# APPENDIX A WOODSIDE HEALTH, SAFETY, ENVIRONMENT AND QUALITY AND RISK MANAGEMENT POLICIES

WOODSIDE POLICY

woodside

# Health, Safety, Environment and Quality Policy

## OBJECTIVES

Strong health, safety, environment and quality (HSEQ) performance is essential for the success and growth of our business. Our aim is to be recognised as an industry leader in HSEQ through managing our activities in a sustainable manner with respect to our workforce, our communities and the environment.

At Woodside we believe that process and personal safety related incidents, and occupational illnesses, are preventable. We are committed to managing our activities to minimise adverse health, safety or environmental impacts, incorporating a right first time approach to quality.

## PRINCIPLES

Woodside will achieve this by:

- implementing a systematic approach to HSEQ risk management
- complying with relevant laws and regulations and applying responsible standards where laws do not exist
- setting, measuring and reviewing objectives and targets that will drive continuous improvement in HSEQ performance
- embedding HSEQ considerations in our business planning and decision making processes
- integrating HSEQ requirements when designing, purchasing, constructing and modifying equipment and facilities
- maintaining a culture in which everybody is aware of their HSEQ obligations and feels empowered to speak up and intervene on HSEQ issues
- undertaking and supporting research to improve our understanding of HSEQ and using science to support impact assessments and evidence based decision making
- taking a collaborative and pro-active approach with our stakeholders
- requiring contractors to comply with our HSEQ expectations in a mutually beneficial manner
- publicly reporting on HSEQ performance

## APPLICATION

Responsibility for the application of this policy rests with all Woodside employees, contractors and joint venturers engaged in activities under Woodside operational control. Woodside managers are also responsible for promotion of this policy in non-operated joint ventures.

This policy will be reviewed regularly and updated as required.

December 2015

WOODSIDE POLICY

# Risk Management Policy

## OBJECTIVES

Woodside recognises that risk is inherent to its business and that effective management of risk is vital to delivering on our objectives, our success and our continued growth. We are committed to managing all risk in a proactive and effective manner.

Our approach to risk enhances opportunities, reduces threats and sustains Woodside's competitive advantage.

The objective of our risk management system is to provide a consistent process for the recognition and management of risks across Woodside's business. The success of our risk management system lies in the responsibility placed on everyone at all levels to proactively identify, manage, review and report on risks relating to the objectives they are accountable for delivering.

## PRINCIPLES

Woodside achieves these objectives by:

- Applying a structured and comprehensive risk management system across Woodside which establishes common risk management understanding, language and methodology
- Identifying, assessing, monitoring and reporting risks to provide management and the Board with the assurance that risks are being effectively identified and managed
- Ensuring risks consider impacts across the following key areas of exposure: health and safety, environment, finance, reputation and brand, legal and compliance, and social and cultural
- Understanding our exposure to risk and applying this to our decision making
- Embedding risk management into our critical business activities and processes
- Assuring the effectiveness of risk controls and of the risk management process
- Building our internal resilience to the effects of adverse business impacts in order to sustain performance.

## APPLICATION

The Managing Director of Woodside is accountable to the Board of Directors for ensuring this policy is effectively implemented.

Managers are responsible for promoting and applying the Risk Management Policy. Responsibility for the effective application of this policy rests with all Woodside employees, contractors and joint venturers engaged in activities under Woodside operational control.

This policy will be reviewed regularly and updated as required.

December 2012

# APPENDIX B RELEVANT REQUIREMENTS

This appendix refers to Commonwealth Legislation related to the project. Western Australian State Legislation relevant to an accidental release of hydrocarbons in WA State waters is outlined in the Julimar Phase 2 Drilling and Subsea Installation Oil Pollution Emergency Plan.

| Commonwealth Legislation | Legislation Summary |
|---|---|
| *Air Navigation Act 1920*<br><br>• *Air Navigation Regulations 1947*<br>• *Air Navigation (Aerodrome Flight*<br>• *Corridors) Regulations 1994*<br>• *Air Navigation (Aircraft Engine*<br>• *Emissions) Regulations 1995*<br>• *Air Navigation (Aircraft Noise)*<br>• *Regulations 1984*<br>• *Air Navigation (Fuel Spillage) Regulations 1999* | This Act relates to the management of air navigation. |
| *Australian Maritime Safety Authority Act 1990* | This Act establishes a legal framework for the Australian Maritime Safety Authority (AMSA), which represents the Australian Government and international forums in the development, implementation and enforcement of international standards including those governing ship safety and marine environment protection. AMSA is responsible for administering the Marine Orders in Commonwealth waters. |
| *Australian Radiation Protection and Nuclear Safety Act 1998* | This Act relates to the protection of the health and safety of people, and the protection of the environment from the harmful effects of radiation. |
| *Biosecurity Act 2015*<br>• *Quarantine Regulations 2000*<br>• *Biosecurity Regulation 2016*<br>• *Australian Ballast Water Management Requirements 2017* | This Act provides the Commonwealth with powers to take measures of quarantine, and implement related programs as are necessary, to prevent the introduction of any plant, animal, organism or matter that could contain anything that could threaten Australia's native flora and fauna or natural environment. The Commonwealth's powers include powers of entry, seizure, detention and disposal.<br><br>This Act includes mandatory controls on the use of seawater as ballast in ships and the declaration of sea vessels voyaging out of and into Commonwealth waters. The Regulations stipulate that all information regarding the voyage of the vessel and the ballast water is declared correctly to the quarantine officers. |
| *Environment Protection and Biodiversity Conservation Act 1999*<br><br>• *Environment Protection and Biodiversity Conservation Regulations 2000* | This Act protects matters of national environmental significance (NES). It streamlines the national environmental assessment and approvals process, protects Australian biodiversity and integrates management of important natural and culturally significant places.<br><br>Under this Act, actions that may be likely to have a significant impact on matters of NES must be referred to the Commonwealth Environment Minister. |
| *Environment Protection (Sea Dumping) Act 1981*<br><br>• *Environment Protection (Sea Dumping) Regulations 1983* | This Act provides for the protection of the environment by regulating dumping matter into the sea, incineration of waste at sea and placement of artificial reefs. |
| *Industrial Chemicals (Notification and Assessment Act) 1989*<br>• *Industrial Chemicals (Notification and Assessment) Regulations 1990* | This Act creates a national register of industrial chemicals. The Act also provides for restrictions on the use of certain chemicals which could have harmful effects on the environment or health. |

| Commonwealth Legislation | Legislation Summary |
|---|---|
| | |
| *National Environment Protection Measures (Implementation) Act 1998*<br><br>• *National Environment Protection Measures (Implementation) Regulations 1999* | This Act and Regulations provide for the implementation of National Environment Protection Measures (NEPMs) to protect, restore and enhance the quality of the environment in Australia and ensure that the community has access to relevant and meaningful information about pollution.<br><br>The National Environment Protection Council has made NEPMs relating to ambient air quality, the movement of controlled waste between states and territories, the national pollutant inventory, and used packaging materials. |
| *National Greenhouse and Energy Reporting Act 2007*<br><br>• *National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015* | This Act and associated Rule establishes the legislative framework for the NGER scheme for reporting greenhouse gas emissions and energy consumption and production by corporations in Australia. |
| *Navigation Act 2012*<br>• *Marine order 12 – Construction – subdivision and stability, machinery and electrical installations*<br>• *Marine order 30 - Prevention of collisions*<br>• *Marine order 47 - Mobile offshore drilling units*<br>• *Marine order 57 - Helicopter operations*<br>• *Marine order 60 - Floating offshore facilities*<br>• *Marine order 91 - Marine pollution prevention—oil*<br>• *Marine order 93 - Marine pollution prevention—noxious liquid substances*<br>• *Marine order 94 - Marine pollution prevention—packaged harmful substances*<br>• *Marine order 96 - Marine pollution prevention—sewage*<br>• *Marine order 97 - Marine pollution prevention—air pollution* | This Act regulates navigation and shipping including Safety of Life at Sea (SOLAS). The Act will apply to some activities of the MODU and project vessels.<br><br>This Act is the primary legislation that regulates ship and seafarer safety, shipboard aspects of marine environment protection and pollution prevention. |
| *Offshore Petroleum and Greenhouse Gas Storage Act 2006*<br><br>• *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009*<br>• *Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011*<br>• *Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009* | This Act is the principal Act governing offshore petroleum exploration and production in Commonwealth waters. Specific environmental, resource management and safety obligations are set out in the Regulations listed. |
| *Ozone Protection and Synthetic Greenhouse Gas Management Act 1989*<br><br>• *Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995* | This Act provides for measures to protect ozone in the atmosphere by controlling and ultimately reducing the manufacture, import and export of ozone depleting substances (ODS) and synthetic greenhouse gases, and replacing them with suitable alternatives. The Act will only apply to Woodside if it manufactures, imports or exports ozone depleting substances. |

| Commonwealth Legislation | Legislation Summary |
|---|---|
| *Protection of the Sea (Powers of Intervention) Act 1981* | This Act authorises the Commonwealth to take measures for the purpose of protecting the sea from pollution by oil and other noxious substances discharged from ships and provides legal immunity for persons acting under an AMSA direction. |
| *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*<br><br>*Protection of the Sea (Prevention of Pollution from Ships) (Orders) Regulations 1994*<br><br>• *Marine order 91 - Marine pollution prevention—oil*<br>• *Marine order 93 - Marine pollution prevention—noxious liquid substances*<br>• *Marine order 94 - Marine pollution prevention—packaged harmful substances*<br>• *Marine order 95 - Marine pollution prevention—garbage*<br>• *Marine order 96 - Marine pollution prevention—sewage*<br><br>*Maritime Legislation Amendment (Prevention of Air Pollution from Ships) Act 2007*<br><br>MARPOL Convention | This Act relates to the protection of the sea from pollution by oil and other harmful substances discharged from ships. Under this Act, discharge of oil or other harmful substances from ships into the sea is an offence. There is also a requirement to keep records of the ships dealing with such substances.<br><br>The Act applies to all Australian ships, regardless of their location. It applies to foreign ships operating between 3 nautical miles (nm) off the coast out to the end of the Australian Exclusive Economic Zone (200 nm). It also applies within the 3 nm of the coast where the State/Northern Territory does not have complementary legislation.<br><br>All the Marine Orders listed, except for Marine Order 95, are enacted under both the *Navigation Act 2012* and the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*.<br><br>This Act is an amendment to the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*. This amended Act provides the protection of the sea from pollution by oil and other harmful substances discharged from ships. |
| *Protection of the Sea (Harmful Antifouling Systems) Act 2006*<br>• *Marine order 98—(Marine pollution prevention—anti-fouling systems)* | This Act relates to the protection of the sea from the effects of harmful anti-fouling systems. It prohibits the application or reapplication of harmful anti-fouling compounds on Australian ships or foreign ships that are in an Australian shipping facility. |

# APPENDIX C EPBC ACT PROTECTED MATTERS SEARCH REPORTS

Australian Government
Department of the Environment and Energy

# EPBC Act Protected Matters Report

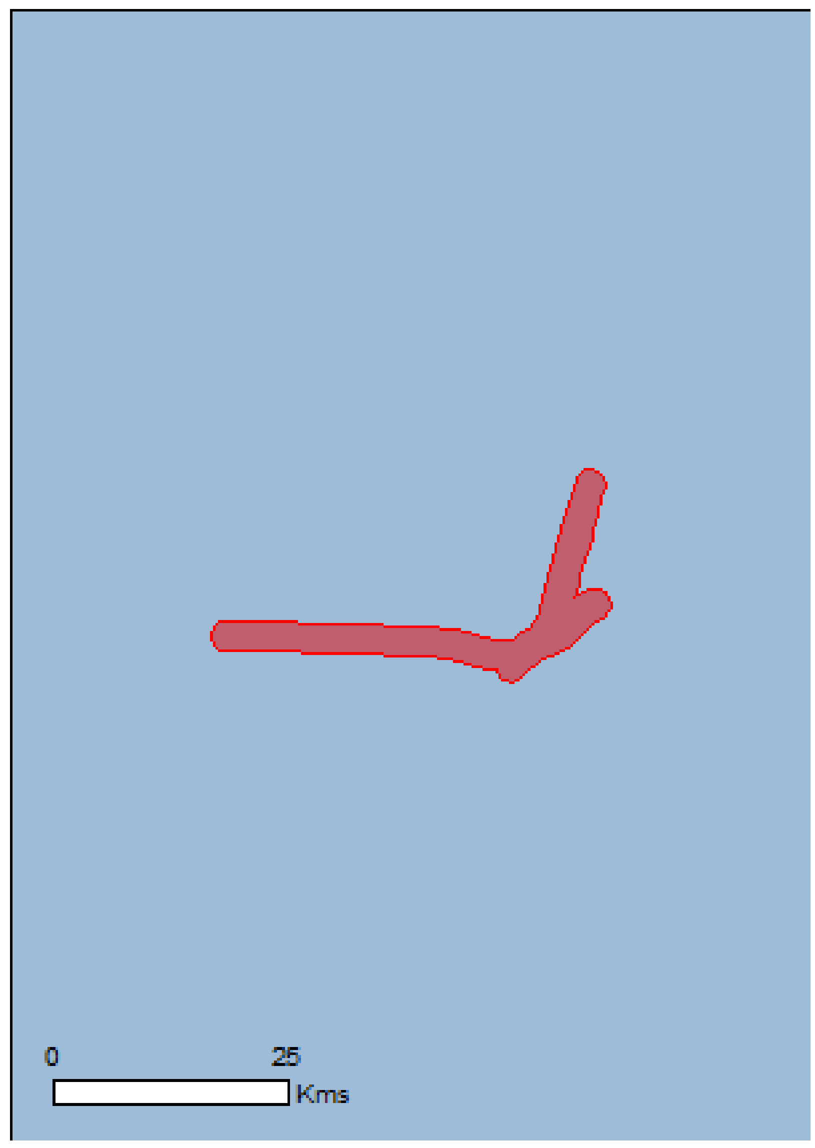
This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 15/04/19 14:54:03


Summary
Details
Matters of NES
Other Matters Protected by the EPBC Act
Extra Information
Caveat
Acknowledgements




Coordinates
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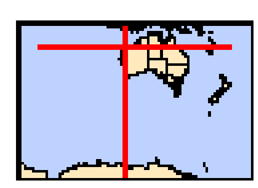

# Summary

## 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: | 15 |
| Listed Migratory Species: | 31 |

## Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

| | |
|---|---|
| Commonwealth Land: | None |
| Commonwealth Heritage Places: | None |
| Listed Marine Species: | 55 |
| Whales and Other Cetaceans: | 23 |
| Critical Habitats: | None |
| Commonwealth Reserves Terrestrial: | None |
| Australian Marine Parks: | None |

## Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

| | |
|---|---|
| State and Territory Reserves: | None |
| Regional Forest Agreements: | None |
| Invasive Species: | None |
| Nationally Important Wetlands: | None |
| Key Ecological Features (Marine) | 1 |

# 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** | | |
| Calidris canutus | | |
| Red Knot, Knot [855] | 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 |
| **Mammals** | | |
| Balaenoptera borealis | | |
| Sei Whale [34] | Vulnerable | Species or species habitat likely to occur within area |
| Balaenoptera musculus | | |
| Blue Whale [36] | Endangered | Species or species habitat likely to occur within area |
| Balaenoptera physalus | | |
| Fin Whale [37] | Vulnerable | Species or species habitat likely to occur within area |
| Megaptera novaeangliae | | |
| Humpback Whale [38] | Vulnerable | Species or species habitat known to occur within area |
| **Reptiles** | | |
| Caretta caretta | | |
| Loggerhead Turtle [1763] | Endangered | Species or species habitat likely to occur within area |
| Chelonia mydas | | |
| Green Turtle [1765] | Vulnerable | Species or species habitat likely to occur within area |

| Name | Status | Type of Presence |
|---|---|---|
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Species or species habitat likely to occur within area |
| Sharks | | |
| Carcharias taurus (west coast population)<br>Grey Nurse Shark (west coast population) [68752] | Vulnerable | Species or species habitat may occur within area |
| Carcharodon carcharias<br>White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat may occur within area |
| Pristis zijsron<br>Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442] | Vulnerable | Species or species habitat known to occur within area |
| Rhincodon typus<br>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<br>Common Noddy [825] | | Species or species habitat may occur within area |
| Calonectris leucomelas<br>Streaked Shearwater [1077] | | Species or species habitat likely to occur within area |
| Fregata ariel<br>Lesser Frigatebird, Least Frigatebird [1012] | | Species or species habitat likely to occur within area |
| Fregata minor<br>Great Frigatebird, Greater Frigatebird [1013] | | Species or species habitat may occur within area |
| Migratory Marine Species | | |
| Anoxypristis cuspidata<br>Narrow Sawfish, Knifetooth Sawfish [68448] | | Species or species habitat may occur within area |
| Balaenoptera borealis<br>Sei Whale [34] | Vulnerable | Species or species habitat likely to occur within area |
| Balaenoptera edeni<br>Bryde's Whale [35] | | Species or species habitat may occur within area |
| Balaenoptera musculus<br>Blue Whale [36] | Endangered | Species or species habitat likely to occur within area |
| Balaenoptera physalus<br>Fin Whale [37] | Vulnerable | Species or species habitat likely to occur within area |

| Name | Threatened | Type of Presence |
|---|---|---|
| Carcharodon carcharias<br>White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat may occur within area |
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat likely to occur within area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Species or species habitat likely to occur within area |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area |
| Isurus oxyrinchus<br>Shortfin Mako, Mako Shark [79073] | | Species or species habitat likely to occur within area |
| Isurus paucus<br>Longfin Mako [82947] | | Species or species habitat likely to occur within area |
| Manta alfredi<br>Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994] | | Species or species habitat may occur within area |
| Manta birostris<br>Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995] | | Species or species habitat may occur within area |
| Megaptera novaeangliae<br>Humpback Whale [38] | Vulnerable | Species or species habitat known to occur within area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Species or species habitat likely to occur within area |
| Orcinus orca<br>Killer Whale, Orca [46] | | Species or species habitat may occur within area |
| Physeter macrocephalus<br>Sperm Whale [59] | | Species or species habitat may occur within area |
| Pristis zijsron<br>Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442] | Vulnerable | Species or species habitat known to occur within area |
| Rhincodon typus<br>Whale Shark [66680] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |
| Tursiops aduncus (Arafura/Timor Sea populations)<br>Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900] | | Species or species habitat may occur within area |
| **Migratory Wetlands Species** | | |
| Actitis hypoleucos<br>Common Sandpiper [59309] | | Species or species habitat may occur within area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | | Species or species habitat may occur within area |

| Name | Threatened | Type of Presence |
|---|---|---|
| Calidris canutus<br>Red Knot, Knot [855] | Endangered | Species or species habitat may occur within area |
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
| Pandion haliaetus<br>Osprey [952] | | Species or species habitat may occur within area |

## Other Matters Protected by the EPBC Act

### Listed Marine Species [ Resource Information ]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

| Name | Threatened | Type of Presence |
|---|---|---|
| Birds | | |
| Actitis hypoleucos<br>Common Sandpiper [59309] | | Species or species habitat may occur within area |
| Anous stolidus<br>Common Noddy [825] | | Species or species habitat may occur within area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | | Species or species habitat may occur within area |
| Calidris canutus<br>Red Knot, Knot [855] | Endangered | Species or species habitat may occur within area |
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area |
| Calonectris leucomelas<br>Streaked Shearwater [1077] | | Species or species habitat likely to occur within area |
| Fregata ariel<br>Lesser Frigatebird, Least Frigatebird [1012] | | Species or species habitat likely to occur within area |
| Fregata minor<br>Great Frigatebird, Greater Frigatebird [1013] | | Species or species habitat may occur within area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
| Pandion haliaetus<br>Osprey [952] | | Species or species habitat may occur within area |
| Fish | | |

| Name | Threatened | Type of Presence |
|---|---|---|
| Campichthys tricarinatus<br>Three-keel Pipefish [66192] | | Species or species habitat may occur within area |
| Choeroichthys brachysoma<br>Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194] | | Species or species habitat may occur within area |
| Choeroichthys suillus<br>Pig-snouted Pipefish [66198] | | Species or species habitat may occur within area |
| Corythoichthys flavofasciatus<br>Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200] | | Species or species habitat may occur within area |
| Cosmocampus banneri<br>Roughridge Pipefish [66206] | | Species or species habitat may occur within area |
| Doryrhamphus dactyliophorus<br>Banded Pipefish, Ringed Pipefish [66210] | | Species or species habitat may occur within area |
| Doryrhamphus excisus<br>Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211] | | Species or species habitat may occur within area |
| Doryrhamphus janssi<br>Cleaner Pipefish, Janss' Pipefish [66212] | | Species or species habitat may occur within area |
| Filicampus tigris<br>Tiger Pipefish [66217] | | Species or species habitat may occur within area |
| Halicampus brocki<br>Brock's Pipefish [66219] | | Species or species habitat may occur within area |
| Halicampus grayi<br>Mud Pipefish, Gray's Pipefish [66221] | | Species or species habitat may occur within area |
| Halicampus spinirostris<br>Spiny-snout Pipefish [66225] | | Species or species habitat may occur within area |
| Haliichthys taeniophorus<br>Ribboned Pipehorse, Ribboned Seadragon [66226] | | Species or species habitat may occur within area |
| Hippichthys penicillus<br>Beady Pipefish, Steep-nosed Pipefish [66231] | | Species or species habitat may occur within area |
| Hippocampus angustus<br>Western Spiny Seahorse, Narrow-bellied Seahorse [66234] | | Species or species habitat may occur within area |
| Hippocampus histrix<br>Spiny Seahorse, Thorny Seahorse [66236] | | Species or species habitat may occur within area |
| Hippocampus kuda<br>Spotted Seahorse, Yellow Seahorse [66237] | | Species or species habitat may occur within area |
| Hippocampus planifrons<br>Flat-face Seahorse [66238] | | Species or species habitat may occur within area |

| Name | Threatened | Type of Presence |
|---|---|---|
| Hippocampus spinosissimus<br>Hedgehog Seahorse [66239] | | Species or species habitat may occur within area |
| Micrognathus micronotopterus<br>Tidepool Pipefish [66255] | | Species or species habitat may occur within area |
| Solegnathus hardwickii<br>Pallid Pipehorse, Hardwick's Pipehorse [66272] | | Species or species habitat may occur within area |
| Solegnathus lettiensis<br>Gunther's Pipehorse, Indonesian Pipefish [66273] | | Species or species habitat may occur within area |
| Solenostomus cyanopterus<br>Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183] | | Species or species habitat may occur within area |
| Syngnathoides biaculeatus<br>Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279] | | Species or species habitat may occur within area |
| Trachyrhamphus bicoarctatus<br>Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280] | | Species or species habitat may occur within area |
| Trachyrhamphus longirostris<br>Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281] | | Species or species habitat may occur within area |
| Reptiles | | |
| Acalyptophis peronii<br>Horned Seasnake [1114] | | Species or species habitat may occur within area |
| Aipysurus duboisii<br>Dubois' Seasnake [1116] | | Species or species habitat may occur within area |
| Aipysurus eydouxii<br>Spine-tailed Seasnake [1117] | | Species or species habitat may occur within area |
| Aipysurus laevis<br>Olive Seasnake [1120] | | Species or species habitat may occur within area |
| Aipysurus tenuis<br>Brown-lined Seasnake [1121] | | Species or species habitat may occur within area |
| Astrotia stokesii<br>Stokes' Seasnake [1122] | | Species or species habitat may occur within area |
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat likely to occur within area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Species or species habitat likely to occur within area |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area |
| Disteira kingii<br>Spectacled Seasnake [1123] | | Species or species habitat may occur within area |

| Name | Threatened | Type of Presence |
|---|---|---|
| Disteira major<br>Olive-headed Seasnake [1124] | | Species or species habitat may occur within area |
| Ephalophis greyi<br>North-western Mangrove Seasnake [1127] | | Species or species habitat may occur within area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area |
| Hydrophis czeblukovi<br>Fine-spined Seasnake [59233] | | Species or species habitat may occur within area |
| Hydrophis elegans<br>Elegant Seasnake [1104] | | Species or species habitat may occur within area |
| Hydrophis mcdowelli<br>null [25926] | | Species or species habitat may occur within area |
| Hydrophis ornatus<br>Spotted Seasnake, Ornate Reef Seasnake [1111] | | Species or species habitat may occur within area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Species or species habitat likely to occur within area |
| Pelamis platurus<br>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<br>Sei Whale [34] | Vulnerable | Species or species habitat likely to occur within area |
| Balaenoptera edeni<br>Bryde's Whale [35] | | Species or species habitat may occur within area |
| Balaenoptera musculus<br>Blue Whale [36] | Endangered | Species or species habitat likely to occur within area |
| Balaenoptera physalus<br>Fin Whale [37] | Vulnerable | Species or species habitat likely to occur within area |
| Delphinus delphis<br>Common Dophin, Short-beaked Common Dolphin [60] | | Species or species habitat may occur within area |
| Feresa attenuata<br>Pygmy Killer Whale [61] | | Species or species habitat may occur within area |
| Globicephala macrorhynchus<br>Short-finned Pilot Whale [62] | | Species or species habitat may occur within area |
| Grampus griseus<br>Risso's Dolphin, Grampus [64] | | Species or species habitat may occur within area |

| Name | Status | Type of Presence |
|---|---|---|
| Kogia breviceps<br>Pygmy Sperm Whale [57] | | Species or species habitat may occur within area |
| Kogia simus<br>Dwarf Sperm Whale [58] | | Species or species habitat may occur within area |
| Megaptera novaeangliae<br>Humpback Whale [38] | Vulnerable | Species or species habitat known to occur within area |
| Orcinus orca<br>Killer Whale, Orca [46] | | Species or species habitat may occur within area |
| Peponocephala electra<br>Melon-headed Whale [47] | | Species or species habitat may occur within area |
| Physeter macrocephalus<br>Sperm Whale [59] | | Species or species habitat may occur within area |
| Pseudorca crassidens<br>False Killer Whale [48] | | Species or species habitat likely to occur within area |
| Stenella attenuata<br>Spotted Dolphin, Pantropical Spotted Dolphin [51] | | Species or species habitat may occur within area |
| Stenella coeruleoalba<br>Striped Dolphin, Euphrosyne Dolphin [52] | | Species or species habitat may occur within area |
| Stenella longirostris<br>Long-snouted Spinner Dolphin [29] | | Species or species habitat may occur within area |
| Steno bredanensis<br>Rough-toothed Dolphin [30] | | Species or species habitat may occur within area |
| Tursiops aduncus<br>Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418] | | Species or species habitat may occur within area |
| Tursiops aduncus (Arafura/Timor Sea populations)<br>Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900] | | Species or species habitat may occur within area |
| Tursiops truncatus s. str.<br>Bottlenose Dolphin [68417] | | Species or species habitat may occur within area |
| Ziphius cavirostris<br>Cuvier's Beaked Whale, Goose-beaked Whale [56] | | Species or species habitat may occur within area |

## Extra Information

## 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 |

# 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

-19.5505 116.4735,-19.54309 116.4893,-19.54231 116.4937,-19.54278 116.498,-19.54511 116.503,-19.5492 116.5068,-19.55437 116.5086,-19.55959 116.5083,-19.56336 116.5067,-19.56732 116.5033,-19.57137 116.4958,-19.57529 116.4909,-19.59535 116.4682,-19.6005 116.4569,-19.60459 116.442,-19.62318 116.4222,-19.62531 116.4184,-19.62628 116.4144,-19.62594 116.4094,-19.62387 116.4046,-19.62057 116.401,-19.61613 116.3987,-19.61489 116.3882,-19.60593 116.3534,-19.60266 116.3286,-19.59865 116.1701,-19.59883 116.1383,-19.5977 116.1336,-19.59507 116.1295,-19.5914 116.1266,-19.58675 116.1252,-19.58253 116.1254,-19.57825 116.1272,-19.57486 116.1303,-19.5726 116.1345,-19.57177 116.139,-19.57149 116.1674,-19.57559 116.3302,-19.57952 116.3601,-19.58864 116.3955,-19.58922 116.4032,-19.58815 116.4131,-19.58252 116.4216,-19.57897 116.4296,-19.57311 116.4352,-19.56989 116.4369,-19.52316 116.4498,-19.4799 116.4633,-19.45863 116.4691,-19.44454 116.4742,-19.44047 116.4767,-19.43735 116.4806,-19.43569 116.4852,-19.43562 116.4901,-19.43758 116.4957,-19.44155 116.5001,-19.44665 116.5026,-19.45187 116.503,-19.45692 116.5019,-19.46145 116.4995,-19.47628 116.4957,-19.49 116.4912,-19.49369 116.4915,-19.49719 116.4909,-19.50328 116.4872,-19.51191 116.4847,-19.51757 116.4841,-19.52331 116.4813,-19.53202 116.4787,-19.53587 116.4791,-19.53958 116.4785,-19.5456 116.4749,-19.5505 116.4735

# 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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Department of the Environment and Energy

# EPBC Act Protected Matters Report

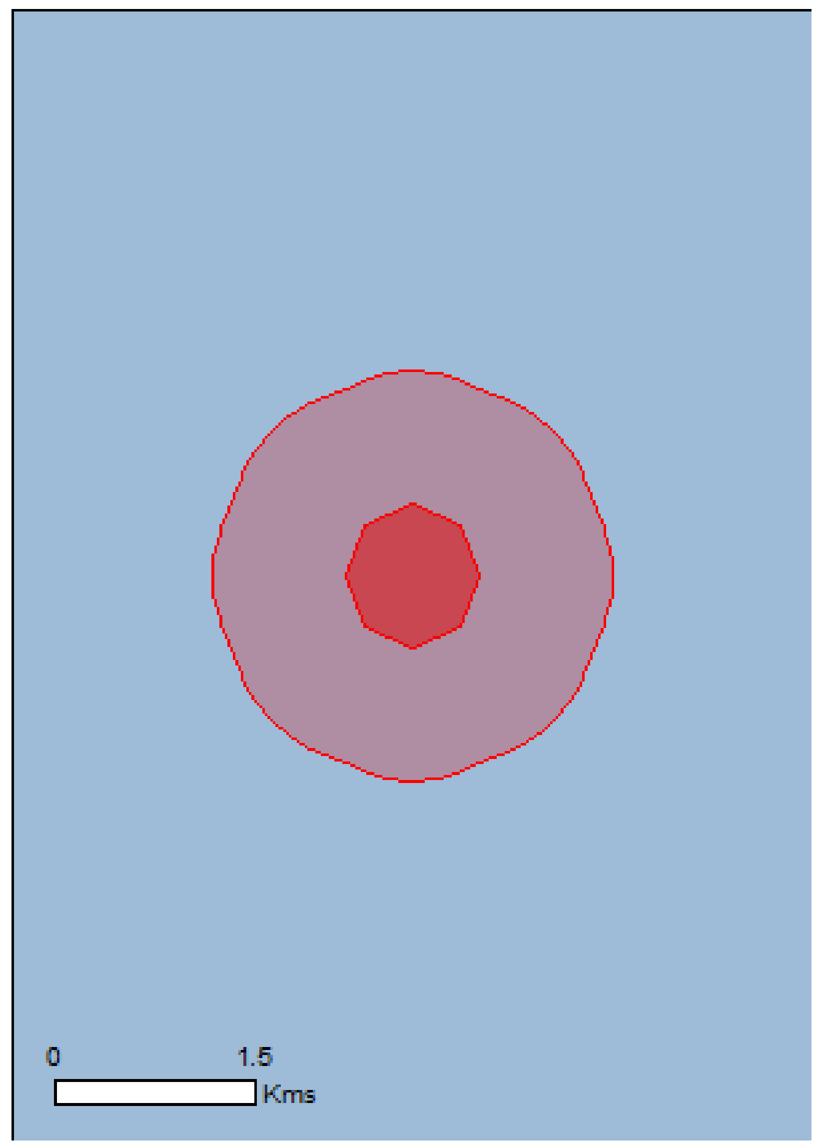
This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

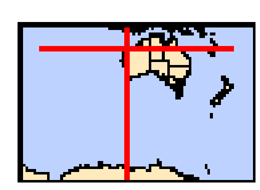
Report created: 15/04/19 14:55:48


- Summary
- Details
  - Matters of NES
  - Other Matters Protected by the EPBC Act
  - Extra Information
- Caveat
- Acknowledgements




Coordinates
Buffer: 1.0Km



# Summary

## Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

| | |
|---|---|
| World Heritage Properties: | None |
| National Heritage Places: | None |
| Wetlands of International Importance: | None |
| Great Barrier Reef Marine Park: | None |
| Commonwealth Marine Area: | 1 |
| Listed Threatened Ecological Communities: | None |
| Listed Threatened Species: | 15 |
| Listed Migratory Species: | 30 |

## Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

| | |
|---|---|
| Commonwealth Land: | None |
| Commonwealth Heritage Places: | None |
| Listed Marine Species: | 55 |
| Whales and Other Cetaceans: | 13 |
| Critical Habitats: | None |
| Commonwealth Reserves Terrestrial: | None |
| Australian Marine Parks: | None |

## Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

| | |
|---|---|
| State and Territory Reserves: | None |
| Regional Forest Agreements: | None |
| Invasive Species: | None |
| Nationally Important Wetlands: | None |
| Key Ecological Features (Marine) | None |

# Details

## Matters of National Environmental Significance

### Commonwealth Marine Area [ Resource Information ]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

| Name |
| --- |
| EEZ and Territorial Sea |

### Marine Regions [ Resource Information ]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

| Name |
| --- |
| North-west |

### Listed Threatened Species [ Resource Information ]

| Name | Status | Type of Presence |
| --- | --- | --- |
| **Birds** | | |
| Calidris canutus | | |
| Red Knot, Knot [855] | Endangered | Species or species habitat may occur within area |
| Numenius madagascariensis | | |
| Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
| **Mammals** | | |
| Balaenoptera borealis | | |
| Sei Whale [34] | Vulnerable | Species or species habitat may occur within area |
| Balaenoptera musculus | | |
| Blue Whale [36] | Endangered | Species or species habitat likely to occur within area |
| Balaenoptera physalus | | |
| Fin Whale [37] | Vulnerable | Species or species habitat may occur within area |
| Megaptera novaeangliae | | |
| Humpback Whale [38] | Vulnerable | Species or species habitat known to occur within area |
| **Reptiles** | | |
| Caretta caretta | | |
| Loggerhead Turtle [1763] | Endangered | Species or species habitat likely to occur within area |
| Chelonia mydas | | |
| Green Turtle [1765] | Vulnerable | Species or species habitat likely to occur within area |

| Name | Status | Type of Presence |
|---|---|---|
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Species or species habitat likely to occur within area |
| **Sharks** | | |
| Carcharias taurus  (west coast population)<br>Grey Nurse Shark (west coast population) [68752] | Vulnerable | Species or species habitat may occur within area |
| Carcharodon carcharias<br>White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat may occur within area |
| Pristis zijsron<br>Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442] | Vulnerable | Species or species habitat known to occur within area |
| Rhincodon typus<br>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<br>Common Noddy [825] | | Species or species habitat may occur within area |
| Calonectris leucomelas<br>Streaked Shearwater [1077] | | Species or species habitat likely to occur within area |
| Fregata ariel<br>Lesser Frigatebird, Least Frigatebird [1012] | | Species or species habitat likely to occur within area |
| Fregata minor<br>Great Frigatebird, Greater Frigatebird [1013] | | Species or species habitat may occur within area |
| **Migratory Marine Species** | | |
| Anoxypristis cuspidata<br>Narrow Sawfish, Knifetooth Sawfish [68448] | | Species or species habitat may occur within area |
| Balaenoptera borealis<br>Sei Whale [34] | Vulnerable | Species or species habitat may occur within area |
| Balaenoptera edeni<br>Bryde's Whale [35] | | Species or species habitat may occur within area |
| Balaenoptera musculus<br>Blue Whale [36] | Endangered | Species or species habitat likely to occur within area |
| Balaenoptera physalus<br>Fin Whale [37] | Vulnerable | Species or species habitat may occur within area |

| Name | Threatened | Type of Presence |
|---|---|---|
| Carcharodon carcharias<br>White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat may occur within area |
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat likely to occur within area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Species or species habitat likely to occur within area |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area |
| Isurus oxyrinchus<br>Shortfin Mako, Mako Shark [79073] | | Species or species habitat likely to occur within area |
| Isurus paucus<br>Longfin Mako [82947] | | Species or species habitat likely to occur within area |
| Manta alfredi<br>Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994] | | Species or species habitat may occur within area |
| Manta birostris<br>Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995] | | Species or species habitat may occur within area |
| Megaptera novaeangliae<br>Humpback Whale [38] | Vulnerable | Species or species habitat known to occur within area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Species or species habitat likely to occur within area |
| Orcinus orca<br>Killer Whale, Orca [46] | | Species or species habitat may occur within area |
| Pristis zijsron<br>Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442] | Vulnerable | Species or species habitat known to occur within area |
| Rhincodon typus<br>Whale Shark [66680] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |
| Tursiops aduncus (Arafura/Timor Sea populations)<br>Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900] | | Species or species habitat may occur within area |
| **Migratory Wetlands Species** | | |
| Actitis hypoleucos<br>Common Sandpiper [59309] | | Species or species habitat may occur within area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | | Species or species habitat may occur within area |
| Calidris canutus<br>Red Knot, Knot [855] | Endangered | Species or species habitat may occur within area |

| Name | Threatened | Type of Presence |
|---|---|---|
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
| Pandion haliaetus<br>Osprey [952] | | Species or species habitat may occur within area |

## Other Matters Protected by the EPBC Act

### Listed Marine Species [ Resource Information ]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

| Name | Threatened | Type of Presence |
|---|---|---|
| Birds | | |
| Actitis hypoleucos<br>Common Sandpiper [59309] | | Species or species habitat may occur within area |
| Anous stolidus<br>Common Noddy [825] | | Species or species habitat may occur within area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | | Species or species habitat may occur within area |
| Calidris canutus<br>Red Knot, Knot [855] | Endangered | Species or species habitat may occur within area |
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area |
| Calonectris leucomelas<br>Streaked Shearwater [1077] | | Species or species habitat likely to occur within area |
| Fregata ariel<br>Lesser Frigatebird, Least Frigatebird [1012] | | Species or species habitat likely to occur within area |
| Fregata minor<br>Great Frigatebird, Greater Frigatebird [1013] | | Species or species habitat may occur within area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
| Pandion haliaetus<br>Osprey [952] | | Species or species habitat may occur within area |
| Fish | | |

| Name | Threatened | Type of Presence |
|---|---|---|
| Campichthys tricarinatus<br>Three-keel Pipefish [66192] | | Species or species habitat may occur within area |
| Choeroichthys brachysoma<br>Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194] | | Species or species habitat may occur within area |
| Choeroichthys suillus<br>Pig-snouted Pipefish [66198] | | Species or species habitat may occur within area |
| Corythoichthys flavofasciatus<br>Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200] | | Species or species habitat may occur within area |
| Cosmocampus banneri<br>Roughridge Pipefish [66206] | | Species or species habitat may occur within area |
| Doryrhamphus dactyliophorus<br>Banded Pipefish, Ringed Pipefish [66210] | | Species or species habitat may occur within area |
| Doryrhamphus excisus<br>Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211] | | Species or species habitat may occur within area |
| Doryrhamphus janssi<br>Cleaner Pipefish, Janss' Pipefish [66212] | | Species or species habitat may occur within area |
| Filicampus tigris<br>Tiger Pipefish [66217] | | Species or species habitat may occur within area |
| Halicampus brocki<br>Brock's Pipefish [66219] | | Species or species habitat may occur within area |
| Halicampus grayi<br>Mud Pipefish, Gray's Pipefish [66221] | | Species or species habitat may occur within area |
| Halicampus spinirostris<br>Spiny-snout Pipefish [66225] | | Species or species habitat may occur within area |
| Haliichthys taeniophorus<br>Ribboned Pipehorse, Ribboned Seadragon [66226] | | Species or species habitat may occur within area |
| Hippichthys penicillus<br>Beady Pipefish, Steep-nosed Pipefish [66231] | | Species or species habitat may occur within area |
| Hippocampus angustus<br>Western Spiny Seahorse, Narrow-bellied Seahorse [66234] | | Species or species habitat may occur within area |
| Hippocampus histrix<br>Spiny Seahorse, Thorny Seahorse [66236] | | Species or species habitat may occur within area |
| Hippocampus kuda<br>Spotted Seahorse, Yellow Seahorse [66237] | | Species or species habitat may occur within area |
| Hippocampus planifrons<br>Flat-face Seahorse [66238] | | Species or species habitat may occur within area |

| Name | Threatened | Type of Presence |
| --- | --- | --- |
| Hippocampus spinosissimus<br>Hedgehog Seahorse [66239] | | Species or species habitat may occur within area |
| Micrognathus micronotopterus<br>Tidepool Pipefish [66255] | | Species or species habitat may occur within area |
| Solegnathus hardwickii<br>Pallid Pipehorse, Hardwick's Pipehorse [66272] | | Species or species habitat may occur within area |
| Solegnathus lettiensis<br>Gunther's Pipehorse, Indonesian Pipefish [66273] | | Species or species habitat may occur within area |
| Solenostomus cyanopterus<br>Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183] | | Species or species habitat may occur within area |
| Syngnathoides biaculeatus<br>Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279] | | Species or species habitat may occur within area |
| Trachyrhamphus bicoarctatus<br>Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280] | | Species or species habitat may occur within area |
| Trachyrhamphus longirostris<br>Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281] | | Species or species habitat may occur within area |
| Reptiles | | |
| Acalyptophis peronii<br>Horned Seasnake [1114] | | Species or species habitat may occur within area |
| Aipysurus duboisii<br>Dubois' Seasnake [1116] | | Species or species habitat may occur within area |
| Aipysurus eydouxii<br>Spine-tailed Seasnake [1117] | | Species or species habitat may occur within area |
| Aipysurus laevis<br>Olive Seasnake [1120] | | Species or species habitat may occur within area |
| Aipysurus tenuis<br>Brown-lined Seasnake [1121] | | Species or species habitat may occur within area |
| Astrotia stokesii<br>Stokes' Seasnake [1122] | | Species or species habitat may occur within area |
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat likely to occur within area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Species or species habitat likely to occur within area |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area |
| Disteira kingii<br>Spectacled Seasnake [1123] | | Species or species habitat may occur within area |

| Name | Threatened | Type of Presence |
|---|---|---|
| Disteira major<br>Olive-headed Seasnake [1124] | | Species or species habitat may occur within area |
| Ephalophis greyi<br>North-western Mangrove Seasnake [1127] | | Species or species habitat may occur within area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area |
| Hydrophis czeblukovi<br>Fine-spined Seasnake [59233] | | Species or species habitat may occur within area |
| Hydrophis elegans<br>Elegant Seasnake [1104] | | Species or species habitat may occur within area |
| Hydrophis mcdowelli<br>null [25926] | | Species or species habitat may occur within area |
| Hydrophis ornatus<br>Spotted Seasnake, Ornate Reef Seasnake [1111] | | Species or species habitat may occur within area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Species or species habitat likely to occur within area |
| Pelamis platurus<br>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<br>Sei Whale [34] | Vulnerable | Species or species habitat may occur within area |
| Balaenoptera edeni<br>Bryde's Whale [35] | | Species or species habitat may occur within area |
| Balaenoptera musculus<br>Blue Whale [36] | Endangered | Species or species habitat likely to occur within area |
| Balaenoptera physalus<br>Fin Whale [37] | Vulnerable | Species or species habitat may occur within area |
| Delphinus delphis<br>Common Dophin, Short-beaked Common Dolphin [60] | | Species or species habitat may occur within area |
| Grampus griseus<br>Risso's Dolphin, Grampus [64] | | Species or species habitat may occur within area |
| Megaptera novaeangliae<br>Humpback Whale [38] | Vulnerable | Species or species habitat known to occur within area |
| Orcinus orca<br>Killer Whale, Orca [46] | | Species or species habitat may occur within area |

| Name | Status | Type of Presence |
|---|---|---|
| Pseudorca crassidens<br>False Killer Whale [48] | | Species or species habitat likely to occur within area |
| Stenella attenuata<br>Spotted Dolphin, Pantropical Spotted Dolphin [51] | | Species or species habitat may occur within area |
| Tursiops aduncus<br>Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418] | | Species or species habitat may occur within area |
| Tursiops aduncus (Arafura/Timor Sea populations)<br>Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900] | | Species or species habitat may occur within area |
| Tursiops truncatus s. str.<br>Bottlenose Dolphin [68417] | | Species or species habitat may occur within area |

## Extra Information

# Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

# Coordinates

-19.49962 116.5979,-19.50095 116.6011,-19.50415 116.6024,-19.50734 116.6011,-19.50866 116.5979,-19.50733 116.5947,-19.50413 116.5934,-19.50094 116.5947,-19.49962 116.5979

# 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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Australian Government
Department of the Environment and Energy

# EPBC Act Protected Matters Report

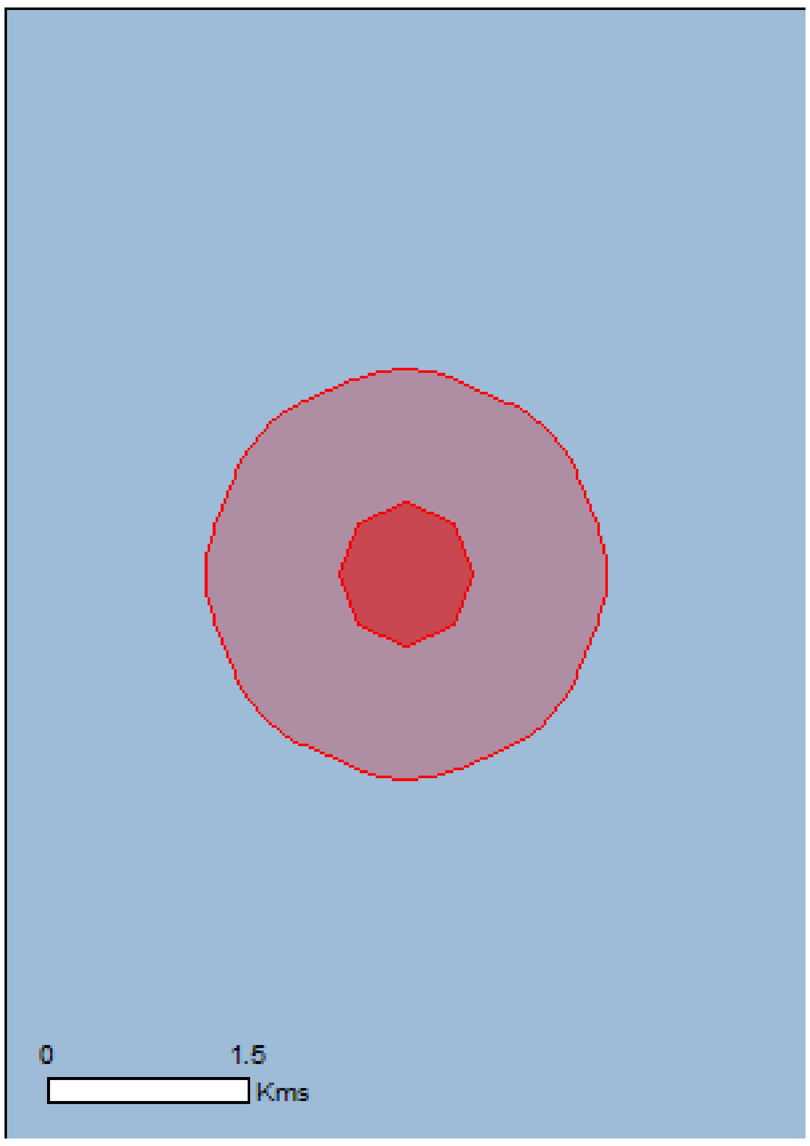
This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

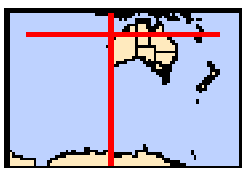
Report created: 15/04/19 14:54:33


- Summary
- Details
  - Matters of NES
  - Other Matters Protected by the EPBC Act
  - Extra Information
- Caveat
- Acknowledgements




Coordinates
Buffer: 1.0Km



# Summary

## Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

| | |
|---|---|
| World Heritage Properties: | None |
| National Heritage Places: | None |
| Wetlands of International Importance: | None |
| Great Barrier Reef Marine Park: | None |
| Commonwealth Marine Area: | 1 |
| Listed Threatened Ecological Communities: | None |
| Listed Threatened Species: | 14 |
| Listed Migratory Species: | 30 |

## Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

| | |
|---|---|
| Commonwealth Land: | None |
| Commonwealth Heritage Places: | None |
| Listed Marine Species: | 47 |
| Whales and Other Cetaceans: | 22 |
| Critical Habitats: | None |
| Commonwealth Reserves Terrestrial: | None |
| Australian Marine Parks: | None |

## Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

| | |
|---|---|
| State and Territory Reserves: | None |
| Regional Forest Agreements: | None |
| Invasive Species: | None |
| Nationally Important Wetlands: | None |
| Key Ecological Features (Marine) | 1 |

# 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** | | |
| Calidris canutus<br>Red Knot, Knot [855] | Endangered | Species or species habitat may occur within area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
| **Mammals** | | |
| Balaenoptera borealis<br>Sei Whale [34] | Vulnerable | Species or species habitat likely to occur within area |
| Balaenoptera musculus<br>Blue Whale [36] | Endangered | Species or species habitat likely to occur within area |
| Balaenoptera physalus<br>Fin Whale [37] | Vulnerable | Species or species habitat likely to occur within area |
| Megaptera novaeangliae<br>Humpback Whale [38] | Vulnerable | Species or species habitat known to occur within area |
| **Reptiles** | | |
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat likely to occur within area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Species or species habitat likely to occur within area |

| Name | Status | Type of Presence |
|---|---|---|
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Species or species habitat known to occur within area |
| Sharks | | |
| Carcharodon carcharias<br>White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat may occur within area |
| Pristis zijsron<br>Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442] | Vulnerable | Species or species habitat known to occur within area |
| Rhincodon typus<br>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<br>Common Noddy [825] | | Species or species habitat may occur within area |
| Calonectris leucomelas<br>Streaked Shearwater [1077] | | Species or species habitat likely to occur within area |
| Fregata ariel<br>Lesser Frigatebird, Least Frigatebird [1012] | | Species or species habitat likely to occur within area |
| Fregata minor<br>Great Frigatebird, Greater Frigatebird [1013] | | Species or species habitat may occur within area |
| Migratory Marine Species | | |
| Anoxypristis cuspidata<br>Narrow Sawfish, Knifetooth Sawfish [68448] | | Species or species habitat may occur within area |
| Balaenoptera borealis<br>Sei Whale [34] | Vulnerable | Species or species habitat likely to occur within area |
| Balaenoptera edeni<br>Bryde's Whale [35] | | Species or species habitat may occur within area |
| Balaenoptera musculus<br>Blue Whale [36] | Endangered | Species or species habitat likely to occur within area |
| Balaenoptera physalus<br>Fin Whale [37] | Vulnerable | Species or species habitat likely to occur within area |
| Carcharodon carcharias<br>White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat may occur within area |

| Name | Threatened | Type of Presence |
|---|---|---|
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat likely to occur within area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Species or species habitat likely to occur within area |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area |
| Isurus oxyrinchus<br>Shortfin Mako, Mako Shark [79073] | | Species or species habitat likely to occur within area |
| Isurus paucus<br>Longfin Mako [82947] | | Species or species habitat likely to occur within area |
| Manta alfredi<br>Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994] | | Species or species habitat may occur within area |
| Manta birostris<br>Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995] | | Species or species habitat may occur within area |
| Megaptera novaeangliae<br>Humpback Whale [38] | Vulnerable | Species or species habitat known to occur within area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Species or species habitat known to occur within area |
| Orcinus orca<br>Killer Whale, Orca [46] | | Species or species habitat may occur within area |
| Physeter macrocephalus<br>Sperm Whale [59] | | Species or species habitat may occur within area |
| Pristis zijsron<br>Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442] | Vulnerable | Species or species habitat known to occur within area |
| Rhincodon typus<br>Whale Shark [66680] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |
| Tursiops aduncus (Arafura/Timor Sea populations)<br>Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900] | | Species or species habitat may occur within area |
| **Migratory Wetlands Species** | | |
| Actitis hypoleucos<br>Common Sandpiper [59309] | | Species or species habitat may occur within area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | | Species or species habitat may occur within area |
| Calidris canutus<br>Red Knot, Knot [855] | Endangered | Species or species habitat may occur within area |

| Name | Threatened | Type of Presence |
|---|---|---|
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |

## Other Matters Protected by the EPBC Act

### Listed Marine Species [ Resource Information ]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

| Name | Threatened | Type of Presence |
|---|---|---|
| Birds | | |
| Actitis hypoleucos<br>Common Sandpiper [59309] | | Species or species habitat may occur within area |
| Anous stolidus<br>Common Noddy [825] | | Species or species habitat may occur within area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | | Species or species habitat may occur within area |
| Calidris canutus<br>Red Knot, Knot [855] | Endangered | Species or species habitat may occur within area |
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area |
| Calonectris leucomelas<br>Streaked Shearwater [1077] | | Species or species habitat likely to occur within area |
| Fregata ariel<br>Lesser Frigatebird, Least Frigatebird [1012] | | Species or species habitat likely to occur within area |
| Fregata minor<br>Great Frigatebird, Greater Frigatebird [1013] | | Species or species habitat may occur within area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
| Fish | | |
| Campichthys tricarinatus<br>Three-keel Pipefish [66192] | | Species or species habitat may occur within area |

| Name | Threatened | Type of Presence |
|---|---|---|
| Choeroichthys brachysoma<br>Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194] | | Species or species habitat may occur within area |
| Choeroichthys suillus<br>Pig-snouted Pipefish [66198] | | Species or species habitat may occur within area |
| Corythoichthys flavofasciatus<br>Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200] | | Species or species habitat may occur within area |
| Cosmocampus banneri<br>Roughridge Pipefish [66206] | | Species or species habitat may occur within area |
| Doryrhamphus dactyliophorus<br>Banded Pipefish, Ringed Pipefish [66210] | | Species or species habitat may occur within area |
| Doryrhamphus excisus<br>Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211] | | Species or species habitat may occur within area |
| Doryrhamphus janssi<br>Cleaner Pipefish, Janss' Pipefish [66212] | | Species or species habitat may occur within area |
| Filicampus tigris<br>Tiger Pipefish [66217] | | Species or species habitat may occur within area |
| Halicampus brocki<br>Brock's Pipefish [66219] | | Species or species habitat may occur within area |
| Halicampus grayi<br>Mud Pipefish, Gray's Pipefish [66221] | | Species or species habitat may occur within area |
| Halicampus spinirostris<br>Spiny-snout Pipefish [66225] | | Species or species habitat may occur within area |
| Haliichthys taeniophorus<br>Ribboned Pipehorse, Ribboned Seadragon [66226] | | Species or species habitat may occur within area |
| Hippichthys penicillus<br>Beady Pipefish, Steep-nosed Pipefish [66231] | | Species or species habitat may occur within area |
| Hippocampus angustus<br>Western Spiny Seahorse, Narrow-bellied Seahorse [66234] | | Species or species habitat may occur within area |
| Hippocampus histrix<br>Spiny Seahorse, Thorny Seahorse [66236] | | Species or species habitat may occur within area |
| Hippocampus kuda<br>Spotted Seahorse, Yellow Seahorse [66237] | | Species or species habitat may occur within area |
| Hippocampus planifrons<br>Flat-face Seahorse [66238] | | Species or species habitat may occur within area |
| Hippocampus spinosissimus<br>Hedgehog Seahorse [66239] | | Species or species habitat may occur within area |

| Name | Threatened | Type of Presence |
|---|---|---|
| Micrognathus micronotopterus<br>Tidepool Pipefish [66255] | | Species or species habitat may occur within area |
| Solegnathus hardwickii<br>Pallid Pipehorse, Hardwick's Pipehorse [66272] | | Species or species habitat may occur within area |
| Solegnathus lettiensis<br>Gunther's Pipehorse, Indonesian Pipefish [66273] | | Species or species habitat may occur within area |
| Solenostomus cyanopterus<br>Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183] | | Species or species habitat may occur within area |
| Syngnathoides biaculeatus<br>Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279] | | Species or species habitat may occur within area |
| Trachyrhamphus bicoarctatus<br>Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280] | | Species or species habitat may occur within area |
| Trachyrhamphus longirostris<br>Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281] | | Species or species habitat may occur within area |
| Reptiles | | |
| Aipysurus laevis<br>Olive Seasnake [1120] | | Species or species habitat may occur within area |
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat likely to occur within area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Species or species habitat likely to occur within area |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area |
| Disteira kingii<br>Spectacled Seasnake [1123] | | Species or species habitat may occur within area |
| Disteira major<br>Olive-headed Seasnake [1124] | | Species or species habitat may occur within area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area |
| Hydrophis czeblukovi<br>Fine-spined Seasnake [59233] | | Species or species habitat may occur within area |
| Hydrophis elegans<br>Elegant Seasnake [1104] | | Species or species habitat may occur within area |
| Hydrophis ornatus<br>Spotted Seasnake, Ornate Reef Seasnake [1111] | | Species or species habitat may occur within area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Species or species habitat known to occur within area |

| Name | Threatened | Type of Presence |
|---|---|---|
| Pelamis platurus<br>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<br>Sei Whale [34] | Vulnerable | Species or species habitat likely to occur within area |
| Balaenoptera edeni<br>Bryde's Whale [35] | | Species or species habitat may occur within area |
| Balaenoptera musculus<br>Blue Whale [36] | Endangered | Species or species habitat likely to occur within area |
| Balaenoptera physalus<br>Fin Whale [37] | Vulnerable | Species or species habitat likely to occur within area |
| Delphinus delphis<br>Common Dophin, Short-beaked Common Dolphin [60] | | Species or species habitat may occur within area |
| Feresa attenuata<br>Pygmy Killer Whale [61] | | Species or species habitat may occur within area |
| Globicephala macrorhynchus<br>Short-finned Pilot Whale [62] | | Species or species habitat may occur within area |
| Grampus griseus<br>Risso's Dolphin, Grampus [64] | | Species or species habitat may occur within area |
| Kogia breviceps<br>Pygmy Sperm Whale [57] | | Species or species habitat may occur within area |
| Kogia simus<br>Dwarf Sperm Whale [58] | | Species or species habitat may occur within area |
| Megaptera novaeangliae<br>Humpback Whale [38] | Vulnerable | Species or species habitat known to occur within area |
| Orcinus orca<br>Killer Whale, Orca [46] | | Species or species habitat may occur within area |
| Peponocephala electra<br>Melon-headed Whale [47] | | Species or species habitat may occur within area |
| Physeter macrocephalus<br>Sperm Whale [59] | | Species or species habitat may occur within area |
| Pseudorca crassidens<br>False Killer Whale [48] | | Species or species habitat likely to occur within area |
| Stenella attenuata<br>Spotted Dolphin, Pantropical Spotted Dolphin [51] | | Species or species habitat may occur within area |

| Name | Status | Type of Presence |
|---|---|---|
| Stenella coeruleoalba<br>Striped Dolphin, Euphrosyne Dolphin [52] | | Species or species habitat may occur within area |
| Stenella longirostris<br>Long-snouted Spinner Dolphin [29] | | Species or species habitat may occur within area |
| Steno bredanensis<br>Rough-toothed Dolphin [30] | | Species or species habitat may occur within area |
| Tursiops aduncus (Arafura/Timor Sea populations)<br>Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900] | | Species or species habitat may occur within area |
| Tursiops truncatus s. str.<br>Bottlenose Dolphin [68417] | | Species or species habitat may occur within area |
| Ziphius cavirostris<br>Cuvier's Beaked Whale, Goose-beaked Whale [56] | | Species or species habitat may occur within area |

## Extra Information

### 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 |

# 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

-19.71745 115.8547,-19.71879 115.8579,-19.722 115.8592,-19.72518 115.8579,-19.72648 115.8547,-19.72514 115.8515,-19.72193 115.8502,-19.71875 115.8515,-19.71745 115.8547

# 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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Australian Government

Department of the Environment and Energy

# EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

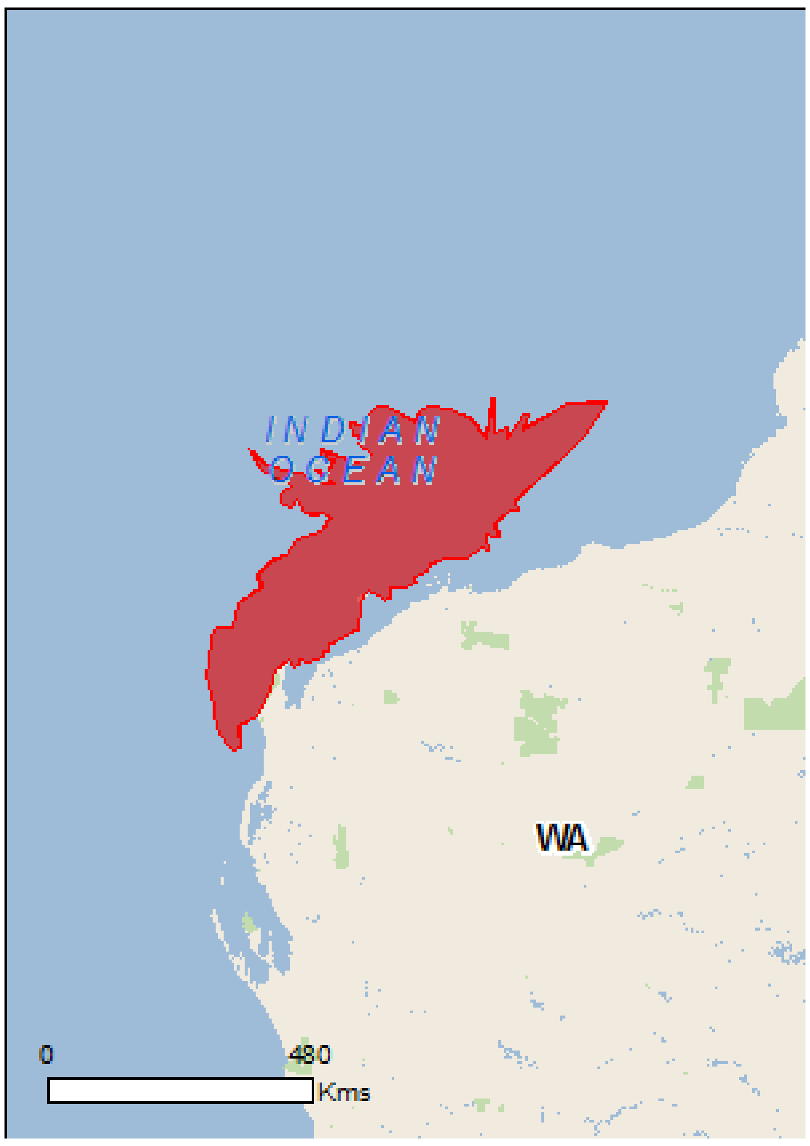
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 15/08/19 16:14:27


Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

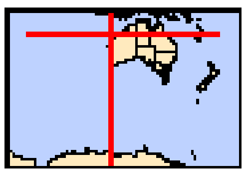
Caveat
Acknowledgements




Coordinates

Buffer: 1.0Km



# Summary

## Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

| | |
|---|---|
| World Heritage Properties: | 1 |
| National Heritage Places: | 1 |
| Wetlands of International Importance: | None |
| Great Barrier Reef Marine Park: | None |
| Commonwealth Marine Area: | 1 |
| Listed Threatened Ecological Communities: | None |
| Listed Threatened Species: | 41 |
| Listed Migratory Species: | 56 |

## 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: | 2 |
| Commonwealth Heritage Places: | 2 |
| Listed Marine Species: | 105 |
| Whales and Other Cetaceans: | 29 |
| Critical Habitats: | None |
| Commonwealth Reserves Terrestrial: | None |
| Australian Marine Parks: | 6 |

## Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

| | |
|---|---|
| State and Territory Reserves: | 15 |
| Regional Forest Agreements: | None |
| Invasive Species: | 11 |
| Nationally Important Wetlands: | 2 |
| Key Ecological Features (Marine) | 7 |

# Details

## Matters of National Environmental Significance

### World Heritage Properties [ Resource Information ]

| Name | State | Status |
|---|---|---|
| The Ningaloo Coast | WA | Declared property |

### National Heritage Properties [ Resource Information ]

| Name | State | Status |
|---|---|---|
| **Natural** | | |
| The Ningaloo Coast | WA | Listed place |

### 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** | | |
| Calidris canutus | | |
| Red Knot, Knot [855] | Endangered | Species or species habitat known to occur within area |
| Calidris ferruginea | | |
| Curlew Sandpiper [856] | Critically Endangered | Species or species habitat known to occur within area |
| Limosa lapponica  baueri | | |
| Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380] | Vulnerable | Species or species habitat may occur within area |
| Limosa lapponica  menzbieri | | |
| Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432] | Critically Endangered | Species or species habitat may occur within area |
| Macronectes giganteus | | |
| Southern Giant-Petrel, Southern Giant Petrel [1060] | Endangered | Species or species habitat may occur within area |
| Malurus leucopterus  edouardi | | |
| White-winged Fairy-wren (Barrow Island), Barrow Island Black-and-white Fairy-wren [26194] | Vulnerable | Species or species habitat likely to occur within area |
| Numenius madagascariensis | | |
| Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat known to occur within area |

| Name | Status | Type of Presence |
|---|---|---|
| Papasula abbotti<br>Abbott's Booby [59297] | Endangered | Species or species habitat may occur within area |
| Pezoporus occidentalis<br>Night Parrot [59350] | Endangered | Species or species habitat may occur within area |
| Pterodroma mollis<br>Soft-plumaged Petrel [1036] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |
| Rostratula australis<br>Australian Painted-snipe, Australian Painted Snipe [77037] | Endangered | Species or species habitat likely to occur within area |
| Sternula nereis nereis<br>Australian Fairy Tern [82950] | Vulnerable | Breeding known to occur within area |
| Thalassarche impavida<br>Campbell Albatross, Campbell Black-browed Albatross [64459] | Vulnerable | Species or species habitat may occur within area |
| Fish | | |
| Milyeringa veritas<br>Blind Gudgeon [66676] | Vulnerable | Species or species habitat known to occur within area |
| Ophisternon candidum<br>Blind Cave Eel [66678] | Vulnerable | Species or species habitat known to occur within area |
| Mammals | | |
| Balaenoptera borealis<br>Sei Whale [34] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |
| Balaenoptera musculus<br>Blue Whale [36] | Endangered | Migration route known to occur within area |
| Balaenoptera physalus<br>Fin Whale [37] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |
| Bettongia lesueur Barrow and Boodie Islands subspecies<br>Boodie, Burrowing Bettong (Barrow and Boodie Islands) [88021] | Vulnerable | Species or species habitat known to occur within area |
| Dasyurus hallucatus<br>Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331] | Endangered | Species or species habitat may occur within area |
| Eubalaena australis<br>Southern Right Whale [40] | Endangered | Species or species habitat likely to occur within area |
| Isoodon auratus barrowensis<br>Golden Bandicoot (Barrow Island) [66666] | Vulnerable | Species or species habitat known to occur within area |
| Lagorchestes conspicillatus conspicillatus<br>Spectacled Hare-wallaby (Barrow Island) [66661] | Vulnerable | Species or species habitat known to occur within area |
| Lagorchestes hirsutus Central Australian subspecies<br>Mala, Rufous Hare-Wallaby (Central Australia) [88019] | Endangered | Translocated population known to occur within area |
| Megaptera novaeangliae<br>Humpback Whale [38] | Vulnerable | Congregation or aggregation known to occur within area |

| Name | Status | Type of Presence |
|---|---|---|
| Osphranter robustus isabellinus<br>Barrow Island Wallaroo, Barrow Island Euro [89262] | Vulnerable | Species or species habitat likely to occur within area |
| Petrogale lateralis lateralis<br>Black-flanked Rock-wallaby, Moororong, Black-footed Rock Wallaby [66647] | Endangered | Species or species habitat known to occur within area |
| Rhinonicteris aurantia (Pilbara form)<br>Pilbara Leaf-nosed Bat [82790] | Vulnerable | Species or species habitat known to occur within area |
| **Other** | | |
| Kumonga exleyi<br>Cape Range Remipede [86875] | Vulnerable | Species or species habitat known to occur within area |
| **Reptiles** | | |
| Aipysurus apraefrontalis<br>Short-nosed Seasnake [1115] | Critically Endangered | Species or species habitat known to occur within area |
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Breeding known to occur within area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Breeding known to occur within area |
| Ctenotus zastictus<br>Hamelin Ctenotus [25570] | Vulnerable | Species or species habitat likely to occur within area |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat known to occur within area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Breeding known to occur within area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Breeding known to occur within area |
| **Sharks** | | |
| Carcharias taurus (west coast population)<br>Grey Nurse Shark (west coast population) [68752] | Vulnerable | Species or species habitat known to occur within area |
| Carcharodon carcharias<br>White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat known to occur within area |
| Pristis clavata<br>Dwarf Sawfish, Queensland Sawfish [68447] | Vulnerable | Species or species habitat known to occur within area |
| Pristis zijsron<br>Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442] | Vulnerable | Species or species habitat known to occur within area |
| Rhincodon typus<br>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<br>Common Noddy [825] | | Species or species habitat likely to occur within area |

| Name | Threatened | Type of Presence |
|---|---|---|
| Apus pacificus<br>Fork-tailed Swift [678] | | Species or species habitat likely to occur within area |
| Ardenna carneipes<br>Flesh-footed Shearwater, Fleshy-footed Shearwater [82404] | | Species or species habitat likely to occur within area |
| Ardenna pacifica<br>Wedge-tailed Shearwater [84292] | | Breeding known to occur within area |
| Calonectris leucomelas<br>Streaked Shearwater [1077] | | Species or species habitat likely to occur within area |
| Fregata ariel<br>Lesser Frigatebird, Least Frigatebird [1012] | | Species or species habitat known to occur within area |
| Fregata minor<br>Great Frigatebird, Greater Frigatebird [1013] | | Species or species habitat may occur within area |
| Hydroprogne caspia<br>Caspian Tern [808] | | Breeding known to occur within area |
| Macronectes giganteus<br>Southern Giant-Petrel, Southern Giant Petrel [1060] | Endangered | Species or species habitat may occur within area |
| Onychoprion anaethetus<br>Bridled Tern [82845] | | Breeding known to occur within area |
| Phaethon lepturus<br>White-tailed Tropicbird [1014] | | Foraging, feeding or related behaviour likely to occur within area |
| Sterna dougallii<br>Roseate Tern [817] | | Breeding known to occur within area |
| Sternula albifrons<br>Little Tern [82849] | | Congregation or aggregation known to occur within area |
| Thalassarche impavida<br>Campbell Albatross, Campbell Black-browed Albatross [64459] | Vulnerable | Species or species habitat may occur within area |
| **Migratory Marine Species** | | |
| Anoxypristis cuspidata<br>Narrow Sawfish, Knifetooth Sawfish [68448] | | Species or species habitat known to occur within area |
| Balaena glacialis  australis<br>Southern Right Whale [75529] | Endangered* | Species or species habitat likely to occur within area |
| Balaenoptera bonaerensis<br>Antarctic Minke Whale, Dark-shoulder Minke Whale [67812] | | Species or species habitat likely to occur within area |
| Balaenoptera borealis<br>Sei Whale [34] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |
| Balaenoptera edeni<br>Bryde's Whale [35] | | Species or species habitat likely to occur within area |
| Balaenoptera musculus<br>Blue Whale [36] | Endangered | Migration route known to occur within area |

| Name | Threatened | Type of Presence |
|---|---|---|
| Balaenoptera physalus<br>Fin Whale [37] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |
| Carcharodon carcharias<br>White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat known to occur within area |
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Breeding known to occur within area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Breeding known to occur within area |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat known to occur within area |
| Dugong dugon<br>Dugong [28] | | Breeding known to occur within area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Breeding known to occur within area |
| Isurus oxyrinchus<br>Shortfin Mako, Mako Shark [79073] | | Species or species habitat likely to occur within area |
| Isurus paucus<br>Longfin Mako [82947] | | Species or species habitat likely to occur within area |
| Lamna nasus<br>Porbeagle, Mackerel Shark [83288] | | Species or species habitat may occur within area |
| Manta alfredi<br>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<br>Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995] | | Species or species habitat known to occur within area |
| Megaptera novaeangliae<br>Humpback Whale [38] | Vulnerable | Congregation or aggregation known to occur within area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Breeding known to occur within area |
| Orcinus orca<br>Killer Whale, Orca [46] | | Species or species habitat may occur within area |
| Physeter macrocephalus<br>Sperm Whale [59] | | Species or species habitat may occur within area |
| Pristis clavata<br>Dwarf Sawfish, Queensland Sawfish [68447] | Vulnerable | Species or species habitat known to occur within area |
| Pristis zijsron<br>Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442] | Vulnerable | Species or species habitat known to occur within area |
| Rhincodon typus<br>Whale Shark [66680] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |
| Sousa chinensis<br>Indo-Pacific Humpback Dolphin [50] | | Species or species |

| Name | Threatened | Type of Presence |
|---|---|---|
| | | habitat known to occur within area |
| Tursiops aduncus (Arafura/Timor Sea populations)<br>Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900] | | Species or species habitat known to occur within area |
| **Migratory Terrestrial Species** | | |
| Hirundo rustica<br>Barn Swallow [662] | | Species or species habitat may occur within area |
| Motacilla cinerea<br>Grey Wagtail [642] | | Species or species habitat may occur within area |
| Motacilla flava<br>Yellow Wagtail [644] | | Species or species habitat may occur within area |
| **Migratory Wetlands Species** | | |
| Actitis hypoleucos<br>Common Sandpiper [59309] | | Species or species habitat known to occur within area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | | Species or species habitat known to occur within area |
| Calidris canutus<br>Red Knot, Knot [855] | Endangered | Species or species habitat known to occur within area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat known to occur within area |
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area |
| Charadrius veredus<br>Oriental Plover, Oriental Dotterel [882] | | Species or species habitat may occur within area |
| Glareola maldivarum<br>Oriental Pratincole [840] | | Species or species habitat may occur within area |
| Limosa lapponica<br>Bar-tailed Godwit [844] | | Species or species habitat known to occur within area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat known to occur within area |
| Pandion haliaetus<br>Osprey [952] | | Breeding known to occur within area |
| Thalasseus bergii<br>Crested Tern [83000] | | Breeding known to occur within area |
| Tringa nebularia<br>Common Greenshank, Greenshank [832] | | Species or species habitat likely to occur within area |

