikes on blue whales is considered when assessing actions that increase vessel traffic in areas where blue whales occur and, if required, appropriate mitigation measures are implemented. • Protect habitat important to the survival of the species (humpback whales); assess and manage physical disturbance and development activities (such as ship-strike and pollution). • Ensure the risk of vessel strike on humpback whales is considered when assessing actions that increase vessel traffic in areas where humpback whales occur and, if required appropriate mitigation measures are implemented to reduce the risk of vessel strike. • Environmental assessment processes must ensure that existing information about coastal habitat requirements of humpback whales, environmental suitability of coastal locations, historic high use and emerging areas are taken into consideration. • Contribute to the long-term prevention of the incidence of harmful marine debris	• EP Section 7.2. – Waste Management, • EP Section 7.3 - Noise and Vibration • EP Section 7.5.1 - Introduction of invasive marine species • EP Section 7.5.2 - Physical presence of vessels and interaction with marine fauna • EP Section 7.6 - Seabed disturbance • EP Section 7.1.3 - Routine discharges • EP Section 8 - Emergency condition (oil spills)

Fauna Type	Conservation management documents	Summary of relevant aspects/threats identified from conservation management documents	Summary of relevant actions from conservation management documents	Relevant exposure / risk evaluation section of EP
	Department of Environment and Energy. 2018. Threat abatement plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans. Commonwealth of Australia. Department of Sustainability, Environment, Water, Population and Communities (DSEWPac). 2012. Marine bioregional plan for the North-west Marine Region. DSEWPac, Canberra, ACT. Department of Sustainability, Environment, Water, Population and Communities (DSEWPac). 2012. Marine bioregional plan for the North Marine Region. DSEWPac, Canberra, ACT.		• if a whale or dolphin surfaces in the vicinity of a vessel travelling for a purpose other than whale and dolphin watching, take all care necessary to avoid collisions. This may include stopping, slowing down and/or steering away from the animal.	

Appendix C-
Stakeholder consultation log

STAKEHOLDER	Date of Correspondence	Type of Correspondence	Activity of Relevance	Attachments	Summary of Correspondence	Assessment of Merit and Relevant Matters
Authorities						
Australian Border Force (ABF), Broome Office (Cwth)	5/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). INPEX welcomed feedback, and requested any is provided by 16 September 2019. INPEX requested that the stakeholder advise of any information/comments that are not suitable for public disclosure such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.
Australian Border Force (ABF), Darwin Office (Cwth)	6/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). INPEX welcomed feedback, and requested any is provided by 16 September 2019. INPEX requested that the stakeholder advise of any information/comments that are not suitable for public disclosure such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.
Australian Border Force, Canberra (Cwth)	6/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). INPEX welcomed feedback, and requested any is provided by 16 September 2019. INPEX requested that the stakeholder advise of any information/comments that are not suitable for public disclosure such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.

Australian Fisheries Management Authority (AFMA) (Cwth)	5/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development fact sheet - North West Slope Trawl Fishery map	Email informed the stakeholder that INPEX plans to develop and submit EPs to NOPSEMA for further development well drilling and installation of umbilicals, risers and flowlines (URF) in production licence area WA-50-L. The purpose of the engagement was explained to the stakeholder and feedback requested by Friday 6th September 2019. The proposed field development activities were summarised and the stakeholder was referred to the attached Ichthys LNG field development activities fact sheet for further information. INPEX summarised its process of identifying and engaging with commercial fishery stakeholders, noting that commercial fishing activities in the vicinity of production licence area WA-50-L are understood to be limited. A summary of the only Commonwealth-managed fishery that operates in the vicinity of WA-50-L, the North West Slope Trawl Fishery, was also provided including a map of the fishery licence area relative to the location of WA-50-L. INPEX advised that licence holders of the NDSMF and relevant fishing industry associations, including the Commonwealth Fisheries Association and the Western Australian Fishing Industry Council, are being invited to provide feedback on the proposed Ichthys LNG field development activities. INPEX summarised the potential impacts and proposed control measures for managing interactions and impacts to commercial fishers, including: - Physical presence of the MODU and support vessels, including associated safety zones and Notice to Mariners; - Planned discharges, including management of discharges in accordance with legislative requirements and INPEX's chemical selection process; - Prohibition of recreational fishing on any INPEX-operated facility/vessel or contracted vessel. INPEX requested that the stakeholder advise of any information/comments that is not suitable for public disclosure - such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.
Australian Maritime Safety Authority (AMSA) - Nautical Advice (Cwth)	6/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). INPEX welcomed feedback and requested that the stakeholder advise of any information/comments that are not suitable for public disclosure - such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.

	7/08/2019	Email / letter from stakeholder	Ichthys LNG Field Development	No	AMSA responded with the following information: The Master should notify AMSA's Joint Rescue Coordination Centre (JRCC) by e-mail for promulgation of radio-navigation warnings at least 24-48 hours before operations commence. AMSA's JRCC will require the vessel details, satellite communications details, area of operation, requested clearance from other vessels and any other information that may contribute to safety at sea. JRCC will also need to be advised when operations start and end. Contact the Australian Hydrographic Office no less than four working weeks before operations, with details relevant to the operations. The AHO will promulgate the appropriate Notice to Mariners (NTM), which will ensure other vessels are informed of your activities. Advised that if INPEX would like to obtain a vessel traffic plot showing Automatic Identification System (AIS) traffic data, they can visit AMSA's spatial data gateway and Spatial@AMSA portal to download digital data sets and maps.	Relevant matter – stakeholder has provided information relevant to the petroleum activity and/or the stakeholder's functions, interests or activities. This information has been incorporated into Section 7.7.1 of the EP. Relevant matter – stakeholder has requested to be notified of activity commencement or other project activities. This has been incorporated into Section 9 of the EP.
Australian Maritime Safety Authority (AMSA) - Marine Environment Pollution Response (Cwth)	7/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). INPEX welcomed feedback and provided contact details to do so. INPEX requested that the stakeholder advise of any information/comments that are not suitable for public disclosure - such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.
Department of Agriculture and Water Resources (DAWR) – Biosecurity (Marine Pests) (Cwth)	6/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet - Additional information required by DAWR	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). Advised INPEX has attached a letter to address the information requirements outlined on the DAWR website, including: - Titleholder details - Proposed dates the activity is being undertaken - Map of area the activity is being undertaken - Type of activity being undertaken - Types of vessels that will be servicing the offshore installation and their origin and destination (domestic or international movements). - A description of the marine environment that may be affected by planned aspects of the activity. This may include information of water depth, the surrounding marine habitat (reef, sandy, rocky), and proximity to island or shoals.	Not a relevant matter - correspondence sent by INPEX.

				- Details and an evaluation of the environmental impacts including the risks of introducing/spreading an IMS into Australian waters. The titleholder must identify the risks relevant to marine pest biosecurity branch of the departments, and propose appropriate control measures prior to consultation. If the risk is uncertain or unknown the titleholder must identify perceived risks or specific sections of the EP that they wish to enquire about. - A demonstrated understanding of how Australia's ballast water and biofouling requirements apply to the facility and/or vessel(s). - Details of the control measures that will be in place to reduce the risk of introducing or spreading marine pests. Control measures should represent best practice, and includes, but is not limited to, vessel ballast water management plans and certificates (in line with the Australian - - Ballast Water Management Requirements), and biofouling management plans (in line with the IMO biofouling guidelines and Australian biofouling management guidelines). INPEX welcomed feedback, and requested any is provided by 16 September 2019. INPEX requested that the stakeholder advise of any information/comments that are not suitable for public disclosure such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	
12/08/2019	Email / letter from stakeholder	Ichthys LNG Field Development	Yes: - Exposed conveyances exceptions determination - Offshore Installations - Biosecurity Guide	DAWR - Biosecurity (Marine Pests) replied, advising the Quarantine Act 1908 was replaced by the Biosecurity Act in 2015. DAWR advised that now where domestic conveyances become exposed through interactions with persons, goods or conveyances outside of Australian Territorial Sea, they automatically become subject to biosecurity control upon their return. If the Department of Agriculture concludes that the level of biosecurity risk associated with the offshore installation is low within the meaning of the determination (attached), an exposed conveyance (the support vessels to the offshore installation) may be eligible for exemption from biosecurity control. This assessment is regarding the topside of the offshore installation only and does not address the marine biosecurity management – which is addressed elsewhere. DAWR noted the commencement dates and requested that if INPEX are intending to apply for the low biosecurity risk status for the INPEX proposed activities, DWAR can assist with the application. DAWR attached the installations guide. Advised DAWR representative will be in Perth next week and could meet INPEX to go through any initial questions on biosecurity requirements for offshore installations and their support vessels.	Relevant matter – stakeholder has provided information relevant to the petroleum activity and/or the stakeholder's functions, interests or activities. This information has been incorporated into Section 7.5.1 of the EP.
13/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	No	Advised INPEX has been through the process of obtaining 'low risk status' for facilities during earlier phases of the Ichthys project and have taken the biosecurity requirements into account for the next phase. Organised to meet with DAWR on 21/08/2019	Not a relevant matter - correspondence sent by INPEX.
21/08/2019	Meeting with stakeholder	Ichthys LNG Field Development	No	INPEX and DAWR met to discuss INPEX's biosecurity management approach, which has been developed and implemented in accordance with regulation and industry guidelines as per previous offshore works. Discussions were around biosecurity management implications of the proposed offshore developments. No issues or concerns were raised by DAWR.	Not a relevant matter - general correspondence only

	22/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - slides presented yesterday - an Abstract on Biofouling management - a copy of INPEX's Domestic Biofouling risk assessment process (developed in consultation with DPIRD) - an example of a Biosecurity risk assessment	INPEX provided documents that were discussed during the meeting, including: a copy of the slides presented yesterday; a copy of INPEX's recent APPEA presentation; an Abstract on Biofouling management; a copy of INPEX's Domestic Biofouling risk assessment process developed in consultation with DPIRD; and an example of a Biosecurity risk assessment INPEX prepared for a small scope of work proposed last year.	Not a relevant matter - correspondence sent by INPEX.
	11/09/2019	Email / letter from stakeholder	Ichthys LNG Field Development	No	Another officer from the Marine Pests branch responded to the original fact sheet provided 06/08/2019, advising the Marine Biosecurity Unit has reviewed these documents and is comfortable with the management practices specified to manage ballast water and biofouling. Advised Marine Pests branch had contacted the Seaports team and the Inspection Group in Western Australia and they do not have any comments on the documents either.	Not a relevant matter - general correspondence only.
Department of Agriculture and Water Resources (DAWR) – Biosecurity (Vessels, aircraft and personnel) (Cwth)	6/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet - Additional information required by DAWR	Advised INPEX has attached a letter that was sent to the Marine Pest team addressing the additional information requirements stated on the DAWR website. Advised INPEX's plans and controls will be consistent with work recently completed. The same contractor that performed the initial subsea installation will be completing the next phase of subsea installation work, and a new drilling contractor will be conducting the drilling. Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). INPEX welcomed feedback, and requested any is provided by 16 September 2019. INPEX requested that the stakeholder advise of any information/comments that are not suitable for public disclosure such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.
	13/08/2019	Email / letter from stakeholder	Ichthys LNG Field Development	No	Advised that international vessels involved with the drilling and subsea work that have interactions with domestic conveyances will need to put in place processes that will allow them to gain Biosecurity Low Risk status, if the domestic conveyances wish to claim exemption from biosecurity reporting when returning to the Australian mainland.	Not a relevant matter - correspondence sent by INPEX.

Department of Agriculture and Water Resources (DAWR) - Fisheries (Cwth)	5/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development fact sheet - North West Slope Trawl Fishery map	Email informed the stakeholder that INPEX plans to develop and submit EPs to NOPSEMA for further development well drilling and installation of umbilicals, risers and flowlines (URF) in production licence area WA-50-L. The purpose of the engagement was explained to the stakeholder and feedback requested by Friday 6th September 2019. The proposed field development activities were summarised and the stakeholder was referred to the attached Ichthys LNG field development activities fact sheet for further information. INPEX summarised its process of identifying and engaging with commercial fishery stakeholders, noting that commercial fishing activities in the vicinity of production licence area WA-50-L are understood to be limited. A summary of the only Commonwealth-managed fishery that operates in the vicinity of WA-50-L, the North West Slope Trawl Fishery, was also provided including a map of the fishery licence area relative to the location of WA-50-L. INPEX advised that licence holders of the NDSMF and relevant fishing industry associations, including the Commonwealth Fisheries Association and the Western Australian Fishing Industry Council, are being invited to provide feedback on the proposed Ichthys LNG field development activities. INPEX summarised the potential impacts and proposed control measures for managing interactions and impacts to commercial fishers, including: - Physical presence of the MODU and support vessels, including associated safety zones and Notice to Mariners; - Planned discharges, including management of discharges in accordance with legislative requirements and INPEX's chemical selection process; - Prohibition of recreational fishing on any INPEX-operated facility/vessel or contracted vessel. INPEX requested that the stakeholder advise of any information/comments that is not suitable for public disclosure - such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.
Department of Biodiversity Conservation and Attractions (DBCA) - Environmental Management Branch (WA)	5/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). INPEX welcomed feedback, and requested any is provided by 10 September 2019. INPEX requested that the stakeholder advise of any information/comments that are not suitable for public disclosure such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.

	6/09/2019	Email / letter from stakeholder	Ichthys LNG Field Development	No	Confirmed reciept of information provided 05/08/2019. Advised that based on the information provided, DBCA has no comments to provide in relation to its responsibilities under the Conservation and Land Management Act 1984 and Biodiversity Conservation Act 2016.	Not a relevant matter - general correspondence only
Department of Defence, Directorate of Property Acquisition, Mining and Native Title (Cwth)	6/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). INPEX welcomed feedback, and requested any is provided by 16 September 2019. INPEX requested that the stakeholder advise of any information/comments that are not suitable for public disclosure such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.
Department of Defence, RAN Australian Hydrographic Office (AHO) (Cwth)	7/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). INPEX welcomed feedback, and requested any is provided by 16 September 2019. INPEX requested that the stakeholder advise of any information/comments that are not suitable for public disclosure such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.
	7/08/2019	Email / letter from stakeholder	Ichthys LNG Field Development	No	Automated confirmation of receipt.	Not a relevant matter - general correspondence only

Department of Environment and Energy (DEE)	6/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). INPEX welcomed feedback, and requested any is provided by 10 September 2019. INPEX requested that the stakeholder advise of any information/comments that are not suitable for public disclosure such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.
Department of Foreign Affairs and Trade (DFAT)	9/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). Advised that in accordance with Australian Government Guidance regarding consultation with relevant Australian Government agencies on offshore petroleum and greenhouse gas activities, INPEX believe that it should engage DFAT on Ichthys LNG offshore activities, specifically where: a proposed activity poses any oil spill or other environmental risks that could result in impacts to other international jurisdictions; and relevant persons that may be impacted by a proposed activity include foreign individuals or governments. Informed INPEX is aware of the notification arrangements outlined in the National Plan Guidance: Coordination of International Incidents: Notification Arrangements Guidance (NP–GUI–007), which stipulate that 'in the event a pollution incident is affecting or is likely to affect another country, the Control Agency (in the case of pollution from a ship or unknown source) and the Department of Industry, Innovation and Science (in the case of pollution from an offshore petroleum facility) will contact DFAT as soon as practicable through the contact point advised by DFAT.' Accordingly, INPEX will reflect these arrangements in all offshore oil pollution emergency plans (OPEPs) for the proposed Ichthys LNG field development activities, and will consult AMSA to ensure that roles and responsibilities in all possible scenarios are understood. INPEX welcomed feedback, and requested any is provided by 16 September 2019. INPEX requested that the stakeholder advise of any information/comments that are not suitable for public disclosure such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.

Department of Industry, Innovation and Science (DIIS) (Cwth)	6/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). INPEX welcomed feedback, and requested any is provided by 16 September 2019. INPEX requested that the stakeholder advise of any information/comments that are not suitable for public disclosure such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.
Department of Mines, Industry Regulation and Safety (DMIRS) (WA)	6/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). Advised INPEX will inform DMIRS of the commencement and cessation of these activities at the appropriate time. INPEX welcomed feedback, and requested any is provided by 16 September 2019. INPEX requested that the stakeholder advise of any information/comments that are not suitable for public disclosure - such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.
	15/08/2019	Email / letter from stakeholder	Ichthys LNG Field Development	No	Advised that DMIRS has reviewed the information provided and acknowledged the proposed drilling and completions activities and installation of umbilicals, risers and flowlines will be regulated by NOPSEMA under the provisions of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009. Advised no further information is required at this stage but requested INPEX send through activity commencement and cessation notifications.	Relevant matter - stakeholder has requested to be notified of activity commencement or other project activities. This has been incorporated into Section 9 of the EP.
Department of Planning, Lands and Heritage (DPLH) (WA)	19/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). INPEX welcomed feedback, and requested any is provided by 16 September 2019. INPEX requested that the stakeholder advise of any information/comments that are not suitable for public disclosure such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.

	21/08/2019	Email / letter from stakeholder	Ichthys LNG Field Development	No	DPLH confirmed that a review of the Register of Places and Objects as well as the Department of Planning, Lands and Heritage (DPLH) Aboriginal Heritage Database concludes that the proposed works as described in the attached document DO NOT intersect the "Restricted Boundary" of any Aboriginal Sites or Places as administered DPLH. As such, the proposed activity does not affect the heritage values of any DPLH Aboriginal Sites or Places and no statutory approvals are required.	Not a relevant matter - general correspondence only
Department of Primary Industries and Regional Development (DPIRD) - Aquatic Environment section (WA)	5/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development fact sheet - Northern Demersal Scalefish Managed Fishery map	Email informed the stakeholder that INPEX plans to develop and submit EPs to NOPSEMA for further development well drilling and installation of umbilicals, risers and flowlines (URF) in production licence area WA-50-L. The purpose of the engagement was explained to the stakeholder and feedback requested by Friday 6th September 2019. The proposed field development activities were summarised and the stakeholder was referred to the attached Ichthys LNG field development activities fact sheet for further information. INPEX summarised its process of identifying and engaging with commercial fishery stakeholders, noting that commercial fishing activities in the vicinity of production licence area WA-50-L are understood to be limited. A summary of the only WA-managed fishery that operates in the vicinity of WA-50-L, the Northern Demersal Scalefish Managed Fishery, was also provided including a map of the fishery licence area relative to the location of WA-50-L. INPEX advised that licence holders of the NDSMF and relevant fishing industry associations, including the Commonwealth Fisheries Association and the Western Australian Fishing Industry Council, are being invited to provide feedback on the proposed Ichthys LNG field development activities. INPEX summarised the potential impacts and proposed control measures for managing interactions and impacts to commercial fishers, including: - Physical presence of the MODU and support vessels, including associated safety zones and Notice to Mariners; - Planned discharges, including management of discharges in accordance with legislative requirements and INPEX's chemical selection process; - Prohibition of recreational fishing on any INPEX-operated facility/vessel or contracted vessel. INPEX requested that the stakeholder advise of any information/comments that is not suitable for public disclosure - such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.

Department of Primary Industries and Regional Development (DPIRD) - Sustainability and Biosecurity section (WA)	5/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised INPEX will continue to implement the Biofouling risk management controls in place for the Ichthys field and apply lessons learned from the initial development phase. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). Informed stakeholder that to date INPEX have not identified any new IMS as result of our visual observations on vessels and the facility hulls. INPEX welcomed feedback, and requested any is provided by 10 September 2019. Finally, INPEX requested that the stakeholder advise if any information/comments they provide are not suitable for public disclosure - such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.
	5/08/2019	Email / letter from stakeholder	Ichthys LNG Field Development	No	Requested clarification on a statement in the fact sheet "In 2019 INPEX will….to support continued field development for Ichthys" - Enquired whether this meant more infrastructure is being installed associated with Ichthys, whether this refers to separate developments.	Not a relevant matter - general correspondence only
	22/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	No	INPEX clarified it is currently in the planning phase for future expansion of the Ichthys subsea system. This will just feed in to the existing CPF and FPSO assets. Advised the subsea installation work is unlikely to happen until 2021 but there is a new Drill rig coming in next year to drill additional wells. INPEX offered to discuss the proposed controls we will put in place for the new activities which include management of biofouling.	Not a relevant matter - correspondence sent by INPEX.
	2/09/2019	Email / letter to stakeholder	Ichthys LNG Field Development	No	Follow up with stakeholder to see if DPIRD received the additional information and check if DPIRD had any comments or queries.	Not a relevant matter - correspondence sent by INPEX.
Department of Transport - Marine (WA DoT) (WA)	6/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised that INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). Advised DoT that INPEX will be in touch with details the required by the guidance note and a copy of the OPEP for each activity once it has been drafted. INPEX welcomed feedback and provided contact details to do so. Finally, INPEX requested that the stakeholder advise if any information/comments they provide are not suitable for public disclosure - such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.

	30/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	No	Advised DoT that INPEX is in the process of preparing an EP & OPEP for short duration geophysical/geotechnical survey activities in the Ichthys Field (WA-50-L). INPEX identified the key points as follows: - The activity will involve typically a single small (~<100m) survey vessel, conducting low level visual, bathymetric/acoustic surveys and sediment sampling activities. - The survey data will support engineering design for future infrastructure development (Ichthys Phase 2 expansion). - The activity under this new EP is away from the existing assets, therefore no interaction risks. - The area of the survey activity is west of the existing CPF/FPSO in-field infrastructure, and therefore further away from Browse Island than previous risk assessments. - Vessels largest individual wing-tanks are expected to be <150m3, however INPEX has based our spill risk assessment using modelling of a 250 m3 marine diesel spill - The 250 m3 diesel spill modelling in the Ichthys Field (100 runs x 3 seasons), has concluded the following: - no exposure of any shoreline at >1 g/m2 of floating oil - no shoreline would receive >1m3 of oil on shoreline - from a risk assessment perspective, no impact to shorelines anticipated, and therefore no credible scenario which would require a shoreline oil spill response - The OPEP INPEX proposed to submit to NOPSEMA would be almost identical to the 2D seismic survey OPEP in every way, with the exception of two minor changes. - The new OPEP will replace of the words 'seismic survey' with words 'geotechnical survey' through to the document - The OPEP will acknowledge that there is no credible shoreline risk, however will still including all the usual details of INPEX's capabilities for shoreline clean-up and wildlife response. INPEX noted that WA DoT had no comments on the Ichthys 2D seismic survey activity/OPEP (other than routine compliance with the industry guidance note). INPEX inquired whether WA DoT still require a review this OPEP, for the Phase 2A Geophysical / Geotechnical survey, or are WA DoT happy with the above information.	Not a relevant matter - correspondence sent by INPEX.
	2/09/2019	Email / letter from stakeholder	Ichthys LNG Field Development	No	DoT advised that based on the information INPEX have provided and detailing similarities between the proposed Geotechnical/Geophysical Survey – WA-50-L in Commonwealth waters and the previously provided Ichthys 2D Seismic Survey OPEP, where the risk to State waters and shorelines is very low, the Department of Transport (DoT) does not need to review the OPEP in this case. Requested that DoT be consulted if there is any change to this risk profile. DoT requested INPEX ensure any oil spill arrangements align to the requirements as set out in the DoT Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements (September 2018). DoT requested a copy of the OPEP once accepted by NOPSEMA for our records.	Relevant matter - stakeholder has confirmed that they consider the OPEP to be satisfactory. INPEX will provide a copy of the OPEP to the Department once it is accepted.
	2/09/2019	Email / letter to stakeholder	Ichthys LNG Field Development	No	Confirmed INPEX will provide a copy of the OPEP when it's accepted by NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.

Department of Water and Environment Regulation (DWER) (WA) Hazard Management Branch Contaminated Sites Branch	6/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). INPEX welcomed feedback and requested any be provided by 15 September 2019. Finally, INPEX requested that the stakeholder advise if any information/comments they provide are not suitable for public disclosure - such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.
Indonesian Ministry for Marine Affairs and Fisheries (MMAF)	5/08/2019	Email / letter to stakeholder	Both Ichthys LNG Field Development and Ichthys 2019 Update	Yes: - Ichthys LNG Field Development Fact Sheet - Ichthys 2019 Update Fact Sheet	INPEX advised the stakeholder of the purpose of engagement, including its commitment to keep stakeholders informed of INPEX's activities and regulatory requirement to consult with stakeholders. INPEX advised the attached fact sheets provide details on a proposed and current activities that may be of interest to the MMAF. INPEX noted the location of these activities overlaps the Australia–Indonesia Memorandum of Understanding (MOU) Box relating to the operations of Indonesian traditional fishermen in the Australian Fishing Zone. INPEX welcomed feedback and provided contact details to do so.	Not a relevant matter - correspondence sent by INPEX.
Kimberley Land Council (KLC)	19/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). INPEX welcomed feedback, and requested any is provided by 16 September 2019. INPEX requested that the stakeholder advise of any information/comments that are not suitable for public disclosure such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.

National Native Title Tribunal (NNTT) (Cwth)	15/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). INPEX expressed understanding that it is not the NNTT's position to make comment on offshore activities (in line with recommendations of past years). Advised INPEX proposes to provide the attached information sheet to the Kimberley Land Council as the Representative Aboriginal/Torres Strait Islander Body with jurisdiction for Commonwealth waters off the coast of Western Australia. INPEX welcomed feedback, and requested any is provided by 16 September 2019. INPEX requested that the stakeholder advise of any information/comments that are not suitable for public disclosure such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.
National Offshore Petroleum Titles Administrator (NOPTA) (Cwth)	6/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). INPEX welcomed feedback, and requested any is provided by 16 September 2019. INPEX requested that the stakeholder advise of any information/comments that are not suitable for public disclosure such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.
	6/08/2019	Email / letter from stakeholder	Ichthys LNG Field Development	No	Confirmation of receipt of the above correspondence.	Not a relevant matter - general correspondence only

NT Department of Environment and Natural Resources (DENR)	6/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). INPEX welcomed feedback provided contact details to do so. INPEX requested that the stakeholder advise of any information/comments that are not suitable for public disclosure - such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.
NT Department of Infrastructure, Planning and Logistics - Transport - Marine Safety Branch (DIPL)	6/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). INPEX welcomed feedback, and requested any is provided by 10 September 2019. INPEX requested that the stakeholder advise of any information/comments that are not suitable for public disclosure such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.
Office of the Director of National Parks (Cwth)	6/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). INPEX welcomed feedback, and requested any is provided by 10 September 2019. INPEX requested that the stakeholder advise of any information/comments that are not suitable for public disclosure such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.
	6/09/2019	Email / letter from stakeholder	Ichthys LNG Field Development	No	DNP observed that the planned activities do not overlap any Australian Marine Parks, and that the activity is approximately 105 km, 145 km and 175 km to Kimberley, Cartier Island and Ashmore Reef marine parks respectively. Advised that therefore there are no authorisation requirements from the DNP.	Not a relevant matter - general corresondence only

						DNP highlighted the NOPSEMA guidance note that outlines what titleholders need to consider and evaluate in relation to AMPs. DNP advised that when preparing the EP, INPEX should consider the Australian marine parks and their representativeness. INPEX should identify and manage all impacts and risks on Australian marine park values (including ecosystem values) to an acceptable level and has considered all options to avoid or reduce them to as low as reasonably practicable. The EP should clearly demonstrates that the activity will not be inconsistent with the management plan.	Relevant matter – stakeholder has provided information relevant to the petroleum activity and/or the stakeholder's functions, interests or activities. NOPSEMA's guidance note that outlines what titleholders need to consider and evaluate in relation to AMPs has been considered in Sections 7 and 8 of the EP.
						DNP advised the The North-west Marine Parks Network Management Plan 2018 provides further information on values for Kimberley, Cartier Island and Ashmore Reef marine parks. Advised information on the values for the marine parks is also located on the Australian Marine Parks Science Atlas. Advised specific values for the Kimberley, Cartier Island and Ashmore Reef marine parks include (but are not limited to): • the ancient coastline at the 125m depth contour containing diverse and biologically important benthic habitats; • continental slope habitat supporting a high diversity and endemism of demersal fish communities; • critical and biologically important areas for species, including marine turtles (inter-nesting and nesting habitat), seabirds (breeding and foraging habitat), inshore dolphin (breeding, calving and foraging habitat) humpback whales (nursing habitat and migratory pathways), pygmy blue • whales (migratory pathways), dugong (foraging habitat) and whale sharks (foraging habitat); • habitat for an internationally significant abundance and diversity of sea snakes; • coral reef and seagrass ecosystems; • parts of the Kimberly Marine Park is sea country of the Wunambal Gaambera, Dambimangari and Bardi Jawi people.	Relevant matter – stakeholder has provided information relevant to the petroleum activity and/or the stakeholder's functions, interests or activities. Values for Kimberley, Cartier Island and Ashmore Reef marine parks have been identified in Section 4.3 of the EP. Potential impacts to these AMPs are considered in Sections 7 and 8 of the EP.
						DNP confirmed that it does not require further notification of progress made in relation to this activity unless details regarding the activity change and result in an overlap with or new impact to a marine park, or for emergency responses (see details below).	Not a relevant matter - general corresondence only
						Advised the DNP should be made aware of oil/gas pollution incidences which occur within a marine park or are likely to impact on a marine park as soon as possible. Notification should be provided to the 24 hour Marine Compliance Duty Officer on 0419 293 465. The notification should include: • titleholder details • time and location of the incident (including name of marine park likely to be effected) • proposed response arrangements as per the Oil Pollution Emergency Plan (e.g. dispersant, containment, etc.) • confirmation of providing access to relevant monitoring and evaluation reports when available; and • contact details for the response coordinator.	Relevant matter – stakeholder has provided information relevant to the petroleum activity and/or the stakeholder's functions, interests or activities. Stakeholder's request to be made aware of oil/gas pollution incidences which occur within a marine park or are likely to impact on a marine park have been incorporated in Section 9 of the EP.
Business							