## Other Matters Protected by the EPBC Act

### Commonwealth Land [ Resource Information ]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

| Name |
|---|
| Commonwealth Land -<br>Defence - LEARMONTH - AIR WEAPONS RANGE |

### Commonwealth Heritage Places [ Resource Information ]

| Name | State | Status |
|---|---|---|
| Natural | | |
| Learmonth Air Weapons Range Facility | WA | Listed place |
| Ningaloo Marine Area - Commonwealth Waters | WA | 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 | | |
| Actitis hypoleucos<br>Common Sandpiper [59309] | | Species or species habitat known to occur within area |
| Anous stolidus<br>Common Noddy [825] | | Species or species habitat likely to occur within area |
| Apus pacificus<br>Fork-tailed Swift [678] | | Species or species habitat likely to occur within area |
| Ardea alba<br>Great Egret, White Egret [59541] | | Species or species habitat known to occur within area |
| Ardea ibis<br>Cattle Egret [59542] | | Species or species habitat may occur within area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | | Species or species habitat known to occur within area |
| Calidris canutus<br>Red Knot, Knot [855] | Endangered | Species or species habitat known to occur within area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat known to occur within area |
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area |
| Calonectris leucomelas<br>Streaked Shearwater [1077] | | Species or species habitat likely to occur within area |
| Charadrius veredus<br>Oriental Plover, Oriental Dotterel [882] | | Species or species habitat may occur within area |
| Chrysococcyx osculans<br>Black-eared Cuckoo [705] | | Species or species habitat known to occur within area |
| Fregata ariel<br>Lesser Frigatebird, Least Frigatebird [1012] | | Species or species habitat known to occur |

| Name | Threatened | Type of Presence |
|---|---|---|
| | | within area |
| Fregata minor<br>Great Frigatebird, Greater Frigatebird [1013] | | Species or species habitat may occur within area |
| Glareola maldivarum<br>Oriental Pratincole [840] | | Species or species habitat may occur within area |
| Haliaeetus leucogaster<br>White-bellied Sea-Eagle [943] | | Species or species habitat known to occur within area |
| Hirundo rustica<br>Barn Swallow [662] | | Species or species habitat may occur within area |
| Larus novaehollandiae<br>Silver Gull [810] | | Breeding known to occur within area |
| Limosa lapponica<br>Bar-tailed Godwit [844] | | Species or species habitat known to occur within area |
| Macronectes giganteus<br>Southern Giant-Petrel, Southern Giant Petrel [1060] | Endangered | Species or species habitat may occur within area |
| Merops ornatus<br>Rainbow Bee-eater [670] | | Species or species habitat may occur within area |
| Motacilla cinerea<br>Grey Wagtail [642] | | Species or species habitat may occur within area |
| Motacilla flava<br>Yellow Wagtail [644] | | Species or species habitat may occur within area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat known to occur within area |
| Pandion haliaetus<br>Osprey [952] | | Breeding known to occur within area |
| Papasula abbotti<br>Abbott's Booby [59297] | Endangered | Species or species habitat may occur within area |
| Phaethon lepturus<br>White-tailed Tropicbird [1014] | | Foraging, feeding or related behaviour likely to occur within area |
| Pterodroma mollis<br>Soft-plumaged Petrel [1036] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |
| Puffinus carneipes<br>Flesh-footed Shearwater, Fleshy-footed Shearwater [1043] | | Species or species habitat likely to occur within area |
| Puffinus pacificus<br>Wedge-tailed Shearwater [1027] | | Breeding known to occur within area |
| Rostratula benghalensis (sensu lato)<br>Painted Snipe [889] | Endangered* | Species or species habitat likely to occur within area |
| Sterna albifrons<br>Little Tern [813] | | Congregation or aggregation known to |

| Name | Threatened | Type of Presence |
| --- | --- | --- |
| | | occur within area |
| Sterna anaethetus<br>Bridled Tern [814] | | Breeding known to occur within area |
| Sterna bengalensis<br>Lesser Crested Tern [815] | | Breeding known to occur within area |
| Sterna bergii<br>Crested Tern [816] | | Breeding known to occur within area |
| Sterna caspia<br>Caspian Tern [59467] | | Breeding known to occur within area |
| Sterna dougallii<br>Roseate Tern [817] | | Breeding known to occur within area |
| Sterna fuscata<br>Sooty Tern [794] | | Breeding known to occur within area |
| Sterna nereis<br>Fairy Tern [796] | | Breeding known to occur within area |
| Thalassarche impavida<br>Campbell Albatross, Campbell Black-browed Albatross [64459] | Vulnerable | Species or species habitat may occur within area |
| Thinornis rubricollis<br>Hooded Plover [59510] | | Species or species habitat may occur within area |
| Tringa nebularia<br>Common Greenshank, Greenshank [832] | | Species or species habitat likely to occur within area |
| **Fish** | | |
| Acentronura larsonae<br>Helen's Pygmy Pipehorse [66186] | | Species or species habitat may occur within area |
| Bhanotia fasciolata<br>Corrugated Pipefish, Barbed Pipefish [66188] | | Species or species habitat may occur within area |
| Bulbonaricus brauni<br>Braun's Pughead Pipefish, Pug-headed Pipefish [66189] | | Species or species habitat may occur within area |
| Campichthys tricarinatus<br>Three-keel Pipefish [66192] | | Species or species habitat may occur within area |
| Choeroichthys brachysoma<br>Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194] | | Species or species habitat may occur within area |
| Choeroichthys latispinosus<br>Muiron Island Pipefish [66196] | | Species or species habitat may occur within area |
| Choeroichthys suillus<br>Pig-snouted Pipefish [66198] | | Species or species habitat may occur within area |
| Corythoichthys amplexus<br>Fijian Banded Pipefish, Brown-banded Pipefish [66199] | | Species or species habitat may occur within area |
| Corythoichthys flavofasciatus<br>Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200] | | Species or species habitat may occur within area |

| Name | Threatened | Type of Presence |
|---|---|---|
| Corythoichthys intestinalis<br>Australian Messmate Pipefish, Banded Pipefish [66202] | | Species or species habitat may occur within area |
| Corythoichthys schultzi<br>Schultz's Pipefish [66205] | | Species or species habitat may occur within area |
| Cosmocampus banneri<br>Roughridge Pipefish [66206] | | Species or species habitat may occur within area |
| Doryrhamphus dactyliophorus<br>Banded Pipefish, Ringed Pipefish [66210] | | Species or species habitat may occur within area |
| Doryrhamphus excisus<br>Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211] | | Species or species habitat may occur within area |
| Doryrhamphus janssi<br>Cleaner Pipefish, Janss' Pipefish [66212] | | Species or species habitat may occur within area |
| Doryrhamphus multiannulatus<br>Many-banded Pipefish [66717] | | Species or species habitat may occur within area |
| Doryrhamphus negrosensis<br>Flagtail Pipefish, Masthead Island Pipefish [66213] | | Species or species habitat may occur within area |
| Festucalex scalaris<br>Ladder Pipefish [66216] | | Species or species habitat may occur within area |
| Filicampus tigris<br>Tiger Pipefish [66217] | | Species or species habitat may occur within area |
| Halicampus brocki<br>Brock's Pipefish [66219] | | Species or species habitat may occur within area |
| Halicampus dunckeri<br>Red-hair Pipefish, Duncker's Pipefish [66220] | | Species or species habitat may occur within area |
| Halicampus grayi<br>Mud Pipefish, Gray's Pipefish [66221] | | Species or species habitat may occur within area |
| Halicampus nitidus<br>Glittering Pipefish [66224] | | Species or species habitat may occur within area |
| Halicampus spinirostris<br>Spiny-snout Pipefish [66225] | | Species or species habitat may occur within area |
| Haliichthys taeniophorus<br>Ribboned Pipehorse, Ribboned Seadragon [66226] | | Species or species habitat may occur within area |
| Hippichthys penicillus<br>Beady Pipefish, Steep-nosed Pipefish [66231] | | Species or species habitat may occur within area |
| Hippocampus angustus<br>Western Spiny Seahorse, Narrow-bellied Seahorse [66234] | | Species or species habitat may occur within area |

| Name | Threatened | Type of Presence |
|---|---|---|
| Hippocampus histrix<br>Spiny Seahorse, Thorny Seahorse [66236] | | Species or species habitat may occur within area |
| Hippocampus kuda<br>Spotted Seahorse, Yellow Seahorse [66237] | | Species or species habitat may occur within area |
| Hippocampus planifrons<br>Flat-face Seahorse [66238] | | Species or species habitat may occur within area |
| Hippocampus spinosissimus<br>Hedgehog Seahorse [66239] | | Species or species habitat may occur within area |
| Hippocampus trimaculatus<br>Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720] | | Species or species habitat may occur within area |
| Micrognathus micronotopterus<br>Tidepool Pipefish [66255] | | Species or species habitat may occur within area |
| Phoxocampus belcheri<br>Black Rock  Pipefish [66719] | | Species or species habitat may occur within area |
| Solegnathus hardwickii<br>Pallid Pipehorse, Hardwick's Pipehorse [66272] | | Species or species habitat may occur within area |
| Solegnathus lettiensis<br>Gunther's Pipehorse, Indonesian Pipefish [66273] | | Species or species habitat may occur within area |
| Solenostomus cyanopterus<br>Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183] | | Species or species habitat may occur within area |
| Syngnathoides biaculeatus<br>Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279] | | Species or species habitat may occur within area |
| Trachyrhamphus bicoarctatus<br>Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280] | | Species or species habitat may occur within area |
| Trachyrhamphus longirostris<br>Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281] | | Species or species habitat may occur within area |
| Mammals | | |
| Dugong dugon<br>Dugong [28] | | Breeding known to occur within area |
| Reptiles | | |
| Acalyptophis peronii<br>Horned Seasnake [1114] | | Species or species habitat may occur within area |
| Aipysurus apraefrontalis<br>Short-nosed Seasnake [1115] | Critically Endangered | Species or species habitat known to occur within area |
| Aipysurus duboisii<br>Dubois' Seasnake [1116] | | Species or species habitat may occur within area |
| Aipysurus eydouxii<br>Spine-tailed Seasnake [1117] | | Species or species habitat may occur within area |

| Name | Threatened | Type of Presence |
|---|---|---|
| Aipysurus laevis<br>Olive Seasnake [1120] | | Species or species habitat may occur within area |
| Aipysurus tenuis<br>Brown-lined Seasnake [1121] | | Species or species habitat may occur within area |
| Astrotia stokesii<br>Stokes' Seasnake [1122] | | Species or species habitat may occur within area |
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Breeding known to occur within area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Breeding known to occur within area |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat known to occur within area |
| Disteira kingii<br>Spectacled Seasnake [1123] | | Species or species habitat may occur within area |
| Disteira major<br>Olive-headed Seasnake [1124] | | Species or species habitat may occur within area |
| Emydocephalus annulatus<br>Turtle-headed Seasnake [1125] | | Species or species habitat may occur within area |
| Ephalophis greyi<br>North-western Mangrove Seasnake [1127] | | Species or species habitat may occur within area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Breeding known to occur within area |
| Hydrelaps darwiniensis<br>Black-ringed Seasnake [1100] | | Species or species habitat may occur within area |
| Hydrophis czeblukovi<br>Fine-spined Seasnake [59233] | | Species or species habitat may occur within area |
| Hydrophis elegans<br>Elegant Seasnake [1104] | | Species or species habitat may occur within area |
| Hydrophis mcdowelli<br>null [25926] | | Species or species habitat may occur within area |
| Hydrophis ornatus<br>Spotted Seasnake, Ornate Reef Seasnake [1111] | | Species or species habitat may occur within area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Breeding known to occur within area |
| Pelamis platurus<br>Yellow-bellied Seasnake [1091] | | Species or species habitat may occur within area |

## Whales and other Cetaceans [ Resource Information ]

| Name | Status | Type of Presence |
|---|---|---|
| Mammals | | |

| Name | Status | Type of Presence |
|---|---|---|
| Balaenoptera acutorostrata<br>Minke Whale [33] | | Species or species habitat may occur within area |
| Balaenoptera bonaerensis<br>Antarctic Minke Whale, Dark-shoulder Minke Whale [67812] | | Species or species habitat likely to occur within area |
| Balaenoptera borealis<br>Sei Whale [34] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |
| Balaenoptera edeni<br>Bryde's Whale [35] | | Species or species habitat likely to occur within area |
| Balaenoptera musculus<br>Blue Whale [36] | Endangered | Migration route known to occur within area |
| Balaenoptera physalus<br>Fin Whale [37] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |
| Delphinus delphis<br>Common Dophin, Short-beaked Common Dolphin [60] | | Species or species habitat may occur within area |
| Eubalaena australis<br>Southern Right Whale [40] | Endangered | Species or species habitat likely to occur within area |
| Feresa attenuata<br>Pygmy Killer Whale [61] | | Species or species habitat may occur within area |
| Globicephala macrorhynchus<br>Short-finned Pilot Whale [62] | | Species or species habitat may occur within area |
| Grampus griseus<br>Risso's Dolphin, Grampus [64] | | Species or species habitat may occur within area |
| Kogia breviceps<br>Pygmy Sperm Whale [57] | | Species or species habitat may occur within area |
| Kogia simus<br>Dwarf Sperm Whale [58] | | Species or species habitat may occur within area |
| Lagenodelphis hosei<br>Fraser's Dolphin, Sarawak Dolphin [41] | | Species or species habitat may occur within area |
| Megaptera novaeangliae<br>Humpback Whale [38] | Vulnerable | Congregation or aggregation known to occur within area |
| Mesoplodon densirostris<br>Blainville's Beaked Whale, Dense-beaked Whale [74] | | Species or species habitat may occur within area |
| Orcinus orca<br>Killer Whale, Orca [46] | | Species or species habitat may occur within area |
| Peponocephala electra<br>Melon-headed Whale [47] | | Species or species habitat may occur within area |
| Physeter macrocephalus<br>Sperm Whale [59] | | Species or species |

| Name | Status | Type of Presence |
|---|---|---|
| | | habitat may occur within area |
| Pseudorca crassidens<br>False Killer Whale [48] | | Species or species habitat likely to occur within area |
| Sousa chinensis<br>Indo-Pacific Humpback Dolphin [50] | | Species or species habitat known to occur within area |
| Stenella attenuata<br>Spotted Dolphin, Pantropical Spotted Dolphin [51] | | Species or species habitat may occur within area |
| Stenella coeruleoalba<br>Striped Dolphin, Euphrosyne Dolphin [52] | | Species or species habitat may occur within area |
| Stenella longirostris<br>Long-snouted Spinner Dolphin [29] | | Species or species habitat may occur within area |
| Steno bredanensis<br>Rough-toothed Dolphin [30] | | Species or species habitat may occur within area |
| Tursiops aduncus<br>Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418] | | Species or species habitat likely to occur within area |
| Tursiops aduncus (Arafura/Timor Sea populations)<br>Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900] | | Species or species habitat known to occur within area |
| Tursiops truncatus s. str.<br>Bottlenose Dolphin [68417] | | Species or species habitat may occur within area |
| Ziphius cavirostris<br>Cuvier's Beaked Whale, Goose-beaked Whale [56] | | Species or species habitat may occur within area |

## Australian Marine Parks [ Resource Information ]

| Name | Label |
|---|---|
| Argo-Rowley Terrace | Multiple Use Zone (IUCN VI) |
| Gascoyne | Habitat Protection Zone (IUCN IV) |
| Gascoyne | Multiple Use Zone (IUCN VI) |
| Montebello | Multiple Use Zone (IUCN VI) |
| Ningaloo | National Park Zone (IUCN II) |
| Ningaloo | Recreational Use Zone (IUCN IV) |

# Extra Information

## State and Territory Reserves [ Resource Information ]

| Name | State |
|---|---|
| Airlie Island | WA |
| Barrow Island | WA |
| Bessieres Island | WA |
| Boodie, Double Middle Islands | WA |
| Cape Range | WA |
| Jurabi Coastal Park | WA |
| Lowendal Islands | WA |
| Montebello Islands | WA |
| Muiron Islands | WA |
| Round Island | WA |
| Serrurier Island | WA |
| Unnamed WA40322 | WA |
| Unnamed WA40828 | WA |
| Unnamed WA41080 | WA |

| Name | State |
|---|---|
| Unnamed WA44665 | 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 |
|---|---|---|
| Birds | | |
| Columba livia<br>Rock Pigeon, Rock Dove, Domestic Pigeon [803] | | Species or species habitat likely to occur within area |
| Mammals | | |
| Canis lupus  familiaris<br>Domestic Dog [82654] | | Species or species habitat likely to occur within area |
| Capra hircus<br>Goat [2] | | Species or species habitat likely to occur within area |
| Equus caballus<br>Horse [5] | | Species or species habitat likely to occur within area |
| Felis catus<br>Cat, House Cat, Domestic Cat [19] | | Species or species habitat likely to occur within area |
| Mus musculus<br>House Mouse [120] | | Species or species habitat likely to occur within area |
| Oryctolagus cuniculus<br>Rabbit, European Rabbit [128] | | Species or species habitat likely to occur within area |
| Rattus rattus<br>Black Rat, Ship Rat [84] | | Species or species habitat likely to occur within area |
| Vulpes vulpes<br>Red Fox, Fox [18] | | Species or species habitat likely to occur within area |
| Plants | | |
| Cenchrus ciliaris<br>Buffel-grass, Black Buffel-grass [20213] | | Species or species habitat likely to occur within area |
| Reptiles | | |
| Hemidactylus frenatus<br>Asian House Gecko [1708] | | Species or species habitat likely to occur within area |

## Nationally Important Wetlands [ Resource Information ]

| Name | State |
|---|---|
| Cape Range Subterranean Waterways | WA |
| Learmonth Air Weapons Range - Saline Coastal Flats | WA |

## 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 |
|---|---|

| Name | Region |
| --- | --- |
| Ancient coastline at 125 m depth contour | North-west |
| Canyons linking the Cuvier Abyssal Plain and the | North-west |
| Commonwealth waters adjacent to Ningaloo Reef | North-west |
| Continental Slope Demersal Fish Communities | North-west |
| Exmouth Plateau | North-west |
| Glomar Shoals | North-west |
| Mermaid Reef and Commonwealth waters | 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

-22.58504 113.66457,-22.7547 113.36396,-23.06375 113.37809,-23.11618 113.25119,-22.88264 113.0513,-22.556 112.96702,-22.42229 112.96955,-21.99185 112.82821,-21.76761 112.88008,-21.42163 112.9115,-21.25396 113.01587,-21.24157 113.25946,-20.87838 113.34742,-20.63147 113.72613,-20.42098 113.67495,-20.20549 113.90803,-20.14958 114.1243,-19.88452 114.32363,-19.77562 114.71243,-19.55404 114.85848,-19.47518 114.74917,-19.4961 114.62068,-19.46804 114.45231,-19.26088 114.32895,-19.38924 114.20903,-19.31441 114.05061,-19.1997 114.03572,-19.06112 114.21955,-18.80972 113.74008,-18.65678 113.62902,-18.52707 113.58001,-18.7457 113.79987,-18.81325 114.08473,-18.86804 114.39179,-19.00627 114.62452,-19.032 114.89855,-18.8245 114.61248,-18.85497 114.84366,-18.63599 114.90355,-18.62066 114.70709,-18.51286 114.69826,-18.68764 115.33112,-18.5614 115.53417,-18.412 115.32941,-18.3209 115.40383,-18.25399 115.24497,-18.0709 115.20392,-18.1182 115.37752,-17.91674 115.55477,-17.83134 115.60749,-17.82543 115.6288,-17.82702 115.67086,-17.82215 115.72021,-17.83122 115.78304,-17.86843 115.87988,-18.06325 116.24493,-17.85823 116.35117,-17.8238 116.52822,-17.85268 116.79447,-17.97765 117.12814,-18.31697 117.42738,-17.69251 117.52443,-18.25918 117.52806,-18.14418 117.75745,-18.33313 117.75884,-17.94224 118.03136,-17.94456 118.12297,-18.19178 118.02432,-17.95311 118.47544,-17.76984 118.73385,-17.76927 119.37564,-18.28274 119.02555,-18.52755 118.78621,-19.29519 117.89941,-19.45106 117.923,-19.42046 117.79594,-19.64985 117.56782,-19.83308 117.60437,-19.81345 117.40549,-20.04406 117.4473,-20.00653 117.32734,-20.17482 117.11418,-20.17174 116.82879,-20.18318 116.77124,-20.28148 116.51029,-20.3802 116.44901,-20.46582 116.22388,-20.54759 116.24885,-20.62872 116.08795,-20.64536 115.83697,-20.80621 115.82221,-20.83066 115.76379,-20.73943 115.6752,-20.67802 115.49951,-20.70172 115.42688,-20.8327 115.3488,-20.98762 115.3552,-21.26064 115.29808,-21.36662 115.12031,-21.43316 114.96601,-21.50692 114.82554,-21.59471 114.83495,-21.61723 114.74748,-21.69018 114.72893,-21.73757 114.60402,-21.77852 114.48661,-21.71826 114.3609,-21.80485 114.34848,-21.84788 114.27399,-21.72959 114.19503,-21.76624 114.12814,-21.83491 114.03408,-21.90487 113.96499,-22.1734 113.85059,-22.31184 113.80909,-22.58504 113.66457

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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# APPENDIX D OIL SPILL PREPAREDNESS AND RESPONSE STRATEGY SELECTION AND EVALUATION

# Oil Spill Preparedness and Response Mitigation Assessment for Okha Floating Production Storage and Offloading Facility Operations Environment Plan

Security & Emergency Management

Hydrocarbon Spill Preparedness Unit

October 2019

Revision: C; Final Submission

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# EXECUTIVE SUMMARY

Woodside Energy Ltd (Woodside) has developed its oil spill preparedness and response position for the Okha FPSO Facility Operations, hereafter known as the Petroleum Activities Program (PAP).

This document demonstrates that the risks and impacts from an unplanned hydrocarbon release, and the associated response operations, are controlled to As Low As Reasonably Practicable (ALARP) and Acceptable levels. It achieves this by evaluating response options to address the potential environmental impacts resulting from an unplanned loss of hydrocarbon containment associated with the PAP described in the Environment Plan (EP). This document then outlines Woodside's decisions and techniques for responding to a hydrocarbon release event and the process for determining its level of hydrocarbon spill preparedness.

A summary of the key facts and references to additional detail within this document are presented below.

**Table 0-1: Summary of the key details for assessment**

| Key details of assessment | Summary | Reference to additional detail |
|---|---|---|
| Worst Case Credible Scenarios (WCCS) | **Scenario MEE-01: Hydrocarbon release caused by a well loss of containment**<br>Subsea release of 185,915 $m^3$ over 77 days of Cossack Light Crude from Lambert well LH3 (19° 26' 58.47" S, 116° 29' 16.23" E). 15.3% residual component of 28,445 $m^3$ | Section 1.1 |
| | **Scenario MEE-03: Hydrocarbon release due to a support vessel tank rupture**<br>Instantaneous surface release of 105 $m^3$ marine diesel from a support vessel at Site 3 (19° 35' 21.00" S, 116° 26' 48.00" E). 5% residual component of 5.25 $m^3$. | |
| | **Scenario MEE-05: Hydrocarbon release caused by a vessel cargo tank rupture**<br>Surface release of 30,302 $m^3$ over 24 hours of Cossack Light Crude near Lambert well LH3 (19° 35' 21.00" S, 116° 26' 48.00" E). 15.3% residual component of 4,636 $m^3$ | |
| Hydrocarbon Properties | **Cossack Light Crude (API 48.1)**<br>Contains a moderate proportion (15.3% by mass) of hydrocarbon compounds that will not evaporate at atmospheric temperatures. The unweathered mixture has a dynamic viscosity of 1.40 cP. The pour | Section 6 of the EP |

| | | |
|---|---|---|
| | point of the whole oil (-24 °C) ensures that it will remain in a liquid state over the annual temperature range observed on the North West Shelf.<br>The mixture is composed of hydrocarbons that have a wide range of boiling points and volatilities at atmospheric temperatures, and which will begin to evaporate at different rates on exposure to the atmosphere.<br>Evaporation rates will increase with temperature, but in general about 52.2% of the oil mass should evaporate within the first 12 hours (BP < 180 °C); a further 20.5% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and a further 12.0% should evaporate over several days (265 °C < BP < 380 °C).<br>**Marine Diesel (API 37.2)**<br>In general, about 6% of the oil mass should evaporate within the first 12 hours (BP < 180 °C); a further 35% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and a further 54% should evaporate over several days (265 °C < BP < 380 °C). Approximately 5% of the oil is shown to be persistent (50 $m^3$). Under calm conditions the majority of the remaining oil on the water surface will weather at a slower rate due to being comprised of the longer-chain compounds with higher boiling points. Evaporation of the residual compounds will slow significantly, and they will then be subject to more gradual decay through biological and photochemical processes. | Appendix A of the First Strike Plan (FSP) |
| Modelling Results | **Stochastic modelling**<br>A quantitative, stochastic assessment has been undertaken for credible spill scenarios to help assess the environmental risk of a hydrocarbon spill.<br>A total of 100 replicate simulations were completed for Scenario 1 (MEE-01) over an annual period to test for trends and variations in the trajectory and weathering of the spilled oil, with an even number of replicates completed using samples of metocean data that commenced within each calendar quarter (25 simulations per quarter). For Scenario 5 (MEE-05) a total of 200 replicate simulations were run over an annual period (50 simulations per quarter). | Section 2.3 |

<table>
<tr>
<td></td>
<td>
Deterministic modelling<br>
Deterministic modelling was then undertaken for scenarios MEE-01 and MEE-05 (Table 2-1) as the worst-case credible scenarios (WCCS) to establish the following for response planning purposes:
<ul>
<li>Minimum time to commencement of oil accumulation at any shoreline receptor (at a threshold of 100 g/m²)</li>
<li>Maximum cumulative oil volume accumulated at any individual shoreline receptor (at concentrations in excess of 100 g/m²)</li>
<li>Maximum cumulative oil volume accumulated across all shoreline receptors (at concentrations in excess of 100 g/m²)</li>
</ul>
Results as follows:
<table>
<tr><th></th><th>Scenario MEE-01: Hydrocarbon release caused by a well loss of containment</th><th>Scenario MEE-05: Hydrocarbon release caused by a vessel cargo tank rupture</th></tr>
<tr><td>Minimum time to shoreline contact (above 100 g/m²)</td><td>Model 12, Q3<br>14.2 days at Barrow Island (2 m³)</td><td>Model 24, Q2<br>7.2 days (Barrow Island – 42 m³)</td></tr>
<tr><td>Largest volume ashore at any single Response Priority Area (RPA) (above 100 g/m²)</td><td>Model 3, Q2<br>65.8 m³ at Pilbara Islands – Southern Islands Group (43 days)</td><td>Model 32, Q2<br>110 m³ (Montebello Islands and Montebello Islands State Marine Park – 11.1 days)</td></tr>
<tr><td>Largest total shoreline accumulation (above 100 g/m²) across all shorelines</td><td>Model 23, Q2<br>124.9 m³ (Pilbara Islands – Southern Islands Group is first/worst receptor impacted)</td><td>Model 32, Q2<br>165.5 m³ (Montebello Islands and Montebello Islands State Marine Park)</td></tr>
</table>
</td>
<td></td>
</tr>
<tr>
<td>Net Environmental</td>
<td>Monitor and evaluate, source control via relief well drilling, source control (vessel), subsea dispersant injection, surface dispersant spraying,</td>
<td>Section 4</td>
</tr>
</table>

| | | |
|---|---|---|
| Benefit Assessment | containment and recovery, protection and deflection, shoreline cleanup, oiled wildlife response, are all identified as potentially having a net environmental benefit (dependent on the actual spill scenario) and carried forward for further assessment. | |
| ALARP evaluation of selected response techniques | The evaluation of the selected response techniques shows the proposed controls reduced the risk to an ALARP and acceptable level for the risk presented in Section 2, including the implementation of considered additional, alternative or improved control measures. | Section 6 |

# 1 INTRODUCTION

## 1.1. Overview

Woodside has developed its oil spill preparedness and response position for the Okha FPSO Facility Operations, hereafter known as the PAP. This document outlines Woodside's decisions and techniques for responding to a hydrocarbon loss of containment event and the process for determining its level of hydrocarbon spill preparedness.

## 1.2. Purpose

This document, together with the documents listed below, meet the requirements of the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Environment Regulations) relating to hydrocarbon spill response arrangements.

- The Okha FPSO Facility Operations EP
- Oil Pollution Emergency Arrangements (OPEA) (Australia)
- The Okha FPSO Facility Operations Oil Pollution Emergency Plan (OPEP) including
  - First Strike Plan (FSP)
  - Relevant Operations Plans
  - Relevant Tactical Response Plans (TRPs)
  - Relevant Supporting Plans
  - Data Directory.

The purpose of this document is to demonstrate that the risks and impacts from an unplanned hydrocarbon release and the associated response operations are controlled to ALARP and Acceptable levels.

## 1.3. Scope

This document demonstrates that the risks and impacts from an unplanned hydrocarbon release, and the associated response operations, are controlled to ALARP and Acceptable levels. It achieves this by evaluating response options to address the potential environmental risks and impacts resulting from an unplanned loss of hydrocarbon containment associated with the PAP described in the EP. This document then outlines Woodside's decisions and techniques for responding to a hydrocarbon release event and the process for determining its level of hydrocarbon spill preparedness. It should be read in conjunction with the documents listed in

Table 1-1. The location of the PAP is shown in Figure 3-1 of the EP.

## 1.4. Oil spill response document overview

The documents outlined in

Table 1-1 and Figure 1-1 are collectively used to manage the preparedness and response for a hydrocarbon release.

ANNEX A: Net Environmental Benefit Analysis detailed outcomes contains a pre-operational Net Environmental Benefit Analysis (NEBA) summary, outlining the selected response techniques for this PAP. Relevant Operational Plans to be initiated for associated response techniques are identified in the FSP and relevant forms to initiate a response are appended to the FSP.

The process to develop an Incident Action Plan (IAP) begins once the Oil Pollution FSP is underway. The IAP includes inputs from the Monitor and Evaluate operations and the operational NEBA (Section 4). Planning, coordination and resource management are initiated by the Incident Management Team (IMT). In some instances, technical specialists may be utilised to provide expert advice. The planning may also involve liaison officers from supporting government agencies.

During each operational period, field reports are continually reviewed to evaluate the effectiveness of response operations. In addition, the operational NEBA is continually reviewed and updated to ensure the response techniques implemented continue to result in a net environmental benefit (see Section 4).

The response will continue as described in Section 5 until the response termination criteria have been met.

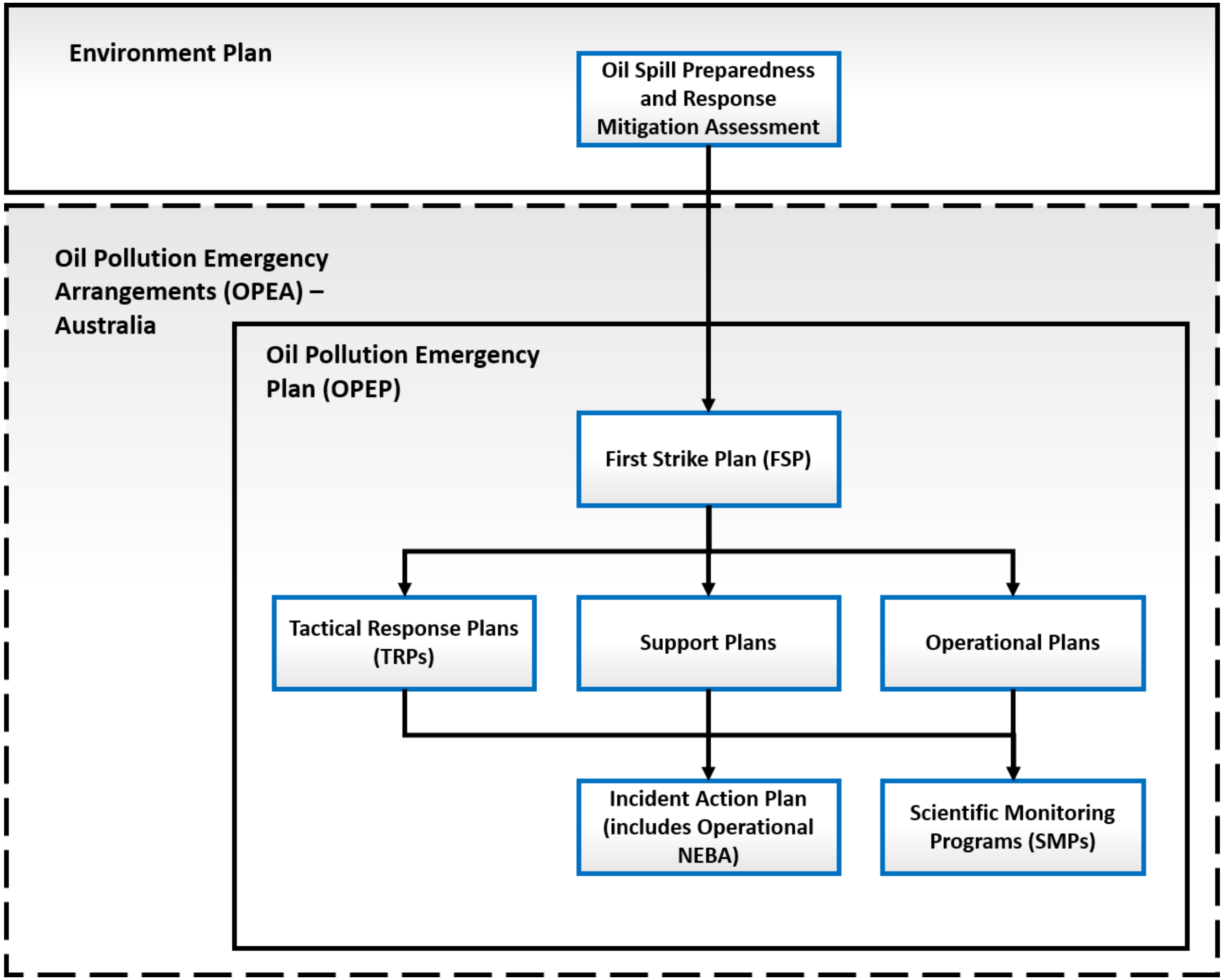


**Figure 1-1: Woodside hydrocarbon spill document structure**

**Table 1-1: Hydrocarbon Spill preparedness and response – document references**

| Document | Document overview | Stakeholders | Relevant information | Document subsections (if applicable) |
|---|---|---|---|---|
| **Okha FPSO Facility Operations EP** | Demonstrates that potential adverse impacts on the environment associated with the Okha FPSO Facility Operations (during both routine and non-routine operations) are mitigated and managed to ALARP and will be of an acceptable level. | NOPSEMA<br>Woodside internal | EP Section 6 (Identification and evaluation of environmental risks and impacts, including credible spill scenarios)<br>EP Section 7 (Implementation strategy – including emergency preparedness and response)<br>EP Section 7 (Reporting and compliance)<br>EP Section 7 (Performance outcomes, standards and measurement criteria) | |
| **Oil Pollution Emergency Arrangements (OPEA) Australia** | Describes the arrangements and processes adopted by Woodside when responding to a hydrocarbon spill from a petroleum activity. | Regulatory agencies<br>Woodside internal | All | |
| **Oil Spill Preparedness and Response Mitigation Assessment for the Okha FPSO Facility Operations (this document)** | Evaluates response options to address the potential environmental impacts resulting from an unplanned loss of hydrocarbon containment associated with the PAP described in the EP. | Regulatory agencies<br>Corporate Incident Control Centre (CICC): Control function in an ongoing spill response for activity-specific response information. | All<br>Performance outcomes, standards and measurement criteria related to hydrocarbon spill preparedness and response are included in this document. | |
| **Okha FPSO Facility Operations Oil Pollution FSP** | Facility specific document providing details and tasks required to mobilise a first strike response.<br>Primarily applied to the first 24 hours of a response until a full IAP specific to the event is developed.<br>Oil Pollution First Strike Response Plans are intended to be the first document used to provide immediate guidance to the responding IMT. | Site-based IMT for initial response, activation and notification.<br>CICC for initial response, activation and notification.<br>CICC: Control function in an ongoing spill response for activity- | Initial notifications and reporting required within the first 24 hours of a spill event.<br>Relevant spill response options that could be initiated for mobilisation in the event of a spill.<br>Recommended pre-planned tactics.<br>Details and forms for use in immediate response. Activation process for oil spill trajectory modelling, aerial surveillance and oil spill tracking buoy details. | |

| Document | Document overview | Stakeholders | Relevant information | Document subsections (if applicable) |
|---|---|---|---|---|
| | | specific response information. | | |
| **Operational Plans** | Lists the actions required to activate, mobilise and deploy personnel and resources to commence response operations.<br>Includes details on access to equipment and personnel (available immediately) and steps to mobilise additional resources depending on the nature and scale of a release.<br>Relevant operational plans will be initially selected based on the Oil Pollution FSP; additional operational plans will be activated depending on the nature and scale of the release. | CICC: Operations and Logistics functions for first strike activities.<br>CICC: Planning Function to help inform the IAP on resources available. | Locations from where resources may be mobilised.<br>How resources will be mobilised.<br>Details of where resources may be mobilised to and what facilities are required once the resources arrive.<br>Details on how to implement resources to undertake a response. | Operational Monitoring Plan<br>Source Control and Well Intervention<br>Subsea Dispersants<br>Surface Dispersants<br>Containment and Recovery<br>Protection and Deflection<br>Shoreline Clean-up<br>Oiled Wildlife<br>Scientific Monitoring |
| **Tactical Response Plans (TRPs)** | Provides options for response techniques in selected RPAs. Provides site, access and deployment information to support a response at the location. | CICC: Planning Function to help develop IAPs, and Logistics Function to assist with determining resources required. | Indicative response techniques.<br>Access requirements and/or permissions.<br>Relevant information for undertaking a response at that site.<br>Where applicable, may include equipment deployment locations and site layouts. | Mangrove Bay<br>Turquoise Bay<br>Yardie Creek<br>Ningaloo Reef - Refer to Mangrove/Turquoise bay and Yardie Creek<br>Barrow and Lowendal Islands<br>Montebello Island - Stephenson Channel Nth TRP<br>Montebello Island Champagne Bay and Chippendale channel TRP<br>Montebello Island - Claret Bay TRP<br>Montebello Island - Hermite/Delta Island Channel TRP<br>Montebello Island - Hock Bay TRP<br>Montebello Island - North and Kelvin Channel TRP |

| Document | Document overview | Stakeholders | Relevant information | Document subsections (if applicable) |
|---|---|---|---|---|
| | | | | Montebello Island - Sherry Lagoon Entrance TRP<br>Pilbara Islands - Southern Island Group<br>Shark Bay Areas 1-11<br>Exmouth Gulf<br>Muiron Islands |
| **Support Plans** | Support Plans detail Woodside's approach to resourcing and the provision of services during a hydrocarbon spill response. | CICC: Operations, Logistics and Planning functions. | Technique for mobilising and managing additional resources outside of Woodside's immediate preparedness arrangements. | Marine<br>Logistics<br>People and Global Capability Surge Labour Requirement Plan<br>Health and Safety<br>Aviation<br>IT (First Strike Response)<br>IT (Extended Response)<br>Communications (First Strike Response)<br>Communications (Extended Response)<br>Stakeholder Engagement<br>Accommodation and Catering<br>Waste Management<br>Guidance for Oil Spill Claims Management<br>(Land based)<br>Security Support Plan<br>Hydrocarbon Spill Responder Health Monitoring Guideline |

# 2 RESPONSE PLANNING PROCESS

This document details Woodside's process for identifying potential response options for the hydrocarbon release scenarios, identified in the EP. Figure 2-1 outlines the interaction between Woodside's response, planning/preparedness and selection process.

This structure has been used because it shows how the planning and preparedness activities inform a response and provides indicative guidance on what activities would be undertaken, in sequential order, if a real event were to occur. The process also evaluates alternative, additional and/or improved control measures specific to the PAP.

The Okha FPSO Facility Operations FSP then summarises the outcome of the response planning process and provides initial response guidance and a summary of ongoing response activities, if an incident were to occur.

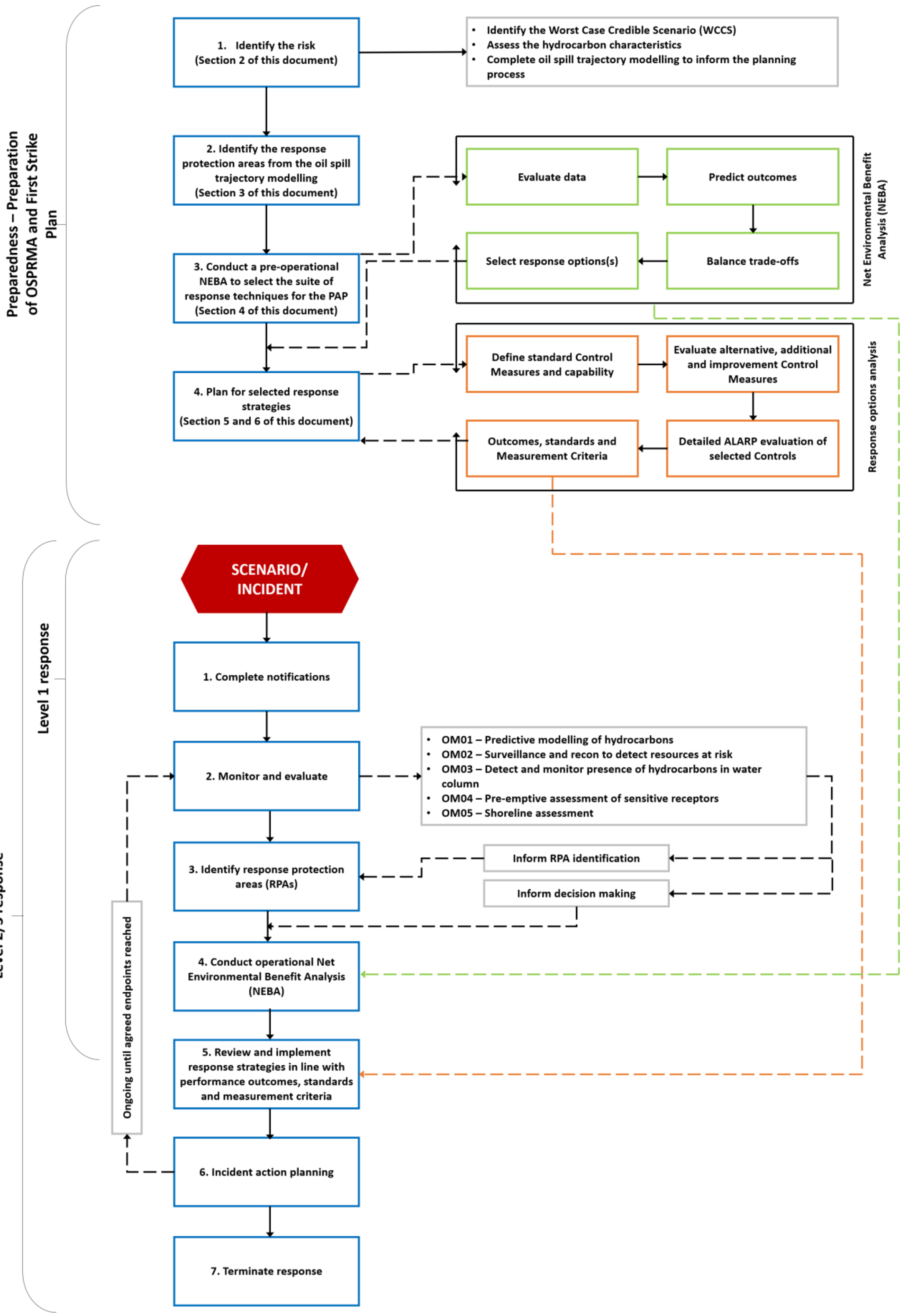


**Figure 2-1: Response planning and selection process**

## 2.1. Response planning process outline

This document is expanded below to provide additional context on the key steps in determining capability, evaluating ALARP and hydrocarbon spill response requirements.

Section 1. INTRODUCTION

Section 2. RESPONSE PLANNING PROCESS

- identification of worst-case credible scenario(s) (WCCS)
- spill modelling for WCCS

Section 3. IDENTIFY RESPONSE PROTECTION AREAS (RPAs)

- areas predicted to be contacted at concentration >100g/m$^2$.

Section 4. NET ENVIRONMENTAL BENEFIT ANALYSIS (NEBA)

- pre-operational NEBA (during planning/ALARP evaluation): this must be reviewed during the initial response to an incident to ensure its accuracy
- selected response techniques prioritised and carried forward for ALARP assessment

Section 5. HYDROCARBON SPILL ALARP PROCESS

- determines the response need based on predicted consequence parameters.
- details the environmental performance of the selected response options based on the need.
- sets the environmental performance outcomes, environmental performance standards and measurement criteria.

Section 6. ALARP EVALUATION

- evaluates alternative, additional, and improved options for each response technique to demonstrate the risk has been reduced to ALARP.
- provides a detailed ALARP assessment of selected control measure options against:
  - predicted cost associated with implementing the option
  - predicted change to environmental benefit
  - predicted effectiveness / feasibility of the control measure

Section 7. ENVIRONMENTAL RISK ASSESSMENT OF SELECTED RESPONSE TECHNIQUES

- evaluation of impacts and risks from implementing selected response options

Section 8. ALARP CONCLUSION

Section 9. ACCEPTABILITY CONCLUSION

### 2.1.1. Response Planning Assumptions – Timing, Resourcing and Effectiveness

| IMT Call-out/ Notification | Contract Activation | Response Option Mobilisation | Response Option Deployment | Response Option Effectiveness |
|---|---|---|---|---|
| This is the time taken from call-out to mobilise the IMT to the designated Incident Control Centre | This is the time taken once the IMT has been mobilised to activate specific contracts for resources (SFRT, FWADC, AMOSC, AMSA, OSRL, etc) | This is the time taken to mobilise resources from home location to laydown/staging area (expected to be airport or sea port) close to response area | This is the time taken to deploy resources from laydown/staging area (expected to be airport or sea port) to response area/field | This relates to the performance of equipment/response option as well as required personnel resourcing (Specialists/Supervisors + support personnel) |
| Approx 2-4 hours | Approx 2-4 hours | Response Technique specific | Field/Location specific | Response Strategy specific |

**Figure 2-2: Response Planning Assumptions – Timing, Resourcing and Effectiveness**

## 2.2. Environment plan risk assessment (credible spill scenarios)

Potential hydrocarbon release scenarios from the PAP have been identified during the risk assessment process (Section 6 of the EP). Further descriptions of risk, impacts and mitigation measures (which are not related to hydrocarbon preparedness and response) are provided in Section 6 of the EP. Five unplanned events or credible spill scenarios for the PAP have been selected as representative across types, sources and incident/response levels, up to and including the WCCS.

Table 2-1 presents the credible scenarios for the PAP. The WCCS for the activity is then used for response planning purposes, as all other scenarios are of a lesser scale and extent. By demonstrating capability to manage the response to the WCCS, Woodside assumes other scenarios that are smaller in nature and scale can also be managed by the same capability. Response performance measures have been defined based on a response to the WCCS.

Loss of well containment scenario (MEE-01) has been modelled and considered to determine the WCCS for response planning purposes.

The hydrocarbon release caused by a vessel cargo tank rupture (MEE-05) is considered the worst case when responding to floating hydrocarbons, given the large volume released over a short period of time. As such this scenario is used to scale the surface and shoreline response.

**Table 2-1: Petroleum Activities Program credible spill scenarios**

| MEE No.[1] | Scenario selected for planning purposes | Scenario description | Maximum credible volume released (liquid $m^3$) | Incident Level | Hydrocarbon (HC) type | Residual proportion | Residual volume (liquid $m^3$) | Key credible scenarios informing response planning |
|---|---|---|---|---|---|---|---|---|
| MEE-01 | Yes | Hydrocarbon release caused by well loss of containment after a loss of well control | 185,915 | 3 | Cossack Light Crude | 15.3% | 369 $m^3$ per day | A long-term (77-day) uncontrolled subsea release from Lambert Well LH3, representing loss of containment after a loss of well control |
| MEE-02* | No | Hydrocarbon release caused by flowline or riser rupture | 773 | 2 | Cossack Light Crude | 15.3% | 118 $m^3$ | An instantaneous subsea release (over 10 seconds) at Site 2 due to a flowline or riser rupture at the midpoint of the WC Production Line flowline |
| MEE-03* | No | Hydrocarbon release caused by support vessel tank rupture | 105 | 1 | Marine diesel | 5% | 5.25 $m^3$ | An instantaneous surface release of diesel at Site 3 due to a support vessel tank rupture |
| MEE-04* | No | Hydrocarbon release caused by offtake system failure or incident | 724 | 2 | Cossack Light Crude | 15.3% | 111 $m^3$ | An instantaneous surface at Site 3 due to an offtake system failure or incident |
| MEE-05 | Yes | Hydrocarbon release caused by vessel cargo tank rupture | 30,302 | 3 | Cossack Light Crude | 15.3% | 4,636 $m^3$ | A short-term (24-hour) uncontrolled surface release representing loss of containment after a vessel cargo tank rupture |

**These scenarios had previously been modelled for the original Okha EP (RPS, 2013) and were re-analysed at new thresholds applying contemporary receptor boundary definitions to align with the new scenarios (MEE-01 and MEE-05).*

[1] A full description of MEEs used in this document is included in EP Section 6.8.

### 2.2.1. Hydrocarbon characteristics

The hydrocarbon characteristics for the WCCS are as follows. More detailed hydrocarbon characteristics, including modelled weathering data and ecotoxicity, are included in Section 6 of the EP.

***Cossack Light Crude***

Cossack Light Crude (API 48.1) contains a moderate proportion (15.3% by mass) of hydrocarbon compounds that will not evaporate at atmospheric temperatures. These compounds will persist in the marine environment.

The unweathered mixture has a dynamic viscosity of 1.40 cP. The pour point of the whole oil (-24 °C) ensures that it will remain in a liquid state over the annual temperature range observed on the North West Shelf.

The mixture is composed of hydrocarbons that have a wide range of boiling points and volatilities at atmospheric temperatures, and which will begin to evaporate at different rates on exposure to the atmosphere. Evaporation rates will increase with temperature, but in general about 52.2% of the oil mass should evaporate within the first 12 hours (BP < 180 °C); a further 20.5% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and a further 12.0% should evaporate over several days (265 °C < BP < 380 °C).

Selective evaporation of the lower boiling-point components will lead to a shift in the physical properties of the remaining mixture, including an increase in the viscosity and pour point. Although removal of the volatile compounds through evaporation and dissolution will result in an increase in density of the remaining oil, the mixture is unlikely to solidify or sink as it weathers.

The whole oil has low asphaltene content (<0.05%), indicating a low propensity for the mixture to take up water to form water-in-oil emulsion over the weathering cycle.

Soluble aromatic hydrocarbons contribute approximately 14.5% by mass of the whole oil, with a moderate proportion (7.4%) in the C4-C10 range of hydrocarbons. These compounds will evaporate rapidly, reducing the potential for dissolution of a proportion of them into the water.

***Marine Diesel***

Marine Diesel is typically classed as an International Tanker Owners Pollution Federation (ITOPF) Group two oil. Group two oils are a mixture of volatile and persistent hydrocarbons, with approximately 40-50% by mass predicted to evaporate over the first day or two, depending upon the prevailing conditions, with further evaporation slowing over time.

Modelling shows about 6% of the oil mass should evaporate within the first 12 hours (BP < 180 °C); a further 35% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and a further 54% should evaporate over several days (265 °C < BP < 380 °C). Approximately 5% of the oil is shown to be persistent. Under these calm conditions the majority of the remaining oil on the water surface will weather at a slower rate due to being comprised of the longer-chain compounds with higher boiling points. Evaporation of the residual compounds will slow significantly, and they will then be subject to more gradual decay through biological and photochemical processes.

It is predicted that 5.25 $m^3$ of product would remain after weathering from the WCC marine diesel scenario.

## 2.3. Hydrocarbon spill modelling

Oil spill trajectory modelling (OSTM) tools are used for environmental impact assessment and during response planning to understand spatial scale and timeframes for response operations. Woodside recognises that there is a degree of uncertainty related to the use of modelling data and has subsequently utilised conservative approaches to volumes, weathering, spatial areas, timing and response effectiveness to scale capability to need.

The Oil Spill Model and Response System (OILMAP) and Integrated Oil Spill Impact Model System (SIMAP) models are both used for stochastic and deterministic trajectory modelling. They have been developed over three decades of planning, exercises, actual responses, several peer reviews, and validation studies. OILMAP was originally derived from the United States Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Type A model (French et al. 1996), for assessing marine transport, biological impact and economic damage that was also used under the United States Oil Pollution Act 1990 Natural Resource Damage Assessment (NRDA) regulations. Notable spills where the model has been used and validated against actual field observations include, Exxon Valdez (French McCay 2004), North Cape Oil Spill (French McCay 2003), along with an assessment of 20 other spills (French McCay and Rowe, 2004). In addition, test spills designed to verify fate, weathering and movement algorithms have been conducted regularly and in a range of climate conditions (French and Rines 1997; French et al. 1997; Payne et al. 2007; French McCay et al. 2007).

Further to this, the algorithms have been updated using the latest findings from the Macondo/Deepwater Horizon well blowout in the Gulf of Mexico and validated according to the Deepwater Horizon (DWH) oil spill in support of the NRDA (Spaulding et al. 2015; French McCay et al. 2015, 2016). Finally, the OILMAP and SIMAP models have been used extensively in Australia to prosecute pollution offences, predict discharge locations and likely spill volumes based on weathering and surveillance observations, and has been used as expert witness evidence in Australian court proceedings, aiding the prosecution to determine spill quantum estimates.

### 2.3.1. Stochastic modelling

Quantitative, stochastic modelling was completed for the scenarios presented in Table 2-1 to help assess the environmental consequences of a hydrocarbon spill.

A total of 100 replicate simulations were completed for scenario 1 (MEE-01) over an annual period to test for trends and variations in the trajectory and weathering of the spilled oil, with an even number of replicates completed using samples of metocean data that commenced within each calendar quarter (25 simulations per quarter). For scenario 5 (MEE-05) a total of 200 replicate simulations were run over an annual period (50 simulations per quarter). MEE-02, MEE-03 and MEE-04 had previously been modelled for the original Okha EP (RPS, 2013) and were just re-analysed at new thresholds applying contemporary receptor boundary definitions to align with the new scenarios. Further details relating to the assessments for the scenarios can be found in Section 6.8.1.2 of the EP.

#### 2.3.1.1. Environmental impact thresholds – EMBA and hydrocarbon exposure

The outputs of the stochastic spill modelling are used to assess the potential environmental impact from the credible scenarios. The stochastic modelling results are used to delineate areas of the marine and shoreline environment that could be exposed to hydrocarbon levels exceeding environmental impact threshold concentrations. The summary of all the locations where hydrocarbon thresholds could be exceeded by any of the simulations modelled is defined as Environment that May Be Affected (EMBA) and is discussed further in Section 6.8.1.2 of the EP. As the weathering of different fates of hydrocarbons (surface, entrained and dissolved) differs due to the influence of the metocean mechanism of transportation, a different EMBA is presented for each fate within the EP.

A conservative approach – adopting accepted contact thresholds for impacts on the marine environment – is used to define the EMBA. These hydrocarbon thresholds are presented in Table 2-2 below and described in Section 6.8.1.2 of the EP.

**Table 2-2: Summary of thresholds applied to the stochastic hydrocarbon spill modelling to determine EMBA and environmental impacts**

| Floating Oil Concentration (g/m$^2$) | Shoreline Oil Concentration (g/m$^2$) | Entrained Oil Concentration (ppb) | Dissolved Aromatic Hydrocarbon Concentration (ppb) |
|---|---|---|---|
| 1 | 10 | 10 | 10 |
| 10 | 100 | 100 | 50 |
| 50 | 1,000 | 500 | 400 |
| | | | 500 |

## 2.3.2. Deterministic modelling

Woodside uses deterministic modelling results to evaluate risks and impacts and response capability requirements. These results are provided in both shapefile and data table format with each row of the data table representing a 1 km$^2$ cell. This cell size has been used as it represents the approximate area that a single containment and recovery operation or surface dispersant operation (single sortie or vessel spraying) can effectively treat in one ten (10) hour day. Smaller cell sizes have been considered but would not change the response need as the potential distance between cells would not allow multiple cells to be treated per day by response operations. Additionally, a 1 km$^2$ cell is expected to allow averaging of threshold concentrations and mass across the spatial extent to represent a conservative approach (patches of oil and windrows) to response planning that simulates operational monitoring feedback in a real event.

A sample of these deterministic results from the Okha FPSO Facility Operations loss of well control is provided below as an indication of the data format and content.

- Column A and B provide the latitude and longitude of the cell
- Column C is the elapsed time since the release occurred
- Column D represents the average thickness across the cell in g/m$^2$
- Column E represents the viscosity of the hydrocarbon in centistokes (cSt) at sea surface temperature
- Column F and G represent the mass of hydrocarbon across the entire cell in kg and tonnes (rounded to nearest whole tonne) respectively.

**Table 2-3: Example deterministic modelling data**

| Latitude<br>A | Longitude<br>B | Time_hour<br>C | Conc_gm$^2$<br>D | Visc_cSt<br>E | Mass_kg<br>F | Mass_ tonnes<br>G |
|---|---|---|---|---|---|---|
| -19.449291 | 116.445009 | 6 | 2.337393 | 82.261904 | 2346.834779 | 2 |
| -19.458323 | 116.454564 | 6 | 3.904446 | 82.019348 | 3919.990957 | 4 |
| -19.449291 | 116.454564 | 6 | 10.141920 | 82.122816 | 10182.875395 | 10 |
| -19.440258 | 116.454564 | 6 | 1.559455 | 82.177729 | 1565.840662 | 2 |
| -19.458323 | 116.464119 | 6 | 8.628178 | 81.472017 | 8662.519664 | 9 |
| -19.449291 | 116.464119 | 6 | 13.686730 | 81.834673 | 13741.982430 | 14 |
| -19.467355 | 116.473674 | 6 | 1.192110 | 79.455729 | 1196.785212 | 1 |
| -19.458323 | 116.473674 | 6 | 23.075033 | 79.218639 | 23166.844726 | 23 |
| -19.449291 | 116.473674 | 6 | 2.359922 | 81.058523 | 2346.834779 | 2 |

The deterministic modelling data provides an indication of the response need by displaying the potential surface area and volume that may be treated or recovered by response operations. Existing capability is reviewed to approximate the surface area and volumes that can be treated or removed and a range of alternate, improved and additional options, to reduce risks and impacts to ALARP, are considered.

Woodside recognises that no single response technique will treat all available subsea or surface oil and that a combination of response techniques will be required for the identified scenario. Even with the significant resources available to Woodside through existing capability and third-party resources, the primary offshore response techniques of surface dispersant application and containment and recovery will only treat or recover a minor proportion (<30%) of the available surface hydrocarbons based on previous response experience.

Woodside is committed to a realistic, scalable response capability that is commensurate to the level of risk and able to be practically implemented and feasibly sustained.

#### 2.3.2.1. Response planning thresholds for surface and shoreline hydrocarbon exposure

Thresholds to determine the EMBA are used to predict and assess environmental impacts and inform the SMP, however they do not appropriately represent the thresholds at which an effective response can be implemented. Additional response thresholds are used for response planning and to determine areas where response techniques would be most effective. The deterministic modelling is then used to assess the nature and scale of a response.

In the event of an actual response, existing deterministic modelling would be reviewed for suitability and additional modelling would be conducted using real-time data and field information to inform IMT decisions.

The deterministic spill modelling outputs are presented at response planning thresholds for surface hydrocarbons for the WCCS. Surface spill concentrations are expressed as grams per square metre ($g/m^2$) (Section 1.1). The thresholds used are derived from oil spill response planning literature and industry guidance and are summarised below.

### 2.3.2.2. Surface hydrocarbon concentrations

**Table 2-4: Hydrocarbon thresholds for response planning**

| Surface hydrocarbon concentration ($g/m^2$) | Description | Bonn Agreement Oil Appearance Code | Mass per area ($g/m^2$) |
|---|---|---|---|
| >10 | Predicted minimum threshold for commencing operational monitoring[2] | Code 3 – dull metallic colours | 5 to 50 |
| 50 | Predicted minimum floating oil threshold for containment and recovery and surface dispersant application[3] | Code 4 – discontinuous true oil colour | 50 to 200 |
| 100 | Predicted optimum floating oil threshold for containment and recovery and surface dispersant application | Code 5 – continuous true oil colour | >200 |
| **Shoreline hydrocarbon concentration ($g/m^2$)** | **Description** | **National Plan Guidance on Oil Contaminated Foreshores** | **Mass per area ($g/m^2$)** |
| 100 | Predicted minimum shoreline accumulation threshold for shoreline assessment operations | Stain | >100 |
| 250 | Predicted minimum threshold for commencing shoreline clean-up operations | Level 3 – thin coating | 200 - 1000 |

The surface thickness of oil at which dispersants are typically effective is approximately 100 $g/m^2$. However, substantial variations occur in the thickness of the oil within the slick, and most fresh crude oils spread within a few hours, so that overall the average thickness is 0.1 mm (or approx. 100 $g/m^2$) (International Tanker Owners Pollution Federation [ITOPF] 2011). Additionally, the recommended rate of application for surface dispersant is typically 1-part dispersant to 20 or 25 parts of spilled oil. These figures assume a 0.1 mm slick thickness, averaged over the thickest part of the spill, to calculate a litres/hectare application rate from vessels and aircraft. In practice, this can be difficult to achieve as it is not possible to accurately assess the thickness of the floating oil.

Some degree of localised over-dosage and under-dosage is inevitable in dispersant response. An average oil layer thickness of 0.1 mm is often assumed, although the actual thickness can vary over a wide range (from less than 0.0001 mm to more than 1 mm) over short distances (International Petroleum Industry Environment Conservation Association [IPIECA] 2015).

Guidance from the Australian Maritime Safety Authority (AMSA, 2015) indicates that spreading of spills of Group II or III products will rapidly decrease slick thickness over the first 24 hours of a spill resulting in the potential requirement of up to a ten (10) fold increase in capability on day 2 to achieve the same level of performance.

Further guidance from the European Maritime Safety Authority (EMSA) states that spraying the 'metallic' looking area of an oil slick (Bonn Agreement Oil Appearance Code [BAOAC] 3, approx. 5 – 50 µm) with dispersant from spraying gear designed to treat an oil layer 0.1 mm (100 µm) thick, will inevitably cause dispersant over-treatment by a factor of 2 to 20 times (EMSA 2012).

[2] Operational monitoring will be undertaken from the outset of a spill whether or not this threshold has been reached. Monitoring is needed throughout the response to assess the nature of the spill, track its location and inform the need for any additional monitoring and/or response techniques. It also informs when the spill has entered State Waters and/or control of the incident passes to statutory authorities e.g. WA DoT or AMSA.

[3] At 50$g/m^2$, containment and recovery and surface dispersant application operations are not expected to be particularly effective. This threshold represents a conservative approach to planning response capability and containing the spread of surface oil.

Therefore, dispersant application should be concentrated on the thickest areas of an oil slick and Woodside intends on applying surface dispersants to only BAOAC 4 and 5. Spraying areas of oil designated as BAOAC Code 4 (Discontinuous true oil colour) with dispersant will, on average, deliver approximately the recommended treatment rate of dispersant.

Spraying areas of oil designated as BAOAC Code 5 with dispersant (Continuous true oil colour and more than 0.2 mm thick) will, on average, deliver approximately half the recommended treatment rate of dispersant. Repeated application of these areas of thicker oil, or increased dosage ratios, will be required to achieve the recommended treatment rate of dispersant (EMSA 2012).

Guidance from the National Oceanic and Atmospheric Administration (NOAA) in the United States is found in the document: *Characteristics of Response Techniques: A Guide for Spill Response Planning in Marine Environments 2013 (NOAA 2013).* This guide outlines advice for response planning across all common techniques, including surface dispersant spraying and containment and recovery. It states that oil thickness can vary by orders of magnitude within distinct areas of a slick, thus the actual slick thickness and oil distribution of target areas are crucial for determining response method feasibility. Further to this, ITOPF also states that in terms of oil spill response, sheen can be disregarded as it represents a negligible quantity of oil, cannot be recovered or otherwise dealt with to a significant degree by existing response techniques, and is likely to dissipate readily and naturally (ITOPF, 2014).

Figure 2-3 below from AMSA's Identification of Oil on Water – Aerial Observation and Identification Guide (AMSA, 2014) shows expected percent coverage of surface hydrocarbons as a proportion of total surface area. Wind-rows, heavy oil patches and tar balls, for example, must be considered, as they influence oil encounter rates, chemical dosages and ignition potential. Each method has different thickness thresholds for effective response.

From this information and other relevant sources (Allen and Dale, 1996, EMSA, 2012, Spence, 2018) the surface threshold of 50 g/m$^2$ was chosen as an average / equilibrium thickness (50g/m$^2$ is an average of 50% coverage of 0.1mm Bonn Agreement Code 4 – discontinuous true oil colour, or 25% coverage of 0.2mm Bonn Agreement Code 5 – continuous true oil colour which would represent small patches of thick oil or wind-rows.

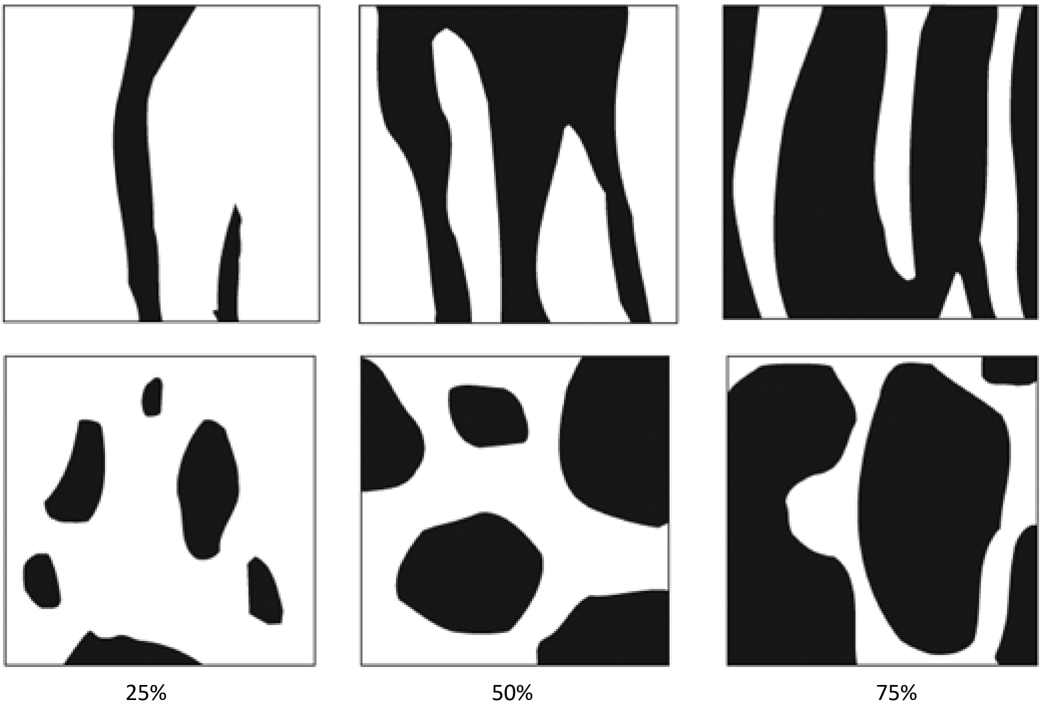


**Figure 2-3: Proportion of total area coverage (AMSA, 2014)**

Figure 2-4 illustrates the general relationships between on-water response techniques and slick thickness. Wind-rows, heavy oil patches and tar balls, for example, must be considered, as they influence oil encounter rates, chemical dosages and ignition potential. Each method has different thickness thresholds for effective response.

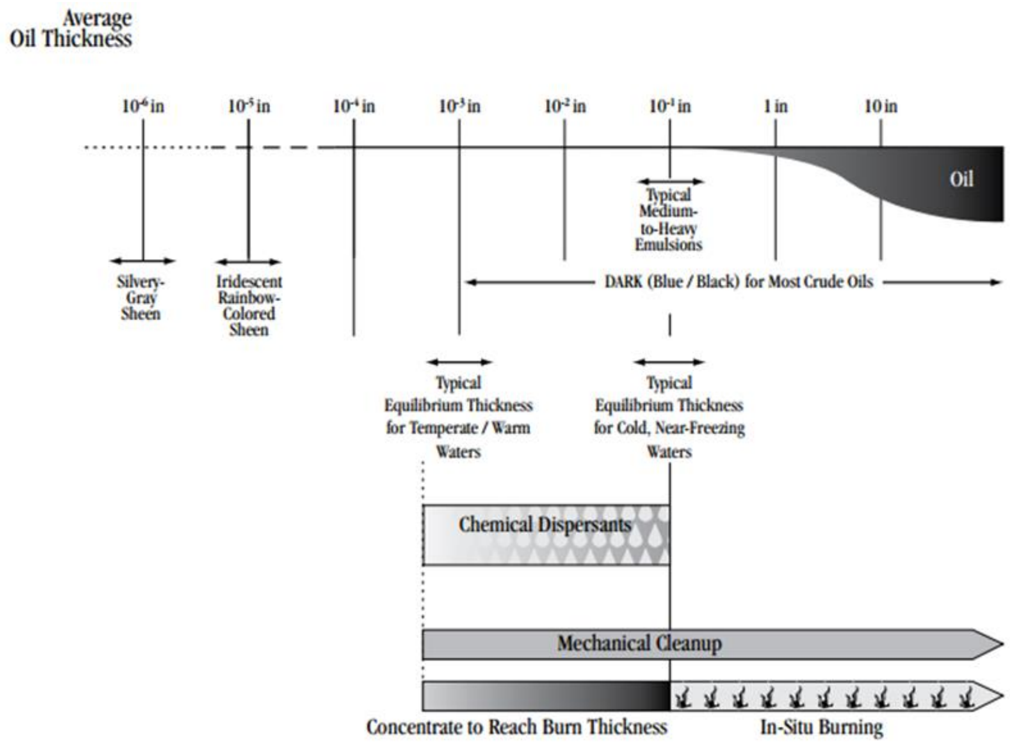


**Figure 2-4: Oil thickness versus potential response options (from Allen & Dale 1996)**

Wind and wave influences on the feasibility of response operations are also considered below:

- Dispersants: effective dispersion requires a threshold amount of surface mixing energy (typically a few knots of wind and a light chop) to be effective. At higher wind and sea conditions, dispersant evaporation and wind-drift will limit chemical dispersion application effectiveness; and, there is a point (~25 kt winds, 10 ft waves) where natural dispersion forces become greater, particularly for light oils. Because of droplet size versus slick thickness constraints and application dose-rate limitations, dispersants work best on slick thicknesses of a few thousandths (approximately 50 g/m$^2$) to hundredths of an inch (approximately 250 g/m$^2$). Improved dispersants, higher dose rates, and multiple-pass techniques may extend the thickness limitation to 2.5 mm or more.
- Mechanical clean-up: effectiveness drops significantly because of entrainment and/or splash-over as short period waves develop beyond 0.6–0.9 m in height. Waves and wind can also be limiting factors for the safe operation of vessels and aircraft.

### 2.3.2.3. Surface hydrocarbon viscosity

**Table 2-5: Surface hydrocarbon viscosity thresholds**

| Surface viscosity threshold (cSt) | Description | European Maritime Safety Authority (EMSA) | Viscosity at sea temperature (cSt) |
|---|---|---|---|
| 5,000* | Predicted optimum viscosity for surface dispersant operations | Generally possible to disperse | 500-5,000 |
| 15,000* | Predicted maximum viscosity for effective surface dispersant operations | Sometimes possible to disperse | 5,000-15,000 |

Further to the required thickness for surface dispersant application and containment and recovery to be deployed effectively as outlined above, changes to viscosity will also limit the treatment of offshore response techniques. As outlined in the EMSA Manual on the Applicability of Oil Spill Dispersants (EMSA, 2012), guidance around changes to viscosity and likely effectiveness of surface dispersant application is provided.

This includes the following statements; ”It has been known for many years that it is more difficult to disperse a high viscosity oil than a low or medium viscosity oil. Laboratory testing had shown that the effectiveness of dispersants is related to oil viscosity, being highest for modern “Concentrate, UK Type 2/3” dispersants at an oil viscosity of about 1,000 or 2,000 mPa.s (1,000 – 2,000 cSt) and then declining to a low level with an oil viscosity of 15,000 mPa.s (15,000 cSt). It was considered that some generally applicable viscosity limit, such as 2,000 or 5,000 mPa.s (2,000 – 5,000 cSt), could be applied to all oils.”

However, modern oil spill dispersants are generally effective up to an oil viscosity of 5,000 mPa.s (5,000 cSt) or more, and their performance gradually decreases with increasing viscosity; oils with a viscosity of more than 15,000 are, in most cases, no longer dispersible. Guidance from CEDRE (EMSA, 2012) also indicates that products with a range of 500-5,000 cSt at sea temperature are generally possible to disperse, while 5,000-15,000 cSt at sea temperature above pour point are sometimes possible to disperse, with products beyond 15,000 cSt at sea temperature below pour point are generally impossible to disperse.

To support decision making and response planning, a threshold of 15,000 cSt at sea temperature was chosen as a conservative estimate of maximum viscosity for surface dispersant spraying operations.

The thresholds described above are compared with the modelling results for the WCCS (The selected deterministic runs used to represent the WCCS are based on response thresholds:

- Minimum time to commencement of hydrocarbon accumulation at any shoreline receptor (at a threshold of 100 g/m2).
- Minimum time to floating hydrocarbon contact with the offshore edge(s) of any shoreline receptor polygon (at a threshold of 10 g/m2).
- Minimum time to entrained/dissolved hydrocarbon contact with the offshore edges of any receptor polygon (at a threshold of 500 ppb).
- Maximum cumulative hydrocarbon volume accumulated across all shoreline receptors.
- Maximum cumulative hydrocarbon volume accumulated at any individual shoreline receptor.

The volumes as presented in Table 2-6 are the worst case volumes resulting from the deterministic modelling and have been used to determine appropriate level of response. Scenario MEE-01 has no contact at 10 g/m2. Stochastic modelling results for marine diesel (MEE-03) showed no shoreline contact at any threshold thus deterministic modelling was not undertaken for this scenario.

Table 2-6).

### 2.3.3. Spill modelling results

The selected deterministic runs used to represent the WCCS are based on response thresholds:

- Minimum time to commencement of hydrocarbon accumulation at any shoreline receptor (at a threshold of 100 g/m$^2$).
- Minimum time to floating hydrocarbon contact with the offshore edge(s) of any shoreline receptor polygon (at a threshold of 10 g/m$^2$).
- Minimum time to entrained/dissolved hydrocarbon contact with the offshore edges of any receptor polygon (at a threshold of 500 ppb).
- Maximum cumulative hydrocarbon volume accumulated across all shoreline receptors.
- Maximum cumulative hydrocarbon volume accumulated at any individual shoreline receptor.

The volumes as presented in Table 2-6 are the worst case volumes resulting from the deterministic modelling and have been used to determine appropriate level of response. Scenario MEE-01 has no contact at 10 g/m$^2$. Stochastic modelling results for marine diesel (MEE-03) showed no shoreline contact at any threshold thus deterministic modelling was not undertaken for this scenario.

**Table 2-6: Worst case credible scenario modelling results**

| Response parameter | Modelled result | |
|---|---|---|
| | **Scenario MEE-01: Hydrocarbon release caused by a well loss of containment** | **Scenario MEE-05: Hydrocarbon release caused by a vessel cargo tank rupture** |
| Maximum continuous liquid hydrocarbon release rate and duration | Hydrocarbon release caused by a well loss of containment – subsea release of 185,915 m$^3$ over 77 days of Cossack Light Crude | Hydrocarbon release caused by a vessel cargo tank rupture – surface release of 30,302 m$^3$ over 24 hours of Cossack Light Crude. |
| Maximum residual surface hydrocarbon after weathering | 15.3% residual component – 4,636 m$^3$ of Cossack Light Crude | 15.3% residual component – 28,445 m$^3$ of Cossack Light Crude. |
| **Deterministic modelling results** | | |
| Minimum time to commencement of hydrocarbon accumulation at any shoreline receptor (at a threshold of 100 g/m$^2$) | 14.2 days at Barrow Island (2 m$^3$)<br>Model 12, Q3 | 7.2 days at Barrow Island (42 m$^3$)<br>Model 24, Q2 |
| Minimum time to floating hydrocarbon contact with the offshore edge(s) of any shoreline receptor polygon (at a threshold of 10 g/m$^2$) | No contact >10 g/m$^2$<br>(*13.6 days to contact at 1 g/m$^2$ at Pilbara Islands – Southern Islands Group*)<br>Model 11, Q2 | 7.7 days at Montebello State Marine Park<br>Model 2, Q2 |
| Maximum cumulative hydrocarbon volume accumulated across all shoreline receptors contacted by accumulated hydrocarbons (including those contacted at <100 g/m$^2$ accumulation concentration) | 124.9 m$^3$<br>(Pilbara Islands – Southern Islands Group is first/worst receptor impacted)<br>Model 23, Q2 | 165.5 m$^3$<br>(Montebello Islands and Montebello Islands State Marine Park is first/worst receptor impacted)<br>Model 32, Q2 |
| Maximum cumulative hydrocarbon volume accumulated at any individual shoreline receptor | 65.8 m$^3$ at Pilbara Islands – Southern Islands Group (43 days)<br>Model 3, Q2 | 110 m$^3$ at Montebello Islands and Montebello Islands State Marine Park (11 days)<br>Model 32, Q2 |
| Minimum time to entrained/dissolved hydrocarbon contact with the offshore edges of any receptor polygon (at a threshold of 500 ppb) | 9.1 days at Montebello Islands (515 ppb)<br>Model 14, Q2 | 5.7 days at Montebello Islands (2,564 ppb)<br>Model 24, Q2 |

The maps below display the predicted surface concentration of oil at 50–200 g/m$^2$ (BAOAC Code 4 – discontinuous true oil colour - brown) and 200 g/m$^2$ and above (BAOAC Code 5 – continuous true oil colour - black) over the initial seven days of the two scenarios and have been chosen for planning purposes.

As shown in the figures below and from analysis of the deterministic results, modelling predicts the following:

- The subsea release results in surface concentrations below thresholds suitable for containment and recovery and surface dispersant operations during the first seven days (MEE-01, Figure 2.5).
- The surface release results in surface concentrations at thresholds suitable for containment and recovery and surface dispersant operations on Days 1 and 2 and for part of Day 3 (MEE-05, Figure 2.6).
- Spreading and weathering of the surface oil occurs rapidly due to the loss of light, volatile components.
- The maximum modelled viscosity of Cossack Light Crude for the duration of MEE-01 is 166 cSt.
- Response operations cannot be implemented if the safety of response personnel cannot be guaranteed. Safety circumstances that limit the execution of this control measure include volatile concentrations of hydrocarbons in the atmosphere, high winds (>20 knots), waves and/or sea states (>1.5m waves) and high ambient temperatures.

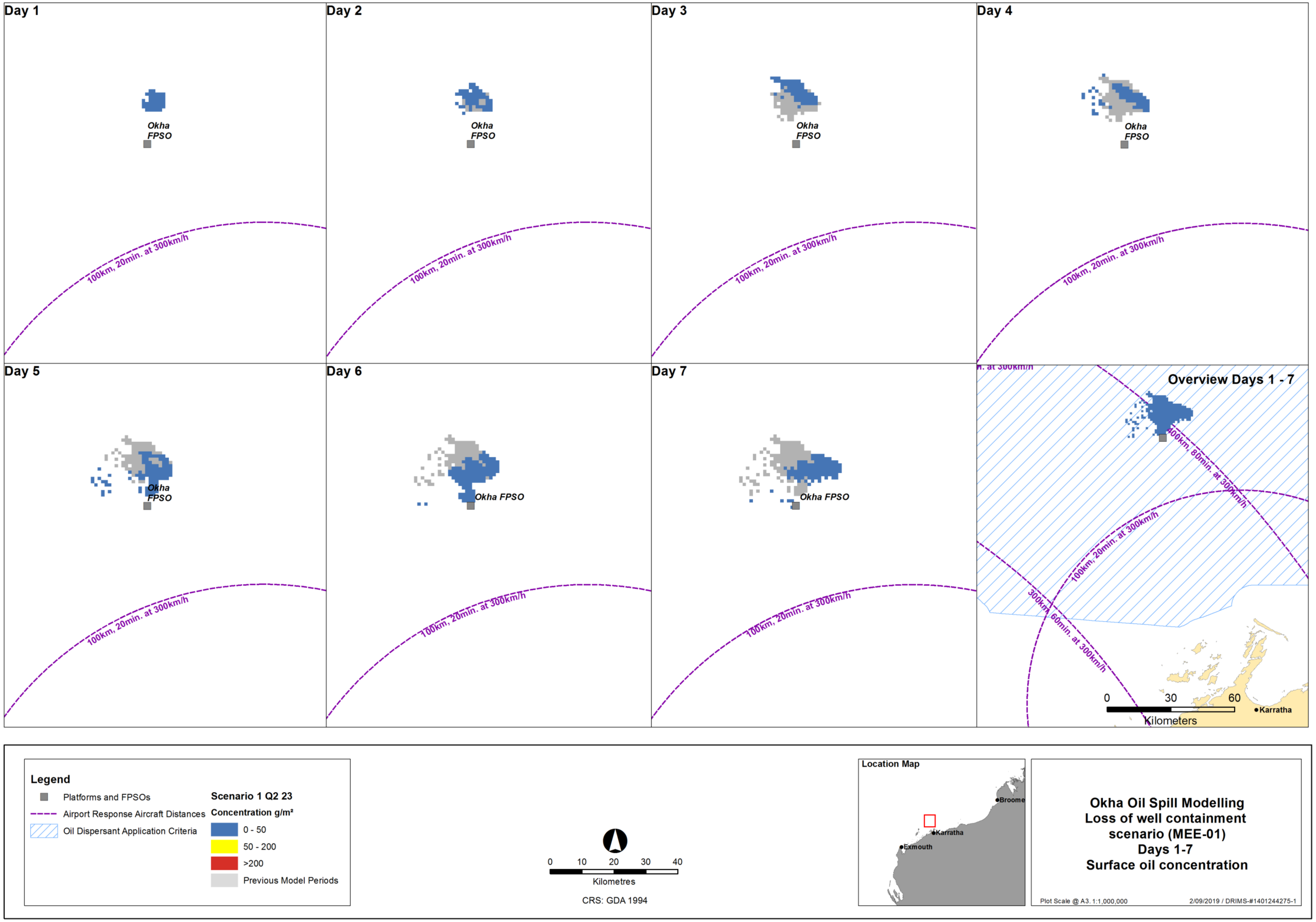


**Figure 2-5: Okha FPSO Facility Operations loss of well containment (MEE-01) – Day 1-7 – Surface oil concentration**

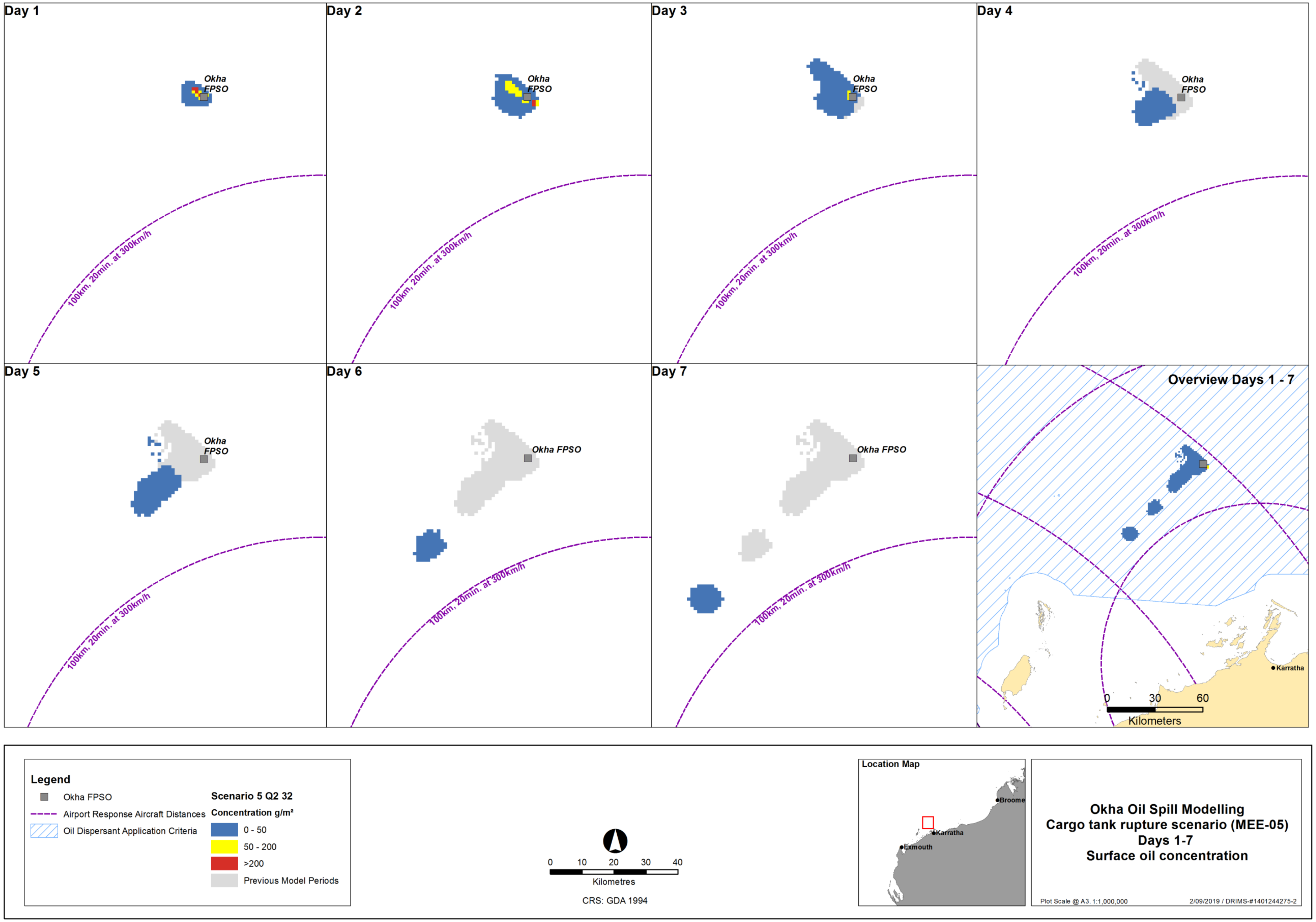


**Figure 2-6: Okha FPSO Facility Operations vessel cargo tank rupture (MEE-05) – Day 1-7 – Surface oil concentration**

# 3 IDENTIFY RESPONSE PROTECTION AREAS

In a response, operational monitoring programs – including trajectory modelling and vessel/aerial observations – would be used to predict RPAs that may be impacted. For the purposes of planning and appropriately scaling a response, modelling has been used to identify RPAs as outlined below in Figure 3-1.

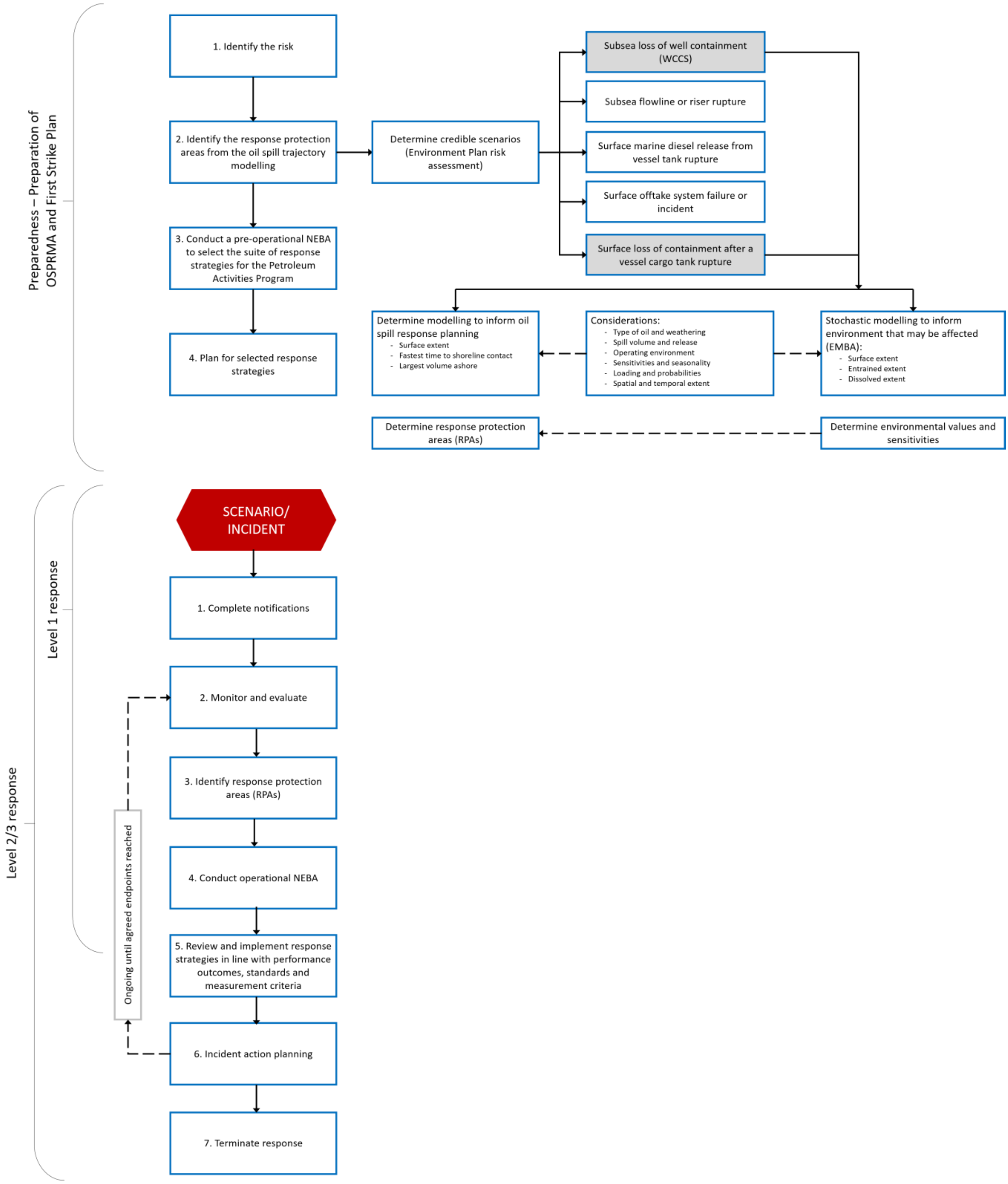


**Figure 3-1: Identify Response Protection Areas (RPAs) flowchart**

## 3.1. Identified sensitive receptor locations

Section 4 of the EP includes the list of sensitive receptor locations that have been identified by stochastic modelling as meeting the requirements outlined below:

- receptors with the potential to incur surface, entrained or shoreline accumulation contact above environmental impact thresholds
- receptors within the EMBA which meet the following:
  - a number of priority protection criteria/categories
  - International Union for Conservation of Nature (IUCN) marine protected area categories
  - high conservation value habitat and species
  - important socio-economic/heritage value.

## 3.2. Response Protection Areas (RPAs)

RPAs have been selected on the basis of their environmental ecological, social, economic, cultural and heritage values and sensitivities and the ability to conduct a response based on the minimum response thresholds (Section 2.3.2.1). It is important to note that the figures outlined in Table 3-1 are the combined results of the individual worst-case runs and do not indicate a single WCCS (where the timings and volumes are all expected from one release).

From the identified sensitive receptors described in Section 4 of the EP, only those which a shoreline response could feasibly be conducted (accumulation >100 g/m$^2$ for shoreline assessment and/or contact with surface slicks >10 g/m$^2$ for operational monitoring[4]) have been selected for response planning purposes. While not discounting other sensitivities, these RPAs have been used as the basis for demonstrating the capability to respond to the nature and scale of a spill from the WCCS and prioritising response techniques.

Table 3-1 outlines locations which were identified from the modelling runs for the WCCS but does not constitute the full list of RPAs potentially contacted from stochastic modelling (as per EMBA definition) (see Section 4 of the EP). Other RPA outliers were identified from the modelling and have been included in the assessment of capability in Sections 5 and 6.

Additional sensitive receptors are presented the existing environment description (Section 4 of the EP) and impact assessment section (Section 6 of the EP) for each respective spill scenario. The pre-operational NEBA (Section 4) considers the results from the stochastic modelling to ensure all feasible response techniques are considered in the planning phase, therefore additional receptors are also included in the pre-operational NEBA/.

The RPAs identified in Table 3-1 are used to plan for the nature and scale of a shoreline response.

[4] Operational monitoring will be undertaken from the outset of a spill whether or not this threshold has been reached. Monitoring is needed throughout the response to assess the nature of the spill, track its location and inform the need for any additional monitoring and/or response techniques. It also informs when the spill has entered State Waters and/or control of the incident passes to statutory authorities e.g. WA DoT or AMSA.

**Table 3-1: Response Protection Areas (RPAs) from deterministic modelling**

| Areas of coastline contacted | Conservation status | IUCN protection category | Minimum time to shoreline contact (above 100g/m$^2$) in days [5] | Maximum shoreline accumulation (above 100g/m$^2$) in m$^3$ [6] | Minimum time to shoreline contact (above 100g/m$^2$) in days | Maximum shoreline accumulation (above 100g/m$^2$) in m$^3$ |
|---|---|---|---|---|---|---|
| | | | Scenario 1 (MEE-01) – Model 23, Q2 | | Scenario 5 (MEE-05) – Model 32, Q2 | |
| Ningaloo Coast North and World Heritage Area | State Marine Park<br>Australian Marine Park<br>World Heritage Area | IUCN IV – Recreational Use Zone (AMP)<br>IUCN II – Marine National Park Zone | 75 days (20 m$^3$) | 30 m$^3$ (day 77) | 40 days (0.3 m$^3$) | 1.1 m$^3$ (day 44) |
| Montebello Islands and State Marine Park | State Marine Park Australian Marine Park | IUCN IA – Strict Nature Reserve<br>IUCN VI – Multiple Use Zone<br>IUCN II and IV – Recreational Use Zone<br>IUCN II – Marine National Park Zone | No contact | No contact | 11 days (71 m$^3$) | 113 m$^3$ (day 14) |
| Barrow Island | Barrow Island Marine Park<br>Barrow Island Marine Management Area | IUCN IA – Strict Nature Reserve<br>IUCN VI – Multiple Use Zone<br>IUCN IV – Recreational Use Zone | No contact | No contact | 12 days (4 m$^3$) | 63 m$^3$ (day 15) |
| Lowendal Islands | State Marine Park | IUCN VI – Multiple Use Zone | No contact | No contact | 12 days (1 m$^3$) | 3 m$^3$ (day 16) |
| Pilbara Islands – Southern Islands Group | State Marine Park<br>Australian Marine Park | IUCN IV – Recreational Use Zone (AMP)<br>IUCN II – Marine National Park Zone | 76 days (1.4 m$^3$) | 66 m$^3$ (day 84) | 19 days (0.7 m$^3$) | 36 m$^3$ (day 40) |

[5] This volume and time represent the first time to contact on defined shoreline polygon and the maximum volume ashore for that 24 hour period.
[6] This volume and time represent the maximum volume ashore on defined shoreline polygon for any 24 hour time period

| Areas of coastline contacted | Conservation status | IUCN protection category | Minimum time to shoreline contact (above 100g/m$^2$) in days (5) | Maximum shoreline accumulation (above 100g/m$^2$) in m$^3$ (6) | Minimum time to shoreline contact (above 100g/m$^2$) in days | Maximum shoreline accumulation (above 100g/m$^2$) in m$^3$ |
|---|---|---|---|---|---|---|
| | | | Scenario 1 (MEE-01) – Model 23, Q2 | | Scenario 5 (MEE-05) – Model 32, Q2 | |
| Shark Bay World Heritage Area | State Marine Park<br>Australian Marine Park<br>World Heritage Area | N/A | 99 days (0.2 m$^3$) | 0.2 m$^3$ (99 days) | No contact | No contact |
| Exmouth Gulf West | N/A | N/A | 83 days (0.08 m$^3$) | 0.2 m$^3$ (87 days) | No contact | No contact |
| Muiron Islands Marine Management Area and World Heritage Area | Muiron Islands Marine Management Area | IUCN IA – Strict Nature Reserve<br>IUCN VI – Multiple Use Zone | 75 days (0.3 m$^3$) | 41 m$^3$ (99 days) | 40 days (3 m$^3$) | 4 m$^3$ (day 45) |

# 4 NET ENVIRONMENTAL BENEFIT ANALYSIS (NEBA)

A Net Environmental Benefit Analysis (NEBA) is a structured process to consider which response techniques are likely to provide the greatest net environmental benefit.

The NEBA process typically involves four key steps outlined in Figure 4-1: evaluate data, predict outcomes, balance trade-offs, and select response options. These steps are followed in the planning/preparedness process and would also be followed in a response.

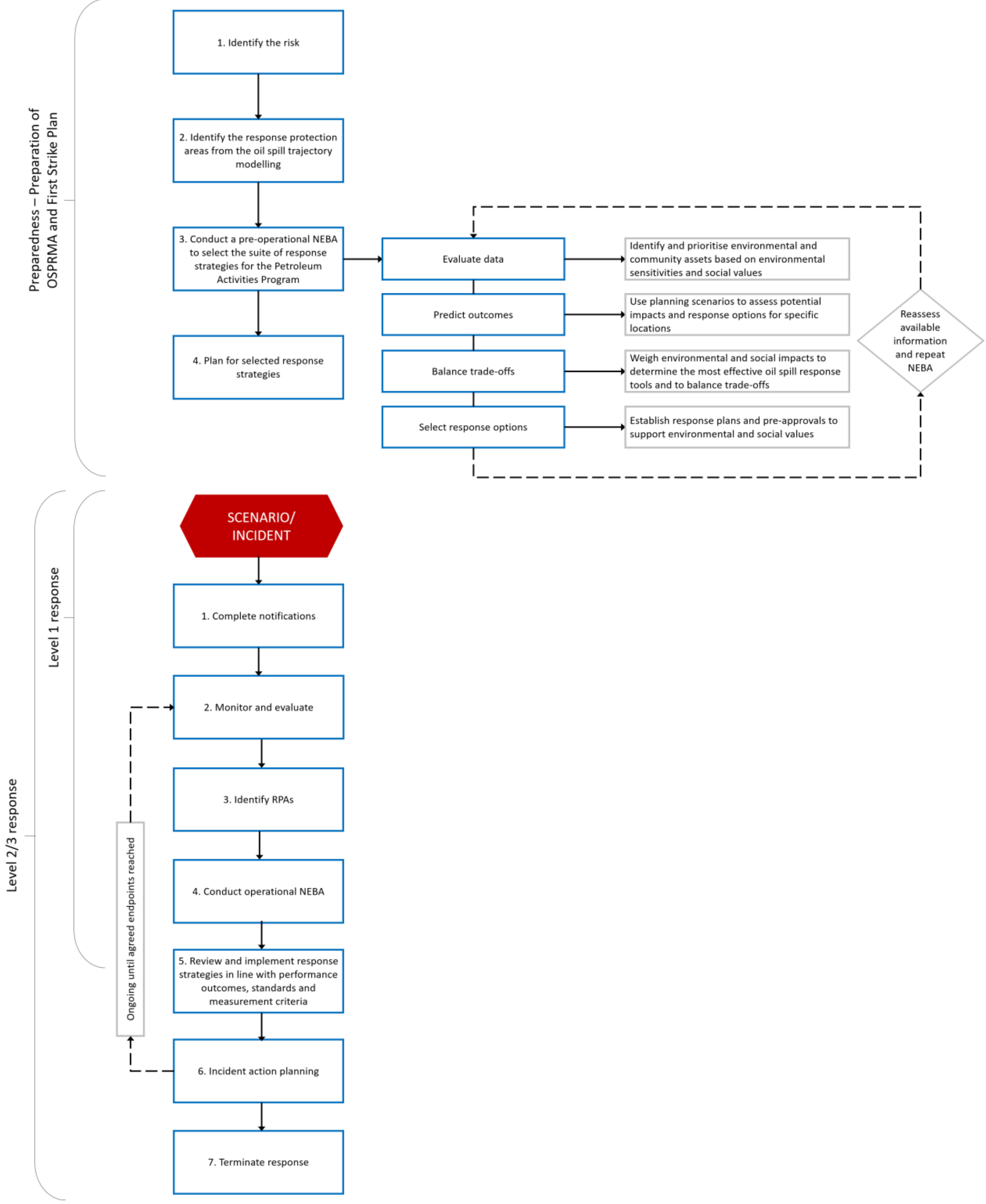


**Figure 4-1: Net Environmental Benefit Analysis (NEBA) flowchart**

## 4.1. Pre-operational / Strategic NEBA

The pre-operational NEBA identifies positive and negative impacts to sensitive receptors from implementing the response techniques. Feasibility is considered by assessing the receptors potentially impacted above response thresholds (Section 2.3.2.1) and the surface concentrations (Section 2.3.2.2) from the deterministic modelling.

Completing a pre-operational NEBA is a key response planning control that reduces the environmental risks and impacts of implementing the selected response techniques. Comprehensive details of the pre-operational NEBA for this PAP are contained in ANNEX A: Net Environmental Benefit Analysis detailed outcomes.

## 4.2. Stage 1: Evaluate data

Woodside identifies and prioritises environmental and community assets based on environmental sensitivities and social values, informed through the use of trajectory modelling. Interpretation of stochastic oil spill modelling determines the EMBA for the release, which defines the spatial area that may be potentially impacted by the PAP activities.

### 4.2.1. Define the scenario(s)

Woodside uses scenarios identified from the risk assessment in the EP to assess potential impacts and response options for specific locations. The WCCS is then selected for deterministic modelling and is used for this pre-operational NEBA outlier locations with potential environmental impacts, selected from the stochastic modelling may also be included for assessment. The worst-case diesel scenario is also included to meet regulatory requirements.  Response thresholds and deterministic modelling are then used to assess the feasibility/effectiveness and scale of the response.

**Table 4-1: Scenario summary information (WCCS)**

| **Scenario summary information (WCCS – MEE-001)** | |
|---|---|
| **Scenario** | Subsurface release after a loss of well control |
| **Location** | Lat: 19° 29' 58.47" S<br>Long: 116° 29' 16.23" E |
| **Oil Type** | Cossack Light Crude |
| **Fate and Weathering** | 52.2% of the oil mass should evaporate within the first 12 hours (BP < 180 °C)<br>20.5% should evaporate within the first 24 hours (180 °C < BP < 265 °C)<br>12.0% should evaporate over several days (265 °C < BP < 380 °C) |
| **Volume and duration of release** | 185,945 $m^3$ over 77 days |
| **Scenario summary information (WCCS – MEE-003)** | |
| **Scenario** | Surface release due to a support vessel tank rupture |
| **Location** | Lat: 19° 35' 21.00" S<br>Long: 116° 26' 48.00" E |
| **Oil Type** | Marine diesel |
| **Fate and Weathering** | 6% of the oil mass should evaporate within the first 12 hours (BP < 180 °C);<br>35% should evaporate within the first 24 hours (180 °C < BP < 265 °C);<br>54% should evaporate over several days (265 °C < BP < 380 °C). |
| **Volume and duration of release** | 105 $m^3$ – instantaneous |
| **Scenario summary information (WCCS – MEE-005)** | |
| **Scenario** | Surface release after a rupture of a vessel cargo tank |
| **Location** | Lat: 19° 35' 21.00" S<br>Long: 116° 26' 48.00" E |
| **Oil Type** | Cossack Light Crude |
| **Fate and Weathering** | 52.2% of the oil mass should evaporate within the first 12 hours (BP < 180 °C)<br>20.5% should evaporate within the first 24 hours (180 °C < BP < 265 °C)<br>12.0% should evaporate over several days (265 °C < BP < 380 °C) |
| **Volume and duration of release** | 30,302 $m^3$ over 24 hours |

#### 4.2.1.1. Hydrocarbon characteristics

***Cossack Light Crude (MEE-01 and MEE-05)***

Cossack Light Crude (API 48.1) contains a moderate proportion (15.3% by mass) of hydrocarbon compounds that will not evaporate at atmospheric temperatures. These compounds will persist in the marine environment.

Selective evaporation of the lower boiling-point components will lead to a shift in the physical properties of the remaining mixture, including an increase in the viscosity and pour point.

***Subsea release (MEE-01)***

The results of the OILMAP simulation predict that the discharge will generate a cone of rising gas that will entrain the oil droplets and ambient sea water up to the water surface. The mixed plume is initially forecast to jet towards the water surface with a vertical velocity of around 3 m/s, gradually slowing and increasing in plume diameter as more ambient water is entrained. The diameter of the central cone of rising water and oil at the point of surfacing is predicted to be approximately 16 m.

The discharge velocity and turbulence generated by the expanding gas plume is predicted to generate oil droplets 840-3,040 µm in diameter. The droplet size calculation was based on a modified form of the OILMAP droplet algorithm that considers the influence of reservoir pressure. These droplets will be subject to mixing due to turbulence generated by the lateral displacement of the rising plume, as well as vertical mixing induced by wind and breaking waves. With reasonable buoyancy relative to other mixing processes, the droplets are likely to form floating slicks under calm wind conditions.

The ongoing nature of the release combined with the potential for the plume to breach the water surface may present other hazards, including conditions that may lead to high local concentrations of atmospheric volatiles. These issues should be considered when evaluating the practicality of response operations at or near the blowout site. The results suggest that beyond the immediate vicinity of the blowout the majority of the released hydrocarbons will be present in the upper layers of the ocean, with the potential for oil to form floating slicks under sufficiently calm local wind conditions.

***Diesel***

Marine Diesel Oil is typically classed as an ITOPF Group I/II oil. It is a mixture of volatile and persistent hydrocarbons with low proportions of highly volatile and residual components.

Stochastic modelling results showed no shoreline contact at any threshold thus deterministic modelling was not undertaken. The response techniques that would be considered are monitor and evaluate, source control on the vessel (if feasible) and oiled wildlife response, if required.

**Table 4-2: Oil fate, behaviour and impacts**

| **Deterministic modelling results** | | |
|---|---|---|
| | **MEE-01** | **MEE-05** |
| **Surface area of hydrocarbons (>50g/m$^2$ and <15,000cSt)** | Surface hydrocarbons above threshold (>50 g/m$^2$ and <15,000 cSt) are predicted to be:<br>• 3 km$^2$ (197 m$^3$) at Week 2<br>• Drop off to 0 km$^2$ (0 m$^3$) at Week 3<br>• 5 km$^2$ (347 m$^3$) by Week 4<br>• 15 km$^2$ (900 m$^3$) during Month 2<br><br>Surface hydrocarbons return to 0 km$^2$ (0 m$^3$) thereafter. | Surface hydrocarbons above threshold (>50 g/m$^2$ and <15,000 cSt) are predicted to be:<br>• 9 km$^2$ (2,251 m$^3$) on Day 1<br>• 15 km$^2$ (1,633 m$^3$) on Day 2<br><br>Surface hydrocarbons return to 0 km$^2$ (0 m$^3$) on Day 3. |
| **Minimum time to shoreline contact (above 100 g/m$^2$)** | 14 days (Barrow Island – 2 m$^3$) | 7 days (Barrow Island – 42 m$^3$) |
| **Largest volume ashore at any single RPA (above 100g/m$^2$)** | 66 m$^3$ (Pilbara Islands – Southern Islands Group – 84 days) | 110 m$^3$ (Montebello Islands and Montebello Islands State Marine Park – 11 days) |
| **Largest total shoreline accumulation (above 100g/m$^2$)** | 125 m$^3$ (Pilbara Islands – Southern Islands Group) | 165 m$^3$ (Montebello Islands and Montebello Islands State Marine Park) |

| **Response Protection Areas (RPAs)** | | | | |
|---|---|---|---|---|
| | **MEE-01 (Model 23, Q2)** | | **MEE-05 (Model 32, Q2)** | |
| | **Minimum time to shoreline contact (above 100g/m$^2$) in days** | **Maximum shoreline accumulation (above 100g/m$^2$) in m$^3$** | **Minimum time to shoreline contact (above 100g/m$^2$) in days** | **Maximum shoreline accumulation (above 100g/m$^2$) in m$^3$** |
| Ningaloo Coast North and WHA | 75 days (20 m$^3$) | 30 m$^3$ (day 77) | 40 days (0.3 m$^3$) | 1.1 m$^3$ (day 44) |
| Montebello Islands and State Marine Park | No contact | No contact | 11 days (71 m$^3$) | 113 m$^3$ (day 14) |
| Barrow Island | No contact | No contact | 12 days (4 m$^3$) | 63 m$^3$ (day 15) |
| Lowendal Islands | No contact | No contact | 12 days (1 m$^3$) | 3 m$^3$ (day 16) |
| Pilbara Islands – Southern Islands Group | 76 days (1.4 m$^3$) | 66 m$^3$ (day 84) | 19 days (0.7 m$^3$) | 36 m$^3$ (day 40) |
| Shark Bay WHA | 99 days (0.2 m$^3$) | 0.2 m$^3$ (99 days) | No contact | No contact |
| Exmouth Gulf West | 83 days (0.08 m$^3$) | 0.2 m$^3$ (87 days) | No contact | No contact |
| Muiron Islands and MMA-WHA | 75 days (0.3 m$^3$) | 41 m$^3$ (99 days) | 40 days (3 m$^3$) | 4 m$^3$ (day 45) |

### 4.2.2. Determining potential response options

The available response techniques based on current technology can be summarised under the following headings:

- Monitor and evaluate (including operational monitoring)
- Source control
  - Remotely operated vehicle (ROV) intervention
  - debris clearance and/or removal
  - capping stack
  - relief well drilling
- Source control on the vessel
- Subsea dispersant injection
- Surface dispersant application:
  - aerial dispersant application
  - vessel dispersant application
- Mechanical dispersion
- In-situ burning
- Containment and recovery
- Shoreline protection and deflection:
  - protection
  - deflection
- Shoreline clean-up:
  - Phase 1 – Mechanical clean-up
  - Phase 2 – Manual clean-up
  - Phase 3 – Final polishing
- Oiled wildlife response

Support functions may include:

- Waste management
- Post spill monitoring/scientific monitoring

An assessment of which response options are feasible for the scenarios is included below in Table 4-3, Table 4-4 and Table 4-5. These options are evaluated against each scenario's parameters including oil type, volume and characteristics, prevailing weather conditions, logistical support, and resource availability to determine their deployment feasibility.

A shortlist of the feasible response options is then carried forward for the ALARP assessment with a justification for the exclusion of other response techniques included in Section 4.2.3. This assessment will typically result in a range of available options, that are deployed at different areas (at-source, offshore, nearshore and onshore) and times through the response. The NEBA process assists in prioritising which options to use where and when and timings throughout the response.

**Table 4-3: Response technique evaluation – Subsea Release (MEE-01)**

| Response Technique | Effectiveness | Feasibility | Decision | Rationale for the decision |
|---|---|---|---|---|
| **Hydrocarbon: Cossack Light Crude** | | | | |
| **Monitor and evaluate** | Will be effective in tracking the location of the spill, informing when it has entered State Waters, predicting potential impacts and triggering further monitoring and response techniques as required. Monitoring techniques include:<br>• OM01 Predictive modelling of hydrocarbons – used throughout spill. 'Ground-truthed' using the outputs of all other monitoring techniques.<br>• OM02 Surveillance and reconnaissance to detect hydrocarbons and resources at risk – from outset of spill.<br>• OM03 Monitoring of hydrocarbon presence, properties, behaviour and weathering in water – from outset of spill.<br>• OM04 Pre-emptive assessment of sensitive receptors at risk – triggered once OM01, OM02 and OM03 inform likely RPAs at risk.<br>• OM05 Shoreline assessment – once OM02, OM03 and OM04 inform which RPAs have been impacted. | Monitoring of a Cossack Light Crude spill is a feasible response technique and an essential element of all spill response incidents. Outputs will be used to guide decision making on the use of other monitoring/response techniques and providing required information to regulatory agencies including AMSA and WA DoT. | Yes | Monitoring the spill will be necessary to:<br>• validate trajectory and weathering models<br>• determine the behaviour of the oil in water<br>• determine the location and state of the slick<br>• provide forecasts of spill trajectory<br>• determine appropriate response techniques<br>• determine effectiveness of response techniques<br>• confirm impact pathways to receptors<br>• provide regulatory agencies with required information. |
| **Source control via Blowout Preventer (BOP) intervention using ROV and hotstab** | N/A | N/A | No | N/A – Okha's LH3 well is a production well with no blowout preventer thus intervention and/or hotstab are not feasible response techniques. |
| **Debris clearance** | Debris clearance via ROV is an effective and necessary procedure prior to installation of subsea dispersant injection system. | Debris clearance is a feasible, and widely accepted and utilised technique. | Yes | Debris clearance will be a necessary procedure prior to installation of the subsea dispersant injection system, if required. |
| **Source control via capping stack** | N/A | N/A | No | N/A – Okha LH3 well has a vertical xmas tree upon which a capping stack cannot be utilised. Furthermore, in the event of the complete removal or major damage to the production tree, debris clearance and capping activities are not considered viable as there would not be any infrastructure to land the capping on and secure it for well control operations. |
| **Source control via relief well drilling** | A subsea release of Cossack Light Crude will be over approximately 77 days. Relief well drilling will be the primary option to stop the release. | For a spill from the Okha FPSO Facility, relief well drilling will be the primary means of controlling of well containment event. Relief well drilling is a widely accepted and utilised technique. | Yes | Relief well drilling will be the primary technique employed to control a loss of well containment event.<br>The additional impacts introduced from drilling a relief well are comprehensively understood and are low in comparison to an ongoing release of hydrocarbons. Therefore, the environmental benefit for implementing relief well drilling outweighs the risk of implementing the response strategy. |
| **Subsea Dispersant Injection (SSDI)** | Application of subsea dispersant may reduce the scale and extent of hydrocarbons reaching the surface and thus reduce spill volumes contacting predicted RPAs.<br>SSDI can increase dispersed/entrained hydrocarbons which can potentially have higher toxicity to biota in shallow water than naturally dispersed hydrocarbons.<br>Entrained oil could potentially impact on sensitive shallow-water receptors e.g. corals, which may be otherwise unaffected.<br>Entrained oil plume likely to be increased resulting in greater spatial extent of entrained oil. | Predicted to be feasible for the subsea hydrocarbon release due to properties of Cossack, Wanaea, Lambert, Hermes (CWLH) crudes upon which dispersant efficacy was undertaken – testing shows it is effective up to 65% weathering.<br>Furthermore, SSDI could potentially be applied from outside the exclusion zone thus could be deployed even when there are high VOC levels at the spill source. | Yes | Potentially can treat large volumes of oil at source that could cause secondary contamination of wildlife or shorelines.<br>Enhances biodegradation of hydrocarbons in water. |
| **Surface dispersant application** | Can potentially remove hydrocarbon from the surface preventing secondary contamination of wildlife or shorelines.<br>Enhances biodegradation of hydrocarbons in water. | Appropriate surface concentration for surface dispersant application is present (50 g/m$^2$).<br>Predicted to be feasible for surfacing hydrocarbon from the subsea release due to CWLH crude properties – dispersant efficacy testing shows it is effective up to 65% weathering. | Yes | In the event that SSDI cannot be employed, surface dispersant would provide the next greatest reduction in surface hydrocarbon availability. This reduces potential impacts to shorelines and wildlife. |

| | | | | |
|---|---|---|---|---|
| | Dispersant can increase dispersed/entrained hydrocarbons which can potentially have higher toxicity to biota in shallow water than naturally dispersed hydrocarbons.<br>Entrained oil could potentially impact on sensitive shallow-water receptors e.g. corals, which may be otherwise unaffected.<br>Entrained oil plume likely to be increased resulting in greater spatial extent of entrained oil. | Safety of response personnel must be ensured before deployment. | | |
| **Mechanical Dispersion** | Mechanical dispersion involves the use of a vessel's prop wash and/or fire hose to target surface hydrocarbons to achieve dispersion into the water column. However, this strategy is of limited benefit in an open ocean environment where wind and wave action are likely to deliver similar advantages. | Although the strategy is feasible, highly volatile hydrocarbons are likely to weather, spread and evaporate quickly.<br>Volatile nature of the oil likely to lead to unsafe conditions in the vicinity of fresh hydrocarbon. | No | Given the poor effectiveness of mechanical dispersion and the associated risk of implementing the response for this activity, this strategy is unsuitable for the Okha activity. |
| **In-situ Burning** | In-situ burning is only effective where minimum slick thickness can be achieved and where calm metocean conditions can be ensured. Use of this technique would also cause an increase the release of atmospheric pollutants. | There is a limited window of opportunity in which this technique can be applied (prior to evaporation of the volatiles) which would be difficult to achieve.<br>Furthermore, this technique may be prevented from being undertaken due to personnel safety issues arising from predicted high local concentrations of atmospheric volatiles. | No | The safety concerns and the predicted low effectiveness associated with implementing an in-situ burning response outweigh the potential environmental benefit. |
| **Containment and Recovery** | Containment and recovery has an effective recovery rate of 5-10% when a hydrocarbon encounter rate of 25-50% is achieved at BAOAC 4 and 5. It has the potential to reduce the magnitude, probability, extent, contact and accumulation of hydrocarbon on shorelines receptors when suitable encounter rates can be achieved. It also has the potential to reduce the magnitude and extent of contact with submerged receptors by removing oil before further natural entraining/dissolving of hydrocarbons occurs. | Appropriate surface concentration for containment and recovery is present.<br>Predicted low effectiveness – typical expectation is less than 10% of hydrocarbon released can be contained and recovered. Deepwater Horizon/Macondo was approx. 3–5% with the largest containment and recovery operation ever conducted.<br>Meteorological conditions and sea-state must allow the deployment of booms and skimmers. Surface hydrocarbon would need to be corralled to a sufficient thickness to permit efficient recovery by skimmers.<br>Volatile nature of the hydrocarbon likely to lead to unsafe conditions near release location. | Yes | Potential to slightly reduce the magnitude, probability of, extent of, contact with and accumulation on shorelines receptors if and when appropriate encounter rates can be achieved and in conditions that are safe for response personnel. |
| **Shoreline Protection and Deflection** | Shoreline protection and deflection can be effective at preventing contamination of sensitive resources and can be used to corral oil into slicks thick enough to skim effectively. | If real-time Operational Monitoring activities (OM01, OM02 and OM03) indicate surface hydrocarbons are moving toward shorelines, pre-emptive assessments of sensitive receptors at risk (OM04) and existing TRPs will be utilised to guide shoreline protection and deflection operations, in agreement with WA DoT (for Level 2/3 spills).<br>For MEE-01, first shoreline contact is predicted from floating surface hydrocarbon on Day 14 (2 $m^3$ at Barrow Island) allowing adequate time to deploy this technique.<br>Protection strategies can be used for targeted protection of sensitive resources.<br>Access to sensitive areas may cause more negative impact than benefit. | Yes | Response Protection Areas predicted to be contacted are based on modelling outputs and thus may differ under the prevailing conditions of a real event.<br>If RPAs are deemed to be at risk, based on real-time modelling during a spill event, shoreline protection and deflection techniques will be employed to minimise hydrocarbon contact providing net environmental benefit. |
| **Shoreline Clean-up** | Shoreline clean-up is an effective means of hydrocarbon removal from contaminated shorelines. | If real-time Operational Monitoring activities (OM01, OM02 and OM03) indicate hydrocarbons will contact shorelines, pre-emptive assessments of sensitive receptors at risk (OM04), shoreline assessments (OM05) and existing TRPs will be utilised, in agreement with WA DoT (for Level 2/3 spills), to establish the extent and distribution of oiling and thus direct any shoreline clean-up operations.<br>For MEE-01, first shoreline contact is predicted from floating surface hydrocarbon on Day 14 (2 $m^3$ at Barrow Island) allowing adequate time to deploy this technique.<br>Can reduce or prevent impact on sensitive receptors in most cases.<br>Must ensure, through shoreline assessment, that sensitive sites will benefit from clean-up activities as the response itself may cause more negative impact than benefit through disturbance of habitats and species. | Yes | Response Protection Areas predicted to be contacted are based on modelling outputs and thus may differ under the prevailing conditions of a real event.<br>If RPAs are at risk, based on real-time modelling during a spill event, shoreline clean-up techniques will be deployed to expedite clean-up of the impacted sites.<br>Removal of hydrocarbons will help shorten the recovery window unless shoreline type is of a sensitive nature.<br>This technique can help prevent remobilisation of hydrocarbon and impact on shorelines. |

| | | | | |
|---|---|---|---|---|
| **Oiled Wildlife Response** | Oiled wildlife response is an effective response technique for reducing the overall impact of a spill on wildlife. This is achieved through rehabilitation of fauna already subject to contamination and also through pre-emptive capture/hazing to prevent additional fauna from being contaminated. | The level of oiled wildlife response can be scalable based on the predicted number of animals oiled.<br>Must be undertaken by qualified, trained wildlife response personnel.<br>Wildlife response typically has a very high mortality rate for seabirds and waders. | Yes | This technique may prevent impact to and/or treat oiled wildlife providing net environmental benefit. |

**Table 4-4: Response technique evaluation – Hydrocarbon release of due to a Support Vessel Tank Rupture (MEE-03)**

| Response Technique | Effectiveness | Feasibility | Decision | Rationale for the decision |
|---|---|---|---|---|
| **Hydrocarbon: Marine Diesel** | | | | |
| **Monitor and Evaluate** | Will be effective in tracking the location of the spill, predicting potential impacts and triggering further monitoring and response techniques as required. Monitoring techniques include:<br>• OM01 Predictive modelling of hydrocarbons – used throughout spill. 'Ground-truthed' using the outputs of all other monitoring techniques.<br>• OM02 Surveillance and reconnaissance to detect hydrocarbons and resources at risk – from outset of spill.<br>• OM03 Monitoring of hydrocarbon presence, properties, behaviour and weathering in water – from outset of spill.<br>• OM04 Pre-emptive assessment of sensitive receptors at risk – triggered once OM01, OM02 and OM03 inform likely RPAs at risk.<br>• OM05 Shoreline assessment – once OM02, OM03 and OM04 inform which RPAs have been impacted. | Monitoring of a Marine Diesel spill is a feasible response technique and outputs will be used to guide decision making on the use of other monitoring/response techniques and providing information to regulatory agencies including AMSA and WA DoT. Practicable techniques that could be used for this scenario include predictive modelling (OM01), surveillance and reconnaissance OM02), monitoring of hydrocarbon presence in water (OM03).<br><br>Due to the fact that modelling predicts no shoreline impacts at any threshold, pre-emptive assessment of sensitive receptors at risk (OM04) and monitoring of contaminated resources (OM05) are unlikely to be required. | **Yes** | Monitoring the spill will be necessary to:<br>• validate trajectory and weathering models<br>• determine the behaviour of the oil in water<br>• determine the location and state of the slick<br>• provide forecasts of spill trajectory<br>• determine appropriate response techniques<br>• determine effectiveness of response techniques<br>• confirm impact pathways to receptors<br>• provide regulatory agencies with required information. |
| **Source Control (vessel)** | Controlling the spill of diesel at source would be the most effective way to limit the quantity of hydrocarbon entering the marine environment. | A spill of diesel from a vessel collision will be instantaneous and source control will be limited to what the vessel or facility can achieve whilst responding to the incident. | **Yes** | Ability to stop the spill at source will be dependent upon the specific spill circumstances and whether or not it is safe for response personnel to access/isolate the source of the spill. |
| **Surface Dispersant Application** | Dispersants are not considered effective when applied on thin surface films such as marine diesel as the dispersant droplets tend to pass through the surface films without binding to the hydrocarbon. | Marine diesel is non-persistent and is prone to rapid spreading and evaporation thus the use of dispersant would be deemed an unnecessary response technique. | **No** | The application of dispersant to marine diesel is unnecessary as the diesel will rapidly evaporate and would thus unnecessarily introduce additional chemical substances to the marine environment. The additional entrainment would also increase exposure of subsea species and habitats to hydrocarbons. |
| **Containment and Recovery** | Containment and recovery has an effective recovery rate of 5-10% when a hydrocarbon encounter rate of 25-50% is achieved at BAOAC 4 and 5. | Marine diesel is non-persistent, prone to rapid spreading and evaporation, and does not tend to form emulsions thus reducing the feasibility of containment and recovery as a response technique. | **No** | Containment and recovery would be an inappropriate response technique as it requires the spilled hydrocarbon to be BAOAC 4 or 5 with a 50-100% coverage of 100 g/m$^2$ to 200 g/m$^2$ which a spill of marine diesel would not achieve.<br>In addition, most of the spilled diesel would have been subject to rapid evaporation prior to the commencement of containment and recovery operations. |
| **In-situ Burning** | In-situ burning is only effective where minimum slick thickness can be achieved. | Use of in-situ burning as a response technique for marine diesel is unfeasible as the minimum slick thickness cannot be attained due to rapid spreading and evaporation. In addition, there is a limited window of opportunity in which this technique can be applied (prior to evaporation of the volatiles) which is unlikely to be achieved. Furthermore, entering a volatile environment to undertake this technique would be unsafe for response personnel. | **No** | Diesel characteristics are not appropriate for the use of in-situ burning and would unnecessarily cause an increase the release of atmospheric pollutants. |
| **Shoreline Protection and Deflection** | Shoreline protection and deflection can be effective at preventing contamination of at-risk areas. | Use of shoreline protection and deflection for a spill of marine diesel is unlikely to provide any significant environmental benefit as the diesel will be subject to rapid spreading and evaporation prior to contact with any sensitive areas. | **No** | In addition to the rapid spreading and evaporation of the diesel, the modelling undertaken predicts that no shoreline receptors would be contacted by floating oil concentrations at any of the assessed thresholds. |

| | | | | |
|---|---|---|---|---|
| **Shoreline Clean-up** | Shoreline clean-up is an effective means of hydrocarbon removal from contaminated shorelines where coverage is at an optimum level of 250 g/m$^2$. | Modelling undertaken predicts that no shoreline receptors would be contacted by floating oil concentrations at any of the assessed thresholds. | **No** | Modelling undertaken predicts that no shoreline receptors would be contacted by floating oil concentrations at any of the assessed thresholds and a spill of marine diesel is unlikely to accumulate at concentrations appropriate for shoreline clean-up techniques. |
| **Oiled Wildlife** | Oiled wildlife response is an effective response technique for reducing the overall impact of a spill on wildlife. This is mostly achieved through hazing to prevent additional fauna from being contaminated and through rehabilitation of fauna already subject to contamination. | Due to the likely volatile atmospheric conditions surrounding a diesel spill, response options would be limited to hazing to ensure the safety of response personnel. In addition, any rehabilitation could only be undertaken by trained specialists. | **Yes** | The modelling undertaken predicts that no sensitive areas will be impacted thus it is unlikely that this technique would be required. However, in the event that fauna are at risk of contamination, oiled wildlife response will be undertaken as and where required. |

**Table 4-5: Response technique evaluation – Hydrocarbon release caused by a vessel cargo tank rupture (MEE-05)**

| Response Technique | Effectiveness | Feasibility | Decision | Rationale for the decision |
|---|---|---|---|---|
| **Hydrocarbon: Cossack Light Crude** | | | | |
| **Monitor and evaluate** | Will be effective in tracking the location of the spill, informing when it has entered State Waters, predicting potential impacts and triggering further monitoring and response techniques as required. Monitoring techniques include:<br>• OM01 Predictive modelling of hydrocarbons – used throughout spill. 'Ground-truthed' using the outputs of all other monitoring techniques.<br>• OM02 Surveillance and reconnaissance to detect hydrocarbons and resources at risk – from outset of spill.<br>• OM03 Monitoring of hydrocarbon presence, properties, behaviour and weathering in water – from outset of spill.<br>• OM04 Pre-emptive assessment of sensitive receptors at risk – triggered once OM01, OM02 and OM03 inform likely RPAs at risk.<br>• OM05 Shoreline assessment – once OM02, OM03 and OM04 inform which RPAs have been impacted. | Monitoring of a Cossack Light Crude spill is a feasible response technique and an essential element of all spill response incidents. Outputs will be used to guide decision making on the use of other monitoring/response techniques and providing required information to regulatory agencies including AMSA and WA DoT. | **Yes** | Monitoring the spill will be necessary to:<br>• validate trajectory and weathering models.<br>• determine the behaviour of the oil in water.<br>• determine the location and state of the slick.<br>• provide forecasts of spill trajectory.<br>• determine appropriate response techniques.<br>• determine effectiveness of response techniques.<br>• confirm impact pathways to receptors.<br>• provide regulatory agencies with required information. |
| **Source Control (vessel)** | Controlling a cargo tank spill at source would be the most effective way to limit the quantity of hydrocarbon entering the marine environment. | Source control will be limited to what the vessel or facility can achieve during the spill duration (24 hours) whilst simultaneously responding to the incident. | Yes | Ability to stop the spill at source will be dependent upon the specific spill circumstances and whether or not it is safe for response personnel to access/isolate the source of the spill. |
| **Surface dispersant application** | Can potentially remove hydrocarbon from the surface preventing secondary contamination of wildlife or shorelines.<br>Enhances biodegradation of hydrocarbons in water.<br>Dispersant can increase dispersed/entrained hydrocarbons which can potentially have higher toxicity to biota in shallow water than naturally dispersed hydrocarbons.<br>Entrained oil could potentially impact on sensitive shallow-water receptors e.g. corals, which may be otherwise unaffected.<br>Entrained oil plume likely to be increased resulting in greater spatial extent of entrained oil. | Appropriate surface concentration for surface dispersant application is present (50 g/m$^2$).<br>Predicted to be feasible for the surface hydrocarbon release due to CWLH crude properties – dispersant efficacy testing shows it is effective up to 65% weathering.<br>Safety of response personnel must be ensured before deployment. | Yes | Surface dispersant can provide the greatest reduction in surface hydrocarbon availability offshore. This reduces potential impacts to shorelines and wildlife. |
| **Mechanical Dispersion** | Mechanical dispersion involves the use of a vessel's prop wash and/or fire hose to target surface hydrocarbons to achieve dispersion into the water column. However, this strategy is of limited benefit in an open ocean environment where wind and wave action are likely to deliver similar advantages. | Although the strategy is feasible, highly volatile hydrocarbons are likely to weather, spread and evaporate quickly.<br>Volatile nature of the oil likely to lead to unsafe conditions in the vicinity of fresh hydrocarbon. | No | Given the poor effectiveness of mechanical dispersion and the associated risk of implementing the response for this activity, this strategy is unsuitable for the Okha activity. |
| **In-situ Burning** | In-situ burning is only effective where minimum slick thickness can be achieved and where calm metocean conditions can be ensured. Use of this technique would also cause an increase the release of atmospheric pollutants. | There is a limited window of opportunity in which this technique can be applied (prior to evaporation of the volatiles) which would be difficult to achieve.<br>Furthermore, this technique may be prevented from being undertaken due to personnel safety issues arising from predicted high local concentrations of atmospheric volatiles. | No | The safety concerns and the predicted low effectiveness associated with implementing an in-situ burning response outweigh the potential environmental benefit. |

| | | | | |
|---|---|---|---|---|
| **Containment and Recovery** | Containment and recovery has an effective recovery rate of 5-10% when a hydrocarbon encounter rate of 25-50% is achieved at BAOAC 4 and 5. It has the potential to reduce the magnitude, probability, extent, contact and accumulation of hydrocarbon on shorelines receptors. It also has the potential to reduce the magnitude and extent of contact with submerged receptors by entrained/ dissolved hydrocarbons.<br>Predicted low effectiveness – typical expectation is less than 10% of hydrocarbon released can be contained and recovered. Deepwater Horizon/Macondo was approx. 3–5% with the largest containment and recovery operation ever conducted. | Appropriate surface concentration for containment and recovery is present.<br>Meteorological conditions and sea-state must allow the safe deployment of booms and skimmers.<br>Surface hydrocarbon would need to be corralled to a sufficient thickness to permit efficient recovery by skimmers.<br>Volatile nature of the hydrocarbon likely to lead to unsafe conditions near release location. | Yes | Potential to slightly reduce the magnitude, probability of, extent of, contact with and accumulation on shorelines receptors if and when appropriate encounter rates can be achieved and in conditions that are safe for response personnel. |
| **Shoreline Protection and Deflection** | Shoreline protection and deflection can be effective at preventing contamination of sensitive resources and can be used to corral oil into slicks thick enough to skim effectively. | If real-time Operational Monitoring activities (OM01, OM02 and OM03) indicate surface hydrocarbons are moving toward shorelines, pre-emptive assessments of sensitive receptors at risk (OM04) and existing TRPs will be utilised to guide shoreline protection and deflection operations, in agreement with WA DoT (for Level 2/3 spills).<br>For MEE-05, first shoreline contact is predicted from floating surface hydrocarbon on Day 7 (42 $m^3$ at Barrow Island) allowing adequate time to deploy this technique.<br>Protection strategies can be used for targeted protection of sensitive resources.<br>Access to sensitive areas may cause more negative impact than benefit. | Yes | Response Protection Areas predicted to be contacted are based on modelling outputs and thus may differ under the prevailing conditions of a real event.<br>If RPAs are deemed to be at risk, based on real-time modelling during a spill event, shoreline protection and deflection techniques will be employed to minimise hydrocarbon contact providing net environmental benefit. |
| **Shoreline Clean-up** | Shoreline clean-up is an effective means of hydrocarbon removal from contaminated shorelines where coverage is at an optimum level of 250 g/$m^2$. | If real-time Operational Monitoring activities (OM01, OM02 and OM03) indicate hydrocarbons will contact shorelines, pre-emptive assessments of sensitive receptors at risk (OM04), shoreline assessments (OM05) and existing TRPs will be utilised, in agreement with WA DoT (for Level 2/3 spills), to establish the extent and distribution of oiling and thus direct any shoreline clean-up operations.<br>For MEE-05, first shoreline contact is predicted from floating surface hydrocarbon on Day 7 (42 $m^3$ at Barrow Island) allowing adequate time to deploy this technique.<br>Can reduce or prevent impact on sensitive receptors in most cases.<br>Must ensure, through shoreline assessment, that sensitive sites will benefit from clean-up activities as the response itself may cause more negative impact than benefit through disturbance of habitats and species. | Yes | Response Protection Areas predicted to be contacted are based on modelling outputs and thus may differ under the prevailing conditions of a real event.<br>If RPAs are at risk, based on real-time modelling during a spill event, shoreline clean-up techniques will be deployed to expedite clean-up of the impacted sites.<br>Removal of hydrocarbons will help shorten the recovery window unless shoreline type is of a sensitive nature.<br>This technique can help prevent remobilisation of hydrocarbon and impact on shorelines. |
| **Oiled Wildlife Response** | Oiled wildlife response is an effective response technique for reducing the overall impact of a spill on wildlife. This is achieved through rehabilitation of fauna already subject to contamination and also through hazing to prevent additional fauna from being contaminated. | The level of oiled wildlife response can be scalable based on the predicted number of animals oiled.<br>Must be undertaken by qualified, trained wildlife response personnel.<br>Wildlife response typically has a very high mortality rate for seabirds and waders. | Yes | This technique may prevent impact to and/or treat oiled wildlife providing net environmental benefit. |

### 4.2.3. Exclusion of response techniques

#### 4.2.3.1. Source control via Blowout Preventer (BOP) intervention using ROV and hotstab

Okha's LH3 well is a production well with no blowout preventer thus intervention and/or hotstab are not feasible response techniques.

#### 4.2.3.2. Source control via capping stack deployment

The worst-case scenario identified for the petroleum activity program is considered to be a loss of well containment from LH3 well. This well has a vertical xmas tree upon which a capping stack cannot be used. Furthermore, major damage to, or complete loss of, the xmas tree from a producing well would result in there being no infrastructure upon which to land the cap and secure it for well control operations.

Woodside does, however, maintain capability for well intervention, debris clearance and capping stack as part of expected industry practice.

#### 4.2.3.3. Mechanical dispersion

Mechanical dispersion involves the use of a vessel's prop wash and/or fire hose to target surface hydrocarbons to achieve dispersion into the water column. However, this technique is of limited benefit in an open ocean environment where wind and wave action are likely to deliver similar advantages.

#### 4.2.3.4. In-situ burning

This technique requires calm sea state conditions as is required for containment and recovery operations, which limits its feasibility on the Northwest shelf. Optimum weather conditions are <20 knot wind speed and waves <1 to 1.5 m with oil collected to a minimum 3mm thick layer. Due to the conditions in the region, it is expected that the ability to contain oil may be limited as the sea state may exceed the optimum conditions. The window of opportunity for this technique is also limited by the need for very fresh, non-weathered hydrocarbon in order to maximise burn efficiency and reduce residue thickness.

There are health and safety risks for response personnel associated with the containment and subsequent burning of hydrocarbons. It is also suggested that the residue from attempts to burn would sink, thereby posing a risk to the environment. The longer-term effects of burn residues on the marine environment are not fully understood and therefore, no assessment of the potential environmental impact can be determined.

Until further operational and environmental information becomes available, Woodside will not consider this option.

## 4.3. Stage 2: Predict outcomes

Woodside uses planning scenarios to assess potential impacts and response options for specific locations. Locations with potential environmental impacts, selected from the stochastic modelling are included for assessment. Response thresholds and deterministic modelling are then used to assess the feasibility/effectiveness of a response.