Australian Marine Oil Spill Centre (AMOSC)	6/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). INPEX welcomed feedback and requested any be provided by 10 September 2019. Finally, INPEX requested that the stakeholder advise if any information/comments they provide are not suitable for public disclosure - such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.
Oil Spill Response Limited (OSRL)	6/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development Fact Sheet	Advised INPEX is looking to continue drilling and to expand the subsea infrastructure within WA 50-L and the purpose of the attached information is to provide details on proposed Ichthys LNG field development activities, as part of the development of EPs. Advised the Ichthys gas–condensate field (Production Licence WA-50-L) is located in Commonwealth waters in the Browse Basin, approximately 220 kilometres offshore of Western Australia. Identified the key proposed activities as drilling of the production wells (beginning in March 2020 and continuing for 5 years), and installation of subsea umbilicals, risers and flowlines, support structures and control systems (scheduled to commence from 2021). INPEX welcomed feedback and requested any be provided by 10 September 2019. Finally, INPEX requested that the stakeholder advise if any information/comments they provide are not suitable for public disclosure - such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.
RPS Asia-Pacific Applied Science Associates (RAPASA) (formerly APASA)	6/08/2019	Email / letter to stakeholder	Both Ichthys LNG Field Development and Ichthys 2019 Update	Yes: - Ichthys LNG Field Development fact sheet - Ichthys 2019 Update fact sheet	Advised that a service provider for INPEX's spill response, RAPASA has been identified as a relevant stakeholder to INPEX's activities. Provided RAPASA with the fact sheets on the 2019 Ichthys Project updates and Ichthys Field Development.	Not a relevant matter - correspondence sent by INPEX.
	6/08/2019	Email / letter from stakeholder	Both Ichthys LNG Field Development and Ichthys 2019 Update	No	Acknowledgement of above correspondence.	Not a relevant matter - general correspondence only
Commercial Fishing and Pearling Stakeholders						
Industry Associations						

Commonwealth Fisheries Association	5/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development fact sheet - North West Slope Trawl Managed Fishery map	Email informed the stakeholder that INPEX plans to develop and submit EPs to NOPSEMA for further development well drilling and installation of umbilicals, risers and flowlines (URF) in production licence area WA-50-L. The purpose of the engagement was explained to the stakeholder and feedback requested by Friday 6th September 2019. The proposed field development activities were summarised and the stakeholder was referred to the attached Ichthys LNG field development activities fact sheet for further information. INPEX summarised its process of identifying and engaging with commercial fishery stakeholders, noting that commercial fishing activities in the vicinity of production licence area WA-50-L are understood to be limited. A summary of the Commonwealth-managed North West Slope Trawl Fishery (NWSTF) was provided including a map of the fishery licence area relative to the location of WA-50-L. INPEX advised that licence and concession holders of the NWSTF are being invited to provide feedback on the proposed Ichthys LNG field development activities. INPEX noted that other fisheries' licence areas overlap WA-50-L, but as no fishing activities occur in these locations, licence holders in these fisheries are not being contacted . INPEX summarised the potential impacts and proposed control measures for managing interactions and impacts to commercial fishers, including: - Physical presence of the MODU and support vessels, including associated safety zones and Notice to Mariners; - Planned discharges, including management of discharges in accordance with legislative requirements and INPEX's chemical selection process; - Prohibition of recreational fishing on any INPEX-operated facility/vessel or contracted vessel. INPEX requested that the stakeholder advise of any information/comments that is not suitable for public disclosure - such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.
Western Australian Fishing Industry Council (WAFIC)	30/07/2019	Phone call with stakeholder	Ichthys LNG Field Development	No	Phone call to inform stakeholder of INPEX's intention to pursuer development drilling in the WA-50-L permit area. WAFIC confirmed that fishing licence holders should only be consulted if they have fished in the permit area in the last 5-8 years. WAFIC confirmed that if fishers didn't fall within this category, the could be excluded from receiving activity information but should be retained on a list of potentially affected parties within the EMBA. WAFIC recommended that INPEX contact AFMA to receive a heat map showing effort of Commonwealth fisheries.	Not a relevant matter - general correspondence only (related to relevant stakeholder identification)
	31/07/2019	Email / letter to stakeholder	Ichthys LNG Field Development	No	INPEX provided a summary of the above phone conversation. INPEX advised that it has analysed FishCube data for individual fisheries to confirm whether fishing had occurred in WA-50-L title block. INPEX advised that no fisheries fish within the title area, however the North West Slope Trawl Fisher and the Northern Demersal Scalefish Managed Fishery both fish in close proximity. INPEX proposed to limit WA/Commonwealth fisheries stakeholder consultation to these two fisheries, excluding the rest due to the planned drilling and construction activities not presenting a risk to the resource overlap with fishing activates. Finally, INPEX provided a table summarising/justifying the relevance of each fishery to the activity. The table included information on the gear used, target species and whether fishing occurs within the permit area.	Not a relevant matter - correspondence sent by INPEX.

	5/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development fact sheet - Northern Demersal Scalefish Managed Fishery map - North West Slope Trawl Managed Fishery map	Email informed the stakeholder that INPEX plans to develop and submit EPs to NOPSEMA for further development well drilling and installation of umbilicals, risers and flowlines (URF) in production licence area WA-50-L. The purpose of the engagement was explained to the stakeholder and feedback requested by Friday 6th September 2019. The proposed field development activities were summarised and the stakeholder was referred to the attached Ichthys LNG field development activities fact sheet for further information. INPEX summarised its process of identifying and engaging with commercial fishery stakeholders, noting that commercial fishing activities in the vicinity of production licence area WA-50-L are understood to be limited. A summary of the WA-managed Northern Demersal Scalefish Managed Fishery (NDSMF) and Commonwealth-managed North West Slope Trawl Fishery (NWSTF) were provided including a map of the fishery licence area relative to the location of WA-50-L. INPEX advised that licence and concession holders of the NDSMF and NWSTF are being invited to provide feedback on the proposed Ichthys LNG field development activities. INPEX noted that other fisheries' licence areas overlap WA-50-L, but as no fishing activities occur in these locations, licence holders in these fisheries are not being contacted . INPEX summarised the potential impacts and proposed control measures for managing interactions and impacts to commercial fishers, including: - Physical presence of the MODU and support vessels, including associated safety zones and Notice to Mariners; - Planned discharges, including management of discharges in accordance with legislative requirements and INPEX's chemical selection process; - Prohibition of recreational fishing on any INPEX-operated facility/vessel or contracted vessel. INPEX requested that the stakeholder advise of any information/comments that is not suitable for public disclosure - such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.
Commonwealth Managed Fisheries						
North West Slope Trawl Fishery	2/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development fact sheet - North West Slope Trawl Managed Fishery map	Letter informed licence and concession holders of the North West Slope Trawl Fishery that INPEX plans to develop and submit EPs to NOPSEMA for further development well drilling and installation of umbilicals, risers and flowlines (URF) in production licence area WA-50-L. The purpose of the engagement was explained to the stakeholder and feedback requested by Friday 6th September 2019. The proposed field development activities were summarised and the stakeholder was referred to the enclosed Ichthys LNG field development activities fact sheet for further information. INPEX summarised its process of identifying and engaging with commercial fishery stakeholders, noting that commercial fishing activities in the vicinity of production licence area WA-50-L are understood to be limited. A summary of the Commonwealth-managed North West Slope Trawl Fishery was provided including a map of the fishery licence area relative to the location of WA-50-L. INPEX noted that fishing activities do not typically occur in WA-50-L.	Not a relevant matter - correspondence sent by INPEX.

					INPEX summarised the potential impacts and proposed control measures for managing interactions and impacts to commercial fishers, including: - Physical presence of the MODU and support vessels, including associated safety zones and Notice to Mariners; - Planned discharges, including management of discharges in accordance with legislative requirements and INPEX's chemical selection process; - Prohibition of recreational fishing on any INPEX-operated facility/vessel or contracted vessel. INPEX requested that the stakeholder advise of any information/comments that is not suitable for public disclosure - such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	
WA Managed Fisheries						
Northern Demersal Scalefish Managed Fishery	2/08/2019	Email / letter to stakeholder	Ichthys LNG Field Development	Yes: - Ichthys LNG Field Development fact sheet - Northern Demersal Scalefish Managed Fishery Map	Letter informed licence holders of the Northern Demersal Scalefish Managed Fishery that INPEX plans to develop and submit EPs to NOPSEMA for further development well drilling and installation of umbilicals, risers and flowlines (URF) in production licence area WA-50-L. The purpose of the engagement was explained to the stakeholder and feedback requested by Friday 6th September 2019. The proposed field development activities were summarised and the stakeholder was referred to the enclosed Ichthys LNG field development activities fact sheet for further information. INPEX summarised its process of identifying and engaging with commercial fishery stakeholders, noting that commercial fishing activities in the vicinity of production licence area WA-50-L are understood to be limited. A summary of the WA-managed Northern Demersal Scalefish Managed Fishery was provided including a map of the fishery licence area relative to the location of WA-50-L. INPEX noted that WA-50-L and the proposed field development activities are located in Area C of the fishery and understood that fishing activities do not typically occur in this location and water depth. INPEX summarised the potential impacts and proposed control measures for managing interactions and impacts to commercial fishers, including: - Physical presence of the MODU and support vessels, including associated safety zones and Notice to Mariners; - Planned discharges, including management of discharges in accordance with legislative requirements and INPEX's chemical selection process; - Prohibition of recreational fishing on any INPEX-operated facility/vessel or contracted vessel. INPEX requested that the stakeholder advise of any information/comments that is not suitable for public disclosure - such information will be omitted/redacted from the full EP, but provided separately and privately to NOPSEMA.	Not a relevant matter - correspondence sent by INPEX.

Appendix D-
Oil Pollution Emergency Plan

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I Initial Response Requirements

An overview of the initial response requirements for vessel masters (VM), client site representative (CSR) and the INPEX incident management team (IMT) is provided in Table I-1.

Table I-1 has been developed to guide the response personnel through the key steps of this OPEP during a Level 2 or Level 3 spill (defined in Section 2.1).

Table I-1 contains an initial response guide for vessel spills, where the Australian Maritime Safety Authority (AMSA) is the Control Agency, however also includes all the steps the INPEX IMT may be required to take, if AMSA requests support from the INPEX IMT.

Information to support the initial and ongoing response requirements are included in this OPEP.

Table I-1: Initial Response Requirements – Vessel spill

Spill from vessel (AMSA Control Agency) Definitions for 'Action by' persons are as follows: **VM** – Vessel Master (Contractor) **CSR** – Client Site Representative (INPEX) **IMT** – Incident Management Team (INPEX)					
VM	CSR	IMT	Immediate Response Actions	Information/Resources	Comments
■			Stop the spill.	Activate vessel shipboard oil pollution emergency plan (SOPEP).	
■			Classify the spill incident level.	See Section 2.1 Spill classification. Table 2-1: Incident classification.	
■			Verbally notify AMSA.	See Section 2.4.2 External agencies notification. Table 2-2: Jurisdictional boundaries for Jurisdictional Authority and Control Agencies. Table 2-3: External notifications matrix. INPEX Emergency Contact Directory (PER-2153095942).	AMSA is the designated Control Agency for oil spills from vessels within Commonwealth jurisdiction and are to be notified immediately of all ship-sourced incidents through the AMSA Rescue Coordination Centre (RCC) Australia on +61 2 6230 6811. Upon notification of an incident involving a ship, AMSA will assume control of the incident and respond in accordance with AMSA's National Plan for Maritime Environmental Emergencies.
■			Verbally notify the CSR.	See Section 2.4.1 Initial spill notification.	
■	■		Deploy satellite tracking buoys.	See Section 4.4.1 Operational Monitoring and Evaluation.	1 x tracking buoy located on the survey vessel. Additional tracking buoys can be requested for deployment from the INPEX IMT Leader. The location of satellite tracking buoys is maintained in the Oil Spill Preparedness and Response Register (PER-2153236568), available on DMS.
	■	■	INPEX CSR to notify IMT Leader via INPEX Emergency Call Centre. IMT Leader notify INPEX Crisis Management Team (CMT) Leader. IMT Leader to activate IMT.	Activate via INPEX Emergency Call Centre. (See Section 2.4.1 Initial spill notification). INPEX Emergency Contact Directory (PER-2153095942).	INPEX Emergency Call Centre 24-hour activation numbers are: 1800 305 789. +61 8 6213 6350 +61 439 694 175
■	■		Prepare marine pollution report (POLREP), submit to AMSA and copy to CSR. CSR to forward POLREP to IMT Leader.	POLREP. (See Table 5-1: Oil Spill Response Forms).	
		■	IMT to contact AMSA and confirm POLREP and offer support as per memorandum of understanding (MOU).	See Section 2.2 Jurisdictional Authority and Control Agency.	AMSA and INPEX acknowledge that AMSA retains Control Agency responsibility for all ship sourced marine pollution incidents. INPEX agrees to provide all available support to AMSA in AMSA's performance of its Control Agency responsibilities under the National Plan for Maritime Environmental Emergencies. All resources and capabilities within this OPEP can be implemented, upon AMSA's request. Should AMSA request INPEX IMT support, INPEX IMT to progress with the steps below this row.

Spill from vessel (AMSA Control Agency)

Definitions for 'Action by' persons are as follows:

VM – Vessel Master (Contractor) **CSR** – Client Site Representative (INPEX) **IMT** – Incident Management Team (INPEX)

VM	CSR	IMT	Immediate Response Actions	Information/Resources	Comments
		■	Develop situational awareness.	See Section 3.1 Gain situational awareness.	During the initial phase of a spill, obtaining and communicating information to allow the establishment of situational awareness is critical for response planning.
		■	Notify Australian Marine Oil Spill Centre (AMOSC).	INPEX Emergency Contact Directory (PER-2153095942).	AMOSC will provide support and guidance to the INPEX IMT during any Level 2 or Level 3 spill event. AMOSC's 24-hour mobile number is +61 (0) 438 379 328; email amosc@amosc.com.au Telephone call and e-mail confirmation to AMOSC required for mobilisation of response personnel and equipment, and call-out authorities will be required to confirm they are the IMT Leader to AMOSC. AMOSC will email a service contract for the request of AMOSC resources/personnel. This contract must be completed and signed by the IMT Leader and emailed to AMOSC, prior to AMOSC mobilisation.
		■	Notify additional regulators and stakeholders.	See Section 2.4.2 External agencies notification. Table 2-3: External notifications matrix. INPEX Emergency Contact Directory (PER-2153095942).	External agencies contact information is available in the INPEX Emergency Contacts Directory (PER-2153095942).
		■	Initiate 'Immediate Response Measures' - Operational Monitoring and Evaluation – aerial, vessel, and satellite (as appropriate).	See Section 4.4.1 Operational Monitoring and Evaluation.	Must be implemented as a priority, prior to the development of Incident Action Plans. Additional details on Operational Monitoring and Evaluation are also provided in Appendix A - OM03.
		■	Obtain long-term weather forecasts.	For weather forecast service provider see the INPEX Emergency Contact Directory (PER-2153095942).	Site–specific, long-term weather forecasts are available through the INPEX subscription to the Bureau of Meteorology (BOM).
		■	Implement oil spill trajectory modelling – Operational Monitoring and Evaluation.	Transmit to spill modelling provider via Oil Spill Trajectory Modelling Request. Oil Spill Response Forms Register (PER-2153332031).	Additional details on spill trajectory modelling are also provided in Section 4.4.1 and in Appendix A. RPS modelling request activated via 24/7 duty phone – 0408 477 196, followed by email of modelling request form to response@rpsgroup.com.au
		■	Identify protection priorities.	See Section 3.3 Identify protection priorities.	Figures of the environmental sensitivities and values as defined in the Environment Plan are attached to this checklist in IMT Room 'Environment' folder.
		■	Validate Operational spill impact mitigation assessment (SIMA) template to generate Operational SIMA.	See Section 3.4 Operational SIMA.	The Operational SIMA template provides a summary of key considerations for relevant spill response techniques, and will assist the IMT to determine the appropriate response strategies to include in the Incident Action Plan.
		■	Develop Incident Action Plan (IAP).	See Section 3.5 Develop an Incident Action Plan. Appendix B: INPEX Incident Action Plan template.	Resources descriptions, capabilities and activation processes are provided in Section 4 Spill Response Resources. Utilise this information during the development of the IAP.
		■	Implement IAP.	See Section 4 Spill Response Resources.	

Spill from vessel (AMSA Control Agency) Definitions for 'Action by' persons are as follows: **VM** – Vessel Master (Contractor) **CSR** – Client Site Representative (INPEX) **IMT** – Incident Management Team (INPEX)					
VM	CSR	IMT	Immediate Response Actions	Information/Resources	Comments
		■	Use spill surveillance and reconnaissance data (OM03) to update oil spill trajectory modelling (OM01) outputs.	See Section 4.4.1 Operational Monitoring and Evaluation. Section 4.7 Operational and scientific monitoring.	
		■	Use oil monitoring (OM) program data to determine scientific monitoring (SM) activation.	See Section 4.7.2 Scientific monitoring and Appendix A.	
		■	Terminate response.	See Section 3.6 Response termination and Section 4 Spill Response Resources.	General response termination considerations are provided in Section 3.6 Response termination. Response strategy specific termination criteria considerations are provided in Section 4 Spill Response Resources. OMs and SMs termination criteria are provided in Appendix A.

II Abbreviations and acronyms

Abbreviation/acronym	Description
AIMS	Australian Institute of Marine Science
ALARP	as low as reasonably practicable
AMOSC	Australian Marine Oil Spill Centre
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Authority
ANZECC/ARMCANZ	Australian and New Zealand Environment and Conservation Council / Agriculture and Resource Management Council of Australia and New Zealand
AODN	Australian Ocean Data Network
ARP	applied research program
BACI	before–after, control–impact
BIA	biologically important area
BOM	Bureau of Meteorology
CASA	Civil Aviation Safety Authority
CMT	crisis management team
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSR	company site rep
Cwlth	Commonwealth
DEE	Department of the Environment and Energy (Cwlth)

Abbreviation/acronym	Description
DWER	Department of Water and Environmental Regulation (WA)
DIIS	Department of Industry, Innovation and Science (Cwlth)
DMS	document management system
DMIRS	Department of Mines, Industry Regulation and Safety (WA)
DNP	Director of National Parks (Cwlth)
DPaW	Department of Parks and Wildlife (WA) now WA DBCA
EEZ	exclusive economic zone
EMBA	environment that may be affected
EP	environment plan
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
ERT	emergency response team
ESP	environmental service provider
FOB	forward operating base
GPS	global positioning system
HSE	health, safety and environment
IAP	incident action plan
I-GEM	Industry–Government Environmental Metadata
IMG	incident management guide

Abbreviation/acronym	Description
IMT	incident management team
ITOPF	International Tanker Owners Pollution Federation Limited
JHA	job hazard analysis
JPDA	Joint Petroleum Development Area
LAT	lowest astronomical tide
MARPOL 73/78	International Convention for the Prevention of Pollution from Ships, 1973/1978
MNES	Matter of National Environmental Significance
MoU	memorandum of understanding
MPC	marine pollution coordinator
NATA	National Association of Testing Authorities
National Plan (NatPlan)	National Plan for Maritime Environmental Emergencies
NAXA	Northern Australia Exercise Area
NOAA	National Oceanic and Atmospheric Administration (US)
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority (Cwlth)
nm	nautical mile
OM	Operational Monitoring
OPEP	oil pollution emergency plan
OPGGS (E) Regulations	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cwlth)

Abbreviation/acronym	Description
OSCP	oil spill contingency plan
OSMP	Operational and Scientific Monitoring Program
OSRL	Oil Spill Response Limited
OWR	oiled wildlife response
PEARS	People, Environment, Assets, Reputation and Sustainability
POLREP	marine pollution report
PPE	personal protective equipment
PTW	permit to work
RCC	Rescue Coordination Centre
SAR	synthetic aperture radar
SCAT	shoreline clean-up and assessment technique
SIMA	spill impact mitigation assessment
SITREP	situation report
SM	scientific monitoring
SHP-MEE	State Hazard Plan – Maritime Environmental Emergencies
SOPEP	shipboard oil pollution emergency plan
TBOSIET	tropical basic offshore safety induction and emergency training
US EPA	United States Environmental Protection Agency
UXO	unexploded ordnance

Abbreviation/acronym	Description
VM	vessel master
WA	Western Australia
WA DBCA	Department of Biodiversity, Conservation and Attractions (WA)
WA DoT	Department of Transport (WA)

1 Introduction

1.1 Purpose

In accordance with Regulation 14(8) of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (OPGGS (E) Regulations), the implementation strategy for an environment plan (EP) must include an oil pollution emergency plan (OPEP).

This OPEP has been developed specifically to respond to emergency conditions as described and defined in the Ichthys Geotechnical and Geophysical Survey WA-50-L Environment Plan (Doc. No. E075-AH-PLN-70003); hereafter referred to as the EP. The scope of this OPEP is consistent with the activities described in Section 3 of the EP.

The purpose of this OPEP is to:

- describe the oil spill emergency response arrangements and capabilities that are in place for the duration of the petroleum activity
- provide high-level guidance and process support for the INPEX Incident Management Team (IMT)
- demonstrate that the intent of Regulation 14(8) of the OPGGS (E) Regulations has been met.

1.2 Plan scope

INPEX defines an Emergency Condition as:

'A hazardous situation (or threat of a hazardous situation) where Company standard operating procedures will not resolve the situation safely or prevent harm to the people, environment or assets. Successful management of an emergency situation will require coordinated action to control the event, correct the consequences and return the function to a safe condition.'

The emergency condition identified in the EP is:

- vessel collision, resulting in a Group II (diesel) spill to the marine environment at the sea surface (250 m^3).

The activity will be conducted within the production licence area WA-50-L, located in Commonwealth waters as shown in Figure 1-1.

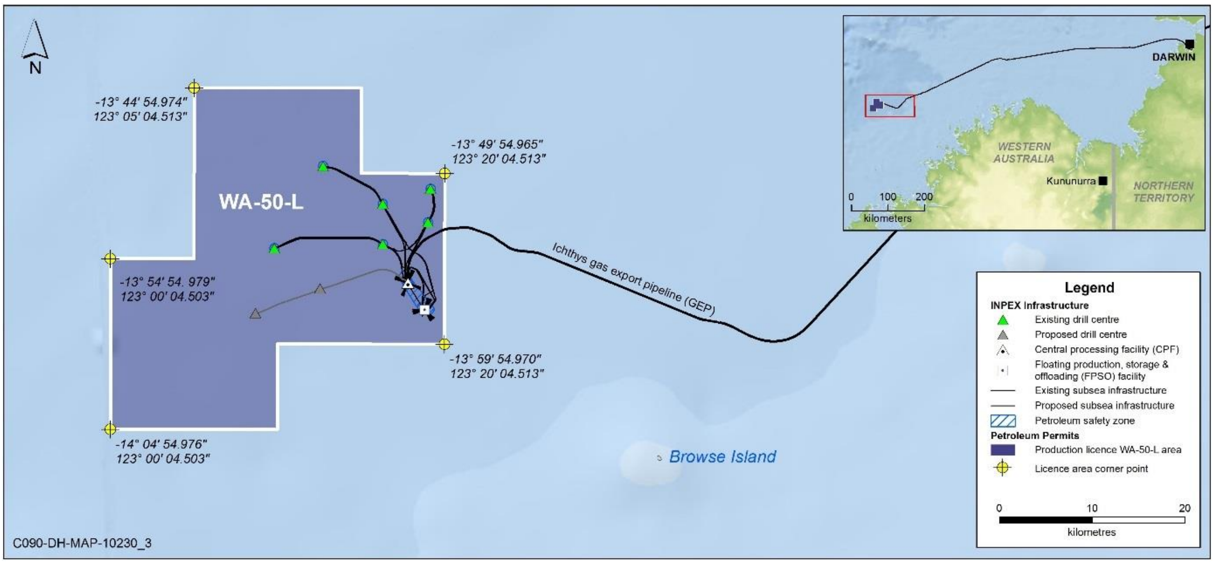


Figure 1-1: Location and coordinates of WA-50-L

2 Spill classification and responsible agencies

2.1 Spill classification

Under the National Plan for Maritime Environmental Emergencies (AMSA 2019), marine hydrocarbon spills and their response requirements are categorised into three levels, based on a combination of factors:

- the known or inferred spill size, scale and complexity
- the likely fate of the spill
- environmental and socioeconomic values within the vicinity
- the capability of equipment in the field in regard to the spill, and the level of support required to respond.

Table 2-1 summarises the hydrocarbon spill level response models adopted for this OPEP. Given the maximum spill scenario is a 250 m^3 release, the maximum incident level for this OPEP is a level 2. Level 3 information has been included for information.

In the event of a spill occurring where effective response is considered beyond the immediate response capabilities of INPEX (i.e. a spill above Level 1), the response will be escalated immediately to the next level. Spill volumes are a guide only and not to be strictly applied.

Table 2-1: Incident classification

Incident level	Spill volume (m^3)	Description
1	<10	Generally, can be resolved through the application of local or initial response resources (first strike response).
2	10 to 1000	Typically, more complex in size, duration, resource management and risk than Level 1 incidents. May require deployment of resources beyond the first strike response.
3	>1000	Characterised by a high degree of complexity, requiring strategic leadership and response coordination. May require national and international response resources.

2.2 Jurisdictional Authority and Control Agency

The NatPlan defines the State/Territory and Commonwealth agencies in the following terms.

Jurisdictional Authority

Any agency which has jurisdictional or legislative responsibilities for maritime environmental emergencies is obligated to work closely with the Control Agency to ensure that incident response actions are adequate.

Control Agency

The organisation that directs and manages the spill response (with response assistance provided by other parties under the direction of the Control Agency). The Control Agency responsibility does not always coincide with that of a Jurisdictional Authority. The Control Agency has the operational responsibility to take action in order to respond to an oil spill in the marine environment in accordance with the relevant contingency plan.

Table 2-2 defines the Jurisdictional Authority and Control Agency responsibilities within relevant jurisdictions.

Control Agency in Commonwealth Waters

The NatPlan specifies that for spills in Commonwealth waters, resulting from a 'Facility', the Operator shall become the Control Agency. Where the spill is not from a Facility (i.e. a vessel spill), AMSA will become the Control Agency.

Under this EP, the only credible spill scenario is a vessel collision, with AMSA as Control Agency.

In the instance that AMSA is the Control Agency, INPEX has committed under Clause 7 of a memorandum of understanding (MoU) between INPEX and AMSA, that INPEX 'agrees to provide all available support to AMSA in AMSA's performance of its Combat (Control) Agency responsibilities' (AMSA and INPEX 2013).

The MoU further states that for ship-sourced marine pollution events:

- AMSA is the designated Combat (Control) Agency for oil spills from vessels within the Commonwealth jurisdiction. Upon notification of an incident involving a ship, AMSA will assume control of the incident and respond in accordance with AMSA's Marine Pollution Response Plan.
- AMSA's Marine Pollution Response Plan is the operational response plan for the management of ship-sourced incidents.
- AMSA is to be notified immediately of all ship-sourced incidents through RCC Australia on +61 2 6230 6811.

2.2.1 Control Agency in WA waters

Incidents involving an oil spill response could result in more than one agency having jurisdictional control across the oil spill response area. This situation is possible where a significant spill (Level 2 or 3) originates from the vessel in Commonwealth waters (where AMSA is the Control Agency) and transitions into (or threatens) WA state waters.

Where there is potential for WA state water impact, under the WA State Hazard Plan - Maritime Environmental Emergencies (SHP-MEE) (WA DoT 2018), the WA Department of Transport (WA DoT) will be the Control Agency for the response activity that occurs within WA state waters.

Table 2-2: Jurisdictional boundaries for Jurisdictional Authority and Control Agencies

Jurisdictional boundary	Spill source	Jurisdictional Authority	Control Agency			Relevant documentation
			Level 1	Level 2*	Level 3*	
Commonwealth waters (3 to 200 nautical miles from territorial sea baseline).	Survey vessel in INPEX licence area (WA-50-L).	AMSA	AMSA With support from vessel contractor and INPEX if required.	AMSA With support from vessel contractor, INPEX and AMOSC if required.	AMSA With support from vessel contractor, INPEX and AMOSC if required.	Vessel SOPEP, NatPlan and (this) INPEX OPEP
WA State waters (territorial sea baseline to 3 nautical miles and some areas around offshore atolls and islands (e.g. Browse Island)).	Survey vessel in INPEX licence area (WA-50-L).	WA DoT	Vessel Level 1 spill response from vessel, under vessel SOPEP.	WA DoT With support from vessel contractor, INPEX and AMOSC if required	WA DoT With support from vessel contractor, INPEX and AMOSC if required.	Vessel SOPEP, SHP-MEE (WA DoT 2018) and (this) INPEX OPEP

*AMOSC and government agencies may assist the relevant Control Agency for Level 2 and Level 3 spills, as appropriate to the spill characteristics.

2.3 INPEX response team activation

Where a spill is assessed to be Level 2 or Level 3, the IMT shall be activated by the INPEX Client Representative via the INPEX Emergency Call Centre.

Once the IMT has been activated it shall provide support to AMSA (as Control Agency for vessels spills) for implementing spill response control measures, interaction with regulatory authorities and support agencies, monitoring, reporting and response termination.

Further information regarding the INPEX emergency and crisis management organisation can be found within Section 9 of the EP.

2.4 Incident notification

2.4.1 Initial spill notification

The spill observer shall raise the alarm and take action to stop the spill, if possible:

- For a spill observed or detected from a vessel, the Vessel Master shall be notified.
- The Vessel Master shall alert the INPEX Client Representative.
- The INPEX Client Representative shall alert the IMT Leader.
- The IMT Leader shall consult with the CMT (crisis management team) Leader, and jointly determine whether to activate only the IMT or both the IMT and the CMT.