## 4.4. Stage 3: Balance trade-offs

Woodside considers environmental impacts and response effectiveness/feasibility to determine the most effective oil spill response tools and balance trade-offs, using an automated NEBA tool. The tool considers potential benefits and impacts associated with a response at sensitive receptors and then considers the effectiveness/feasibility of the response to select the response techniques carried forward to the ALARP assessment. The NEBA can be found in ANNEX A: Net Environmental Benefit Analysis detailed outcomes.

## 4.5. Stage 4: Select best response options

To select the response technique, all the other stages in the NEBA process are considered and used to establish response plans and any pre-approvals to support protection of identified environmental and social values.

The response techniques implemented may vary according to a particular spill. The hydrocarbon type released and the sensitivities of the receptors (both ecological and socio-economic) may influence the response. The pre-operational NEBA broadly evaluates each response technique and supports decisions on whether they are feasible and of net environmental benefit. Response techniques that are not feasible or beneficial are rejected at this stage and not progressed to planning.

Further risks and impacts from implementing these selected response options are outlined in Section 6.10.

**Table 4-6: Selection and prioritisation of response techniques**

| Response planning scenario | Key characteristics for response planning (times are minimum times to contact for first receptor and/or shoreline contacted above response threshold) | Feasibility of response techniques | | | | | | | | | | | | | Outline response technique |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Monitor and evaluate | Debris clearance – for subsea dispersant | Source control – capping stack | Source control on the vessel | Source control – relief well drilling | Subsea dispersant injection | Surface dispersant application | Mechanical dispersion | In-situ burning | Containment and recovery | Shoreline protection and deflection | Shoreline cleanup | Oiled wildlife response | |
| MEE-01: Hydrocarbon release caused by loss of well containment.<br>185,915 m³ of Cossack Light Crude released over 77 days (residual component of 28,445 m³) | Fastest time to shoreline accumulation >100 g/m²:<br>Barrow Island<br>14 days (2 m³)<br>Largest shoreline accumulation:<br>Pilbara Islands – Southern Islands Group<br>66 m³ (43 days) | Yes | Yes | No | N/A | Yes | Yes | Yes | No | No | Yes | Yes | Yes | Yes | Monitor and evaluate.<br>Initiate relief well drilling.<br>Initiate subsea dispersant injection.<br>Initiate surface dispersant application.<br>Consider Containment and Recovery viability and implement if NEB determined<br>Plan for shoreline protection and deflection (in liaison with WA DoT) if there is potential contact predicted.<br>Plan for shoreline monitoring and clean-up (in liaison with WA DoT) where contact predicted.<br>Plan for oiled wildlife response and implement if oiled wildlife is observed. |
| MEE-03:<br>Instantaneous surface release of 105 m³ marine diesel from a support vessel (5% residual component of 5.25 m³) | No shoreline contact predicted at any modelled threshold | Yes | N/A | N/A | Yes | N/A | N/A | No | No | No | No | No | No | Yes | Monitor and evaluate.<br>Initiate source control if feasible.<br>Plan for oiled wildlife response and implement if oiled wildlife is observed. |
| MEE-05: Hydrocarbon release caused by a vessel cargo tank rupture.<br>30,302 m³ of Cossack Light Crude released over 24 hours (residual component of 4,636 m³) | Fastest time to shoreline accumulation >100 g/m²:<br>Barrow Island<br>7 days (42 m³)<br>Largest shoreline accumulation:<br>Montebello Islands and Montebello Islands State Marine<br>110 m³ (11 days) | Yes | N/A | N/A | Yes | N/A | N/A | Yes | No | No | Yes | Yes | Yes | Yes | Monitor and evaluate.<br>Initiate source control if feasible.<br>Initiate surface dispersant application.<br>Consider Containment and Recovery viability and implement if NEB determined<br>Plan for shoreline protection and deflection (in liaison with WA DoT) if there is potential contact predicted.<br>Plan for shoreline monitoring and clean-up (in liaison with WA DoT) where contact predicted.<br>Plan for oiled wildlife response and implement if oiled wildlife is observed. |

From the NEBA undertaken on the WCCSs identified (loss of well containment – MEE-01, marine diesel from a support vessel – MEE-03 and vessel cargo tank rupture – MEE-05), the recommended response techniques are;

- Monitor and evaluate
- Source control via relief well drilling (MEE-01)
- Source control on the vessel (MEE-03 and MEE-05)
- Debris clearance for subsea dispersant injection (MEE-01)
- Subsea dispersant injection (MEE-01)

- Surface dispersant application
- Containment and recovery
- Shoreline protection and deflection at identified RPAs
- Shoreline clean-up on priority impacted coastlines.
- Oiled wildlife response

Support functions include:

- Waste management
- Scientific monitoring programs

# 5 HYDROCARBON SPILL ALARP PROCESS

Woodside's hydrocarbon spill ALARP process is aligned with guidance provided by NOPSEMA in *Guideline N-04750-GL1687* (2016) and is set out in the 'Woodside Oil Spill Preparedness and Response Mitigation Assessment (OSPRMA) Guidelines'.

From the identified response planning need and pre-operational NEBA, Woodside conducts a structured, semi-quantitative hydrocarbon spill process which has the following steps:

1. considers the Response Planning Need identified in terms of surface area ($km^2$) and available surface hydrocarbon volumes ($m^3$) against existing Woodside capability
2. considers alternative, additional, and improved options for each response technique/control measure by providing an initial and, if required, detailed evaluation of:
   - predicted cost associated with adopting the control measure
   - predicted change/environmental benefit
   - predicted effectiveness/feasibility of the control measure.
3. evaluates the risks and impacts of implementing the proposed response techniques, and any further control measures with associated environmental performance to manage these additional risks and impacts.

Woodside considers the risks and impacts from a hydrocarbon spill to have been reduced to ALARP when:

1. a structured process for identifying and considering alternative, additional, and improved options has been completed for each selected response technique
2. the analysis of alternate, additional, and improved control measures meets one of the following criteria:
   - all identified, reasonably practicable control measures have been adopted
   - no identified reasonably practicable additional, alternative and/or improved control measures would provide further overall increased proportionate environmental benefit; or
   - no reasonably practical additional, alternative, and/or improved control measures have been identified.
3. where an alternative, additional and/or improved control measure is adopted, a measurable level of environmental performance has been assigned
4. higher order impacts/ risks have received more comprehensive alternative, additional, and improved control measure evaluations and do not just compare the cost of the adopted control measures to the costs of an extreme or clearly unreasonable control measure
5. cumulative effects have been analysed when considered in combination across the whole activity.

The response technique selection is based on the risk assessment conducted in the EP. The risk assessment identifies the type of oil, volume of release, duration of release, predicted fate, weathering and the EMBA (along with other requirements such as time to impact and predicted volumes ashore). Modelling is then used to inform the NEBA and the prioritisation of suitable response options. The scale of the response techniques selected in the pre-operational NEBA is informed through the assessment of results from deterministic modelling.

For the purpose of the ALARP assessment, the following terms and definitions have been used:

- Response techniques are considered the control measures that reduce consequences from hydrocarbon spill events. The terms 'response technique' and 'control measure' are used interchangeably.

- Cost is defined as the time, effort and/or trouble taken in financial, safety, design/storage/installation, capital/lease, and/or operations/maintenance terms to adopt a control measure.
- Where the predicted change to environmental impact is compared against standard environmental values and sensitivities impacts using positive or negative criteria from the NEBA Impact Ranking Classification Guidance in ANNEX A.

## 5.1. Monitor and Evaluate (including operational monitoring)

Monitor and evaluate includes the gathering and evaluation of data to inform the oil spill response planning and operations. It includes fate and trajectory modelling, spill tracking, weather updates and field observations. This response option is deployed in some capacity for every event.

The table below provides the operations monitoring plans that support the successful execution of this response technique.

**Table 5-1: Description of supporting operational monitoring plans**

| ID | Title |
|---|---|
| OM01 | Predictive modelling of hydrocarbons to assess resources at risk |
| OM02 | Surveillance and reconnaissance to detect hydrocarbons and resources at risk |
| OM03 | Monitoring of hydrocarbon presence, properties, behaviour and weathering in water |
| OM04 | Pre-emptive assessment of sensitive receptors at risk |
| OM05 | Shoreline assessment |

Woodside maintains an *Operational Monitoring Operational Plan*. If shoreline contact is predicted, Response Protection Areas (RPAs) will be identified and assessed before contact. If shorelines are contacted, a shoreline assessment survey will be completed to guide effective shoreline clean-up operations. This plan includes the process for the IMT to mobilise resources depending on the nature and scale of the spill.

The proximity of Dampier, Karratha, Port Hedland, Exmouth and Onslow to the spill event location means that multiple logistical options are available to monitor the spill in relatively short timeframes. The primary mobilisation base for initial monitoring activities would be Dampier, however, in the event of an extended spill with potential to impact receptors further afield, monitoring activities may also be mobilised from Onslow, Port Hedland and Exmouth.

### 5.1.1. Response need based on predicted consequence parameters

The following statements identify the key parameters upon which a response need can be based:

- Operational monitoring will be undertaken from the outset of a spill. This is needed to assess the nature of the spill and track its location. The data collected from the operational monitoring will inform the need for any additional operational monitoring, deployment of response techniques and may assist post-spill scientific monitoring. It also informs when the spill has entered State Waters and control of the incident passes to WA DoT.
- The shortest timeframe that shoreline contact from floating oil is predicted is 7 days (42 $m^3$, vessel cargo tank rupture scenario – MEE-05) and 14 days (2 $m^3$, loss of well containment scenario – MEE-01).
- The time to contact for oil at concentrations of entrained hydrocarbons greater than 500 ppb at shoreline receptors is 5.7 days at Montebello Islands (2,564 ppb, vessel cargo tank rupture scenario – MEE-05) and 9.1 days at Montebello Islands (515 ppb, loss of well containment scenario – MEE-01).
- Arrangements for support organisations who provide specialist services or resources should be tested regularly.
- Plans, procedures and support documents need to be in place for Operational and Support functions. These should be reviewed and updated regularly.
- The duration of the spill may extend up to 77 days with response operations extending up to Month 4 (MEE-01) based on the predicted time to complete shoreline clean-up operations.
- The location, trajectory and fate of the spill will be verified by real-time spill tracking via modelling, direct observation and remote sensing (OM01, OM02, OM03, OM04 and OM05).

### 5.1.2. Environmental performance based on need

**Table 5-2: Environmental Performance - Monitor and Evaluate**

| **Environmental Performance Outcome** | | To gather information from multiple sources to establish an accurate common operating picture as soon as possible and predict the fate and behaviour of the spill to validate planning assumptions and adjust response plans as appropriate to the scenario. | | |
|---|---|---|---|---|
| **Control measure** | | **Performance Standard** | | **Measurement Criteria (see Section 5.12)** |
| 1 | Oil spill trajectory modelling | 1.1 | Initial modelling available within 6 hours using the Rapid Assessment Tool | 1, 3B, 3C, 4 |
| | | 1.2 | Detailed modelling available within 4 hours of APASA receiving information from Woodside | |
| | | 1.3 | Detailed modelling service available for the duration of the incident upon contract activation | |
| 2 | Tracking buoy | 2.1 | Tracking buoy located on facility/vessel and ready for deployment 24/7 | 1, 3A, 3C, 4 |
| | | 2.2 | Deploy tracking buoy from facility within 2 hours as per the first strike plan. | 1, 3A, 3B, 4 |
| | | 2.3 | Contract in place with service provider to allow data from tracking buoy to be received 24/7 and processed. | 1, 3B, 3C, 4 |
| | | 2.4 | Data received to be uploaded into Woodside COP daily to improve the accuracy of other monitor and evaluate techniques. | 1, 3B, 4 |
| 3 | Satellite imagery | 3.1 | Contract in place with 3rd party provider to enable access and analysis of satellite imagery. Imagery source/type requested on activation of service. | 1, 3C, 4 |
| | | 3.2 | 3rd party provider will confirm availability of an initial acquisition within 2 hours | 1, 3B, 3C, 4 |
| | | 3.3 | First image received with 24 hours of Woodside confirming to 3rd party provider its acceptance of the proposed acquisition plan. | 1 |
| | | 3.4 | 3rd party provider to submit report to Woodside per image. Report is to include a polygon of any possible or identified slick(s) with metadata. | 1 |
| | | 3.5 | Data received to be uploaded into Woodside COP daily to improve accuracy of other monitor and evaluate techniques. | 1, 3B, 4 |
| | | 3.6 | Satellite Imagery services available and employed during response | 1, 3C, 4 |
| 4 | Aerial surveillance | 4.1 | 2 trained aerial observers available to be deployed by day 1 from resource pool. | 1, 2, 3B, 3C, 4 |
| | | 4.2 | 1 aircraft available for 2 sorties per day, available for the duration of the response from day 1 | 1, 3C, 4 |
| | | 4.3 | Observer to compile report during flight as per first strike plan. Observers report available to the IMT within 2 hours of landing after each sortie. | 1, 2, 3B, 4 |
| | | 4.4 | Unmanned Aerial Vehicles/Systems (UAV/UASs) to support Shoreline Clean-up Assessment Technique (SCAT), containment and recovery and surface dispersal and pre-emptive assessments as contingency if required. | 1, 2 |
| 5 | Hydrocarbon detections in water | 5.1 | Activate 3rd party service provider as per first strike plan. Deploy resources within 3 days:<br>• 3 specialists in water quality monitoring<br>• 2 monitoring systems and ancillaries<br>• 1 vessel for deploying the monitoring systems with a dedicated winch, A-frame or Hiab and ancillaries to deploy the equipment. | 1, 2, 3C, 3D, 4 |
| | | 5.2 | Water monitoring services available and employed during response | 1, 3C, 4 |
| | | 5.3 | Preliminary results of water sample as per contractor's implementation plan within 7 days of receipt of samples at the accredited lab | |
| | | 5.4 | Daily fluorometry reports as per service provider's implementation plan will be provided to IMT to validate modelling and monitor presence/absence of entrained hydrocarbons. | |

| | | | | |
|---|---|---|---|---|
| | | 5.5 | Use of Autonomous Underwater Vehicles (AUVs) for hydrocarbon presence and detection may be used as a contingency if the operational SIMA confirms conventional methods are unsafe or not possible. | 1, 2, 3C, 4 |
| 6 | Pre-emptive assessment of sensitive receptors | 6.1 | Within 2 days, in agreement with WA DoT (for Level 2/3 incidents), deployment of 2 specialists from resource pool in establishing the status of sensitive receptors. | 1, 2, 3B, 3C, 4 |
| | | 6.2 | Daily reports provided to IMT on the status of the receptors to prioritise Response Protection Areas (RPAs) and maximise effective utilisation of resources. | 1, 3B, 4 |
| 7 | Shoreline assessment | 7.1 | Within 2 days, in agreement with WA DoT (for Level 2/3 incidents), deployment of 1 specialist(s) in SCAT from resource pool for each of the Response Protection Areas (RPAs) with predicted impacts. | 1, 2, 3B, 3C, 4 |
| | | 7.2 | SCAT reports provided to IMT daily detailing the assessed areas to maximise effective utilisation of resources | 1, 3B, 4 |
| | | 7.3 | Shoreline access routes with the least environmental impact identified will be selected by a specialist in SCAT operations | 1 |

The control measures and capability of Woodside and its third-party service providers are shown to support Monitor and Evaluate activities up to and including the identified WCCS. This is demonstrated by the following:

- Woodside has a documented, structured and tested capability for Monitor and Evaluate operations including internal trajectory modelling capabilities, tracking buoys located offshore and contracted aerial observation platforms with access to trained observers.
- Woodside and its third-party service providers ensure there is sufficient capability for the duration of the response.
- Woodside has assessed the existing capability available and considered potential alternative, additional and improved control measures. Where control measures have been selected and implemented, they are included in Section 6.
- The health and safety, financial, capital and operations/maintenance costs of implementing the alternative, additional or improved control measures identified and not carried forward are considered clearly disproportionate to the environmental benefit gained and/or not reasonably practicable for this PAP.
- The Monitor and Evaluate capability outlined in this section is part of the response developed to manage potential risks and impacts associated with the scenarios to ALARP, and there are no further additional, alternative and improved control measures other than those implemented that would provide further benefit.

## 5.2. Source Control via Relief Well Drilling

The worst-case scenario identified for the petroleum activity program is considered to be a loss of well containment from LH3 well (MEE-01). This well has a vertical xmas tree upon which a capping stack cannot be used. Furthermore, major damage to, or complete loss of, the Xmas tree from a producing well would result in there being no infrastructure upon which to land the cap and secure it for well control operations. The primary response would therefore be relief well drilling.

The Woodside Source Control Response Procedure includes the process for the IMT to mobilise resources for Subsea First Response Toolkit (SFRT) support. This plan has pre-identified vessel specifications and contracts required for SFRT debris clearance work and Woodside monitors the availability and location of these vessels.

Woodside is a signatory to the APPEA Memorandum of Understanding (MOU) between Australian offshore operators to provide mutual aid to facilitate and expedite mobilising a mobile offshore drilling unit (MODU) and drilling a relief well, if a loss of well containment incident were to occur. The MOU commits the signatories to share rigs, equipment, personnel and services to assist another operator in need. Dynamically positioned and most jack up rigs are not suitable for the Okha FPSO water depth, therefore a moored MODU would be required.

Source control operations cannot be implemented if the safety of response personnel cannot be guaranteed. Circumstances that limit the safe execution of this control measure include LEL concentrations, volatile concentrations of hydrocarbons in the atmosphere, weather window, waves and/or sea states (>1.5m waves) and high ambient temperatures.

### 5.2.1. Response need based on predicted consequence parameters

The following statements identify the key parameters upon which a response need can be based:

- Prior to any source control activities, Woodside will implement protocols to ensure that the site is safe including subsea ROV surveys and surface air monitoring.
- Hydrocarbons will flow from the well until one of the following interventions can be made:
    - Closure of the Tubing Retrievable Safety Valve (TRSV)
    - A relief well is drilled and first attempt at well kill within 77 days
- Arrangements for support organisations who provide specialist services or resources should be tested regularly.
- Plans, procedures and support documents need to be in place for Operational and Support functions. These should be reviewed and updated regularly.
- The duration of the spill may extend up to 77 days with response operations extending up to Month 4 (MEE-01) based on the predicted time to complete shoreline clean-up operations.

In addition, a number of assumptions are required to estimate the response need for source control. These assumptions have been described in the table below.

**Table 5-3: Response Planning Assumptions – Source Control**

| | |
|---|---|
| **Safety considerations** | Source control operations cannot be implemented if the safety of response personnel cannot be guaranteed. This requires an initial and ongoing risk assessment of health and safety hazards and risks at the site, in accordance with the Woodside Management System (WMS). Personnel safety issues may include:<br>• Hydrocarbon gas and/or liquid exposure<br>• High winds, waves and/or sea states<br>• High ambient temperatures. |

| | |
|---|---|
| **Feasibility considerations** | Woodside's primary source control option would be ROV intervention followed by relief well drilling for the Okha FPSO Facility and its wells.<br>The following approaches outline Woodside's hierarchy for relief well drilling;<br>• Primary relief well – review internal drilling programs and MODU availability to source an appropriate rig operating within Australia with an approved Safety Case;<br>• Alternate relief well – source and contract a MODU through APPEA MOU that is operating within Australia with an approved Safety Case;<br>• Contingency relief well – if required, source and contract a MODU outside Australia with an approved Australian Safety Case |

### 5.2.2. Environmental performance based on need

**Table 5-4: Environmental Performance – Source Control**

| **Environmental Performance Outcome** | | To stop the flow of hydrocarbons into the marine environment. | | |
|---|---|---|---|---|
| **Control measure** | | **Performance Standard** | | **Measurement Criteria (see Section 5.12)** |
| 8 | Subsea First Response Toolkit (SFRT) | 8.1 | Oceaneering support staff available all year round, via contract, to assist with the mobilisation, deployment, and operation of the SFRT equipment. | 1, 3B, 3C |
| | | 8.2 | Intervention vessel with minimum requirement of a working class ROV and operator. | 1, 3C |
| | | 8.3 | Mobilised to site for deployment within 11 days. | 1, 3B, 3C |
| | | 8.4 | Open communication line to be maintained between IMT and infield operations to ensure awareness of progress against plan(s). | 1, 3A, 3B |
| 9 | Well intervention | 9.1 | Frame agreements with ROV providers in place to be mobilised upon notification. ROV equipment deployed within 7 days. | 1, 3B, 3C |
| | | 9.2 | Identify source control vessel availability within 24 hours and begin contracting process. Vessel mobilised to site for deployment within 12 days for SSDI. | 1, 3B, 3C |
| | | 9.3 | Wild Well Control Inc (WWCI) staff available all year round to assist with the mobilisation, deployment, and operation of well intervention equipment. | 1, 3B, 3C |
| | | 9.4 | MODU mobilised to site for relief well drilling within 21 days. | 1, 3C |
| | | 9.5 | First well kill attempt completed within 77 days. | 1, 3B, 3C |
| | | 9.6 | Open communication line(s) to be maintained between IMT and infield operations to ensure awareness of progress against plan(s). | 1, 3A, 3B |
| | | 9.7 | Monthly monitoring of the availability of MODUs through existing market intelligence including current Safety Case history, to meet specifications for relief well drilling. Titleholders of suitable MODUs notified. | 3C |
| | | 9.8 | At least two communication methods, one of which will include the capability to communicate with aviation. | 1, 3A |
| 10 | Support vessels | 10.1 | Monthly monitoring of availability of larger vessels through existing Frame Agreements and market intelligence to meet specifications for source control. | 3C |
| | | 10.2 | Frame agreements for Infield Support Vessels (ISVs) require vessels maintain in-force safety case approvals covering ROV operations and provide support in the event of an emergency. | 1, 3B, 3C |
| | | 10.3 | MODU and vessel contracts include clause outlining requirement for support in the event if an emergency | 1, 3C |
| | | 10.4 | Monthly monitoring of registered operators and Woodside will maintain minimum safe operating standards that can be provided to MODU and vessel operators for Safety Case | 1, 3B, 3C |
| 11 | Safety case | 11.1 | Woodside will prioritise MODU or vessel(s) for intervention work(s) that have an existing safety case | 1, 3C |
| | | 11.2 | Woodside Planning, Logistics, and Safety Officers (on-roster/ call 24/7) to assist in expediting the safety case assessment process as far as practicable. | 1, 3C |
| | | 11.3 | Woodside will maintain minimum safe operating standards that can be provided to MODU and vessel operators for safety case guidance | 1, 3C |

The resulting source control capability has been assessed against the WCCS. The range of techniques provide a feasible and viable approach to relief well drilling operations to stop the well flowing.

- The health and safety, financial, capital and operations/maintenance costs of implementing the alternative, additional or improved control measures identified and not carried forward are considered clearly disproportionate to the insignificant environmental benefit gained and/or not reasonably practicable for this PAP.

- Woodside has assessed the existing capability available and considered potential alternative, additional and improved control measures. Where control measures have been selected and implemented, they are included in Section 6.2.

## 5.3. Subsea Dispersant Injection

Subsea dispersant injection involves the deployment of a subsea dispersant manifold with associated equipment to inject chemical dispersant directly into the oil plume in the event of a loss of well containment. As it may take some time to mobilise subsea dispersant equipment, surface dispersants are generally used in the interim to treat oil that makes it to the surface.

The use of subsea dispersants has similar benefits to surface dispersant application including a potential reduction in the volume of hydrocarbons that reach the shoreline thereby reducing impacts to sensitive receptors. In addition to these benefits, subsea dispersant application may reduce volatile organic compound (VOC) levels during surface response operations, reducing risks and hazards to responders.

The *Subsea Dispersants Operational Plan* details the mobilisation and resource requirements for dispersant operations including the logistics, support and facility arrangements to manage the movement of personnel and resources.

### 5.3.1. Response need based on predicted consequence parameters

The following statements identify the key parameters upon which a response need can be based:

- The maximum volume of subsea hydrocarbons released is predicted to be approximately 2,414 $m^3$/day for 11 weeks/ Day 77 day when the well is killed.
- Ability to treat a large proportion of the daily hydrocarbon release volumes.
- A subsea dispersant injection system with sufficient coiled tubing for water depth.
- Arrangements for support organisations who provide specialist services, including subsea plume monitoring, or resources should be tested regularly.
- Plans, procedures and support documents need to be in place for Operational and Support functions. These should be reviewed and updated regularly.
- The duration of the spill may extend up to 77 days with response operations extending up to Month 4 (MEE-01) based on the predicted time to complete shoreline clean-up operations.

In addition, a number of assumptions are required to estimate the response need for Subsea Dispersant Injection. These assumptions have been described in the table below.

**Table 5-5: Response Planning Assumptions – Subsea Dispersant Injection**

| Response Planning Assumptions | | |
|---|---|---|
| **Technique** | **Predicted performance range**[7]<br>(% of oil volume predicted to be treated by response technique) | |
| **Subsea Dispersant Injection** | Lower | 1:100 DOR (used to determine the volume of dispersant required) |
| | Upper | 1:50 DOR (used to determine the volume of dispersant required) |
| | The predicted performance range for SSDI is based on;<br>• Total rate of released oil available for SSDI.<br>• Subsea inspection (ROV) observing oil release and technique safe for deployment.<br>• Dispersant to oil application at 1:50-1:100.<br>• Predicted dispersant effectiveness of 50-60% of contacted subsea oil. | |

[7] Performance ranges outlined above are indicative for response planning purposes. Where actual figures and concentrations exist based on deterministic modelling or laboratory results, these will be used for response and capability planning.

| | |
|---|---|
| **SSDI operation** | • 1 x SSDI operation includes:<br>– 1 x suitable ISV (vessel specifications as per SFRT and Capping Stack Mobilisation Plan)<br>– Subsea dispersant delivery system<br>– Work class ROV with ancillaries and Hydraulic Power Unit (HPU)<br>– Dispersant pump<br>– Down hole line / coiled tubing<br>– Trained ROV operator(s)<br>– Trained subsea specialists |
| **Dispersant delivery (per operation)** | • Lower – 60$m^3$ per 24 hours<br>• Upper – 75$m^3$ per 24 hours |
| **Dispersant Effectiveness** | Average subsea dispersant efficacy, based upon industry research, is:<br>• Lower – 50%<br>• Upper – 60% |

### 5.3.2. Environmental performance based on need

**Table 5-6: Environmental Performance - Subsea Dispersant Injection**

| **Environmental Performance Outcome** | | To reduce consequences to surface and shoreline receptors and increase the bioavailability of hydrocarbons for microbial breakdown. | | |
|---|---|---|---|---|
| **Control measure** | | **Performance Standard** | | **Measurement Criteria (see Section 5.12)** |
| 12 | Subsea spraying | 12.1 | Contract in place to provide Subsea Dispersant equipment resources (via SFRT) | 1, 3B, 3C, 4 |
| | | 12.2 | Oceaneering support staff available all year round, via contract, to assist with the mobilisation, deployment, and operation of the SFRT equipment. | |
| | | 12.3 | Subsea Dispersant vessel will have the following minimum specifications:<br>• Compensated seabed crane up to 36 MT<br>• Mobilised to site for deployment within 12 days | 1, 3A, 3C, 4 |
| | | 12.4 | Per day dispersant log completed to record quantity of dispersants applied | 1, 3A, 3B |
| | | 12.5 | Contract in place with WWCI to provide SSDI and debris clearance equipment and trained personnel | 1, 3B, 3C, 4 |
| 13 | Support vessels | 13.1 | At least two communication methods, one of which will include the capability to communicate with aviation. | 1, 3C, 4 |
| | | 13.2 | Monthly monitoring of the availability of ISVs through existing Frame Agreements and market intelligence to meet specifications for subsea dispersant injection. | 3C, 4 |
| | | 13.3 | Frame agreements for ISVs require vessels to maintain in-force safety case approvals covering ROV operations and provide support in the event of an emergency. | 1, 3B, 3C |
| | | 13.4 | Monitoring of NOPSEMA's list of registered operators and cross reference against their locations and minimum specifications for SSDI vessels | 1, 3A, 4 |
| 14 | Dispersant | 14.1 | Year-round access to 5,000m$^3$ of dispersant located globally which is ready to be mobilised within 24-48 hours under activation of GDS membership. | 1, 3A, 3B, 3C, 3D, 4 |
| | | 14.2 | Year-round access to additional dispersant stockpiles via memberships with OSRL and AMOSC. | |
| | | 14.3 | OSCA approved dispersants prioritised for surface and subsea use | 1, 3A, 3B, 3C, 4 |

The resulting subsea dispersant injection capability has been assessed against the WCCS. The maximum volume of subsea hydrocarbons released is predicted to be approximately 2,414 m$^3$/day for 11 weeks/ 77 days when the well is killed.

Dispersant efficacy testing has not been undertaken for subsea conditions, but industry experience estimates a subsea amenability to dispersant of approximately 50-60% effectiveness.

The SSDI capability currently available provides the capacity to treat 1,800-4,500 m$^3$ of subsea hydrocarbons per day with the application of 60-75m$^3$/day of dispersant. The release rates for Okha FPSO Facility Operations LH3 well is within this range and therefore the SSDI is considered a primary response technique for the subsea loss of well control scenarios and the capability is deemed sufficient.

Under optimal conditions, during the subsea release period the capability available meets the need identified and indicates that, the subsea dispersant capability has the following expected performance(s):

- Entrained hydrocarbon concentrations in the water column are predicted to increase at most subsurface receptor locations, with dispersant application from the trapping of treated entrained hydrocarbons at a lower depth (from subsea dispersant application) due to the greatly reduced droplet size and therefore reduced buoyancy.

- The application of subsea dispersant may reduce the maximum local concentrations and maximum accumulated volumes at receptors predicted to be contacted by floating hydrocarbons and may reduce the amount of hydrocarbons reaching the shoreline.
- The scope of the Frame Agreement Vessel Safety Case includes a range of subsea activities that would cover the requirement for SSDI operations such as subsea manifold installation, commissioning, cargo transfer (including bulk liquids), operating as a stable platform for activities including ROV operations, and accommodation support alongside or within the 500m safety zone of an existing facility which may be in production.
- An SSDI vessel can be activated and mobilised within 12 days. Detailed breakdown of this timing is included in Section 6.2.5.1. Whilst Woodside will make every endeavour to accelerate the activities to reduce this timeframe, Woodside believes that the timeframe outlined is appropriate and realistic to ensure these activities can be completed reliably.
- Woodside has assessed the existing capability available and considered potential alternative, additional and improved control measures. Where control measures have been selected and implemented, they are included in Section 6.2.5.1.

## 5.4. Surface Dispersant Application

Surface dispersant application may reduce surface hydrocarbons and therefore prevent, or reduce the scale of, shoreline contact. Priority would be placed on treating high volume surface hydrocarbons closest to the release location as this is where high surface concentrations are predicted, and dispersant application is expected to achieve the greatest environmental benefit (refer to ANNEX A: Net Environmental Benefit Analysis detailed outcomes).

Weathering of the hydrocarbons would reduce dispersant efficacy. In the event of an ongoing loss of well control, modelling predicts hydrocarbons reaching the surface may be spread below effective response thresholds. Surface dispersant application is weather and sea–state dependent. Periods of downtime can be expected.

The *Surface Dispersant Operational Plan* details the mobilisation and resource requirements for dispersant operations including the logistics, support and facility arrangements to manage the movement of personnel and resources.

### 5.4.1. Response need based on predicted consequence parameters

**Okha FPSO Facility Operations loss of well containment (MEE-01)**

The following statements identify the key parameters upon which response need is based for each scenario:

- Based on deterministic modelling, surface hydrocarbons within threshold concentration (>50g/m$^2$) and viscosity parameters (<15,000 cSt) available for surface dispersant application are predicted to be:
  - 197 m$^3$ in Week 2
  - 0 m$^3$ in Week 3
  - 347 m$^3$ in Week 4
  - 900 m$^3$ during Month 2
  - 0 m$^3$ thereafter
- Surface volume peaks at 900 m$^3$ in Month 2 and surface area peaks at 15 km$^2$ in Month 2.
- The duration of the spill may extend up to 77 days with response operations extending up to Month 4 (MEE-01) based on the predicted time to complete shoreline clean-up operations.

**Okha FPSO Facility Operations vessel cargo tank rupture (MEE-05)**

The following statements identify the key parameters upon which response need is based:

- Based on deterministic modelling, surface hydrocarbons within threshold concentration (>50g/m$^2$) and viscosity parameters (<15,000 cSt) available for surface dispersant application are predicted to be:
  - 2,251 m$^3$ on Day 1
  - 1,633 m$^3$ on Day 2
  - 0 m$^3$ (at threshold concentration) on Day 3.
- Surface volume peaks at 2,251 m$^3$ on Day and surface area peaks at 15 km$^2$ on Day 2.
- The duration of the spill may extend up to 24 hours with response operations extending to 2 months based on the predicted time to complete shoreline clean-up operations.

**All scenarios**

- Arrangements for support organisations who provide specialist services (dispersant spray aircraft, logistics services for mobilising dispersant and Air Attack Supervisors) or resources (dispersants and transfer pumping systems) and should be tested regularly.
- Plans, procedures and support documents are in place for Operational and Support functions. These should be reviewed and updated regularly.
- Defined Zone of Application (ZoA) to reduce environmental consequences on subsea receptors.

In addition, a number of assumptions are required to estimate the response need for Surface Dispersant Application. These assumptions have been described in the table below.

**Table 5-7: Response Planning Assumptions – Surface Dispersant Application**

<table>
<tr><th colspan="3">Response Planning Assumptions</th></tr>
<tr><th>Technique</th><th colspan="2">Predicted performance range[8]<br>(% of surface oil volume available predicted to be treated by response technique)</th></tr>
<tr><td rowspan="3">Surface Dispersant Application (Combined vessel and aircraft)</td><td>Lower</td><td>2% (1:25 DOR x 16% effectiveness x 50% encounter rate)</td></tr>
<tr><td>Upper</td><td>12% (1:20 DOR x 84% effectiveness x 75% encounter rate)</td></tr>
<tr><td colspan="2">The predicted performance range for surface dispersant application (SDA) is based on;<br>• Remaining surface oil available for SDA following weathering.<br>• Monitor and evaluate operations observing surface oil at minimum BAOAC 4 (discontinuous true oil colour) or BAOAC 5 (continuous true oil colour).<br>• Safe for deployment, within range of vessels and aircraft.<br>• Dispersant to oil application at 1:20-1:25 (based on uniform surface oil 100g/$m^2$ and 50 litres/hectare application rate) allows for 3-4 $km^2$ per aircraft per day.<br>• Predicted dispersant effectiveness of 16-84% for contacted surface oil.<br>• Spraying encounter rate of approximately 50-75% (50-25% of dispersant sprayed does not contact surface oil).<br>•</td></tr>
<tr><td>Physical properties</td><td colspan="2"><u>Surface Threshold</u><br>• Lower – 50g/$m^2$ (equates to 100g/$m^2$ with approx. 50% coverage and/or 200g/$m^2$ with approx. 25% coverage)<br>– BAOAC 4 – Discontinuous true oil colour - lower threshold 50g/$m^2$<br>• Optimum – 100g/$m^2$ (equates to >100g/$m^2$ with approx. 100% coverage and/or 200g/$m^2$ with approx. 50% coverage)<br>– BAOAC 5 – Continuous true oil colour – lower threshold 200 g/$m^2$<br><u>Viscosity</u><br>• Optimum – <5,000 cSt at sea surface temperature<br>• Upper – 15,000 cSt at sea surface temperature</td></tr>
<tr><td>Dispersant Effectiveness</td><td colspan="2">Dispersant testing on Cossack Light Crude indicates that average dispersant efficiency (%) for oil age will be;<br>• ~45% (0 hours)<br>• ~84% (<12 hrs)<br>• ~16% (48-96 hrs)<br>This data is based on a range of weathering results and five National Plan OSCA approved and/or transitional dispersants that will be the most likely dispersants used by Woodside.</td></tr>
</table>

[8] Performance ranges outlined above are indicative for response planning purposes. Where actual figures and concentrations exist based on deterministic modelling or laboratory results, these will be used for response and capability planning.

### 5.4.2. Environmental performance based on need

**Table 5-8: Environmental Performance - Surface Dispersant Application**

| **Environmental Performance Outcome** | | To reduce consequences to surface and shoreline receptors and increase the bioavailability of hydrocarbons for microbial breakdown. | | |
|---|---|---|---|---|
| **Control measure** | | **Performance Standard** | | **Measurement Criteria (see Section 5.12)** |
| 15 | Aerial spraying | 15.1 | One aircraft with minimum payload of 1,850 litre mobilised to site within 4 hours of activation.<br>One additional aircraft mobilised to site within another 20 hours of activation.<br>Four additional aircraft mobilised to site within 48 hours of activation. | 1, 3B, 3C, 4 |
| | | 15.2 | One high capacity aircraft with minimum payload of $10m^3$ available to spray on day 2. | |
| | | 15.3 | FWADC to complete a minimum of 2 sorties per day and high capacity aircraft to complete a minimum of 2 sorties per day. | 1 |
| | | 15.4 | Per sortie spray log completed to record where dispersants were applied. | 1, 3A, 3B |
| 16 | Vessel spraying | 16.1 | Two offtake support vessels from integrated fleet will undertake dispersant trials within 48 hours of the release as per first strike plan. | 1, 3A, 3B, 3C, 4 |
| | | 16.2 | Two offtake support vessels will be available for deployment to spray dispersant for the duration of the response. | 3A, 3C, 4 |
| | | 16.3 | Up to 4 vessels spraying per day by day 5. | 1, 3C |
| | | 16.4 | Per day spray log completed to record where dispersants were applied. | 1, 3A, 3B |
| 17 | Dispersant | 17.1 | Year-round access to $5,000m^3$ of dispersant located globally which is ready to be mobilised on activation of GDS membership within 24-48 hours. | 1, 3A, 3B, 3C, 3D, 4 |
| | | 17.2 | Year-round access to additional dispersant stockpiles via memberships with OSRL and AMOSC. | |
| | | 17.3 | OSCA approved dispersants prioritised for surface and subsea use. | 1, 3A, 3B, 3C, 4 |
| | | 17.4 | Only apply surface dispersants within the ZoA and on BAOAC 4 and 5. | |
| | | 17.5 | Continuous monitoring of dispersed oil plume and visual monitoring of effectiveness | |

The resulting surface dispersant response capability following ALARP evaluation has been assessed against the WCCS and surface release scenario.

- Surface concentration, viscosity and mass vary for each time step based on spreading and weathering algorithms from the deterministic modelling results. Woodside has reviewed the deterministic modelling data based to determine the Response Need and required capability for surface dispersant application as a response technique.
- **Okha FPSO Facility Operations loss of well containment (MEE-01)** – Deterministic modelling predicts that surface hydrocarbon volume peaks at 900 $m^3$ in Month 2 (and surface area peaks at 15 $km^2$ in Month 2) for vessel and aerial dispersant operations to treat at threshold concentration. Woodside's existing capability is sufficient to treat the expected surface hydrocarbons throughout the incident.
- **Okha FPSO Facility Operations vessel cargo tank rupture (MEE-05)** – Deterministic modelling predicts that surface hydrocarbon volume peaks at 2,250 $m^3$ on Day 1 (and surface area peaks at 15 $km^2$ on Day 2) for vessel and aerial dispersant operations to treat at threshold concentration. Woodside's existing capability is sufficient to treat the expected surface hydrocarbons throughout the incident.

- Woodside has assessed the existing capability available and considered potential alternative, additional and improved control measures. Where control measures have been selected and implemented, they are included in Section 6.4.
- No further control measures that may result in an increased environmental benefit that involve moderate to significant cost and/or dedication of resources have been adopted as the limited scale and timeframe for deployment of this technique does not justify the excessive costs of identified alternate, improved or additional controls.

## 5.5. Containment and Recovery

Containment and recovery is used to reduce damage to sensitive resources by the physical containment and mechanical removal of hydrocarbons from the marine environment. It has a lower capacity for removing surface oil than the application of dispersant but avoids potential additional impacts created by the resulting increase in entrained hydrocarbons in the water column.

Weathering and spreading of hydrocarbons will significantly reduce containment and recovery effectiveness. In the event of an ongoing loss of well control, modelling predicts fresh hydrocarbons reaching the surface may be heavily weathered and present in small discrete patches. Containment and Recovery is also weather and sea–state dependent. Periods of downtime can be expected.

The average annual conditions in the vicinity of the Okha FPSO are expected to be Beaufort Sea-state 3-4 (wind speed 4.7 m/s to 7.5 m/s) with maximum windspeeds of Beaufort Sea-state 6-10 (wind speed 12.4 m/s to 25.5 m/s) (RPS, 2019). It is, therefore, expected that open water containment and recovery operations would not, in general, be an effective response technique. However, Containment and recovery may be available for deployment nearshore and/or when the weather window permits, and priority would be given to being prepared to deploy units if the required conditions are met.

The *Containment and Recovery Operational Plan* details the mobilisation and resource requirements for response operations including the logistics, support and facility arrangements to manage the movement of personnel and resources.

### 5.5.1. Response need based on predicted consequence parameters

**Okha FPSO Facility Operations loss of well containment (MEE-01)**

The following statements identify the key parameters upon which response need is based:

- Based on deterministic modelling, surface hydrocarbons above threshold concentration (>50g/m$^2$) available for containment and recovery are predicted to be:
  - 197 m$^3$ in Week 2
  - 0 m$^3$ in Week 3
  - 347 m$^3$ in Week 4
  - 900 m$^3$ during Month 2
  - 0 m$^3$ thereafter
- Surface volume peaks at 877 m$^3$ on Day 58, surface area peaks at 3 km$^2$ on Day 48.
- The duration of the spill may be up to 77 days with offshore response operations extending from Week 2 to Month 2 (at times when surface hydrocarbons are at recoverable threshold concentrations) and shoreline response operations extending up to Month 4 based on the predicted time to complete shoreline clean-up operations.

**Okha FPSO Facility Operations vessel cargo tank rupture (MEE-05)**

The following statements identify the key parameters upon which response need is based:

- Surface hydrocarbons above threshold concentration (>50 g/m$^2$) available for containment and recovery are predicted to be 2,250 m$^3$ on Day 1 and 1,633 m$^3$ on Day 2 based on the deterministic modelling.
- Surface volume peaks at 2,250 m$^3$ on Day 1 and surface area peaks at 15 km$^2$ on Day 2.
- The duration of the spill may be up to 24 hours with offshore response operations extending to 2 days (when surface hydrocarbons fall below recoverable threshold concentrations) and shoreline response operations extending to Month 2 based on the predicted time to complete shoreline clean-up operations.

**All scenarios**

- Arrangements for support organisations who provide specialist services (logistics services for mobilising equipment, trained Offshore Supervisors and waste disposal) and/or resources (vessels, containment and recovery equipment, transfer pumping systems) should be tested regularly.

- Plans, procedures and support documents need to be in place for Operational and Support functions. These should be reviewed and updated regularly.

In addition, a number of assumptions are required to estimate the response need for Containment and Recovery. These assumptions have been described in the table below.

**Table 5-9: Response Planning Assumptions – Containment and Recovery**

| | | |
|---|---|---|
| **Technique** | **Predicted performance range**<br>(% of surface oil volume available predicted to be recovered by response technique) | |
| Containment and recovery | Lower | 5% |
| | Upper | 10% |
| | The predicted performance range for containment and recovery is based on;<br>• remaining surface oil available for containment and recovery following weathering,<br>• Monitor and evaluate operations observing surface oil at minimum BAOAC 4 (discontinuous true oil colour) or BAOAC 5 (continuous true oil colour)<br>• safe for deployment, within range of vessels and aircraft,<br>• encounter rate of approximately 50-75% (50-25% of surface coverage is not surface oil) | |
| **Response Capability details** | | |
| Containment and recovery **operation** | • 1 x containment and recovery operation includes;<br>– 2 x suitable vessels (vessel specifications as per Marine Operations Plan)<br>– 1 x boom system (minimum 800 mm overall height and approximately 200 m length) with all required ancillaries)<br>or<br>– 1 x suitable vessel (vessel specifications as per Marine Operations Plan)<br>– 1 x single ship system (minimum 800 mm overall height and approximately 200 m length) with all required ancillaries)<br>and<br>– 1 x skimmer (min 20 $m^3$ / hr) with all required ancillaries<br>– 1-2 x trained supervisor per operation<br>– 8-10 x support personnel per operation | |
| **Physical properties** | **Surface Threshold**<br>• Lower – 50g/$m^2$ (equates to 100g/$m^2$ with approx. 50% coverage and/or 200g/$m^2$ with approx. 25% coverage)<br>– BAOAC 4 – Discontinuous true oil colour - lower threshold 50g/$m^2$<br>• Optimum – 100g/$m^2$ (equates to >100g/$m^2$ with approx. 100% coverage and/or 200g/$m^2$ with approx. 50% coverage)<br>– BAOAC 5 – Continuous true oil colour – lower threshold 200 g/$m^2$ | |

| | |
|---|---|
| **Expected effectiveness** | • 1 x containment and recovery operation is expected to be able to contain and recover approx. 22.5 – 67.5 $m^3$ per day (10 hr operation) includes one (1) change out of temporary waste storage equipment (if required)<br>• Based on the following assumptions;<br>– Boom system with 70m opening = 0.07 km<br>– Vessel moving at 0.7kn = 1.3 km/h<br>– Area covered per hour = 0.07 km x 1.3 km = 0.09 $km^2$<br>– Area covered per day = 0.09 $km^2$ x 10 hours = 0.9 $km^2$ / day<br>– Recovery per day (low) = 0.9 $km^2$ x 50 $g/m^2$ x 50% coverage = 22.5 $m^3$ / 10-hour day<br>– Recovery per day (high) = 0.9 $km^2$ x 100 $g/m^2$ x 75% = 67.5 $m^3$ / 10-hour day<br><br>Increased surface oil concentration may result in increased recovery capacity providing other conditions and oil properties remain suitable for containment and recovery. For planning purposes, conservative concentrations outlined above have been used. |

### 5.5.2. Environmental performance based on need

**Table 5-10: Environmental Performance – Containment and Recovery**

| **Environmental Performance Outcome** | | To reduce consequences to surface and shoreline receptors. | | |
|---|---|---|---|---|
| **Control measure** | | **Performance Standard** | | **Measurement Criteria (see Section 5.12)** |
| 18 | Vessel-based recovery systems | 18.1 | Woodside maintains an integrated fleet of vessels, including vessels with at least 10t bollard pull. Additional vessels can be sourced through existing contracts/frame agreements | 1, 3A, 3B, 3C, 4 |
| | | 18.2 | 2 containment and recovery operations would be deployed by day 2. | |
| | | 18.3 | 4 additional containment and recovery operations using 3rd party provider resources would be deployed by day 10 | |
| | | 18.4 | Each operation will have internal or added 100 $m^3$ of liquid waste storage onboard. | |
| 19 | Response teams | 19.1 | Deployment of 2 containment and recovery teams would be available by day 2 and 4 containment and recovery teams available by day 5. | 1, 2, 3A, 3B, 3C, 4 |
| | | 19.2 | Deployment team will be comprised of:<br>• 1-2 trained specialists per operation<br>• 8-10 personnel for support<br>• Personnel sourced through resource pool | 1, 2, 3B, 4 |
| | | 19.3 | Teams will segregate liquid and solid wastes at the earliest opportunity. | |
| | | 19.4 | Open communication line to be maintained between IMT and infield operations to ensure awareness of progress against plan(s) | 1, 3A, 3B |
| 20 | Response systems | 20.1 | Rapid sweep systems and active boom systems to be prioritised for mobilisation in the event of a response. | 1, 3C |
| 21 | Management of Environmental Impact of the response risks | 21.1 | The boom will be monitored and maintained to ensure trapped fauna are released as early as possible, with Containment and Recovery activities occurring in daylight hours only. | 1 |
| | | 21.2 | If vessels are required for access, anchoring locations will be selected to minimise disturbance to benthic primary producer habitats. Where existing fixed anchoring points are not available, locations will be selected to minimise impact to nearshore benthic environments with a preference for areas of sandy seabed where they can be identified | |

Woodside has assessed the resulting containment and recovery capability against the WCCS and surface release scenario.

Available surface oil will reduce based on movement of the slick and ongoing weathering, and thus the efficiency of this response technique will also decrease significantly once surface concentrations are below thresholds for effective offshore response. Based on deterministic modelling, this is predicted to be Day 2 for MEE-05 and Day 58 for MEE-01.

- Surface concentration and mass vary for each time step based on spreading and weathering algorithms within the model. Woodside has reviewed the deterministic modelling data based on the response planning assumptions outlined above to determine the Response Need and required capability.
- **For the subsea loss of well containment scenario (MEE-01)** – Deterministic modelling predicts that there will be sufficient volumes (peak volume of 877 $m^3$ on Day 58, surface area peaks at 3 $km^2$ on Day 48) of surface hydrocarbons for containment and recovery operations to recover. Woodside's existing capability is sufficient to recover the expected surface hydrocarbons throughout the incident.

- **For the surface vessel cargo tank rupture scenario (MEE-05)** – Deterministic modelling predicts that there will be sufficient volumes of surface hydrocarbons (peak volume of 2,250 $m^3$ on Day 1 and surface area peaks at 15 $km^2$ on Day 2) available for recovery. Surface hydrocarbons are at sufficient recovery thresholds into Month 4. Woodside's existing capability is sufficient to recover the expected remaining surface hydrocarbons by Day 5 until Month 4 when surface hydrocarbons fall below recovery thresholds.
- Woodside has assessed the existing capability available and considered potential alternative, additional and improved control measures. Where control measures have been selected and implemented, they are included in Section 6.4.5.

## 5.6. Shoreline Protection and Deflection

The placement of containment, protection or deflection booms on and near a shoreline is a response technique to reduce the potential volume of hydrocarbons contacting or spreading along shorelines, which may reduce the scale of shoreline clean-up. Hydrocarbons contained by the booms would be collected where practicable.

Shorelines would be protected where accessible via vessel or shore. Where hydrocarbon contact has already occurred, there may still be value in deploying protection equipment to limit further accumulations and preventing remobilisation of stranded hydrocarbons.

Shoreline protection and deflection equipment would be mobilised to selected locations, where the following conditions were met:

- sea-states and hydrocarbon characteristics are safe to deploy protection and deflection measures,
- oil trajectory has been identified as heading towards identified RPAs.

### 5.6.1. Response need based on predicted consequence parameters

**Okha FPSO Facility Operations loss of well containment (MEE-01)**

The following statements identify the key parameters upon which the response need can be based:

- The shortest timeframe that shoreline contact from floating oil above threshold is predicted to be 14 days at Barrow Island (2 $m^3$).
- Pre-emptive assessment and shoreline assessments (OM04 and OM05) will be mobilised prior to shoreline contact which is predicted to occur on day 14 at Barrow Island (2 $m^3$).
- The duration of the spill may be up to 77 days with response operations extending up to Month 4 based on the predicted time to complete shoreline clean-up operations.

**Okha FPSO Facility Operations vessel cargo tank rupture (MEE-05)**

The following statements identify the key parameters upon which a response need can be based:

- The shortest timeframe that shoreline contact from floating oil is predicted to be 7 days at Barrow Island (42 $m^3$).
- Pre-emptive assessment and shoreline assessments (OM04 and OM05) will be mobilised prior to shoreline contact which is predicted to occur on day 7 at Barrow Island (42 $m^3$).
- The duration of the spill may be up to 24 hours with response operations extending up to Month 2 based on the predicted time to complete shoreline clean-up operations.

**All scenarios**

- Predictive modelling (OM01), direct observation/surveillance (OM02) and, where appropriate, hydrocarbon detection in water (OM03), will be employed from the outset of a spill to track the oil, assess where and when appropriate response techniques can be deployed and to identify when the spill enters State Waters. When RPAs at threat of impact can be accurately deduced, this will trigger the undertaking of pre-emptive assessments of sensitive receptors at risk (OM04), to direct any protection and deflection operations. OM04 would be undertaken in liaison with WA DoT (if a Level 2/3 incident and within State Waters).
- Following pre-emptive assessments of sensitive receptors at risk, and in agreement of prioritisation with WA DoT (if a Level 2/3 incident and within State Waters), protection and deflection operations would commence until agreed termination criteria are reached.
- Arrangements for support organisations who provide specialist services (trained personnel, protection and deflection equipment) and/or resources should be tested regularly; and
- TRPs for RPAs along with other relevant plans, procedures and support documents need to be in place for Operational and Support functions. These should be reviewed and updated regularly.

In addition, a number of assumptions are required to estimate the response need for Shoreline Protection and Deflection. These assumptions have been described in the table below.

**Table 5-11: Response Planning Assumptions – Shoreline Protection and Deflection**

| Response Planning Assumptions | |
|---|---|
| **Safety considerations** | Shoreline protection and deflection operations cannot be implemented if the safety of response personnel cannot be guaranteed. This requires an initial and ongoing risk assessment of health and safety hazards and risks at the site. Personnel safety issues may include:<br>• hydrocarbon gas and/or liquid exposure<br>• high winds, waves and/or sea states<br>• high ambient temperatures. |
| **Shoreline Protection and Deflection** | • 1 x Shoreline Protection and Deflection operation may include;<br>– Quantity of shoreline sealing boom (as outlined in TRP)<br>– Quantity of fence or curtain boom (as outlined in TRP)<br>– 1-2 x trained supervisors<br>– 8-10 x personnel / labour hire<br>Specific details of each operation would be tailored to the TRP implemented (where available). |

### 5.6.2. Environmental performance based on need

**Table 5-12: Environmental Performance – Shoreline Protection and Deflection**

| **Environmental Performance Outcome** | | To stop hydrocarbons encountering particularly sensitive areas | | |
|---|---|---|---|---|
| **Control measure** | | **Performance Standard** | | **Measurement Criteria (see Section 5.12)** |
| 22 | Response teams | 22.1 | In liaison with WA DoT (for Level 2/3 incidents), relevant TRPs will be identified in the first strike plan for activation within 24 hours of the release. | 1, 3A, 3C, 4 |
| | | 22.2 | In liaison with WA DoT (for Level 2/3 incidents), mobilise teams to RPAs within 48 hours of operational monitoring predicting impacts.<br>Teams to contaminated RPAs comprised of:<br>• 1-2 trained specialists per operation<br>• 8-10 personnel/labour hire<br>• Personnel sourced through resource pool | 1, 2, 3B, 3C, 4 |
| | | 22.3 | In liaison with WA DoT (for Level 2/3 incidents), 1 operation mobilised within 48 hours of operational monitoring predicting impacts to each identified RPA. Expected to be 3 RPAs within 14 days (operation as detailed above). | 1, 3A, 3B, 4 |
| | | 22.4 | 14 trained personnel (2 supervisors plus 12 additional personnel) available within 48 hours sourced through resource pool. | 1, 2, 3A, 3B, 3C, 4 |
| | | 22.5 | Open communication line to be maintained between IMT and infield operations to ensure awareness of progress against plan(s) | 1, 3A, 3B |
| | | 22.6 | The safety of shoreline response operations will be considered and appropriately managed. During shoreline operations:<br>• All personnel in a response will receive an operational/safety briefing before commencing operations<br>• Gas monitoring and site entry protocols will be used to assess safety of an operational area before allowing access to response personnel | 1, 3B, 4 |
| 23 | Response equipment | 23.1 | Equipment mobilised from closest stockpile within 48 hours. | 1, 3A, 3C, 4 |
| | | 23.2 | Supplementary equipment mobilised from State, AMOSC, AMSA stockpiles within 48 hours. | 1, 3C, 3D, 4 |
| | | 23.3 | Supplementary equipment mobilised from OSRL within 72 hours. | |
| | | 23.4 | Woodside maintains integrated fleet of vessels. Additional vessels can be sourced through existing contracts/frame agreements | 1, 3A, 3C, 4 |
| 24 | Management of Environmental Impact of the response risks | 24.1 | If vessels are required for access, anchoring locations will be selected to minimise disturbance to benthic primary producer habitats. Where existing fixed anchoring points are not available, locations will be selected to minimise impact to nearshore benthic environments with a preference for areas of sandy seabed where they can be identified | 1 |
| | | 24.2 | Shallow draft vessels will be used to access remote shorelines to minimise the impacts associated with seabed disturbance on approach to the shorelines | |

The resulting shoreline protection and deflection capability has been assessed against the WCCS. The range of techniques provide an ongoing approach to shoreline protection and deflection at identified RPAs.

Under optimal conditions, during the subsea and surface releases the capability available exceeds the need identified. It indicates that, the shoreline protection and deflection capability have the following expected performance:

- Deterministic modelling scenarios indicate that first shoreline impact at Barrow Island within 7 days for MEE-05 and Barrow Island within 14 days for MEE-01.
- Existing capability allows for mobilisation and deployment of shoreline protection operations by Day 1 (if required). Given shoreline contact at RPAs is not predicted until Day 7 at Barrow Island

(MEE-05), the existing capability is considered sufficient to mobilise and deploy protection at RPAs prior to hydrocarbon contact, guided by the ongoing operational monitoring.

- TRPs have been developed for all identified RPAs predicted to be impacted in less than 14 days except in international locations.
- Woodside has assessed the existing capability available and considered potential alternative, additional and improved control measures. Where control measures have been selected and implemented, they are included in Section 6.6.
- No further control measures that may result in an increased environmental benefit that involve moderate to significant cost and/or dedication of resources have been adopted as the timeframe required for deployment of this technique does not justify the excessive costs of identified alternate, improved or additional controls.

## 5.7. Shoreline Clean-up

Shoreline clean-up may be undertaken using a broad range of techniques when floating hydrocarbons contact shorelines. The timing, location and extent of shoreline clean-up activities can vary from one scenario to another, depending on the hydrocarbon type, sensitivities and values contacted, shoreline type and access, degree of oiling, and area oiled.

Shoreline clean-up is typically undertaken as a three-phase process, phase one (gross contamination removal) involving the collection of bulk oil, either floating against the shoreline or stranded on it, phase two (moderate to heavy contamination removal) involving removal or in-situ treatment of shoreline substrates such as sand or pebble beaches, and phase three (final treatment or polishing) involving removal of the remaining residues of oil. As phase one typically involves recovery of floating and pooled oil, and phase three removes minor volumes, they have not been considered in the assessment of response need for the scenarios identified.

The *Shoreline Cleanup Operational Plan* details the mobilisation and resource requirements for a shoreline clean-up operation including the logistics, support and facility arrangements to manage the movement of personnel and resources. It includes the process for the IMT to mobilise resources depending on the nature and scale of the spill. Woodside would activate and mobilise trained and competent personnel in shoreline assessment before or following shoreline contact at response thresholds.

Shoreline clean-up consists of different manual and mechanical recovery techniques to remove hydrocarbons and contaminated debris from a shoreline; this is to minimise ongoing environmental contamination and impact. The National Plan also provides guidance on shoreline clean-up techniques as outlined in National Plan Guidance *Response, assessment and termination of cleaning for oil contaminated foreshores* (AMSA 2015).

### 5.7.1. Response need based on predicted consequence parameters

**Okha FPSO Facility Operations loss of well containment (MEE-01)**

The following statements identify the key parameters upon which the response need can be based:

- The shortest timeframe that shoreline contact from floating oil is predicted to be 14 days at Barrow Island (2 $m^3$) with shoreline accumulation peaking at approximately 96 $m^3$ in Month 3.
- The duration of the spill may be up to 77 days with response operations extending up to Month 4 based on the predicted time to complete shoreline clean-up operations.

**Okha FPSO Facility Operations vessel cargo tank rupture (MEE-05)**

The following statements identify the key parameters upon which a response need can be based:

- The shortest timeframe that shoreline contact from floating oil is predicted to be 7 days at Barrow Island (42 $m^3$) with shoreline accumulation peaking at approximately 113 $m^3$ in Week 2.
- The duration of the spill may be up to 24 hours with response operations extending up to Month 2 based on the predicted time to complete shoreline clean-up operations.

**All scenarios**

- Predictive modelling (OM01), direct observation/surveillance (OM02) and, where appropriate, hydrocarbon detection in water (OM03), will be employed from the outset of a spill to track the oil, assess where and when appropriate response techniques can be deployed and when the spill enters State Waters. When RPAs at threat of impact can be accurately deduced, this will trigger the undertaking of pre-emptive assessments of sensitive receptors at risk (OM04) and, subsequently, shoreline assessments (OM05) to establish the extent and distribution of oiling and thus direct any shoreline clean-up operations. OM04 and OM05 would be undertaken in liaison with WA DoT (if a Level 2/3 incident and within State Waters).
- Following Shoreline Assessment, and agreement of prioritisation with WA DoT (if a Level 2/3 event), clean-up operations would commence until agreed termination criteria are reached.

- Arrangements for support organisations who provide specialist services (trained personnel, labour hire, shoreline clean-up, and site management equipment) and/or resources and should be tested regularly.
- TRPs for RPAs along with other relevant plans, procedures and support documents need to be in place for Operational and Support functions. These should be reviewed and updated regularly.

In addition, a number of assumptions are required to estimate the response need for shoreline clean-up. These assumptions have been described in the table below.

**Table 5-13: Response Planning Assumptions – Shoreline Clean-up**

| **Response planning assumptions: Shoreline clean-up** | |
|---|---|
| **Manual shoreline clean-up operation (Phase 2)** | 1 x manual shoreline clean-up operation (Phase 2) may include:<br>• 1–2 x trained supervisor<br>• 8–10 x personnel/labour hire<br>• Supporting equipment for manual clean-up including rakes, shovels, plastic bags etc. |
| **Physical properties** | **<u>Surface Threshold for Response Planning</u>**<br>• Lower – 100 g/m$^2$ – 100% coverage of 'stain' – cannot be scratched off easily on coarse sediments or bedrock<br>• Optimum – 250 g/m$^2$ – 25% coverage of 'coat' – can be scratched off with a fingernail on coarse sediments<br>In the event of a real incident, operational monitoring will be undertaken from the outset of a spill whether or not these thresholds have been reached. |
| **Efficiency**<br>**(m$^3$ oil recovered per person per day)** | Manual shoreline clean-up (Phase 2) – approx. 0.25–1 m$^3$ oil recovered per person per 10 hr day is based on moderate to high coverage of oil (100 g/m$^2$–1000 g/m$^2$) with manual removal using shovels/rakes, etc. from studies of previous response operations and exercises |

**Table 5-14: Shoreline Cleanup techniques and recommendations**

| Technique | Description | Shoreline type | | Application |
|---|---|---|---|---|
| | | Recommended | Not recommended | |
| Natural recovery | Allowing shoreline to self-clean; no intervention undertaken. | Remote and inaccessible shorelines for personnel, vehicles and machinery.<br>Other clean-up techniques may cause more damage than allowing the shoreline to naturally recover.<br>Natural recovery may be recommended for areas with mangroves and coral reefs due to their sensitivity to disturbance from other shoreline clean-up techniques.<br>High-energy shorelines: where natural removal rates are high, and hydrocarbons will be removed over a short timeframe. | Low-energy shorelines: these areas tend to be where hydrocarbon accumulates and penetrates soil and substrates. | May be employed, if the operational NEBA identifies that other clean-up techniques will have a negligible or negative environmental impact on the shoreline.<br>May also be used for buried or reworked hydrocarbons where other techniques may not recover these. |
| Manual recovery | Use of manpower to collect hydrocarbons from the shoreline.<br>Use of this form of clean-up is based on type of shoreline. | Areas where shorelines may not be accessible by vehicles or machinery and personnel can recover hydrocarbons manually.<br>Where hydrocarbons have formed semi-solid to solid masses that can be picked up manually.<br>Areas where nesting and breeding fauna cannot or should not be disturbed. | Coral reef or other sensitive intertidal habitats, as the presence of a response may cause more environmental damage then allowing them to recover naturally.<br>For some high-energy shorelines such as cliffs and sea walls, manual recovery may not be recommended as it may pose a safety threat to responders. | May be used for sandy shorelines. Buried hydrocarbons may be recovered using shovels into small carry waste bags, but where possible the shoreline should be left to naturally recover to prevent any further burying of hydrocarbons (from general clean-up activities). |

| Technique | Description | Shoreline type<br>Recommended | Shoreline type<br>Not recommended | Application |
|---|---|---|---|---|
| Sorbents | Sorbent boom or pads used to recover fluid or sticky hydrocarbons. Can also be used after manual clean-up to remove any residues from crevices or from vegetation. | When hydrocarbons are free-floating close to shore or stranded onshore.<br>As a secondary treatment method after hydrocarbon removal and in sensitive areas where access is restricted. | Access for deploying and retrieving sorbents should not be through soft or sensitive habitats or affect wildlife. | Used for rocky shorelines.<br>Sorbent boom will allow for deployment from small shallow draught vessels, which will allow deployment close to shore where water is sheltered and to aid recovery.<br>Sorbents will create more solid waste compared with manual clean-up, so will be limited to clean rocky shorelines. |
| Vacuum recovery, flushing, washing | The use of high volumes of low-pressure water, pumping and/or vacuuming to remove floating hydrocarbons accumulated at shorelines. | Suited to rocky or pebble shores where flushing can remobilise hydrocarbons (to be broken up) and aid natural recovery.<br>Any accessible shoreline type from land or water. May be mounted on barges for water-based operations, on trucks driven to the recovery area, or hand-carried to remote sites.<br>Flushing and vacuum may be useful for rocky substrate.<br>Medium- to high-energy shorelines where natural removal rates are moderate to high.<br>Where flushed hydrocarbons can be recovered to prevent further oiling of shorelines. | Areas of pooled light, fresh hydrocarbons may not be recoverable via vacuum due to fire and explosion risks.<br>Shorelines with limited access.<br>Flushing and washing not recommended for loose sediments.<br>High-energy shorelines where access is restricted. | High volume low pressure (HVLP) flushing and washing into a sorbent boom could be used for rocky substrate, if protection booming has been unsuccessful in deflecting hydrocarbons from these areas. |
| Sediment reworking | Movement of sediment to surf to allow hydrocarbons to be removed from the sediment and move sand via heavy machinery. | When hydrocarbons have penetrated below the surface.<br>Recommended for pebble/cobble shoreline types.<br>Medium- to high-energy shorelines where natural removal rates are moderate to high. | Low-energy shorelines as the movement of substrate will not accelerate the natural cleaning process.<br>Areas used by fauna which could potentially be affected by remobilised hydrocarbons. | Use of wave action to clean sediment: appropriate for sandy beaches where light machinery is accessible. |

| Technique | Description | Shoreline type | | Application |
|---|---|---|---|---|
| | | Recommended | Not recommended | |
| Vegetation cutting | Cutting vegetation to prevent oiling and reduce volume of waste and debris. | Vegetation cutting may be recommended to reduce the potential for wildlife being oiled.<br>Where oiling is restricted to fringing vegetation. | Access in bird-nesting areas should be restricted during nesting seasons.<br>Areas of slow-growing vegetation. | May be used on shorelines where vegetation can be safely cleared to reduce oiling. |
| Cleaning agents (National Plan registered Oil Spill Cleaning Agent – 'OSCA') | Application of chemicals such as dispersants to remove hydrocarbons. | May be used for manmade structures and where public safety may be a concern. | Natural substrates and in low-energy environments where sufficient mixing energy is not present. | Not recommended for shorelines. Could be used for manmade structures such as boat ramps. |

### 5.7.2. Environmental performance based on need

**Table 5-15: Environmental Performance – Shoreline Clean-up**

| **Environmental Performance Outcome** | | To remove bulk and stranded hydrocarbons from shorelines and facilitate shoreline amenity habitat recovery. | | |
|---|---|---|---|---|
| **Control measure** | | **Performance Standard** | | **Measurement Criteria (see Section 5.12)** |
| 25 | Shoreline responders | 25.1 | In liaison with WA DoT (for Level 2/3 incidents), deployment of 1 shoreline clean-up team to each contaminated RPA comprised of:<br>• 1-2 trained specialists per operation<br>• 8-10 personnel/labour hire<br>• Personnel sourced through resource pool upon request from the IMT.<br>• | 1, 2, 3A, 3B, 3C, 4 |
| | | 25.2 | Relevant TRPs will be identified in the first strike plan for activation within 48 hours of operational monitoring predicting impacts. | 1, 3A, 3C, 4 |
| | | 25.3 | Relevant TRPs available for shoreline contacted within 48 hours of operational monitoring predicting impacts. | 1, 3A, 3C, 4 |
| | | 25.4 | Clean-up operations for shorelines in line with results and recommendations from SCAT outputs | 1, 3A, 3B |
| | | 25.5 | All shorelines zoned and marked before clean-up operations commence to prevent secondary contamination and minimise the mixing of clean and oiled sediment and shoreline substrates | |
| | | 25.6 | In liaison with WA DoT (for Level 2/3 incidents), Mmobilise and deploy up to 1 shoreline clean-up operations by Day 5. | 1, 2, 3A, 3C, 4 |
| | | 25.7 | In liaison with WA DoT (for Level 2/3 incidents), Mmobilise and deploy up to 4 shoreline clean-up operations by Week 2. | |
| | | 25.8 | In liaison with WA DoT (for Level 2/3 incidents), Mmobilise and deploy up to 1 shoreline clean-up operations where operational monitoring predicts accumulations >100 g/m$^2$ within 48 hours of operational monitoring predicting impacts. | 1, 2, 3A, 3C, 4 |
| | | 25.9 | The safety of shoreline response operations will be considered and appropriately managed. During shoreline clean-up operations:<br>• All personnel in a response will receive an operational/safety briefing before commencing operations<br>• Gas monitoring and site entry protocols will be used to assess safety of an operational area before allowing access to response personnel | 1, 3B, 4 |
| | | 25.10 | Open communication line to be maintained between IMT and infield operations to ensure awareness of progress against plan(s) | 1, 3A, 3B |
| 26 | Shoreline clean up equipment | 26.1 | Contract in place with 3rd party providers to access equipment. | 1, 3A, 3C, 4 |
| | | 26.2 | Equipment mobilised from closest stockpile within 48 hours. | |
| | | 26.3 | Supplementary equipment mobilised from State, AMOSC, AMSA stockpiles within 48 hours. | 1, 3C, 3D, 4 |
| | | 26.4 | Supplementary equipment mobilised from OSRL within 72 hours. | |
| 27 | Management of Environmental Impact of the response risks | 27.1 | If vessels are required for access, anchoring locations will be selected to minimise disturbance to benthic primary producer habitats. Where existing fixed anchoring points are not available, locations will be selected to minimise impact to nearshore benthic environments with a preference for areas of sandy seabed where they can be identified | 1 |
| | | 27.2 | Shallow draft vessels will be used to access remote shorelines to minimise the impacts associated with seabed disturbance on approach to the shorelines | |
| | | 27.3 | Vehicular access will be restricted on dunes, turtle nesting beaches an in mangroves | |
| | | 27.4 | Removal of vegetation will be limited to moderately or heavily oiled vegetation | |

| | | | | |
|---|---|---|---|---|
| | | 27.5 | Oversight by trained personnel who are aware of the risks | |
| | | 27.6 | Trained unit leader's brief personnel of the risks prior to operations | |

The resulting shoreline clean-up capability has been assessed against the WCCS. The range of techniques provide an ongoing approach to shoreline clean-up at identified RPAs. Woodside's capability can cover all required shoreline clean-up operations for the PAP.