2.4.2 External agencies notification

The Vessel Master shall immediately notify AMSA, who will be the Control Agency for the spill in Commonwealth Waters.

In consultation with AMSA (as the Control Agency), the Vessel Master, Client Representative Supervisor and IMT Leader (as relevant) shall provide verbal notifications of Level 2 or Level 3 spill events to the organisations listed in Table 2-3.

The IMT Leader, in consultation with AMSA, should consider additional stakeholder notifications, based on values and sensitivities affected. Additional stakeholders for consideration include those listed in Table 5-1 of the EP.

If written forms are required as part of a notification, they can be identified through Table 5-1 of this OPEP.

If activated, the IMT shall notify AMOSC of the spill event. AMOSC shall provide technical support to assist and shall also provide access to oil spill response equipment and personnel, if required. Details of resource availability are provided in Section 4 of this OPEP.

2.4.3 INPEX emergency contacts directory

All relevant contact details required of this OPEP are contained within the INPEX Emergency Contacts Directory (Doc. No. PER-2153095942), a hard copy of which is maintained in the IMT Room with an electronic copy available on the incident management system (EMQNet).

The INPEX Emergency Contacts Directory is reviewed at least annually to check all relevant call-off contracts (refer to sections 4.1 and 4.2) are included and all contact numbers are kept up to date.

Table 2-3: External notifications matrix

Contact	Comments	Method	Timing	Responsibility
Spill in any location				
AMOSC (may assist as a support response agency).	Level 2/Level 3 spill – response agency. Alert and put on standby, as required. Activate if spill response escalates in order to mobilise spill response resources.	Phone call and email. Service contract with AMOSC to be signed by IMT Leader. Refer to Table 5-1.	As soon as practicable.	IMT Leader or delegate.
OSRL (may assist as a support response agency).	Level 2/Level 3 spill – response agency. Alert and put on standby as required. Activate if spill response escalates in order to mobilise spill response resources.	Phone call and email.	As soon as practicable.	IMT Leader or delegate.
Oil spill modelling service provider.	Provide POLREP and other relevant event information to activate real-time spill modelling as soon as practicable.	Phone call first, followed by email of modelling request form. Spill modelling request / activation forms. Refer to Table 5-1.	As soon as practicable (must be activated within 2 hours of IMT formation).	IMT Leader of delegate.
Spill in Commonwealth waters				
AMSA duty officer.	Notification is required as soon as possible after the occurrence of the event. If AMSA has already been notified by the vessel ERT, IMT to confirm situational awareness and Control Agency responsibility with AMSA.	Phone call, within two hours. From vessel, the message must begin with the code word "POLREP", then the vessel name, the IMO number and the call sign of the ship. Written report within 24 hours of a request from AMSA, via POLREP form. Refer to Table 5-1. Written update via SITREP as required, via SITREP form. Refer to Table 5-1.	Verbally, within two hours. Written POLREP, within 24 hours. SITREP as required.	Vessel Master, CSR and IMT Leader or delegate (as relevant).
NOPSEMA.	Notification of reportable incidents is required under OPPGS (E) Regulations 2009, Regulations 26, 26A and 26AA.	Phone call, as soon as possible and not later than 2 hours after the occurrence of a Level 2 or Level 3 event only. Written report within three days. Use NOPSEMA report form Report of an accident, dangerous occurrence or environmental incident (FM0831). Refer to Table 5-1.	Verbally, within 2 hours. Written within three days.	INPEX CSR, or INPEX IMT Leader or delegate (as relevant).
Commonwealth Department of the Environment and Energy (DEE).	Notification is required in cases where matters of national environmental significance (MNES) are at risk, or where there is death or injury to protected species. Permits from DEE are required to enter and undertake activities in the Commonwealth marine parks.	Phone call notification within 24 hours of becoming aware of the incident or non-conformance resulting in impacts to MNES. Written / email report within 3 days.	Verbally, within 24 hours. Written, within 3 days.	IMT Leader or delegate (as relevant).

Contact	Comments	Method	Timing	Responsibility
Spill within or heading toward an Australian Marine Park				
Director National Parks (DNP).	Notify the DNP in the event of oil pollution within or heading toward an Australian marine park (AMP), or where an oil spill response action must be taken within an AMP, so far as reasonably practicable, prior to response action being taken.	Phone call to the DNP 24-hour Marine Compliance Duty Officer: 0419 293 465. The notification should include: • titleholder details • time and location of the incident (including name of marine park likely to be affected) • proposed response arrangements as per the Oil Pollution Emergency Plan (e.g. dispersant, containment, etc.) • confirmation of providing access to relevant monitoring and evaluation reports when available; and • contact details for the response coordinator.	As soon as practicable and prior to action being taken within an AMP.	IMT Leader or delegate (as relevant).
Spill heading towards WA State waters (e.g. Browse Island, Kimberley coastline)				
WA Department of Transport (WA DoT).	Jurisdictional Authority and Control Agency for spills in WA waters. Notification is required in the event of a hydrocarbon spill which is predicted to enter WA State waters.	Phone call. Written notification by POLREP. Written update via SITREP, as required. Refer to Table 5-1.	Verbally, within two hours. Written POLREP, within 24 hours. SITREP, as required.	IMT Leader or delegate.
WA Department of Environment Regulation (DER).	Contact in the event of a hydrocarbon spill which is predicted to cause contamination of shorelines.	Phone call, as soon as practicable. Written report within 21 days.	As required.	IMT Leader or delegate.
Spill within or heading toward Defence Practice Areas				
Department of Defence.	Notification is required as soon as practicable in the event of a hydrocarbon spill which is predicted to enter the NAXA, Yampi Sound or any other defence area. Notification may be required if significant vessel mobilisations or activities are required within a Defence Practice Area to ensure response vessels have clearance to access any currently active Defence Practice Areas.	Phone call to Department of Defence – Defence Switchboard. Relevant contacts: Director General Maritime Operations, Headquarters Joint Operations Command. Assistant Secretary, Property Management Branch.	As soon as practicable.	IMT Leader or delegate.
Spill heading towards Indonesia or East Timorese waters				
Department of Industry, Innovation and Science (DIIS).	In the event that a spill is predicted to enter Indonesian or East Timorese waters, or the Joint Petroleum Development Area (JPDA), the Australian Government is required to notify the international governments. DIIS will notify the	Phone call to DIIS.	As soon as practicable.	IMT Leader or delegate, in consultation with CMT.

Contact	Comments	Method	Timing	Responsibility
	Department of Foreign Affairs and Trade, who will notify the relevant foreign government.			

2.5 Pollution report (POLREP)

A marine pollution report (POLREP) is required to be sent to AMSA for any vessel-based spill.

The POLREP should also be sent to the IMT, as it contains the relevant information necessary for the IMT to gain initial situational awareness.

The following information shall be included in the POLREP regarding any vessel spill for reporting and response planning purposes:

- the name of vessel
- the date and time of the spill
- the location of the spill
- details of the spilled material
- the source and cause of the spill
- an estimated volume of the spill
- the vessel/Facility status (stability, condition of the ship etc.)
- the estimated rate of release and maximum credible volume if the spill is ongoing
- the condition of the spill, i.e. stopped/ongoing, contained/uncontained
- the meteorological conditions:
  - air temperature
  - wind speed and direction
  - visibility
- the oceanographic conditions:
  - sea temperature
  - current speed and direction
  - Beaufort sea state.

See Table 5-1 for further information regarding POLREP template and submission timeframes.

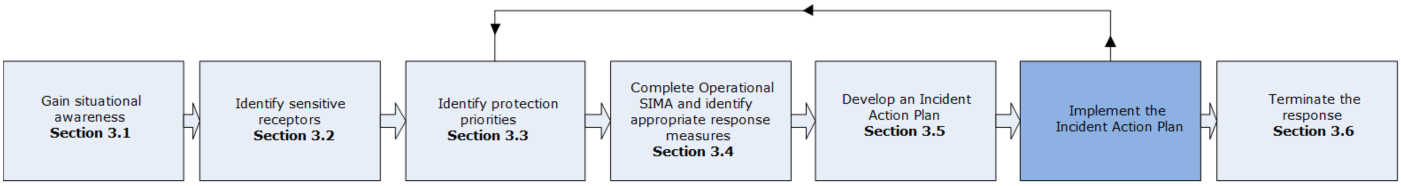
2.6 Immediate (first strike) response measures

The immediate response has been predetermined by the Operational SIMA (see Section 3.4) and must be implemented as soon as practicable, before the development of IAPs.

The immediate response for all Level 2 and Level 3 spill events is Operational Monitoring and Evaluation, as detailed in Section 4.4.1 of this OPEP.

Further details are also provided in Appendix A (OM01 and OM03).

3 Incident action plan (IAP) development



The process for identifying appropriate IAPs is illustrated in Figure 3-1.

Figure 3-1: Typical response procedure

3.1 Gain situational awareness

The IMT will gain situational awareness from all available sources including:

- Operational Monitoring and Evaluation data
- vessel or Facility POLREP
- ongoing updates from the vessel
- long-term weather forecast
- Bureau of Meteorology (BOM) weather stations
- other vessels or Facilities in the vicinity
- other operators' activities.

3.2 Identify sensitive receptors

Particular values and sensitivities with the potential to be exposed to a spill event have been identified within Section 4 of the EP.

The INPEX IMT room is equipped with maps and tools to identify actual/real-time exposure risks.

Where there is a seasonal component associated with a particular value or sensitivity, it is shown in Table 3-1.

Table 3-1: Seasonality of values and sensitivities

Values and sensitivities	Example Locations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		Month											
Coral spawning (offshore reefs)	Browse Island, Kimberley coast, Rowley Shoals, Scott Reef, Seringapatam Reef, Rowley Shoals, Hibernia Reef												
Green turtle breeding and hatching	Browse Island and Scott Reef (Sandy Islet)*												
	80 Mile Beach, Adele, Lacepede Islands, Cassini and Maret Islands**												
	Mainland east of Mary Island to mainland adjacent to Murrara Island including adjacent offshore islands												
Turtle foraging	Turtle foraging BIA												
Hawksbill turtle nesting	Scott Reef*												
Olive ridley turtle nesting	Kimberley coast*												
Flatback Turtle Nesting	Buccaneer, Bonaparte Archipelago and Eastern Kimberley (including Cape Dommett)**												
	SW Kimberley including Lacepede Islands, Echo Beach and Eighty Mile Beach*												
Humpback whale migration	Kimberley coast							Northern and southern migration					
Humpback whale calving	North-west Commonwealth Marine Reserves Network, Lalang-garram / Camden Sound Marine Park and humpback whale Biologically Important Areas (BIA)**							Whales present in calving grounds					
Blue whale and pygmy blue whale migration	Open ocean (approx. 500 m depth contour)				Northern migration					Southern migration			
Whale shark	Whale shark foraging BIA												
Dugong and Inshore Dolphins	WA coast, North Kimberley Marine Park and Roebuck Bay**												
Seabird feeding, aggregation and breeding	Marine avifauna BIA (e.g Browse Island, Cartier Island)				Breeding and foraging								
Shorebird migration	Migratory birds present in coastal habitats				Northern migration					Southern migration			
Shorebird breeding	Marine avifauna BIA and WA coastline												
Indonesian traditional fishing	Offshore islands and reefs located within the traditional fishing MoU area.												
Recreational fishing	Open ocean, WA coast												
Commercial fishing	Within and adjacent to the licence area.												

Values and sensitivities	Example Locations	Month											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Legend													
	Peak occurrence/activity (reliable and predictable)												
	Intermediate occurrence/activity (less reliable and less predictable)												
	Low occurrence/activity (may vary from year to year)												
	No occurrence												

* Source: DEE (2017).

** Source: Waples et al. (2019)

3.3 Identify protection priorities

In the event of a spill, the primary aims of the response will be aligned with the NatPlan (AMSA 2019) and the INPEX People, Environment, Assets, Reputation and Sustainability (PEARS) model and include protection of the following, in descending order of priority:

- human health and safety
- habitat and cultural resources (environmental sensitivities)
- rare and/or endangered flora and fauna (environmental sensitivities)
- commercial resources
- amenities.

Table 3-2 illustrates how shoreline protection priorities are determined. Each shoreline location is evaluated based on predicted time to contact and consequence of contact.

The level of consequence associated with identified values and sensitivities is defined within Section 8 of the EP.

Time to contact during a spill event will be based on the location and trajectory (model outputs) and visual observations of the spill.

Table 3-2: Protection priority matrix

		Time to contact			
		<24 hours	24-48 hours	48-72 hours	>72 hours
	Multiplier	4	3	2	1
Catastrophic	6	24	18	12	6
Major	5	20	15	10	5
Significant	4	16	12	8	4
Moderate	3	12	9	6	3
Minor	2	8	6	4	2
Insignificant	1	4	3	2	1

Based on the modelling results for the Group II (marine diesel) (RPS 2019) spill scenario, there are no shorelines that would be impacted at >1 g/m^2 floating oil, with no oil accumulation >1 m^3 on any shoreline from a 250 m^3 diesel spill in WA-50-L.

Note the actual survey vessel is expected to have fuel tanks of <100 m^3, as such the use of 250 m^3 diesel spill is considered conservative with regards to assessing shoreline protection priorities.

Therefore, based on the modelling results, there are no pre-determined protection priorities, as no receptors are predicted to be contacted above impact thresholds at any time. However, in the extremely unlikely event that shoreline contact occurred, this OPEP includes a description of spill response resources available to INPEX, consistent with existing capabilities stated in other INPEX OPEP’s. These are provided in Section 4.

In the event of a spill, the protection priorities identified should be confirmed by reviewing the specific information relating to the spill received from Operational Monitoring and Evaluation data and predicted time to exposure based on spill model outputs.

Note that WA DoT are the Control Agency in the event of a spill in WA State waters and have the final decision regarding protection priorities, response strategies and tactics.

3.4 Operational SIMA

Strategic spill impact mitigation assessments (SIMAs) for the vessel collision spill scenario is located in Appendix F of the EP. This OPEP provides an 'Operational SIMA Template' for the relevant spill scenario (Group II (marine diesel)). The Operational SIMA template includes a summary of key points from the Strategic SIMA.

During an oil spill emergency event, the IMT will develop an Operational SIMA by evaluating the validity of the assumptions of the Strategic SIMA, which are summarised in the Operational SIMA template including relevant ALARP considerations from Section 8 of the EP. The Operational SIMA would need to consider the specific conditions of the spill event, such as the oil type, spill location and trajectory, the sea state and weather forecast, environmental sensitivities and seasonality, which may have a bearing on the effectiveness and feasibility of implementing various responses.

The outcome of the Operational SIMA will be used in development of the IAP(s).

The Operational SIMA shall remain as a record of the reasoning behind the selection or elimination of various response measures during an actual event.

The Operational SIMA and IAP may need to be revised if additional information arises.

See Table 3-4 for the Operational SIMA templates for Group II spills.

Table 3-3: Operational SIMA template - Group II/Diesel spills

Response measure	Strategic SIMA Summary	ALARP Summary	Operational SIMA comments	IMT Leader sign-off
Operational Monitoring and Evaluation	Operational Monitoring and Evaluation will provide timely information to the IMT, enabling situational awareness to assist with IAP development, implementation and termination of oil spill response strategies. Operational monitoring and evaluation **shall** be implemented for any Level 2/3 spill.	Prioritise the activation of the following activities: Oil Spill Trajectory Modelling, Aerial Surveillance, and deployment of oil spill tracker buoys. Consider the flammability levels and VOC exposure for any oil spill tracker buoy deployments and aerial/vessel observation tasks. Use of crew change helicopters for aerial surveillance should only be during initial stages of a spill, and only when helicopters are not required for other emergency tasks. Longer-term aerial surveillance operations should utilise fixed-wing aircraft. Trained aerial observers should be arranged for longer-term aerial surveillance operations. Vessel surveillance is less efficient than aerial surveillance. Data from opportunistic vessels sightings can be collected, but this should not be a primary strategy for visual observations of slicks over large areas. Consider satellite imagery acquisition to complement longer-term aerial surveillance programs and support OSTM validation.		
Shoreline clean-up	Shoreline clean-up has been consistently found to not enhance ecological recovery of oiled coastlines (Sell et al. 1995) but it may protect other resources in the area, such as birds, marine mammals or subtidal habitats including coral reefs or fish farms (CSIRO 2016). Choosing a particular clean-up technique is dependent on factors such as shoreline type, exposure, sensitivity, amount of oil, persistence of oil, toxicity of oil and rate of natural oil removal (IPIECA 2015). The clean-up of Group II spills on a shoreline is likely to be difficult, generating high volumes of waste in comparison to the volume of oil recovered. Most offshore island shorelines would be expected to 'self-clean' any accumulated Group II oils, due to the lack of adhesiveness of these oil types, the coarse substrate, the high wave energy and high tidal regime. Sensitive shorelines with lower energy, such as mudflats and mangroves on the WA/NT coastline and any coral reefs would likely be damaged by the physical activities associated with shoreline clean-up, and therefore these locations would also be left to self-clean.	Weathered diesel is a relatively non-adhesive oil and is not expected to form a thick adhesive layer on a shoreline. Utilise Operational Monitoring and Evaluation data (including shoreline clean-up assessments) to determine the likely success of any shoreline clean-up response compared to allowing natural weathering to occur. Shoreline clean-up techniques should focus on manual clean-up techniques, such as the use of rakes and shovels. Mechanical clean-up equipment (graders, loaders etc) should not be used to physically collect oil. However, small mechanical aids (e.g. rubber tracked bob-cats) can be used to assist in moving collected oily waste around a shoreline. Careful planning of track routes is required to avoid disturbance of any turtle/bird nesting sites. Personnel and equipment transport to and from the shoreline would be by small utility helicopter and/or vessels. Low sea-states and calm weather are required for use of vessels for shoreline landings. Tide forecasts should also be consulted to ensure appropriate and safe vessel activities. A large support vessel or Facility (with a helicopter pad, if relevant) would need to be used as the accommodation and logistics base for shoreline response personnel at remote locations. Upon successful clean-up of the shoreline, bulka bags/IBCs containing oily contaminated waste would be transferred by helicopter or landing barge to a support vessel, for further transport to the mainland for appropriate disposal with a licenced waste contractor. In general, to reduce wildlife disturbance on small, offshore remote locations, a longer duration response with minimum numbers of response personnel required to achieve the IAP objective is desired.		

Response measure	Strategic SIMA Summary	ALARP Summary	Operational SIMA comments	IMT Leader sign-off
Pre-contact oiled wildlife response	Group II hydrocarbons are not likely to generate a thick surface layer on the ocean surface or on a shoreline. Therefore, there is reduced potential to coat adult nesting turtles or turtle hatchlings as they transit to the ocean, or coat large numbers of seabirds. Wildlife hazing can be an effective control measure when deployed across a limited geographical area and against specific wildlife population, where the surface oil resulting from a spill is largely contained, e.g. at a beach/specific shoreline. Capture and translocation of turtles (adults and hatchlings) from a shoreline to an area away from the slick may provide an environmental benefit, however minimising the time during which turtles (especially hatchlings) are in captivity is critical to success of the operation. Wildlife hazing in the open ocean is inherently unlikely to be effective due to a number of limitations, including numbers of vessels required and associated safety issues, ongoing spread and movement of the slick and hazed animals moving into adjacent areas of the slick. Attempting to capture large numbers (or an entire flock) of healthy seabirds would be very challenging, if not impossible (DPaW and AMOSC 2014), especially at a remote shoreline location (e.g. Browse Island). There is no practicable method to capture healthy seabirds at sea (DPaW and AMOSC 2014). Potential harm to healthy seabirds could occur during the capture process. Any seabirds released would likely fly back to the shoreline from which they originally were captured. Long term veterinary care (e.g. feeding) would be required for any successfully captured birds, until spill weathering or remediation has occurred, and it was safe to release the animals. Animals would be under stress while in veterinary care/rehabilitation facilities and potentially exposed to human and zoonotic diseases, which could be spread to wild populations upon their release.	Wildlife hazing or wildlife capture and translocation in the open ocean should only be considered when Operational Monitoring and Evaluation data clearly indicates that a positive outcome could be achieved. The merits of wildlife hazing or wildlife capture and translocation at a shoreline should be considered by the IMT when Operational Monitoring and Evaluation data indicates that populations of wildlife on a shoreline may be at risk of an inbound spill and conditions are suitable for this activity to occur. There are significant manual handling risks associated with translocating adult turtles, (adult green turtles are often >100kg), which need to be evaluated and managed if this activity is to occur. Therefore, translocation of turtle hatchlings is more likely to be successful. Wildlife response personnel and equipment transport to and from the shoreline would be by small utility helicopter and/or vessels. Low sea-states and calm weather are required for use of vessels for shoreline landings. Tide forecasts should also be consulted to ensure appropriate and safe vessel activities. A large support vessel or Facility (with a helicopter pad, if relevant) would need to be used as the accommodation and logistics base for shoreline response personnel. In general, to reduce wildlife disturbance on small, offshore remote locations, a longer duration response with minimum numbers of response personnel required to achieve the IAP objective is desired.		

Response measure	Strategic SIMA Summary	ALARP Summary	Operational SIMA comments	IMT Leader sign-off
Post-contact oiled wildlife response	Group II hydrocarbons are relatively non-adhesive compared to crude oils, and generally not considered an oil product that would 'coat' the feathers of birds, requiring a full wildlife cleaning response on a shoreline. They are also not likely to generate a thick surface barrier on a shoreline which would coat adult nesting turtles or turtle hatchlings as they transit to the ocean. Capture, relocation, assessment, cleaning and rehabilitation of oiled wildlife has the ability to increase the survival of individuals. ITOPF (2011) note that there are many cases where oiled turtles have been cleaned successfully and returned to the water. Once oiled, it is generally agreed that the bird species present in the Browse Basin region will have very low survival rates, even when rescue and cleaning is attempted. Any seabirds captured, cleaned and released would likely fly back to the shoreline from which they were originally captured. Therefore, long-term veterinary care (e.g. rehabilitation, feeding, etc.) would be required for any successfully captured birds, until spill weathering or remediation had occurred, and it was safe to release the seabirds. Animals would be under stress while in veterinary care/rehabilitation facilities and potentially exposed to human and zoonotic diseases, which could be spread to wild populations upon their release.	Oiled wildlife capture in the open ocean should only be considered when Operational monitoring and evaluation data clearly indicates that a positive outcome could be achieved. The merits of wildlife capture, cleaning and rehabilitation at a shoreline should be considered by the IMT when Operational Monitoring and Evaluation data indicates that populations of wildlife on a shoreline have been impacted by the spill and conditions are suitable for this activity to occur. Wildlife response personnel and equipment transport to and from the shoreline would be by small utility helicopter and/or vessels. Low sea-states and calm weather are required for use of vessels for shoreline landings. Tide forecasts should also be consulted to ensure appropriate and safe vessel activities. A large support vessel or Facility (with a helicopter pad, if relevant) would need to be used as the accommodation and logistics base for shoreline response personnel, including temporary oiled wildlife stabilisation facility. In general, to reduce wildlife disturbance on small, offshore remote locations, a longer duration response with minimum numbers of response personnel required to achieve the IAP objective is desired.		

3.5 Develop an Incident Action Plan

The IMT shall prepare an IAP once it has gained accurate and reliable situational awareness, reviewed protection priorities and completed the Operational SIMA. Note that this section should be read in conjunction with the INPEX Australia Incident Management Plan (0000-AH-PLN-60005) which contains descriptions of IMT roles and the emergency management competency training associated with these roles.

An IAP is typically prepared for response activities beyond the immediate response measures (first strike) timeframe.

The IAP shall:

- establish the overall incident response objectives and strategies – determine what is to be achieved, where, when and by whom?
- ensure continuity of incident control – decisions are made and agreed at one location and cascaded down
- provide for effective use of resources – usage is coordinated from one central location, facilitating more accurate planning and resource allocation.

The IAP shall be the mechanism for oil spill management from the moment it comes into force through to the termination of the response. The intent is that it is used to direct response operations while ensuring that everyone involved in the response is mitigating identified risks and working towards the same objectives and priorities. It shall therefore:

- provide responders with clear strategies on what needs to be done
- supply information on the resources, methods and protocols to be used in order to keep the entire response effective
- provide documentation regarding the decisions, strategies, safety concerns, plans and other key pieces of information critical to achieving the incident response objectives. It will be the document referred to when dealing with post-incident analysis on issues such as cost and legal requirements, as well as the overall effectiveness of the response and its personnel.

The IAP shall be documented and given a period of operational validity (from–to date and time). The plan shall be revisited and updated prior to the next operational period.

The basic steps for IAP development are provided in Table 3-5 and a copy of the INPEX IAP template (PER-20153316130) is provided in Appendix B.

Table 3-4: IAP development

Step	Action
1.	Incident objectives are set. The IMT Leader shall approve the objectives.
2.	IMT tactics meeting to develop supporting strategies and tactics to achieve incident objectives. This involves identifying strategies and tactics that when implemented will achieve incident objectives.
3.	Information is collected in preparation for a planning meeting. Includes resource identification and availability, safety requirements, environmental impact, potential and current situation reports and maps to support the plan to achieve the identified objectives.
4.	Planning meeting to compile information to complete IAP. An overview of the proposed plan is given to the full IMT. This includes the general concept, work assignments, resources, incident projections and an estimated impact of strategies in containing/controlling the incident. After review, any amendments should be captured and incorporated into an overall plan.
5.	IAP developed and approved by IMT Leader. IMT members responsible for areas of plan development provide information for inclusion in the IAP. The IAP is approved by the IMT Leader.
6.	Operations briefing. A briefing is given to inform all members of the IMT and those implementing the plan so they are aware of the planned actions and any specific task allocations they are required to complete. This shall include any safety considerations and need to provide status updates and briefings on incident progress. In early stages of an incident this may be an oral briefing only. In later stages, it is anticipated this will involve written material to support the oral briefing.
7.	IAP dissemination and execution. The IAP is circulated and planned actions and tasks to meet plan objectives are completed as per plan requirements.
8.	Progress against incident objectives is assessed. Situation reports and status briefings provide progress against the objectives and identify any obstacles to achieving objectives. This information is the commencement point for the development of the IAP for the next operational period.
9.	Return to item 1 and develop plan for next operational period as defined by the IMT Leader.

3.6 Response termination

The termination of a response to a Level 2 or Level 3 spill within Commonwealth waters shall be only when the following conditions have been fulfilled, as determined by the IMT Leader, in consultation with AMSA, DEE and AMOSC:

- when the source of the spill has been stopped
- when the objectives of the Incident Action Plans have been met
- when there are no further practicable steps that can be taken to respond to a spill.

The termination of a response to a spill which has entered WA state waters will be the responsibility of WA DoT.

Relevant factors to consider for termination of each response strategy is provided within each strategy sub-section in Section 4.

Termination criteria for the Operational and Scientific Monitoring Programs (OSMP) are detailed in Appendix A.

4 Spill Response Resources

4.1 Support vessel availability

INPEX maintain a range of support vessel call-off contracts with various support vessel providers. Call-off contracts allow for mobilisation of available support vessels, including for oil spill response.

Support vessel contracts range from small ~10–40 m support vessels and landing barges for coastal/nearshore, or light weight equipment activities offshore, to larger ~50–130 m offshore support vessels capable of long-duration responses activities.

Large offshore support vessels can be used as accommodation support vessels, for shoreline response activities. Large vessels with helicopter pads will facilitate faster, more efficient crew changes, which could be required during long duration response activities, or support a light utility helicopter, if required for shoreline response activities.

INPEX requires all vessels to comply with the INPEX Marine Standard (0000-AG-STD-60002) and Vessel Inspection Work Instruction (0000-AG-WIN-60029), which includes processes to enable rapid inspection and approval for use of vessels in emergency situations. In an emergency event where a vessel may be required immediately and is unable to meet marine inspection procedure requirements, the Marine Manager or delegate shall perform a suitable audit of the vessel, which may be performed as a desktop exercise.

The IMT Leader is responsible for the activation and mobilisation of support vessels under the 'manual of authorities' specified in the INPEX Emergency Management Guideline (PER-2150838677).

Contact details to activate the available support vessel contractors are listed in the INPEX Emergency Contacts Directory (PER-2153095942).

4.2 Aviation asset availability

INPEX maintains a range of aviation support call-off contracts with various fixed-wing aircraft and helicopter providers. These call-off contracts allow for mobilisation of available aviation assets, including for oil spill response.

Crew change helicopters can be used for routine crew change activities to approved helicopter pads.

Fixed wing aircraft are best suited to ongoing aerial observations.

Light utility helicopters can be mobilised for specific tasks such as mobilisation of personnel and equipment and removal of waste from remote shoreline locations, or for operational monitoring and evaluation at remote shorelines, where close inspection is required.

INPEX requires all aircrafts to comply with the INPEX Aviation Standard (0000-AG-STD-60003). In an emergency event where an aircraft may be required and is unable to meet the INPEX Aviation Standard, the Aviation Manager or delegate shall perform a desktop risk assessment, taking into account the nature of the proposed activity and its urgency, before making any exemption.

Contact details for the available aviation asset contractors are listed in the INPEX Emergency Contacts Directory (PER-2153095942).

4.3 Oil Spill Preparedness and Response Register

INPEX maintains an internal Oil Spill Preparedness and Response Register (PER-2153236568).

This register is maintained on INPEX's Document Management System (DMS) https://dms.inpex.com.au/D2/?docbase=INPEX_per_prod&locateId=0901e2408085789c

It can be accessed during any spill event and includes the following information:

- INPEX oil spill response key contracts
- INPEX personnel trained in oil spill response and their level of training
- INPEX oil spill satellite tracking buoys – including their location, servicing schedule and log-in details to the satellite tracking website
- AMOSC equipment register(s) and trained aerial observers
- OSRL support capabilities and activation processes
- Broome, Darwin Port and AMSA stockpile inventory lists, including oiled wildlife response kits.

4.4 Immediate (first strike) response measures and relevant arrangements (resources and equipment)

For the recommended response strategies identified within Operational SIMAs (Section 3.4), a summary and demonstration of preparedness is provided below.

4.4.1 Operational Monitoring and Evaluation

Operational Monitoring and Evaluation does not in itself control or reduce the impacts of the spill; however, it allows response team managers/IMT to maintain situational awareness. This is vital in a number of respects as it:

- addresses some of the key information requirements necessary for spill management:
  - where the spill is
  - how big it is
  - where it is going
  - how long it will take to get there.
- facilitates internal and external initial notification and subsequent reporting
- provides information critical for identifying sensitive receptors under threat, identifies protection priorities, and informs Operational SIMA and IAP development
- identifies the trajectory of the spill and thereby defines the potential stakeholders and environment that may be affected (EMBA) by the oil. This will inform any subsequent scientific monitoring and recovery phase actions.

Depending on the spill type and volume, Operational Monitoring and Evaluation techniques that may be used to gain situational awareness could include:

- oil spill trajectory modelling
- electronic surface tracking buoy(s)
- aerial surveillance
- vessel surveillance
- satellite imagery analysis.

The Operational Monitoring and Evaluation program is effectively comprised of Oil Spill Trajectory Modelling (OM01) and Oil Spill Surveillance and Reconnaissance (OM03). Additional details are provided in Section 4.7 and Appendix A.

Termination of the response will be determined by the IMT in collaboration with relevant stakeholders. This decision will take into consideration factors such as whether:

- the source of the spill has been stopped
- the objectives of the IAPs have been met
- there are no further practicable steps that can be taken to respond to a spill
- whether cleaning techniques have become ineffective
- whether pre-agreed criteria on the level of clean have been achieved and thus situational awareness can be terminated or scaled down
- termination criteria for OM01 and OM03 specified in Appendix A.

Oil spill trajectory modelling

Oil spill modelling can be used to forecast the trajectory and fate of oil plumes resulting from surface or subsurface releases. It can be initiated almost immediately and provides rapid results. However, its accuracy depends on the spill estimates and the predicted metocean data, as well as the reliability of forecasts of wind speed and direction.

Oil spill trajectory modelling is an iterative process, whereby real-time observations from vessel/aerial surveillance, electronic surface tracking buoy data and/or satellite imagery, is used to refine modelling predictions, using both hindcast and forecasting techniques.

INPEX maintain a contract with an oil spill trajectory modelling provider, which enables 24-hour per day access to real-time oil spill modelling capability. Contact details for the provider are contained in the INPEX Emergency Contacts Directory (PER-2153095942) and oil spill trajectory modelling activation forms can be accessed via the INPEX Oil Spill Forms Register (PER-2153332031) (Table 5-1).

Further details regarding oil spill trajectory modelling are provided in Appendix A (refer OM01).

Electronic surface tracking buoys

Electronic surface tracking buoys can be rapidly deployed at, or near to, the site of a spill, from support vessels or helicopters. Thereafter, they drift with the surface currents (their design minimises wind influence). The buoys transmit their global positioning system (GPS) location in near real-time, and the data is delivered to an online data management portal. The buoys enable the trajectory of surface oil to be tracked. However, they are not able to provide information on the direction or strength of subsurface currents, nor the trajectory of dissolved and entrained oil resulting from a subsurface spill.

INPEX maintains ten electronic surface tracking buoys to be strategically placed across various work activities. At least one tracking buoy will remain onshore so it could be deployed from the air to any spill location. It should be noted, however, that deployment of articles from aircraft, including satellite tracking buoys, require Civil Aviation Safety Authority (CASA) permission. INPEX will consider initiating a special helicopter deployment from Broome/Darwin if required, and if CASA permission can be achieved.

For the duration of the survey, a tracking buoy will be located on the CPF available for immediate deployment.

Aerial surveillance

Aerial observation is a very effective way of establishing the location and extent of a spill and verifying predictions of its movement and fate. The INPEX Oil Spill Observation and Dispersant Application Guide (refer to Table 5-1) provides additional guidance on estimating extent and volume of the spill. Key considerations associated with this activity are as follows:

- Flights shall be made regularly and where possible timed at the beginning or end of each day so that results can be used by the IMT and other response agencies.
- Flight paths and timetables should be coordinated.
- Aerial observers shall be trained, experienced and able to reliably detect, recognise and record oil pollution at sea.
- Preferably, there should be a consistency of at least one observer throughout a series of flights, so that variations in reports reflect changes in the state of oil pollution and not differences between the perceptions of observers.
- Aircraft used for aerial observation should preferably feature good, all-round visibility.
- Over the open sea, the use of fixed-wing aircraft (rather than helicopters) is preferable, due to their superior speed and range. The extra margin of safety afforded by a twin-engine or multi-engine aircraft is essential. However, helicopter observations may be required to allow for closer inspection of shorelines, such as at Browse Island or WA coastlines.
- Weather conditions can affect visibility and may therefore make surveillance flying impractical.
- The minimum deployment time of surveillance aircraft and personnel is typically in the order of 24 hours.
- Aircraft of opportunity with untrained observers, such as helicopter flights on crew change and Coastwatch aircraft (via AMSA) can also be requested to provide any relevant information available to them, which may improve situational awareness.

Vessel surveillance

Oil spill surveillance can be carried out from vessels, although its practicality is limited by the number of available vessels and the scale of the spill.

For smaller spills, their dimensions, direction of travel, colour and state of weathering can be reasonably well estimated and reported. For large spills, it would be difficult to accurately estimate the size of a slick from the bridge of a vessel because sight is limited to the horizon. However, it would be possible to determine what is happening to the oil, such as its colour, thickness, weathering and the slick’s direction of travel.

Satellite imagery analysis

Satellite-based remote sensors can be used to detect oil on water and, because such images cover extensive sea areas, they can provide a comprehensive picture of the overall extent of pollution from a spill. The sensors used include those operating in the visible and infrared regions of the spectrum, and synthetic aperture radar (SAR).

Optical observations of oil require clear, daylight skies, thereby severely limiting the application of such systems. SAR, on the other hand, is not limited by the presence of cloud and, since it does not rely on reflected light, remains operational at night. However, radar imagery often includes a number of anomalous features, or false positives, such as algal blooms, wind shadows and rain squalls, which can be mistaken for oil. Consequently, the imagery requires expert interpretation.

The minimum time for satellite imagery in the licence area from commercial suppliers is anticipated to be between 24 and 48 hours.

Arrangements and capabilities

The arrangements and capabilities as described in the subsections above are summarised in Table 4-1.

Table 4-1: Arrangements and capabilities – Operational Monitoring and Evaluation

Technique	Resource capability and availability	Implementation time	Activation
Oil spill trajectory modelling (OSTM)	INPEX maintain a contracted spill modelling service provider for 24-hour support.	OSTM activated within 2 hours of IMT formation.	IMT via the INPEX Emergency Contacts Directory (PER-2153095942). Trajectory modelling activation forms in Table 5-1.
Aerial surveillance	Aviation assets, crew change helicopters and fixed wing aircraft.	Information from project assets (crew change helicopters) will be available within 5 hours (daylight hours only).	IMT via the INPEX Emergency Contacts Directory (PER-2153095942) and the Oil Spill Preparedness and Response Register (PER-2153236568).
	Trained aerial observers can be sourced via AMOSC/AMSA and mobilised to an aircraft.	Within 48 hours.	
Vessel surveillance	Smaller support vessel assets less than 40 m in length.	Commence mobilisation in Broome/Darwin within 24 hours.	IMT via the INPEX Emergency Contacts Directory (PER-2153095942) and the Oil Spill Preparedness and Response Register (PER-2153236568).
	Larger platform support vessels.	Commence mobilisation in Broome/Darwin within 48 hours.	
Electronic surface tracking buoy(s)	INPEX has several surface tracking buoys which it positions at operational locations, as deemed appropriate by INPEX. At least one tracking buoy will be maintained onshore (i.e. at Broome or Darwin) which can be deployed from an aircraft to any spill location (if CASA has granted permission to undertake this aerial deployment activity).	Immediately from the CPF or other location (INPEX vessel) within WA-50-L. <24 hours for tracking buoys located at other operational locations / onshore to be deployed by other vessels of opportunity.	Tracking buoy locations managed via the Oil Spill Preparedness and Response Register. Tracking buoys deployed from vessels or aircraft, as directed by the Vessel Master/CSR or IMT. Tracking buoy online tracking tool activated by IMT.
Satellite imagery analysis	Sourced via OSRL and/or AMSA.	Images within 48 hours.	IMT via the INPEX Emergency Contacts Directory (PER-2153095942) and the Oil Spill Preparedness and Response Register.

4.5 Secondary response measures and relevant arrangements (resources and equipment)

4.5.1 Shoreline clean-up

The IMT shall consider all Operational Monitoring and Evaluation data to determine potential or actual shoreline contact and potential impacts. The INPEX IMT will need to consider, in consultation with WA DoT, the practicalities, likely success and risks associated with a shoreline clean-up operation, compared with allowing stranded oil to naturally weather.

More detailed planning regarding a shoreline clean-up are available in the Browse Island Oil Spill IMG (X060-AH-GLN-60015). This document also provides guidance on response at any remote shoreline.

There are several logistical options available to conduct shoreline clean-up at Browse Island or other remote shoreline locations.

If weather/sea state conditions are benign, a fully vessel based logistical solution may be practicable. This would involve the use of an accommodation support vessel (ASV) as the Forward Operating Base (FOB), and tenders/landing barges to move people and equipment between the FOB and the shoreline.

If weather conditions or other factors preclude the use of small landing craft, light utility helicopters, launched from an ASV helideck would be required.

Crew changes could occur via vessel or crew change helicopter, depending on the situation.

A shoreline clean-up would most likely involve the mobilisation of personnel and manual cleaning equipment such as rakes and shovels, to remove the oil from the shoreline. Oily contaminated waste would be stored in impermeable bulka bags or other similar small impermeable waste collection containers. The oily waste containers would then most likely be backloaded to the ASV, either using a landing barge or slung underneath a light utility helicopter. The waste would then transport to shore for appropriate disposal.

Large mechanical equipment such as graders would not be appropriate for remote shoreline clean-up (risk of secondary contamination and general difficulty in mobilising this equipment). However, smaller machines such as rubber tracked bob-cats could be used to help transport collected oily waste and other response equipment around the shoreline.

There are significant logistical constraints and HSE risks with flying personnel in light utility helicopters to remote offshore locations or operating out of small vessels at remote offshore locations. Also, there is the potential disturb wildlife populations on small islands by landing large numbers of response personnel. Therefore, the number of shoreline response personnel working in remote locations at any one time will be agreed in consultation with the WA DoT but is likely to be limited to between 20 and 30 people at any one location.

In a typical shoreline response, a worker is expected to clean between 0.5 to 1.0 m^3 of oily waste per day. Given the hot climates of the Browse Basin, a lower estimate of 0.5 m^3 of oily waste, per person, per day would be appropriate.

Depending on the duration of the operations, this may require the establishment of a one or two week on/off roster system, drawing on trained personnel from AMOSC, and other labour hire sources, until the response is terminated.

A decontamination staging post would be established at the clean-up location to enable decontamination of equipment and personnel before demobilisation at the end of each day. Ultimately, all contaminated equipment and personal protective equipment (PPE) would be back-loaded from the location to the mainland for cleaning or appropriate disposal.

During any shoreline clean-up, a daily progress report will be provided by the response team to the IMT Leader regarding the effectiveness of the activity. The report shall include, as a minimum:

- date(s), time(s) and location(s) of shoreline clean-up activities
- the volume of oily waste generated and disposed of
- the overall effectiveness of shoreline clean-up activities (including photographic evidence, where possible).

Shoreline clean-up operations are often considered in three stages; Stage 1 - bulk oil is removed from the shore to prevent remobilisation; Stage 2 - removal of stranded oil and oiled shoreline material which is often the most protracted part of shoreline clean-up, and; Stage 3 - final clean-up of light contamination and removal of stains, if required. Depending upon the nature of the contamination, progression through each of these stages may not be required, depending on the termination criteria set by the IMT.

Termination criteria highlight when continuing clean-up activities may be detrimental to recovery as well as costly (Ecosystem Management and Associates 2008). Termination of response will be determined by the IMT in collaboration with relevant stakeholders and will consider factors including the following:

- the safety of responders
- the current effectiveness of the response
- deteriorating weather conditions (including wind, visibility and sea conditions).

AMSA present guidelines for agreed environmental values and acceptable levels of clean which are useful in guiding the IMT. AMSA (2019) note that the response for shorelines should be terminated when remaining residues are not going to inhibit potential recovery through toxic or smothering effects. Also, ITOPF (2002) suggest the use of three questions to determine when termination of the response should occur:

1) Is the remaining oil likely to damage environmentally sensitive resources?
2) Does it interfere with the aesthetic appeal and amenity use of the shoreline?
3) Is this oil detrimental to economic resources or disrupting economic activities?

If the answers to the questions are no, then there is no rationale to continue shoreline clean up. Ecosystem Management and Associates (2008) suggest that activities can conclude on exposed rocky shores when the shoreline no longer generates sheens that affect sensitive wildlife.

The final decision on whether to activate and terminate a shoreline clean-up response will remain with the WA DoT, as the Control Agency for the WA shorelines.

Arrangements and capabilities

The arrangements and capabilities as described in the subsections above are summarised in Table 4-2.

Table 4-2: Arrangement and capabilities – Shoreline clean-up

Technique	Resource capability and availability	Implementation time	Activation

Shoreline clean-up personnel	Under the WA DoT State Hazard Plan – Marine Environmental Emergency, the relevant Control Agency (WA DoT or INPEX for Commonwealth lands) will provide the On-Scene Commander / Division Commander.
	Trained shoreline response personnel would be available through AMOSC Core Group.
	• Additional personnel, who would receive on the job training would be sourced from:
	  ○ INPEX environmental service providers
	  ○ INPEX general offshore labour hire contracts
		24 hours to mobilise personnel to Broome/Darwin to board vessels and/or helicopters.	IMT via the Emergency Contacts Directory (PER-2153095942).

Shoreline clean-up equipment	Shoreline clean-up equipment can be mobilised from the Broome or Darwin stockpiles. Additional shoreline clean-up equipment can be mobilised through AMOSC/AMSA Tier 2/3 stockpiles, or it can be purchased/hired from retail outlets in Broome/Darwin.	24 hours to mobilise shoreline response equipment from the warehouse to a support vessel alongside in Broome/Darwin Port.	IMT via Emergency Contacts Directory (PER-2153095942) and the Oil Spill Preparedness and Response Register (PER-2153236568).
Helicopters	Crew transfer helicopters (for personnel transfer to designated landing zones only, not to remote shoreline beaches).	Within 5 hours.	IMT via the Emergency Contacts Directory (PER-2153095942) and the Oil Spill Preparedness and Response Register (PER-2153236568).
	Utility helicopters suitable for landing on remote shorelines are available via INPEX aviation call-off arrangements.	Within 7 days.	
Vessels	Smaller support vessel assets <40 m in length.	Commence mobilisation in Broome/Darwin within 24 hours.	IMT via the Emergency Contacts Directory (PER-2153095942) and the Oil Spill Preparedness and Response Register (PER-2153236568).
	Larger platform support vessels / accommodation support vessels.	Commence mobilisation in Broome/Darwin within 48 hours.	

4.5.2 Pre-contact and post-contact oiled wildlife response

The INPEX IMT shall consult AMOSC for advice regarding any wildlife response activities, as well as consult the DEE (as the Jurisdictional Authority for wildlife in Commonwealth waters), for any risks from the spill to MNES (including oiled wildlife).

The INPEX IMT shall also consult, via WA DoT, a WA DBCA 'oiled wildlife adviser' to provide support to for any wildlife response activities, including obtaining permits to conduct an OWR in WA State waters and/or Commonwealth waters, as stated above. OWRs along the WA shoreline areas are managed under the West Kimberley Region Oiled Wildlife Response Plan (DPaW and AMOSC 2015).

More detailed planning regarding a shoreline wildlife response is also available in the Browse Island Oil Spill IMG (X060-AH-GLN-60015). This document also provides guidance on response at any remote shoreline location.

AMOSC maintains an 'oiled wildlife response capability register' on behalf of industry to support OWRs. The AMOSC register maintains currency of potential resources, such as:

- equipment and the locations of stockpiles
- response personnel (including global OWR specialists such as Sea Alarm)
- training/exercise materials
- aid (national and international).

WA DBCA and AMOSC have collaboratively developed an OWR model (shown in Figure 4-1) that is based on a small number of OWR adviser(s) who receive specific training at an IMT level to manage an OWR. At a site-management level this is further broken into 'OWR Field Management' who are moderately trained to supervise field response, such as the WA DBCA oiled wildlife advisors and the AMOSC OWR team.

The Oiled Wildlife Rehabilitators Network (fauna care/rehabilitation volunteers, vets, zoo personnel, etc.) is a group of more than 100 Western Australian personnel who have been trained in physical oiled wildlife capture, cleaning, rehabilitation and using the dedicated OWR containers maintained by AMOSC and WA DoT. The Oiled Wildlife Rehabilitators Network personnel are available on a volunteer basis. The list of current personnel is maintained and activated by the WA DBCA.

Philip Island Nature Park (Victoria) have over 100 personnel also trained in OWR. These personnel are available, under a 'best endeavours' MoU agreement with AMOSC.

'General Field Responders' are personnel who receive basic 'just-in-time training' to carry out tasks as directed by personnel with higher levels of OWR training. INPEX maintain service agreements with various environmental service providers and general labour hire companies who can provide personnel to assist as general field responders, who would receive on-the-job training to assist with wildlife response activities.

The OWR Division Coordinator (within the IMT) may engage with qualified veterinarian specialists' to provide in-field expertise and technical support to the OWR Coordinator.

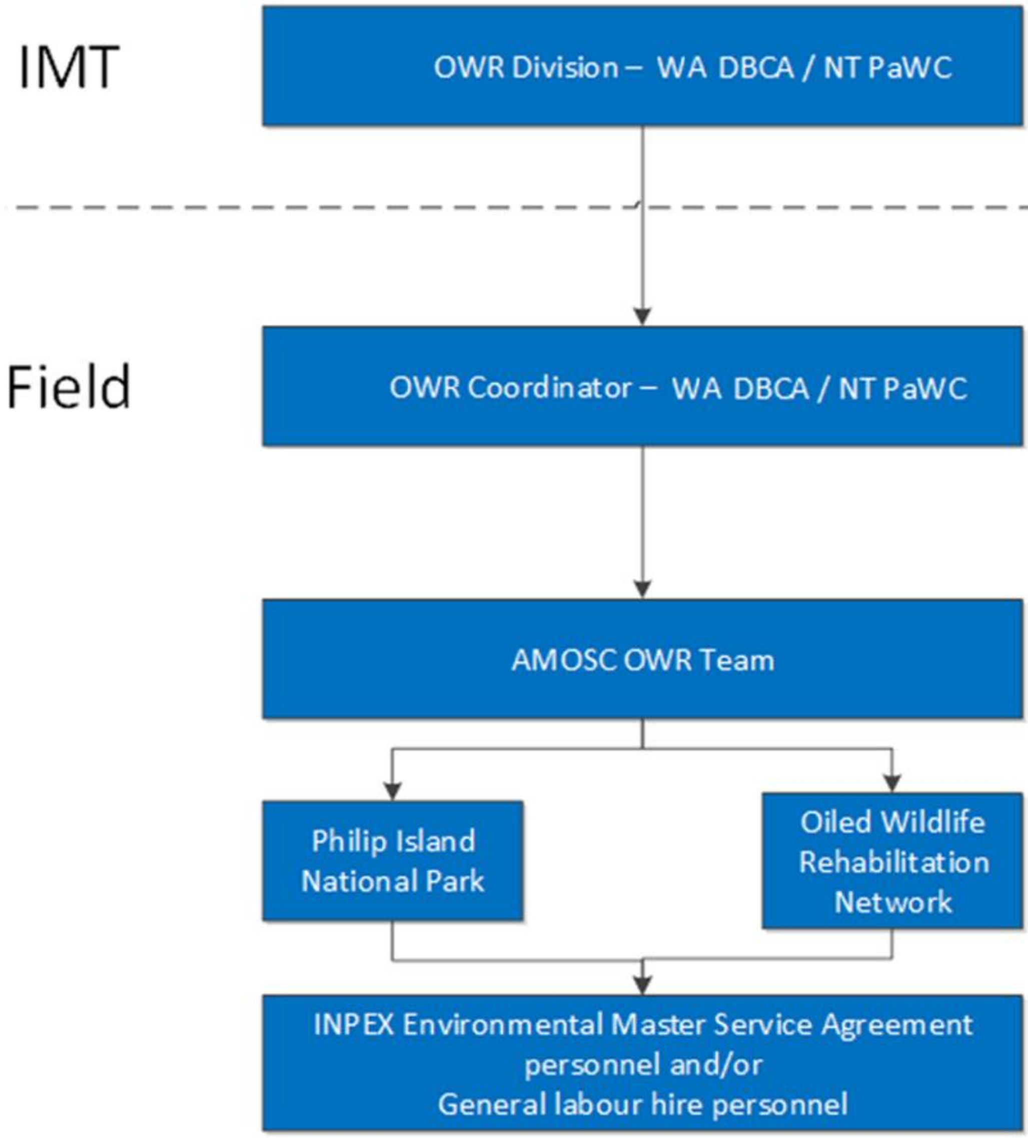


Figure 4-1: Oiled Wildlife Response Division model

There are significant logistical constraints and HSE risks with flying personnel in light utility helicopters to remote offshore locations or operating out of small vessels at remote offshore locations. Also, there is the potential to disturb wildlife populations on small islands by landing large numbers of response personnel. Therefore, the number of oiled wildlife responders working in remote locations at any one time will be agreed in consultation with the WA DBCA oiled wildlife response coordinator but is likely to be limited to between 20 and 30 people at any one location. Depending on the duration of the operations, this may require the establishment of a one or two week on/off roster system, drawing on trained personnel from AMOSC, Oiled Wildlife Rehabilitators Network, WA DBCA and WA DoT (as discussed above), until the response is terminated.

WA DBCA (previously DPaW) (DPaW pers. comm. 2016)[1] indicates that shore-based response priorities would generally consider the following fauna:

- Priority 1: birds endangered, threatened or protected by treaty
- Priority 2: common birds
- Priority 3: adult nesting female turtles (wipe down only)
- Priority 4: turtle hatchlings (potential translocation).

Response priorities at the time will be finalised in consultation with the WA DBCA 'oiled wildlife adviser'.

Under specific circumstances, pre-contact wildlife response could potentially be used to prevent or reduce the impacts of a spill on populations of seabirds and turtles. It is most suitable when used on wildlife affected by persistent oily slicks; however, it may also be considered for residuals from a Group II spills. Operational Monitoring and Evaluation of the spill would provide data regarding spill trajectory and potential wildlife that may be affected by the spill.

Wildlife hazing can be an effective control measure when deployed across limited geographical areas and against specific populations, where the surface oil resulting from a spill is largely contained. Hazing could potentially be used to deter marine fauna, seabirds and shorebirds from entering a spill area. It is not an effective measure against volatile spills which rapidly evaporate, nor does it have particular application against dissolved or dispersed oils.

Techniques include:

- vessel traffic that generates underwater noise and motion
- vessel air horns (where available) to create above-water noise
- vessel fire hoses that direct streams of water in front of whales and other fauna.

Oiled wildlife capture at sea is also theoretically possible; however, it would present significant challenges.

The capture and relocation of turtle nests/eggs prior to oil arrival or following oil arrival onshore to prevent oiling of emerging hatchlings could be achieved using translocation and release. Onshore incubation and release of hatchlings at alternative locations away from the oil spill is possible, as noted in the Gulf of Mexico oil spill where personnel successfully relocated and incubated approximately 25,000 turtle eggs and successfully released approximately 15,000 turtle hatchlings (which is roughly the same proportion as natural hatchling success) (Gaskill 2010).

Helicopter transport is preferred over vessel transport due to the latter being more likely to disturb egg orientation. Egg orientation and temperature variation must be minimised.

An option that is easier, cheaper and less logistically challenging than nest relocation is using fencing above high tide line to fence off potential nesting areas, then monitoring fences to capture and relocate newly emerged hatchlings out of areas at risk from the spill.

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[1] Personal communication, Mr Brad Daws, Department of Parks and Wildlife, Oil Spill Response Wildlife Management Course, Fremantle, pers. comm. 24-26 May 2016

Under specific circumstances, post-contact OWR (wildlife capture, cleaning and rehabilitation) could potentially be used to prevent or reduce the impacts of a spill on populations of seabirds and potentially other marine megafauna. It is most suitable when used on wildlife affected by persistent oily slicks, however it may also be considered for residuals from a Group II spill.

In scenarios where an onshore treatment or rehabilitation facility cannot be located close enough to the site of wildlife collection to be acceptable in terms of wildlife welfare (such as the case at Browse Island and many other WA coastline locations) an 'on-water' facility would need to be established. Details of how to activate this are contained in the Browse Island Oil Spill IMG (X060-AH-GLN-60015).

According to DPaW and AMOSC 2015, an ideal 'on-water' OWR centre would:

- accommodate a minimum of 30 oiled wildlife responders
- have suitable deck space to house at least one 20 metre OWR sea container and air-conditioned holding containers
- have an ability to safely load/unload wildlife to and from adjacent vessels (i.e. through rescue hatches or by using a loading crane)
- be able to facilitate washdown of animals and have the ability to store oily waste or have an oil-in-water separator and holding tanks for waste oil.

A list of potential onshore wildlife rehabilitation facilities is provided in the West Kimberley Region Oiled Wildlife Response Plan (DPaW and AMOSC 2015).

Following a pre or post-contact OWR activity, a report will be provided by the response team to the IMT Leader regarding the effectiveness of the activity. The report shall include, as a minimum:

- date(s), time(s) and location(s) of wildlife capture and release activities
- statistics of daily and total number of wildlife capture, cleaning, rehabilitation, per species
- the overall effectiveness of wildlife response activities (including photographic evidence, where possible).

The final decision on whether to terminate a shoreline wildlife response will remain with the WA DoT, as the Control Agency for WA shorelines.

The Western Australian Oiled Wildlife Response Plan (DPaW and AMOSC 2014) notes that options to assist the IMT make a decision on response termination include setting an agreed threshold for ceasing operations, as well as thresholds for scaling back rescue operations.

Termination of response will be determined by the IMT in collaboration with relevant stakeholders and will consider factors including the following:

- the safety of responders
- the current effectiveness of the response
- deteriorating weather conditions (including wind, visibility, sea conditions)
- habitats are deemed clear from risk of oiling
- lack of presence of oiled wildlife remaining in the affected area; or the numbers of affected wildlife being captured fall towards the agreed threshold for ceasing operations
- stabilisation and transportation of all captured wildlife has taken place

- collection and removal of carcasses has occurred.

The final decision on whether to terminate a shoreline wildlife response will remain with the WA DoT, as the Control Agency for WA shorelines.

Arrangements and capabilities

The arrangements and capabilities as described in the subsections above are summarised in Table 4-3.

Table 4-3: Arrangements and capabilities – Pre-contact and post-contact oiled wildlife response

Technique	Resource capability and availability	Implementation time	Activation
Oiled wildlife response personnel	Under the WA DoT State Hazard Plan – Marine Environmental Emergency, the relevant Control Agency (WA DoT, or INPEX for Commonwealth waters/lands) will provide the On-Scene Commander / Division Commander. WA DBCA will provide the in-field Oiled Wildlife Coordinator, and potentially additional wildlife response personnel (via WA DoT, under the West Australian Oiled Wildlife Response Plan, West Kimberley Region Oiled Wildlife Response Plan. Approximately 20–30 trained OWR personnel would be available through the following sources: • AMOSC Oiled Wildlife Response Team • WA DBCA OWR personnel • Oiled Wildlife Rehabilitators Network • Philip Island Nature Park • Additional personnel, who would receive on the job training would be sourced from: o AMOSC core-group o INPEX environmental service providers o INPEX general offshore labour hire contracts.	24 hours to mobilise personnel to Broome/Darwin, to board vessels and/or helicopters.	IMT via the INPEX Emergency Contacts Directory (PER-2153095942) and the Oil Spill Preparedness and Response Register (PER-2153236568).
Oiled wildlife response kit	Section 3 of the West Kimberley Oiled Wildlife Response Plan identifies a large number of OWR kits, including those located in Broome, Exmouth and Dampier. AMOSC maintains an 'oiled wildlife response capability register' on behalf of industry to support an OWR.	The AMOSC Broome OWR kit is available to mobile to a vessel in Broome Port within 24 hours.	IMT via the INPEX Emergency Contacts Directory (PER-2153095942) and the Oil Spill Preparedness and Response Register (PER-2153236568).
Helicopters	Crew transfer helicopters (for personnel transfer to designated landing zones only, not to remote shoreline beaches).	Within 5 hours (daylight only).	IMT via the INPEX Emergency Contacts Directory (PER-2153095942) and the Oil Spill Preparedness and Response Register (PER-2153236568).
	Utility helicopters suitable for landing on remote shorelines.	Within 7 days.	
Vessels	Smaller support vessel assets <40 m in length.	Commence mobilisation in Broome/Darwin within 24 hours.	IMT via the INPEX Emergency Contacts Directory (PER-2153095942) and the Oil Spill Preparedness and Response Register (PER-2153236568).
	Larger platform support vessels / accommodation support vessels.	Commence mobilisation in Broome/Darwin within 48 hours.	

4.6 Waste management

Waste will be managed in accordance with the INPEX Waste Management Standard (0000-AH-STD-60047), MARPOL 73/78 Annex V – Garbage, relevant Commonwealth and State/Territory regulations regarding disposal of waste generated as a result of spill-response strategies.