Whilst modelling predicts shoreline contact from day 7 at Barrow Island (MEE-05), Woodside is satisfied that the current capability is managing risks and impacts to ALARP.

The capability available meets the need identified for this activity. The shoreline clean-up capability has the following expected performance (if required during a response):

- Woodside has the capacity to mobilise and deploy up to 15-20 shoreline clean-up teams (approximately 150-200 responders in total) by week 4 at up to 5 RPAs using existing labour hire contracts with Woodside, AMOSC, Core Group, AMSA, WA DoT and OSRL team leads.
- Assessment of response capability indicates that for a worst-case scenario the actual teams required would meet the available capability and the response would be completed by Month 2 (MEE-05) and Month 4 (MEE-01).
- Woodside has considered deployment of additional personnel to undertake shoreline clean-up operations but is satisfied that the identified level of resource is balanced between cost, time and effectiveness. The most significant constraint on expanding the scale of response operations is accommodation in the Exmouth to Port Hedland region and transport of personnel and management of response generated waste. From previous assessment of accommodation in the region, Woodside estimates that current accommodation can cater for a range of 500-700 personnel per day for an ongoing operation.
- TRPs have been developed for all identified RPAs predicted to be impacted in less than 14 days excepting international locations.
- Woodside has assessed the existing capability available and considered potential alternative, additional and improved control measures. Where control measures have been selected and implemented, they are included in Section 6.7
- No further control measures that may result in an increased environmental benefit that involve moderate to significant cost and/or dedication of resources have been adopted as the limited scale and timeframe for deployment of this technique does not justify the excessive costs of identified alternate, improved or additional controls.

## 5.8. Waste Management

Waste management is considered a support technique to wildlife response, containment and recovery and shoreline clean-up. Waste generated and collected during the response that will require handling, management and disposal may consist of:

- Liquids (hydrocarbons and contaminated liquids) collected during wildlife response, containment and recovery and shoreline clean-up, and/or
- Solids/semi-solids (oily solids, garbage, contaminated materials) and debris (e.g. seaweed, sand, woods, and plastics) collected during wildlife response, containment and recovery and shoreline clean-up.

Expected waste volumes during an event are likely to vary depending on oil type, volume released, response techniques employed and how weathering of hydrocarbons. Waste management, handling and capacity should be scalable to ensure continuous response operations can be maintained.

All waste management activities will follow the Environment Protection (Controlled Waste) Regulations 2004 and the waste will be managed to minimise final disposal volumes. Waste treatment techniques will consider contaminated solids treatment to allow disposal to landfill and solids with high concentrations of hydrocarbon will be treated and recycled where possible or used in clean fill if suitable.

The waste products would be transported from response locations to the nearest suitable staging area/waste transfer station for treatment, disposal or recycling. Waste will be transferred with appropriately licensed vehicles. Containers will be available for temporary waste storage and will be:

- labelled with the waste type
- provided with appropriate lids to prevent waste being blown overboard
- bunded if storing liquid wastes.
- processes will be in place for transfers of bulk liquid wastes and include:
  - inspection of transfer hose undertaken prior to transfer
  - watchman equipped with radio visually monitors loading hose during transfer
  - tank gauges monitored throughout operation to prevent overflow

The *Oil Spill Preparedness Waste Management Support Plan* details the procedures, capability and capacity in place between Woodside and its primary waste services contractor (Veolia Waste Management) to manage waste volumes generated from response activities.

### 5.8.1. Response need based on predicted consequence parameters

**Table 5-16: Response Planning Assumptions – Waste Management**

| Response planning assumptions: Waste management | |
|---|---|
| **Waste loading per m$^3$ oil recovered (multiplier)** | Containment & Recovery – approx. 10x multiplier for oily waste generated by containment and recovery operations |
| | Shoreline clean-up (manual) – approx. 5-10x multiplier for oily solid and liquid wastes generated by manual clean-up |
| | Oiled wildlife response – approx. 1 m$^3$ of oily liquid waste generated for each wildlife unit cleaned |

### 5.8.2. Environmental performance based on need

**Table 5-17: Environmental Performance – Waste Management**

| **Environmental Performance Outcome** | | To minimise further impacts, waste will be managed, tracked and disposed of in accordance with laws and regulations. | | |
|---|---|---|---|---|
| **Control measure** | | **Performance Standard** | | **Measurement Criteria (see Section 5.12)** |
| 28 | Waste Management | 28.1 | Contract with waste management services for transport, removal, treatment and disposal of waste | 1, 3A, 3B, 3C, 4 |
| | | 28.2 | Access to at least 675 m$^3$ of solid and liquid waste storage available within 5 days upon activation of 3rd party contract. | |
| | | 28.3 | Access to up to 120,000m$^3$ waste storage by end of Month 4. | |
| | | 28.4 | Decanting in accordance with National Plan guidelines to occur in daylight hours into the apex of the boom once hydrocarbon/water has settled in storage container. | |
| | | 28.5 | Recovered hydrocarbons and wastes will be transferred to licensed treatment facility for reprocessing or disposal. | |
| | | 28.6 | Teams will segregate liquid and solid wastes at the earliest opportunity. | |
| | | 28.7 | Waste management provider support staff available year-round to assist in the event of an incident with waste management as detailed in contract. | |
| | | 28.8 | Open communication line to be maintained between IMT and waste management services to ensure the reliable flow of accurate information between parties. | 1, 3A, 3B |
| | | 28.9 | Waste management to be conducted in accordance with Australian laws and regulations | 1, 3A, 3B, 3C, 4 |
| | | 28.10 | Waste management services available and employed during response | |

The resulting waste management capability has been assessed against the WCCS. The range of techniques provide an ongoing approach to waste management at identified RPAs.

Given the largest shoreline volumes ashore are predicted for MEE-05 during Week 2 at a maximum volume of 113 m$^3$, 2,653 m$^3$ of waste is expected across all shoreline clean-up operations during the response, and the capability available exceeds the need identified.

It indicates that the waste management capability has the following expected performance:

- Offshore operations may generate up to an additional peak of 364 m$^3$ oily waste for one week (Week 4) for MEE-01, and up to 4,077 m$^3$ oily waste for one week (Week 1) off offshore operations for MEE-05.
- Shoreline and nearshore operations may generate up to 2,653 m$^3$ oily waste over 2 months of operations.
- Veolia has the capacity to treat up to 120,000 m$^3$ overall waste volumes. The waste management requirements are within Woodside's and its service providers existing capacity.
- Woodside has assessed the existing capability available and considered potential alternative, additional and improved control measures. Where control measures have been selected and implemented, they are included in Section 6.7.
- No further control measures that may result in an increased environmental benefit that involve moderate to significant cost and/or dedication of resources have been adopted as the current capability meets the need thus does not justify the excessive costs of identified alternate, improved or additional controls.

## 5.9. Oiled wildlife response

Woodside would implement a response in accordance with the *Oiled Wildlife Operational Plan*. This plan includes the process for the IMT to mobilise resources depending on the nature and scale of the spill. Oiled wildlife operations would be implemented with advice and assistance from the Oiled Wildlife Advisor from the Department of Biodiversity, Conservation and Attractions (DBCA).

Oiled wildlife response is undertaken in accordance with the Western Australian Oiled Wildlife Response Plan to ensure it is conducted in accordance with legislative requirements under the Animal Welfare Act 2002.

If there is a net environmental benefit, oiled wildlife operations will be conducted 24 hours per day to reduce the time for rehabilitation and release of oiled wildlife. Hazing and pre-emptive capture techniques to keep non-oiled animals away from contaminated habitat in instances where it is deemed appropriate will be conducted in accordance with the Western Australian Oiled Wildlife Response Plan, specifically vessels used in hazing/pre-emptive capture will approach fauna at slow speeds to ensure animals are not directed towards the oil and deterrence/hazing and pre-emptive capture will only be conducted if Woodside has licensed authority from DBCA and approval from the Incident Controller.

Shoreline access will be considered as part of the operational NEBA. Vehicular access would be restricted on dunes, turtle nesting beaches and in mangroves. Woodside retains specialist personnel to support and manage oiled wildlife operations, including trained and competent responders in Exmouth, Dampier and Perth. Additional personnel would be sourced through Woodside's arrangements to support an oiled wildlife response as required.

### 5.9.1. Response need based on predicted consequence parameters

The following statements identify the key parameters upon which a response need can be based:

- Modelling predicts the shortest time to shoreline contact on day 7 at Barrow Island (42 $m^3$, MEE-05).
- The offshore location of the release site is expected to initially result in low numbers of at-risk or impacted wildlife.
- As the surface oil approaches shorelines, potential for oiled wildlife impacts are likely to increase.
- It is estimated that an oiled wildlife response would be between Level 2 and Level 3, as defined in the WA OWRP.

**Table 5-18: Key at-risk species potentially in Priority Protection Areas and open ocean**

| Species | Open ocean | Montebello Islands | Barrow Island | Lowendal Islands | Pilbara Islands – Southern Islands Group | Muiron Islands | Ningaloo Coast and WHA | Exmouth Gulf | Shark Bay |
|---|---|---|---|---|---|---|---|---|---|
| Marine turtles | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Sea birds and migratory shorebirds | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Cetaceans – whales | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| Cetaceans – dolphins and porpoises | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Dugongs | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Whale sharks | ✓ | ✓ | ✓ | ✓ | | ✓ | | | |
| Sea snakes | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Sharks and rays | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

The oiled wildlife response technique targets key wildlife populations at risk within Commonwealth open waters and the nearshore waters as described in Section 4 of the EP. Responding to oiled wildlife consists of eight key stages, as described in Table 5-19 below.

**Table 5-19: Oiled wildlife response stages**

| Stage | Description |
|---|---|
| Stage 1: Wildlife first strike response | Gather situational awareness including potential wildlife assets at risk. |
| Stage 2: Mobilisation of wildlife resources | Resources include personnel, equipment and facilities. |
| Stage 3: Wildlife reconnaissance | Reconnaissance to identify potentially affected animals. |
| Stage 4: IAP wildlife sub-plan development | The IAP includes the appropriate response options for oiled wildlife, including wildlife priorities for protection from oiling; deterrence measures (see below); and recovery and treatment of oiled wildlife; resourcing of equipment and personnel.<br>It includes consideration of deterrence practices such as 'hazing' to prevent fauna from entering areas potentially contaminated by spilled hydrocarbons, as well as dispersing, displacing or relocating fauna to minimise/prevent contact and provide time for clean-up. |
| Stage 5: Wildlife rescue and staging | This includes the different roles of finding oiled wildlife, capturing wildlife, and holding and/or transportation of wildlife to oiled wildlife facilities. |
| Stage 6: Establishment of an oiled wildlife facility | Treatment facilities would be required for the first-aid, cleaning and rehabilitation of affected animals.<br>A vessel-based 'on-water' facility would likely need to be established to enable stabilisation of oiled wildlife before transport to a suitable treatment facility.<br>Suitable staging sites in Dampier and Exmouth have been identified in the draft Regional OWROP, should a land-based site be required. |
| Stage 7: Wildlife rehabilitation | Considerations include a suitable rehabilitation centre and personnel, wildlife housing, record keeping and success tracking. |
| Stage 8: Oiled wildlife response termination | Once a decision has been made to terminate operations, the Incident Controller will stand down individual participating and supporting agencies. |

Reconnaissance and primary response would be done during operational monitoring and surveillance activities. Where marine fauna are observed on water or transiting near or within the spill area, observations would be recorded through surveillance records. The shoreline assessments would be done in accordance with OM05, which would be used as a further tool to identify fauna and habitats contacted by hydrocarbons.

Staging sites would be established as forward bases for shoreline- or vessel-based field teams. Once recovered to a staging site, wildlife would be transported to the designated oiled wildlife facility or a temporary holding centre (before being transported to the oiled wildlife facility). Temporary holding centres are required when there is significant distance between a staging site and the oiled wildlife facility, to enable stabilisation of oiled animals. The oiled wildlife facility is the primary location where animals would be housed and treated. Sites proposed for staging a regional oiled wildlife response in Dampier and Exmouth have been identified.

To deploy a response that is appropriate to the nature and scale of the event, as well as scalable over time, Woodside would implement an oiled wildlife response in consultation with DBAC and use the capability outlined in the WA OWRP, with additional capability if required (e.g. volunteers) accessible through Woodside's *People & Global Capability Surge Labour Requirement Plan*.

The WA OWRP provides indicative oiled wildlife response levels (Table 5-20) and the resources likely to be needed at each increasing level of response.

**Table 5-20: Indicative oiled wildlife response level (adapted from the WA OWRP, 2014)**

| Oiled wildlife response Level | Indicative personnel numbers | Indicative duration | Indicative number of birds (non-threatened species) | Indicative number of birds (threatened species) | Turtles (hatchlings, juveniles, adults) | Cetaceans | Pinnipeds | Dugongs |
|---|---|---|---|---|---|---|---|---|
| Level 1 | 6 | < 3 days | 1–2/day<br>< 5 total | None | None | None | None | None |
| Level 2 | 26 | > 4–14 days | 1–5/day<br>< 20 total | None | < 20 hatchlings<br>No juv/adults | None | None | None |
| Level 3 | 59 | > 4–14 days | 5–10/day | 1–5/day<br>< 10 total | < 5 juv/adults<br>< 50 hatchlings | None | < 5 | None |
| Level 4 | 77 | > 4–14 days | 5–10/day<br>< 200 total | 5–10/day | < 20 juv/adults<br>< 500 hatchlings | < 5, or known habitats affected | 5–50 | Habitat affected only |
| Level 5 | 116 | > 4–14 days | 10–100/day<br>> 200 total | 10–50/day | > 20 juv/adults<br>> 500 hatchlings | < 5 dolphins | > 50 | Dugongs oiled |
| Level 6 | 122 | > 4–14 days | > 100/day | 10–50/day | > 20 juv/adults<br>> 500 hatchlings | > 5 dolphins | > 50 | Dugongs oiled |

### 5.9.2. Environmental performance based on need

**Table 5-21: Environmental Performance – Oiled Wildlife Response**

| **Environmental Performance Outcome** | | Oiled Wildlife Response is conducted in accordance with the Western Australian Oiled Wildlife Response Plan (WAOWRP) to ensure it is conducted in accordance with legislative requirements to house, release or euthanise fauna under the Animal Welfare Act 2002. | | |
|---|---|---|---|---|
| **Control measure** | | **Performance Standard** | | **Measurement Criteria (see Section 5.12)** |
| 29 | Wildlife response equipment | 29.1 | Contracted capability to treat 100 individual fauna for immediate mobilisation to Response Priority Areas (RPAs) | 1, 3A, 3B, 3C, 4 |
| | | 29.2 | Contracted capability to treat up to an additional 250 individual fauna within a five-day period. | |
| | | 29.3 | National plan access to additional resources under the guidance of the WA DoT (up to a Level 5 oiled wildlife response as specified in the OWRP), with the ability to treat about 600 individual fauna by the time hydrocarbons contact the shoreline. | 1, 3C, 4 |
| | | 29.4 | Vessels used in hazing/pre-emptive capture will approach fauna at slow speeds to ensure animals are not directed towards the hydrocarbons. | 1, 3A, 3B, 4 |
| | | 29.5 | Facilities for the rehabilitation of oiled wildlife are operational 24/7 as per WAOWRP. | 1, 3A, 4 |
| 30 | Wildlife responders | 30.1 | 4 wildlife divisional commanders to lead the oiled wildlife operations who have completed an Oiled Wildlife Response Management course | 1, 2, 3B |
| | | 30.2 | Wildlife responders to be accessed through resource pool and additional agreements with specialist providers | 1, 2, 3A, 3B, 3C, 4 |
| | | 30.3 | Oiled wildlife operations (including hazing) would be implemented with advice and assistance from the Oiled Wildlife Advisor from the DBCA. | 1 |
| | | 30.4 | Open communication line to be maintained between IMT and infield operations to ensure awareness of progress against plan(s) | 1, 3A, 3B |

The resulting wildlife response capability has been assessed against the WCCS. The range of techniques provide an ongoing approach to response at identified RPAs.

Under optimal conditions, during the subsea or surface release the capability available meets the need identified. It indicates that, the wildlife response capability has the following expected performance:

- Mobilisation and deployment of approximately 3 wildlife collection teams by Week 1 at Barrow Islands, Montebello Islands and Lowendal Islands RPAs (MEE-05).
- Mobilisation and deployment of approximately 1 wildlife collection teams by Week 3 at Pilbara Islands – Southern Islands Group RPA (MEE-05).
- Mobilisation and deployment of approximately 2 wildlife collection teams by Week 6 at Ningaloo Coast North and WHA and Muiron Islands and MMA-WHA RPAs (MEE-05).
- Mobilisation and deployment of 1 central wildlife treatment and rehabilitation locations at Dampier or Exmouth in accordance with WA OWRP, if required.

Wildlife collection operations would be expected to be completed by Month 2 based on the shoreline impacts predicted. Additional capability could be deployed but given modelling predicts that impacts will desist after the second month, additional personnel are unlikely to increase the net environmental benefit and this capability meets the need.

Woodside would establish a wildlife collection point at the RPA for identified oiled wildlife collection and sorting. From these locations, recovered wildlife would be transported to a central treatment location at Dampier or Exmouth.

## 5.10. Scientific monitoring

A scientific monitoring program (SMP) would be activated following a Level 2 or 3 unplanned hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors. This would consider receptors at risk (ecological and socio-economic) for the entire predicted Environment that Maybe Affected (EMBA) and in particular, any identified Pre-emptive Baseline Areas (PBAs) for the worst-case credible spill scenarios or other identified unplanned hydrocarbon releases associated with the operational activities (refer to Table 2-1).

It should be noted that the resulting SMP receptor locations differ from the Response Protection Areas (RPAs) presented and discussed in Section 3 of this document due to the applicability of different hydrocarbon threshold levels. The SMP would be informed by the data collected via the operational monitoring program (OMP), however, it differs from the OMP in being a long-term program independent of, and not directing, the operational oil spill response or monitoring of impacts from response activities (refer to ANNEX B: Operational Monitoring Activation and Termination Criteria) for operational monitoring overview).

Key objectives of the Woodside oil spill SMP are:

- assess the extent, severity and persistence of the environmental impacts from the spill event
- monitor subsequent recovery of impacted key species, habitats and ecosystems.

The SMP comprises ten targeted environmental monitoring programs to assess the condition of a range of physico-chemical (water and sediment) and biological (species and habitats) receptors including EPBC Act listed species, environmental values associated with protected areas and socio-economic values, such as fisheries. The ten SMPs are as follows:

- SM01 – Assessment of the presence, quantity and character of hydrocarbons in marine waters (linked to OM01 to OM03)
- SM02 – Assessment of the presence, quantity and character of hydrocarbons in marine sediments (linked to OM01 and OM05)
- SM03 – Assessment of impacts and recovery of subtidal and intertidal benthos
- SM04 – Assessment of impacts and recovery of mangroves/saltmarsh habitat
- SM05 – Assessment of impacts and recovery of seabird and shorebird populations
- SM06 – Assessment of impacts and recovery of nesting marine turtle populations
- SM07 – Assessment of impacts to pinniped colonies including haul-out site populations
- SM08 – Desktop assessment of impacts to other non-avian marine megafauna
- SM09 – Assessment of impacts and recovery of marine fish (linked to SM03)
- SM10 – Assessment of physiological impacts to important fish and shellfish species (fish health and seafood quality/safety) and recovery.

These SMPs have been designed to cover all key tropical and temperate habitats and species within Australian waters and broader, if required.

### 5.10.1. Scientific Monitoring Deployment Considerations

**Table 5-22: Scientific monitoring deployment considerations**

| **Scientific Monitoring Deployment Considerations** | |
|---|---|
| Existing baseline studies for sensitive receptor locations predicted to be affected by a spill | PBAs of the following two categories:<br>• PBAs within the predicted <10-day hydrocarbon contact time prediction: The approach is to conduct a desktop review of available and appropriate baseline data for key receptors for locations (if any) that are potentially impacted within 10 days of a spill and look to conduct baseline data collection to address data gaps and demonstrate spill response preparedness. Planning for baseline data acquisition is typically commenced pre-PAP and execution of studies undertaken with consideration of weather, receptor type, seasonality and temporal assessment requirements.<br>• PBAs >10 days' time to predicted hydrocarbon contact in the event of an unplanned hydrocarbon release (from the facility operational activities). SMP activation (as per the Ohka Floating Production Storage and Offloading Facility Operations FSP) directs the SMP team to follow the steps outlined in the SMP Operational Plan. The steps include: checking the availability and type of existing baseline data, with particular reference to any PBAs identified as >10 days to hydrocarbon contact. Such information is used to identify response phase PBAs and plan for the activation of SMPs for pre-emptive (i.e. pre-hydrocarbon contact) baseline assessment. |
| Pre-emptive Baseline in the event of a spill | Activation of SMPs in order to collect baseline data at sensitive receptor locations with predicted hydrocarbon contact time >10 days (as documented in ANNEX C: Oil Spill Scientific monitoring Program). |
| Survey platform suitability and availability | In the event of the SMP activation, suitable survey platforms are available and can support the range of equipment and data collection methodologies to be implemented in nearshore and offshore marine environments. |
| Trained personnel to implement SMPs suitable and available. | Access to trained personnel and the sampling equipment contracted for scientific monitoring via a dedicated scientific monitoring program standby contract. |
| Met-ocean conditions | The following met-ocean conditions have been identified to implement SMPs:<br>• Waves <1 m for nearshore systems<br>• Waves <1.5 m for offshore systems<br>• Winds <20 knots<br>• Daylight operations only<br>SMP implementation will be planned and managed according to HSE risk reviews and the met-ocean conditions on a day to day basis by SMP operations. |

### 5.10.2. Response planning assumptions

**Table 5-23: Scientific monitoring response planning assumptions**

| **Response Planning Assumptions** | |
|---|---|
| PBAs | PBAs identified through the application of defined hydrocarbon impact thresholds during the Quantitative Spill Risk Assessment process and a consideration of the minimum time to contact at receptor locations fall into two categories:<br>• PBAs for which baseline data exist or are planned for and data collection may commence pre-PAP (≤ 10 days minimum time to contact).<br>• PBAs (> 10 days minimum time to contact) for which baseline data may be collected in the event of an unplanned hydrocarbon release. Response phase PBAs are prioritised for SMP activities due to vulnerability (i.e. time to contact and environmental sensitivity) to potential impacts from hydrocarbon contact and an identified need to acquire baseline data. |

| **Response Planning Assumptions** | |
|---|---|
| | Time to hydrocarbon contact of >10 days has been identified as a minimum timeframe within which it is feasible to plan and mobilise applicable SMPs and commence collection of baseline (pre-hydrocarbon contact) data, in the event of an unplanned hydrocarbon release from the Ohka Floating Production Storage and Offloading Facility Operations.<br><br>PBAs for the Ohka FPSO Facility Operations are identified and listed in ANNEX D: Scientific Monitoring Program and Baseline Studies for the Petroleum Activities Program, Table D-1. The PBAs together with the situational awareness (from the operational monitoring) are the basis for the response phase SMP planning and implementation. |
| Pre-Spill | A review of existing baseline data for receptor locations with potential to be contacted by surface or entrained hydrocarbons at environmental thresholds within ≤10 days has identified the following:<br><br>• Barrow Island<br>• Montebello Islands<br>• Lowendal Islands[9]<br>• Montebello State Marine Park<br>• Glomar Shoals[10]<br>• Rankin Bank[9]<br><br>For example, adequate baseline data are available for Rankin Bank and Glomar Shoals as last surveyed (benthic communities and fish assemblages) in November 2018 (Currey-Randall et al, 2019), refer to ANNEX D: Scientific Monitoring Program and Baseline Studies for the Petroleum Activities Program Table D-2.<br><br>Australian Marine Parks (AMPs) potentially affected includes:<br><br>• Montebello AMP<br><br>All the AMPs are located in offshore waters where hydrocarbon exposure is possible on surface waters and in the water column. |
| **In the Event of a Spill** | Locations with >10 days to hydrocarbon contact, as well as the wider area, will be investigated and identified by the SMP team (in the Environment Unit of the Incident Control Centre (ICC)) as the spill event unfolds and as the situational awareness provided by the OMPs permits delineation of the spill affected area (for example, updates to the spill trajectory tracking). The full list is presented in ANNEX D: Scientific Monitoring Program and Baseline Studies for the Petroleum Activities Program, based on the PAP worst-case credible spill scenario(s) (Table 2-1).<br><br>To address the initial focus in a response phase SMP planning situation, receptor locations predicted to be contacted between >10 days and 20 days have been identified as follows:<br>• Ningaloo Coast north[11]<br>• Muiron Islands<br>• Pilbara Southern Island Group<br>• Ningaloo AMP<br>• Gascoyne AMP<br>• Argo Rowley Terrace AMP |

[9] ≤10 days time to contact is specifically applicable to Barrow Island and Montebello Islands; however, the Lowendal Islands are being included as a precautionary approach, given the spill modelling does not encompass the complex hydrographic processes for these islands groups.
[10] Floating oil will not accumulate on submerged features and at open ocean locations, therefore, no surface contact is possible with only entrained hydrocarbon contact predicted at Rankin Bank and Glomar Shoals ≤10 days.
[11] Ningaloo Coast and Muiron Islands includes the WHA, State Marine Park and Marine Management Area.

| Response Planning Assumptions | |
|---|---|
| | In the event key receptors within geographic locations that are potentially impacted after 10 days following a spill event or commencement of the spill and where adequate and appropriate baseline data are not available, there will be a response phase effort to collect baseline data for the following purposes:<br><br>i. Priority will be given to the collection of baseline data for receptors predicted to be within the spill affected area prior to hydrocarbon contact. The process is initiated with the investigation of available baseline and time to hydrocarbon contact (>10 days which is sufficient time to mobilise SMP teams and start to acquire data before hydrocarbon contact). With reference to the Ohka FPSO Facility Operations, priority would be focused on the Ningaloo Coast north and Muiron Islands.<br>ii. Highly sensitive and/or valued habitats and communities in coastal waters will be prioritised for pre-emptive baseline surveys over open water areas of AMPs e.g. Gascoyne AMP.<br>iii. Collect baseline data for receptors predicted to be outside the spill affected area, so reference datasets for comparative analysis with impacted receptor types, can be assessed post-spill. |
| Baseline Data | A summary of the spill affected area and receptor locations as defined by the EMBA for the PAP worst-case credible spill MEE 1 and 5 is are presented Ohka Floating Production Storage and Offloading Facility Operations EP (Section 6).<br><br>The key receptors at risk by location and corresponding SMPs based on the ecological EMBA for the PAP are presented in ANNEX D: Scientific Monitoring Program and Baseline Studies for the Petroleum Activities Program, as per the PAP worst-case credible spill MEE 1 and 5. This matrix maps the receptors at risk with their location and the applicable SMPs that may be triggered in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors. Receptor locations and applicable SMPs are colour coded to highlight possible time to contact based on receptor locations identified as PBAs.<br><br>The status of baseline studies relevant to the PAP are tracked by Woodside through the maintenance of a Corporate Environment Environmental Baseline Database (managed by the Woodside Environmental Science team), as well as accessing external databases such as IGEM (Industry-Government Environmental Metadata database) (refer to ANNEX C: Oil Spill Scientific monitoring Program). |

### 5.10.3. Summary – scientific monitoring

The resulting scientific monitoring capability has been assessed against the PAP worst-case credible spill scenarios. The range of techniques provide an ongoing approach to monitoring operations to assess and evaluate the scale and extent of impacts. All known reasonably practicable control measures have been adopted with the cost and organisational complexity of these options determined to be moderate and the overall delivery effectiveness determined to be medium. The SMP's main objectives can be met, with no additional, alternative or improved control measures providing further benefit.

### 5.10.4. Response planning: need, capability and gap – scientific monitoring

The receptor locations identified in ANNEX D: Scientific Monitoring Program and Baseline Studies for the Petroleum Activities Program provide the basis of the SMPs likely to be selected and activated. Once the Woodside SMP Delivery team and the SMP standby contractor have been stood up and the exact nature and scale of the spill becomes known, the SMPs to be activated will be confirmed as per the process set out in the SMP Operational Plan.

<u>Scope of SMP Operations in the event of a hydrocarbon spill:</u>

Receptor locations of interest for the SMP during the response phase are:

- Ningaloo Coast North
- Muiron Islands

Documented baseline studies are available for certain sensitive receptor locations including the Barrow Island, Montebello Islands, Lowendal Islands, Glomar Shoals, Rankin Bank and Montebello AMP (ANNEX D: Scientific Monitoring Program and Baseline Studies for the Petroleum Activities Program, Table D-2). The SMP approach in the response phase would still deploy SMP teams to maximise the opportunity to collect pre-emptive baseline data at sensitive receptor locations, i.e., the sections of the Ningaloo Coast not immediately exposed to hydrocarbons. As the exact locations where hydrocarbon contact occurs may be unpredictable, SM01 would be mobilised as a priority to be able to detect hydrocarbons and track the leading edge of the spill to verify where hydrocarbon contact occurs which will assist with where SMP resources are a priority need to obtain pre-emptive baseline data.

The option analysis in Section 6.10 considers ways to reduce the gap by considering alternate, additional, and/or improved control measures on each selected response strategy.

### 5.10.5. Environmental performance based on need

**Table 5-24: Scientific monitoring**

| **Environmental Performance Outcome** | | Woodside can demonstrate preparedness to stand up the SMP to quantitatively assess and report on the extent, severity, persistence and recovery of sensitive receptors impacted from the spill event. | | |
|---|---|---|---|---|
| **Control measure** | | **Performance Standard** | | **Measurement Criteria** |
| 31 | • Woodside has an established and dedicated SMP team comprising the Environmental Science Team and additional Environment Advisers within the Health Safety Environment and Quality (HSEQ) Function. | 31.1 | SMP team comprises a pool of competent Environment Advisers (stand up personnel) who receive training regarding the SMP, SMP activation and implementation of the SMP on an annual basis. | • Training materials.<br>• Training attendance registers.<br>• Process that maps minimum qualification and experience with key SMP role competency and a tracker to manage availability of competent people for the SMP team including redundancy and rostering. |
| 32 | • Woodside have a SMP standby contractor to provide scientific personnel to resource a base capability of one team per SMP (SM01-SM10, see Table C-2, ANNEX C: Oil Spill Scientific monitoring Program) as detailed in Woodside's SMP standby contractor Implementation Plan, to implement the oil spill scientific monitoring programs. The availability of relevant personnel is reported to Woodside on a monthly basis via a simple report on the base-loading availability of people for each of the SMPs comprising field work for data collection (SMP resourcing report register).<br>• In the event of a spill and the SMP is activated, the base-loading availability of scientific personnel will be provided by SMP standby contractor for the individual SMPs and where gaps in resources are identified, SMP standby contractor/Woodside will seek additional personnel (if needed) from other sources including Woodside's Environmental Services Panel. | 32.1 | Woodside maintains the capability to mobilise personnel required to conduct scientific monitoring programs SM01 – SM10 (except desktop based SM08):<br>• Personnel are sourced through the existing standby contract with SMP standby contractor, as detailed within the SMP Implementation Plan.<br>• Scientific Monitoring Program Implementation Plan describes the process for standing up and implementing the scientific monitoring programs.<br>• SMP team stand up personnel receive training regarding the stand up, activation and implementation of the SMP on an annual basis. | • OSPU Internal Control Environment tracks the quarterly review of the Oil Spill Contracts Master.<br>• SMP resource report of personnel availability provided by SMP contractor on monthly basis (SMP resourcing report register).<br>• Training materials.<br>• Training attendance registers.<br>• Competency criteria for SMP roles.<br>• SMP annual arrangement testing and reporting. |

| | | | | |
|---|---|---|---|---|
| 33 | • Roles and responsibilities for SMP implementation are captured in Table C-1 (ANNEX C: Oil Spill Scientific monitoring Program) and the SMP team (as per the organisational structure of the ICC) is outlined in SMP Operational Plan. Woodside has a defined Crisis and Incident Management structure including Source Control, Operations, Planning and Logistics functions to manage a loss of well control response.<br>• SMP Team structure, interface with SMP standby contractor (standby SMP contractor) and linkage to the ICC is presented in Figure C-1, ANNEX C: Oil Spill Scientific monitoring Program.<br>• Woodside has a defined Command, Control and Coordination structure for Incident and Emergency Management that is based on the AIIMS framework utilised in Australia.<br>• Woodside utilises an online Incident Management Information System (IMIS) to coordinate and track key incident management functions. This includes specialist modelling programs, geographic information systems (GIS), as well as communication flows within the Command, Control and Coordination structure.<br>• SMP activated via the FSP.<br>• Step by step process to activation of individual SMPs provided in the SMP Operational Plan.<br>• All decisions made regarding SMP logged in the online IMIS (SMP team members trained in using Woodside's online Incident Management System).<br>• SMP component input to the ICC IAP as per the identified ICC timed sessions and the SMP IAP logged on the online IMIS.<br>• Woodside Environmental Science Team provide awareness training on the activation and standup of the Scientific Monitoring Programme (SMP) for the Environment Advisers in Woodside who are listed on the SMP team on an annual basis.<br>• Woodside Environmental Science Team provide awareness training on the activation and standup of the Scientific Monitoring Programme (SMP) for the SMP standby contractor.<br>• Woodside Environmental Science Team co-ordinates an annual SMP arrangement testing exercise which the SMP standby contractor. SMP team participates in since 2016 (report on 2016 SMP simulation: and SMP standby contractor the SMP | 33.1 | • Woodside have established an SMP organisational structure and processes to stand up and deliver the SMP. | • SMP Oil Spill Scientific Monitoring Operational Plan.<br>• SMP Implementation Plan.<br>• SMP annual arrangement testing and reporting. |

| | | | | |
|---|---|---|---|---|
| | arrangements (people and equipment availability) tested annually since 2016. | | | |
| 34 | • Chartered and mutual aid vessels.<br>• Suitable vessels would be secured from the Woodside support vessels, regional fleet of vessels operated by Woodside and other operators and the regional charter market.<br>• Vessel suitability will be guided by the need to be equipped to operate grab samplers, drop camera systems and water sampling equipment (the individual vessel requirements are outlined in the relevant SMP methodologies (refer to Table C-2, ANNEX C: Oil Spill Scientific monitoring Program).<br>• Nearshore mainland waters could use the same approach as for open water. Smaller vessels may be used where available and appropriate. Suitable vehicles and machinery for onshore access to nearshore SMP locations would be provided by Woodside's transport services contract and sourced from the wider market.<br>• Dedicated survey equipment requirements for scientific monitoring range from remote towed video and drop camera systems to capture seabed images of benthic communities to intertidal/onshore surveying tools such as quadrats, theodolites and spades/trowels, cameras and binoculars (specific survey equipment requirements are outlined in the relevant SMP methodologies (refer to Table C-2, ANNEX C: Oil Spill Scientific monitoring Program)). Equipment would be sourced through the existing SMP standby contract with SMP standby contractor for SMP resources and if additional surge capacity is required this would be available through the other Woodside Environmental Services Panel Contractors and specialist contractors. SMP standby contractor can also address equipment redundancy through either individual or multiple suppliers. MoUs are in place with one marine sampling equipment companies and one analytical laboratory (SMP resourcing report register).<br>• Availability of SMP equipment for offshore/onshore scientific monitoring team mobilisation is within one week to ten days of the commencement of a hydrocarbon release. This meets the SMP mobilisation lead time that will support meeting the response objective of 'acquire, where practicable, the environmental baseline | 34.1 | Woodside maintains standby SMP capability to mobilise equipment required to conduct scientific monitoring programs SM01 – SM10 (except desktop based SM08):<br>• Equipment are sourced through the existing standby contract with SMP standby contractor, as detailed within the SMP Implementation Plan. | • OSPU Internal Control Environment tracks the quarterly review of the Oil Spill Contracts Master.<br>• SMP standby monthly resource reports of equipment availability provided by SMP contractor (SMP resourcing report register).<br>• SMP annual arrangement testing and reporting. |

| | | | | |
|---|---|---|---|---|
| | data prior to hydrocarbon contact required to support the post-response SMP. | | | |
| 35 | Woodside's SMP approach addresses the pre-PAP acquisition of baseline data for PBAs with ≤10 days if required following a baseline gap analysis process. | 35.1 | • Annual reviews of environmental baseline data.<br>• PAP specific Pre-emptive Baseline Area baseline gap analysis. | • Annual review/update of Woodside Baseline Environmental Studies Database |

| | | | | |
|---|---|---|---|---|
| | Woodside maintains knowledge of Environmental Baseline data through:<br>• Documentation annual reviews of the Woodside Baseline Environmental Studies Database, and specific activity baseline gap analyses.<br>• Industry Government Environmental Meta-database (IGEM) Baseline Studies Database: http://www.igem.com.au/landing/ (Note – the IGEM password is documented in the SMP Operational Plan). | | | • Desktop review to assess the environmental baseline study gaps completed prior to EP submission.<br>• Accessing baseline knowledge via the SMP annual arrangement testing. |

| **Environmental Performance Outcome** | | SMP plan to acquire response phase monitoring targeting pre-emptive baseline data achieved | | |
|---|---|---|---|---|
| **Control measure** | | **Performance Standard** | | **Measurement Criteria** |
| 36 | Woodside's SMP approach addresses:<br>• Scientific data acquisition for PBAs >10 days to hydrocarbon contact and activated in the response phase and<br>• Transition into post-response SMP monitoring. | 36.1 | **Pre-emptive Baseline Area (PBA) baseline data acquisition in the response phase**<br><br>If baseline data gaps are identified for PBAs predicted to have hydrocarbon contact in >10 days, there will be a response phase effort to collect baseline data. Priority in implementing SMPs will be given to receptors where pre-emptive baseline data can be acquired or improved.<br><br>SMP team (within the Environment Unit of the ICC) contribute SMP component of the ICC Planning Function in development of the IAP. | • Response SMP plan.<br>• Woodside's online Incident Management System Records.<br>• SMP component of the Incident Action Plan. |
| | | 36.2 | **Post Spill contact**<br>For the receptors contacted by the spill in where baseline data are available, SMPs programs to assess and monitor receptor condition will be implemented post spill (i.e. after the response phase): | • SMP planning document.<br>• SMP Decision Log.<br>• IAPs. |

<table>
<tr><th colspan="2">Environmental Performance Outcome</th><td colspan="3">Implementation of the SMP (response and post-response phases).</td></tr>
<tr><th colspan="2">Control measure</th><th colspan="2">Performance Standard</th><th>Measurement Criteria</th></tr>
<tr><td rowspan="3">37</td><td rowspan="3"><ul><li>Scientific monitoring will address quantitative assessment of environmental impacts of a level 2 or 3 spill or any release event with the potential to contact sensitive environmental receptors. The SMP comprises ten targeted environmental monitoring programs.</li><li>SMP supporting documentation: (1) Oil Spill Scientific Monitoring Operational Plan; (2) SMP Implementation Plan and (3) SMP Process and Methodologies Guideline.</li><li>The Oil Spill Scientific Monitoring Operational Plan details the process of SMP selection, input to the IAP to trigger operational logistic support services. Methodology documents for each of the ten SMPs are accessible detailing equipment, data collection techniques and the specifications required for the survey platform support.</li><li>The SMP standby contractor holds a Woodside SMP implementation plan detailing activation processes, linkage with the Woodside SMP team and the general principles for the planning and mobilisation of SMPs to deliver the individual SMPs activated. Monthly resourcing report are issued by the SMP standby contractor (SMP resourcing report register). All SMP documents and their status are tracked via SMP document register.</li></ul></td><td>37.1</td><td>Implementation of SM01<br>SM01 will be implemented to assess the presence, quantity and character of hydrocarbons in marine waters during the spill event in nearshore areas.</td><td>Evidence SM01 has been triggered:<ul><li>Documentation as per requirements of the SMP Operational Plan.</li><li>Woodside’s online Incident Management System Records.</li><li>SMP component of the IAP.</li><li>SMP data records from field.</li></ul></td></tr>
<tr><td>37.2</td><td>Implementation of SM02-SM10<br>SM02-SM10 will be implemented in accordance with the objectives and activation triggers as per Table C-2 of ANNEX C: Oil Spill Scientific monitoring Program.</td><td>Evidence SMPs have been triggered:<ul><li>Documentation as per requirements of the SMP Operational Plan.</li><li>Woodside’s online Incident Management System Records.</li><li>SMP component of the IAP.</li><li>SMP Data records from field.</li></ul></td></tr>
<tr><td>37.3</td><td>Termination of SMP plans<br>The Scientific Monitoring Program will be terminated in accordance with termination triggers for the SMP’s detailed in Table C-2 of ANNEX C: Oil Spill Scientific monitoring Program, and the Termination Criteria Decision-tree for Oil Spill Environmental Monitoring (Figure C-3 of ANNEX C: Oil Spill Scientific monitoring Program):</td><td>Evidence of Termination Criteria triggered:<ul><li>Documentation and approval by relevant stakeholders to end SMPs for specific receptor types.</li></ul></td></tr>
</table>

## 5.11. Incident Management System

The Incident Management System is both a control measure and a measurement criteria. As a control measure the IMS function is to prompt, facilitate and record the completion of three key response planning processes detailed below. As a measurement criteria the IMS records the evidence of the timeliness of all response actions included in the environmental performance standards and the plans used of the PAP.

As the IMS does not directly remove hydrocarbons spilt into the marine environment there is no direct relationship to the response planning need.

### 5.11.1. Incident action planning

The ICC will be required to collect and interpret information from the scene of the incident to determine support requirements to the site-based IMT, develop an IAP and assist the IMT with the execution of that plan. The site-based IC may request the ICC to complete notifications internally within Woodside, to stakeholders and government agencies as required. Depending on the type and scale of the incident either the ICC Duty Manager (DM) or IC will be responsible for ensuring the development of the IAP. Incident Action Planning is an ongoing process that involves continual review to ensure techniques to control the incident are appropriate to the situation at the time.

### 5.11.2. Operational NEBA process

In the event of a response Woodside will confirm that the response techniques adopted at the time of EP/OPEP acceptance remain appropriate to reduce the consequences of the spill. This process verifies that there is a continuing net environmental benefit associated with continuing the response technique through the operational NEBA process. This process manages the environmental risks and impacts of response techniques during the spill response, an operational NEBA will be undertaken throughout the response, for each operational period.

The operational NEBA will consider the risks and benefits of conducting and response activity. For example, if vessels are required for access to nearshore or onshore areas, anchoring locations will be selected to minimise disturbance to benthic habitats. Vessel cleanliness would be commensurate with the receiving environment. The operational NEBA will consider the risks and benefits of conducting other response techniques.

The operational NEBA process is also used to terminate a response. Using data from operational and scientific monitoring activities the response to a hydrocarbon spill will be terminated in accordance with the termination process outlined in the OPEA. In effect the operational NEBA will determine whether there is net environmental benefit to continue response operations.

### 5.11.3. Stakeholder engagement process

Woodside will ensure stakeholders are engaged during the spill response in accordance with internal standards. This process requires that Woodside will:

- Undertake all required notifications (including government notifications) for stakeholders in the region (identified in the First-Strike Response Plan). This includes notification to mariners to communicate navigational hazards introduced through response equipment and personnel.
- In the event of a response, identify and engage with relevant stakeholders and continually assess and review.

## 5.11.4. Environmental performance based on need

**Table 5-25: Environmental Performance – Incident Management System**

| **Environmental Performance Outcome** | | To support the effectiveness of all other control measures and monitor/record the performance levels achieved. | | |
|---|---|---|---|---|
| **Control measure** | | **Performance Standard** | | **Measurement Criteria (see Section 5.12)** |
| 38 | Operational SIMA | 38.1 | Confirm that the response techniques adopted at the time of acceptance remain appropriate to reduce the consequences of the spill within 24 hours. | 1, 3A |
| | | 38.2 | Record the evidence and justification for any deviation from the planned response activities. | |
| | | 38.3 | Record the information and data from operational and scientific monitoring activities used to inform the SIMA. | |
| 39 | Stakeholder engagement | 39.1 | Prompt and record all notifications (including government notifications) for stakeholders in the region are made | |
| | | 39.2 | In the event of a response, identification of relevant stakeholders will be re-assessed throughout the response period. | |
| | | 39.3 | Undertake communications in accordance with:<br>Woodside Crisis Management Functional Support Team Guideline – Reputation;<br>External Communication Operating Standard;<br>External Stakeholder Engagement Operating Standard. | |
| 40 | Personnel required to support any response | 40.1 | Action planning is an ongoing process that involves continual review to ensure techniques to control the incident are appropriate to the situation at the time. | 1, 3B |
| | | 40.2 | A duty roster of trained and competent people will be maintained to ensure that minimum manning requirements are met all year round. | 3C |
| | | 40.3 | Immediately activate the IMT with personnel filling one or more of the following roles:<br>• Operations Duty Manager;<br>• D&C Duty Manager;<br>• Operations Coordinator;<br>• Deputy Operations Coordinator;<br>• Planning Coordinator;<br>• Logistics (materials, aviation, marine and support positions);<br>• Management Support;<br>• Health and Safety Advisor;<br>• Environment duty Manager;<br>• People Coordinator;<br>• Public Information Coordinator;<br>• Intelligence Coordinator; and<br>• Finance Coordinator. | 1, 2, 3B, 3C, 4 |
| | | 40.4 | Collect and interpret information from the scene of the incident to determine support requirements to the site-based IMT, develop an IAP and assist with the execution of that plan. | |
| | | 40.5 | S&EM advisors will be integrated into ICC to monitor performance of all functional roles. | |
| | | 40.6 | Continually communicate the status of the spill and support Woodside to determine the most appropriate response by delivering on the responsibilities of their role. | |
| | | 40.7 | Follow the OPEA, Operational Plans, FSPs, support plans and the IAPs developed. | 1, 2, 3A, 4 |

| | | | | |
|---|---|---|---|---|
| | | 40.8 | Contribute to Woodside's response in accordance with the aims and objectives set by the Duty Manager. | 1, 2, 3B, 3C, 4 |

## 5.12. Measurement criteria for all response techniques

Woodside ensures compliance with environmental performance outcomes and standards through four primary mechanisms. The aforementioned performance tables identify which of these four mechanisms monitors the readiness and records the effectiveness and performance of the control measures adopted.

### *1. The Incident Management System*

The Incident Management System (IMS) supports the implementation of the Emergency & Crisis Management Procedure. The IMS provides a near real-time, single source of information for monitoring and recording an incident and measuring the performance of those control measures.

The Emergency & Crisis Management Procedure defines the management framework, including roles and responsibilities, to be applied to any size incident (including hydrocarbon spills). The organisational structure required to manage an incident is developed in a modular fashion and is based on the specific requirements of each incident. The structure can be scaled up or down.

The IAP process formally documents and communicated the:

- incident objectives;
- status of assets;
- operational period objectives;
- response techniques (defined during response planning);
- the effectiveness of response techniques.

The information captured in the IMS (including information from personal logs and assigned tasks/close outs) confirms the response techniques implemented remain appropriate to reduce the consequences of the spill. The system also records all information and data that can be used to support the site-based IMT, development and the execution of the IAP.

### *2. The Security & Emergency Management Competency Dashboard*

The Security & Emergency Management (S&EM) competency dashboard records the number of trained and competent responders that are available across Woodside, and some external providers, to participate in a response.

This number varies dependent on expiry of competency certificates, staff attrition, internal rotations, leave and other absences. As such the Dashboard is designed to identify the minimum manning requirements and to identify sufficient redundancy to cater for the variances listed above.

Figure 5-1 shows the minimum manning numbers for the different hydrocarbon spill response roles and the number of qualified persons against those roles.

Woodside's pool of trained responders is composed of but not limited to personnel from the following organisations:

- Woodside internal
- AMOSC core group
- AMOSC
- OSRL
- Marine Spill Response Corporation (MSRC)
- AMSA
- Woodside contracted workforce

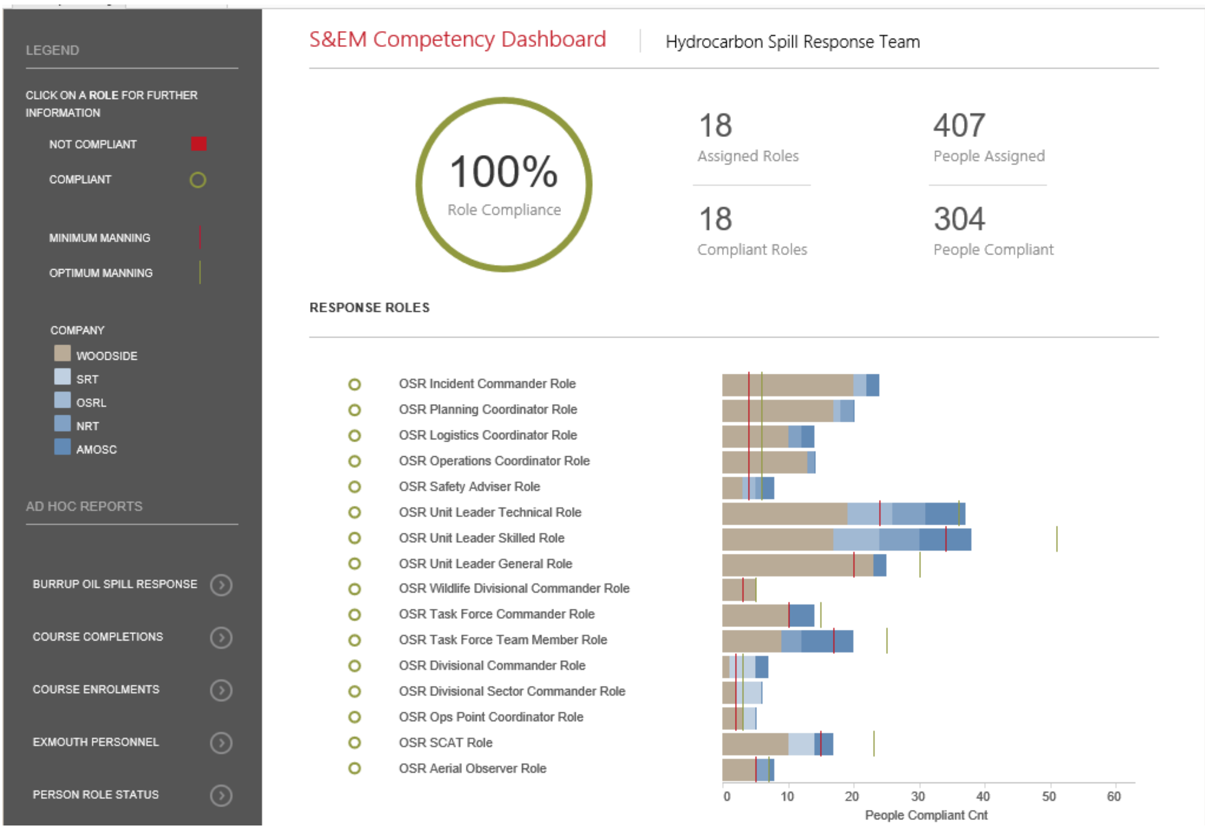


**Figure 5-1: Example screen shot of the Hydrocarbon Spill Preparedness competency dashboard**

The Dashboard is one of Woodside's key means of monitoring its readiness to respond. It also shows that Woodside can meet the requirements of the environmental performance standard that relate to filling certain response roles.

Figure 5-2 shows deeper dive into the Ops Point Coordinator role and the training modules required to show competence.

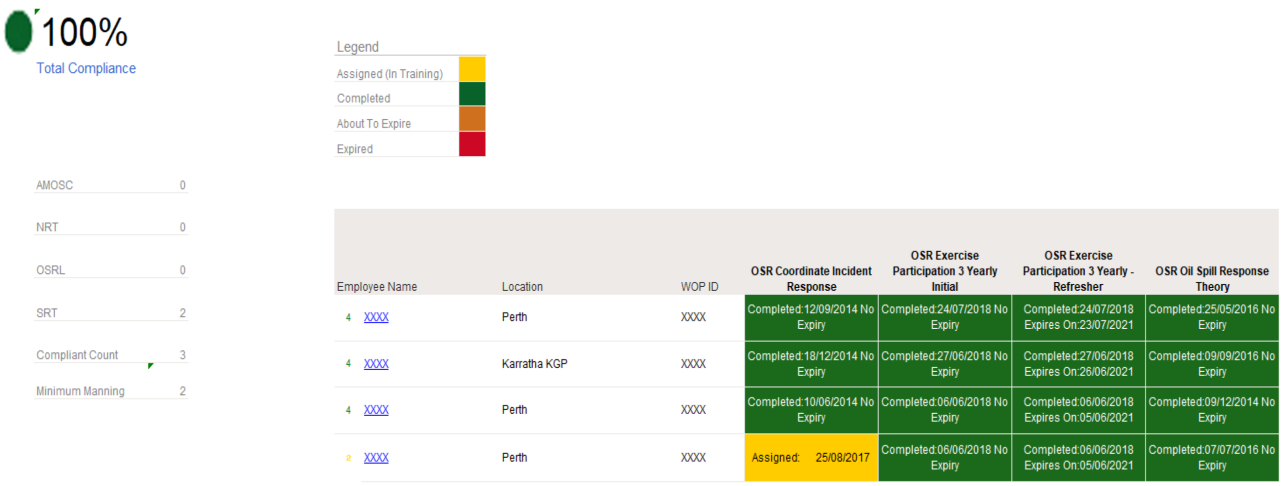


**Figure 5-2: Example screen shot for the Ops Point Coordinator role**

### *3. The Hydrocarbon Spill Preparedness ICE Assurance Process*

The Hydrocarbon Spill Response Team has developed a Hydrocarbon Spill Preparedness and Response Internal Control Environment (ICE) process to align and feed into the Woodside Management

System Assurance process for hydrocarbon spill. The process tracks compliance over four key control areas:

a) **Plans** – Ensures all plans (including: OPEA, FSPs, operational plans, support plans and TRPs) are current and in line with regulatory and internal requirements.
b) **Competency** – Ensures the competency dashboard is up to date and there are the minimum competency numbers across ICC, CMT and hydrocarbon spill response roles. The hydrocarbon spill training plan and exercise schedule, including testing of arrangements is also tracked. The Testing of Arrangements (TOA) register tracks the testing of all hydrocarbon spill response arrangements, key contracts and agreements in place with internal and external parties to ensure compliance.
c) **Capability** – Tracks and monitors capability that could be required in a hydrocarbon incident, including but not limited to: integrated fleet[12] vessel schedule, dispersant availability, rig/vessels monitoring, equipment stockpiles, tracking buoy locations and the CICC duty roster.
d) **Compliance & Assurance** – Ensures all regulator inspection outcomes are actioned and closed out, the global legislation register is up to date and that the key assurance components are tracked and managed. Assurance activities (including Audits) conducted on memberships with key Oil Spill Response Organisations (OSROs) including AMOSC and OSRL are also tracked and recorded in the ICE.

The ICE assurance process records how each commitment listed in the performance tables above is managed to ensure ongoing compliance monitoring. The level of compliance can be reviewed in real time and is reported on a monthly basis through the S&EM Function.

The completion of the assurance checks (over and above the ICE process) is also applied via the Woodside Integrated Risk & Compliance System (WiRCs) and subject to the requirements of Woodside's Provide Assurance Procedure.

### 4. The Hydrocarbon Spill Preparedness and Response Procedure

This procedure sets out how to plan and prepare for a liquid hydrocarbon spill to the marine environment. (Note, this procedure does not apply to scenarios relating to gas releases in the marine environment).

This procedure details the:

- Requirement for an OPEP to be developed, maintained, reviewed, and approved by appropriate regulators (where applicable) including:
- − Defining how spill scenarios are developed on an activity specific basis;
- − Developing and maintaining all hydrocarbon spill related plans;
- − Ensuring the ongoing maintenance of training and competency for personnel;
- − Developing the testing of spill response arrangements; and
- − Maintaining access to identified equipment and personnel.
- Planning for hydrocarbon spill response preparedness
- Accountabilities for hydrocarbon spill response preparedness
- Spill training requirements
- Requirements for spill exercising / testing of spill response arrangements
- Spill equipment and services requirements.

The procedure also details the roles and responsibilities of the dedicated Woodside Hydrocarbon Spill Preparedness team. This team is responsible for:

- Assuring that Woodside hydrocarbon spill responders meet competency requirements.

[12] The Integrated fleet consists of vessels from multiple operators that have been contracted to Woodside to undertake a number of duties including hydrocarbon spill response

- Establishing the competency requirements, annual training schedule and a training register of trained personnel.
- Establishing and maintaining the total numbers of trained personnel required to provide an effective response to any hydrocarbon spill incident.
- Ensuring equipment and services contracts are maintained.
- Establishing OPEPs.
- Establishing OPEAs.
- Priority response receptor determination.
- ALARP determination.
- Ensuring compliance and assurance is undertaken in accordance with external and internal requirements.

# 6 ALARP EVALUATION

This Section should be read in conjunction with Section 5 which is the capability planned for this activity.

## 6.1. Monitor and Evaluate – ALARP Assessment

Alternative, Additional and Improved options have been identified and assessed against the base capability described in Section 5 with those that have been selected for implementation highlighted in green. Items highlighted in red have been considered and rejected on the basis that they are not feasible, the costs are clearly disproportionate to the environmental benefit, and/or the option is not reasonably practical. Control measures where there is not a clear justification for their inclusion or exclusion may be subject to a detailed ALARP assessment.

### 6.1.1. Monitor and Evaluate – Control Measure Options Analysis

#### 6.1.1.1. Alternative Control Measures

| **Alternative Control Measures considered**<br>*Alternative, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Aerostat (or similar inflatable observation platform) for localised aerial surveillance. | Lead time to Aerostat surveillance is disproportionate to the environmental benefit. The system also provides a very limited field of visibility around the vessel it is deployed from. | Long lead time to access (>10 days). Each system would require an operator to interpret data and direct vessels accordingly. Requires multiple systems for shoreline use. | Purchase cost per system approx. $300,000. | This option is not adopted as the minimal environmental benefit gained is disproportionate to the cost and complexity of its implementation. | No |
| Use of Autonomous Underwater Vehicles (AUVs) for hydrocarbon presence and detection. | Use of AUVs may be feasible and may provide an environmental benefit in assessing inaccessible areas for presence of hydrocarbons in the water however cost of purchase is disproportionate to the environmental benefit when compared to the monitoring types in place. | AUVs may be considered as an additional method of monitoring, should remote systems be required for health and safety reasons. | Cost $10,000 for mobilisation and $15,000 a day when deployed. | This option is not adopted as other monitoring techniques already in place meet the need and have lower implementation costs. | No |

#### 6.1.1.2. Additional Control Measures

| **Additional Control Measures considered**<br>*Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Additional personnel trained to use systems. | Current arrangement provides an environmental benefit in the availability of trained personnel facilitating access to monitoring data used to inform all other response techniques. No improvement required. | No improvement can be made, all personnel in technical roles e.g. intelligence unit are trained and competent on the software systems. Personnel are trained and exercised regularly. Use of the software and systems forms part of regular work assignments and projects. | Cost for training in-house staff would be approx. $25,000. | This option is not adopted as the current capability meets the need. | No |
| Additional satellite tracking buoys to enable greater area coverage. | Increased capability does not provide an environmental benefit compared to the disproportionate cost in having an additional contract in place. | Tracking buoy on location at manned facility, additional needs are met from Woodside owned stocks in King Bay Support Facility (KBSF) and Exmouth or can be provided by service provider. | Cost for an additional satellite tracking buoy would be $200 per day or $6,000 to purchase. | This option is not adopted as the current capability meets the need, but additional units are available if required. | No |
| Additional trained aerial observers. | Woodside has access to a pool of trained, competent observers at strategic locations to ensure timely and sustainable response. Additional observers are available through current contracts with AMOSC and OSRL. | Aviation standards & guidelines ensure all aircraft crews are competent for their roles. Woodside maintains a pool of trained and competent aerial observers with various home base locations to be called upon at the time of an incident. Regular audits of oil spill response organisations ensure training and competency is maintained. | Cost for additional trained aerial observers would be $2,000 per person per day. | This option is not adopted as the current capability meets the need, but additional observers are available via response contractors if required. | No |

#### 6.1.1.3. Improved Control Measures

| **Additional Control Measures considered**<br>*Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Faster turnaround time from modelling contractor. | Improved control measure does not provide an environmental benefit compared to the disproportionate cost in having an additional contract in place. | External contractor on ICC roster to be called as soon as required. However initial information needs to be gathered by ICC team to request an accurate model. External | Modelling service with a faster activation time would be achieved via membership of an alternative modelling | This option is not adopted as the minimal environmental benefit gained is | No |

| | | | | | |
|---|---|---|---|---|---|
| | | contractor has person on call to respond from their own location. | service at an annual cost of $50,000 for 24hr access plus an initial $5,000 per modelling run. | disproportionate to the cost and complexity of its implementation. | |
| Night time aerial surveillance. | The risk of undertaking the aerial observations at night is disproportionate to the limited environmental benefit. The images would be of low quality and as such the variable is not adopted. | Flights will only occur when deemed safe by the pilot. The risk of night operations is disproportionate to the benefit gained, as images from sensors (IR, UV, etc). will be low quality.<br>Flight time limitations will be adhered to. | No improvement can be made without risk to personnel health and safety and breaching Woodside's golden rules. | This option is not adopted as the safety considerations outweigh any environmental benefit gained. | No |
| Faster mobilisation time (for water quality monitoring). | Due to the restriction on accessing the spill location on Day one there is no environmental benefit in having vessels available from day one. The cost of having dedicated equipment and personnel is disproportionate to the environmental benefit. The availability of vessels and personnel meets the response need.<br>Shortening the timeframes for vessel availability would require dedicated response vessels on standby in KBSF.<br>The cost and organisational complexity of employing two dedicated response vessels (approximately $15M/year per vessel) is considered disproportionate to the potential environmental benefit to be realised by adopting this delivery options. | Operations are not feasible on day 1 as the hydrocarbon will take time to surface, and volatility has potential to cause health concerns within the first 24 hours of the response. | Cost for purchase of equipment approx. $200,000. Ongoing costs per annum for cost of hire and pre-positioning for life of asset/activity would be larger than the purchase cost.<br>Dedicated equipment and personnel, living locally and on short notice to mobilise. The cost would be approx. $1M per annum, which is disproportionate to the incremental benefit this would provide, assets are already available on day 1. 2 integrated fleet vessels are available from day 1, however these could be tasked with other operations. | This option is not adopted as the area could not be accessed earlier due to safety considerations. Additionally, the cost and complexity of implementation outweighs the benefits. | No |

### 6.1.2. Selected Control Measures

Following review of alternative, additional and improved control measures as outlined above, the following controls were selected for implementation for the PAP.

- Alternative
  - None selected
- Additional
  - None selected
- Improved
  - None selected

## 6.2. Source Control – ALARP Assessment

Woodside has based its response planning on the worst-case credible scenario (as described in Section 1.1). This includes the following selection of primary source control and well intervention techniques which would be conducted concurrently;

- ROV intervention
- Debris clearance and/or removal
- Relief well drilling

### 6.2.1. ROV Intervention

Following confirmation of an emergency event, Woodside would mobilise inspection class ROVs via existing frame agreements to undertake inspection activities. The ROV available on the MODU can be deployed within 48 hours. Should the ROV on the MODU be unavailable, work class ROVs are also available through the existing frame agreements and are available for deployment within seven days (Figure 6-2).

As Woodside holds Frame Agreements for vessels along with contracts for ROV providers and pilots, inspection activities using ROVs are expected to commence within seven days.

**Table 6-1: ROV timings**

| | Estimate ROV inspection duration for Okha FPSO Operations (days) |
|---|---|
| Source and mobilise vessel with work class ROV | 2 days |
| Liaise with Regulator regarding risks and impacts* | 4 days |
| Undertake ROV Inspection | 1 day |
| **TOTAL** | **7 days*** |

** Based on timings from the Report into the Montara Commission of Enquiry, submission and discussion of revised documentation for limited activities inside the Petroleum Safety Zone (water deluge operations) to manage personnel risks and impacts was up to 20 days.*

#### 6.2.1.1. Safety Case considerations

Woodside has assessed against the NOPSEMA safety case guidance (NOPSEMA N-09000-GN1161), confirming that vessels conducting subsea intervention operations are not classified as an “associated offshore place” but as a facility and therefore require the appropriate Safety Case arrangements to be in place. In the event of an emergency, Woodside has access to suitable vessels (ISVs) for well intervention through existing frame agreements. The frame agreements for ISV vessels require the vessels to maintain in-force safety case approval covering a range of subsea activities. This would cover the requirement for intervention operations such as subsea manifold installation, maintenance and repair, commissioning, cargo transfer (including bulk liquids) and ROV operations. With frame agreements in place, the credible Safety Case Scenario from those presented in Figure 6-3 for implementing this response would be “no safety case revision required”. Timeframes for well intervention are detailed in Figure 6-2 and would be implemented concurrently to the actions required by the “no Safety Case” revision scenario detailed in Figure 6-3, therefore, the Safety Case scenario will have no impact on the delivery of the strategy.

### 6.2.2. Debris clearance and/or removal

The Woodside Source Control Response Procedure details the mobilisation and resource requirements for implementing this strategy. Debris clearance may be required as a prerequisite to deployment of Subsea Dispersant Injection (SSDI). The AMOSC SFRT would be mobilised from Fremantle. The mobilisation of the SFRT would take place in parallel with mobilisation of the SSDI equipment to ensure initial ROV surveys and debris clearance have commenced before the arrival of the SSDI equipment. The SFRT comprises ROV-deployed cutters and tools that are used to remove damaged or redundant items from the wellhead and allow improved access to the well. The SFRT can be mobilised and deployed with well intervention attempted within 11 days.

#### 6.2.2.1. Safety Case considerations

Woodside has assessed against the NOPSEMA safety case guidance (NOPSEMA N-09000-GN1161) and can confirm that vessels conducting debris clearance and removal operations are not classified as an “associated offshore place” but as a facility and therefore require the appropriate Safety Case arrangements in place. In the event of an emergency, Woodside has access to suitable ISVs for these operations through existing frame agreements. The frame agreements for ISVs require the vessels to maintain in-force safety case approval covering a range of subsea activities. This would cover the requirement for debris clearance and removal operations such as subsea manifold installation, commissioning, cargo transfer (including bulk liquids) and ROV operations. With frame agreements in place, the credible Safety Case Scenario, from those presented in Figure 6-3 for implementing this response would be “no safety case revision required”. Timeframes for debris clearance and removal equipment deployment are detailed in Figure 6-2 and would be implemented concurrently to the actions required by the “No Safety Case” revision scenario detailed in Figure 6-3, therefore, the Safety Case scenario will have no impact on the delivery of the strategy.

### 6.2.3. Relief Well drilling

- The options analysis detailed in this section considers options to source, contract and mobilise a MODU and ensure necessary regulatory approvals are in place to meet timelines for relief well drilling. The screening for relief well drilling MODUs is based on the following: Primary – review internal Woodside drilling programs and MODU availability to source an appropriate rig operating within Australia with an approved Safety Case;
- Alternate – source and contract a MODU through APPEA MOU that is operating within Australia with an approved Safety Case;
- Contingency – if required, source and contract a MODU outside Australia with an approved Australian Safety Case. This option is not required for Okha due to the high certainty of rig availability.

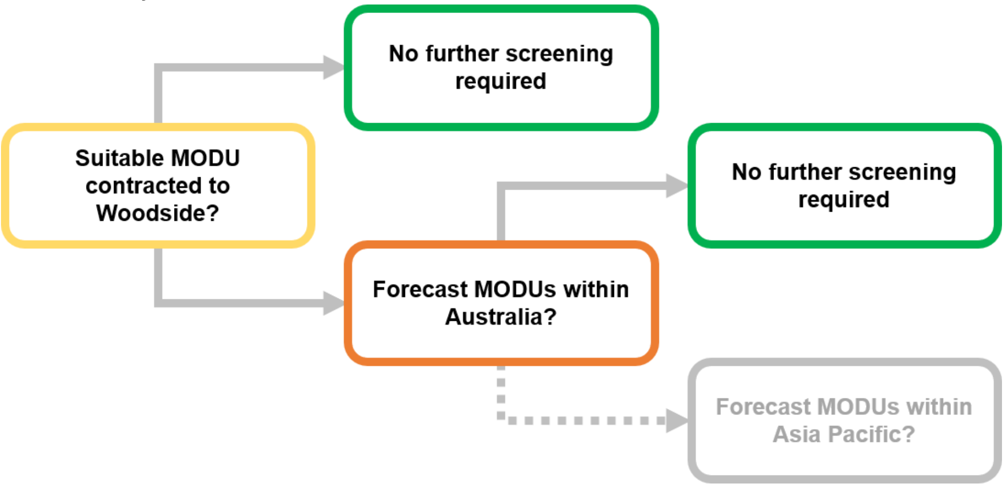


**Figure 6-1: Okha process for sourcing relief well MODU**

Woodside has not assessed the timeframe for obtaining a relief well MODU through international supply for this project as the certainty of supply has been confirmed through local supply. Screening of a relief well MODU from international waters is undertaken only if required, i.e. there is low confidence in local (Australian) availability. The screening of relief well MODUs is undertaken and presented at a well design stage peer assessment. The capability, location and Australian Safety Case status is assessed for each Woodside contracted MODU. In the event the Woodside contracted MODUs are unsuitable, screening is extended to all MODUs operating in Australian Waters. The suitability and location of pre-identified relief well MODUs is tested again prior to and during the operation. Though the APPEA MoU will serve as the instrument to facilitate the transfer of drilling units and well site services between operators in the event of an emergency, Woodside will engage each of the identified titleholders in advance to maintain confidence in MODU suitability and availability.

Based on the detail provided, the Primary and Alternate approaches are expected to be achieved within the 77-day period.

The detail of these arrangements demonstrates that the risks have been reduced to ALARP and Acceptable levels through the control measures and performance standards outlined in Section 5.2.

### 6.2.3.1. Relief Well drilling timings

The duration of a blowout (from initiation to a successful kill) is assessed as 77 days for Okha FPSO Facility Operations. Relief wells for other wells within the field are expected to be similar duration.

Details on the steps and time required to drill a relief well is shown in Table 6-2 below. Dynamically positioned and most jack up rigs are not suitable for water depth around the Okha FPSO, therefore a moored MODU would be required.

On a monthly basis, Woodside tracks and assesses the suitability of available MODUs internally and externally, plus MODU activities of registered operators and MODUs with approved safety cases. MODUs expected to be stationed in Australia for the duration of project are identified as part of the Relief Well Peer review conducted during the planning phase and immediately prior to spud.

The ability to meet MODU mobilisation of 21 days is screened based on where the pre-identified MODUs will be stationed. For this project, suitable MODUs based in Australia have been identified by Woodside and thus there is a high level of confidence that the stated 21 day timeframe can be met.