As soon as the details of a spill become evident, a Waste Management Plan, developed in consultation with AMOSC and the relevant control agency shall be developed, to ensure the ongoing supply and backload of appropriate waste management equipment.

Based on the maximum credible spill scenarios modelled and expected volumes of oil ashore (no expected recoverable oil ashore), large volumes of oily waste are not expected to be generated. Therefore, waste storage on remote shorelines and support vessels can be manage with small, easily transportable waste receptacles.

Table 4-4 outlines the waste storage, disposal and treatment options available for the various oily waste streams.

All waste stored or transferred will be fully documented, including details of exact volume and nature of the waste, date and time, receiver of the waste and destination of the waste, in accordance with vessel Garbage Management Plans and the onshore licenced waste contractor's waste tracking process.

Table 4-4: Waste storage, disposal and treatment options for hydrocarbon-contaminated waste.

Waste category	On-site storage option	Transport and disposal options	Location of waste management capabilities	End destination
Solid wastes, including oily residue (e.g. waxy residual diesel; oiled organic materials such as sand and seagrass).	Impermeable bulka bags Lined skips/tanks Oil drums 1 m^3 IBCs Industrial waste bags	Oily waste containers will be back-loaded by tender or light utility helicopter to the support vessel for temporary storage offshore, prior to transport to shore. The waste would then transport to shore for appropriate disposal: • recovery and recycling • bioremediation • land farming • incineration • landfill	INPEX Broome supply base	Licensed waste contractor – Broome and/or Darwin.
Solid wastes, including oiled man-made materials (e.g. PPE, booms and sorbent pads).	Impermeable bulka bags Lined skips/tanks Oil drums 1 m^3 IBCs Industrial waste bags	Oily waste containers will be back-loaded by tender or light utility helicopter to the support vessel for temporary storage offshore, prior to transport to shore. The waste would then transport to shore for appropriate disposal: • recovery and recycling • incineration • landfill	INPEX Broome supply base	Licensed waste contractor – Broome and/or Darwin.
Liquid wastes, including diesel and oily water.	Oil drums 1 m^3 IBCs Slops tanks on vessels	Oily waste containers will be back-loaded by tender or light utility helicopter to the support vessel for temporary storage offshore, prior to transport to shore. The waste would then transport to shore for appropriate disposal: • recovery and recycling • incineration Alternatively, a support vessel may use its MARPOL compliant oily water treatment system to treat and dispose of oily water offshore.	Onboard vessels and INPEX supply bases	Licensed waste contractor – Broome and/or Darwin.
Biological oiled waste (e.g. euthanised oiled wildlife).	Impermeable bulka bags Oil drums 1 m^3 IBCs Industrial waste bags	Oily waste containers will be back-loaded by tender or light utility helicopter to the support vessel for temporary storage offshore, prior to transport to shore. The waste would then transport to shore for appropriate disposal: • incineration • landfill	INPEX Broome supply base	Licensed waste contractor – Broome and/or Darwin.

Arrangements and capabilities

The arrangements and capabilities as described in the subsections above are summarised in Table 4-5.

Table 4-5: Arrangements and capabilities – Waste management

Technique	Resource capability and availability	Implementation time	Activation
Waste receptacles	MARPOL compliant vessel oily water storage/treatment systems.	Maintained onboard support vessels.	IMT via the INPEX Emergency Contacts Directory (PER-2153095942) and the Oil Spill Preparedness and Response Register (PER-2153236568).
	Waste management contractor equipment; • Impermeable bulka bags • Lined skips • Oil drums • Industrial waste bags • 1 m^3 IBCs AMOSC equipment; • Oily waste storage tanks/bladders	Available from licenced waste contractor, to be delivered to Broome supply base within 24 hours. AMOSC waste storage equipment within 24 hours (Broome stockpile) or 48-72 hours (other Australian stockpiles).	
Waste disposal	Waste management contractor will provide; • recovery and recycling • bioremediation • land farming • incineration • landfill • water treatment and discharge	N/A.	IMT via the INPEX Emergency Contacts Directory (PER-2153095942) and the Oil Spill Preparedness and Response Register (PER-2153236568).
Helicopters	Utility helicopters suitable for landing on remote shorelines.	Within 7 days.	IMT via the INPEX Emergency Contacts Directory (PER-2153095942) and the Oil Spill Preparedness and Response Register (PER-2153236568).
Vessels	Smaller support vessel assets <40 m in length.	Commence mobilisation in Broome/Darwin within 24 hours.	IMT via the INPEX Emergency Contacts Directory (PER-2153095942) and the Oil Spill Preparedness and Response Register (PER-2153236568).
	Larger platform support vessels / accommodation support vessels.	Commence mobilisation in Broome/Darwin within 48 hours.	

4.7 Operational and scientific monitoring

In 2011, an Operational and Scientific Monitoring Program (OSMP) was developed by the Environment Group Browse Basin (of which INPEX is a member). The program encompasses a number of individual Operational Monitoring (OM) and Scientific Monitoring (SM) programs to guide a spill response, assess potential environmental impacts and inform any remediation activities. The OSMP described in this OPEP has been reviewed and refined for the emergency conditions described in Section 8 of the EP. The OSMP is presented in Appendix A, with a division of the OM and SM programs, as follows:

- Operational monitoring is to commence as soon as a spill occurs and aims to characterise the nature and scale of the spill for the duration of the spill. Monitoring is designed to collect information on the predicted spread of the oil and the locations it may impact and, in turn, the OM informs and supports a secondary oil spill response, such as wildlife hazing, as well as the scientific monitoring.
- Scientific monitoring is the investigation component which assesses the overall impact and recovery of the ecosystems which have been exposed to hydrocarbons and response activities, as informed by the OM program.

The OM and SM programs are summarised in sections 4.7.1 and 4.7.2 with further program-specific details, including objectives and triggers for activating and terminating each OM and SM, provided in Appendix A.

Each OM/SM will be tailored, activated and terminated as appropriate to the characteristics, nature and scale of the spill under the supervision of the INPEX IMT Leader, in consultation with:

- the INPEX IMT environmental adviser
- AMOSC
- environmental service providers
- AMSA (for vessel-based spills)
- environmental science coordinators (WA DoT) for spills entering WA waters.

INPEX will maintain a contract with an environmental service provider (ESP) to allow the timely implementation of the OM/SM programs following notification of a Level 2 or Level 3 spill. Details of the ESPs Operational and Scientific Monitoring programs will be maintained in the ESPs Project Execution Plan.

This contract ensures the timely activation of field surveys and delivery of results from survey activities/studies. Results arising from OSMP will be technically reviewed by subject matter experts as determined by the ESPs project manager and technical lead prior to submission to the INPEX environment team.

The monitoring programs will be designed to be repeatable so that in the event of a Level 2 or Level 3 spill there is continuity throughout all monitoring phases to detect potential impacts and subsequent recovery. This will include the use of before–after, control–impact (BACI) design or gradient design monitoring programs for impact detection, as appropriate. However, it is important to note that the actual OSMP design will be dependent on the outcomes and any recommendation from baseline monitoring; receptors potentially to be impacted and the nature and scale of the spill. Further details on baseline information are provided in Section 4 of the EP. INPEX will organise and implement the OSMP for spills for which INPEX is the Control Agency (i.e. Facility based spills), as displayed in Figure 4-2.

While AMSA is responsible for monitoring in instances where AMSA is the Control Agency (i.e. vessel-based spills), INPEX will provide support to AMSA in accordance with the MoU (AMSA and INPEX 2013).

The person responsible for activating and terminating the OSMP is the INPEX IMT Leader (in consultation with those personnel listed above), as presented in Figure 4-2.

Consultation with relevant regulatory authorities, regarding progress and outcomes of the OSMP, will occur as part of ongoing notifications and reporting during a Level 2 or Level 3 spill.

All scientific report outputs associated with this OSMP will undergo timely peer review by appropriate subject matter experts; for example, those from contracted environmental service providers.

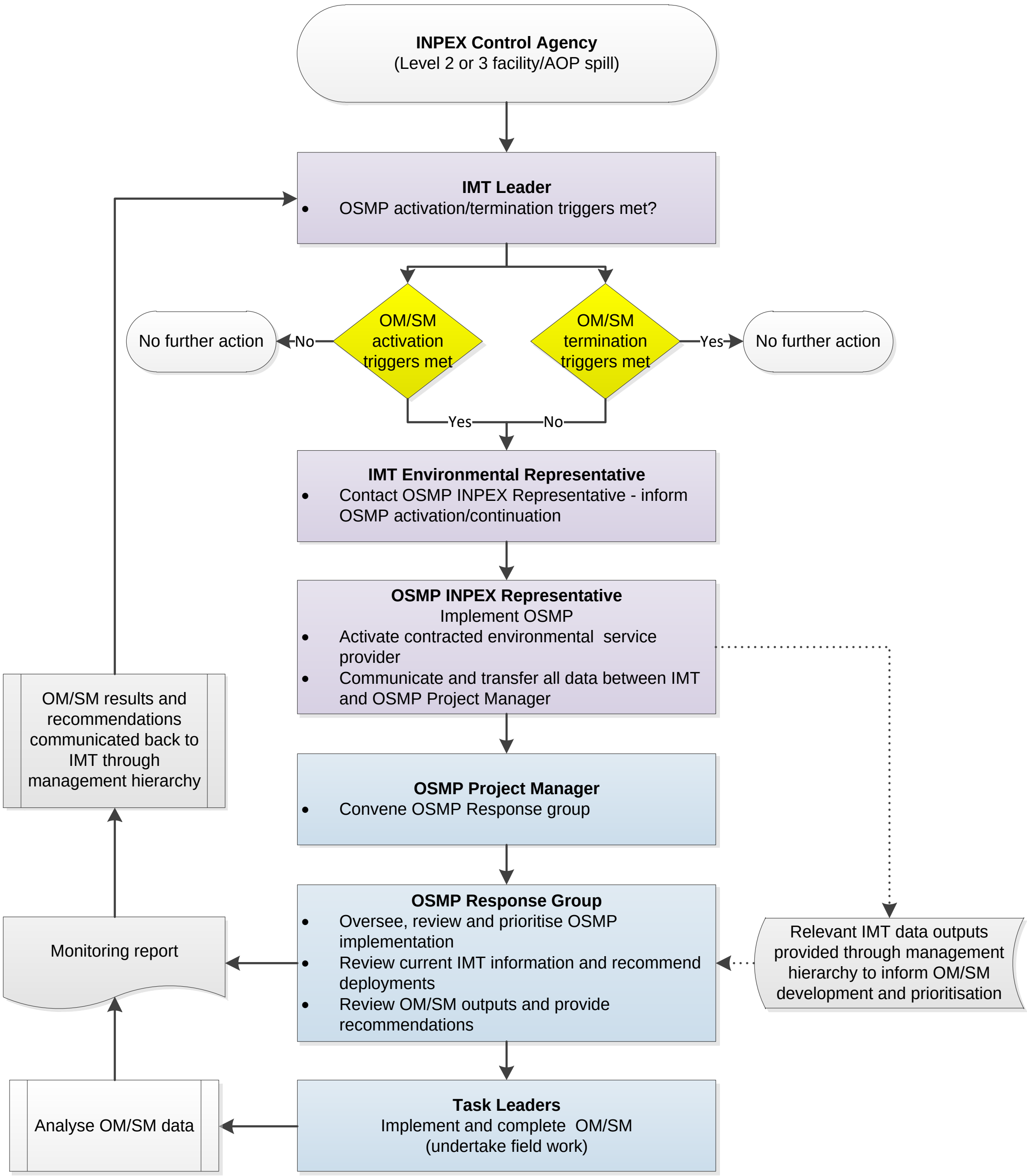

Figure 4-2: OM and SM activation, termination and communication flowchart

4.7.1 Operational monitoring

The focus of the OM program is to assist the IMT to maintain situational awareness by providing information regarding the nature and scale of a spill, and the values and sensitivities at risk.

Information from the OM program also drives the response strategy with regards to triggering and monitoring the effectiveness of secondary response measures, such as wildlife hazing (if required). The data outputs will also be used to trigger the longer-term SM programs (as required).

A summary of the OM programs is provided in Table 4-6. In summary, OM03 and OM01 will be supported by OM04 and OM06. OM04 and OM06 require analysis of water and sediment quality (e.g. laboratory analysis of samples, calibrated field instruments) and will be completed as soon as it is practical to mobilise vessels to the area (nominally seven days). Surface slicks tracked or modelled as part of OM03 and OM01 respectively, may provide an initial indication of the location of any entrained or dissolved hydrocarbons. This will then drive the desktop review of key areas and environmental sensitives at risk from the spill (OM05). Additional details are provided in Appendix A.

Table 4-6: Summary of operational monitoring programs

OM #	Monitoring program	Monitoring method(s)	Data output
OM01	Oil Spill Trajectory Modelling	Forecast and hindcast modelling.	Forecast and hindcast modelling of movement and weathering of oil. This enables the identification of values and sensitivities that may be impacted and drives the response strategy with regards to any secondary response measures and scientific monitoring that may be implemented.
OM03	Oil Spill Surveillance and Reconnaissance	Vessel and aerial surveillance, satellite imagery and satellite tracking buoys.	Assess the colour, consistency, distribution and locations of the surface slicks. Identify values and sensitivities likely to be impacted by the spill. This assists in validation of the model.
OM04	Operational Monitoring of Oil Properties, Behaviour and Weathering at Sea	Vessel-based water sampling.	Assess hydrocarbon physical and chemical properties, as well as the spatial and temporal extent. This assists in validation of the model and identifies any scientific monitoring that may be implemented.
OM05	Pre-emptive Desktop Assessment of Sensitive Resources	Desktop analysis of baseline data.	Detailed analysis of values and sensitivities that may be impacted. Identifies any secondary response measures and scientific monitoring that may be implemented.
OM06	Assessment of the Presence and Quantity of Petroleum Hydrocarbons in Water and Sediments	Vessel-based water and sediment sampling.	Assess hydrocarbon physical and chemical properties, as well as the spatial and temporal extent in water and sediment. This assists in validation of the model and identifies any scientific monitoring that may be implemented.

4.7.2 Scientific monitoring

The SM program does not directly inform spill response operations directed by the INPEX IMT. It does, however, assess the overall impact and subsequent recovery of the identified values and sensitivities to hydrocarbon exposure and oil spill response activities.

SM will only be undertaken in the event of a Level 2 or Level 3 spill and where the information obtained through the OM program indicates values and sensitivities are predicted to be impacted or have been impacted.

SM will be consistent with the nature and scale of the spill and sufficient to inform any remediation activities, where appropriate. It may begin before the termination of similar OM activities. Details on the SM program are provided in Appendix A.

As discussed in Section 8 of the EP, any wind driven entrained components of a Group II surface spill, will remain within the top 30 m (with the vast majority in the top 10 m) of the water column. Therefore, for all surface spills, SM relating to water quality (SM05), sediment quality (SM06) and intertidal and benthic environments (SM07 and SM08) will only be activated where OM indicates potential impacts to areas shallower than –30 m LAT.

All Level 2 and Level 3 spills have the potential to impact planktonic communities. Therefore, SM09 has been included.

A surface diesel spill could potentially impact marine megafauna such as cetaceans, dugongs, turtles, whale sharks and marine avifauna. Therefore, SM10 and SM11 have been included in order to monitor for potential impacts and recovery of MNES within Biologically Important Areas (BIAs) or other identified populations.

As commercial, recreational and traditional fishing all occur within the EMBA, SM12 has been included to understand potential impacts to this sensitivity.

Note that limited information is presented in Appendix A with respect to timings for implementation of the SM program. Unlike the OM program, in order to implement an effective SM program, thorough planning is required to ensure the correct data is collected with respect to confirming potential lasting impacts from a spill. This relies on data outputs generated from the OM program and therefore the planning stage may take additional time. Mobilisation times for the SM program will be as soon as practicable given the context of the area and mobilisation will generally commence within seven days of receipt of notification.

4.7.3 Baseline data to support the OSMP

A range of data has been used to establish the environmental baseline in the Browse Basin as described in Section 4 of the EP. This includes information collected during various environmental surveys completed by INPEX (2006-2009) and the Applied Research Program (ARP) partnership between Shell, INPEX and the Australian Institute of Marine Science (AIMS) (2014–2018). The focus of the ARP was to collect baseline data to inform understanding of the extent, severity and persistence of impacts in the unlikely event that a significant spill occurs during the activity.

In addition to INPEX-collected data, INPEX is also a member of the Industry-Government Environmental Metadata (I-GEM) project. The pilot I-GEM project was completed in 2014 and contains accessible metadata from industry, research institutes and government organisations Australia-wide, which were uploaded to the Australian Ocean Data Network (AODN) portal. Metadata searches can be conducted via the AODN portal and the standalone I-GEM website which contain data sets from the Abrolhos Islands to the Timor Sea, out to the extent of Australia's exclusive economic zone (EEZ).

Published monitoring reports from the Montara spill augment this data both spatially and temporally. Further to this, extensive multi-year monitoring programs have been undertaken by other operators (e.g. Woodside and Shell) in the Browse Basin, which also augment the INPEX data, spatially and temporally, for physical and biological aspects of the environment.

Research institutes and organisations such as AIMS, the Western Australian Museum and Monash University have also conducted long-term monitoring programs in the Browse Basin. This data further increases the environmental understanding of the region. INPEX has also formalised an agreement with WA DBCA which confirms WA DBCA will supply environmental data (including Western Australian Marine Science Institution data (C075-PAW-IPX-LE-00001)) to INPEX Australia in the event of an incident or oil spill in the nearshore/coastal waters of the region.

Information collected from these surveys, as well as the ARP program, provide a substantial baseline on the marine flora, fauna and habitats which may be referenced in the event of a Level 2 or Level 3 spill event. The current states of knowledge for receptors in the Browse region relevant to this OPEP are described in Section 4 of the EP.

4.8 Health and safety

Health and safety considerations will be incorporated into any spill response.

INPEX health and safety objectives are to:

- adhere to the INPEX PEARS philosophy as detailed in the INPEX Emergency and Crisis Management Standard (0000-AH-STD-60051)
- provide a safe working environment and prevent workplace incidents by managing risks to ALARP
- eliminate, or minimise all environment and community risks to ALARP and ensure any impacts are neither serious nor long-lasting
- ensure the security of INPEX personnel, assets and information.

The IMT should develop a Safety Management Plan utilising the National Plan Guidance on Marine Oil Spill Response Health and Safety document (AMSA 2018).

Contractors are responsible for the development of site-specific risk assessments before undertaking any activities.

The safety of personnel is the primary concern in a spill incident. An individual risk assessment, such as a job hazard analysis (JHA), will always be conducted by a response contactor or other appointed or responsible personnel, such as the HSE manager or supervisor.

If the response is conducted by a Control Agency other than INPEX (i.e. AMSA), that agency is expected to adhere to stringent safety procedures as outlined in their respective oil spill response plans (i.e. the NatPlan).Table 4-7 provides examples of hazards and risks that may be encountered during a response to a spill.

Table 4-7: Examples of health and safety risks from spill response

Hazards	Risks	Prevention and mitigation considerations
Inadequately trained personnel carrying out the response	Lack of appropriate training	Prior to any response being implemented, a HSE Plan must be prepared, and will identify induction/on-the-job training requirements, and associated JHAs etc. All personnel must complete the induction/on-the-job training and sign onto the JHA prior to commencing work. Appropriately qualified personnel, such as AMOSC core-group members, will be appointed as field response team leaders, and will provide on-the-job supervision and training (as required) to other response team members.
Flammability	Fire and explosion	Firefighting capacity of INPEX-contracted vessels and their tenders as per flag state requirements and INPEX standards.
		Permit to work (PTW) system and JHAs applied to all activities.
Toxicity of hydrocarbon	Inhalation, ingestion or contact with skin or eyes leading to dermal irritation or illness	Air quality monitoring equipment, to protect the health of oil spill responder personnel, is available as part of the Broome Supplementary Stockpile.
		PPE including respiratory protection, coveralls, gloves, glasses, boots and barrier gels, to be provided to all personnel working on the response.
		Clean-up area provided for responders to decontaminate and remove soiled clothing. Ample quantity of clean PPE available.
Manual handling	Manual handling injuries	Use of cranes, or large teams of trained personnel, to lift response materials as required.
Slips, trips and	General injury	Hydrocarbon waste and used absorption equipment will have dedicated waste receptacles. Additional supply of absorption material to be located at access and egress points from vessels

Hazards	Risks	Prevention and mitigation considerations
falls		and/or in and out of offices, to mitigate the additional risk of slipping on oily surfaces, and to minimise the spread of hydrocarbons.
		Designated and separate, clean and contaminated work areas and movement routes in all work areas.
Working over water	Drowning	Mandatory use of lifejackets when working over water and independent sentry posted to monitor activity. “Man overboard” procedures clearly defined and included in personnel inductions and ongoing training. PTW from vessel master to be in place for personnel working over water.
Dangerous marine fauna	Bites, stings and other injury from marine fauna	No personnel are permitted in the water. Sentry in place whenever personnel are working over the water and to watch for fauna. All work will be done under a PTW from a response contractor. Any personnel retrieving equipment or wildlife from the water will be alert to marine animals. All personnel working to retrieve equipment or wildlife from the water will be equipped with gloves and protective clothing, and all retrieved equipment will be washed to remove any marine life.
Working from helicopters	Helicopter downed	As a minimum, any helicopter working for an INPEX response must meet the INPEX minimum aviation standards. Any personnel working from a helicopter over water must have a completed Tropical Basic Offshore Safety Induction and Emergency Training (TBOSIET) certificate or equivalent.
Excessive	Fatigue	Personnel will work under the applicable working-hour limitations. As a minimum, the INPEX

Hazards	Risks	Prevention and mitigation considerations
working hours		fitness-for-work standard will be used as a template for all INPEX employees. There will be monitoring of fatigue and personnel fitness by work supervisors. A roster will be established to allow change-out of personnel as required, depending on the nature and duration of the spill response.
Weather	Dehydration, heatstroke	The INPEX fitness-for-work standard and the fatigue guidelines will be used as minimum requirements.
Quarantine	Human communicable diseases	Browse Island and other locations within the traditional fishing MoU box have the potential for contact between spill response personnel and Indonesian fishermen. Communicable diseases, such as tuberculosis can be transmitted from human to human. Inductions need to communicate that no contact with Indonesian fishermen is permitted, and appropriate controls will be implemented to mitigate this risk.

The Browse Island Oil Spill IMG (X060-AH-GLN-60015) contains completed HAZID reports for helicopter, vessel and shoreline response activities. These HAZID reports should be used to generate HSE plans and associated JHAs for shoreline response activities.

5 INPEX forms and guidance

Table 5-1 has been copied from the Oil Spill Forms Register (PER-2153332031).

The table provides rapid access for IMT personnel to forms needed during an oil pollution emergency event. Not all of the forms on this table are relevant to the spill event described in the EP. Please use the most recent version of the controlled copy of the Oil Spill Forms Register (PER-2153332031) during an emergency response.

Table 5-1: Oil Spill Response Forms

Form type	Form title	Purpose	Reporting timeframe	Applicable for oil spills in				Document reference (Coreworx, DMS or URL)
				Darwin Harbour	NT	WA	Cwlth Waters	
Notify & Report	NT Oil spill notification report (POLREP) - as per NT OSCP	Notify the following external parties of an oil spill in NT waters: • Darwin Port (DP) for spills inside Darwin Port limits • NT Department of Infrastructure, Planning and Logistics (NT DIPL) – Marine Safety Branch for spills inside Territory waters (but outside Darwin Port limits) • NT Department of Environment and Natural Resources (NT DENR) for spills inside Territory waters and/or Darwin Port limits (NOTE: The NT POLREP is a modified version of AMSA's Marine Pollution Report (POLREP). (IMT Environment to obtain copy).	< 2hrs	✓	✓			C020-AG-FRM-0008
	NT Incident update report (SITREP) – as per NT OSCP	Notify the following external parties of an oil spill in NT waters: DPC for spills inside Darwin Port limits NT DIPL – Marine Safety Branch for spills inside Territory waters (but outside Darwin Port limits) NT DENR for spills inside Territory waters and/or Darwin Port limits (NOTE: The NT SITREP is a modified version of AMSA's Marine Pollution Situation Report (SITREP) available at www.amsa.gov.au) (IMT Environment to obtain copy).	Daily Or as situation changes significantly	✓	✓			C020-AG-FRM-0010
	AMSA harmful substances report (POLREP)	Vessel master to report marine pollution incidents in Commonwealth waters to AMSA. (IMT Environment to obtain copy).	< 2hrs				✓	C075-AH-FRM-10009
	WA Department of Transport - POLREP WA Department of Transport - SITREP	Vessel master to report marine pollution incidents, which **may** threaten WA waters / lands to WA DoT. (IMT Environment to obtain copies of POLREP/SITREP).	Immediately			✓		https://www.transport.wa.gov.au/mediaFiles/marine/MAC-F-PollutionReport.pdf https://www.transport.wa.gov.au/mediaFiles/marine/MAC-F-SituationReport.pdf
	WA Department of Environment Regulation (DER) - Online Pollution Report	Pollution onto WA land (i.e. oil contacting WA shoreline) is to be reported online. (IMT Environment to complete).	< 12 hrs			✓		http://www.der.wa.gov.au/your-environment/reporting-pollution/report-pollution-form

	Offshore occurrence report form (Western Australian Department of Mines & Petroleum (DMP))	Report to DMP for marine incidents within the 3 nautical mile limit (WA State waters) by INPEX IMT Leader. This includes reporting oil spill incidents that originated in commonwealth or NT waters, but moved into WA State waters. (IMT Environment to complete).	< 3 days			✓		DEV-CEX-FM-0002
	Report of a known or suspected contaminated site (*Contaminated Sites Act 2003 (WA)*)	Report to WA DER of a contaminated site on land, shoreline or seabed within WA State waters (within 3 nm). (IMT Environment to complete).	< 21 days			✓		DEV-CEX-FM-0001
	NOPSEMA incident report form (FM0831)	Report to NOPSEMA offshore incidents in accordance with relevant OPEP (typically this is only required for Level 2 or 3 spills). (INPEX IMT Leader to issue report) NOTE: NOPSEMA must be verbally notified within 2 hours after becoming aware of the incident	< 3 days				✓	C075-AH-FRM-10007
Log	Emergency incident log	Record the specific activities undertaken by personnel during an oil spill response (Individual form optional for IMT Carbon copy incident log books also available)	Ongoing during emergency	✓	✓	✓	✓	C020-AG-FRM-0005
	Telephone call record	Record all phone calls, both incoming and outgoing, particularly those to and from government agencies, external support agencies, employees' families, etc. (Individual form optional for IMT Carbon copy incident log books also available)	Ongoing during emergency	✓	✓	✓	✓	C020-AG-FRM-0007
	Dispersant Activity Log	To be completed by vessel master (for dispersant applied by vessel) or by an aerial observer (for dispersant applied by aircraft) (Field personnel to prepare)	Ongoing during emergency	✓	✓	✓	✓	C075-AH-LOG-10000
Situational Awareness	Oil Spill Observation and Visual Dispersant Guide for Aircraft and Vessels	Provide guidance to vessel and aircraft operators on how to identify oil spills; record their location; estimate the oil thickness, quantity of oil and area affected; look for colour changes to oil once dispersant has been applied and assess effectiveness; instructions to take photos or video footage; and reporting protocols. (Field personnel to prepare)	Ongoing during emergency	✓	✓	✓	✓	C075-AH-GLN-10016
	Shoreline clean-up and assessment technique (SCAT)	Assess the state of the shoreline should a spill make contact (or if there is a significant threat of a spill making contact) (IMT Leader to complete).	Prior to shoreline contact (i.e.	✓	✓	✓	✓	C020-AG-FRM-0012

			<12-24 hrs) Ongoing until termination					
Modelling	RPS Search & Rescue request form	Search & request form to activate RPS to conduct trajectory modelling under Contract # 800767 (IMT Environment to request)	Info only	NA	NA	NA	NA	C075-AH-FRM-10001
	RPS Oil Spill Modelling Response Procedures and Interpret Subsequent Results	Procedure: How to Activate RPS Oil Spill Modelling Response Procedures and Interpret Subsequent Results (info only)	Info only	NA	NA	NA	NA	PER-2153332031
	RPS oil spill trajectory modelling request form	Modelling request form to activate RPS to conduct oil spill trajectory modelling under Contract # 800767 (IMT Environment to request)	< 2 hrs	✓	✓	✓	✓	C020-AG-FRM-0015
	RPS oil spill trajectory model update form	Update of oil-spill trajectory to RPS (IMT Environmental to request)	Daily	✓	✓	✓	✓	PER-2153332031
	RPS Gas or Vapour Plume Modelling request form	Modelling request form to activate RPS to conduct gas and vapour modelling under Contract # 800767 (IMT HS Officer to request)	< 2 hrs	✓	✓	✓	✓	C075-AH-FRM-10003
	RPS Chemical Spill Trajectory Modelling Request Form	Modelling request form to activate RPS to conduct chemical spill trajectory modelling under Contract # 800767 (IMT Environmental to request)	< 2 hrs	✓	✓	✓	✓	C075-AH-FRM-10004
AMOSC/OSRL	AMOSC mobilisation and authorisation form	In order to mobilise AMOSC, a service contract must be completed by the IMT Leader to identify AMOSC requirements for equipment, consumables, personnel, advice and estimated duration. (IMT Leader to sign)	> Level 2 incident	✓	✓	✓	✓	NA
	OSRL notification form	To notify Oil Spill Response Limited of an incident that may requires support under the terms of the Agreement (ORSL #129). (IMT Environmental to request)	> Level 2 incident	✓	✓	✓	✓	C075-AH-FRM-10005
	OSRL mobilisation form	To authorise activation of Oil Spill Response Limited and its resources in connection with an incident under the terms of the Agreement (ORSL #129). (IMT Environmental to request)	> Level 2 incident	✓	✓	✓	✓	C075-AH-FRM-10006

Wildlife Permit	Permit to interfere with EPBC listed species	General permit application for interfering with threatened species and ecological communities, migratory species, whales and dolphins and listed marine species. (IMT Environmental to prepare)	As required	NA	NA	NA	✓	C075-AH-FRM-10010
	Wildlife Status and Situation Report	To record situation of wildlife found, whether they are alive (or dead) and if they have been (or are planned to be) cleaned and/or released. (IMT Environmental to prepare)	As required			✓	✓	Appendix J of C075-AH-REP-10086 (WA Oiled Wildlife Response Plan)
	Wildlife Rescue & Release Form	This form is to accompany any live oiled wildlife from the time it is rescued until it is released or euthanized. The form should record each time an animal is cleaned, transported etc and any general observations (of improvement, decline) made during its rehabilitation. (IMT Environmental to prepare)	As required, per oiled wildlife			✓	✓	Appendix J of C075-AH-REP-10086 (WA Oiled Wildlife Response Plan)
	Fauna Admission Form (Vet to complete)	This form is to be used to when admitting the oiled wildlife to a veterinary clinic. (Vet to prepare)	As required, per oiled wildlife admitted to vet			✓	✓	Appendix J of C075-AH-REP-10086 (WA Oiled Wildlife Response Plan)
WA DoT Cross Jurisdiction Spill	IMT Handover Checklist (cross jurisdictional arrangements)	For use by IPX IMT-Leader, to check handover of relevant incident information to WA DoT IMT-Leader, when INPEX spill moved into WA Waters				✓		PER-2153261255
	IMT Functions and Lead IMT Designations (cross jurisdictional arrangements)	For use by IPX IMT-Leader, and WA DoT IMT-Leader, to define each IMT 'lead' roles, when INPEX spill moved into WA State waters and a cross jurisdictional spill response is underway.				✓		PER-2153261254

6 References

AMOSC–see Australian Marine Oil Spill Centre.