To validate the effectiveness of the relief MODU supply arrangements through the APPEA MoU, the 21-day mobilisation period was tested in April 2019 in an exercise facilitated by an external party. This exercise included suspension of the assisting operator's activities, contracting the MODU, vessel safety case revision and transit to location. The testing of mobilisation arrangements has been incorporated into Woodside's Hydrocarbon Spill Arrangements Testing Schedule.

**Table 6-2: Relief well drilling timings**

| | Estimate Relief Well duration for Okha FPSO Operations (days) |
|---|---|
| **Source and contract MODU comprising the following stages:** | **21 days total:** |
| *Activate MOU.* | *8 days* |
| *Secure and suspend well.* | |
| *Complete relief well design.* | |
| *Secure relief well materials.* | |
| *Transit to location based on mobilisation from Northwest shelf region.* | *2 days* |
| *Backload and loadout bulks and equipment.* | *2 days* |
| *Complete internal assurance of relief well design.* | |
| *Contingency for unforeseen event e.g. longer transit from another area of Australia, problems in securing well, cyclone event.* | *9 days* |
| **Pre-spud survey** | **Already included – concurrent with MODU mobilisation above** |
| **Mooring Spread Installation**<br>*NB Occurs in parallel with the 21 days to mobilise the rig, so the timing included here is the difference.* | **15.8 days** |
| **Drilling, casing and test BOP estimate** | **25.9 days** |
| **Intersection & well kill comprising the following stages:** | **14 days total:** |
| *Drill out shoe, conduct formation integrity test and drill towards intersection point.* | *1.5 days* |
| *Execute well-specific ranging plan to intersect blowout wellbore in minimum timeframe, with highest possible accuracy.* | *9.5 days* |
| *Pump kill weight drilling fluid per the relief well plan. Confirm the well is static with no further flow.* | *0.5 days* |
| *Contingency for unforeseen technical issues (e.g.: more ranging runs required to make intersect, additional mud circulations required to execute kill).* | *2.5 days* |
| | **76.7 days (77 days)** |

The following conditions and assumptions are applicable:

- The 21-day mobilisation time assumes a local MODU is available in Australia with another titleholder.
- A pre-lay mooring spread is required to moor the rig over subsea infrastructure. Mobilisation would occur in parallel to MODU mobilisation. The breakdown of this timeframe is as follows:

**Table 6-3: Mooring Spread installation timings**

| Activity | Duration (days) |
|---|---|
| Design mooring spread and commence sourcing equipment | 7 |
| Source equipment and mobilise to supply base | 21 |
| Install pre-lay spread | 7 |
| Run anchors and prepare to spud | 1.8 |
| **Total** | **36.8** |

- Whilst Woodside will make every endeavour to accelerate these activities to reduce the pre-lay mooring timeframe, Woodside believes they are sufficiently conservative to ensure these activities can be completed. Woodside has considered a broad range of alternate, additional, and improved options as outlined in Section Source Control – Control Measure Options Analysis6.2.4.
- Intersect and kill duration is estimated at 14 days. This is a moderately conservative estimate. During the intersect process, the relief well will be incrementally drilled and logged to accurately approach and locate the existing well bore. This will result in the highest probability of intersecting the well on the first attempt and thus will reduce the overall time to kill the well. During the Montara incident, it took five attempts to achieve a successful intersect.

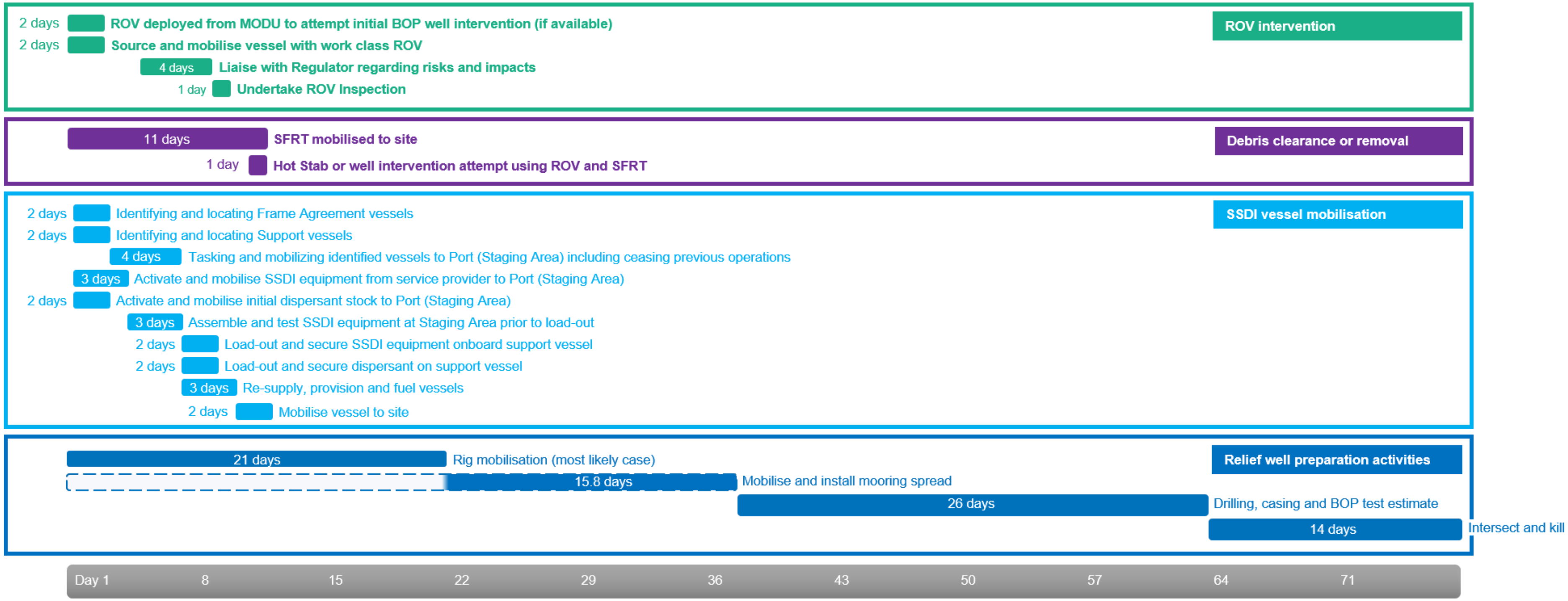


**Figure 6-2: Source control and well intervention response strategy deployment timeframes**

#### 6.2.3.2. Safety Case considerations

Woodside recognises that it will not be the Operator or holder of the Safety Case for the MODU and/or vessels involved in relief well activities. In the event that a revision to the Operator's Safety Case is required for relief well drilling, Woodside has identified measures to ensure timely response and optimise preparedness as far as practicable that can be undertaken to expedite a straightforward Safety Case revision for a MODU/ vessel to commence drilling a relief well. Performance standards associated with these measures have been included in Section 5.2.

These include;

- Access to Safety and Risk discipline personnel with specialist knowledge.
- Monitoring internal and external rigs and vessel availability in region and extended area through contracted arrangements on a monthly basis.
- Prioritisation of rigs/vessels with current or historical contracting arrangements. Woodside maintains records of previous contracting arrangements and companies. All current contracts for vessels and rigs are required to support Woodside in the event of an emergency.
- Leverage mutual aid arrangements such as the APPEA MOU for vessel and rig support.
- Woodside Planning and Logistics, and Safety Officers (on-Roster/Call 24/7) which can articulate need for, and deliver Woodside support, in key delivery tasks including sitting with potential outside operators.
- Ongoing strategic industry engagement and collaboration with NOPSEMA to work toward time reductions in regulatory approvals for emergency events.

Woodside has identified three safety case revision development and submission scenarios for a MODU and plotted these alongside the relief well preparation activities in Figure 6-3. The assumptions for each of the cases are detailed subsequently in Table 6-4.

The MODUs screened for contingency relief well drilling all operate under an accepted base Safety Case. A relief well Safety Case Revision would leverage the previously accepted Safety Case Revision for the Okha project, including the associated site-specific well hazards. As such, there is less new detail for the regulator to review and should present a short review timeframe with no impact expected to the commencement of relief well drilling activities.

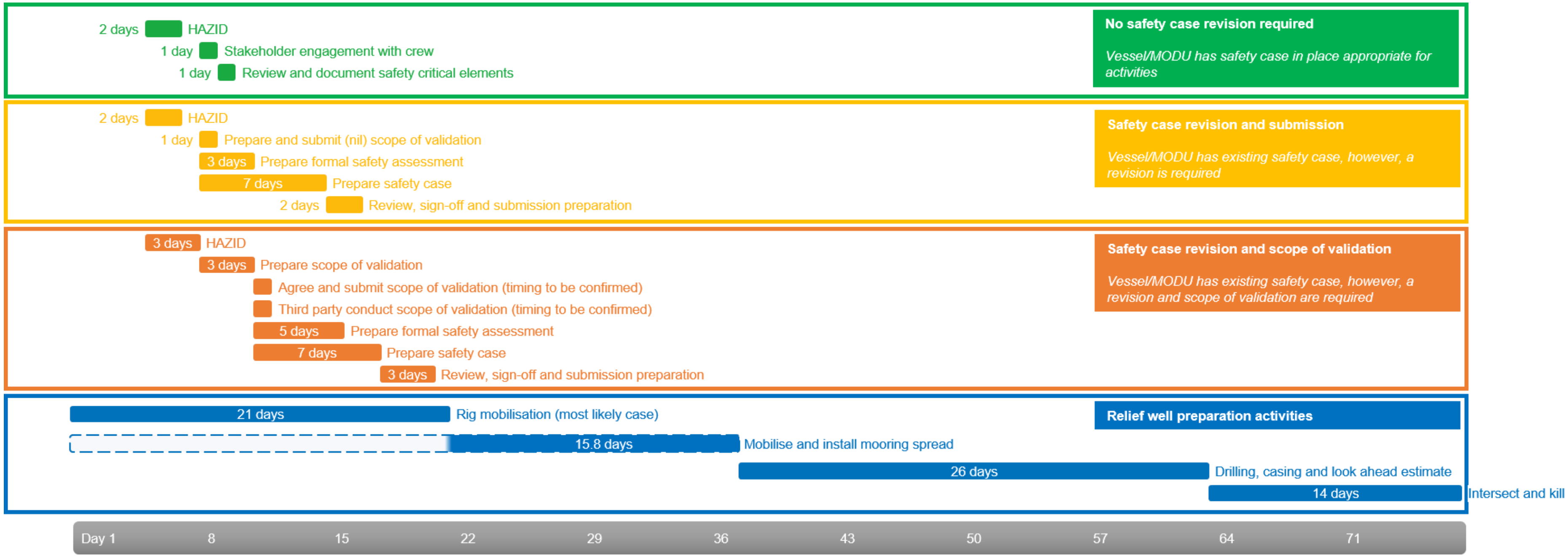


**Figure 6-3: Timeline showing safety case revision timings alongside relief well preparation activity timings**

**Table 6-4: Safety case revision conditions and assumptions**

| Case | No safety case revision required | Safety case revision and submission | Safety case revision and scope of validation |
|---|---|---|---|
| **Description** | Vessel/MODU has a safety case in place appropriate for activities. | Vessel/MODU has an existing safety case, however, a revision is required. | Vessel/MODU has an existing safety case, however, a revision is required plus scope of validation. |
| **Conditions/ assumptions** | • Assumes that existing vessel/MODU safety case covers working under the same conditions or the loss of containment is not severe enough to result in any risk on the sea surface. | • Safety case timing assumes vessel/MODU selected and crew and available for workshops and safety case studies. | • Safety case timing assumes vessel/ MODU selected and crew and available for workshops and safety case studies. |
| | | • Assumes nil scope of validation. This assumes that the vessel for SSDI allows for working in a hydrocarbon environment and control measures are already in place in the existing safety case. For MODU, it assumes that the relief well equipment is already part of the MODU facility and MODU safety case. | • Validation will be required for new facilities only. The time needed for the validator to complete the review (from the last document received) and prepare validation statement is undetermined. This is not accounted for here as the safety case submission is not dependent on the validation statement, however the safety case acceptance is. |
| | | • Assumes safety case preparation is undertaken 24/7. | • Assumes safety case preparation is undertaken 24/7. |

### 6.2.4. Source Control – Control Measure Options Analysis

The assessment described in Sections 6.2.1, 6.2.2 and 6.2.3 outlines the primary source control activities that that Woodside would implement**.**

Woodside has outlined the options considered against the activation, mobilisation (improved options), deployment (alternate and additional options) process described in Section 2.1.1 that provides an evaluation of:

- Predicted cost associated with adopting the option
- Predicted change/environmental benefit
- Predicted effectiveness/feasibility of the option

Alternative, Additional and Improved options have been identified and assessed against the base capability described in Section 5 with those that have been selected for implementation highlighted in green. Items highlighted in red have been considered and rejected on the basis that they are not feasible, the costs are clearly disproportionate to the environmental benefit, and/or the option is not reasonably practical.

- Alternative options, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control.
- Additional control measures are evaluated in terms of their ability to reduce an impact or risk when added to the existing suite of control measures.
- Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures in terms of functionality, availability, reliability, survivability, independence and compatibility

Options where there is not a clear justification for their inclusion or exclusion may be subject to a detailed assessment.

#### 6.2.4.1. Activation/Mobilisation Options considered

**Alternative**

- Standby MODU shared for all Woodside activities
- Standby MODU shared across APPEA MOU Titleholders

**Additional**

- Implement and maintain minimum standards for Safety Case development

**Improved**

- Monitor internal drilling programs for rig availability
- Monitor external activity for rig availability
- Monitor status of Registered Operators/ Approved Safety cases for rigs

#### 6.2.4.2. Deployment Options considered

**Additional**

- Pre-drilling top-holes
- Purchase and maintain mooring system
- Contract in place with WWCI and Oceaneering

**Improved**

- Maintaining relief well drilling supplies (mud, casing, etc).

### 6.2.5. Activation/Mobilisation – Control Measure Options Analysis

#### 6.2.5.1. Alternative control measures

| **Alternative Control Measures Considered**<br>*Alternative, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Feasibility** | **Environmental benefits/impacts** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Standby MODU shared for all Woodside activities | A standby MODU shared across all Woodside activities is likely to provide a moderate environmental benefit as it may reduce the 21-day sourcing, contracting and mobilisation time by up to 10 days (to 11 days). This would reduce the volume and duration of release and may reduce impacts on receptors and sensitivities. This may allow the well to be killed up to 10 days sooner (total of 67 days for well kill) and may result in a reduction of up to 24,140 $m^3$ of Cossack Light Crude for the worst-case credible scenario. | This option is not considered feasible for all Woodside activities as there are a large range of well depths, complexities, geologies and geophysical properties across all Woodside's operations. The large geographic area of Woodside activities also means that the MODU is unlikely to be in the correct location at the right time when required. | Even with costs shared across Woodside operations, the costs (approx $219M per annum, $1,095B over the five years) of maintaining a shared MODU are considered disproportionate to the environmental benefit potentially achieved by reducing mobilisation times by up to 10 days. | The costs and complexity of having a MODU and maintaining this arrangement for the duration of the Petroleum Activities Program are disproportionate to the environmental benefit gained above finding a MODU through the MOU agreement for all spill scenarios. | No |
| Standby MODU shared across APPEA MOU Titleholders | A standby MODU shared across all titleholders who are signatories to the APPEA MOU is likely to provide a minor environmental benefit as it may reduce the 21-day sourcing, contracting and mobilisation time by up to seven days (to 14 days). This would reduce the volume and duration of release and may reduce impacts on receptors and sensitivities. This may result in a reduction of up to 16,898 $m^3$ of Cossack Light Crude for the worst-case credible scenario. | This option is not considered feasible for a number of Titleholders due to the remote distances in Australia as well as a substantial range of well depths, types, complexities, geologies and geophysical properties across a range of Titleholders | As the environmental benefit is only considered minor and the reduction in timing would only be for the mobilisation period (reduction from 21 days to 14 days) the costs are considered disproportionate to the minor benefit gained. | The costs and complexity of having a MODU and maintaining a shared arrangement for the duration of the Petroleum Activities Program are disproportionate to the environmental benefit gained above finding a MODU through the MOU agreement for all spill scenarios. | No |

#### 6.2.5.2. Additional control measures

| **Additional Control Measures Considered**<br>*Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Feasibility** | **Environmental benefits/impacts** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Implement and maintain minimum standards for Safety Case development | Woodside's contingency planning consideration would be to source a rig from outside Australia with an existing Safety Case. This would require development and approval of a safety case revision for the rig and activities prior to commencing well kill operations. | This option is considered feasible and would require Woodside to develop minimum standards for safe operations for relevant Safety Case input along with maintaining key resources to support review of Safety Cases. Woodside would not be the operator for relief well drilling and would therefore not develop or submit the Safety Case revision. Woodside's role as Titleholder would be to provide minimum standard for safe operations that MODU operators would be required to meet and/or exceed. | Woodside has outlined control measures and performance standards regarding template Safety Case documentation and maintenance of resources and capability for expedited Safety Case review. | This option has been selected based on its feasibility, low cost and the potential environmental benefits it would provide. | Yes |

### 6.2.5.3. Improved control measures

| **Improved control measures Considered**<br>*Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures in terms of functionality, availability, reliability, survivability, independence and compatibility* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Feasibility** | **Environmental benefits/impacts** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Monitor internal drilling programs for rig availability | Woodside may be conducting other activities that overlap with the Petroleum Activities Program, potentially providing availability of a relief well drilling rig within Woodside. The environmental benefit of monitoring other drilling programs internally is for Woodside to understand what other rigs may be rapidly available for relief well operations if required, potentially reducing the time to drill the relief well, resulting in less hydrocarbon to the environment. | Woodside monitors vessel and MODU availability through market intelligence services for location. Woodside will continually monitor other drilling and exploration activities within Australia and as available throughout the region to track rigs and explore rig availability during well intervention operations. | Associated cost of implementation is minimal to the environmental benefit gained.<br>Woodside has outlined control measures and performance standards. | This option is a low-cost control measure with potential to reduce the volume of hydrocarbon released to the environment. | Yes |
| Monitor external activity for rig availability | The environmental benefit achieved by monitoring drilling programs and rig movements across industry provides the potential for increased availability of suitable rigs for relief well drilling. Additional discussions with other Petroleum Titleholders may be undertaken to potentially gain faster access to a rig and reduce the time taken to kill the well and therefore volume of hydrocarbons released. | Woodside will source a relief well drilling rig in accordance with the APPEA MOU on rig sharing in the unlikely event this is required. Commercial and operational provisions do not allow Woodside to discuss current and potential drilling programs in detail with other Petroleum Titleholders. | Associated cost of implementation is moderate to the environmental benefit gained. Woodside will continually engage with other Titleholders and Operators regarding activities within Australia and as available throughout the region to track rigs and explore rig availability during well intervention operations. | This option is a low-cost control measure with potential to reduce the volume of hydrocarbon released to the environment. | Yes |
| Monitor status of Registered Operators/ Approved Safety cases for rigs | Woodside can monitor the status of Registered Operators for rigs operating within Australia (and therefore safety case status) on a monthly basis. This allows for a prioritised selection of rigs in the event of a response with priority given to those with an existing safety case. | The environmental benefit of monitoring rigs is for Woodside to understand what other rigs may be rapidly available for relief well operations if required, potentially reducing the time to drill the relief well, resulting in less hydrocarbon to the environment. | The cost is minimal. | This option is a low-cost control measure with potential to reduce the volume of hydrocarbon released to the environment. | Yes |

### 6.2.6. Deployment – Control Measure Options Analysis

#### 6.2.6.1. Additional Control Measures

| **Additional Control Measures considered**<br>*Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Pre-drilling top-holes | This option represents additional environmental impacts associated with discharge of additional drill cuttings and fluids along with benthic habitat disturbance. It is also not expected to result in a significant decrease in relief well timings | This option is not considered feasible due to the uncertainties related to the location and trajectory of the intervention well, which may vary according to the actual conditions at the time the loss of containment event occurs. Additionally, there is only expected to be a minor reduction in timing for this option of 1-2 days based on the drilling schedule. Duration to drill and kill may be reduced by 1-2 days, but top-hole may have to be relocated, due to location being unsafe or unsuitable and further works will be required each year to maintain the top holes. | Utilising an existing MODU and pre-drilling top-hole for relief well commencement would significantly increase costs associated the Petroleum Activities Program. Estimated cost over the program's life is approx. $555,000 per day over the PAP based on 2-4 days of top-hole drilling (plus standby time) for the 5 wells as the worst-case scenarios. | This option would not provide an environmental benefit due to the additional environmental impacts coupled with a lack of improved relief well timings. | No |
| Purchase and maintain mooring system | Purchasing and maintaining a mooring system could provide a moderate environmental benefit as it may reduce equipment sourcing time. However, due to the continued need for specialists to install the equipment plus sourcing a suitable vessel, the timeframe reduction would be minimal. | Woodside is not a specialist in installing and maintaining moorings so would require specialists to come in to install the moorings and would also require specialist vessels to be sourced to undertake the work. | The cost of purchasing, storing and maintaining pre-lay mooring systems with anchors, chains, buoys and ancillary equipment is considered disproportionate to the environmental benefit gained. | This option would not provide an environmental benefit as timeframe reductions would be minimal. | No |
| Contract in place with WWCI and Oceaneering | Woodside has an agreement in place with WWCI and Oceaneering to provide trained personnel in the event of an incident. This will ensure that competent personnel are available in the shortest possible timeframe. | Having contracts in place to access trained, competent personnel in the event of an incident would reduce mobilization times. This option is considered reasonably practicable. | Minimal cost implications – Woodside has standing contract in place to provide assistance across all activities. | This control measure is adopted as the costs and complexity are not considered disproportionate to any environmental benefit that might be realised. | Yes |

#### 6.2.6.2. Improved Control Measures

| **Improved Control Measures considered**<br>*Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures in terms of functionality, availability, reliability, survivability, independence and compatibility* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Maintaining relief well drilling supplies | There is not predicted to be any reduction in relief well timing or spill duration from Woodside maintaining stocks of drilling supplies (mud, casing, cement, etc.) | It would be feasible to source some relief well drilling supplies such as casing but the actual composition of the cement and mud required will need to be specific to the well. This option is also not deemed necessary as the lead time for sourcing and mobilising these supplies is included in the 21 days for sourcing and mobilising a rig. | The capital cost of Woodside purchasing relevant drilling supplies is expected to be approximately $600K with additional costs for storage and ongoing costs for replenishment. These costs are considered disproportionate to the environmental benefit gained. | This option would not provide an environmental benefit. | No |

### 6.2.7. Selected Control Measures

Following review of alternative, additional and improved control measures as outlined above, the following controls were selected for implementation for the PAP.

- Alternative
  - None selected
- Additional
  - Implement and maintain minimum standards for Safety Case development
  - Contract in place with WWCI and Oceaneering to supply trained, competent personnel
- Improved
  - Monitor internal drilling programs for MODU availability
  - Monitor external activity for MODU availability
  - Monitor status of Registered Operators / Approved Safety cases for MODUs

## 6.3. Subsea Dispersant Injection - ALARP Assessment

Alternative, Additional and Improved options have been identified and assessed against the base capability described in Section 5 with those that have been selected for implementation highlighted in green. Items highlighted in red have been considered and rejected on the basis that they are not feasible, the costs are clearly disproportionate to the environmental benefit, and/or the option is not reasonably practical. Control measures where there is not a clear justification for their inclusion or exclusion may be subject to a detailed ALARP assessment.

### 6.3.1. Subsea Dispersant Injection timing

The scope of existing safety cases for Frame Agreement vessels includes all relevant activities for SSDI operations. Depending on the location and availability of vessels, Woodside expects the SSDI capability can be mobilised to site for deployment within 12 days. This may be able to be achieved faster if vessels are closer to appropriate staging areas and not already involved in other operations. The following steps are included within the indicative timeframe and many of these are expected to be concurrent activities, as shown in Figure 6-3.

1. Identifying and locating Frame Agreement vessels (1-2 days)
2. Identifying and locating Support vessels (1-2 days)
3. Tasking and mobilising identified vessels to Port (Staging Area) including ceasing previous operations (2-4 days)
4. Activate and mobilise SSDI equipment from service provider to Port (Staging Area) (2-3 days)
5. Activate and mobilise initial dispersant stock to Port (Staging Area) (1-2 days)
6. Assemble and test SSDI equipment at Staging Area prior to load-out (2-3 days)
7. Re-supply, provision and fuel vessels (1-2 days)
8. Load-out and secure SSDI equipment onboard ISV (1-2 days)
9. Load-out and secure Dispersant on Support Vessel (1-2 days)
10. Contingency for unforeseen events (1 day)

### 6.3.2. Response Planning: Okha FPSO Facility Operations loss of well containment (MEE-01)

Following a loss of well control it may take 2-5 days to complete a risk assessment, discuss and agree appropriate control measures with NOPSEMA (Safety, Environment and Well Integrity divisions), and monitor the operating environment within the Petroleum Safety Zone around a well or facilities. Subsea dispersant injection is unlikely to be deployed until approximately Day 12, subject to subsea ROV survey of the site and agreement of risk assessment and recommended control measures to ensure personnel safety.

Dispersant efficacy testing has not been undertaken for subsea conditions, but industry experience estimates a subsea amenability to dispersant of approximately 50-60% effectiveness. Based on response planning assumptions outlined in Section 5.3, the subsea dispersant injection system (as part of the SFRT package) is able to deliver approx. 60-75 m³ per day on a continuous 24 hour/7 day basis.

For the purpose of capability demonstration below, Woodside has shown that once the SSDI system arrives and is able to be deployed safely, sufficient capability exists to commence and continue SSDI until the well is killed (approximately day 77).

**Table 6-5: Response Planning – Subsea Dispersant Injection**

| | Subsea Dispersant Injection (SSDI) | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 7 | Week 2 | Week 3 | Week 4 | Month 2 | Month 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Oil Release** | | | | | | | | | | | | |
| R1 | Oil Release Rate – m³ | 2,414 | 2,414 | 2,414 | 2,414 | 2,414 | 2,414 | 2,414 | 16,898 | 16,898 | 16,898 | 72,420 | 45,866 |
| A | **Capability available - m³** | | | | | | | | | | | | |
| A1 | Predicted oil volume treated by SSDI (lower) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3,600 | 12,600 | 50,400 | 50,400 |
| A2 | Predicted oil volume treated by SSDI (upper) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4,500 | 9,000 | 31,500 | 126,000 | 126,000 |
| A3 | Dispersant application volume (lower) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 120 | 420 | 1,680 | 1,680 |
| A4 | Dispersant application volume (upper) | 0 | 0 | 0 | 0 | 75 | 75 | 75 | 75 | 150 | 525 | 2,100 | 2,100 |
| B | **Subsea release oil remaining - m³** | | | | | | | | | | | | |
| B1* | Predicted oil volume not treated (Okha FPSO Facility Operations) (lower) | 2,414 | 2,414 | 2,414 | 2,414 | 2,414 | 2,414 | 2,414 | 16,898 | 13,298 | 4,298 | 22,020 | -4,534 |
| B2* | Predicted oil volume not treated (Okha FPSO Facility Operations) (upper) | 2,414 | 2,414 | 2,414 | 2,414 | 2,414 | 2,414 | 2,414 | 12,398 | 7,898 | -14,602 | -53,580 | -80,134 |

*A1 and A2 – the upper and lower volumes in m³ that subsea dispersant injection may be able to treat (based on response planning assumptions in Section 5.3 and volumes in A3 and A4). These are based on a 1:50 ratio for A1 and a 1:100 ratio for A2*

*A3 and A4 - the upper and lower volumes in m³ of the associated dispersant injection volumes for A1 and A2,*

*B1 and B2 – the upper and lower volumes in m³ of the subsea oil that is not treated on each day, following predicted treatment outlined in A1 and A2 (oil released - predicted oil volume treated (R1-A1))*

### 6.3.3. Subsea Dispersant Injection – Control Measure Options Analysis

#### 6.3.3.1. Alternative Control Measures

| **Alternative Control Measures Considered**<br>*Alternative, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Dedicated, contracted ISV for SSDI mobilisation and deployment (based in Australia) | Reducing the mobilisation and deployment time of the SSDI through vessel standby/pre-positioning is unlikely to result in a significant change in environmental benefit. Under current arrangements the SSDI system can be on location from approx. day 12 depending on ISV availability where a dedicated, contracted vessel may enable the SSDI system on location from day 10.<br>Once deployed the SSDI will be utilised to increase entrainment of released oil and to ensure safe operations for surface deployment of SFRT and other surface response techniques. | A modified Construction vessel or vessels with suitable remote operated underwater vehicles (ROVs) is required to load, transport and deploy the SSDI system.<br>The critical element in deployment of the SSDI is the availability of an appropriate ISV. Achieving a shorter mobilisation would require the vessel's work schedule to be permanently restricted so as to permit a quicker return to Dampier, reducing the utilisation of the vessel, or the permanent retention of a dedicated ISV. Neither option is considered reasonably practicable.<br>Acceleration is limited by availability of the SSDI system mobilisation and this control measure is not expected to reduce the estimated extent and magnitude of impact from a well release on receptor locations compared with the proposed mobilisation plan using pre-identified or vessels available through frame agreements. | A dedicated vessel on standby in Dampier, ready to load is estimated to cost $20M AUD per annum. This is considered cost-prohibitive for the PAP. | This response strategy is not considered as a primary response and this control measure is not adopted as the cost, complexity and feasibility is considered disproportionate to the minor environmental benefit that might be gained | No |
| Shared, contracted ISV for SSDI mobilisation and deployment (shared between Titleholders) | Reducing the mobilisation and deployment time of the SSDI through vessel standby/pre-positioning is unlikely to result in a significant change in environmental benefit. Under current arrangements the SSDI system can be on location from approx. day 12 depending on ISV availability where a dedicated, contracted vessel may enable the SSDI system on location from day 10.<br>Once deployed the SSDI will be utilised to increase entrainment of released oil and to ensure safe operations for surface deployment of SFRT and other surface response techniques. | A modified Construction vessel or vessels with suitable remote operated underwater vehicles (ROVs) is required to load, transport and deploy the SSDI system.<br>The critical element in deployment of the SSDI is the availability of an appropriate ISV. Achieving a shorter mobilisation would require the vessel's work schedule to be permanently restricted so as to permit a quicker return to Dampier, reducing the utilisation of the vessel, or the permanent retention of a dedicated ISV. Neither option is considered reasonably practicable.<br>This option is not considered feasible for a number of Titleholders due to the remote distances in Australia as well as a substantial range of well depths, types, complexities, geologies and geophysical properties across a range of Titleholders.<br>Additionally, acceleration is limited by availability of the SSDI system mobilisation and this control measure is not expected to reduce the estimated extent and magnitude of impact from a well release on receptor locations compared with the proposed mobilisation plan using pre-identified or vessels available through frame agreements. | A dedicated vessel on standby in Dampier, ready to load is estimated to cost $20M AUD per annum. As a shared cost across a range of titleholders, this may be approximately $2M each. This is considered cost-prohibitive for the PAP. | This response strategy is not considered as a primary response and this control measure is not adopted as the cost, complexity and feasibility is considered disproportionate to the minor environmental benefit that might be gained by 1-2 days of additional subsea dispersant injection. | No |

#### 6.3.3.2. Additional Control Measures

| **Additional Control Measures Considered**<br>*Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Pre-identifying / contracting vessels through Frame Agreements for SSDI loading and operations | Ensuring the mobilisation and deployment time of the SSDI through vessel availability / contracting strategy is likely to result in a moderate environmental benefit as using these arrangements, the SSDI will be on location from approximately Day 12. | Achieving a shorter mobilisation would require the vessel being on standby with limited duties to permit a faster return to Dampier and this is not considered reasonably practical.<br>Woodside has established frame agreements with vessel providers and will track availability of similar vessels. These options are both considered reasonably practicable. | Associated cost of implementation is minimal to the environmental benefit gained. | This control measure is adopted as the costs and complexity are not considered disproportionate to any environmental benefit that might be realised. | Yes |

### 6.3.4. Selected Control Measures

Following review of alternative, additional and improved control measures, the following controls were selected for implementation for the PAP.

- Alternative
  - None selected

- Additional
  - Pre-identifying / contracting vessels through Frame Agreements for SSDI loading and operations
- Improved
  - None selected

## 6.4. Surface Dispersant Application – ALARP Assessment

Alternative, Additional and Improved options have been identified and assessed against the base capability described in Section 5 with those that have been selected for implementation highlighted in green. Items highlighted in red have been considered and rejected on the basis that they are not feasible, the costs are clearly disproportionate to the environmental benefit, and/or the option is not reasonably practical. Control measures where there is not a clear justification for their inclusion or exclusion may be subject to a detailed ALARP assessment.

### 6.4.1. Existing capability - Surface Dispersant Application

Woodside's existing level of capability is based on internal and third-party resources that are available 24 hours, 7 days per week. The capability presented below and is displayed as ranges from lower to upper to incorporate operational factors such as weather, daylight, crew/vessel/aircraft location and duties prior to deployment, survey or classification society inspection requirements for vessels, overflight/port/quarantine permits and inspections, crew/pilot duty and fatigue hours, refuelling/re-stocking provisioning, and other similar logistics and operational limitations that are beyond Woodside's direct control.

**Table 6-6: Existing Capability - Surface Dispersant Application**

| **E** | **Existing Capability** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **E1** | **Existing level of SDA capability available – Aerial Dispersant Application ($m^3$)** | | | | | | | | | | | | |
| **Existing capability - Surface Dispersant Application** | | **Day 1** | **Day 2** | **Day 3** | **Day 4** | **Day 5** | **Day 6** | **Day 7** | **Week 2** | **Week 3** | **Week 4** | **Month 2** | **Month 3** |
| | **By Volume – $m^3$** | | | | | | | | | | | | |
| **E1.1** | **Predicted oil contacted by SDA (lower) - $m^3$** | 0 | 113 | 463 | 938 | 1,050 | 1,213 | 1,213 | 8,488 | 8,488 | 8,488 | 36,375 | 36,375 |
| **E1.2** | **Predicted oil dispersed by SDA (lower) - $m^3$** | 0 | 52 | 213 | 431 | 483 | 558 | 558 | 3,904 | 3,904 | 3,904 | 16,733 | 16,733 |
| **E1.3** | **Predicted oil contacted by SDA (upper) - $m^3$** | 0 | 885 | 1,260 | 2,385 | 2,385 | 2,385 | 2,385 | 16,695 | 16,695 | 16,695 | 71,550 | 71,550 |
| **E1.4** | **Predicted oil dispersed by SDA (upper) - $m^3$** | 0 | 730 | 1,040 | 1,968 | 1,968 | 1,968 | 1,968 | 13,773 | 13,773 | 13,773 | 59,029 | 59,029 |
| **E1.5** | **Dispersant delivery available (lower) - $m^3$** | 0 | 9 | 37 | 75 | 84 | 97 | 97 | 679 | 679 | 679 | 2,910 | 2,910 |
| **E1.6** | **Dispersant delivery available (upper) - $m^3$** | 0 | 59 | 84 | 159 | 159 | 159 | 159 | 1,113 | 1,113 | 1,113 | 4,770 | 4,770 |
| | **By Surface Area– $km^2$** | | | | | | | | | | | | |
| **E1.7** | **Predicted surface area treated by SDA (lower) – $km^2$** | 0 | 2 | 7 | 15 | 17 | 19 | 19 | 136 | 136 | 136 | 582 | 582 |
| **E1.8** | **Predicted surface area treated by SDA (upper) – $km^2$** | 0 | 12 | 17 | 32 | 32 | 32 | 32 | 223 | 223 | 223 | 954 | 954 |
| **E2** | **Existing level of SDA capability available – Vessel Dispersant Application ($m^3$)** | | | | | | | | | | | | |
| | **By Volume - $m^3$** | | | | | | | | | | | | |
| **E2.1** | **Predicted oil contacted by SDA (lower) - $m^3$** | 50 | 50 | 50 | 50 | 100 | 100 | 100 | 700 | 700 | 700 | 3,000 | 3,000 |
| **E2.2** | **Predicted oil dispersed by SDA (lower) - $m^3$** | 23 | 23 | 23 | 23 | 46 | 46 | 46 | 322 | 322 | 322 | 1,380 | 1,380 |
| **E2.3** | **Predicted oil contacted by SDA (upper) - $m^3$** | 80 | 160 | 320 | 320 | 320 | 480 | 480 | 2,240 | 2,240 | 2,240 | 6,000 | 6,000 |
| **E2.4** | **Predicted oil dispersed by SDA (upper) - $m^3$** | 66 | 132 | 264 | 264 | 264 | 396 | 396 | 1,848 | 1,848 | 1,848 | 4,950 | 4,950 |
| **E2.5** | **Dispersant delivery available (lower) - $m^3$** | 8 | 8 | 8 | 8 | 16 | 16 | 16 | 112 | 112 | 112 | 480 | 480 |
| **E2.6** | **Dispersant delivery available (upper) - $m^3$** | 8 | 16 | 32 | 32 | 32 | 48 | 48 | 224 | 224 | 224 | 600 | 600 |
| | **By Surface Area – $km^2$** | | | | | | | | | | | | |
| **E2.7** | **Predicted surface area treated by SDA (lower) – $km^2$** | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 22 | 22 | 22 | 96 | 96 |
| **E2.8** | **Predicted surface area treated by SDA (upper) – $km^2$** | 2 | 3 | 6 | 6 | 6 | 10 | 10 | 45 | 45 | 45 | 120 | 120 |

### 6.4.2. Response Planning: Okha FPSO Facility Operations – loss of well containment (MEE-01)

Deterministic modelling scenarios indicate that first shoreline impact at Barrow Island occurs within 14 days for the loss of well containment scenario (MEE-01). The deterministic model run selected for response planning, however, does not contact Barrow Island and the initial impact is at Ningaloo Coast on Day 75. This model run was selected to demonstrate how a larger scale surface dispersant operation would be developed and implemented.

Modelling results at defined response thresholds (>50 g/m$^2$) indicate that the subsea release from scenario MEE-01 is not expected provide widespread opportunities for surface dispersant application or containment and recovery due to release rates, droplet size at the well head and significant weathering of the hydrocarbon through the water column. Modelling predicts there is unlikely to be large surface concentrations at BAOAC 5 (greater than 200g/m$^2$) and will be below 15,000 cSt due to spreading, weathering and dissolution through the water column. Due to this weathering and the extensive subsea movement of hydrocarbons from currents at different water depths, there will be limited volumes and surface area available for surface dispersant operations.

Modelling results at defined response thresholds (>50 g/m$^2$ and <15,000 cSt) where surface dispersants are likely to be effective indicate that the subsea release from MEE-01 is expected to be available for surface dispersant operations for up to two months (based on predicted dispersant effectiveness). From approximately Month 2, modelling predicts there are no longer sufficient surface hydrocarbons to treat with surface dispersant application due to spreading, weathering and entrainment.

To remove the majority of the surface hydrocarbons before shoreline contact would require the treatment of the majority of the initial surface release (197 m$^3$ available surface oil in Week 2). This would require 1 m$^3$-6 m$^3$ of dispersant delivery in Week 2 from 1 Fixed Wing Aerial Dispersant Contract (FWADC) aircraft. The surface area of hydrocarbons within threshold values peaks at 15 km$^2$ in Month 2 and would require 2 FWADC and 2 large capacity aircraft covering approximately 3-4 km$^2$ per aircraft per day.

Current capability will meet the required response need from Day 2 for the available surface area (0 km$^2$) and volume (0 m$^3$) above treatable threshold concentrations, and onwards for the loss of well containment scenario (MEE-01). Additionally, there will be limitations on available surface area that can be treated as aircraft operations from Dampier will have a predicted upper limit of 6 aircraft undertaking approximately 18-24 sorties per day based on aviation operation limitations (daylight operations, transit time to surface hydrocarbons, ground support, turnaround/refuelling times).

For the purpose of capability demonstration below, Woodside has shown that sufficient capability exists to commence and continue SDA until surface hydrocarbons no longer meet threshold parameters (approximately Month 2).

**Table 6-7: Okha FPSO Facility Operations loss of well containment (MEE-01) – Release volumes**

| Okha FPSO Facility Operations loss of well containment (MEE-01) | | Day | Day | Day | Day | Day | Day | Day | Week | Week | Week | Month | Month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 2 | 3 | 4 | 2 | 3 |
| | Oil on sea surface | | | | | | | | | | | | |
| A | Total volume of oil released (subsea) – m$^3$ | 2,414 | 2,414 | 2,414 | 2,414 | 2,414 | 2,414 | 2,414 | 16,898 | 16,898 | 16,898 | 72,420 | 45,866 |
| B | Cumulative volume released – m$^3$ | 2,414 | 4,828 | 7,242 | 9,656 | 12,070 | 14,484 | 16,898 | 33,796 | 50,694 | 67,592 | 140,012 | 185,878 |
| C | Total volume of surface oil remaining after weathering (per day) – m$^3$ | 369 | 369 | 369 | 369 | 369 | 369 | 369 | 2,585 | 2,585 | 2,585 | 11,080 | 7,017 |

*A and B - This volume represents the total volume of hydrocarbons released from the identified Worst-Case Credible discharge scenario of a loss of well containment of the Okha FPSO Facility Operations well. The total volume for this spill is released over approximately 77 days with a daily flow rate of 2,414 m$^3$ / day.*

*C - The Okha FPSO Facility Operations Cossack Light Crude (API 48.1) contains a moderate proportion (15.3% by mass) of hydrocarbon compounds that will not evaporate at atmospheric temperatures. These compounds will persist in the marine environment. The unweathered mixture has a dynamic viscosity of 1.40 cP. The pour point of the whole oil (-24 °C) ensures that it will remain in a liquid state over the annual temperature range observed on the North West Shelf. The mixture is composed of hydrocarbons that have a wide range of boiling points and volatilities at atmospheric temperatures, and which will begin to evaporate at different rates on exposure to the atmosphere. Evaporation rates will increase with temperature, but in general about 52.2% of the oil mass should evaporate within the first 12 hours (BP < 180 °C); a further 20.5% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and a further 12.0% should evaporate over several days (265 °C < BP < 380 °C). Selective evaporation of the lower boiling-point components will lead to a shift in the physical properties of the remaining mixture, including an increase in the viscosity and pour point. Although removal of the volatile compounds through evaporation and dissolution will result in an increase in density of the remaining oil, the mixture is unlikely to solidify or sink as it weathers. The whole oil has low asphaltene content (<0.05%), indicating a low propensity for the mixture to take up water to form water-in-oil emulsion over the weathering cycle. Soluble aromatic hydrocarbons contribute approximately 14.5% by mass of the whole oil, with a moderate proportion (7.4%) in the C4-C10 range of hydrocarbons. These compounds will evaporate rapidly, reducing the potential for dissolution of a proportion of them into the water.*

**Table 6-8: Okha FPSO Facility Operations loss of well containment (MEE-01) – Treatable hydrocarbons**

| Okha FPSO Facility Operations loss of well containment (MEE-01) | | Day | Day | Day | Day | Day | Day | Day | Week | Week | Week | Month | Month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 2 | 3 | 4 | 2 | 3 |
| **C** | **Treatable hydrocarbons following weathering** | | | | | | | | | | | | |
| **C1** | **Total volume of surface oil >50g/m$^2$ – m$^3$** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **197** | **0** | **347** | **900** | **0** |
| **C2** | **Total surface area >50g/m$^2$– km$^2$** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **3** | **0** | **5** | **15** | **0** |
| | **Dispersable hydrocarbons** | | | | | | | | | | | | |
| **C3** | **Surface oil volume >50g/m$^2$ and viscosity <15,000 cSt – m$^3$** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **197** | **0** | **347** | **900** | **0** |
| **C4** | **Surface area >50g/m$^2$ and viscosity <15,000 cSt – km$^2$** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **3** | **0** | **5** | **15** | **0** |

*C1 – indicates the total remaining volume of hydrocarbons in cubic metres (m$^3$) on the sea surface above 50g/m$^2$. Based on the information outlined in Section 2.3.2.1 regarding surface concentration thresholds, this is the total volume of oil that can be treated by containment and recovery and surface dispersant spraying operations.*

*C2 – indicates the total surface area in square kilometres (km$^2$) of hydrocarbons above 50g/m$^2$. This is the total surface area of BAOAC 4 and above that can be treated by containment and recovery and surface dispersant spraying operations.*

*C3 – indicates the total remaining volume of hydrocarbons in cubic metres (m$^3$) on the sea surface above 50g/m$^2$ and below 15,000 cSt. This is the total volume of oil that can potentially be treated by surface dispersant spraying operations.*

*C4 – indicates the total surface area in square kilometres (km$^2$) of hydrocarbons above 50g/m$^2$ and below 15,000 cSt. This is the total surface area of BAOAC 4 and above that can potentially be treated by surface dispersant spraying operations.*

### 6.4.2.1. Response Planning Need: Okha FPSO Facility Operations loss of well containment (MEE-01) – Summary

Offshore response operations will always be guided by Operational Monitoring to target the thickest part of the slick, typically BAOAC 5 – continuous true oil colour with a surface oil concentration >200g/m$^2$ and BAOAC 4 – discontinuous true oil colour with a surface oil concentration between 50 and 200g/m$^2$.

For a subsea release, the slick does not have a leading edge similar to a surface release so hydrocarbons will surface over a broad area and typically as thin sheens or small discrete patches of oil. As the spill continues to weather and spread over a number of days and weeks, the surface concentration and surface area of continuous oil colour spreads and reduces to discontinuous true oil colour and finally sheen as shown above.

The response need for this scenario is calculated from the surface area and volume of treatable hydrocarbons following weathering as outlined in Table 6-11. For the Okha FPSO Facility Operations loss of well containment scenario, due to the chemical and physical properties of the oil and subsea release, there is no surface oil predicted at BAOAC 5 throughout the deterministic model run. In order to maximise the effectiveness of response operations, Woodside would deploy surface dispersant spraying to target thick patches of oil (BAOAC 4 for this scenario) based on operational monitoring observations. This approach would result in the greatest volume and surface area treated by surface dispersant operations but may also limit the geographic area and effectiveness of containment and recovery as these operations cannot be conducted under or near the surface dispersant spraying operations due to personnel safety reasons. In evaluating the response need for offshore operations, surface dispersant application is prioritised for BAOAC 4.

**Table 6-9: Okha FPSO Facility Operations loss of well containment (MEE-01) – Response Planning Need**

| Okha FPSO Facility Operations loss of well containment (MEE-01) | | Day | Day | Day | Day | Day | Day | Day | Week | Week | Week | Month | Month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 2 | 3 | 4 | 2 | 3 |
| **D** | **Response Planning Need** | | | | | | | | | | | | |
| **D1** | **Bonn Agreement Oil Appearance Code (BAOAC) 5 – Continuous True oil colour** | | | | | | | | | | | | |
| | **Surface area of BAOAC 5 (>200 g/m$^2$) – km$^2$** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | **Surface area of BAOAC 5 (>200 g/m$^2$) and <15,000 cSt – km$^2$** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | **Volume of surface oil BAOAC 5 (>200 g/m$^2$) - m$^3$** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | **Volume of surface oil BAOAC 5 (>200 g/m$^2$) and <15,000 cSt - m$^3$** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **D2** | **Bonn Agreement Oil Appearance Code (BAOAC) 4 – Discontinuous True oil colour** | | | | | | | | | | | | |
| | **Surface area of BAOAC 4 (50-200 g/m$^2$) – km$^2$** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 5 | 15 | 0 |
| | **Surface area of BAOAC 4 (50-200 g/m$^2$) and <15,000 cSt – km$^2$** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 5 | 15 | 0 |
| | **Volume of surface oil BAOAC 4 (50-200 g/m$^2$) - m$^3$** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 197 | 0 | 347 | 900 | 0 |
| | **Volume of surface oil BAOAC 4 (50-200 g/m$^2$) and <15,000 cSt - m$^3$** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 197 | 0 | 347 | 900 | 0 |
| **D3** | **Bonn Agreement Oil Appearance Code (BAOAC) 3, 2 and 1 – Sheen** | | | | | | | | | | | | |
| | **Surface area of BAOAC 3, 2 and 1 (<50 g/m$^2$) – km$^2$** | 33 | 3 | 10 | 15 | 57 | 118 | 101 | 210 | 145 | 1,159 | 1,936 | 517 |
| | **Volume of surface oil BAOAC 3, 2 and 1 (<50 g/m$^2$) - m$^3$** | 208 | 41 | 68 | 49 | 361 | 781 | 441 | 1,001 | 502 | 7,457 | 10,634 | 1,381 |

### 6.4.2.2. Surface Dispersant Operations loss of well containment (MEE-01): Surface area and surface volume

Surface Dispersant operations using vessels and aircraft would target the identified heavy (BAOAC 4 and 5) patches of oil as this technique is able to treat larger volumes and surface areas than containment and recovery and is subject to a window of opportunity (prior to spreading below 50g/m$^2$ and/or viscosity increasing above 15,000 cSt).

The surface area of thickest oil (BAOAC 4 and <15,000 cSt) available for surface dispersant application peaks at approximately 15 km$^2$ in Month 2 where surface concentration and viscosity thresholds are met. By this time, Woodside would have daily use of seven FWADC and at least one larger aircraft from OSRL, each able to undertake at least two sorties each per day, operating from airfields in Dampier. These could cover approximately 672 km$^2$ and contact from 21,728 m$^3$-46,908 m$^3$ surface oil plus six vessels conducting dispersant spraying daily covering approximately 3 km$^2$ per response operation (504 km$^2$ total) and treating 6,720 m$^3$ to 13,440 m$^3$ of surface oil in Month 2.

This capability is sufficient to treat the surface area of BAOAC 4 at full spraying rate (50 l/hectare) and the dispersant application volume would treat the available surface volume (900 m$^3$).

### 6.4.3. Response Planning: Okha FPSO Facility Operations – vessel cargo tank rupture (MEE-05)

Deterministic modelling scenarios indicate that first shoreline impact occurs at Barrow Island within 7 days for the vessel cargo tank rupture scenario (MEE-05). The deterministic model run selected for response planning, however, does not contact Barrow Island until approximately Day 12. This model run was selected to demonstrate how a larger scale surface dispersant operation would be developed and implemented.

On Day 1, modelling predicts 2,251 $m^3$ surface hydrocarbons above threshold of >50g/$m^2$ and approximately 9 $km^2$ of surface area at dispersible concentrations. When viscosity thresholds are also considered, the surface volume >50g/$m^2$ and with viscosity <15,000 cSt, still peaks at 2,251 $m^3$ and approximately 9 $km^2$ of surface area at dispersible concentrations on Day 1. Surface area peaks at 15 $km^2$ on Day 2.

Current capability will meet the required response need from Day 3 due to surface concentrations falling below threshold and remaining so for the remaining duration of scenario MEE-05 . As spreading and weathering occurs, there will be limitations on available surface area that can be treated. Additionally, aircraft operations from Dampier will have a predicted upper limit of 6 aircraft undertaking approximately 18-24 sorties per day based on aviation operation limitations (daylight operations, transit time to surface hydrocarbons, ground support, turnaround/refuelling times).

**Table 6-10: Response Planning Okha FPSO Facility Operations vessel cargo tank rupture (MEE-05) – Release volumes**

| Okha FPSO Facility Operations – vessel cargo tank rupture (MEE-05) | | Day | Day | Day | Day | Day | Day | Day | | Week | Week | Week | | Month | Month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | 2 | 3 | 4 | | 2 | 3 |
| | **Oil on sea surface** | | | | | | | | | | | | | | |
| A | **Total volume of oil released (surface) - $m^3$** | 30,302 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |
| B | **Total volume of surface oil remaining after weathering (per day) - $m^3$** | 4,636 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |

*A - This volume represents the total volume of hydrocarbons released from the identified Worst-Case Credible discharge. The total volume for this spill is 30,302 $m^3$ which is released over approximately 24 hours.*

*B - The Okha FPSO Facility Operations Cossack Light Crude (API 48.1) contains a moderate proportion (15.3% by mass) of hydrocarbon compounds that will not evaporate at atmospheric temperatures. These compounds will persist in the marine environment. The unweathered mixture has a dynamic viscosity of 1.40 cP. The pour point of the whole oil (-24 °C) ensures that it will remain in a liquid state over the annual temperature range observed on the North West Shelf. The mixture is composed of hydrocarbons that have a wide range of boiling points and volatilities at atmospheric temperatures, and which will begin to evaporate at different rates on exposure to the atmosphere. Evaporation rates will increase with temperature, but in general about 52.2% of the oil mass should evaporate within the first 12 hours (BP < 180 °C); a further 20.5% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and a further 12.0% should evaporate over several days (265 °C < BP < 380 °C). Selective evaporation of the lower boiling-point components will lead to a shift in the physical properties of the remaining mixture, including an increase in the viscosity and pour point. Although removal of the volatile compounds through evaporation and dissolution will result in an increase in density of the remaining oil, the mixture is unlikely to solidify or sink as it weathers. The whole oil has low asphaltene content (<0.05%), indicating a low propensity for the mixture to take up water to form water-in-oil emulsion over the weathering cycle. Soluble aromatic hydrocarbons contribute approximately 14.5% by mass of the whole oil, with a moderate proportion (7.4%) in the C4-C10 range of hydrocarbons. These compounds will evaporate rapidly, reducing the potential for dissolution of a proportion of them into the water.*

** - For the deterministic modelling run selected, the shoreline impact occurs from Day 7.*

**Table 6-11: Okha FPSO Facility Operations vessel cargo tank rupture (MEE-05) – Treatable hydrocarbons**

| Okha FPSO Facility Operations vessel cargo tank rupture (MEE-05) | | Day | Day | Day | Day | Day | Day | Day | | Week | Week | Week | | Month | Month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | 2 | 3 | 4 | | 2 | 3 |
| C | **Treatable hydrocarbons following weathering** | | | | | | | | | | | | | | |
| C1 | **Total volume of surface oil >50g/$m^2$ – $m^3$** | 2,251 | 1,633 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |
| C2 | **Total surface area >50g/$m^2$– $km^2$** | 9 | 15 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |
| | **Dispersable hydrocarbons** | | | | | | | | | | | | | | |
| C3 | **Surface oil volume >50g/$m^2$ and viscosity <15,000 cSt – $m^3$** | 2,251 | 1,633 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |
| C4 | **Surface area >50g/$m^2$ and viscosity <15,000 cSt – $km^2$** | 9 | 15 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |

*C1 – indicates the total remaining volume of hydrocarbons in cubic metres ($m^3$) on the sea surface above 50g/$m^2$. Based on the information outlined in Section 2.3.2.1 regarding surface concentration thresholds, this is the total volume of oil that can be treated by surface dispersant spraying and containment and recovery operations.*

*C2 – indicates the total surface area in square kilometres ($km^2$) of hydrocarbons above 50g/$m^2$. This is the total surface area of BAOAC 4 and above that can be treated by surface dispersant spraying and containment and recovery operations.*

*C3 – indicates the total remaining volume of hydrocarbons in cubic metres ($m^3$) on the sea surface above 50g/$m^2$ and below 15,000 cSt. This is the total volume of oil that can potentially be treated by surface dispersant spraying operations.*

*C4 – indicates the total surface area in square kilometres ($km^2$) of hydrocarbons above 50g/$m^2$ and below 15,000 cSt. This is the total surface area of BAOAC 4 and above that can potentially be treated by surface dispersant spraying operations.*

#### 6.4.3.1. Response Planning Need: Okha FPSO Facility Operations vessel cargo tank rupture (MEE-05) – Summary

Offshore response operations will always be guided by Operational Monitoring to target the thickest part of the slick, typically BAOAC 5 – continuous true oil colour with a surface oil concentration >200g/$m^2$ and BAOAC 4 – discontinuous true oil colour with a surface oil concentration between 50 and 200g/$m^2$.

For a surface release, the thickest oil is typically in the leading edge of the slick, driven by wind and currents. As the spill continues to weather and spread over a number of days and weeks, the surface concentration and surface area of continuous oil colour spreads and reduces to discontinuous true oil colour and finally sheen as shown below.

The response need is calculated from the surface area and volume of treatable hydrocarbons following weathering as outlined in Table 6-8 above. In order to target response operations, Woodside would deploy surface dispersant spraying at the leading edge. This approach would result in the greatest volume and surface area treated by surface dispersant operations but may also limit the geographic area and effectiveness of containment and recovery as these operations cannot be conducted under or near the surface dispersant spraying operations due to personnel safety reasons. In evaluating the response need for offshore operations, surface dispersant application is prioritised for BAOAC 5.

**Table 6-12: Okha FPSO Facility Operations vessel cargo tank rupture (MEE-05) – Response Planning Need**

| Okha FPSO Facility Operations – vessel cargo tank rupture (MEE-05) | | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 7 | | Week 2 | Week 3 | Week 4 | | Month 2 | Month 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **D** | **Response Planning Need** | | | | | | | | | | | | | | |
| **D1** | **Bonn Agreement Oil Appearance Code (BAOAC) 5 – Continuous True oil colour** | | | | | | | | | | | | | | |
| | **Surface area of BAOAC 5 (>200 g/m²) – km²** | 5 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |
| | **Surface area of BAOAC 5 (>200 g/m²) and <15,000 cSt – km²** | 5 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |
| | **Volume of surface oil BAOAC 5 (>200 g/m²) - m³** | 1,706 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |
| | **Volume of surface oil BAOAC 5 (>200 g/m²) and <15,000 cSt - m³** | 1,706 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |
| **D2** | **Bonn Agreement Oil Appearance Code (BAOAC) 4 – Discontinuous True oil colour** | | | | | | | | | | | | | | |
| | **Surface area of BAOAC 4 (50-200 g/m²) – km²** | 4 | 15 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |
| | **Surface area of BAOAC 4 (50-200 g/m²) and <15,000 cSt – km²** | 4 | 15 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |
| | **Volume of surface oil BAOAC 4 (50-200 g/m²) - m³** | 545 | 1633 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |
| | **Volume of surface oil BAOAC 4 (50-200 g/m²) and <15,000 cSt - m³** | 545 | 1633 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |
| **D3** | **Bonn Agreement Oil Appearance Code (BAOAC) 3, 2 and 1 – Sheen** | | | | | | | | | | | | | | |
| | **Surface area of BAOAC 3, 2 and 1 (<50 g/m²) – km²** | 39 | 74 | 109 | 64 | 62 | 67 | 73 | | 488 | 102 | 55 | | 79 | 0 |
| | **Volume of surface oil BAOAC 3, 2 and 1 (<50 g/m²) - m³** | 383 | 759 | 770 | 329 | 309 | 297 | 288 | | 1,281 | 149 | 80 | | 107 | 0 |

### 6.4.3.2. Surface Dispersant Operations vessel cargo tank rupture (MEE-05): Surface area and surface volume

Surface Dispersant operations using vessels and aircraft would target the identified heavy (BAOAC 4 and 5) patches of oil as this technique is able to treat larger volumes and surface areas than containment and recovery and is subject to a window of opportunity (prior to spreading below 50g/m² and/or viscosity increasing above 15,000 cSt).

The surface area of thickest oil (BAOAC 4 and 5 and <15,000 cSt) available for surface dispersant application peaks at approximately 15 km² on Day 2 where surface concentration and viscosity thresholds are met. By this time, Woodside would expect 1 Fixed Wing Aerial Dispersant Contract (FWADC) aircraft along with 1 larger aircraft from OSRL, to be operating from airfields in Dampier covering approximately 6-8 km² and contacting from 96 m³-537 m³ plus 1-2 vessels conducting dispersant spraying covering approximately 3 km² and treating 40 m³-160 m³ of surface oil on Day 2.

The capability to treat the surface area of BAOAC 4 and 5 at full spraying rate (50l/hectare) and the dispersant application volume would treat the available surface volume (0 m³ available at threshold concentration) by Day 3.

### 6.4.4. Surface Dispersant Application – Control measure options analysis

#### 6.4.4.1. Alternative Control Measures

| **Alternative Control Measures Considered**<br>*Alternative, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Dedicated Response Vessel in region (exclusive to Woodside) | The environmental benefits associated with surface dispersant application are described above.<br>The additional environmental benefit obtained from immediate access to this equipment, permitting deployment as soon as conditions became favourable, would result in a negligible environmental benefit (25-40m$^3$ of oil contacted resulting in approximately 12-26m$^3$ of oil treated) based on one operation. | Chartering and equipping additional vessels on standby has been considered. The option is reasonably practicable but the sacrifice (charter costs and organisational complexity) is significant, particularly when compared with the anticipated availability of vessel and FWADC resources which have a similar dispersant delivery capacity and are available from Day 2 to treat the spill. The effectiveness of this control (weather dependency, availability and survivability) is rated as very low. | The cost ($15 M per annum for the PAP) and organisational complexity of employing a dedicated response vessel is considered disproportionate to the minor environmental benefit to be realised by implementing this control. | This option is not adopted as it has low effectiveness and cost is disproportionate to the minimal potential environmental benefit. | No |
| Dedicated Response Vessel in region (shared resource) | The environmental benefit would be similar to that described above for Woodside integrated fleet vessels. | Additional resources and capability can be contracted should the need arise, and dispersant build-up is capable of satisfying additional demand. | The cost and complexity of implementing and maintain this alternative control measure is considered high given the predicted effectiveness. Even with consideration of shared costs, the minor benefit of this control measure does not justify the cost. | This option is not adopted as the complexity and cost are disproportionate to the minimal potential environmental benefit. | No |

#### 6.4.4.2. Additional Control Measures

| **Additional Control Measures Considered**<br>*Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Lease/purchase additional spray systems and/or dispersant stocks (based at Exmouth/Dampier) | Purchase of additional system(s) and/or dispersant stocks would not provide a significant environmental benefit compared to the current capability in place. | Time to set up and mobilise a marine charter vessel is ~10 days, at which point existing SDA systems are available for loading onto vessels. Adding additional spray systems would allow for extra surface dispersant application capacity but is unlikely to reduce deployment times for this strategy. | For the WCCS, additional SDA (vessel) spray systems and large quantities of dispersant are already available through AMOSC, AMSA and OSRL therefore the cost is considered disproportionate to the minor benefit gained. | This option is not adopted as the current capability meets the need. | No |
| Train additional Woodside personnel in Dampier to coordinate vessel dispersant application | Limited environmental benefit to be gained by training additional personnel. | Current capability meets need. Woodside has a pool of trained, competent offshore responders / team leaders at strategic locations to ensure timely and sustainable response. Additional personnel are available through current contracts with AMOSC and OSRL and agreements with AMSA. Marine standards & guidelines ensure vessel masters are competent for their roles. Regular audits of oil spill response organisations ensure training and competency is maintained. | Minor additional cost regarding training and maintenance of competency. | This option is not adopted as the current capability meets the need. | No |

#### 6.4.4.3. Improved Control Measures

| **Improved Control Measures considered**<br>*Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures in terms of functionality, availability, reliability, survivability, independence and compatibility* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Cost** | **Assessment conclusions** | **Implemented** |
| Locate vessel spraying equipment on additional in-field support vessel(s) | This option may achieve minor incremental improvements in surface oil and residual oil volumes similar to those described for integrated fleet vessels. However, given the likely vessel re-supply times involved to/from the offshore spill location, this option is unlikely to realise material environmental benefits additional the capability selected. | Woodside currently has dispersant spray systems pre-located on vessels used in-field during cargo transfer activities. Consideration of equipping additional vessels with similar equipment was made but is not being carried through to implementation. | The option is reasonably practicable and the cost (charter and operational/maintenance costs) is expected to be moderate, particularly when compared with the ability to rapidly commence spraying operations, subject to safety considerations but Woodside considers the existing control measures to be sufficient for the need. | This option is not adopted as the current capability meets the need. | No |

### 6.4.5. Selected Control Measures

Following review of alternative, additional and improved control measures as outlined above, the following controls were selected for implementation for the PAP.

- Alternative
  - None selected
- Additional
  - None selected
- Improved
  - None selected

## 6.5. Containment and Recovery – ALARP Assessment

Alternative, Additional and Improved options have been identified and assessed against the base capability described in Section 5 with those that have been selected for implementation highlighted in green. Items highlighted in red have been considered and rejected on the basis that they are not feasible, the costs are clearly disproportionate to the environmental benefit, and/or the option is not reasonably practical. Control measures where there is not a clear justification for their inclusion or exclusion may be subject to a detailed ALARP assessment.

### 6.5.1. Existing Capability – Containment and Recovery

Woodside's exiting level of capability is based on internal and third-party resources that are available 24 hours/7 days. The capability presented below is displayed as ranges to incorporate operational factors such as weather, crew/vessel/aircraft location and duties, survey or classification society inspection requirements, overflight/port/quarantine permits and inspections, crew/pilot duty and fatigue hours, refuelling/re-stocking provisions, and other similar logistic and operational limitation that are beyond Woodside's direct control.

**Table 6-13: Existing Capability – Containment and Recovery**

| E | Existing Capability | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Existing Capability – Containment and Recovery | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 7 | Week 2 | Week 3 | Week 4 | Month 2 | Month 3 |
| E3 | Existing level of CAR capability available ($m^3$ recovered per day) | | | | | | | | | | | | |
| | By Volume – $m^3$ | | | | | | | | | | | | |
| E3.1 | **Predicted oil recovered by** containment and recovery **(lower) – $m^3$** | 0 | 23 | 23 | 92 | 92 | 138 | 161 | 1,127 | 1,127 | 1,127 | 4,830 | 4,830 |
| E3.2 | **Predicted oil recovered by** containment and recovery **(upper) – $m^3$** | 90 | 90 | 270 | 360 | 450 | 540 | 720 | 5,040 | 5,040 | 5,040 | 21,600 | 21,600 |
| | By Surface Area – $km^2$ | | | | | | | | | | | | |
| E3.3 | **Predicted surface area treated by** containment and recovery **(lower) – $km^2$** | 0 | 1 | 1 | 4 | 4 | 5 | 6 | 49 | 49 | 49 | 210 | 210 |
| E3.4 | **Predicted surface area treated by** containment and recovery **(upper) – $km^2$** | 1 | 1 | 3 | 4 | 5 | 6 | 6 | 112 | 112 | 112 | 480 | 480 |

*For E3 – Containment and Recovery, the range of figures shows the predicted recovery rates of surface oil at 50g/m² for the lower figures and 200g/m² for the upper figures using conventional booming systems in a J or U configuration with an encounter rate of 25-50% surface oil meaning 75%-50% of the area within the booming system has surface oil that is not within threshold concentrations <50g/m²).*

### 6.5.2. Response Planning: Okha FPSO Facility Operations – loss of well containment (MEE-01)

Deterministic modelling scenarios indicate that first shoreline impact at Barrow Island occurs within 14 days for the loss of well containment scenario (MEE-01). The deterministic model run selected for response planning, however, does not contact Barrow Island and the initial impact is at Ningaloo Coast on Day 75. This model run was selected to demonstrate how a larger scale containment and recovery operation would be developed and implemented.

Modelling results at defined response thresholds (>50 g/m²) indicate that the subsea release from the loss of well containment scenario (MEE-01) is not expected provide widespread opportunities for containment and recovery due to release rates, droplet size at the well head and significant weathering of the hydrocarbon through the water column.

Modelling predicts there is unlikely to be surface concentrations at BAOAC 5 (greater than 200g/m²) with spreading and evaporation decreasing any BAOAC 5 areas to BAOAC 4 (50-200 g/m²). Due to the weathering and the extensive subsea movement of hydrocarbons from currents at different water depths, there will be likely be sufficient volumes and surface area available for containment and recovery operations throughout the release, but these are expected to be small discrete patches spread over a very large spatial area. Deterministic modelling predicts an initial peak of 197 m³ in Week 2 with approximately 3 km² of surface area at recoverable concentrations. Recoverable concentrations drop back to 0 m³ during Week 3 and then increase again to 347 m³ covering an area of 5 km² in Week 4. The maximum peak is 900 m³ occurring in Month 2 with approximately 15 km² of surface area at recoverable concentrations.

To remove the majority of the surface hydrocarbons before shoreline contact would require the removal of the available surface oil >50g/m² on each day. Based on volume, this capability required would be approximately 2 containment and recovery operations recovering a total of 45 m³-135m³ per day during Week 2, 3 containment and recovery operations recovering 67.5 m³-202.5 m³ each per day during Week 4, and 1-9 containment and recovery operations recovering 22.5 m³-607.5m³ in Month 2. Recovered quantities are based on daily a recovery rate of 22.5 m³-67.5 m³ per operation. As spreading and weathering occur, there will be limitations on available surface area that can be treated as shown in Section 5.5.

The capability available would be able to cover the surface area of BAOAC 4 from the initial instance of surface thresholds being met in Week 2 with approximately 3 km² of surface area at recoverable concentrations. For the purpose of capability demonstration below, Woodside has demonstrated that sufficient capability exists to commence and continue containment and recovery until there are insufficient hydrocarbons for the loss of well containment scenario, at approximately Month 2.