AMSA—see Australian Maritime Safety Authority.

AMSA and INPEX—see Australian Maritime Safety Authority and INPEX Operations Australia Pty. Ltd.

ANZECC/ARMCANZ—see Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand.

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WA DoT—see Western Australian Department of Transport.

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APPENDIX A: OPERATIONAL AND SCIENTIFIC MONITORING PROGRAM

The decision-making process for termination of the OM and SM is undertaken by the INPEX IMT Leader, in consultation with AMOSC and the designated ESP. In addition, relevant jurisdictional agencies, including AMSA, WA DoT and WA DBCA (via WA DoT), as relevant to the nature and scale of the spill, will be consulted.

The termination decision-making process includes the following steps:

- Step 1: Review the data collected by the OM and SM against the OM and SM objectives.
- Step 2: Evaluate whether the OM and SM objectives have been achieved and provide the evaluation to the INPEX IMT Leader.
- Step 3: Reach agreement with the INPEX IMT Leader that the termination criteria have been satisfied.
- Step 4: Sign off for termination of the OM and SM by the INPEX IMT Leader.

Code	Title	Aim of the plan	Key objectives	Activation triggers	Termination criteria	Mobilisation time	Service provider
Operational Monitoring							
OM01	Oil Spill Trajectory Modelling	To use computer-based forecasting methods to predict oil-spill movement and guide the management and execution of oil spill response strategies to maximise the protection of environmental and other resources at risk.	Provide forecasting of the movement and weathering of spilled oil. Assist in identifying values and sensitivities that are at risk of contamination.	All Level 2 and Level 3 spills	The oil discharge has ceased and spill modelling outputs (as verified by OM03, OM04 and OM06, where applicable) show no additional values and sensitivities are at risk of oil spill contact.	<2 hours	Oil spill modelling provider (Refer to Table 5-1).
OM03	Oil Spill Surveillance and Reconnaissance	To provide regular, ongoing oil spill surveillance in the event of a spill (aerial, vessel, satellite imagery, oil spill tracking buoys), as appropriate. Identify key breeding/ aggregation/ foraging areas for wildlife groups that may be at risk from the oil spill.	To assess the colour, consistency, distribution and locations of the surface slick. To identify values and sensitivities likely to be impacted by the spill.	All Level 2 and Level 3 spills	Upon completion of the oil spill response operations (Refer to Section 4.5) AND Spill surveillance indicates (and is supported by OM01 outputs) no additional values and sensitivities are at risk of oil spill contact.	<48 hours	Aircraft providers Vessel providers AMOSC/OSRL satellite imagery provider INPEX oil spill tracking buoys.
OM04	Operational Monitoring of Oil Properties, Behaviour and Weathering at Sea	To provide in-field information on the properties, behaviour, extent and weathering of the spilled oil.	Establish the case-specific situation for the released oil, including: • surface and subsurface extent • density • viscosity • wax and asphaltene content • water content (as water-in-oil emulsion) • proportion of residual	All Level 2 and Level 3 spills	Monitoring of the evolution of the oil properties indicates that the released oil has undergone weathering to reach a steady weathered state*. *Steady weathered state is defined as <10% change in percentage of mass for weathering processes for 3 consecutive days (measured weathering rates compared with weathering curves for the spilled	Preparation to deploy field personnel and equipment will commence on notification from INPEX that this OM has been triggered. Deployment of field personnel and equipment into the field within 7 days of receipt of notification.	Environmental service provider under contract for duration of activities. NATA laboratory for sample analysis.

Code	Title	Aim of the plan	Key objectives	Activation triggers	Termination criteria	Mobilisation time	Service provider
			hydrocarbons over time • proportion of volatile hydrocarbons • proportion of soluble hydrocarbons. Monitor the evolution of these oil properties through time and assess the rate of their reduction or increase.		product, generated through the US National Oceanic and Atmospheric Administration (NOAA) oil spill weathering model ADIOS).		
OM05	Pre-emptive Desktop Assessment of Sensitive Resources	To undertake a rapid desktop assessment of the broad character and ecological integrity of sensitive receptors at risk of impact from a moving oil slick.	Undertake a desktop assessment, to obtain all relevant information in relation to the values and sensitivities that may be affected by the spill. Note: Values and sensitivities for OM05 are defined as those described in Section 4 of the EP, including islands, reefs, shoals and banks, and areas of conservation significance, and BIAs associated with MNES.	All Level 2 and Level 3 spills.	Completion of the desktop assessment of values and sensitivities that were identified by Operational Monitoring (OM01, OM03, OM04 and OM06) as being potentially impacted or contacted by the oil spill.	24 hours	Environmental service provider under contract for duration of activities.
OM06	Assessment of the Presence and Quantity of Petroleum Hydrocarbons in Water and Sediments	To provide a rapid assessment of the presence, type, quantity and character of hydrocarbons in the water and marine sediments to assess the extent of the impact and verify impact predictions for other monitoring plans.	Detect the presence of oil and oil-derived (petrogenic) hydrocarbons in the water column and marine sediments. Determine, if possible, the source of these (i.e. the slick or some other sources). Determine the spatial and temporal distribution of the hydrocarbons. Distinguish between petrogenic and non-petrogenic (natural background) hydrocarbons that are present. Determine the concentrations of the hydrocarbons. Benchmark the level of individual hydrocarbons against trigger levels of concern for aquatic life and human health.	All Level 2 and Level 3 spills	Upon completion of the oil spill response OR Rapid assessment of the hydrocarbons in water and marine sediments has been completed and the operational monitoring has been superseded by relevant SM programs.	Preparation to deploy field personnel and equipment will commence on notification from INPEX that this OM has been triggered. Deployment of field personnel and equipment into the field within 7 days of receipt of notification.	Environmental service provider under contract for duration of activities.
Scientific Monitoring							
SM02	Detailed Characterisation of the Oil	To provide a toxicological assessment of the	Determine the chemical characteristics of the spilled oil throughout a spill response and the	Other scientific monitoring programs are triggered that require information on the	Laboratory results have defined the chemical characteristics of fresh and weathered oil (which	Laboratory testing only; using water and sediment samples	Environmental service provider under contract for

Code	Title	Aim of the plan	Key objectives	Activation triggers	Termination criteria	Mobilisation time	Service provider
	Properties and Ecotoxicological Assessment	spilled oils. To assess the risks posed by short-term exposure (acute effects) or longer term exposure (chronic effects), or both, to potentially impacted values and sensitivities.	character of residual oils as they continue to weather, post-response. Determine the potential adverse effects on values and sensitivities of exposure to fresh and weathered oil, based on the chemical and physical character of the oil.	ecotoxicity of hydrocarbons in the water column and sediments (SM07, SM08, SM09, SM10, SM11 and SM12).	has reached a steady weathered state, as defined in OM04); AND Results have provided contextual information for the potential adverse effects on values and sensitivities exposed to be quantified.	collected from OM04, SM05 and SM06.	duration of activities.
SM05	Monitoring for Hydrocarbons in Marine Waters	To quantify presence and extent, as well as the longer term weathering, persistence and toxicity of hydrocarbon compounds in marine waters, and to assess and verify predicted impacts on values and sensitivities for other SM.	Quantify the temporal and spatial distribution and concentration of hydrocarbon compounds in marine waters in relation to background or reference levels, e.g. ANZECC/ARMCANZ (2000) Determine the sources of any identified hydrocarbons in the water column, e.g. natural, pyrogenic, or petrogenic spill sources. Provide samples to enable toxicity of the hydrocarbon compounds in marine waters to be assessed under SM02.	OM indicates oil contact within 2 km of a shallow, subtidal (–30 m LAT or above) or intertidal location or BIAs associated with MNES; OR Other Scientific Monitoring programs (SM07, SM08, SM09, SM10, SM11 and SM12) are triggered that require information on the presence, extent and toxicity or persistence of hydrocarbons in the water column.	Monitoring results have confirmed the temporal and spatial distribution, concentration and source of hydrocarbons in the water column; AND OM indicates no further values and sensitivities are likely to be contacted; AND Monitoring results have determined petrogenic hydrocarbon concentrations in marine waters are consistent with background or reference levels e.g. ANZECC/ARMCANZ (2000); AND Water samples have been provided for SM02.	Preparation to deploy field personnel and equipment will commence on notification from INPEX that the SM has been triggered. Mobilisation of field personnel and equipment within 7 days of receipt of notification.	Environmental service provider under contract for duration of activities.
SM06	Monitoring for Hydrocarbons in Subtidal and Intertidal Sediments	To understand the behaviour, persistence and fate of hydrocarbons in sediments to provide data to assist in assessing and verifying predicted impacts on key habitats and sensitive receptors.	Determine the distribution (spatial and temporal extent) of oil in shallow, subtidal and intertidal sediments in relation to background or reference levels, e.g. ANZECC/ARMCANZ (2000) Determine the sources of any identified hydrocarbons in sediment, e.g. natural, pyrogenic or petrogenic spill sources. Provide samples to enable toxicity of the hydrocarbon compounds in marine sediments to be assessed under SM02.	OM indicates oil contact within 2 km of a shallow, subtidal (–30 m LAT or above) or intertidal location; OR Other Scientific Monitoring programs (SM07, SM08, SM12) are triggered that require information on the presence, extent and toxicity or persistence of hydrocarbons in benthic sediments.	Monitoring results have confirmed the temporal and spatial distribution, concentration and source of hydrocarbons in the sediments; AND OM indicates no further values and sensitivities are likely to be contacted; AND Monitoring results have determined petrogenic hydrocarbon concentrations in sediments are consistent with	Preparation to deploy field personnel and equipment will commence on notification from INPEX that the SM has been triggered. Mobilisation of field personnel and equipment within 7 days of receipt of notification.	Environmental service provider under contract for duration of activities.

Code	Title	Aim of the plan	Key objectives	Activation triggers	Termination criteria	Mobilisation time	Service provider
					background or reference levels e.g. ANZECC/ARMCANZ (2000); AND Sediment samples have been provided for SM02.		
SM07	Monitoring of Shoreline and Intertidal Benthos to Determine Impacts of Oil Spill and Recovery	To determine and monitor the potential impact of a hydrocarbon spill or response activities and recovery of intertidal benthos and associated organisms.	Collect quantitative data on intertidal habitats and organisms that are at risk from, or have been exposed to, oil. Detect and quantify lethal or sublethal impacts of the spill on intertidal habitats and organisms and monitor recovery to baseline or reference levels.	OM indicates oil contact within 2 km of an intertidal location where sensitive organisms are known to occur.	Impacts to shoreline and intertidal benthos have been quantified and monitoring results indicate no further shoreline and intertidal coastal habitats and organisms are at risk from, or have been exposed to oil; AND Impacted intertidal benthos indicators have returned to baseline or reference levels.	Preparation to deploy field personnel and equipment will commence on notification from INPEX that the SM has been triggered. Mobilisation of field personnel and equipment within 7 days of receipt of notification.	Environmental service provider under contract for duration of activities.
SM08	Monitoring of Subtidal Marine Benthos to Determine Impacts of Oil Spill and Recovery	To determine and monitor the potential impact of a hydrocarbon spill or response activities and recovery of shallow, subtidal benthos and associated organisms.	Collect quantitative data on shallow subtidal habitats and organisms that are at risk from, or have been exposed to oil Detect and quantify lethal or sublethal impacts of the spill on intertidal habitats and organisms and monitor recovery to baseline or reference levels.	OM indicates oil contact within 2 km of a shallow, subtidal (–30 m LAT or above) location where sensitive organisms are known to occur.	Impacts to shallow, subtidal benthos have been quantified and monitoring results indicate no further shallow subtidal benthos and organisms are at risk from, or have been exposed to oil; AND Impacted subtidal benthos indicators have returned to baseline or reference levels.	Preparation to deploy field personnel and equipment will commence on notification from INPEX that the SM has been triggered. Mobilisation of field personnel and equipment within 7 days of receipt of notification.	Environmental Service Provider under contract for duration of activities.
SM09	Determine Impacts of Oil Spill on Plankton Populations and Recovery	To investigate the possible scale of impacts to plankton and the degree to which hydrocarbons may accumulate in populations as a result of a spill event.	Quantify plankton in the vicinity of a spill and at reference sites in the wider region. Determine if there are oil-derived hydrocarbons in plankton. Evaluate the potential for impacts to plankton by the oil spill or response activities. If possible, detect and quantify lethal and, where appropriate, sublethal effects to plankton.	There is a plankton community in the spill vicinity (identified during the course of remote sensing undertaken in OM03) that is likely to support the regionally important natural or commercial resources in the area, or is an important source of recruitment for plankton communities; AND The nature (composition) and magnitude of the spill (volume, area of impact, components, etc.) are sufficient to present a significant risk of exposure and lethal impacts to plankton communities (identified in OM03);	Plankton communities in the vicinity the spill and at reference sites in the wider region have been quantified. Oil-derived hydrocarbon presence in plankton has been determined. Impacts to plankton by the oil spill or response activities have been evaluated. Lethal and sublethal effects to plankton have been quantified.	Preparation to deploy field personnel and equipment will commence on notification from INPEX that the SM has been triggered. Mobilisation of field personnel and equipment within 7 days of receipt of notification.	Environmental Service Provider under contract for duration of activities.

Code	Title	Aim of the plan	Key objectives	Activation triggers	Termination criteria	Mobilisation time	Service provider
				OR A mass spawning event has taken place or is likely to occur within the area of impact.			
SM10	Determine Impact of Oil Spill on Seabirds and Shorebird Populations and Recovery	To assess potential impacts on seabird and shorebird populations within the marine avifauna BIAs, or populations identified by OM01 and/or OM03, which may have been affected by the oil spill or response activities.	Quantify and assess potential impacts to seabirds and coastal bird populations (in particular known breeding colonies) by the spill, and associated response activities, including abundance, mortality, sublethal effects, sickness and oiling. Determine whether oil or response activities were the cause of observed impacts. Monitor the recovery of key behaviour and breeding activities of seabirds and coastal bird populations over time, with regard to reference or baseline levels. Provide information to feed into any restoration or remediation activities that need to be implemented for marine avifauna.	OM indicates oil contact within 2 km of an intertidal location or within a marine avifauna BIA; OR Likely spill contact with any other identified marine avifauna population.	Monitoring results have quantified the lethal or sublethal impacts to seabirds and shorebirds as a result of the oil spill and indicate no new populations are at risk from, or have been exposed to, oil or response activities; AND Key seabird and shorebird behaviour and breeding activities or habitat have been measured and are comparable to baseline or reference levels.	Preparation to deploy field personnel and equipment will commence on notification from INPEX that the SM has been triggered. Mobilisation of field personnel and equipment within 7 days of receipt of notification.	Environmental Service Provider under contract for duration of activities.
SM11	Determine Impact of Oil Spill on Non-Avian Marine Megafauna and Recovery	To assess potential impacts on non-avian marine megafauna within their relevant BIAs, or populations identified by OM01 and/or OM03, which may have been affected by the oil spill or response activities.	Quantify and assess impacts of the spill and associated response activities on non-avian marine megafauna, including abundance, mortality, sublethal effects, sickness and oiling. Determine whether oil or response activities were the cause of observed impacts. Monitor the recovery of key behaviour and breeding activities of non-avian marine megafauna over time, with regard to baseline or reference levels. Provide information to feed into any restoration or remediation activities that need to be implemented for non-avian marine megafauna.	OM indicates oil contact within 2 km of an intertidal location or within a non-avian marine megafauna BIA; OR Likely spill contact with any other identified non-avian marine megafauna population.	Monitoring results have quantified the lethal or sublethal impacts to non-avian marine megafauna to the oil spill and indicate no new populations are at risk from, or have been exposed to, oil or response activities; AND Key non-avian marine megafauna behaviour and breeding activities or habitat have been measured and are comparable to baseline or reference levels.	Preparation to deploy field personnel and equipment will commence on notification from INPEX that the SM has been triggered. Mobilisation of field personnel and equipment within 7 days of receipt of notification.	Environmental Service Provider under contract for duration of activities.
SM12	Determination of the Impact of the Oil Spill on Commercial, Traditional and Recreational Fisheries	To monitor potential impacts of the oil spill and response activities on commercial, traditional and recreational fisheries and	Determine the potential impacts of the oil spill and response activities on commercial, traditional and recreational fisheries and follow their recovery in relation to baseline or reference levels. Evaluate the type and severity of physiological or biochemical changes (as measured by	For surface spills, OM indicates oil contact within 2 km of a shallow, subtidal (−30 m LAT or above) or intertidal location; OR OM predicts contact is possible to commercial, traditional or recreational fisheries species;	Monitoring results have quantified the physiological or biochemical changes and sublethal impacts of the oil spill and clean-up methods on, commercial, traditional and recreational fisheries; AND Contamination in the edible	Preparation to deploy field personnel and equipment will commence on notification from INPEX that the SM has been triggered. Mobilisation of field personnel and	Environmental Service Provider under contract for duration of activities.

Code	Title	Aim of the plan	Key objectives	Activation triggers	Termination criteria	Mobilisation time	Service provider
		subsequent recovery.	biomarkers of fish health) in commercial, traditional and recreational fisheries species affected by the spill, including the identification of potential reproductive impairment. Determine whether oil or response activities were the cause of observed impacts.	OR Advice has been provided to government to restrict, ban or close a fishery. SM12 will commence to provide data for government to enable decisions to be made on when a fishery can be reopened; OR Declarations of intent by commercial fisheries or government agencies to seek compensation for alleged or possible damage.	portion or in the stomach/intestinal contents attributable to the spill is no longer detected; OR No differences are detected in commercial, traditional or recreational fisheries from reference levels; OR The physiological and biochemical parameters in the studied species have returned to baseline levels.	equipment within 7 days of receipt of notification.	

APPENDIX B: INPEX INCIDENT ACTION PLAN TEMPLATE (PER-2153316130)

<table>
<tr><td colspan="4">INPEX – Incident Action Plan</td></tr>
<tr><td>IAP Sequence #</td><td></td><td>IAP Issue Date / Time</td><td></td></tr>
<tr><td colspan="2">Incident Name</td><td colspan="2">Operational Period</td></tr>
<tr><td colspan="2"></td><td colspan="2">From   to</td></tr>
<tr><td colspan="2">IAP Developer - Planning Function Lead</td><td colspan="2">IAP Approver - IMT Leader</td></tr>
<tr><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td colspan="2">Mission Statement</td><td colspan="2">Responsible: IMT Leader</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="2">Situation</td><td colspan="2">Responsible: IMT Leader/Operations
Information from: Incident Status Board</td></tr>
<tr><td colspan="2">Incident Level:</td><td colspan="2"></td></tr>
<tr><td colspan="2">Incident Location</td><td colspan="2"></td></tr>
<tr><td colspan="2">Status:</td><td colspan="2">Is incident contained, escalating , under control</td></tr>
<tr><td colspan="2">Incident Commenced</td><td colspan="2">Time /Date</td></tr>
<tr><td colspan="2">Incident Commander Contact Details:</td><td colspan="2"></td></tr>
<tr><td colspan="2">Brief Description of Incident</td><td colspan="2"></td></tr>
<tr><td colspan="2">Actions Completed</td><td colspan="2"></td></tr>
<tr><td colspan="2">Current Situation</td><td colspan="2"></td></tr>
<tr><td colspan="2">Actions Underway</td><td colspan="2"></td></tr>
<tr><td colspan="2">Predicted Situation
(at end of operational period)</td><td colspan="2"></td></tr>
<tr><td colspan="2">Safety Message / Risks</td><td colspan="2">Responsible: H&S Advisor</td></tr>
<tr><td colspan="4">Key message to prevent further injury or hazard exposure for responders plus key risk areas over the operational period</td></tr>
</table>

Incident Objectives	Ref	**People**	Ref	**Environment**	Ref	**Assets**	Ref	**Reputation**	Ref	**Sustainability**
	PO1		*EO1*		*AO1*		*RO1*		*SO1*	
	PO2		*EO2*		*AO2*		*RO2*		*SO2*	
	P03		*EO3*		*AO3*		*RO3*		*SO3*	
	PO4		*EO4*		*AO4*		*RO4*		*SO4*	

Strategies	Ref		Ref		Ref		Ref		Ref	
							RO1		*SO1*	
			EO1		*AO1*					
	PO1									
							RO2		*SO2*	
			EO2		*AO2*					
	PO2									
	PO3									

Tasks		IMT Function responsible		IMT Function responsible		IMT Function responsible		IMT Function responsible		IMT Function responsible

Resources	*Responsible:* *Logistics Function*	*Information from:* *Resources Summary Board*
A summary of resources required and being used during Operational period ETD and ETA are to be included.		

Medical Plan	*Responsible:* *HR Function*	*Information from:* *Medical Planning Board*
A summary of casualties, medevacs and medical facilities		
Communications Plan	*Responsible:* *IMT Leader (EA&JV Function can assist if activated by P-CMT Leader)*	*Information from:* *Stakeholder Management Board*
A summary of key stakeholder deadlines and planned engagements or updates required during Operational Period		
Key Timings	*Responsible:* *IMT Leader/Planning*	
A summary of key timings within this Operational Period such as next IMT Update Briefing, Shift Change, etc.		
Administration	*Responsible:* *All*	
Additional specialist functions activated to support incident management. *A summary of administrative arrangements such as feeding, accommodation, security, travel etc.*		

Appendix E-
Strategic Spill Impact Assessment (SIMA) for Surface diesel release

X060-AH-LIS-60032 Spill Impact Mitigation Assessment Surface Diesel Release

Location	N/W WA and NT Waters	Spill Scenario	<500m^3 Marine Diesel Instantaneous Surface Release

	SIMA Stage 2: Predict Outcomes		SIMA Stage 3: Balance Trade-Offs - Impact Modification Factors													
	Potential Relative Impact		Prediction of the effectiveness and impact modification potential of the response options													
Resource Compartment (including values dependent on the resource compartment)	No Intervention (natural weathering)		Contain and Recover		Protect and Deflect		Shoreline Clean-up		Chemical Dispersant (near spill location)		Pre-Contact Wildlife Response (Hazing & Translocation)		Post Contact Wildlife Response		In-situ Burn (near spill location)	Operational monitoring and evaluation
		A	B1	A x B1	B2	A x B2	B3	A x B3	B4	A x B4	B5	A x B5	B6	A x B6		
Subtidal Benthic Communities															In-situ is not considered to be safe, effective or feasible.	Operational monitoring and evaluation is implemented under all oil spill scenarios
Benthic primary producer habitat (coral, seagrass, macro-algae and shallow water EPBC species foraging within this habitat)	Moderate	3	1	3	0	0	0	0	-1	-3	0	0	0	0		
Deep-sea features (filter feeding communities, deep water EPBC species foraging areas and Key Ecological Features)	None / Insignificant	1	0	0	0	0	0	0	0	0	0	0	0	0		
Deep-sea unconsolidated muds and sands	None / Insignificant	1	0	0	0	0	0	0	0	0	0	0	0	0		
Intertidal seabed																
Intertidal Coral Reef	Moderate	3	1	3	-2	-6	-1	-3	-1	-3	0	0	0	0		
Mangrove/Mudflats/Samphires	Minor	2	1	2	-1	-2	-1	-2	-1	-2	0	0	0	0		
Sandy Beach	Minor	2	1	2	1	2	1	2	-1	-2	0	0	0	0		
Rocky Shoreline	Minor	2	1	2	1	2	1	2	-1	-2	0	0	0	0		
Macro-Algae and Seagrass	Minor	2	1	2	1	2	-1	-2	-1	-2	0	0	0	0		
Intertidal habitat which is important habitat for protected species (nesting / roosting / foraging)	Moderate	3	1	3	1	3	1	3	-1	-3	1	3	1	3		
Water column																
Lower water column (below photic zone)	None / Insignificant	1	0	0	0	0	0	0	0	0	0	0	0	0		
Upper water column (in photic zone, including plankton and EPBC foraging in the photic zone)	Minor	2	1	2	0	0	0	0	-1	-2	0	0	0	0		
Water surface, including foraging areas for EPBC listed species	Moderate	3	1	3	0	0	0	0	-1	-3	0	0	1	3		
Air	Minor	2	0	0	0	0	0	0	0	0	0	0	0	0		
Socio-economic																
Commercial demersal fisheries	None / Insignificant	1	0	0	0	0	0	0	0	0	0	0	0	0		
Shallow commercial fisheries (including aquaculture)	None / Insignificant	1	1	1	0	0	1	1	-1	-1	0	0	0	0		
Recreational fisheries	None / Insignificant	1	1	1	0	0	1	1	-1	-1	0	0	0	0		
Cultural heritage																
Aboriginal heritage (cultural practices, sites and fishing / foraging)	None / Insignificant	1	0	0	0	0	1	1	0	0	0	0	0	0		
Indonesian traditional fishing	None / Insignificant	1	1	1	0	0	1	1	-1	-1	0	0	0	0		
		Total Impact Mitigation Score		25		1		4		-25		3		6	-	-
		Carried to ALARP evaluation yes/no		Yes		Yes		Yes		No		Yes		Yes	No	Yes

Resource Compartment (including values dependent on the resource compartment)	No Intervention (natural weathering)		Justification for Potential Relative Impact Score
		A	
Subtidal Benthic Communities			
Benthic primary producer habitat (coral, seagrass, macro-algae and shallow water EPBC species foraging within this habitat)	Moderate	3	Subtidal benthic primary producer habitat (BPPH) may be exposed to entrained/dissolved diesel above impact thresholds from a vessel collision in the Browse Basin. The effect of the toxic fractions of entrained/dissolved oil on intertidal coral includes partial mortality of colonies, reduced growth rates, bleaching, reduced photosynthesis, interruption of chemical communication necessary for mass spawning, premature explosion of larvae, decreased growth rates, decreased lipid content, decreased survival of larvae, decreased gonadal development, negative impacts to coral settlement, increased susceptibility to algae colonisation, epidemic diseases, localised tissue rupture, reduced reef resilience and mortality (Hayes et al 1992; Peters et al 1997; Negri & Heyward 2000; Shigenaka 2001; CSIRO 2016). WA DoT (2018) note that coral is sensitive to dissolved hydrocarbons as it causes toxicity at a cellular level. Corals accumulate oil from the water column (Pie et al 2015) making it biologically available to EPBC species foraging in this habitat. Seagrass and macroalgae may be subject to lethal or sublethal toxic effects, including mortality, reduced growth rates and impacts to seagrass flowering. BPPH is collectively considered to be an important resource as it supports a high biomass of fish, cetaceans and seabirds, including foraging EPBC species (DEWHA 2008). Several studies have indicated rapid recovery rates for seagrass and macroalgae may occur even in cases of heavy oil contamination (Connell et al, 1981; Burns et al. 1993; Dean et al. 1998; Runcie & Riddle 2006), but coral is sensitive to oil (and dispersants), making recovery from spills potentially slow (Guzman et al 1994). RPS (2019) modelling of a 250m3 MGO spill confirmed that at no point would dissolved oil exceed the 500 ppb impact threshold, limiting the potential for toxic effects from an MGO spill. Therefore, the consequence to benthic primary producer habitat is considered to be Moderate.
Deep-sea features (filter feeding communities, deep water EPBC species foraging areas and Key Ecological Features)	None / Insignificant	1	No impact from surface spill of diesel below 25m (RPS 2019).
Deep-sea unconsolidated muds and sands	None / Insignificant	1	No impact from surface spill of diesel below 25m (RPS 2019).
Intertidal seabed			
Intertidal Coral Reef	Moderate	3	Intertidal coral reefs could be impacted by surface fresh, weathered, entrained and dissolved diesel from a vessel collision in the Browse Basin. RPS (2019) modelling of a 250m3 MGO spill confirmed that at no point would dissolved oil exceed the 500 ppb impact threshold, limiting the potential for toxic effects from an MGO spill. The effect of diesel on intertidal coral is unlikely to result in significant smothering as diesel is expected to be weathered and in the form of waxy flakes/residues when it arrives in intertidal coral areas. In this form, toxicity is less than fresh diesel (Woodside 2014). The effect of the toxic fractions of entrained/dissolved oil on intertidal coral include partial mortality of colonies, reduced growth rates, bleaching, reduced photosynthesis, interruption of chemical communication necessary for mass spawning, premature explosion of larvae, decreased growth rates, decreased lipid content, decreased survival of larvae, decreased gonadal development, negative impacts to coral settlement, increased susceptibility to algae colonisation, epidemic diseases, localised tissue rupture, reduced reef resilience and mortality (Hayes et al 1992; Peters et al 1997; Negri & Heyward 2000; Shigenaka 2001; CSIRO 2016). WA DoT (2018) note that coral is sensitive to dissolved hydrocarbons as it causes toxicity at a cellular level. Coral reefs are found in isolated locations within the Browse Basin and are considered to be significant benthic primary producers that play a key role in the ecosystem and have an iconic status in the environment (WA DoT 2018). They are considered of high importance to EPBC species that aggregate, nest, roost and forage in the area, hence isolated populations could potentially be exposed in the event of a spill. As spills disperse, intertidal communities are expected to recover (Dean et al. 1998), though the rate of recovery of coral reefs depends on the level or intensity of the disturbance, with recovery rates ranging from 1 or 2 years, to decades (Fucik et al. 1984, French McCay 2009). Impact on the receptor is considered to be Moderate.
Mangrove/Mudflats/Samphires	Minor	2	Mangrove, mudflats and samphire communities may be exposed to entrained/dissolved diesel above impact thresholds from a vessel collision in the Browse Basin. RPS (2019) modelling of a 250m3 MGO spill confirmed that at no point would dissolved oil exceed the 500 ppb impact threshold, limiting the potential for toxic effects from an MGO spill. Given that mangrove habitats are remote from permit areas, fresh or weathered diesel (both surface and entrained) are unlikely to reach this receptor. The potential effects of entrained and dissolved oil include defoliation and mortality of mangroves (Burns et al. 1993; Duke et al. 2000). Entrained and dissolved oil exposure is only likely to occur at isolated locations amongst a very large and generally contiguous population. The recovery of mangroves from shoreline oil accumulation can be a slow process, due to the long-term persistence of oil trapped in anoxic sediments and subsequent release into the water column (Burns et al. 1993). Any impacts to benthic habitats are expected to be localised and of short to medium term. The potential consequence is considered to be Minor.
Sandy Beach	Minor	2	Sandy beaches could be impacted by surface fresh, weathered, entrained and dissolved diesel from a vessel collision in the Browse Basin. RPS (2019) modelling of a 250m3 MGO spill confirmed that at no point would dissolved oil exceed the 500 ppb impact threshold, limiting the potential for toxic effects from an MGO spill. The effect of gradual accumulation of oil on the receptor could lead to harm including the increased prevalence of tumours in species (CSIRO 2016). Sandy beaches are the dominant shoreline habitat on offshore islands in the Browse Basin and are considered significant habitat for turtles and seabird nesting. Organisms such as polychaete worms, bivalves and crustaceans generally inhabit sandy beaches but the mobile nature of the sands generally limits diversity. These species provide a valuable food source for resident and migratory sea and shorebirds (DEC/MPRA 2005). Law et al (2011) note that when grain size is between 2 and 64 mm, beaches are not considered especially sensitive to oil spills as they are regularly cleaned by wave action and oil is generally not retained. Offshore island beaches of the Browse Basin are generally coarse grained, due to high wave energy. WA DoT (2018) assessed Kimberley sandy beaches and concluded that they are moderately ecologically sensitive and are moderately difficult to rehabilitate from an oil spill. The potential consequence is considered to be Minor.
Rocky Shoreline	Minor	2	Rocky shorelines could be impacted by surface fresh, weathered, entrained and dissolved diesel from a vessel collision in the Browse Basin. RPS (2019) modelling of a 250m3 MGO spill confirmed that at no point would dissolved oil exceed the 500 ppb impact threshold, limiting the potential for toxic effects from an MGO spill. This receptor is typically characterised as being a high wind and wave energy environment (CSIRO 2016). Diesel from a spill has the potential to coat the substrate or become stranded by receding tides – but incoming tides also have the potential to remove deposited diesel (Law et al 2011). CSIRO (2016) note that rocky shorelines are not considered sensitive environments, and IPIECA (2017) state that rocky shorelines generally have a diverse and productive intertidal community which are considered resilient to oil spills and short-term oil persistence. WA DoT (2018) note that rocky shorelines are the least susceptible of shoreline types to long term impacts from a spill of both floating and dissolved oil. As such, this receptor is not expected to have issues relating to recovery from an oil spill. The potential consequence for rocky shorelines is considered to be Minor.

Macro-Algae and Seagrass	Minor	2	Macroalgae and seagrass may be exposed to entrained and dissolved diesel above impact thresholds from a vessel collision in the Browse Basin. RPS (2019) modelling of a 250m3 MGO spill confirmed that at no point would dissolved oil exceed the 500 ppb impact threshold, limiting the potential for toxic effects from an MGO spill. This receptor is unlikely to come into contact with significant amounts of fresh floating surface hydrocarbons, but could potentially be exposed to weathered waxy flakes and residues. WA DoT (2018) note that dissolved oil causes more impacts to algae than floating oil, as it results in cellular level poisoning. The effect of subjecting seagrass and macroalgae to lethal or sublethal toxic effects of oil can result in mortality, reduced growth rates and impacts to seagrass flowering. Several studies have indicated rapid recovery rates may occur even in cases of heavy oil contamination (Connell et al, 1981; Burns et al. 1993; Dean et al. 1998; Runcie & Riddle 2006). Taylor and Rasheed (2011) reported that seagrass meadows were not significantly affected by an oil spill when compared to a non-impacted reference seagrass meadow. Macroalgae support diverse small invertebrates that are the principal food source for a number of inshore fish (WA DoT 2018). Seagrasses provide energy and nutrients for detrital grazing food webs (WA DoT 2018), act as a refuge for fish and invertebrates, and provide a food source for EPBC species such as dugongs and green turtles (DEC 2007). Therefore, the potential consequence is considered to be Minor.
Intertidal habitat which is important habitat for protected species (nesting / roosting / foraging)	Moderate	3	Intertidal habitat may be exposed to fresh, weathered, entrained and dissolved diesel above impact thresholds from a vessel collision in the Browse Basin. RPS (2019) modelling of a 250m3 MGO spill confirmed that at no point would dissolved oil exceed the 500 ppb impact threshold, limiting the potential for toxic effects from an MGO spill. The effect of diesel on this receptor can result in mortality or harm to benthic primary producers and organisms such as EPBC species that rely on these species for food, or rely on the habitat for nesting and roosting. IPIECA (2014) note that dehydration, gastrointestinal problems and anaemia are commonly found in oiled animals, causing potential long-term effects on reproductive success. They further note that the toxic effects of ingested oil generally impacts the liver, whilst volatile fumes damage lungs resulting in debilitating effects (IPIECA 2014). Oiled aquatic EPBC fauna can further suffer hypothermia, irritations, burns, respiratory problems and loss of waterproofing, leading to them moving onto land (i.e. away from their food source) where they have further difficulty thermoregulating and feeding (IPIECA 2017). Specifically, marine reptiles, including turtles and crocodiles can be exposed to hydrocarbons externally in intertidal areas through direct contact; or internally, by ingesting oil, consuming prey containing oil, or inhaling volatile compounds (Milton et al. 2003). Turtle hatchlings may be particularly vulnerable to toxicity and smothering, as they emerge from nests and make their way over the intertidal area to the water (AMSA 2015; Milton et al. 2003). Birds coated in hydrocarbons can suffer damage to external tissues including skin and eyes, as well as internal tissue irritation in their lungs and stomachs (AMSA 2015; WA DoT 2018). Toxic effects may also result where the product is ingested, either through birds' attempts to preen their feathers (Jenssen 1994; Matcott et al. 2019) or ingested as weathered waxy flakes/residues present on shorelines. There is the potential for short to medium term impacts; however, the overall population viability for any protected species would not be threatened from a vessel collision spill. The cumulative potential consequence is considered to be Moderate.
Water column			
Lower water column (below photic zone)	None / Insignificant	1	No impact from surface spill of diesel below 25m (RPS 2019).
Upper water column (in photic zone, including plankton and EPBC foraging in the photic zone)	Minor	2	The upper water column may be exposed to entrained and dissolved diesel above impact thresholds from a vessel collision in the Browse Basin. RPS (2019) modelling of a 250m3 MGO spill confirmed that at no point would dissolved oil exceed the 500 ppb impact threshold, limiting the potential for toxic effects from an MGO spill. The effect of entrained and dissolved oil on this receptor include chronic impacts to juvenile fish, larvae and planktonic organisms due to their sensitivity during these life stages, with the worst impacts predicted to occur in smaller species (WA DoT 2018). Whale sharks are filter feeders and are expected to be highly vulnerable to entrained hydrocarbons (Campagna et al 2011) with potential effects including damage to the liver and lining of the stomach and intestines, as well as toxic effects on embryos (Lee 2011). Marine mammals, marine reptiles and marine avifauna could also be impacted through entrained and dissolved hydrocarbon exposure, primarily through ingestion during foraging activities (AMSA 1998). The upper water column is considered to be very important habitat for EPBC species as a large number of BIAs for marine fauna are present in the Browse Basin. It is expected that the upper water column will recover quickly as a vessel collision spill is unlikely to cause significant or cumulative impacts. The consequence is considered to be Minor.
Water surface, including foraging areas for EPBC listed species	Moderate	3	The water surface may be exposed to fresh and weathered surface diesel above impact thresholds from a vessel collision in the Browse Basin. Fresh diesel and weathered waxy flakes/residues can impact marine mammals surfacing, as they are vulnerable to oil exposure. Blue whales and humpback whales (baleen whales), that filter-feed near the surface, could potentially ingest diesel. Spilled hydrocarbons may also foul the fibres of baleen whales impairing food gathering efficiency or fouling prey with hydrocarbons (AMSA 2015). Turtles can be exposed to hydrocarbons if they surface within the spill, resulting in direct contact with the skin, eyes, and other membranes, as well as the inhalation of vapours or ingestion (Milton et al. 2003). Floating oil is considered to impact reptiles more than entrained/dissolved oil because reptiles hold their breath underwater and are unlikely to directly ingest dissolved oil (WA DoT 2018). Other aspects of turtle behaviour, including a lack of avoidance behaviour, indiscriminate feeding in convergence zones, and large, pre dive inhalations, make them vulnerable to spilled oil (AMSA 2015). Hatchlings spend more time on the surface than older turtles, thus increasing the potential for contact with oil slicks (Milton et al. 2003). Aquatic migratory birds are among the most vulnerable and visible species to be affected by surface oil, with oil impacts frequently leading to long-term physiological changes potentially resulting in lower reproductive rates or survival rates (Fingas 2012). The probability of lethal effects is dependent on factors such as timing, location, oceanographic and weather patterns, and the movements of species that forage, feed, nest and inhabit that area (IPIECA 2014), the amount of time spent on the water surface as well as any oil avoidance behaviour (French-McCay 2009). Direct contact with surface hydrocarbons may break down the ability of plumage to maintain body heat, resulting in direct and indirect impacts such as hypothermia, dehydration, drowning and starvation (AMSA 2015; Matcott et al, 2019; Jenssen 1994; IPIECA 2014; ITOPF 2011). Birds resting at the sea surface or surface plunging can be impacted by oil resulting in damage to external tissues, including skin and eyes, and internal tissue irritation in lungs and stomachs (Clark 1984; WA DoT 2018). Toxic effects may also result where hydrocarbons are ingested, as birds attempt to preen their feathers (Jenssen 1994; Matcott et al. 2019). The water surface is considered an important receptor where EPBC listed species forage. It is expected to recover from oil impacts with time, and it is unlikely that there will be cumulative impacts through bioaccumulation up the food chain. The consequence is considered to be Moderate.
Air	Minor	2	Air may be exposed to fresh surface diesel above impact thresholds from a vessel collision in the Browse Basin. Surface oil may lead to high local concentrations of atmospheric volatiles that have the potential to cause harmful impacts to species such as cetaceans if inhaled. Turtles could also be affected by harmful vapours during pre-dive inhalations (Milton et al. 2003). The receptor is not considered to be sensitive, thus is expected to recover in a very short period of time, as the evaporated hydrocarbons are rapidly dispersed by the wind, and evaporation rapidly reduce with time as oil weathers and entrains. Only a very localised area, immediately above the freshest parts of the oil slick would be impacted by evaporating hydrocarbons. The potential consequence is considered to be Minor.

Socio-economic			
Commercial demersal fisheries	None / Insignificant	1	No impact to fish stocks deeper 25 metres (RPS 2019). Commercial demersal fisheries may be exposed to surface, weathered, entrained and dissolved diesel above impact thresholds from a vessel collision in the Browse Basin. RPS (2019) modelling of a 250m3 MGO spill confirmed that at no point would dissolved oil exceed the 500 ppb impact threshold, limiting the potential for toxic effects from an MGO spill. The effect of diesel on this receptor includes the ability to cause economic loss (through indirect loss of stock and perceived tainting of stock by oil) (WA DoT 2018), impede access to fishing areas from the implementation of an exclusion zone during a spill response; impact seafood quality and employment; plus negatively impact lines and nets (ITOPF 2011). The economic impact from an oil spill is dependent on the species being cultured, as species have different recovery rates. WA DoT (2018) note that dissolved oil will impact finfish, taking 6-8 years for fisheries to recover (due to the time it takes for hatchlings to reach maturity) (WA DoT 2018). This receptor is considered to be important, however a vessel collision spill is unlikely to cause significant impacts to demersal fisheries due to the shallow and localised entrained oil affected area. The real and perceived consequence is considered to be Insignificant.
Shallow commercial fisheries (including aquaculture)	None / Insignificant	1	Shallow commercial fisheries including aquaculture (shallower than 25m, (RPS 2019)) may be exposed to surface, weathered, entrained and dissolved diesel above impact thresholds from a vessel collision in the Browse Basin. RPS (2019) modelling of a 250m3 MGO spill confirmed that at no point would dissolved oil exceed the 500 ppb impact threshold, limiting the potential for toxic effects from an MGO spill. The effect of diesel on this receptor includes the ability to cause economic loss (through indirect loss of stock and perceived tainting of stock by oil) (WA DoT 2018), impede access to fishing areas from the implementation of an exclusion zone during a spill response; impact seafood quality and employment; plus negatively impact lines and nets (ITOPF 2011). The economic impact from an oil spill is dependent on the stock being cultured, as species have different recovery rates. DoT (2018) note that dissolved oil will have the greatest impact, with oyster farms potentially taking 3-4 years to recover from a spill (DoF 2013), whilst finfish farms could take 6-8 years to recover due to the time it takes for hatchlings to reach maturity. WA DoT (2018) note that the pearling industry relies almost exclusively on sourcing pearl oysters from Eighty Mile Beach (south of Broome) and an area off the Lacepede Islands. There is also other aquaculture in the region including trochus and barramundi (Fletcher et al 2017). WA DoT (2018) note that some wild stocks aquaculture species such as mussels are impacted more by dissolved oil than floating oil due to being filter feeders. This receptor is considered to be important however a vessel collision spill in the Browse Basin unlikely to cause any significant impacts to shallow commercial fisheries (including aquaculture) due to the limited and localised surface and shallow entrained oil and remoteness of the shallow commercial fishing areas and aquaculture to potential release locations. Therefore, the real and perceived consequence is considered to be Insignificant.
Recreational fisheries	None / Insignificant	1	Recreational fisheries (shallower than 25m, RPS 2019)) may be exposed to surface, weathered, entrained and dissolved diesel above impact thresholds from a vessel collision in the Browse Basin. RPS (2019) modelling of a 250m3 MGO spill confirmed that at no point would dissolved oil exceed the 500 ppb impact threshold, limiting the potential for toxic effects from an MGO spill. The effects of diesel on this receptor includes negatively impacting nets and lines (ITOPF 2011), impeding access to fishing areas from the implementation of an exclusion zone during a spill response and impacting seafood quality and quantity. Recreational fishing is generally concentrated around readily accessible coastal settlements along the Kimberley and NT coastlines (such as Broome, Wyndham and Darwin) and there is little recreational fishing around the offshore Browse Basin due to the distance from land, lack of features of interest and deep waters. Offshore islands, coral reef systems and continental shelf waters of the Browse Basin however are increasingly being targeted by fishing based charter vessels (Fletcher and Santoro 2014) with extended fishing charters operating during certain times of the year. This receptor is considered to be important, however a vessel collision spill is unlikely to cause significant impacts to recreational fisheries due to the limited and localised surface and shallow entrained oil affected area and very limited recreational fishing in the offshore Browse Basin. The real and perceived consequence is considered to be Insignificant.
Cultural heritage			
Aboriginal heritage (cultural practices, sites and fishing / foraging)	None / Insignificant	1	Aboriginal heritage including special places, cultural landscapes, practices and fishing/foraging along the Kimberley and NT coastline are unlikely to be impacted by surface and weathered diesel above impact thresholds from a vessel collision in the Browse Basin. The effect of surface weathered diesel on this receptor includes physically degrading a site, disrupting the harvesting of fish, and area closures could displace Aboriginal people and have implications on cultural identity, health and wellbeing. The receptor is important however is generally remote from any potential vessel collision locations, limiting the scale of imact, and the recovery is expected to be short to medium term. Therefore, consequence is considered to be Insignificant.
Indonesian traditional fishing	None / Insignificant	1	Indonesian traditional fishing areas shallower than 25m (RPS 2019) may be exposed to fresh, weathered surface oil and entrained/dissolved diesel above impact thresholds from a vessel collision in the Browse Basin. RPS (2019) modelling of a 250m3 MGO spill confirmed that at no point would dissolved oil exceed the 500 ppb impact threshold, limiting the potential for toxic effects from an MGO spill. Indonesian traditional fishing occurs within the MoU box which covers Scott Reef and surrounds, Seringapatam Reef, Browse Island, Ashmore Reef, Cartier Island and various banks and shoals. The effect of diesel on these receptor could include reduction and contamination of target species such as sea cucumbers (bêche-de-mer), trochus (top shell snail), reef fish. Exclusion zones during the spill response may also affect access to fishing locations, even if the target species are not affected by diesel. This receptor is considered to be important however a vessel collision spill is unlikely to cause significant impacts to Indonesian traditional fishing due to the limited and localised surface and shallow entrained oil affected area. The real and perceived consequence is considered to be Insignificant.

Containment and Recovery

Overall statement of likelihood of success of Contain and Recovery (C&R):

Aim: This strategy aims to collect oil from the ocean surface using booms and skimmers, generally at or near the release location, where oil concentrations are highest. Floating booms are used to corral and concentrate spilled floating oil into a surface thickness that will allow for mechanical removal (i.e. pumping oil into temporary storage) by devices such as skimmers (IPIECA 2015).

Type of slick: Surface oil is in the form of Group II floating slicks which have a low viscosity and rapidly spread into a thin sheen. Surface oil concentrations will be approximately 10 g/m^2 (~0.01mm, which equates to Bonn code 1/2) up to approximately 160 km from the spill site and weathered oil concentrations reduce down to below 1 g/m^2 up to approximately 300 km from the spill site.

Likely success/effectiveness against slick: O'Brien (2002) notes that spreading of oil is the main obstacle to a successful at sea contain and recovery response, with this type of oil tending to spread so thinly and quickly that skimmers are unable to efficiently skim and recover meaningful quantities. Generally oil needs to be >100 g/m^2 (>0.1mm, which equates to Bonn code 4/5) to feasibly corral oil with a boom and achieve any significant level of oil recovery with skimmers (O'Brien 2002), as booms have limited effect against thin oil films and no effect against a subsurface plume (ITOPF 2011). The initial, gravity-dominated release and spreading is generally complete within minutes to hours after a release (O'Brien 2002)). In the context of the Browse Basin, with high sea surface and air temperatures in all seasons, the spreading of any diesel spill would be very rapid. Diesel spilled from a vessel collision would therefore remain at a thickness of >100g/m^2 for only a very brief period of time, before evaporation and spread effects generating very thin surface slicks, making C&R inefficient and impractical (IPIECA 2017). Where there is any significant diesel slick, flammable/toxic vapours will also be present, and will likely exceed safe exposure thresholds, further reducing response efficiency (as vessels will not be permitted to operate in areas where explosive limits or VOC exposure thresholds are exceeded). Due to the very thin surface slicks, very low rates of recovery would be expected. Note that IPIECA (2015) state that efficiency of contain and recover operations (for any oil type) can vary widely due to operational, environmental and logistical constraints, but usually it is limited to recovering approximately only 5-20% of the initial spilled volume. Contain and recovery is therefore unlikely to be an effective response strategy, with limited chance of any significant surface slick recovery from a Group II spill.

Resource Compartment (including values dependent on the resource compartment)	Impact Modification Score		Justification for Impact Modification Score
		B	
Subtidal Benthic Communities			
Benthic primary producer habitat (coral, seagrass, macro-algae and shallow water EPBC species foraging areas)	Minor mitigation of impact	1	C&R may result in a minor reduction in localised surface oil which may have a minor positive outcome in reducing future entrained oil in the upper water column including submerged BBPH.
Deep-sea features (filter feeding communities, deep water EPBC species foraging areas and Key Ecological Features)	No or insignificant alteration of impact	0	C&R occurs on the surface and has no impact on entrained oil affecting deep sea features.
Deep-sea unconsolidated muds and sands	No or insignificant alteration of impact	0	C&R occurs on the surface and has no impact on entrained oil affecting deep sea unconsolidated muds and sands.
Intertidal seabed			
Intertidal Coral Reef	Minor mitigation of impact	1	C&R may result in a minor reduction on oil on surface, resulting in very minor reduction in surface and entrained oil reaching intertidal zones.
Mangrove/Mudflats/Samphires	Minor mitigation of impact	1	
Sandy Beach	Minor mitigation of impact	1	
Rocky Shoreline	Minor mitigation of impact	1	
Macro-Algae and Seagrass	Minor mitigation of impact	1	
Intertidal habitat which is important habitat for protected species (nesting / roosting / foraging)	Minor mitigation of impact	1	
Water column			
Lower water column (below photic zone)	No or insignificant alteration of impact	0	C&R occurs on the surface and has no impact on entrained oil affecting fully submerged benthic primary producer habitat.
Upper water column (in photic zone)	Minor mitigation of impact	1	C&R may result in a minor reduction in localised surface oil which may have a minor positive outcome in reducing future entrained oil in the upper water column.
Water surface	Minor mitigation of impact	1	C&R may result in a minor reduction in localised surface oil.
Air	No or insignificant alteration of impact	0	Due to the rapid evaporation of diesel and low expected recovery rates of surface oil, C&R activities would not result in any significant change to local atmospheric VOC concentrations.

Socio-economic			
Commercial demersal fisheries	No or insignificant alteration of impact	0	C&R may result in a minor reduction in localised surface oil which may have a minor positive outcome on entrained oil, resulting in no change to oil exposure to demersal fish
Shallow commercial fisheries (including aquaculture)	Minor mitigation of impact	1	C&R may result in a minor reduction in localised surface oil which may have a minor positive outcome in reducing future entrained oil in the upper water column including shallow commercial and recreational fisheries.
Recreational fisheries	Minor mitigation of impact	1	
Cultural heritage			
Aboriginal heritage (cultural practices, sites and fishing / foraging)	No or insignificant alteration of impact	0	C&R may result in a minor reduction in localised surface oil which may have a minor positive outcome in reducing future entrained oil in the upper water column. However, due to distance to aboriginal cultural heritage receptors, the impact mitigation potential is considered to be insignificant.
Traditional Indonesian fishing	Minor mitigation of impact	1	C&R may result in a minor reduction in localised surface oil which may have a minor positive outcome in reducing future entrained oil in the upper water column including shallow traditional fishing habitats.

Protect and Deflect

Overall statement of likelihood of success of Protect and Deflect (P&D):

Aim: This strategy aims to use physical barriers to exclude or restrict the spill contacting specific sensitive receptors or to deflect the spill from these locations; typically onto less sensitive areas.

Type of slick: Surface oil reaching remote shorelines will be in the form of thin floating slicks of weathered diesel which could accumulate over time. Weathered oil would be in the form of waxy flakes and residues which are generally considered to be of lower toxicity than fresh oil (Woodside 2014).

Likely success/effectiveness against slick: Booms could be used to protect and deflect surface spills away from sensitive habitats, but they have limited effect against thin Group II oil films and no effect against subsurface entrained plumes (ITOPF 2011). Generally oil needs to be >100 g/m^2 (>0.1mm, which equates to Bonn Code 4/5) to feasibly corral oil with a boom (O'Brien 2002), as would be required for a P&D response. However diesel on the ocean surface from a vessel collision is unlikely to have slicks >100 g/m^2. Even in a scenario where the best equipment is available, shoreline protect and deflect activities at Browse Island or other exposed remote shoreline locations, would be technically challenging due to the general exposure to unfavourable sea conditions, large tidal range and shallow coral reefs. Generally protect and deflect is limited to sheltered waters, not exposed reef/beach environments. Only under exceptionally calm sea-states and appropriate tides would it be safe to conduct vessel activities to carry-out an effective protect and deflect operation at remote shorelines. MetOcean conditions required for this technique to be successful include <1 m sea-state and low surface currents - but these are frequently exceeded at remote offshore locations in the Browse Basin region. In addition, given the size of the offshore island shorelines (e.g. Browse Island, one of the smallest offshore islands, has an intertidal zone 3km in diameter, 7km in circumference), a substantial number of booms would be needed to be deployed to protect the shorelines, or deflect oil into a collection point on a beach. Anchoring of booms would most likely result in additional damage to the subtidal and intertidal environment (coral reef) surrounding most offshore islands, due to anchor chain drag. Booms themselves would also drag around on the coral intertidal reef during periods of lower tides, potentially resulting in significant physical damage to the benthos of the reef platform and also result in damage to booms. Booms could potentially be held in place by vessels however due to widths of shorelines requiring protection this would most likely require an unfeasibly large number of vessels, and at low tide this isn't practicable in intertidal zones. Most offshore island shorelines would be expected to 'self clean' any accumulated Group II oil due to the lack of adhesiveness, the coarse substrate, the high wave energy and high tidal regime (Fingas 2012), further reducing the impact mitigation potential of protect and deflect at these locations. As a result of the above mentioned factors, protect and deflect would be unlikely to result in any significant deflection or recovery of Group II diesel at remote intertidal/shoreline habitats.

Resource Compartment (including values dependent on the resource compartment)	Impact Modification Score		Justification for Impact Modification Score
		B	
Subtidal Benthic Communities			
Benthic primary producer habitat (coral, seagrass, macro-algae and shallow water EPBC species foraging areas)	No or insignificant alteration of impact	0	P&D occurs on the surface at a shoreline location and will have insignificant impact on entrained oil affecting subtidal benthic primary producer habitat.
Deep-sea features (filter feeding communities, deep water EPBC species foraging areas and Key Ecological Features)	No or insignificant alteration of impact	0	P&D occurs on the surface at a shoreline location and has insignificant impact on entrained oil affecting deep sea features.
Deep-sea unconsolidated muds and sands	No or insignificant alteration of impact	0	P&D occurs on the surface at a shoreline location and has insignificant impact on entrained oil affecting deep sea unconsolidated muds and sands.
Intertidal seabed			
Intertidal Coral Reef	Moderate additional impact	-2	P&D may result in a minor reduction of thin slicks of weathered diesel reaching intertidal receptors. However, anchoring extensive boom arrays would most likely result in physical damage to subtidal and intertidal coral reefs.
Mangrove/Mudflats/Samphires	Minor additional impact	-1	P&D may result in a minor reduction of thin slicks of weathered diesel reaching intertidal receptors. However, due to the extensive scale of mangrove communities along the mainland and islands of the Kimberley and NT coastline, the ability to successfully achieve a benefit from P&D is extremely limited. Anchors/anchor chains also have the potential to damage mangrove aerial root structures and disturb other fragile low-energy shorelines.
Sandy Beach	Minor mitigation of impact	1	P&D may result in a minor reduction of thin slicks of weathered diesel reaching intertidal receptors. A correctly executed shoreline clean-up may result in a positive outcome compared to natural weathering.

Rocky Shoreline	Minor mitigation of impact	1	P&D may result in a minor reduction of thin slicks of weathered diesel reaching intertidal receptors. A correctly executed clean-up on a rocky shoreline may result in a positive outcome compared to natural weathering.
Macro-Algae and Seagrass	Minor mitigation of impact	1	P&D may result in a minor reduction of thin slicks of weathered diesel reaching intertidal receptors. However, anchoring extensive boom arrays would most likely result in physical damage to subtidal and intertidal coral reefs.
Intertidal habitat which is important habitat for protected species (nesting / roosting / foraging)	Minor mitigation of impact	1	P&D may result in a minor reduction of thin slicks of weathered diesel reaching intertidal receptors. A correctly executed clean-up on a sandy beach or rocky shoreline may result in a positive outcome, including protected species such as marine avifauna and turtles who utilise these habitats.
Water column			
Lower water column (below photic zone)	No or insignificant alteration of impact	0	P&D does not reduce the amount of entrained oil affecting the lower water column.
Upper water column (in photic zone)	No or insignificant alteration of impact	0	P&D does not reduce the amount of entrained oil affecting the upper water column.
Water surface	No or insignificant alteration of impact	0	P&D would only occur near shorelines and would not result in any significant reduction to the volume of oil on the water surface.
Air	No or insignificant alteration of impact	0	P&D would only occur at shorelines remote form the spill release location. The weathered slick will not have any significant volatile components remaining, and therefore P&D would have no effect on local atmospheric conditions.
Socio-economic			
Commercial demersal fisheries	No or insignificant alteration of impact	0	P&D would result in insignificant reduction in entrained oil, resulting in no change to oil exposure to commercial demersal fisheries.
Shallow commercial fisheries (including aquaculture)	No or insignificant alteration of impact	0	P&D would result in insignificant reduction in oil on surface or entrained oil, resulting in no change to oil exposure to shallow commercial fisheries including aquaculture sites.
Recreational fisheries	No or insignificant alteration of impact	0	P&D would result in insignificant reduction in oil on surface or entrained oil, resulting in no change to oil exposure to fish communities, thus no change to recreational fishing.
Cultural heritage			
Aboriginal heritage (cultural practices, sites and fishing / foraging)	No or insignificant alteration of impact	0	P&D would result in insignificant reduction in oil on surface and entrained oil, resulting in no change to impacts on Aboriginal heritage.
Traditional Indonesian fishing	No or insignificant alteration of impact	0	P&D would result in insignificant reduction in oil on surface and entrained oil, resulting in no change to impacts on Indonesian traditional fishing areas.