**Table 6-14: Response Planning Okha FPSO Facility Operations loss of well containment (MEE-01) – Release volumes**

| | Okha FPSO Facility Operations loss of well containment (MEE-01) | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 7 | Week 2 | Week 3 | Week 4 | Month 2 | Month 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Oil on sea surface | | | | | | | | | | | | |
| A | **Total volume of oil released (subsea) - $m^3$** | 2,414 | 2,414 | 2,414 | 2,414 | 2,414 | 2,414 | 2,414 | 16,898 | 16,898 | 16,898 | 72,420 | 45,866 |
| B | **Cumulative volume released – $m^3$** | 2,414 | 4,828 | 7,242 | 9,656 | 12,070 | 14,484 | 16,898 | 33,796 | 50,694 | 67,592 | 140,012 | 185,878 |
| C | **Total volume of surface oil remaining after weathering (per day) - $m^3$** | 369 | 369 | 369 | 369 | 369 | 369 | 369 | 2,585 | 2,585 | 2,585 | 11,080 | 7,017 |

*A and B - This volume represents the total volume of hydrocarbons released from the identified Worst-Case Credible discharge scenario of a loss of well containment of the Okha FPSO Facility Operations well. The total volume for this spill is released over approximately 77 days with a daily flow rate of 2,414 $m^3$ / day.*

*C - The Okha FPSO Facility Operations Cossack Light Crude (API 48.1) contains a moderate proportion (15.3% by mass) of hydrocarbon compounds that will not evaporate at atmospheric temperatures. These compounds will persist in the marine environment. The unweathered mixture has a dynamic viscosity of 1.40 cP. The pour point of the whole oil (-24 °C) ensures that it will remain in a liquid state over the annual temperature range observed on the North West Shelf. The mixture is composed of hydrocarbons that have a wide range of boiling points and volatilities at atmospheric temperatures, and which will begin to evaporate at different rates on exposure to the atmosphere. Evaporation rates will increase with temperature, but in general about 52.2% of the oil mass should evaporate within the first 12 hours (BP < 180 °C); a further 20.5% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and a further 12.0% should evaporate over several days (265 °C < BP < 380 °C). Selective evaporation of the lower boiling-point components will lead to a shift in the physical properties of the remaining mixture, including an increase in the viscosity and pour point. Although removal of the volatile compounds through evaporation and dissolution will result in an increase in density of the remaining oil, the mixture is unlikely to solidify or sink as it weathers. The whole oil has low asphaltene content (<0.05%), indicating a low propensity for the mixture to take up water to form water-in-oil emulsion over the weathering cycle. Soluble aromatic hydrocarbons contribute approximately 14.5% by mass of the whole oil, with a moderate proportion (7.4%) in the C4-C10 range of hydrocarbons. These compounds will evaporate rapidly, reducing the potential for dissolution of a proportion of them into the water.*

**Table 6-15: Okha FPSO Facility Operations loss of well containment (MEE-01) – Treatable hydrocarbons**

| **Okha FPSO Facility Operations loss of well containment (MEE-01)** | | Day | Day | Day | Day | Day | Day | Day | | Week | Week | Week | | Month | Month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | 2 | 3 | 4 | | 2 | 3 |
| **C** | **Treatable hydrocarbons following weathering** | | | | | | | | | | | | | | |
| **C1** | **Total volume of surface oil >50$g/m^2$ – $m^3$** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 197 | 0 | 347 | | 900 | 0 |
| **C2** | **Total surface area >50$g/m^2$– $km^2$** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 3 | 0 | 5 | | 15 | 0 |

*C1 – indicates the total remaining volume of hydrocarbons in cubic metres ($m^3$) on the sea surface above 50$g/m^2$. Based on the information outlined in Section 2.3.2.1 regarding surface concentration thresholds, this is the total volume of oil that can be treated by containment and recovery and surface dispersant spraying operations.*

*C2 – indicates the total surface area in square kilometres ($km^2$) of hydrocarbons above 50$g/m^2$. This is the total surface area of BAOAC 4 and above that can be treated by containment and recovery and surface dispersant spraying operations.*

### 6.5.2.1. Response Planning Need: Okha FPSO Facility Operations loss of well containment (MEE-01) – Summary

Offshore response operations will always be guided by Operational Monitoring to target the thickest part of the slick, typically BAOAC 5 – continuous true oil colour with a surface oil concentration >200$g/m^2$ and BAOAC 4 – discontinuous true oil colour with a surface oil concentration between 50 and 200$g/m^2$. For a subsea release, the slick does not have a leading edge similar to a surface release so hydrocarbons will surface over a broad area and typically as thin sheens or small discrete patches of oil. As the spill continues to weather and spread over a number of days and weeks, the surface concentration and surface area of continuous oil colour spreads and reduces to discontinuous true oil colour and finally sheen.

The response need is calculated from the surface area and volume of treatable hydrocarbons following weathering as outlined in Table 6-14 above. While surface dispersant operations target the leading edge of the slick where surface concentration and viscosity thresholds are met, containment and recovery operations would be deployed behind the surface dispersant application area to target discrete patches of thick oil at BAOAC 4 and 5 and remaining oil that is not dispersed.

**Table 6-16: Okha FPSO Facility Operations loss of well containment (MEE-01) – Response Planning Need**

| **Okha FPSO Facility Operations loss of well containment (MEE-01) – Containment and Recovery** | | Day | Day | Day | Day | Day | Day | Day | | Week | Week | Week | | Month | Month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | 2 | 3 | 4 | | 2 | 3 |
| **D** | **Response Planning Need** | | | | | | | | | | | | | | |
| **D1** | **Bonn Agreement Oil Appearance Code (BAOAC) 5 – Continuous True oil colour** | | | | | | | | | | | | | | |
| | **Surface area of BAOAC 5 (>200 $g/m^2$) – $km^2$** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |
| | **Volume of surface oil BAOAC 5 (>200 $g/m^2$) – $m^3$** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |
| | | | | | | | | | | | | | | | |
| **D2** | | | | | | | | | | | | | | | |
| | **Surface area of BAOAC 4 (50-200 $g/m^2$) – $km^2$** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 3 | 0 | 5 | | 15 | 0 |
| | **Volume of surface oil BAOAC 4 (50-200 $g/m^2$) – $m^3$** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 197 | 0 | 347 | | 900 | 0 |
| | | | | | | | | | | | | | | | |
| **D3** | **Bonn Agreement Oil Appearance Code (BAOAC) 3, 2 and 1 – Sheen** | | | | | | | | | | | | | | |
| | **Surface area of BAOAC 3, 2 and 1 (<50 $g/m^2$) – $km^2$** | 33 | 3 | 10 | 15 | 57 | 118 | 101 | | 210 | 145 | 1,159 | | 1,936 | 517 |
| | **Volume of surface oil BAOAC 3, 2 and 1 (<50 $g/m^2$) - $m^3$** | 208 | 41 | 68 | 49 | 361 | 781 | 441 | | 1,001 | 502 | 7,457 | | 10,634 | 1,381 |

#### 6.5.2.2. Containment and Recovery Operations loss of well containment (MEE-01): Surface area and surface volume

Containment and Recovery operations would target discrete patches of oil identified by Monitor and Evaluate activities for a surface release as this technique is secondary to Surface Dispersant Application.

To remove the majority of the surface hydrocarbons before shoreline contact would require the removal of the available surface oil >50g/m$^2$ on each day. Based on volume, this capability required would be approximately 2 containment and recovery operations recovering a total of 45 m$^3$-135m$^3$ per day during Week 2, 3 containment and recovery operations recovering 67.5 m$^3$-202.5 m$^3$ each per day during Week 4, and 1-9 containment and recovery operations recovering 22.5 m$^3$-607.5m$^3$ in Month 2. Recovered quantities are based on daily a recovery rate of 22.5 m$^3$-67.5 m$^3$ per operation. As spreading and weathering occur, there will be limitations on available surface area that can be treated as shown in Section 5.5.

This capability would be able to cover the surface area of BAOAC 4 from the initial instance of surface thresholds being met in Week 2 with approximately 3 km$^2$ of surface area at recoverable concentrations.

The total surface volume and surface area of the release and the volume and area of BAOAC 4 decrease rapidly due to weathering, spreading and the effect of wind and current. As expected, the volume and area of sheen (BAOAC 3, 2, 1) increase over this period as BAOAC 4 decreases.

### 6.5.3. Response Planning: Okha FPSO Facility Operations – vessel cargo tank rupture (MEE-05)

Deterministic modelling scenarios indicate that first shoreline impact at Barrow Island within 7 days (42 m$^3$) for the Okha FPSO Facility Operations cargo tank rupture scenario (MEE-05). The deterministic model run selected for response planning, however, does not contact Barrow Island until approximately Day 12. This model run was selected to demonstrate how a larger scale containment and recovery operation would be developed and implemented.

Modelling results at defined response thresholds (>50 g/m$^2$), where containment and recovery is likely to be effective, indicate that the surface release from the cargo tank rupture scenario (MEE-05) is expected to be available for containment and recovery operations for up to 2 days. From approximately Day 2, modelling predicts there are no longer sufficient surface hydrocarbons at threshold concentration to recover due to spreading and weathering. Viscosity alone is unlikely to prevent containment and recovery operations, but very high viscosity combined with low surface concentrations (<50gm$^2$) are unlikely to continue to provide a net environmental benefit.

To remove the majority of the surface hydrocarbons before shoreline contact would require the removal of the majority of the initial surface release (2,251 m$^3$ available surface oil >50g/m$^2$ on Day 1). Based on volume, this capability would be approximately 3-23 containment and recovery operations recovering 22.5 m$^3$-67.5 m$^3$ each per day (total of 67.5 m$^3$-1552.5 m$^3$). Based on surface area, this capability would need to cover a peak of 15 km$^2$ on Day 2, decreasing to 0 km$^2$ (available oil above threshold concentrations) by Day 3. This would require approximately 15 containment and recovery operations on Day 2. Recovered quantities are based on daily a recovery rate of 22.5 m$^3$-67.5 m$^3$ per operation. As spreading and weathering occur, there will be limitations on available surface area that can be treated as shown in Section 5.5.

This capability would not cover the surface area of BAOAC 5 on Day 1 (5 km$^2$) and BAOAC 4 on Days 1 and 2 (4 km$^2$ and 15 km$^2$) or the capability to treat the available surface volume within thresholds BAOAC 5 on Day 1 (1,706 m$^3$) and BAOAC 4 on Days 1 and 2 (545 m$^3$ and 1,633 m$^3$), however, due to spreading and weathering these surface concentrations drop below recoverable thresholds (>50 g/m$^2$) on Day 3.

Woodside has considered pre-positioning additional resources and including additional capability on vessels and shore locations, that would allow for the treatment of some additional surface hydrocarbons on Days 1 and 2, thereby potentially limiting the migration of surface hydrocarbons to RPA locations. These options are considered below with selected control measures implemented to improve the capability.

Implementing further capability is not expected to provide a significant environmental benefit as only a minor portion of the available surface hydrocarbons would be treated using this technique. For the purpose of capability demonstration below, Woodside has demonstrated that sufficient capability exists to commence and continue containment and recovery until there are insufficient hydrocarbons at recoverable thresholds for MEE-05 scenario, on approximately Day 2.

**Table 6-17: Okha FPSO Facility Operations vessel cargo tank rupture (MEE-05) – Release volumes**

| Okha FPSO Facility Operations – vessel cargo tank rupture (MEE-05) | | Day | Day | Day | Day | Day | Day | Day | | Week | Week | Week | | Month | Month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | 2 | 3 | 4 | | 2 | 3 |
| | Oil on sea surface | | | | | | | | | | | | | | |
| A | Total volume of oil released (surface) - m$^3$ | 30,302 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |
| B | Total volume of surface oil remaining after weathering (per day) - m$^3$ | 4,636 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |

*A - This volume represents the total volume of hydrocarbons released from the identified Worst-Case Credible discharge. The total volume for this spill is 30,302 m$^3$ which is released over approximately 24 hours.*

*B - The Okha FPSO Facility Operations Cossack Light Crude (API 48.1) contains a moderate proportion (15.3% by mass) of hydrocarbon compounds that will not evaporate at atmospheric temperatures. These compounds will persist in the marine environment. The unweathered mixture has a dynamic viscosity of 1.40 cP. The pour point of the whole oil (-24 °C) ensures that it will remain in a liquid state over the annual temperature range observed on the North West Shelf. The mixture is composed of hydrocarbons that have a wide range of boiling points and volatilities at atmospheric temperatures, and which will begin to evaporate at different rates on exposure to the atmosphere. Evaporation rates will increase with temperature, but in general about 52.2% of the oil mass should evaporate within the first 12 hours (BP < 180 °C); a further 20.5% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and a further 12.0% should evaporate over several days (265 °C < BP < 380 °C). Selective evaporation of the lower boiling-point components will lead to a shift in the physical properties of the remaining mixture, including an increase in the viscosity and pour point. Although removal of the volatile compounds through evaporation and dissolution will result in an increase in density of the remaining oil, the mixture is unlikely to solidify or sink as it weathers. The whole oil has low asphaltene content (<0.05%), indicating a low propensity for the mixture to take up water to form water-in-oil emulsion over the weathering cycle. Soluble aromatic hydrocarbons contribute approximately 14.5% by mass of the whole oil, with a moderate proportion (7.4%) in the C4-C10 range of hydrocarbons. These compounds will evaporate rapidly, reducing the potential for dissolution of a proportion of them into the water.*

**Table 6-18: Okha FPSO Facility Operations vessel cargo tank rupture (MEE-05) – Treatable hydrocarbons**

| Okha FPSO Facility Operations vessel cargo tank rupture (MEE-05) | | Day | Day | Day | Day | Day | Day | Day | | Week | Week | Week | | Month | Month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | 2 | 3 | 4 | | 2 | 3 |
| C | Treatable hydrocarbons following weathering | | | | | | | | | | | | | | |
| C1 | Total volume of surface oil >50g/m$^2$ – m$^3$ | 2,251 | 1,633 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |
| C2 | Total surface area >50g/m$^2$– km$^2$ | 9 | 15 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |

*C1 – indicates the total remaining volume of hydrocarbons in cubic metres ($m^3$) on the sea surface above 50g/$m^2$. Based on the information outlined in Section 2.3.2.1 regarding surface concentration thresholds, this is the total volume of oil that can be treated by containment and recovery and surface dispersant spraying operations.*

*C2 – indicates the total surface area in square kilometres ($km^2$) of hydrocarbons above 50g/$m^2$. This is the total surface area of BAOAC 5 and 4 and above that can be treated by containment and recovery and surface dispersant spraying operations.*

### 6.5.3.1. Response Planning Need: Okha FPSO Facility Operations vessel cargo tank rupture (MEE-05) – Summary

Offshore response operations will always be guided by Operational Monitoring to target the thickest part of the slick, typically BAOAC 5 – continuous true oil colour with a surface oil concentration >200g/$m^2$ and BAOAC 4 – discontinuous true oil colour with a surface oil concentration between 50 and 200g/$m^2$. For a surface release, the thickest oil is typically in the leading edge of the slick, driven by wind and currents. As the spill continues to weather and spread over a number of days and weeks, the surface concentration and surface area of continuous oil colour spreads and reduces to discontinuous true oil colour and finally sheen as shown above.

The response need is calculated from the surface area and volume of treatable hydrocarbons following weathering as outlined in Table 6-18 above. While surface dispersant operations target the leading edge of the slick where surface concentration and viscosity thresholds are met, containment and recovery operations would be deployed behind the surface dispersant application area to target discrete patches of thick oil at BAOAC 4 and 5 and remaining oil that is not dispersed.

**Table 6-19: Okha FPSO Facility Operations vessel cargo tank rupture (MEE-05) – Response Planning Need**

| Okha FPSO Facility Operations vessel cargo tank rupture (MEE-05) – Containment and Recovery | | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 7 | | Week 2 | Week 3 | Week 4 | | Month 2 | Month 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **D** | **Response Planning Need** | | | | | | | | | | | | | | |
| **D1** | **Bonn Agreement Oil Appearance Code (BAOAC) 5 – Continuous True oil colour** | | | | | | | | | | | | | | |
| | **Surface area of BAOAC 5 (>200 g/$m^2$) – $km^2$** | 5 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |
| | **Volume of surface oil BAOAC 5 (>200 g/$m^2$) – $m^3$** | 1,706 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |
| | | | | | | | | | | | | | | | |
| **D2** | | | | | | | | | | | | | | | |
| | **Surface area of BAOAC 4 (50-200 g/$m^2$) – $km^2$** | 4 | 15 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |
| | **Volume of surface oil BAOAC 4 (50-200 g/$m^2$) – $m^3$** | 545 | 1633 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 |
| | | | | | | | | | | | | | | | |
| **D3** | **Bonn Agreement Oil Appearance Code (BAOAC) 3, 2 and 1 – Sheen** | | | | | | | | | | | | | | |
| | **Surface area of BAOAC 3, 2 and 1 (<50 g/$m^2$) – $km^2$** | 39 | 74 | 109 | 64 | 62 | 67 | 73 | | 488 | 102 | 55 | | 79 | 0 |
| | **Volume of surface oil BAOAC 3, 2 and 1 (<50 g/$m^2$) - $m^3$** | 383 | 759 | 770 | 329 | 309 | 297 | 288 | | 1,281 | 149 | 80 | | 107 | 0 |

### 6.5.3.2. Containment and Recovery Operations vessel cargo tank rupture (MEE-05): Surface area and surface volume

Containment and Recovery operations would target discrete patches of oil identified by Monitor and Evaluate activities for a surface release as this technique is secondary to Surface Dispersant Application.

To remove the majority of the surface hydrocarbons before shoreline contact would require the removal of the majority of the initial surface release (2,251 $m^3$ available surface oil >50g/$m^2$ on Day 1). Based on volume, this capability would be approximately 3-23 containment and recovery operations recovering 22.5 $m^3$-67.5 $m^3$ each per day (total of 67.5 $m^3$-1552.5 $m^3$). Based on surface area, this capability would need to cover a peak of 15 $km^2$ on Day 2, decreasing to 0 $km^2$ (available oil above threshold concentrations) by Day 3. This would require approximately 15 containment and recovery operations on Day 2. Recovered quantities are based on daily a recovery rate of 22.5 $m^3$-67.5 $m^3$ per operation. As spreading and weathering occur, there will be limitations on available surface area that can be treated as shown in Section 5.5.

This capability would not cover the surface area of BAOAC 5 on Day 1 (5 $km^2$) and BAOAC 4 on Days 1 and 2 (4 $km^2$ and 15 $km^2$) or the capability to treat the available surface volume within thresholds BAOAC 5 on Day 1 (1,706 $m^3$) and BAOAC 4 on Days 1 and 2 (545 $m^3$ and 1,633 $m^3$), however, due to spreading and weathering these surface concentrations drop below recoverable thresholds (>50 g/$m^2$) by Day 3.

Implementing further capability is not expected to provide a significant environmental benefit as only a minor portion of the available surface hydrocarbons would be treated using this technique. For the purpose of capability demonstration below, Woodside has demonstrated that sufficient capability exists to commence and continue containment and recovery until there are insufficient hydrocarbons at recoverable thresholds for MEE-05 scenario, on approximately Day 2.

### 6.5.4. Containment and Recovery – Control Measure Options Analysis

#### 6.5.4.1. Alternative Control Measures

| **Alternative Control Measures Considered**<br>*Alternative, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Dedicated Response Vessel in region (exclusive to Woodside) | The environmental benefits associated with containment and recovery are described above. The additional environmental benefit obtained from immediate access to this equipment, permitting deployment as soon as conditions became favourable, would result in a negligible environmental benefit – 22.5-67.5 $m^3$ of oil recovered per operating unit per day. | Chartering and equipping additional vessels on standby has been considered. The option is reasonably practicable but the sacrifice (charter costs and organisational complexity) is significant, particularly when compared with the anticipated effectiveness of dispersant operations to treat the spill which are available from Day 2. The effectiveness of this control (encounter rate, weather dependency, availability) is rated as very low. | The cost ($15 M per annum for the PAP) and organisational complexity of employing a dedicated response vessel is considered disproportionate to the insignificant environmental benefit to be realised by implementing this control. | This option is not adopted as it has low effectiveness and cost is disproportionate to the minimal potential environmental benefit. | No |
| Dedicated Response Vessel in region (shared resource) | The environmental benefit would be similar to that described above for Woodside integrated fleet vessels. | Additional containment and recovery resources and capability can be contracted should the need arise. | The cost and complexity of implementing and maintain this alternative control measure is considered high given the predicted effectiveness. Even with consideration of shared costs, the minor benefit of this control measure does not justify the cost. | This option is not adopted as it has low effectiveness and cost is disproportionate to the minimal potential environmental benefit. | No |
| Regional oil spill response contractor | This option may achieve minor incremental improvements in surface oil and residual oil volumes similar to those described for integrated fleet vessels. However, given the likely vessel transit times involved to/from the offshore spill location, this option is unlikely to realise material environmental benefits additional the capability selected. | No current private response contracting capability exists that would significantly improve response timing or effectiveness in the Dampier or Exmouth regions. | N/A – not currently feasible | This option is not adopted as it is not currently feasible. | No |

#### 6.5.4.2. Additional Control Measures

| **Additional Control Measures Considered**<br>*Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Train additional Woodside personnel in Dampier to coordinate containment and recovery operations | Limited environmental benefit to be gained by training additional personnel as the number of operations will be governed by the availability of response vessels. | Current capability meets need. Woodside has a pool of trained, competent offshore responders / team leaders at strategic locations to ensure timely and sustainable response. Additional personnel are available through current contracts with AMOSC and OSRL and agreements with AMSA. Marine standards & guidelines ensure vessel masters are competent for their roles. Regular audits of oil spill response organisations ensure training and competency is maintained. | Minor additional cost regarding training and maintenance of competency. | This option is not adopted as the current capability meets the need. | No |

#### 6.5.4.3. Improved Control Measures

| **Improved Control Measures considered**<br>*Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures in terms of functionality, availability, reliability, survivability, independence and compatibility* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Prioritise rapid sweep systems (NOFI Buster series, Desmi Speed Sweep, etc.) for mobilisation from service providers | The environmental benefit of containment and recovery as a response strategy is minor. This response strategy is not considered to be as effective as surface dispersant application to prevent hydrocarbons reaching the shore, but there is expected to be a minor environmental benefit since each rapid sweep containment and recovery operation could remove an additional 10-45 $m^3$ per operation per day. | Rapid sweep systems allow containment and recovery operations to be undertaken at speeds of up to 3 knots. This allows for greater encounter rates and surface coverage. AMOSC has recently purchased a Speed Sweep system and a number of NOFI systems are available through Mutual Aid arrangements. | Additional costs for prioritising rapid sweep systems are negligible | Although containment and recovery remains a low-efficiency response technique, this control measure is adopted as the costs and complexity are not considered disproportionate to any | Yes |

| | | | | | |
|---|---|---|---|---|---|
| | | | | environmental benefit that might be realised. | |
| Prioritise active booming systems (Ro-skim, etc.) for mobilisation from service providers | The environmental benefit of containment and recovery as a response strategy is minor. This response strategy is not considered to be as effective as surface dispersant application to prevent hydrocarbons reaching the shore, but there is expected to be a minor environmental benefit since each rapid sweep containment and recovery operation could remove an additional 10-45 $m^3$ per operation per day. | Active booming systems allow containment and recovery operations without the need for an additional skimming system. This allows for greater effectiveness and continued skimming operations. Active booming systems are available through OSRL and Mutual Aid arrangements and would be prioritised for mobilisation. | Additional costs for prioritising active booming systems are negligible | Although containment and recovery remains a low-efficiency response technique, this control measure is adopted as the costs and complexity are not considered disproportionate to any environmental benefit that might be realised. | Yes |
| Pre-position additional containment and recovery equipment (Exmouth) | It is unlikely that faster mobilisation and deployment from Exmouth would significantly increase response effectiveness or removal of oil to create an increased environmental benefit | Facilities at Exmouth are currently limited by tides and draft for the loading and unloading of vessels with heavy plant and equipment. Access to the Navy Pier to provide an additional loading location is subject to Defence Force approval and cannot be relied upon for rapid approval in the event of an oil spill. | Limited additional cost considerations. | This option is not adopted as the complexity is disproportionate to the minimal potential environmental benefit due to the low efficiency of containment and recovery as a response technique. | No |
| Re-locate containment and recovery equipment on in-field vessels | The additional environmental benefit obtained from faster mobilisation and deployment would be limited by safety considerations during the initial period following the release. Once operations were considered safe, the vessels would increase recovery capacity to 23-90 $m^3$/day per operation. The limited oil treatment of containment and recovery and expected effectiveness of dispersant application from vessels indicates the preference would be for greater SDA capability. | Operations close to the release location are unlikely to be feasible during the initial period due to the uncertainty of the situation and potential safety impacts on personnel.<br>Vessels may require time to return to port and load equipment, fuel etc. to allow response duration to be the maximum possible once deployed.<br>Shortening the timeframes for vessel availability would require equipment to be pre-positioned on-board vessels. | The cost and organisational complexity of employing two dedicated response vessels (approximately $15M per year per vessel) is considered disproportionate to the limited environmental benefit to be realised by adopting this control | This option is not adopted as the cost is disproportionate to the minimal potential environmental benefit due to the low efficiency of containment and recovery as a response technique. | No |
| Purchase or pre-position larger skimmers | The environmental benefit of containment and recovery for the loss of well control scenario is minor. This response strategy is not considered to be as effective as surface dispersant application to prevent hydrocarbons reaching the shore. | Larger systems such as the Desmi Octopus or Transrec with >200 $m^3$ per hour capacity, could improve recovery rates, however are not readily available in Australia and not easily compatible with booming, waste and hydraulic power systems. If required and deemed to be of benefit, these systems are available through Service Providers such as OSRL. | Cost of purchasing Octopus system is $600,000 plus additional transport, training and commissioning costs and ongoing maintenance costs. Cost for pre-positioning in Australia for the life of the asset/activity is greater than the purchase costs. | This option is not adopted as the cost is disproportionate to the minimal potential environmental benefit due to the low efficiency of containment and recovery as a response technique. | No |

### 6.5.5. Selected Control Measures

Following review of alternative, additional and improved control measures as outlined above, the following controls were selected for implementation for the PAP.

- Alternative
  - None selected
- Additional
  - None selected
- Improved
  - Prioritise rapid sweep systems (NOFI Buster series, Desmi Speed Sweep, etc.) for mobilisation from service providers
  - Prioritise active booming systems (Ro-skim, etc.) for mobilisation from service providers

## 6.6. Shoreline Protection & Deflection - ALARP Assessment

Alternative, Additional and Improved options have been identified and assessed against the base capability described in Section 5 with those that have been selected for implementation highlighted in green. Items highlighted in red have been considered and rejected on the basis that they are not feasible, the costs are clearly disproportionate to the environmental benefit, and/or the option is not reasonably practical. Control measures where there is not a clear justification for their inclusion or exclusion may be subject to a detailed ALARP assessment.

### 6.6.1. Existing Capability – Shoreline Protection and Deflection

Woodside's exiting level of capability is based on internal and third-party resources that are available 24 hours, 7 days per week. The capability presented below is displayed as ranges to incorporate operational factors such as weather, crew/vessel/aircraft/vehicle location and duties, survey or classification society inspection requirements, overflight/port/quarantine permits and inspections, crew/pilot duty and fatigue hours, refuelling/re-stocking provisions, and other similar logistic and operational limitation that are beyond Woodside's direct control.

### 6.6.2. Response Planning: Okha FPSO Facility Operations – Shoreline Protection and Deflection

Planning for shoreline protection is based upon identification of Response Protection Areas (RPAs) from deterministic modelling and the logistics associated with deploying protection at these locations. The response planning scenarios indicate that this would require effective mobilisation to priority shorelines and maintenance of protection until operational monitoring confirms that the locations were no longer at risk. Woodside has identified the RPAs from deterministic modelling results provided from specific scenarios.

The control measures selected provide capability to mobilise shoreline protection equipment by Day 1 if required (1 operation available). Deterministic modelling scenarios indicate that first shoreline impact at Barrow Island within 7 days for the vessel cargo tank rupture scenario (MEE-05) and at Barrow Island within 14 days for the loss of well containment scenario (MEE-01). The deterministic model run selected for response planning, however, does not contact Barrow Island until approximately Day 12. This model run was selected to demonstrate how a larger scale shoreline protection and deflection operation would be developed and implemented. Given shoreline contact at RPAs is not predicted until Day 7 at Barrow Island, the existing capability is considered sufficient to mobilise and deploy protection at RPAs prior to hydrocarbon contact, guided by predictive modelling, direct observation/surveillance and remote sensing methods (OM01, OM02 and OM03) employed from the outset of a spill to track the oil and assess receptors at risk. This will then trigger the undertaking of pre-emptive assessments of sensitive receptors at risk (OM04). OM04 would only be undertaken in liaison with WA DoT.

TRPs exist for many of the RPAs identified. The plans identify values and sensitivities that would be protected at each location. Modelling does not predict that all priority protection shorelines will be at risk of contact at the same time. Therefore, to allow for the best use of available shoreline protection and deflection resources, operational monitoring (OM01, OM02 and OM03) will inform the response, targeting RPAs where contact is predicted. Table 6-20 below outlines the capability required (number of RPAs predicted to be impacted) against the capability available (number of shoreline protection and deflection operations that can be mobilised and deployed). As can be seen from the table below. Woodside's capability exceeds the response planning need identified for shoreline protection and deflection operations at identified RPAs.

**Table 6-20: Response Planning – Shoreline Protection and Deflection**

| | Shoreline Protection & Deflection | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 7 | Week 2 | Week 3 | Week 4 | Month 2 | Month 3 | Month 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Oil on shoreline (from deterministic modelling) m$^3$ | | | | | | | | | | | | | |
| A1 | Number of RPAs contacted (> 100g/m$^2$) - Okha FPSO Facility Operations LOWC (MEE-01) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 1 |
| A2 | Number of RPAs contacted (> 100g/m$^2$) - Okha FPSO Facility Operations vessel cargo tank rupture (MEE-05) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 2 | 0 | 0 |
| B1 | SPD operations available – per day (lower) | 0 | 1 | 1 | 2 | 2 | 4 | 6 | 70 | 70 | 70 | 330 | 330 | 0 |
| B2 | SPD operations available – per day (upper) | 1 | 2 | 3 | 4 | 6 | 8 | 10 | 84 | 84 | 84 | 336 | 336 | 1 |
| C1 | SPD operations gap – per day (lower) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| C2 | SPD operations gap – per day (upper) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

*A1 and A2 – the number of Response Protection Areas contacted by surface hydrocarbons above 100g/m$^2$*

*B1 and B2 – the upper and lower number of shoreline protection and deflection operations available (based on response planning assumptions in Section 5.6),*

*C1 and C2 – the gap between the upper and lower number of shoreline protection and deflection operations required in A1 and A2 compared to the operations available in B1 and B2*

**Table 6-21: RPAs for Okha FPSO Facility Operations Facility Operations**

| Areas of coastline contacted | Conservation status | IUCN protection category | Minimum time to shoreline contact (above 100g/m$^2$) in days [13] | Maximum shoreline accumulation (above 100g/m$^2$) in m$^3$ [14] | Minimum time to shoreline contact (above 100g/m$^2$) in days | Maximum shoreline accumulation (above 100g/m$^2$) in m$^3$ |
|---|---|---|---|---|---|---|
| | | | Scenario 1 (MEE-01) – Model 23, Q2 | | Scenario 5 (MEE-05) – Model 32, Q2 | |
| Ningaloo Coast North and World Heritage Area | State Marine Park<br>Australian Marine Park World Heritage Area | IUCN IV – Recreational Use Zone (AMP)<br>IUCN II – Marine National Park Zone | 75 days (20 m$^3$) | 30 m$^3$ (day 77) | 40 days (0.3 m$^3$) | 1.1 m$^3$ (day 44) |
| Montebello Islands and State Marine Park | State Marine Park AMP | IUCN IA – Strict Nature Reserve<br>IUCN VI – Multiple Use Zone<br>IUCN II and IV – Recreational Use Zone<br>IUCN II – Marine National Park Zone | No contact | No contact | 11 days (71 m$^3$) | 113 m$^3$ (day 14) |
| Barrow Island | Barrow Island Marine Park<br>Barrow Island Marine Management Area | IUCN IA – Strict Nature Reserve<br>IUCN VI – Multiple Use Zone<br>IUCN IV – Recreational Use Zone | No contact | No contact | 12 days (4 m$^3$) | 63 m$^3$ (day 15) |
| Lowendal Islands | State Marine Park | IUCN VI – Multiple Use Zone | No contact | No contact | 12 days (1 m$^3$) | 3 m$^3$ (day 16) |
| Pilbara Islands – Southern Islands Group | State Marine Park<br>Australian Marine Park | IUCN IV – Recreational Use Zone (AMP)<br>IUCN II – Marine National Park Zone | 76 days (1.4 m$^3$) | 66 m$^3$ (day 84) | 19 days (0.7 m$^3$) | 36 m$^3$ (day 40) |

[13] This volume and time represent the first time to contact on defined shoreline polygon and the maximum volume ashore for that 24 hour period.
[14] This volume and time represent the maximum volume ashore on defined shoreline polygon for any 24 hour time period

| Areas of coastline contacted | Conservation status | IUCN protection category | Minimum time to shoreline contact (above 100g/m$^2$) in days (13) | Maximum shoreline accumulation (above 100g/m$^2$) in m$^3$ (14) | Minimum time to shoreline contact (above 100g/m$^2$) in days | Maximum shoreline accumulation (above 100g/m$^2$) in m$^3$ |
|---|---|---|---|---|---|---|
| | | | Scenario 1 (MEE-01) – Model 23, Q2 | | Scenario 5 (MEE-05) – Model 32, Q2 | |
| Shark Bay World Heritage Area | State Marine Park<br>Australian Marine Park<br>World Heritage Area | N/A | 99 days (0.2 m$^3$) | 0.2 m$^3$ (99 days) | No contact | No contact |
| Exmouth Gulf West | N/A | N/A | 83 days (0.08 m$^3$) | 0.2 m$^3$ (87 days) | No contact | No contact |
| Muiron Islands Marine Management Area and World Heritage Area | Muiron Islands Marine Management Area | IUCN IA – Strict Nature Reserve<br>IUCN VI – Multiple Use Zone | 75 days (0.3 m$^3$) | 41 m$^3$ (99 days) | 40 days (3 m$^3$) | 4 m$^3$ (day 45) |

**Table 6-22: Indicative Tactical Response Plan, aims and methods for RPAs contacted within 14 days**

| Tactical Response Plan | Response aims and methods |
|---|---|
| Barrow and Lowendal Islands | **First response objective:** Ongoing operational monitoring and evaluation of the hydrocarbon spill to adapt aims and response tactics to the evolving nature of the incident and to assist in locating relevant booming areas.<br>**Second response objective**: Protection of sensitive areas. Prevent hydrocarbons impact through use of shoreline booms. Areas to protect and formation types to deploy will be dependent on the time available until the hydrocarbon impacts the<br>shoreline and local geographical and tidal/weather conditions.<br>**Third response objective**: Pre-clean of potential impact areas (if time allows) using rakes and shovels to move any debris above the high tide line and then segregate appropriately.<br>**Fourth response objective**: Recovery of floating oil where possible through the use of skimming systems and other appropriate recovery devices. Although boom formations will deflect most of the spilt hydrocarbon away from sensitive areas, it may be necessary to collect and remove floating oil from additional boom formations to prevent the spreading of oil down a coastline.<br>**Fifth response objective:** Clean-up of the shoreline. Manual clean up techniques, use of mechanical recovery methods and techniques where appropriate. |
| Montebello Island Champagne Bay and Chippendale channel TRP | **First response aim:** Ongoing operational monitoring and evaluation of the hydrocarbon spill to adapt aims and response tactics to the evolving nature of the incident and to assist in locating relevant booming areas.<br>**Second response aim**: Protection of Champagne Bay. Prevent hydrocarbon passing into the inner reaches of Champagne Bay through use of shoreline booms at Chippendale Channel and the south-western sides of Champagne Bay. Formation types to deploy will be dependent on the time available until the hydrocarbon impacts the shoreline and local geographical and tidal/weather conditions.<br>**Third response aim**: Collection and specialist cleaning/rehabilitation of oiled wildlife. |
| Montebello Island - Claret Bay TRP | **First response objective:** Ongoing operational monitoring and evaluation of the hydrocarbon spill to adapt aims and response tactics to the evolving nature of the incident and to assist in locating relevant booming areas.<br>**Second response objective**: Protection of mangrove within Claret Bay through use of shoreline booms. Formation types to deploy will be dependent on the time available until the hydrocarbon impacts the shoreline and local geographical and tidal/weather conditions.<br>**Third response objective**: Clean-up of the shoreline. Manual clean up techniques, use of mechanical recovery methods and techniques where appropriate. |
| Montebello Island - Hermite/Delta Island Channel TRP | **First response objective:** Ongoing operational monitoring and evaluation of the hydrocarbon spill to adapt aims and response tactics to the evolving nature of the incident and to assist in locating relevant booming areas. |

| | |
|---|---|
| | **Second response objective**: Protection of Mansion Bay. Prevent hydrocarbon passing through the channel into Mansion Bay with the use of shoreline booms. Formation types to deploy will be dependent on the time available until the hydrocarbon impacts the shoreline and local geographical and tidal/weather conditions. |
| Montebello Island - Hock Bay TRP | **First response objective:** Ongoing operational monitoring and evaluation of the hydrocarbon spill to adapt aims and response tactics to the evolving nature of the incident and to assist in locating relevant booming areas.<br><br>**Second response objective**: Prevent hydrocarbon passing into the inner reaches of Stephenson Channel through use of shoreline booms at Hock Bay. Formation types to deploy will be dependent on the time available until the hydrocarbon impacts the shoreline and local geographical and tidal/weather conditions. |
| Montebello Island - North and Kelvin Channel TRP | **First response objective:** Ongoing operational monitoring and evaluation of the hydrocarbon spill to adapt aims and response tactics to the evolving nature of the incident and to assist in locating relevant booming areas.<br><br>**Second response objective**: Prevent hydrocarbon passing through North Channel and Kelvin Channel into the inner areas of the Montebellos through use of shoreline booms. Formation types to deploy will be dependent on the time available until the hydrocarbon impacts the shoreline and local geographical and tidal/weather conditions.<br><br>**Third response objective**: Recovery of floating oil where possible through the use of skimming systems and other appropriate recovery devices. It is necessary to collect and remove floating oil at sea to reduce shoreline impact. |
| Montebello Island - Sherry Lagoon Entrance TRP | **First response objective:** Ongoing operational monitoring and evaluation of the hydrocarbon spill to adapt aims and response tactics to the evolving nature of the incident and to assist in locating relevant booming areas.<br><br>**Second response objective**: Prevent hydrocarbon passing into Sherry Lagoon through use of shoreline booms at the entrance. Formation types to deploy will be dependent on the time available until the hydrocarbon impacts the shoreline and local geographical and tidal/weather conditions. |
| Montebello Island - Stephenson Channel Nth TRP | **First response objective:** Ongoing operational monitoring and evaluation of the hydrocarbon spill to adapt aims and response tactics to the evolving nature of the incident and to assist in locating relevant booming areas<br><br>**Second response objective**: Prevent hydrocarbon passing into the inner reaches of Stephenson Channel through use of shoreline booms. Formation types to deploy will be dependent on the time available until the hydrocarbon impacts the shoreline and local geographical and tidal/weather conditions.<br><br>**Third response objective**: Recovery of floating oil where possible through the use of skimming systems and other appropriate recovery devices. It is necessary to collect and remove floating oil at sea to reduce shoreline impact. |

Pre-emptive mobilisation of equipment and personnel would commence as soon as practicable prior to oil contact. Additional resources would be mobilised depending on the scale of the event to increase the length or number of shorelines being protected.

A shoreline protection and deflection response would be launched and additional TRPs drafted only when operational monitoring (OM02 and OM03) and modelling (OM01) indicate that contact could occur at RPA(s) within 14 days. The outputs from the monitoring will inform the need for and/or direct any additional response techniques and, additionally, if/when the spill enters State Waters and control of the incident passes to WA DoT.

### 6.6.3. Shoreline Protection and Deflection – Control Measure Options Analysis

#### 6.6.3.1. Alternative Control Measures

**Alternative Control Measures Considered**
*Alternative, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control*

| Option considered | Environmental consideration | Feasibility | Approximate cost | Assessment conclusions | Implemented |
|---|---|---|---|---|---|
| Pre-position equipment at Response Protection Areas (RPAs) | Additional environmental benefit of having equipment prepositioned is considered minor. Equipment is currently available to protect RPAs and additional shorelines, within estimated minimum times until shoreline contact at RPAs, enabling mobilisation of the selected delivery options. | The incremental environmental benefit associated with these delivery options is considered minor and unlikely to reduce the environmental consequence of a significant hydrocarbon release beyond the adopted delivery options. Considering the highly unlikely nature of a significant hydrocarbon release and the costs and organisational complexity associated with prepositioning and maintenance of equipment, the sacrifice is considered disproportionate to the limited environmental benefit that might be realised.<br>Furthermore, these options would conflict with the mutual aid philosophy being adopted under the selected delivery options.<br>The selected delivery options for shoreline protection and deflection meet the relevant objectives of this control measure and do not require prepositioned or additional equipment in Exmouth. | Total cost to preposition protection/ deflection packages at each site of potential impact would be approx. $6,100 per package per day. | This option is not adopted as the existing capability meets the need. | No |

#### 6.6.3.2. Additional Control Measures

**Additional Control Measures Considered**
*Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures*

| Option considered | Environmental consideration | Feasibility | Approximate cost | Assessment conclusions | Implemented |
|---|---|---|---|---|---|
| Supplemented stockpiles of equipment in Exmouth to protect additional shorelines | Additional equipment would increase the number of receptor areas that could be protected from hydrocarbon contact. However, current availability of personnel and equipment is capable of protecting up to 30km of shoreline, commensurate with the scale and progressive nature of shoreline impact. Additional stocks would be made available from international sources if long term up scaling were necessary.<br>A reduction in environmental consequence from a ‘B’ rating (serious long-term impacts) is unlikely to be realised as a result of having more equipment available locally. | The incremental environmental benefit associated with these delivery options is considered minor and unlikely to reduce the environmental consequence of a significant hydrocarbon release beyond the adopted delivery options. Considering the highly unlikely nature of a significant hydrocarbon release and the costs and organisational complexity associated with prepositioning and maintenance of equipment, the sacrifice is considered disproportionate to the limited environmental benefit that might be realised.<br>Furthermore, these options would conflict with the mutual aid philosophy being adopted under the selected delivery options.<br>The selected delivery options for shoreline protection and deflection meet the relevant objectives of this control measure and do not require prepositioned or additional equipment in Exmouth. | Total cost for purchase supplemental protection and deflection equipment would be approx. $455,000 per package. | This option is not adopted as the existing capability meets the need. | No |
| Additional trained personnel | The level of training and competency of the response personnel ensures the shoreline protection and deflection operation is delivered with minimum secondary impact to the environment. Training additional personnel does not provide an increased environmental benefit. | Additional personnel required to sustain an extended response can be sourced through the Woodside *People & Global Capability Surge Labour Requirement Plan*. Additional personnel sourced from contracted OSRO’s (OSRL/AMOSC) to manage other responders.<br>Response personnel are trained and exercised regularly in shoreline response techniques and methods. All personnel involved in a response will receive a full operational/safety brief prior to commencing operations. | Additional Specialist Personnel would cost $2,000 per person per day. | This option is not adopted as the existing capability meets the need. | No |

### 6.6.3.3. Improved Control Measures

| **Improved Control Measures considered**<br>*Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures in terms of functionality, availability, reliability, survivability, independence and compatibility* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Faster response/ mobilisation time | Given modelling does not predict shoreline contact at Barrow Island until approximately 7 days (MEE-05) or 14 days (MEE-01), Woodside considers that there is sufficient time for deployment of protection and deflection operations prior to impact. | Response teams, trained personnel, contracted oil spill response service providers, government agencies and the associated mitigation equipment required to enact an initial protection and deflection response will be available for mobilisation within 24-48 hrs of activation.<br>Additional equipment from existing stockpiles and oil spill response service providers can be on scene within days.<br>Hydrocarbons are predicted to strand after a period of approximately 7 days (MEE-05) or 14 days (MEE-01) therefore allowing enough time to re-locate existing equipment, personnel and other resources to the most appropriate areas. | The cost of establishing a local stockpile of new mitigation equipment (including protection and deflection boom) closer to the expected hydrocarbon stranding areas is not commensurate with the need. | This option is not adopted as the existing capability meets the need. | No |

### 6.6.4. Selected Control Measures

Following review of alternative, additional and improved control measures as outlined above, the following controls were selected for implementation for the PAP.

- Alternative
  - None selected
- Additional
  - None selected
- Improved
  - None selected

## 6.7. Shoreline Cleanup – ALARP Assessment

Alternative, Additional and Improved options have been identified and assessed against the base capability described in Section 5 with those that have been selected for implementation highlighted in green. Items highlighted in red have been considered and rejected on the basis that they are not feasible, the costs are clearly disproportionate to the environmental benefit, and/or the option is not reasonably practical. Control measures where there is not a clear justification for their inclusion or exclusion may be subject to a detailed ALARP assessment.

### 6.7.1. Existing Capability – Shoreline Clean-up

Woodside's exiting level of capability is based on internal and third-party resources that are available 24 hours, 7 days per week. The capability presented below is displayed as ranges to incorporate operational factors such as weather, crew/vessel/aircraft/vehicle location and duties, survey or classification society inspection requirements, overflight/port/quarantine permits and inspections, crew/pilot duty and fatigue hours, refuelling/re-stocking provisions, and other similar logistic and operational limitation that are beyond Woodside's direct control.

### 6.7.2. Response planning: Okha FPSO Facility Operations – Shoreline Clean-up

Woodside has assessed existing capability against the WCCS and has identified that the range of techniques provide an ongoing approach to shoreline clean-up at identified RPAs. Woodside's capability can cover all required shoreline clean-up operations for the PAP.

Modelling predicts fastest shoreline contact at Barrow Island from day 7 (42 m$^3$) for the vessel cargo tank rupture scenario (MEE-05). The deterministic model run selected for response planning, however, does not contact Barrow Island until approximately Day 12. This model run was selected to demonstrate how a larger scale shoreline response operation would be developed and implemented. The largest volumes ashore are at Montebello Islands and Montebello Islands State Marine Park with approximately 110 m$^3$ predicted on Day 11 (MEE-05). These volumes assume no treatment of floating surface oil by containment and recovery or surface dispersant application prior to contact so are considered very conservative. In the event of a real spill, predictive modelling, direct observation/surveillance and remote sensing methods (OM01, OM02 and OM03) will be employed from the outset of a spill to track the oil real-time and assess receptors at risk of impact. This will then trigger the undertaking of pre-emptive assessments of sensitive receptors at risk (OM04) and shoreline assessments (OM05) to establish the extent and distribution of oiling and thus direct any shoreline clean-up operations. OM04 and OM05 would only be undertaken in liaison with WA DoT.

These figures have been combined into a single response planning need scenario that provides a worst-case scenario for planning purposes as outlined below. Given all other shoreline contact scenarios identified from deterministic modelling are longer time frames and lesser volumes, demonstration of capability against this need will ensure Woodside can meet requirements for any other outcome. Woodside is satisfied that the current capability is managing risks and impacts to ALARP.

Due to the time of predicted contact for shoreline clean-up, and deterministic modelling predicting ongoing stranding after this peak, this response may not be as time critical compared to other response techniques and the scale will depend on the success of other techniques preventing oiling occurring. Further, the potential scale and remoteness of a response coupled with the uncertainty of which locations will be affected precludes the stockpiling or prepositioning of equipment specific to shorelines. The most significant constraint is accommodation and transport of personnel in the Dampier region to undertake clean-up operations and to manage wastes generated during the response effort. From previous assessment of facilities in the Dampier region, Woodside estimates that current accommodation can cater for a range of 500-700 personnel per day.

Woodside has identified several options which could be mobilised to achieve defined response objectives. Evaluation considers the benefit in terms of the time to respond and the scale of response made possible by each option. The evaluation of possible control measures is summarised in Section 6.7.3

**Table 6-23: Response Planning – Shoreline Cleanup**

| | Shoreline Cleanup (Phase 2) | Day | Day | Day | Day | Day | Day | Day | Week | Week | Week | Month | Month | Month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 2 | 3 | 4 | 2 | 3 | 4 |
| | Oil on shoreline (from deterministic modelling) m$^3$ | | | | | | | | | | | | | |
| | Shoreline accumulation (above 100g/m$^2$) - m$^3$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 113 | 66 | 0 | 41 | 0 | 0 |
| | Oil remaining following response operations - m$^3$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 45 | 0 | 0 | -25 | 0 |
| A | Capability Required (number of operations) | | | | | | | | | | | | | |
| A1 | Shoreline clean-up operations required (lower) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 11 | 0 | 4 | -2 | 0 |
| A2 | Shoreline clean-up operations required (upper) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 16 | 0 | 6 | -4 | 0 |
| B | Capability Available (number of operations) | | | | | | | | | | | | | |
| B1 | Shoreline clean-up operations available - Stage 2 - Manual (lower) | 0 | 1 | 3 | 5 | 8 | 12 | 15 | 105 | 105 | 105 | 560 | 560 | 560 |
| B2 | Shoreline clean-up operations available - Stage 2 - Manual (upper) | 0 | 2 | 5 | 8 | 10 | 15 | 20 | 140 | 140 | 140 | 560 | 560 | 560 |
| C | Capability Gap | | | | | | | | | | | | | |
| C1 | Shoreline clean-up operations gap (lower) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| C2 | Shoreline clean-up operations gap (upper) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

*A1 and A2 – the number of Shoreline clean-up operations required based on the hydrocarbon volumes ashore above 100g/m$^2$*

*B1 and B2 – the upper and lower number of shoreline clean-up operations available (based on response planning assumptions in Section 5.7),*

*C1 and C2 – the gap between the upper and lower number of shoreline clean-up operations required in A1 and A2 compared to the operations available in B1 and B2*

**Table 6-24: RPAs for Okha FPSO Facility Operations Facility Operations**

| Areas of coastline contacted | Conservation status | IUCN protection category | Minimum time to shoreline contact (above 100g/m$^2$) in days [15] | Maximum shoreline accumulation (above 100g/m$^2$) in m$^3$ [16] | Minimum time to shoreline contact (above 100g/m$^2$) in days | Maximum shoreline accumulation (above 100g/m$^2$) in m$^3$ |
|---|---|---|---|---|---|---|
| | | | Scenario 1 (MEE-01) – Model 23, Q2 | | Scenario 5 (MEE-05) – Model 32, Q2 | |
| Ningaloo Coast North and World Heritage Area | State Marine Park<br>Australian Marine Park<br>World Heritage Area | IUCN IV – Recreational Use Zone (AMP)<br>IUCN II – Marine National Park Zone | 75 days (20 m$^3$) | 30 m$^3$ (day 77) | 40 days (0.3 m$^3$) | 1.1 m$^3$ (day 44) |
| Montebello Islands and State Marine Park | State Marine Park AMP | IUCN IA – Strict Nature Reserve<br>IUCN VI – Multiple Use Zone<br>IUCN II and IV – Recreational Use Zone<br>IUCN II – Marine National Park Zone | No contact | No contact | 11 days (71 m$^3$) | 113 m$^3$ (day 14) |
| Barrow Island | Barrow Island Marine Park<br>Barrow Island Marine Management Area | IUCN IA – Strict Nature Reserve<br>IUCN VI – Multiple Use Zone<br>IUCN IV – Recreational Use Zone | No contact | No contact | 12 days (4 m$^3$) | 63 m$^3$ (day 15) |
| Lowendal Islands | State Marine Park | IUCN VI – Multiple Use Zone | No contact | No contact | 12 days (1 m$^3$) | 3 m$^3$ (day 16) |
| Pilbara Islands – Southern Islands Group | State Marine Park<br>Australian Marine Park | IUCN IV – Recreational Use Zone (AMP)<br>IUCN II – Marine National Park Zone | 76 days (1.4 m$^3$) | 66 m$^3$ (day 84) | 19 days (0.7 m$^3$) | 36 m$^3$ (day 40) |

[15] This volume and time represent the first time to contact on defined shoreline polygon and the maximum volume ashore for that 24 hour period.
[16] This volume and time represent the maximum volume ashore on defined shoreline polygon for any 24 hour time period

| Areas of coastline contacted | Conservation status | IUCN protection category | Minimum time to shoreline contact (above 100g/m$^2$) in days (15) | Maximum shoreline accumulation (above 100g/m$^2$) in m$^3$ (16) | Minimum time to shoreline contact (above 100g/m$^2$) in days | Maximum shoreline accumulation (above 100g/m$^2$) in m$^3$ |
|---|---|---|---|---|---|---|
| | | | Scenario 1 (MEE-01) – Model 23, Q2 | | Scenario 5 (MEE-05) – Model 32, Q2 | |
| Shark Bay World Heritage Area | State Marine Park<br>Australian Marine Park<br>World Heritage Area | N/A | 99 days (0.2 m$^3$) | 0.2 m$^3$ (99 days) | No contact | No contact |
| Exmouth Gulf West | N/A | N/A | 83 days (0.08 m$^3$) | 0.2 m$^3$ (87 days) | No contact | No contact |
| Muiron Islands Marine Management Area and World Heritage Area | Muiron Islands Marine Management Area | IUCN IA – Strict Nature Reserve<br>IUCN VI – Multiple Use Zone | 75 days (0.3 m$^3$) | 41 m$^3$ (99 days) | 40 days (3 m$^3$) | 4 m$^3$ (day 45) |

### 6.7.3. Shoreline Clean-up – Control measure options analysis

#### 6.7.3.1. Alternative Control Measures

| **Alternative Control Measures Considered**<br>*Alternative, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| No reasonably practical alternative control measures identified. | | | | | |

#### 6.7.3.2. Additional Control Measures

| **Additional Control Measures Considered**<br>*Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Additional trained personnel available | The level of training and competency of the response personnel ensures the shoreline clean-up operation is delivered with minimum secondary impact to the environment. Training additional personnel does not provide an increased environmental benefit. | Additional personnel required to sustain an extended response can be sourced through the Woodside *People & Global Capability Surge Labour Requirement Plan*. Additional personnel sourced from contracted OSRO's (OSRL/AMOSC) to manage other responders Response personnel are trained and exercised regularly in shoreline response techniques and methods. All personnel involved in a response will receive a full operational/safety brief prior to commencing operations. | Additional Specialist Personnel would cost $2,000 per person per day. | This option is not adopted as the existing capability meets the need. | No |
| Additional trained personnel deployed | Maintaining a span of control of 200 competent personnel is deemed manageable and appropriate for this activity. Additional personnel conducting clean-up activities may be able to complete the clean-up in a shorter timeframe, but modelling predicts ongoing stranding of hydrocarbons over a period of weeks. Managing a smaller, targeted response is expected to achieve an environmental benefit through ensuring the shoreline clean-up response is suitable and scalable for the shoreline substrate and sensitivity type.<br>This will ensure there is no increased impact from the shoreline clean-up through the presence of unnecessary personnel and equipment. | The figure of 200 personnel is broken down to include on 1-2 x Trained Supervisors managing 8-10 personnel/labour hire responders. This allows for multiple operational teams to operate along the extended shoreline at different locations. Typically, an additional 30-50% of the tactical workforce is required to support ongoing operations including On-Scene control, logistics, safety/medical/welfare and transport.<br>Personnel on site will include members with the appropriate specialties to ensure an efficient shoreline clean-up.<br>Additional personnel are available through existing contracts with oil spill response organisations, labour hire organisations and environmental panel contractors | Additional Specialist Personnel would cost $2,000 per person per day. | This option is not adopted as the existing capability meets the need. | No |

#### 6.7.3.3. Improved Control Measures

| **Improved Control Measures considered**<br>*Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures in terms of functionality, availability, reliability, survivability, independence and compatibility* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Faster response/ mobilisation time | Given modelling does not predict shoreline contact at Barrow Island until approximately 7 days (MEE-05) or 14 days (MEE-01), Woodside considers that there is sufficient time for deployment of shoreline clean-up operations prior to impact. | Response teams, trained personnel, contracted oil spill response service providers, government agencies and the associated mitigation equipment required to enact an initial protection and deflection response will be available for mobilisation within 24-48hrs of activation.<br>Additional equipment from existing stockpiles and oil spill response service providers can be on scene within days.<br>Hydrocarbons are predicted to strand after a period of approximately 7 days (MEE-05) or 14 days (MEE-01) therefore allowing enough time to re-locate existing equipment, personnel and other resources to the most appropriate areas. | The cost of establishing a local stockpile of new shoreline clean-up equipment closer to the expected hydrocarbon stranding areas is not commensurate with the need. | This option is not adopted as the existing capability meets the need. | No |

#### 6.7.4. Selected Control Measures

Following review of alternative, additional and improved control measures as outlined above, the following controls were selected for implementation for the PAP.

- Alternative
    - None selected
- Additional
    - None selected
- Improved
    - None selected

## 6.8. Waste Management – ALARP Assessment

Alternative, Additional and Improved options have been identified and assessed against the base capability described in Section 5 with those that have been selected for implementation highlighted in green. Items highlighted in red have been considered and rejected on the basis that they are not feasible, the costs are clearly disproportionate to the environmental benefit, and/or the option is not reasonably practical. Control measures where there is not a clear justification for their inclusion or exclusion may be subject to a detailed ALARP assessment.

### 6.8.1. Existing Capability – Waste Management

Woodside's exiting level of capability is based on internal and third-party resources that are available 24 hours, 7 days per week. The capability presented below is displayed as ranges to incorporate operational factors such as weather, crew/vessel/aircraft/vehicle location and duties, survey or classification society inspection requirements, overflight/port/quarantine permits and inspections, crew/pilot duty and fatigue hours, refuelling/re-stocking provisions, and other similar logistic and operational limitation that are beyond Woodside's direct control.

### 6.8.2. Waste Management – Control Measure Options Analysis

#### 6.8.2.1. Alternative Control Measures

| **Alternative Control Measures Considered**<br>*Alternative, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| No reasonably practical alternative control measures identified. | | | | | |

#### 6.8.2.2. Additional Control Measures

| **Additional Control Measures Considered**<br>*Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Increased waste storage capability | The procurement of waste storage equipment options on the day of the event will allow immediate response and storage of collected waste. The environmental benefit of immediate waste storage is to reduce ecological consequence by safely securing waste, allowing continuous response operations to occur. | Access to Veolia's storage options provides the resources required to store and transport sufficient waste to meet the need. Access to waste contractors existing facilities enables waste to be stockpiled and gradually processed within the regional waste handling facilities. Additional temporary storage equipment is available through existing contract and arrangements with OSRL. Existing arrangements meet identified need for the PAP. | Cost for increased waste disposal capability would be approx. \$1,300 per $m^3$.<br>Cost for increased onshore temporary waste storage capability would be approx. \$40 per unit per day. | This option is not adopted as the existing capability meets the need. | No |

#### 6.8.2.3. Improved Control Measures

| **Improved Control Measures considered**<br>*Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures in terms of functionality, availability, reliability, survivability, independence and compatibility* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Faster response time | The access to Veolia waste storage options provides the resources to store and transport waste, permitting the wastes to be stockpiled and gradually processed within the regional waste handling facilities.<br>Bulk transport to Veolia's licensed waste management facilities would be undertaken via controlled-waste-licensed vehicles and in accordance with Environmental Protection (Controlled Waste) Regulations 2004.<br>The environmental benefit from successful waste storage will reduce pressure on the treatment and disposal facilities reducing ecological consequences by safely securing waste. In addition, waste storage and transport will allow continuous response operations to occur.<br>This delivery option would increase known available storage, eliminating the risk of additional resources not being available at the time of the event. However, the environmental benefit of Woodside procuring additional waste storage is considered minor as the risk of additional storage not being available at the time of the event is considered low and existing arrangements provide adequate storage to support the response. | Woodside already maintains an equipment stockpile in Dampier to enable shorter response times to incidents. This stockpile includes temporary waste storage equipment.<br>Woodside has access to stockpiles of waste storage and equipment in Dampier and Exmouth through existing contracts and arrangements. | The incremental benefit of having a dedicated local Woodside owned stockpile of waste equipment and transport is considered minor and cost is considered disproportionate to the benefit gained given predicted shoreline contact times. | This option is not adopted as the existing capability meets the need. | No |

### 6.8.3. Selected Control Measures

Following review of alternative, additional and improved control measures as outlined above, the following controls were selected for implementation for the PAP.

- Alternative
  - None selected
- Additional
  - None selected
- Improved
  - None selected

## 6.9. Oiled Wildlife Response – ALARP Assessment

Alternative, Additional and Improved options have been identified and assessed against the base capability described in Section 5 with those that have been selected for implementation highlighted in green. Items highlighted in red have been considered and rejected on the basis that they are not feasible, the costs are clearly disproportionate to the environmental benefit, and/or the option is not reasonably practical. Control measures where there is not a clear justification for their inclusion or exclusion may be subject to a detailed ALARP assessment.

### 6.9.1. Existing Capability – Wildlife Response

Woodside's exiting level of capability is based on internal and third-party resources that are available 24 hours, 7 days per week. The capability presented below is displayed as ranges to incorporate operational factors such as weather, crew/vessel/aircraft/vehicle location and duties, survey or classification society inspection requirements, overflight/port/quarantine permits and inspections, crew/pilot duty and fatigue hours, refuelling/re-stocking provisions, and other similar logistic and operational limitation that are beyond Woodside's direct control.

### 6.9.2. Oiled Wildlife Response – Control Measure Options Analysis

#### 6.9.2.1. Alternative Control Measures

| **Alternative Control Measures Considered**<br>*Alternative, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Direct contracts with service providers | This option duplicates the capability accessed through AMOSC and OSRL and would compete for the same resources. Does not provide a significant increase in environmental benefit. | These delivery options provide increased effectiveness through more direct communication and control of specialists. However, no significant net benefit is anticipated. | Duplication of capability – already subscribed to through contracts with AMOSC and OSRL | This option is not adopted as the existing capability meets the need. | No |

#### 6.9.2.2. Additional Control Measures

| **Additional Control Measures Considered**<br>*Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Additional wildlife treatment systems | The selected delivery options provide access to call-off contracts with selected specialist providers. The agreements ensure that these resources can be mobilised to meet the required response objectives, commensurate with the progressive nature of environmental impact and the time available to monitor hydrocarbon plume trajectories.<br>Provides response equipment and personnel by Day 3. The additional cost in having a dedicated oiled wildlife response (equipment and personnel) in place is disproportionate to environmental benefit.<br>These selected delivery options provide capacity to carry out an oiled wildlife response if contact is predicted; and to scale up the response if required to treat widespread contamination.<br>Current capability meets the needs required and there is no additional environmental benefit in adopting the improvements. | Although hydrocarbon contact above threshold concentrations with offshore waters is expected from Day 1, given the low likelihood of such an event occurring and the low environmental benefit of an offshore response, the cost of implementing measures to reduce the mobilisation time is considered disproportionate to the benefit. Additionally, the remote offshore location of the release site with contact of shoreline receptors predicted on Day 7 provides sufficient opportunity for the ongoing monitoring and surveillance operations to inform the scale of the response.<br>Numbers of oiled wildlife are expected to be low in the remote offshore setting of the oiled wildlife response, given the distance from known aggregation areas.<br>Oiled wildlife response capacity would be addressed for open Commonwealth waters through the AMOSC arrangements, as informed by operational monitoring.<br>The cost and organisational complexity of this approach is moderate, and the overall delivery effectiveness is high. | Additional wildlife response resources could total $1,700 per operational site per day. | This option is not adopted as the existing capability meets the need. | No |
| Additional trained wildlife responders | Current numbers meet the needs required and additional personnel are available through existing contracts with oil spill response organisations and environmental panel contractors.<br>Numbers of oiled wildlife are expected to be low in the remote offshore setting of the oiled wildlife response, given the distance from known aggregation areas.<br>The potential environmental benefit of training additional personnel is expected to be low. | The capability provides the capacity to treat approximately 600 wildlife units (primarily avian fauna) by Day 6, with additional capacity available from OSRL. Additional equipment and facilities would be required to support ongoing response, depending on the scale of the event and the impact to fauna. Materials for holding facilities, portable pools, enclosures and rehabilitation areas would be sourced as required. | Additional wildlife response personnel cost $2,000 per person per day | This option is not adopted as the existing capability meets the need. | No |

### 6.9.2.3. Improved Control Measures

| **Improved Control Measures considered**<br>*Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures in terms of functionality, availability, reliability, survivability, independence and compatibility* | | | | | |
|---|---|---|---|---|---|
| **Option considered** | **Environmental consideration** | **Feasibility** | **Approximate cost** | **Assessment conclusions** | **Implemented** |
| Faster mobilisation time for wildlife response | Response time is limited by specialist personnel mobilisation time. Current timing is sufficient for expected first shoreline contact.<br>This control measure provides increased effectiveness through faster mobilisation of specialists. However, no significant net environmental benefit is expected due to shoreline stranding times.<br>The cost of having dedicated equipment and personnel available to respond faster is considered disproportionate to the environmental benefit. | Pre-positioning vessels or equipment would reduce mobilisation time for oiled wildlife response activities. However, given the effectiveness of an oiled wildlife response is expected to be low, an earlier response would provide a marginal increase in environmental benefit.<br>The selected delivery options provide the capacity to mobilise an oiled wildlife response capable of treating up to 600 wildlife from at least Day 6 and exceeds the estimated Level four oiled wildlife response thought to be applicable. This delivery option provides the maximum expertise pooled across the participating operators, backed up by the international resources provided by OSRL.<br>The availability of vessels and personnel meets the response need. | Wildlife response packages to preposition at vulnerable sites identified through the deterministic modelling cost $700 per package per day. | This option is not adopted as the existing capability meets the need. | No |

### 6.9.3. Selected Control Measures

Following review of alternative, additional and improved control measures as outlined above, the following controls were selected for implementation for the PAP.

- Alternative
  - None selected
- Additional
  - None selected
- Improved
  - None selected

## 6.10. Scientific Monitoring – ALARP Assessment

Alternative, Additional and Improved options have been identified and assessed against the base capability described in Section 5 with those that have been selected for implementation highlighted in green. Items highlighted in red have been considered and rejected on the basis that they are not feasible, the costs are clearly disproportionate to the environmental benefit, and/or the option is not reasonably practical. Control measures where there is not a clear justification for their inclusion or exclusion may be subject to a detailed ALARP assessment.

### 6.10.1. Existing Capability – Scientific Monitoring

Woodside's existing level of capability is based on internal and third-party resources that are available 24 hours, 7 days per week. The capability presented below is displayed as ranges to incorporate operational factors such as weather, crew/vessel/aircraft/vehicle location and duties, survey or classification society inspection requirements, overflight/port/quarantine permits and inspections, crew/pilot duty and fatigue hours, refuelling/re-stocking provisions, and other similar logistic and operational limitation that are beyond Woodside's direct control.

### 6.10.2. Scientific Monitoring – Control Measure Options Analysis

#### 6.10.2.1. Alternative Control Measures

| **Alternative Control Measures considered**<br>*Alternative, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control* | | | | | |
|---|---|---|---|---|---|
| Ref | Control Measure Category | Option considered | Implemented | Environmental Consideration | Feasibility / Cost |
| SM01 | System | Analytical laboratory facilities closer to the likely spill affected area | No | SM01 water quality monitoring requires water samples to be transported to NATA rated laboratories in Perth or over to the East coast. Consider the benefit of laboratory access and transportation times to deliver water samples and complete lab analysis. There is a time lag from collection of water samples to being in receipt of results and confirming hydrocarbon contact to sensitive receptors. The environmental consideration of having access to suitable laboratory facilities in Karratha to carry out the hydrocarbon analysis would provide faster turnaround in reporting of results only by a matter of days (as per the time to transport samples to laboratories). | Laboratory facilities and staff available at locations closer to the spill affected area can reduce reporting times only by a limited amount (days) with associated high costs of maintaining capability and no additional environmental benefit. |
| SM01 | System | Dedicated contracted SMP vessel (exclusive to Woodside) | No | Would provide faster mobilisation time of scientific monitoring resources, environmental benefit associated with faster mobilisation time would be minor compared to selected options. | Chartering and equipping additional vessels on standby for scientific monitoring has been considered. The option is reasonably practicable but the sacrifice (charter costs and organisational complexity) is significant, particularly when compared with the anticipated availability of vessels and resources within in the required timeframes. The selected delivery provides capability to meet the scientific monitoring objectives, including collection of pre-emptive data where baseline knowledge gaps are identified for receptor locations where spill predictions of time to contact are >10 days. The effectiveness of this alternative control (weather dependency, availability and survivability) is rated as very low Employing a dedicated response vessel is considered to have a negligible net benefit. |

#### 6.10.2.2. Additional control measures

| **Additional Control Measures considered**<br>*Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures* | | | | | |
|---|---|---|---|---|---|
| Ref | **Control Measure Category** | **Option considered** | **Implemented** | **Environmental Consideration** | **Feasibility / Cost** |
| SM01 | System | Determine baseline data needs and provide implementation plan in the event of an unplanned hydrocarbon release | Yes | Address resourcing needs to collect post spill (pre-contact) baseline data as spill expands in the event of a loss of well control from the PAP activities. | Woodside relies on existing environmental baseline for receptors which have predicted hydrocarbon contact (above environment threshold) <10 days and acquiring pre-emptive data in the event of a loss of well control from the PAP activities based on receptors predicted to have hydrocarbon contact >10 days.<br><br>Ensure there is appropriate baseline for key receptors for all geographic locations that are potentially impacted <10 days of spill event, where practicable.<br><br>Address resourcing needs to collect pre-emptive baseline as spill expands in the event of a loss of well control from the PAP activities. |

#### 6.10.2.3. Improved Control Measures

No reasonably practicable improved Control Measures identified.

### 6.10.3. Selected Control Measures

Following review of alternative, additional and improved control measures as outlined above, the following controls were selected for implementation for the PAP.

- Alternative
  - None selected
- Additional
  - Determine baseline data needs and activate SMPs for any identified PBAs in the event of an unplanned hydrocarbon release
- Improved
  - None selected

### 6.10.4. Operational Plan

Key actions from the Scientific Monitoring Program Operational Plan for implementing the response are outlined in **Error! Reference source not found.Error! Reference source not found.**.