Shoreline Clean-Up

Overall statement of likelihood of success of Shoreline Clean-Up:

Aim: Using various physical means to clean up oil from affected shorelines to reduce impacts on sensitive receptors or to avoid any reintroduction of the hydrocarbon to the marine environment. It is often viewed as a three step process, with the first phase involving bulk collection of oil floating against the shoreline or stranded on it; phase two involving in-situ treatment of shoreline substrate and phase three involving removal of any remaining residues (final polish) (IPIECA 2015).

Type of slick: Diesel spilled from a vessel collision in the Browse Basin is expected to have undergone several physical and biological weathering processes, such as photo oxidation and biodegradation by the time it strands on a shoreline. Weathered diesel reaching a remote shoreline will be in the form of thin floating slicks which could accumulate over time. Impacts to ecological receptors from exposure to weathered oil (waxy flakes and residues) are far less than those associated with exposure to fresh oils, which have higher levels of toxicity (Milton et al, 2003; Hoff & Michel 2014; Woodside 2014). Group II oils are relatively non-adhesive and will not form a thick adhesive barrier on a shoreline (Fingas 2012).

Likely success/effectiveness against slick: Shoreline clean-up has been consistently found to not enhance ecological recovery of oiled coastlines (Sell et al 1995) but it may protect other resources in the area, such as birds, marine mammals or subtidal habitats including coral reefs or fish farms (CSIRO 2016). Choosing a particular clean-up technique is dependent on factors such as shoreline type, exposure, sensitivity, amount of oil, persistence of oil, toxicity of oil and rate of natural oil removal (IPIECA 2015). Mechanical cleaning is generally not an appropriate technique for offshore/remote shorelines, and manual techniques involving rakes and shovels would likely be required. The clean-up of Group II spills from a beach or shoreline is likely to be difficult, generating high volumes of waste in comparison to the oil recovered. Browse Island and other similar offshore shorelines would be expected to naturally 'self-clean' any accumulated Group II oils, due to factors such as the lack of adhesiveness of these oil types, the coarse substrate present and the high wave energy and high tidal regime (Fingas 2012). Typically, inaccessible rocky coves are highly exposed and are best left to naturally clean (IPIECA 2015). ITOPF (2011) also note that for a number of sensitive shoreline types, such as mangroves, natural cleaning is the preferred option in order to minimise the damage caused from clean-up activities. Thus shoreline clean-up would be most effective in areas which are expected to receive large amounts of shoreline oil; where chosen activities don't physically break/damage sensitive habitat such as coral or mangroves; and in areas which are not expected to self clean.

Resource Compartment (including values dependent on the resource compartment)	Impact Modification Score		Justification for Impact Modification Score
		B	
Subtidal Benthic Communities			
Benthic primary producer habitat (coral, seagrass, macro-algae and shallow water EPBC species foraging areas)	No or insignificant alteration of impact	0	Shoreline clean-up will have no impact on entrained oil in benthic primary producer habitat within subtidal areas.
Deep-sea features (filter feeding communities, deep water EPBC species foraging areas and Key Ecological Features)	No or insignificant alteration of impact	0	Shoreline clean-up will have no impact on entrained oil affecting filter feeding communities within subtidal areas.
Deep-sea unconsolidated muds and sands	No or insignificant alteration of impact	0	Shoreline clean-up will have no impact on entrained oil affecting deep-sea unconsolidated muds and sands in subtidal areas.
Intertidal seabed			
Intertidal Coral Reef	Minor additional impact	-1	Shoreline clean-up on an intertidal coral reef would result in physical damage/breaking of coral structures, therefore a net damage to the eco-system.
Mangrove/Mudflats/Samphires	Minor additional impact	-1	Shoreline clean-up within mangrove/low energy ecosystems is likely to result in more physical damage/breaking of mangrove root structures than benefit from any oil removed.
Sandy Beach	Minor mitigation of impact	1	Shoreline clean-up of sandy beaches is a well understood, well documented spill response technique, which can reliably remove thick oil from the eco-system. This is beneficial for species such as turtles who nest on sandy beaches. However, in the case of a condensate spill, the likely oil accumulating on a shoreline remote from the release location is likely to be very thin, and possibly not recoverable. Natural weathering on high energy beaches may be just as effective as attempting to clean-up very thin, non-adhesive slicks.
Rocky Shoreline	Minor mitigation of impact	1	Shoreline clean-up of rocky shorelines is a well understood, well documented spill response technique, which has the ability to remove some oil from the eco-system. However, certain techniques like steam cleaning and high pressure blasting are known to cause more harm than allowing the oil to naturally weather. Therefore, this technique would likely be successful, provided the correct clean-up techniques are chosen.

Macro-Algae and Seagrass	Minor additional impact	-1	Shoreline clean-up within intertidal macro-algae/seagrass ecosystems would likely result in more physical disturbance to plant/root structures than benefit from any oil removed.
Intertidal habitat which is important habitat for protected species (nesting / roosting / foraging)	Minor mitigation of impact	1	If it is deemed that the amount of hydrocarbons expected to impact shorelines is large enough that a shoreline clean up will have positive impacts, then the removal of oil from the intertidal zones would likely result in reduction in harm to the benthic primary producers and associated food sources utilised by foraging protected fauna such as seabirds. Also, removal of oil reaching a turtle nesting beach would be of benefit to turtle nesting success. However, due to the type (generally non-toxic and non-adhesive weathered oil), shoreline clean-up of weathered diesel may only have limited positive effect compared to natural weathering. Caution is required, as additional physical damage can occur in sensitive intertidal environments, and the general presence of responders can result in additional disturbance to natural wildlife behaviours and processes, especially seabirds and turtle nesting etc.
Water column			
Lower water column (below photic zone)	No or insignificant alteration of impact	0	Shoreline clean-up will have insignificant impact on entrained oil in the lower water column.
Upper water column (in photic zone)	No or insignificant alteration of impact	0	Shoreline clean-up will have insignificant impact on entrained oil in the upper water column.
Water surface	No or insignificant alteration of impact	0	Shoreline clean-up will have insignificant impact on thin surface slicks on the water surface.
Air	No or insignificant alteration of impact	0	As oil will have significantly weathered by the time it reaches a shoreline, clean-up activities will result in no net change to impacts to air quality.
Socio-economic			
Commercial demersal fisheries	No or insignificant alteration of impact	0	There would be no reduction in entrained oil, resulting in no significant change to fish communities, and thus commercial demersal fisheries.
Shallow commercial fisheries (including aquaculture)	Minor mitigation of impact	1	Reduction in oil remobilising from a shoreline into intertidal habitats may result in less harm to intertidal fish nurseries and foraging habitats. However damage to these ecosystems could occur, through physical damage associated with shoreline clean-up in sensitive intertidal environments.
Recreational fisheries	Minor mitigation of impact	1	Reduction in oil remobilising from a shoreline into intertidal habitats may result in less harm to intertidal fish nurseries and foraging habitats. However damage to these ecosystems could occur, through physical damage associated with shoreline clean-up in sensitive intertidal environments.
Cultural heritage			
Aboriginal heritage (cultural practices, sites and fishing / foraging)	Minor mitigation of impact	1	Shoreline clean-up may reduce oil damage to Aboriginal heritage sites along the Kimberley / NT coastline, however care would be required to ensure important sites are not damaged during the clean-up process.
Traditional Indonesian fishing	Minor mitigation of impact	1	Reduction in oil remobilising from a shoreline into intertidal habitats may result in less harm to intertidal fish nurseries and foraging habitats. However damage to these ecosystems could occur, through physical damage associated with shoreline clean-up in sensitive intertidal environments.

Chemical Dispersant - Surface

Overall statement of likelihood of success of Chemical Dispersant:

Aim: To remove oil from the sea's surface via dispersant spraying from vessels and aircraft, thus reducing the amount of oil reaching birds, mammals and other organisms - as well as coastal habitats, socioeconomic features and shorelines (IPIECA 2015).

Type of slick: Surface oil is in the form of Group II floating slicks which have a low viscosity and rapidly spread into a thin sheen. They will be approximately 10 g/m^2 up to approximately 160 km from the spill site and approximately 1 g/m^2 up to approximately 300 km from the spill site.

Likely success/effectiveness against slick: The National Research Council (2005) notes that the window to use dispersants is early, typically within hours to 2 days of a spill, then after that, weathering makes oil more difficult to disperse (due to increased viscosity). Rapid dispersion of dispersant-treated oil begins at a wind speed of approximately 7 knots with wave heights of 0.2 to 0.3 metres (IPIECA 2015). Conditions where wave energy is too low, oil droplets may resurface after being applied with dispersant due to oil not being effectively dispersed into the water column. Dispersant becomes challenging in high winds and rough seas, where floating oil will be over-washed or temporarily submerged (IPIECA 2015). Whilst dispersants reduce the amount of oil on the surface that can affect wildlife, they also increase the exposure of dispersed oil in the upper water column to other wildlife. It is expected that dispersant will not significantly change the proportion of surface oil which would become entrained as the sea-state changes. Therefore, given surface diesel slicks will rapidly entrain with increasing wind-speed, dispersant will have limited effect when compared with natural entrainment processes.

Generally oil slicks needs to be >100 g/m^2 (>0.1mm, which equates to Bonn code 4/5) to feasibly achieve a successfully dispersant operation. However diesel from a vessel collision on the ocean surface is unlikely to have slicks >100 g/m^2. Where there are any significant diesel slick, flammable/toxic vapours will also be present, and will likely exceed safe exposure thresholds, further reducing response efficiency (as vessels will not be permitted to operate in areas where explosive limits or VOC exposure thresholds are exceeded). Due to the very thin surface slicks, very low rates of successful dispersal would be expected. Therefore, surface dispersant application on a diesel vessel slick would not be an effective response strategy.

Resource Compartment (including values dependent on the resource compartment)	Impact Modification Score		Justification for Impact Modification Score
		B	
Subtidal Benthic Communities			
Benthic primary producer habitat (coral, seagrass, macro-algae and shallow water EPBC species foraging areas)	Minor additional impact	-1	Chemical dispersant and additional entrained oil would result in negative impacts to shallow water BPPH. However, impacts would be minor, provided dispersant applied at a significant distance from the BPPH.
Deep-sea features (filter feeding communities, deep water EPBC species foraging areas and Key Ecological Features)	No or insignificant alteration of impact	0	Chemical dispersant would result in an insignificant increase in any additional oil reaching deep water locations, regardless of chemical dispersant application on the surface.
Deep-sea unconsolidated muds and sands	No or insignificant alteration of impact	0	
Intertidal seabed			
Intertidal Coral Reef	Minor additional impact	-1	Dispersant is generally considered ineffective at significantly increasing entrainment of thin sheens of marine diesel, compared to natural rates of entrainment. A significant volume of dispersant would need to be applied to result in any change, therefore this would result in negative impacts, due to additional chemicals on the surface and in the shallow water column, which could negatively impact on sensitive shallow/intertidal receptors such as corals, seagrass etc, and the biota who depend on them, including invertebrates, and mega-fauna who forage in these zones.
Mangrove/Mudflats/Samphires	Minor additional impact	-1	
Sandy Beach	Minor additional impact	-1	
Rocky Shoreline	Minor additional impact	-1	
Macro-Algae and Seagrass	Minor additional impact	-1	
Intertidal habitat which is important habitat for protected species (nesting / roosting / foraging)	Minor additional impact	-1	

Water column			
Lower water column (below photoic zone)	No or insignificant alteration of impact	0	No oil reaching deep water locations, regardless of dispersant application on surface.
Upper water column (in photic zone)	Minor additional impact	-1	Dispersed oil can cause marine organisms inhabiting the upper water column to be briefly exposed to dispersed oil which can potentially have toxic effects. Dispersant is generally considered ineffective at significantly increasing entrainment of thin sheens of marine diesel, compared to natural rates of entrainment. A significant volume of dispersant would need to be applied to result in any change, therefore this would result in negate impacts, due to additional chemicals on the surface and in the shallow water column.
Water surface	Minor additional impact	-1	
Air	No or insignificant alteration of impact	0	A very slight reduction in VOCs in local atmosphere could occur as a result of dispersant application and additional entrainment. However additional chemical dispersant mist in the local atmosphere would likely offset any reduction in VOCs.
Socio-economic			
Commercial demersal fisheries	No or insignificant alteration of impact	0	No oil reaching deep water locations, including demersal fish habitat, regardless of chemical dispersant application on surface.
Shallow commercial fisheries (including aquaculture)	Minor additional impact	-1	Chemical dispersant and additional entrained oil would result in negative impacts to shallow commercial fisheries.
Recreational fisheries	Minor additional impact	-1	Chemical dispersant and additional entrained oil would result in negative impacts to recreational fisheries.
Cultural heritage			
Aboriginal heritage (cultural practices, sites and fishing / foraging)	No or insignificant alteration of impact	0	As any dispersant application would occur within offshore waters, and as there would likely be significant naturally entrained of a diesel spill due to natural wind effects, surface dispersant application would result in an insignificant change in dispersed/entrained oil reaching traditional Aboriginal areas of the Kimberley and NT coastline.
Traditional Indonesian fishing	Minor additional impact	-1	Chemical dispersant and additional entrained oil could result in negative impacts to shallow water BPPH which support Indonesian traditional fishing target species. However, impacts would be minor, provided dispersant applied at a significant distance from the BPPH.

Pre-Contact Wildlife Response (Hazing and Translocation)

Overall statement of likelihood of success of Pre-contact OWR (hazing and relocation/displacement):

Aim: Hazing involves discouraging animals from entering oiled areas by encouraging them to move into low-risk unoiled areas, in an attempt to prevent them from becoming oiled (IPIECA 2017). Hazing techniques include vessels generating underwater noise and motion, vessel air horns making above-water noise and fire hoses directing streams in front of fauna. Translocation/displacement involves removing wildlife who are at risk of becoming oiled from the spill environment in an attempt to prevent them from becoming oiled (IPIECA 2017). This includes holding animals in captivity until the risk of oiling is over, or relocating them to another area not affected by the oil spill (IPIECA 2017).

Type of slick: Surface oil is in the form of Group II floating slicks which have a low viscosity and rapidly spread into a thin sheen. They will be approximately 10 g/m^2 up to approximately 160 km from the spill site and approximately 1 g/m^2 up to approximately 300 km from the spill site. Group II oils are relatively non-adhesive, and oil reaching shorelines is likely to have undergone weathering and will be in the form of waxy flakes and residues which are generally considered to be of lower toxicity than their unweathered counterparts (Milton et al, 2003; Hoff & Michel 2014; Woodside 2014).

Likely success/effectiveness against slick: Wildlife hazing in the open ocean is inherently unlikely to be effective due to a number of limitations;

1) effectiveness depends upon the deployment of numerous ocean-going vessels (as opposed to smaller vessels which can be used near to the shore);
2) against a spreading plume (i.e. away from the immediate source of the spill), the technique becomes entirely impracticable;
3) there are significant safety issues associated with a spill of diesel and vessel masters will not approach the source of the spill, or fresh areas of slick, while the spill is still ongoing; and
4) without the constraints of a shoreline or other geographical feature, the technique may cause wildlife to move into other areas of the spill area instead of away from it.

Wildlife hazing is most suitable when used near sensitive shoreline habitats against persistent oily slicks, such as IFO, HFO or crude oil spills - but in the case of a Group II vessel collision, oil slicks are thin and not considered particularly adhesive, therefore reducing the likelihood and severity of impacts on wildlife. Additionally, hazing isn't considered an effective measure against volatile spills which rapidly evaporate.

In regard to wildlife translocation, IPIECA (2014) advise that the difficulty of capturing wildlife safely and maintaining their health during relocation should not be underestimated, and that working with live or dead animals has health and safety issues including potential injuries (bites, scratches) or zoonotic diseases. Risks to wildlife are high during pre-emptive capture and the risks of oiling need to be weighed against the risk of injury, death etc. (IPIECA 2014). The translocation of turtles from beaches and islands would likely require the capture of large numbers of hatchlings, followed by translocation to a location far from the slick (to prevent surface oil impacts on released hatchlings). The prolonged retention of hatchlings has been demonstrated to be detrimental to hatchling swimming speed and survival, even in short periods (6 hours) of retention (Pilcher and Enderby 2001). Attempting to capture large numbers (or an entire flock) of healthy seabirds would be very challenging, if not impossible (DPaW 2014), especially at a remote shoreline location (such as Browse or Cartier Island). There is no practicable method to capture healthy seabirds at sea (DPaW 2014). Potential harm to healthy seabirds could occur during the capture process. Any seabirds released would likely fly back to the shoreline from which they originally were captured. Therefore, long term veterinary care (feeding etc.) would be required for any successfully captured birds, until spill weathering or remediation has occurred and it was safe to release the animals. An evaluation would need to be undertaken, to ensure the released animals do not pose a disease risk (human/zoonotic diseases), to the wild population into which they are released.

Resource Compartment (including values dependent on the resource compartment)	Impact Modification Score		Justification for Impact Modification Score
		B	
Subtidal Benthic Communities			
Benthic primary producer habitat (coral, seagrass, macro-algae and shallow water EPBC species foraging areas)	No or insignificant alteration of impact	0	Not relevant for pre-contact oiled wildlife response.
Deep-sea features (filter feeding communities, deep water EPBC species foraging areas and Key Ecological Features)	No or insignificant alteration of impact	0	Not relevant for pre-contact oiled wildlife response.
Deep-sea unconsolidated muds and sands	No or insignificant alteration of impact	0	Not relevant for pre-contact oiled wildlife response.
Intertidal seabed			
Intertidal Coral Reef	No or insignificant alteration of impact	0	Not relevant for pre-contact oiled wildlife response.
Mangrove/Mudflats/Samphires	No or insignificant alteration of impact	0	Not relevant for pre-contact oiled wildlife response.
Sandy Beach	No or insignificant alteration of impact	0	Not relevant for pre-contact oiled wildlife response.
Rocky Shoreline	No or insignificant alteration of impact	0	Not relevant for pre-contact oiled wildlife response.
Macro-Algae and Seagrass	No or insignificant alteration of impact	0	Not relevant for pre-contact oiled wildlife response.

Intertidal habitat which is important habitat for protected species (nesting / roosting / foraging)	Minor mitigation of impact	1	Wildlife hazing of flocks of seabirds may temporarily prevent oiling of individuals or small proportions of a local/regional populations, however it is not likely effective across a broad geographical area. Even conducting wildlife hazing in the nearshore environment at an isolated location such as Browse Island would be of logistically challenging and potentially not result in any significant impact mitigation. Hazing of seabirds to prevent them landing on an oiled shoreline may temporarily prevent impacts, whilst shoreline clean-up is occurring. Capture and translocation of turtle hatchlings away from the oiled shoreline, and release in the open ocean is potentially feasible. Therefore, undertaking pre-contact oiled wildlife response at a shoreline may reduce the number of protected species of a local population from being oiled.
Water column			
Lower water column (below photic zone)	No or insignificant alteration of impact	0	Not relevant for pre-contact oiled wildlife response.
Upper water column (in photic zone)	No or insignificant alteration of impact	0	Not relevant for pre-contact oiled wildlife response.
Water surface	No or insignificant alteration of impact	0	Wildlife hazing and/or translocation of seabirds or other megafauna, such as cetaceans and turtles in the open ocean, using vessel presence, vessel noise or at sea capture is highly unlikely to be successful. It may be possible to temporarily (minutes / hours), prevent a few individuals of a protected species from entering a small geographic area affected by a slick. However, over the longer term duration and geographic area of a well-blowout scenario, there would be no alteration to the level of oiling of wildlife populations using this strategy in the open ocean.
Air	No or insignificant alteration of impact	0	Not relevant for pre-contact oiled wildlife response.
Socio-economic			
Commercial demersal fisheries	No or insignificant alteration of impact	0	Not relevant for pre-contact oiled wildlife response.
Shallow commercial fisheries (including aquaculture)	No or insignificant alteration of impact	0	Not relevant for pre-contact oiled wildlife response.
Recreational fisheries	No or insignificant alteration of impact	0	Not relevant for pre-contact oiled wildlife response.
Cultural heritage			
Aboriginal heritage (cultural practices, sites and fishing / foraging)	No or insignificant alteration of impact	0	Not relevant for pre-contact oiled wildlife response.
Traditional Indonesian fishing	No or insignificant alteration of impact	0	Not relevant for pre-contact oiled wildlife response.

Post Contact Oiled Wildlife Response

Overall statement of likelihood of success of Post-contact OWR:

Aim: Post-contact wildlife response involves capturing oiled wildlife - and if necessary, cleaning, rehabilitating and releasing them.

Type of slick: Surface oil is in the form of Group II floating slicks which have a low viscosity and rapidly spread into a thin sheen. They will be approximately 10 g/m^2 up to approximately 160 km from the spill site and approximately 1 g/m^2 up to approximately 300 km from the spill site. Group II oils are relatively non-adhesive, and oil reaching shorelines is likely to have undergone weathering and will be in the form of waxy flakes and residues which are generally considered to be of lower toxicity than fresh oil (Milton et al, 2003; Hoff and Michel 2014; Woodside 2014). Note that Group II hydrocarbons are relatively non-adhesive compared to crude oils, and are generally not considered an oil product that would 'coat' the feathers of birds, requiring a full wildlife cleaning response on a shoreline.

Likely success/effectiveness against slick: Capture, relocation, assessment, cleaning and rehabilitation of oiled wildlife has the ability to increase the survival of individuals. ITOPF (2011) note that there are many cases where oiled turtles have been cleaned successfully and returned to the water. Any seabirds captured, cleaned and released would likely fly back to the shoreline from which they originally were captured. Once oiled, it is generally agreed that birds have a very low survival rate, even when rescue and cleaning is attempted (Bourne et al. 1967; Holmes and Cronshaw 1977; Croxall 1977; Ohlendorf et al. 1978; Chapman, 1981; Ford et al., 1982; Samuels and Lanfear, 1982; Varoujean et al., 1983; Ford, 1985; Evans and Nettleship 1985; Fry 1987; Seip et al. 1991; Anderson et al. 2000). French-McCay (2009) produced mortality estimates of 99% for surface swimmers, 35% for aerial divers and raptors, and 5% for aerial seabirds. Samuels and Lanfear (1982) estimated that 95% of oiled seabirds die. ITOPF (2011) note that penguins and pelicans are often the exception as they are generally more resilient than many other species, however they are not present in the Browse Basin. IPIECA (2014) advise working with live or dead animals has health and safety issues including potential injuries (bites, scratches) or zoonotic diseases. An evaluation would need to be undertaken, to ensure any released animals do not pose a disease risk (human/zoonotic diseases), to the wild population into which they are released.

Resource Compartment (including values dependent on the resource compartment)	Impact Modification Score		Justification for Impact Modification Score
		B	
Subtidal Benthic Communities			
Benthic primary producer habitat (coral, seagrass, macro-algae and shallow water EPBC species foraging areas)	No or insignificant alteration of impact	0	Not relevant for post-contact oiled wildlife response.
Deep-sea features (filter feeding communities, deep water EPBC species foraging areas and Key Ecological Features)	No or insignificant alteration of impact	0	Not relevant for post-contact oiled wildlife response.
Deep-sea unconsolidated muds and sands	No or insignificant alteration of impact	0	Not relevant for post-contact oiled wildlife response.
Intertidal seabed			
Intertidal Coral Reef	No or insignificant alteration of impact	0	Not relevant for post-contact oiled wildlife response.
Mangrove/Mudflats/Samphires	No or insignificant alteration of impact	0	Not relevant for post-contact oiled wildlife response.
Sandy Beach	No or insignificant alteration of impact	0	Not relevant for post-contact oiled wildlife response.
Rocky Shoreline	No or insignificant alteration of impact	0	Not relevant for post-contact oiled wildlife response.
Macro-Algae and Seagrass	No or insignificant alteration of impact	0	Not relevant for post-contact oiled wildlife response.
Intertidal habitat which is important habitat for protected species (nesting / roosting / foraging)	Minor mitigation of impact	1	Post-contact OWR has the ability to increase the likelihood of survival of oil-affected EPBC species (individuals, or small proportion of a local population) in the intertidal/shoreline habitats. However, the seabird species of the Browse Basin are generally not expected to survive the capture, cleaning and rehabilitation process. Capture, cleaning and release of marine turtles would have a greater likelihood of success.

Water column			
Lower water column (below photic zone)	No or insignificant alteration of impact	0	Not relevant for post-contact oiled wildlife response.
Upper water column (in photic zone)	No or insignificant alteration of impact	0	Not relevant for post-contact oiled wildlife response.
Water surface	Minor mitigation of impact	1	It is possible that some individuals of protected species, which have been oiled and are unable to fly, could be captured in the open ocean and relocated to an oiled wildlife treatment facility. Therefore, whilst there is a very low probability of survival, under the right circumstances a positive environmental outcome, for a limited number of individuals of a protected species could be achieved.
Air	No or insignificant alteration of impact	0	Not relevant for post-contact oiled wildlife response.
Socio-economic			
Commercial demersal fisheries	No or insignificant alteration of impact	0	Not relevant for post-contact oiled wildlife response.
Shallow commercial fisheries (including aquaculture)	No or insignificant alteration of impact	0	Not relevant for post-contact oiled wildlife response.
Recreational fisheries	No or insignificant alteration of impact	0	Not relevant for post-contact oiled wildlife response.
Cultural heritage			
Aboriginal heritage (cultural practices, sites and fishing / foraging)	No or insignificant alteration of impact	0	Not relevant for post-contact oiled wildlife response.
Traditional Indonesian fishing	No or insignificant alteration of impact	0	Not relevant for post-contact oiled wildlife response.

In Situ Burn

Overall statement of likelihood of success of In-situ burn (ISB):

Aim: In-site burning rapidly removes the volume of spilled oil's hydrocarbon vapours in place, via combustion or burning (IPIECA 2016). This technique reduces the need to collect, store, transport and dispose recovered oil, plus it can shorten the overall response time (IPIECA 2016).

Type of slick: Surface oil is in the form of Group II floating slicks which have a low viscosity and rapidly spread into a thin sheen. They will be approximately 10 g/m^2 up to approximately 25 km from the spill site and approximately 1 g/m^2 up to approximately 110 km from the spill site.

Likely success/effectiveness against slick: ISB requires wave heights typically below 1 m and wind speeds below 10 knots (IPIECA 2016) which are frequently exceeded at remote offshore locations in the Browse Basin region. Overseas experience shows that burns can be conducted safely, but the most discernible disadvantage is the resulting dark smoke plumes caused by the combustion of oil (IPIECA 2016). Carbon dioxide, soot (PM 2.5), water, polyaromatic hydrocarbons, volatile organic compounds, carbonyls, carbon monoxide, sulphur dioxide and potentially other gases can result from an in-situ burn, which has the potential to affect human and animal health (IPIECA 2016). IPIECA (2016) note that tests and information from previous burns indicate that ISB has little effect on water quality. Burn residue (i.e. burned oil depleted of volatiles and precipitated soot) rarely sinks and smothers benthic species (IPIECA 2016). Plus it is unlikely that Group II burn residue will cause smothering as this generally only occurs for heavier crudes (IPIECA 2016). IPIECA (2016) further note that burn residue is less toxic to aquatic biota than weathered oil.

To implement an effective in-situ burn response, a minimum surface hydrocarbon thickness of 2-5 mm (2000 - 5000 g/m^2) is required to be present. In the case of a vessel collision, the surface slick is not expected to meet the required thickness (i.e. only 10 g/m^2 or 0.1 mm expected thickness in the immediate area of the release). Booms would be required to corral the spill, in an attempt to generate additional oil thickness, but this in turn is expected to exceed the VOC exposure thresholds for the workforce, and also may result in concentrations exceeding the lower explosive limit. Given this, and the lack of suitable booms available for in-situ burns in Australia, implementation of this response in an open ocean, high current environment is not considered to be safe, effective or feasible, especially against the thin sheen and hazardous atmospheric conditions associated with a diesel spill.

Resource Compartment (including values dependent on the resource compartment)	Impact Modification Score		Justification for Impact Modification Score
		B	
Subtidal Benthic Communities			
Benthic primary producer habitat (coral, seagrass, macro-algae and shallow water EPBC species foraging areas)			
Deep-sea features (filter feeding communities, deep water EPBC species foraging areas and Key Ecological Features)			
Deep-sea unconsolidated muds and sands			
Intertidal seabed			
Intertidal Coral Reef			
Mangrove/Mudflats/Samphires			
Sandy Beach			
Rocky Shoreline			
Macro-Algae and Seagrass			
Intertidal habitat which is important habitat for protected species (nesting / roosting / foraging)			
Water column			
Lower water column (below photic zone)			
Upper water column (in photic zone)			
Water surface			
Air			

Socio-economic			
Commercial demersal fisheries			
Shallow commercial fisheries (including aquaculture)			
Recreational fisheries			
Cultural heritage			
Aboriginal heritage (cultural practices, sites and fishing / foraging)			
Traditional Indonesian fishing			

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