**Table 6-25: Scientific monitoring program operational plan actions**

| Responsibility | Action |
|---|---|
| **Activation** | |
| Perth ICC Planning<br>(ICC Planning – Environment Unit) | Mobilise Chief Environmental Scientist/SMP Lead/Manager and SMP Coordinator to the ICC Planning function. |
| Perth ICC Planning<br>(ICC Planning – Environment Unit)<br>(SMP Lead/Manager and SMP Coordinator) | Constantly assess all outputs from OM01, OM02 and OM03 (**Section 5 and** Annex B) to determine receptor locations and receptors at risk. Confirm sensitive receptors likely to be exposed to hydrocarbons, timeframes to specific receptor locations and which SMPs are triggered.<br>Review baseline data for receptors at risk. |
| Perth ICC Planning<br>(ICC Planning – Environment Unit)<br>(SMP Lean/Manager and SMP Coordinator) | SMP co-ordinator stand up SMP Standby contractor.<br>Stand up subject matter experts, if required. |
| Perth ICC Planning (ICC Planning – Environment Unit)<br>(SMP Lead/Manager, SMP Coordinator, SMP Standby contractor) | Establish if, and where, pre-contact baseline data acquisition is required.<br>Determine practicable baseline acquisition program based on predicted timescales to contact and anticipated SMP mobilisation times.<br>Determine scope for preliminary post-contact surveys during the Response Phase.<br>Determine which SMP activities are required at each location based on the identified receptor sensitivities. |
| Perth ICC Planning (ICC Planning – Environment Unit)<br>(SMP Lead/Manager, SMP Coordinator, SMP Standby contractor) | If response phase data acquisition is required, stand up the contractor SMP teams for data acquisition and instruct them to standby awaiting further details for mobilisation from the IMT. |
| Perth ICC Planning (ICC Planning – Environment Unit) | SMP contractor, SMP standby contractor, to prepare the Field Implementation Plan.<br>Prepare and obtain sign-off of the Response Phase SMP work plan and Field Implementation Plan. |

| Responsibility | Action |
|---|---|
| (SMP Lead/Manager, SMP Coordinator, SMP Standby contractor) | Update the IAP. |
| Perth ICC Planning (ICC Planning – Environment Unit)<br>(SMP Lead/Manager, SMP Coordinator, SMP Standby contractor) | Liaise with ICC Logistics, and determine the status and availability of aircraft, vessels and road transportation available to transport survey personnel and equipment to point of departure.<br>Engage with SMP standby contractor, SMP Manager and ICC Logistics to establish mobilisation plan, secure logistics resources and establish ongoing logistical support operations, including:<br>• Vessels, vehicles and other logistics resources<br>• Vessel fit-out specifications (as detailed in the SMP Operational Plan)<br>• Equipment storage and pick-up locations<br>• Personnel pick-up/airport departure locations<br>• Ports of departure<br>• Land based operational centres and forward operations bases accommodation and food requirements. |
| Perth ICC Planning (ICC Planning – Environment Unit)<br>(SMP Lead/Manager, SMP Coordinator, SMP Standby contractor) | Confirm communications procedures between Woodside SMP team, SMP standby contractor, SMP Manager, SMP Team Leads and Operations Point Coordinator. |
| **Mobilisation** | |
| Perth ICC Logistics | Engage vessels and vehicles and arrange fitting out as specified by the mobilisation Plan Confirm vessel departure windows and communicate with the Jacob’s SMP Manager.<br>Agree SMP mobilisation timeline and induction procedures with the Division and Sector Command Point(s). |
| Perth ICC Logistics | Coordinate with SMP standby contractor SMP Manager to mobilise teams and equipment according to the logistics plan and Sector induction procedures. |
| SMP Survey Team Leads | SMP Survey Team Leader(s) coordinate on-ground/on-vessel mobilisations and support services with the Sector Command point(s). |

### 6.10.5. ALARP and Acceptability Summary

**Table 6-26: ALARP and Acceptability Summary**

| ALARP and Acceptability Summary | | |
|---|---|---|
| **Scientific Monitoring** | | |
| **ALARP Summary** | X | All known reasonably practicable control measures have been adopted |
| | | No additional, alternative and improved control measures would provide further benefit |
| | | No reasonably practical additional, alternative, and/or improved control measure exists |
| | The resulting scientific monitoring capability has been assessed against the worst-case credible spill scenarios. The range of strategies provide an ongoing approach to monitoring operations to assess and evaluate the scale and extent of impacts.<br><br>All known reasonably practicable control measures have been adopted with the cost and organisational complexity of these options determined to be Moderate and the overall delivery effectiveness considered Medium. The SMP's main objectives can be met, with the addition of alternative control measures to provide further benefit. | |
| **Acceptability Summary** | • The control measures selected for implementation manage the potential impacts and risks to ALARP.<br>• In the event of a hydrocarbon spill for the PAP, the control measures selected, meet or exceed the requirements of Woodside Management System and industry best-practice.<br>• Throughout the PAP, relevant Australian standards and codes of practice will be followed to evaluate the impacts from a loss of well containment.<br>• The level of impact and risk to the environment has been considered with regard to the principles of Environmentally Sustainable Development (ESD); and risks and impacts from a range of identified scenarios were assessed in detail. The control measures described consider the conservation of biological and ecological diversity, through both the selection of control measures and the management of their performance. The control measures have been developed to account for the worst-case credible case scenarios, and uncertainty has not been used as a reason for postponing control measures. | |
| On the basis from the impact assessment above and in Section 6 of the EP Woodside considers the adopted controls discussed manage the impacts and risks associated with implementing scientific monitoring activities to a level that is ALARP and acceptable. | | |

# 7 ENVIRONMENTAL RISK ASSESSMENT OF SELECTED RESPONSE TECHNIQUES

The implementation of response techniques may modify the impacts and risks identified in the EP and response activities can introduce additional impacts and risks from response operations themselves. Therefore, it is necessary to complete an assessment to ensure these impacts and risks have been considered and specific measures are put in place to continually review and manage these further impacts and risks to ALARP and Acceptable levels. A simplified assessment process has been used to complete this task which covers the identification, analysis, evaluation and treatment of impacts and risks introduced by responding to the event.

## 7.1. Identification of impacts and risks from implementing response techniques

Each of the control measures can modify the impacts and risks identified in the EP. These impacts and risks have been previously assessed within the scope of the EP. Refer to the EP for details regarding how these risks are being managed. They are not discussed further in this document.

- Atmospheric emissions
- Routine and non-routine discharges
- Physical presence, proximity to other vessels (shipping and fisheries)
- Routine acoustic emissions vessels
- Lighting for night work/navigational safety
- Invasive marine species
- Collision with marine fauna
- Disturbance to Seabed

Additional impacts and risks associated with the control measures not included within the scope of the EP include:

- Vessel operations and anchoring
- Presence of personnel on the shoreline
- Increase in entrained hydrocarbons
- Toxicity of dispersant
- Human presence (manual cleaning)
- Vegetation cutting
- Additional stress or injury caused to wildlife
- Secondary contamination from the management of waste

## 7.2. Analysis of impacts and risks from implementing response techniques

The table below compares the adopted control measures for this activity against the environmental values that can be affected when they are implemented.

**Table 7-1: Analysis of risks and impacts**

| | Environmental Value | | | | | | |
|---|---|---|---|---|---|---|---|
| | Soil & groundwater | Marine sediment quality | Water quality | Air quality | Ecosystems/ habitat | Species | Socio-economic |
| Monitor and evaluate | | ✓ | ✓ | | ✓ | ✓ | |
| Source control | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Subsea dispersant injection | | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Surface dispersant application | | | ✓ | | ✓ | ✓ | ✓ |
| Containment and Recovery | | | ✓ | | ✓ | ✓ | ✓ |
| Shoreline protection & deflection | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Shoreline clean-up | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Oiled wildlife response | | | | | ✓ | ✓ | |
| Scientific monitoring | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Waste management | ✓ | | | ✓ | ✓ | ✓ | ✓ |

## 7.3. Evaluation of impacts and risks from implementing response techniques

<u>**Vessel operations and anchoring**</u>

Typical booms used in containment and recovery operations are designed to float, meaning that fauna capable of diving, such as cetaceans, marine turtles and seasnakes can readily avoid contact with the boom. Impacts to species that inhabit the water column such as sharks, rays and fish are not expected. Additionally, some fauna, such as cetaceans, are likely to detect and avoid the spill area, and are not expected to be present in the proximity of containment and recovery operations.

During the implementation of response techniques, where water depths allow, it is possible that response vessels will be required to anchor (e.g. during shoreline surveys). The use of vessel anchoring will be minimal and likely to occur when the impacted shoreline is inaccessible via road. Anchoring in the nearshore environment of sensitive receptor locations will have the potential to impact coral reef, seagrass beds and other benthic communities in these areas. Recovery of benthic communities from anchor damage depends on the size of anchor and frequency of anchoring. Impacts would be highly localised (restricted to the footprint of the vessel anchor and chain) and temporary, with full recovery expected.

<u>**Distribution of entrained hydrocarbons**</u>

Surface dispersant application is intended to treat floating hydrocarbons, thereby reducing the risk of air breathing marine fauna (e.g. cetaceans, dugongs, marine turtles, seabirds and shorebirds) from becoming oiled. It also has the potential to reduce/eliminate contamination of sensitive intertidal habitats such as mangroves, coral reefs, salt marshes and sandy shores (recreational and tourist areas) through the reduction in shoreline loadings.

Chemical dispersants act to break up hydrocarbons by reducing surface tension between the oil and the surrounding water. Dispersants, whether applied on the surface or subsea, result in the breakup of hydrocarbons into micron-sized droplets, which are easier to disperse throughout the water column. These small, dispersed hydrocarbons droplets are degraded by bacteria due to the increased surface area presented by the small droplets. The application of dispersants can enhance biodegradation and dissolution, reducing the volume of hydrocarbons that have the potential to impact shorelines.

Surface application of dispersants results in the micron-sized droplets being mixed into the upper layer of the water column, usually the first 10 to 20m, through wave and wind energy. These elevated concentrations of dispersed hydrocarbons within the upper layer of the water column are rapidly diluted through vertical and horizontal mixing. The application of surface dispersants may result in a greater risk that water column and subtidal habitats could be exposed to elevated concentrations of dispersed hydrocarbons.

**Toxicity of dispersants**

The evaluation of the potential impacts to the receiving environment needs to consider not only the redistribution of hydrocarbons into the water column, but also the potential toxic nature of the dispersant applied and the toxicity effects of dispersed hydrocarbons.

The potential toxicity to the marine environment can be from the chemical/dispersant itself but also chemical dispersion of hydrocarbon can increase the concentration of toxic hydrocarbon compounds in the water column (Anderson et al 2014). Subtidal habitats and communities such as coral reefs, seagrass meadows, plankton, fish, known spawning grounds and periods of increased reproductive outputs (early life stages of fish and invertebrates i.e. meroplankton) are susceptible to toxic effects of chemically dispersed hydrocarbons.

**Presence of personnel on the shoreline**

Presence of personnel on the shoreline during shoreline operations could potentially result in disturbance to wildlife and habitats. During the implementation of response techniques, it is possible that personnel may have minimal, localised impacts on habitats, wildlife and coastlines. The impacts associated with human presence on shorelines during shoreline surveys and response operations may include:

- Damage to vegetation/habitat to gain access to areas of shoreline oiling;
- Damage or disturbance to wildlife during shoreline surveys;
- Removal of surface layers of intertidal sediments (potential habitat depletion); and
- Excessive removal of substrate causing erosion and instability of localised areas of the shoreline.

**Human presence**

Human presence for manual clean-up operations may lead to the compaction of sediments and damage to the existing environment especially in sensitive locations such as mangroves and turtle nesting beaches. However, any impacts are expected to be localised with full recovery expected.

**Drill cuttings and Drilling Fluids Environmental Impact Assessment for Relief Well Drilling**

The identified potential impacts associated with the discharge of drill cuttings and fluids during a relief well drilling activity include a localised reduction in water and seabed sediment quality, and potential localised changes to benthic biota (habitats and communities).

A number of direct and indirect ecological impact pathways are identified for drill cuttings and drilling fluids as follows:

- Temporary increase in total suspended solids (TSS) in the water column;
- Attenuation of light penetration as an indirect consequence of the elevation of TSS and the rate of sedimentation;
- Sediment deposition to the seabed leading to the alteration of the physio-chemical composition of sediments, and burial and potential smothering effects to sessile benthic biota; and
- Potential contamination and toxicity effects to benthic and in-water biota from drilling fluids.

Potential impacts from the discharge of cuttings range from the complete burial of benthic biota in the immediate vicinity of the well site due to sediment deposition, smothering effects from raised sedimentation concentrations as a result of elevated TSS, changes to the physico-chemical properties of the seabed sediments (particle size distribution and potential for reduction in oxygen levels within the surface sediments due to organic matter degradation by aerobic bacteria) and subsequent changes to the composition of infauna communities to minor sediment loading above background and no associated ecological effects. Predicted impacts are generally confined to within a few hundred metres of the discharge point (International Association of Oil and Gas Producers 2016) (i.e. within the EMBA for a hydrocarbon spill event).

The discharge of drill cuttings and unrecoverable fluids from relief well drilling is expected to increase turbidity and TSS levels in the water column, leading to an increased sedimentation rate above ambient levels associated with the settlement of suspended sediment particles in close proximity to the seabed or below sea surface, depending on location of discharge. Cuttings with retained (unrecoverable) drilling fluids are discharged below the water line at the MODU location, resulting in drill cuttings and drilling fluids rapidly diluting, as they disperse and settle through the water column. The dispersion and fate of the cuttings is determined by particle size and density of the retained (unrecoverable) drilling fluids, therefore, the sediment particles will primarily settle in proximity to the well locations with potential for localised spread downstream (depending on the speed of currents throughout the water column and seabed) (IOGP 2016). The finer particles will remain in suspension and will be transported further before settling on the seabed.

These conclusions were supported by discharge modelling which was undertaken by Woodside in support of the Greater Enfield Development EP. Modelling results indicating that the TSS plume of suspended cuttings will typically disperse to the south-west while oscillating with the tide and diminish rapidly with increasing distance from the well locations. Maximum TSS concentrations predicted for 100 m; 250 m and 1 km distances from the wellsite were 7, 5 and 1 mg/L, respectively. Furthermore, water column concentrations below 10 mg/L remain within 235 m of the discharge location for each modelled well. For all well discharge locations (outside of direct discharge sites), TSS concentration did not exceed 10 mg/l. Nelson et al. (2016) identified <10 mg/L as a no effect or sub-lethal minimal effect concentration.

The low sensitivity of the deep-water benthic communities/habitats within and in the vicinity of relief well locations, combined with the relatively low toxicity of WBM and NWBMs, no bulk discharges of NWBM and the highly localised nature and scale of predicted physical impacts to seabed biota indicate that any localised impact would likely be of a slight magnitude (especially when considering the broader consequence of the LOC event a relief well drilling activity would be responding too).

**Waste generation**

Implementing the selected response techniques will result in the generation of the following waste streams that will require management and disposal:

- Liquids (recovered oil/water mixture), recovered from containment and recovery and shoreline clean-up operations
- Semi-solids/solids (oily solids), collected during containment and recovery and shoreline clean-up operations
- Debris (e.g. seaweed, sand, woods, plastics), collected during containment and recovery and shoreline clean-up operations and oiled wildlife response.

If not managed and disposed of correctly, wastes generated during the response have the potential for secondary contamination similar to that described above, impacts to wildlife through contact with or ingestion of waste materials and contamination risks if not disposed of correctly onshore.

Cutting back vegetation prior to impact could minimise the amount of contaminated organic material and thus reduce the amount of oiled/hazardous waste to be handled. However, removal of vegetation also allows more extensive penetration of oil into the substrate and may lead to habitat loss. Any impacts are expected to be localised with full recovery expected.

**Additional stress or injury caused to wildlife**

Additional stress or injury to wildlife could be caused through the following phases of a response:

- Capturing wildlife
- Transporting wildlife
- Stabilisation of wildlife
- Cleaning and rinsing of oiled wildlife
- Rehabilitation (e.g. diet, cage size, housing density)
- Release of treated wildlife

Inefficient capture techniques have the potential to cause undue stress, exhaustion or injury to wildlife, additionally pre-emptive capture could cause undue stress and impacts to wildlife when there are uncertainties in the forecast trajectory of the spill. During the transportation and stabilisation phases there is the potential for additional thermoregulation stress on captured wildlife. Additionally, during the cleaning process, it is important personnel undertaking the tasks are familiar with the relevant techniques to ensure that further injury and the removal of water proofing feathers are managed and mitigated. Finally, during the release phase, it is important that wildlife is not released back into a contaminated environment.

## 7.4. Treatment of impacts and risks from implementing response techniques

In respect of the impacts and risks assessed the following treatment measures have been adopted. It must be recognised that this environmental assessment is seeking to identify how to maintain the level of impact and risks at levels that are ALARP and of an acceptable level rather than exploring further impact and risk reduction. It is for this reason that the treatment measures identified in this assessment will be captured in Operational Plans, TRPs, and/or the FSP.

**Vessel operations and access in the nearshore environment**

- The boom will be monitored and maintained to ensure trapped fauna are released as early as possible, with Containment and Recovery activities occurring in daylight hours only (PS 21.1).
- If vessels are required for access, anchoring locations will be selected to minimise disturbance to benthic primary producer habitats. Where existing fixed anchoring points are not available, locations will be selected to minimise impact to nearshore benthic environments with a preference for areas of sandy seabed where they can be identified (PS 21.2, 24.1, 27.1).
- Shallow draft vessels will be used to access remote shorelines to minimise the impacts associated with seabed disturbance on approach to the shorelines (PS 24.2, 27.2).

**Distribution of entrained hydrocarbons**

- Only apply surface dispersants within the ZoA and on BAOAC 4 and 5 (PS 17.4)
- Continuous monitoring of dispersed oil plume and visual monitoring of effectiveness (PS 17.5)

**Toxicity of dispersants**

- OSCA approved dispersants prioritised for surface and subsea use (PS 17.3)

**Presence of personnel on the shoreline**

- Oversight by trained personnel who are aware of the risks (PS 27.5)
- Trained unit leader's brief personnel of the risks prior to operations (PS 27.6)

**Human Presence**

- Shoreline access route (foot, car, vessel and helicopter) with the least environmental impact identified will be selected by a specialist in SCAT operations (PS 7.3)
- Vehicular access will be restricted on dunes, turtle nesting beaches and in mangroves (PS 27.3)

**Waste generation**

- All shorelines zoned and marked before clean-up operations commence to prevent secondary contamination and minimise the mixing of clean and oiled sediment and shoreline substrates (PS 25.5)
- Removal of vegetation will be limited to moderately or heavily oiled vegetation (PS 27.4)

**Additional stress or injury caused to wildlife**

- Operations conducted with advice from the DBCA Oiled Wildlife Advisor and in accordance with the processes and methodologies described in the WA OWRP and the relevant regional plan (PS 30.3)

# 8 ALARP CONCLUSION

An analysis of alternative, additional and improved control measures has been undertaken to determine their reasonableness and practicability. The tables in Section 6 document the considerations made in this evaluation. Where the costs of an alternative, additional, or improved control measure have been determined to be clearly disproportionate to the environmental benefit gained from its adoption it has been rejected. Where this is not considered to be the case the control measure has been adopted.

The risks from a hydrocarbon spill have been reduced to ALARP because:

- Woodside has a significant hydrocarbon spill response capability to respond to the WCCS through the control measures identified.
- New and modified impacts and risks associated with implementing response techniques have been considered and will not increase the risks associated with the activity.
- A consideration of alternative, additional, and improved control measures identified any other control measures that delivered proportionate environmental benefit compared to the cost of adoption for this activity ensuring that:
  - All known, reasonably practicable control measures have been adopted.
  - No additional, reasonably practicable alternative and/or improved control measures would provide further environmental benefit.
  - No reasonably practical additional, alternative, and/or improved control measure exists.
- A structured process for considering alternative, additional, and improved control measures was completed for each control measure.
- The evaluation was undertaken based on the outputs of the WCCS so that the capability in place is sufficient for all other scenario from this activity.
- The likelihood of the WCCS spill has been ignored in evaluating what was reasonably practicable.

# 9 ACCEPTABILITY CONCLUSION

Following the ALARP evaluation process, Woodside deems the hydrocarbon spill risks and impacts to have been reduced to an acceptable level by meeting all of the following criteria:

- Techniques are consistent with Woodside's processes and relevant internal requirements including policies, culture, processes, standards, structures and systems.
- Levels of risk/ impact are deemed acceptable by relevant persons (external stakeholders) and are aligned with the uniqueness of, and/or the level of protection assigned to the environment, its sensitivity to pressures introduced by the activity, and the proximity of activities to sensitive receptors, and have been aligned with Part 3 of the EPBC Act.
- Selected control measures meet requirements of legislation and conventions to which Australia is a signatory (e.g. MARPOL, the World Heritage Convention, the Ramsar Convention, and the Biodiversity Convention etc.). In addition to these, other non-legislative requirements met include:
  - Australian IUCN reserve management principles for Commonwealth marine protected areas and bioregional marine plans.
  - National Water Quality Management Strategy and supporting guidelines for marine water quality).
  - Conditions of approval set under other legislation.
  - National and international requirements for managing pollution from ships.
  - National biosecurity requirements.
- Industry standards, best practices and widely adopted standards and other published materials have been used and referenced when defining acceptable levels. Where these are inconsistent with mandatory/ legislative regulations, explanation has been provided for the proposed deviation. Any deviation produces the same or a better level of environmental performance (or outcome).

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# 11 GLOSSARY & ABBREVIATIONS

## 11.1. Glossary

| Term | Description / Definition |
|---|---|
| ALARP | Demonstration through reasoned and supported arguments that there are no other practicable options that could reasonably be adopted to reduce risks further. |
| Availability | The availability of a control measure is the percentage of time that it is capable of performing its function (operating time plus standby time) divided by the total period (whether in service or not). In other words, it is the probability that the control has not failed or is undergoing a maintenance or repair function when it needs to be used. |
| Control | The means by which risk from events is eliminated or minimised. |
| Control effectiveness | A measure of how well the control measures perform their required function. |
| Control measure (risk control measure) | The features that eliminate, prevent, reduce or mitigate the risk to environment associated with PAP. |
| Credible spill scenario | A spill considered by Woodside as representative of maximum volume and characteristics of a spill that could occur as part of the PAP. |
| Dependency | The degree of reliance on other systems in order for the control measure to be able to perform its intended function. |
| Environment that may be affected | The summary of quantitative modelling where the marine environment could be exposed to hydrocarbons levels exceeding hydrocarbon threshold concentrations. |
| Incident | An event where a release of energy resulted in or had (with) the potential to cause injury, ill health, damage to the environment, damage to equipment or assets or company reputation. |
| Major Environment Event | The events with potential environment, reputation, social or cultural consequences of category C or higher (as per Woodside's operational risk matrix) which are evaluated against credible worst-case scenarios which may occur when all controls are absent or have failed. |
| Performance outcome | A statement of the overall goal or outcome to be achieved by a control measure |
| Performance standard | The parameters against which [risk] controls are assessed to ensure they reduce risk to ALARP.<br>A statement of the key requirements (indicators) that the control measure has to achieve in order to perform as intended in relation to its functionality, availability, reliability, survivability and dependencies. |
| Preparedness | Measures taken before an incident in order to improve the effectiveness of a response |
| Reasonably practicable | ... a computation ... made by the owner, in which the quantum of risk is placed on one scale and the sacrifice involved in the measures necessary for averting the risk (whether in money, time or trouble) [showing whether or not] that there is a gross disproportion between them ... made by the owner at a point of time anterior to the accident.<br>(Judgement: Edwards v National Coal Board [1949]) |
| Receptors at risk | Physical, biological and social resources identified as at risk from hydrocarbon contact using oil spill modelling predictions. |
| Receptor areas | Geographically referenced areas such as bays, islands, coastlines and/or protected area (WHA, Commonwealth or State marine reserve or park) containing one or more receptor type. |

| Term | Description / Definition |
|---|---|
| Receptor Sensitivities | This is a classification scheme to categorise receptor sensitivity to an oil spill. The Environmental Sensitivity Index (ESI) is a numerical classification of the relative sensitivity of a particular environment (particularly different shoreline types) to an oil spill. Refer to the Woodside OPEA for more details. |
| Regulator | NOPSEMA are the Environment Regulator under the Environment Regulations. |
| Reliability | The probability that at any point in time a control measure will operate correctly for a further specified length of time. |
| Response technique | The key priorities and objectives to be achieved by the response plan<br>Measures taken in response to an event to reduce or prevent adverse consequences. |
| Survivability | Whether or not a control measure is able to survive a potentially damaging event is relevant for all control measures that are required to function after an incident has occurred. |
| Threshold | Hydrocarbon threshold concentrations applied to the risk assessment to evaluate hydrocarbon spills. |
| | |
| Zone of Application | The zone in which Woodside may elect to apply dispersant. The zone is determined based on a range of considerations, such as hydrocarbon characteristics, weathering and metocean conditions. The zone is a key consideration in the Net Environmental Benefit Analysis for dispersant use. |

## 11.2. Abbreviations

| Abbreviation | Meaning |
|---|---|
| AIIMS | Australasian Inter-Service Incident Management System |
| ALARP | As low as reasonably practicable |
| AMOSC | Australian Marine Oil Spill Centre |
| AMP | Australian Marine Park |
| AMSA | Australian Maritime Safety Authority |
| APASA | Asia Pacific Applied Science Associates |
| BAOAC | Bonn Agreement Oil Appearance Code |
| BOP | Blowout Preventer |
| CSt | Centistokes |
| CICC | Corporate Incident Coordination Centre |
| DM | Duty Manager |
| DBCA | Western Australia Department of Biodiversity, Conservation and Attractions (former Western Australian Department of Parks and Wildlife) |
| EMBA | Environment that May Be Affected |
| EMSA | European Maritime Safety Agency |
| EP | Environment Plan |
| Environment Regulations | Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 |
| ESI | Environmental Sensitivity Index |
| ESD | Environmentally Sustainable Development |
| ESP | Environmental Services Panel |
| FPSO | Floating Production Storage Offloading |
| FSP | First Strike Plan |
| GIS | Geographic Information System |
| IAP | Incident Action Plan |
| ICC | Incident Coordination Centre |
| IMT | Incident Management Team |
| IPIECA | International Petroleum Industry Environment Conservation Association |
| ISV | Infield support vessel |
| ITOPF | International Tanker Owners Pollution Federation |
| IUCN | International Union for Conservation of Nature |
| KBSF | King Bay Support Facility |
| MODU | Mobile Offshore Drilling Unit |
| MOU | Memorandum of Understanding |
| NEBA | Net Environmental Benefit Analysis |
| NOAA | National Oceanic and Atmospheric Administration |
| NRDA | Natural Resource Damage Assessment |
| OILMAP | Oil Spill Model and Response System |
| OPEA | Oil Pollution Emergency Arrangements |

| Abbreviation | Meaning |
|---|---|
| OPEP | Oil Pollution Emergency Plan |
| OSCA | Oil Spill Cleaning Agent (registered for use within the National Plan) |
| OSRL | Oil Spill Response Limited |
| OSTM | Oil Spill Trajectory Modelling |
| OWRP | Oiled Wildlife Response Plan |
| OWROP | Regional Oiled Wildlife Response Operational Plan |
| PAP | Petroleum Activities Program |
| PBA | Pre-emptive Baseline Areas |
| PPB | Parts per billion |
| PPM | Parts per million |
| ROV | Remotely Operated Vehicle(s) |
| RPA | Response Protection Area |
| S&EM | Security & Emergency Management |
| SCAT | Shoreline Clean-up Assessment Technique |
| SDA | Surface Dispersant Application |
| SIMAP | Integrated Oil Spill Impact Model System |
| SSDI | Subsea Dispersant Injection |
| SFRT | Subsea First Response Toolkit |
| SMP | Scientific monitoring program |
| TRP | Tactical Response Plan |
| TSS | Total suspended solids |
| WA DoT | Western Australia Department of Transport |
| WHA | World Heritage Area |
| Woodside | Woodside Energy Limited |
| WWCI | Wild Well Control Inc |
| WCCS | Worst Case Credible Scenario |
| ZoA | Zone of Application |

# ANNEX A: NET ENVIRONMENTAL BENEFIT ANALYSIS DETAILED OUTCOMES

A NEBA has been conducted to assess the net environmental benefit of different response techniques to selected receptors in the event of an oil spill from the PAP for a subsea loss of well containment of Cossack Light Crude (MEE-01), a surface hydrocarbon release due to a support vessel tank rupture of marine diesel (MEE-03) and a surface vessel cargo tank rupture scenario of Cossack Light Crude (MEE-05). The complete list of potential receptor locations within the EMBA within the PAP is included in Section 6 of the EP.

The locations utilised for the NEBA were limited to the identified RPAs of the PAP identified from modelling (see Section 3 for outline of selection). These include receptors which have potential for the following:

- Surface contact (>50 g/m$^2$)
- Shoreline accumulation (100g/m$^2$) at any time

The detailed NEBA assessment outcomes are shown below. The Okha FPSO Operations Preoperational NEBA assessments contain the full assessments.

**Table A-1: NEBA assessment technique recommendations for Cossack Light Crude from a loss of well containment (MEE-01)**

| Receptor | Monitor and Evaluate | Source control and well intervention | Source control (vessel) | Dispersant application: sub-sea | Dispersant application: > 20 m water depth and > 10 km from shore/reefs | Mechanical dispersion | In situ burning | Containment and Recovery | Shoreline protection | Shoreline clean-up (manual) | Shoreline clean-up (mechanical) | Shoreline clean-up (chemical) | Oiled Wildlife Response |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ningaloo Coast World Heritage Area | Yes | Yes | N/A | Yes | Yes | No | No | Yes | Yes | Yes | Yes | No | Yes |
| Montebello Islands and State Marine Park | Yes | Yes | N/A | Yes | Yes | No | No | Yes | Yes | Yes | Yes | No | Yes |
| Barrow Island | Yes | Yes | N/A | Yes | Yes | No | No | Yes | Yes | Yes | Yes | No | Yes |
| Southern Pilbara - Islands and Shoreline | Yes | Yes | N/A | Yes | Yes | No | No | Yes | Yes | Yes | Yes | No | Yes |
| Muiron Islands Marine Management Area and World Heritage Area | Yes | Yes | N/A | Yes | Yes | No | No | Yes | Yes | Yes | Yes | No | Yes |
| Commonwealth waters | Yes | Yes | N/A | Yes | Yes | No | No | Yes | No | No | No | No | Yes |
| Shark Bay Open Ocean and World Heritage Area | Yes | Yes | N/A | Yes | Yes | No | No | Yes | Yes | Yes | Yes | No | Yes |
| Exmouth Gulf West | Yes | Yes | N/A | Yes | Yes | No | No | Yes | Yes | Yes | Yes | No | Yes |
| Lowendal Islands | Yes | Yes | N/A | Yes | Yes | No | No | Yes | Yes | Yes | Yes | No | Yes |

**Overall assessment**

| Sensitive receptor (Sites identified in EP) | Monitor and Evaluate | Source control and well intervention | Source control (vessel) | Dispersant application: sub-sea | Dispersant application: > 20 m water depth and > 10 km from shore/reefs | Mechanical dispersion | In situ burning | Containment and Recovery | Shoreline protection | Shoreline clean-up (manual) | Shoreline clean-up (mechanical) | Shoreline clean-up (chemical) | Oiled Wildlife Response |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Is this response Practicable?** | Yes | Yes | N/A | Yes | Yes | No | No | Yes | Yes | Yes | Yes | No | Yes |
| **NEBA identifies Response potentially of Net Environmental Benefit?** | Yes | Yes | N/A | Yes | Yes | No | No | Yes | Yes | Yes | Yes | No | Yes |

**Table A-2: NEBA assessment technique recommendations for surface hydrocarbon release due to a support vessel tank rupture of marine diesel (MEE-03)**

| Receptor | Monitor and Evaluate | Source control and well intervention | Source control (vessel) | Dispersant application: sub-sea | Dispersant application: > 20 m water depth and > 10 km from shore/reefs | Mechanical dispersion | In situ burning | Containment and Recovery | Shoreline protection | Shoreline clean-up (manual) | Shoreline clean-up (mechanical) | Shoreline clean-up (chemical) | Oiled Wildlife Response |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Commonwealth waters | Yes | N/A | Yes | No | No | No | No | No | No | No | No | No | Yes |

**Overall assessment**

| Sensitive receptor (Sites identified in EP) | Monitor and Evaluate | Source control and well intervention | Source control (vessel) | Dispersant application: sub-sea | Dispersant application: > 20 m water depth and > 10 km from shore/reefs | Mechanical dispersion | In situ burning | Containment and Recovery | Shoreline protection | Shoreline clean-up (manual) | Shoreline clean-up (mechanical) | Shoreline clean-up (chemical) | Oiled Wildlife Response |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Is this response Practicable?** | Yes | N/A | Yes | No | No | No | No | No | No | No | No | No | Yes |
| **NEBA identifies Response potentially of Net Environmental Benefit?** | Yes | N/A | Yes | No | No | No | No | No | No | No | No | No | Yes |

**Table A-3: NEBA assessment technique recommendations for Cossack Light Crude from a vessel cargo tank rupture (MEE-05)**

| Receptor | Monitor and Evaluate | Containment and Recovery | Dispersant application: sub-sea | Dispersant application: > 20 m water depth and > 10 km from shore/reefs | Shoreline protection | Shoreline clean-up (manual) | Shoreline clean-up (mechanical) | Shoreline clean-up (chemical) | Oiled Wildlife Response | In situ burning | Mechanical dispersion | Well control and intervention |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ningaloo Coast North and World Heritage Area | Yes | Yes | No | Yes | Yes | Yes | Yes | No | Yes | No | No | No |
| Montebello Islands and State Marine Park | Yes | Yes | No | Yes | Yes | Yes | Yes | No | Yes | No | No | No |
| Barrow Island | Yes | Yes | No | Yes | Yes | Yes | Yes | No | Yes | No | No | No |
| Lowendal Islands | Yes | Yes | No | Yes | Yes | Yes | Yes | No | Yes | No | No | No |
| Southern Pilbara - Islands and Shoreline | Yes | Yes | No | Yes | Yes | Yes | Yes | No | Yes | No | No | No |
| Muiron Islands World Heritage Area and State Marine Park | Yes | Yes | No | Yes | Yes | Yes | Yes | No | Yes | No | No | No |
| Commonwealth waters | Yes | Yes | No | Yes | No | No | No | No | Yes | No | No | No |

**Overall assessment**

| Sensitive receptor (Sites identified in EP) | Monitor and Evaluate | Containment and Recovery | Dispersant application: sub-sea | Dispersant application: > 20 m water depth and > 10 km from shore/reefs | Shoreline protection | Shoreline clean-up (manual) | Shoreline clean-up (mechanical) | Shoreline clean-up (chemical) | Oiled Wildlife Response | In situ burning | Mechanical dispersion | Well control and intervention |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Is this response Practicable?** | Yes | Yes | No | Yes | Yes | Yes | Yes | No | Yes | No | No | Yes |
| **NEBA identifies Response potentially of Net Environmental Benefit?** | Yes | Yes | No | Yes | Yes | Yes | Yes | No | Yes | No | No | Yes |

**NEBA Impact Ranking Classification Guidance**

To reduce variability between assessments, the following ranking descriptions have been devised to guide the workshop process:

| | | | Degree of impact | Potential duration of impact | Equivalent Woodside Corporate Risk Matrix Consequence Level |
|---|---|---|---|---|---|
| **Positive** | **3P** | **Major** | Likely to prevent:<br>• behavioural impact to biological receptors<br>• behavioural impact to socio-economic receptors e.g. changes to day-today business operations, public opinion/behaviours (e.g. avoidance of amenities such as beaches) or regulatory designations. | Decrease in duration of impact by > 5 years | N/A |
| | **2P** | **Moderate** | Likely to prevent:<br>• significant impact to a single phase of reproductive cycle of biological receptors<br>• detectable financial impact, either directly (e.g. loss of income) or indirectly (e.g. via public perception), for socio-economic receptors. | Decrease in duration of impact by 1–5 years | N/A |
| | **1P** | **Minor** | Likely to prevent impacts on:<br>• significant proportion of population or breeding stages of biological receptors<br>• socio-economic receptors such as:<br>  ○ significant impact to the sensitivity of protective designation; or<br>  ○ significant and long-term impact to business/industry. | Decrease in duration of impact by several seasons (< 1 year) | N/A |
| | **0** | **Non-mitigated spill impact** | **No detectable difference to unmitigated spill scenario.** | | |
| **Negative** | **1N** | **Minor** | Likely to result in:<br>• behavioural impact to biological receptors<br>• behavioural impact to socio-economic receptors e.g. changes to day-to-day business operations, public opinion/behaviours (e.g. avoidance of amenities such as beaches), or regulatory designations.<br>**[Note 1]** | Increase in duration of impact by several seasons (< 1 year) | Increase in risk by one sub-category, without changing category (e.g. Minor (E) to Minor (D)) |
| | **2N** | **Moderate** | Likely to result in:<br>• significant impact to a single phase of reproductive cycle for biological receptors; or<br>• detectable financial impact, either directly (e.g. loss of income) or indirectly (e.g. via public perception), for socio-economic receptors. This level of negative impact is recoverable and unlikely to result in closure of business/industry in the region. | Increase in duration of impact by 1–5 years | Increase in risk by one category (e.g. Minor (D) to Moderate (C or B)) |
| | **3N** | **Major** | Likely to result in impacts on:<br>• significant proportion of population or breeding stages of biological receptors<br>• socio-economic receptors resulting in either:<br>  ○ significant impact to the sensitivity of protective designation; or<br>  ○ significant and long-term impact to business/industry. | Increase in duration of impact by > 5 years or unrecoverable | Increase in risk by two categories (e.g. Minor (E) to Major (A)) |

NOTE: the maximum likely impact should be considered; for example, if a spill were to directly impact the behaviour that results in an impact to reproduction and/or the breeding population (such as fish failing to aggregate to spawn), then the score should be a 2 or 3 rather than a 1. Similarly, if a change in behaviour resulted in an increased risk of mortality of a population, then it should be scored as a 2 or 3.

# ANNEX B: OPERATIONAL MONITORING ACTIVATION AND TERMINATION CRITERIA

**Table B-1: Operational monitoring objectives, triggers and termination criteria**

| Operational Monitoring Operational Plan | Objectives | Activation triggers | Termination criteria |
|---|---|---|---|
| **Operational Monitoring Operational Plan 1 (OM01)**<br>Predictive Modelling of Hydrocarbons to Assess Resources at Risk | OM01 focuses on the conditions that have prevailed since a spill commenced, as well as those that are forecasted in the short term (1–3 days ahead) and longer term. OM01 utilises computer-based forecasting methods to predict hydrocarbon spill movement and guide the management and execution of spill response operations to maximise the protection of environmental resources at risk.<br>The objectives of OM01 are to:<br>• Provide forecasting of the movement and weathering of spilled hydrocarbons<br>• Identify resources that are potentially at risk of contamination<br>• Provide simulations showing the outcome of alternative response options (booming patterns etc.) to inform on-going Net Environmental Benefit Analysis (NEBA) and continually assess the efficacy of available response options in order to reduce risks to ALARP | OM01 will be triggered immediately following a level 2/3 hydrocarbon spill. | The criteria for the termination of OM01 are:<br>• The hydrocarbon discharge has ceased and no further surface oil is visible<br>• Response activities have ceased<br>• Hydrocarbon spill modelling (as verified by OM02 surveillance observations) predicts no additional natural resources will be impacted |

| Operational Monitoring Operational Plan | Objectives | Activation triggers | Termination criteria |
|---|---|---|---|
| **Operational Monitoring Operational Plan 2 (OM02)**<br>Surveillance and reconnaissance to detect hydrocarbons and resources at risk | OM02 aims to provide regular, on-going hydrocarbon spill surveillance throughout a broad region, in the event of a spill.<br>The objectives of OM02 are:<br>• Verify spill modelling results and recalibrate spill trajectory models (OM01)<br>• Understand the behaviour, weathering and fate of surface hydrocarbons<br>• Identify environmental receptors and locations at risk or contaminated by hydrocarbons<br>• Inform ongoing Net Environmental Benefit Analysis (NEBA) and continually assess the efficacy of available response options in order to reduce risks to ALARP<br>• To aid in the subsequent assessment of the short- to long-term impacts and/or recovery of natural resources (assessed in SMPs) by ensuring that the visible cause and effect relationships between the hydrocarbon spill and its impacts to natural resources have been observed and recorded during the operational phase. | OM02 will be triggered immediately following a level 2/3 hydrocarbon spill. | The termination triggers for the OM02 are:<br>• 72 hours has elapsed since the last confirmed observation of surface hydrocarbons<br>• Latest hydrocarbon spill modelling results (OM01) do not predict surface exposures at visible levels |

| Operational Monitoring Operational Plan | Objectives | Activation triggers | Termination criteria |
|---|---|---|---|
| **Operational Monitoring Operational Plan 3 (OM03)**<br>Monitoring of hydrocarbon presence, properties, behaviour and weathering in water | OM03 will measure surface, entrained and dissolved hydrocarbons in the water column to inform decision-making for spill response activities.<br><br>The specific objectives of OM03 are as follows:<br>• Detect and monitor for the presence, quantity, properties, behaviour and weathering of surface, entrained and dissolved hydrocarbons<br>• Verify predictions made by OM01 and observations made by OM02 about the presence and extent of hydrocarbon contamination<br><br>Data collected in OM03 will also be used for the purpose of longer-term water quality monitoring during SM01. | OM03 will be triggered immediately following a level 2/3 hydrocarbon spill. | The criteria for the termination of OM03 are as follows:<br>• The hydrocarbon release has ceased<br>• Response activities have ceased<br>• Concentrations of hydrocarbons in the water are below available ANZECC/ ARMCANZ (2018) trigger values for 99% species protection. |
| **Operational Monitoring Operational Plan 4 (OM04)**<br>Pre-emptive assessment of sensitive receptors at risk | OM04 aims to undertake a rapid assessment of the presence, extent and current status of shoreline sensitive receptors prior to contact from the hydrocarbon spill, by providing categorical or semi-quantitative information on the characteristics of resources at risk.<br>The primary objective of OM04 is to confirm understanding of the status and characteristics of environmental resources predicted by OM01 and OM02 to be at risk, to further assist in making decisions on the selection of appropriate response actions and prioritisation of resources.<br>Indirectly, qualitative/semi-quantitative pre-contact information collected by OM04 on the status of environmental resources may also aid in the verification of environmental baseline data and provide context for the assessment of environmental impacts, as determined through subsequent SMPs.<br>OM04 would be undertaken in liaison with WA DoT as the control agency once the oil is in State Waters (if a Level 2/3 incident). | Triggers for commencing OM04 include:<br>• Contact of a sensitive habitat or shoreline is predicted by OM01, OM02 and/or OM03<br>• The pre-emptive assessment methods can be implemented before contact from hydrocarbons (once a receptor has been contacted by hydrocarbons it will be assessed under OM05) | The criteria for the termination of OM04 at any given location are:<br>• Locations predicted to be contacted by hydrocarbons have been contacted<br>• The location has not been contacted by hydrocarbons and is no longer predicted to be contacted by hydrocarbons (resources should be reallocated as appropriate) |

| Operational Monitoring <u>Operational Plan</u> | Objectives | Activation triggers | Termination criteria |
|---|---|---|---|
| **<u>Operational monitoring operational plan 5 (OM05)</u>**<br>Monitoring of contaminated resources | OM05 aims to implement surveys to assess the condition of fauna and habitats contacted by hydrocarbons at sensitive habitat and shoreline locations.<br>The primary objectives of OM05 are:<br>• Record evidence of oiled fauna (mortalities, sub-lethal impacts, number, extent, location) and habitats (mortalities, sub-lethal impacts, type, extent of cover, area, hydrocarbon character, thickness, mass and content) throughout the response and clean-up at locations contacted by hydrocarbons to inform and prioritise clean-up efforts and resources, while minimising the potential impacts of these activities.<br>Indirectly, the information collected by OM05 may also support the assessment of environmental impacts, as determined through subsequent SMPs.<br>OM05 would be undertaken in liaison with WA DoT as the control agency once the oil is in State Waters (if a Level 2/3 incident). | OM05 will be triggered when a sensitive habitat or shoreline is predicted to be contacted by hydrocarbons by OM01, OM02 and/or OM03. | The criteria for the termination of OM05 at any given location are:<br>• No additional response or clean-up of fauna or habitats is predicted<br>• Spill response and clean-up activities have ceased<br>OM05 survey sites established at sensitive habitat and shoreline locations will continue to be monitored during SM02.<br>The formal transition from OM05 to SM02 will begin on cessation of spill response and clean-up activities. |

# ANNEX C: OIL SPILL SCIENTIFIC MONITORING PROGRAM

## Oil Spill Environmental Monitoring

The following provides some further detail on Woodside's oil spill scientific monitoring Program and includes the following:

- The organisation, roles and responsibilities of the Woodside oil spill scientific monitoring team and external resourcing.
- A summary table of the ten scientific monitoring programs as per the specific focus receptor, objectives, activation triggers and termination criteria.
- Details on the oil spill environmental monitoring activation and termination decision-making processes.
- Baseline knowledge and environmental studies knowledge access via geo-spatial metadata databases.
- An outline of the reporting requirements for oil spill scientific monitoring programs.

## Oil Spill Scientific Monitoring – Delivery Team Roles and Responsibilities

*Woodside Oil Spill Scientific Monitoring Delivery Team*

The Woodside science team are responsible for the delivery of the oil spill scientific monitoring. The roles and responsibilities of the Woodside scientific monitoring delivery team are presented in Table C-1 and the organisational structure and ICC linkage provided in Figure C-1.

*Woodside Oil Spill Scientific monitoring program - External Resourcing*

In the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors, scientific monitoring personnel and scientific equipment to implement the appropriate SMPs will be provided by service providers who hold a standby contract for SMP (SMP Standby Contractor) via the Woodside Environmental Services Panel (ESP). In the event that additional resources are required, other consultancy capacity within the Woodside ESP will be used (as needed and may extend to specialist contractors, such as research agencies engaged in long-term marine monitoring programs). In consultation with the SMP Standby Contractor and/or specialist contractors, the selection, field sampling and approach of the SMPs will be determined by the nature and scale of the spill.

**Table C-1: Woodside and Environmental Service Provider – Oil Spill Scientific Monitoring Program Delivery Team Key Roles and Responsibilities**

| Role | Location | Responsibility |
|---|---|---|
| **Woodside Roles** | | |
| SMP Lead/Manager | Onshore (Perth) | • Approves activated the SMPs based on operational monitoring data provided by the Planning Function<br>• Provides advice to the ICC in relation to scientific monitoring<br>• Provides technical advice regarding the implementation of scientific monitoring<br>• Approves detailed sampling plans prepared for SMPs<br>• Directs liaison between statutory authorities, advisors and government agencies in relation to SMPs. |
| SMP Co-ordinator | Onshore (Perth) | • Activates the SMPs based on operational monitoring data provided by the Planning Function<br>• Sits in the Planning function of the ICC.<br>• Liaises with other ICC functions to deliver required logistics, resources and operational support from Woodside to support the Environmental Service Provider in delivering on the SMPs. Acts as the conduit for advice from the SMP Lead/Manager to the Environmental Service Provider<br>• Manages the Environmental Service Provider's implementation of the SMPs<br>• Liaises with the Environmental Service Provider on delivery of the SMPs<br>• Arranges all contractual matters, on behalf of Woodside, associated with the Environmental Service Provider's delivery of the SMPs. |

| Role | Location | Responsibility |
|---|---|---|
| **Environmental Service Provider Roles** | | |
| SMP Standby contractor – SMP Duty Manager/Project Manager (SMP Liaison Officer) | Onshore (Perth) | • Coordinates the delivery of the SMPs<br>• Provides costings, schedule and progress updates for delivery of SMPs<br>• Determines the structure of the Environmental Service Provider's team to necessitate delivery of the SMPs<br>• Verifies that HSE Plans, detailed sampling plans and other relevant deliverables are developed and implemented for delivery of the SMPs<br>• Directs field teams to deliver SMPs<br>• Arranges all contractual matters, on behalf of Environmental Service Provider, associated with the delivery of the SMPs to Woodside<br>• Manages sub-consultant delivery to Woodside<br>• Provides required personnel and equipment to deliver the SMPs |
| SMP Field Teams | Offshore – Monitoring Locations | • Delivers the SMPs in the field consistent with the detailed sampling plans and HSE requirements, within time and budget.<br>• Early communication of time, budget, HSE risks associated with delivery of the SMPs to the Environmental Service Provider – Project Manager<br>• Provides start up, progress and termination updates to the Environmental Service Provider – Project Manager (will be led in-field by a party chief). |

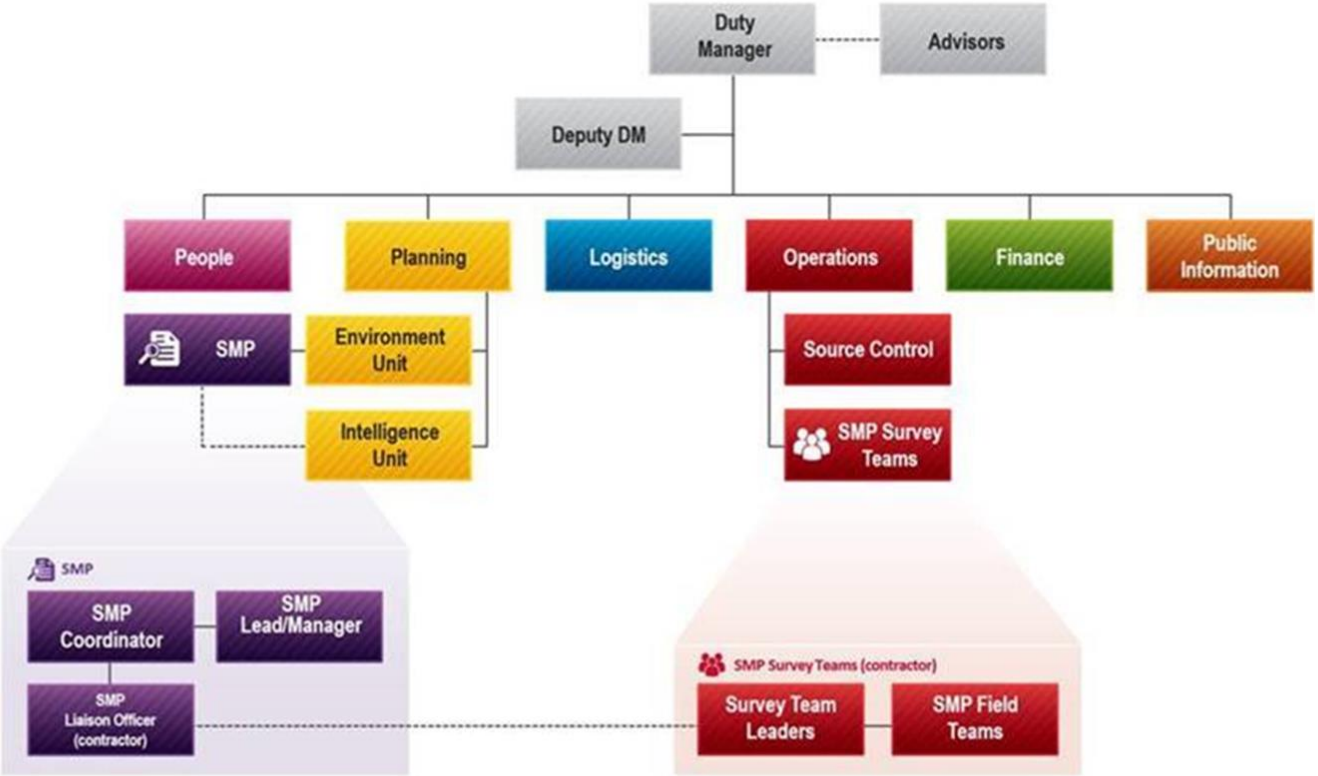


**Figure C-1: Woodside Oil Spill Scientific Monitoring Program Delivery Team and Linkage to Incident Control Centre organisational structure.**

**Table C-2: Oil Spill Environmental Monitoring: Scientific Monitoring Program - Objectives, Activation Triggers and Termination Criteria**

| Scientific monitoring Program (SMP) | Objectives | Activation Triggers | Termination Criteria |
|---|---|---|---|
| **Scientific monitoring program 1 (SM01)**<br>**Assessment of Hydrocarbons in Marine Waters** | SM01 will detect and monitor the presence, extent, persistence and properties of hydrocarbons in marine waters following the spill and the response.<br>The specific objectives of SM01 are as follows:<br>• Assess and document the extent, severity and persistence of hydrocarbon contamination with reference to observations made during surveillance activities and / or in-water measurements made during operational monitoring; and<br>• Provide information that may be used to interpret potential cause and effect drivers for environmental impacts recorded for sensitive receptors monitored under other SMPs. | SM01 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors | SM01 will be terminated when:<br>• Operational monitoring data relating to observations and / or measurements of hydrocarbons on and in water have been compiled, analysed and reported; and<br>• The report provides details of the extent, severity and persistence of hydrocarbons which can be used for analysis of impacts recorded for sensitive receptors monitored under other SMPs.<br>SMP monitoring of sensitive receptor sites:<br>• Concentrations of hydrocarbons in water samples are below NOPSEMA guidance note (2019[17]) concentrations of 1 g/m2 for floating, 10 ppb for entrained and dissolved; and<br>• Details of the extent, severity and persistence of hydrocarbons from concentrations recorded in water have been documented at sensitive receptor sites monitored under other SMPs. |
| **Scientific monitoring program 2 (SM02)**<br>**Assessment of the Presence, Quantity and Character of Hydrocarbons in Marine Sediments** | SM02 will detect and monitor the presence, extent, persistence and properties of hydrocarbons in marine sediments following the spill and the response.<br>The specific objectives of SM02 are as follows:<br>• Determine the extent, severity and persistence of hydrocarbons in marine sediments across selected sites where hydrocarbons were observed or recorded during operational monitoring; and<br>• Provide information that may be used to interpret potential cause and effect drivers for environmental impacts recorded for sensitive receptors monitored under other SMPs. | SM02 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented as follows:<br>• Response activities have ceased; and<br>• Operational monitoring results made during the response phase indicate that shoreline, intertidal or sub-tidal sediments have been exposed to surface, entrained or dissolved hydrocarbons (at or above 0.5 $g/m^2$ surface, 5 ppb for entrained/dissolved hydrocarbons and ≥1 $g/m^2$ for shoreline accumulation). | SM02 will be terminated once pre-spill condition is reached and agreed upon as per the SMP termination criteria process and include consideration of:<br>• Concentrations of hydrocarbons in sediment samples are below ANZECC/ ARMCANZ (2013[18]) sediment quality guideline values (SQGVs) for biological disturbance; and<br>• Details of the extent, severity and persistence of hydrocarbons from concentrations recorded in sediments have been documented. |
| **Scientific monitoring program 3 (SM03)**<br>**Assessment of Impacts and Recovery of Subtidal and Intertidal Benthos** | The objectives of SM03 are:<br>• Characterize the status of intertidal and subtidal benthic habitats and quantify any impacts to functional groups, abundance and density that may be a result of the spill; and<br>• Determine the impact of the hydrocarbon spill and subsequent recovery (including impacts associated with the implementation of response options).<br>Categories of intertidal and subtidal habitats that may be monitored include:<br>• Coral reefs<br>• Seagrass<br>• Macro-algae<br>• Filter-feeders<br>SM03 will be supported by sediment contamination records (SM02) and characteristics of the spill derived from OMPs. | SM03 will be activated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented as follows:<br>• As part of a pre-emptive assessment of PBAs of receptor locations identified by time to hydrocarbon contact >10 days, to target receptors and sites where it is possible to acquire pre-hydrocarbon contact baseline; and<br>• Operational monitoring identified shoreline potential contact of hydrocarbons (at or above 0.5 $g/m^2$ surface, 5 ppb for entrained/dissolved hydrocarbons and ≥1 $g/m^2$ for shoreline accumulation) for subtidal and intertidal benthic habitat. | SM03 will be terminated once pre-spill condition is reached and agreed upon as per the SMP termination criteria process and include consideration of:<br>• Overall impacts to benthic habitats from hydrocarbon exposure have been quantified.<br>• Recovery of impacted benthic habitats has been evaluated.<br>• Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill. |
| **Scientific monitoring program 4 (SM04)**<br>**Assessment of Impacts and Recovery of Mangroves / Saltmarsh** | The objectives of SM04 are:<br>• Characterize the status of mangroves (and associated salt marsh habitat) at shorelines exposed/contacted by spilled hydrocarbons;<br>• Quantify any impacts to species (abundance and density) and mangrove/saltmarsh community structure; and | SM04 will be activated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented as follows: | SM04 will be terminated once pre-spill condition is reached and agreed upon as per the SMP termination criteria process and include consideration of:<br>• Impacts to mangrove and saltmarsh habitat from hydrocarbon exposure have been quantified. |

[17] NOPSEMA (2019) Bulletin #1 – Oil spill modelling – April 2019, https://www.nopsema.gov.au/assets/Bulletins/A652993.pdf
[18] Simpson SL, Batley GB and Chariton AA (2013). Revision of the ANZECC/ARMCANZ Sediment Quality Guidelines. CSIRO and Water Science Report 08/07. Land and Water, pp. 132.

| Scientific monitoring Program (SMP) | Objectives | Activation Triggers | Termination Criteria |
|---|---|---|---|
| | • Determine and monitor the impact of the hydrocarbon spill and potential subsequent recovery (including impacts associated with the implementation of response options).<br>SM03 will be supported by sediment sampling undertaken in SM02 and characteristics of the spill derived from OMPs. | • As part of a pre-emptive assessment of receptor locations identified by time to hydrocarbon contact >10 days; and<br>• Operational monitoring identified shoreline potential contact of hydrocarbons (at or above 0.5 g/m$^2$ surface, 5 ppb for entrained/dissolved hydrocarbons and ≥1 g/m$^2$ for shoreline accumulation) for mangrove/saltmarsh habitat. | • Recovery of impacted mangrove/saltmarsh habitat has been evaluated.<br>• Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill. |
| **Scientific monitoring program 5 (SM05)**<br>**Assessment of Impacts and Recovery of Seabird and Shorebird Populations** | The Objectives of SM05 are to:<br>• Collate and quantify impacts to avian wildlife from results recorded during OM02 and OM05 (such as mortalities, oiling, rescue and release counts) and undertake a desk-based assessment to infer potential impacts at species population level; and<br>• Undertake monitoring to quantify and assess impacts of hydrocarbon exposure to seabirds and shorebird populations at targeted breeding colonies / staging sites / important coastal wetlands where hydrocarbon contact was recorded. | SM05 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented as follows:<br>• As part of a pre-emptive assessment of receptor locations identified by time to hydrocarbon contact >10 days;<br>• Operational monitoring predicts shoreline contact of hydrocarbons (at or above 0.5 g/m$^2$ surface, 5 ppb for entrained/dissolved hydrocarbons and ≥1 g/m$^2$ for shoreline accumulation) at important bird colonies / staging sites / important coastal wetland locations; or<br>• Records of dead, oiled or injured bird species made during the hydrocarbon spill or response. | SM05 will be terminated once it is agreed that the receptor has returned to pre-spill condition. The SMP termination criteria process will be followed and include consideration of:<br>• Impacts to seabird and shorebird populations from hydrocarbon exposure have been quantified.<br>• Recovery of impacted seabird and shorebird populations has been evaluated.<br>• Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill. |
| **Scientific monitoring program 6 (SM06)**<br>**Assessment of Impacts and Recovery of Nesting Marine Turtle Populations** | The objectives of SM06 are to:<br>• To quantify impacts of hydrocarbon exposure or contact on marine turtle nesting populations (including impacts associated with the implementation of response options);<br>• Collate and quantify impacts to adult and hatchling marine turtles from results recorded during OM02 and OM05 (such as mortalities, oiling, rescue and release counts) and undertake a desk-based assessment to infer potential impacts at species population levels (including impacts associated with the implementation of response options); .and<br>• Undertake monitoring to quantify and assess impacts of hydrocarbon exposure to nesting marine turtle populations at known rookeries (including impacts associated with the implementation of response options). | SM06 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented if operational monitoring has:<br>• As part of a pre-emptive assessment of receptor locations identified by time to hydrocarbon contact >10 days;<br>• Predicted shoreline contact of hydrocarbons (at or above 0.5 g/m$^2$ surface, 5 ppb for entrained/dissolved hydrocarbons and ≥1 g/m$^2$ for shoreline accumulation) at known marine turtle rookery locations; or<br>• Records of dead, oiled or injured marine turtle species made during the hydrocarbon spill or response. | SM06 will be terminated once it is agreed that the receptor has returned to pre-spill condition. The SMP termination criteria process will be followed and include consideration of:<br>• Impacts to nesting marine turtle populations from hydrocarbon exposure have been quantified.<br>• Recovery of impacted nesting marine turtle populations has been evaluated.<br>• Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill. |
| **Scientific monitoring program 7 (SM07)**<br>**Assessment of Impacts to Pinniped Colonies including Haul-out Site Populations** | The objectives of SM07 are to:<br>• Quantify impacts on pinniped colonies and haul-out sites as a result of hydrocarbon exposure/contact.<br>• Collate and quantify impacts to pinniped populations from results recorded during OM02 and OM05 (such as mortalities, oiling, rescue and release counts) and undertake a desk-based assessment to infer potential impacts at species population levels. | SM07 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented if operational monitoring has:<br>• As part of a pre-emptive assessment of receptor locations identified by time to hydrocarbon contact >10 days;<br>• Identified shoreline contact of hydrocarbons ((at or above 0.5 g/m$^2$ surface, ≥5 ppb for entrained/dissolved hydrocarbons and ≥1 g/m$^2$ for shoreline accumulation) at known pinniped colony or haul-out site(s) (i.e. most northern site is the Houtman Abrolhos Islands); or<br>• Records of dead, oiled or injured pinniped species made during the hydrocarbon spill or response. | SM07 will be terminated once it is agreed that the receptor has returned to pre-spill condition. The SMP termination criteria process will be followed and include consideration of:<br>• Impacts to pinniped populations from hydrocarbon exposure have been quantified.<br>• Recovery of pinniped populations has been evaluated.<br>• Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill. |
| **Scientific monitoring program 8 (SM08)**<br>**Desk-Based Assessment of Impacts to Other Non-Avian Marine Megafauna** | The objective of SM08 is to provide a desk-based assessment which collates the results of OM02 and OM05 where observations relate to the mortality, stranding or oiling of mobile marine megafauna species not addressed in SM06 or SM07, including:<br>• Cetaceans;<br>• Dugongs; | SM08 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented if operational monitoring reports records of dead, oiled or injured non-avian marine megafauna during the spill/ response phase. | SM08 will be terminated when the results of the post-spill monitoring have quantified impacts to non-avian megafauna. |

| Scientific monitoring Program (SMP) | Objectives | Activation Triggers | Termination Criteria |
|---|---|---|---|
| | • Whale sharks and other shark and ray populations;<br>• Sea snakes; and<br>• Crocodiles.<br>The desk-based assessment will include population analysis to infer potential impacts to marine megafauna species populations. | | • Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill. |
| **Scientific monitoring program 9 (SM09)**<br>**Assessment of Impacts and Recovery of Marine Fish associated with SM03 habitats** | The objectives of SM09 are:<br>• Characterise the status of resident fish populations associated with habitats monitored in SM03 exposed/contacted by spilled hydrocarbons;<br>• Quantify any impacts to species (abundance, richness and density) and resident fish population structure (representative functional trophic groups); and<br>• Determine and monitor the impact of the hydrocarbon spill and potential subsequent recovery (including impacts associated with the implementation of response options). | SM09 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented with SMO3. | SM09 will be undertaken and terminated concurrent with monitoring undertaken for SM03, as per the SMP termination criteria process<br>• Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill. |
| **Scientific monitoring program 10 (SM10)**<br>**SM10 - Assessment of physiological impacts important fish and shellfish species (fish health and seafood quality/safety) and recovery** | SM10 aims to assess any physiological impacts to important commercial fish and shellfish species (assessment of fish health) and if applicable, seafood quality/safety. Monitoring will be designed to sample key commercial fish and shellfish species and analyse tissues to identify fish health indicators and biomarkers, for example:<br>• Liver Detoxification Enzymes (ethoxyresorufin-O-deethylase (EROD) activity)<br>• PAH Biliary Metabolites<br>• Oxidative DNA Damage<br>• Serum SDH<br>• Other physiological parameters, such as condition factor (CF), liver somatic index (LSI), gonado-somatic index (GSI) and gonad histology, total weight, length, condition, parasites, egg development, testes development, abnormalities.<br>Seafood tainting may be included (where appropriate) using applicable sensory tests to objectively assess targeted finfish and shellfish species for hydrocarbon contamination. Results will be used to make inferences on the health of commercial fisheries and the potential magnitude of impacts to fishing industries. | SM10 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented if operational monitoring (OM01, OM02 and OM05) indicates the following:<br>• The hydrocarbon spill will or has intersected with active commercial fisheries or aquaculture activities.<br>• Commercially targeted finfish and/or shellfish mortality has been observed/recorded.<br>• Commercial fishing or aquaculture areas have been exposed to hydrocarbons (≥0.5 g/m$^2$ surface and ≥5 ppb for entrained/dissolved hydrocarbons); and<br>• Taste, odour or appearance of seafood presenting a potential human health risk is observed. | SM10 will be terminated once it is agreed that the receptor has returned to pre-spill condition. The SMP termination criteria process will be followed and include consideration of:<br>• Physiological impacts to important commercial fish and shellfish species from hydrocarbon exposure have been quantified.<br>• Recovery of important commercial fish and shellfish species from hydrocarbon exposure has been evaluated.<br>• Impacts to seafood quality/safety (if applicable) have been assessed and information provided to the relevant stakeholders and regulators for the management of any impacted fisheries.<br>• Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill. |

**Activation Triggers and Termination Criteria**

The Woodside oil spill scientific monitoring team will be stood up immediately with the occurrence of a hydrocarbon spill (actual or suspected) Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors via the FSP for the petroleum activity programme. The presence of any level of hydrocarbons in the marine environment triggers the activation of the oil spill scientific monitoring program (SMP). This is to ensure the full range of eventualities relating to the environmental, socio-economic and health consequences of the spill are considered in the planning and execution of the SMP. The activation process also takes into consideration the management objectives, species recovery plans, conservation advices and conservations plans for any World Heritage Area (WHA), AMPs, State Marine Parks, other protected area designations (e.g., State nature reserves) and Matters of National Environmental Significance (including listed species under part 3 of the EPBC Act) potentially exposed to hydrocarbons. With the first 24-48 hours of a spill event, such information will be sourced and evaluated as part of the SMP planning process guided by Appendix D (identified receptors vulnerable to hydrocarbon contact), the information presented in the Existing Environment section of the EP as well as other information sources such as the Woodside Baseline Environmental Studies Database.

The starting point for decision-making on which SMPs are activated, and the spatial extent of monitoring activities, will be based on the predictive modelling results (OM01) in the first 24-48 hours until more information is made available from other operational monitoring activities such as aerial surveillance and shoreline surveys. Pre-emptive Baseline Areas (WHA, AMPs and State Marine Parks encompassing key ecological and socio-economic values) are a key focus of the SMP activation decision-making process, particularly, in the early spill event/response phase. As the operational monitoring progresses and further situational awareness information becomes available, it will be possible to understand the nature and scale of the spill. The SMP activation and implementation decision-making will be revisited on a daily basis to account for the updates on spill information. One of the priority focus areas in the early phase of the incident will be to identify and execute pre-emptive SMP assessments at key receptor locations, as required. The SMP activation and implementation decision tree is presented in Figure C-2.

*Scientific monitoring program termination*

The basis of the termination process for the active SMPs (SMPs 1-10) will include quantification of impacts, evaluation of recovery for the receptor at risk and consultation with relevant authorities, persons and organisations. Termination of each SMP will not be considered until the results (as presented in annual SMP reports for the duration of each program) indicate that the target receptor has returned to pre-spill condition.

Once the SMP results indicate impacted receptor(s) have returned to pre-spill condition (as identified by Woodside) a termination decision-making process will be triggered and a number of steps will be undertaken as follows:

- Woodside will engage expert opinion on whether the receptor has returned to pre-spill condition (based on monitoring data). Subject Matter Expert (SMEs) will be engaged (via the Woodside SME scientific monitoring terms of reference to review program outcomes, provide expert advice and recommendations for the duration of each SMP.
- Where expert opinion agrees that the receptor has returned to pre-spill condition, findings will then be presented to the relevant authorities, persons and organisations (as defined by the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulation 11A). Stakeholder identification, planning and engagement will be managed by Woodside's Reputation Functional Support Team (FST) and follow the stakeholder management FST guidelines. These guidelines outline the FST roles and responsibilities, competencies, stakeholder communications and planning processes. An assessment of the merits of any objection to termination will be documented in the SMP final report.
- Woodside will decide on termination of SMP based on expert opinion and merits of any stakeholder objections. The final report following termination will include: monitoring results, expert opinion and stakeholder consultation including merits of any objections.

- Termination of SMPs will also consider applicable management objectives, species recovery plans, conservation advices and conservations plans for any WHA, AMPs, State Marine Parks, other protected area designations (e.g., State nature reserves) and Matters of National Environmental Significance (including listed species under part 3 of the EPBC Act).

The SMP termination decision-making process will be applied to each active SMP and an iterative process of decision steps continued until each SMP has been terminated (refer to decision-tree diagram for SMP termination criteria, Figure C-3).

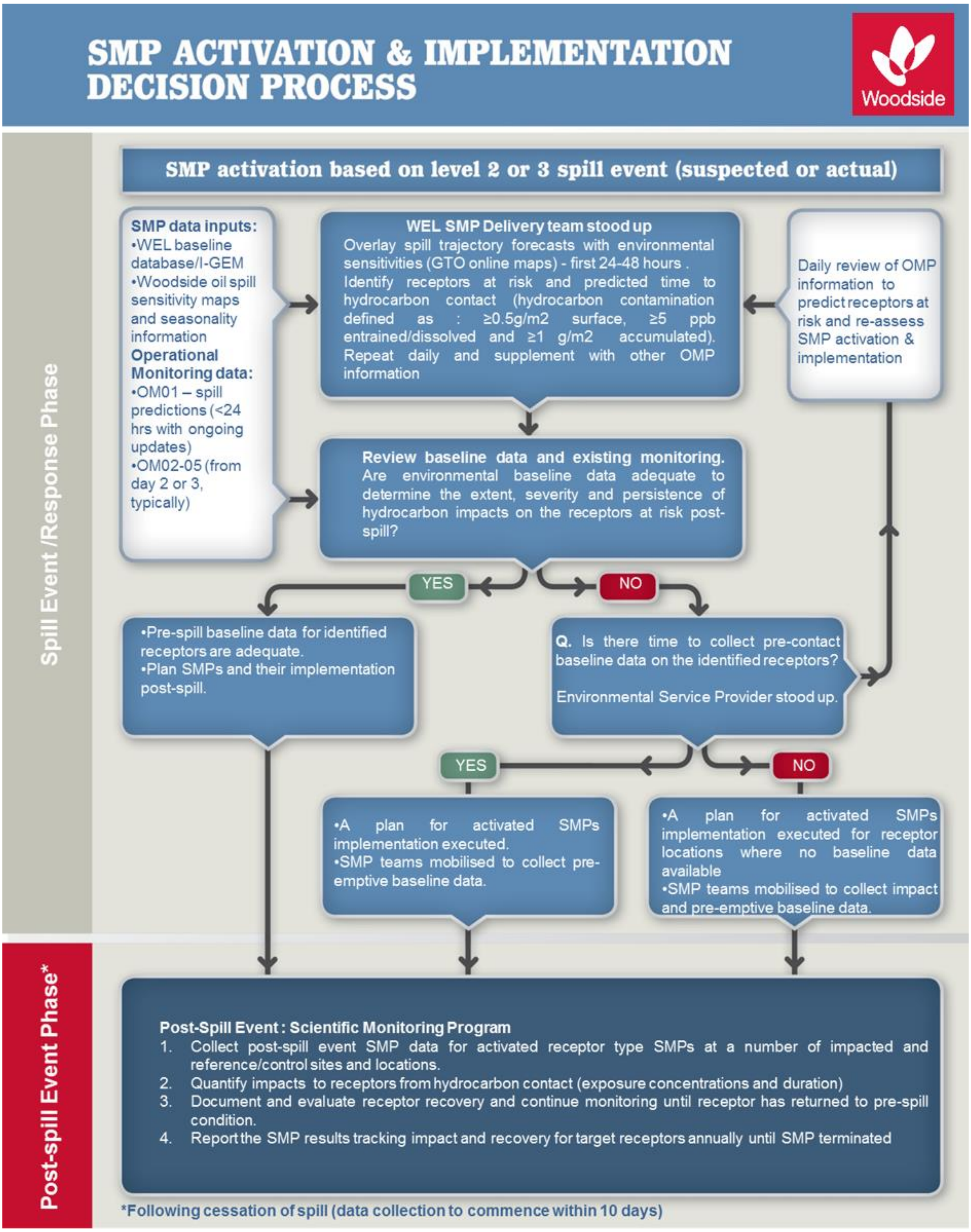


**Figure C-2: Activation and Implementation Decision-tree for Oil Spill Environmental Monitoring**

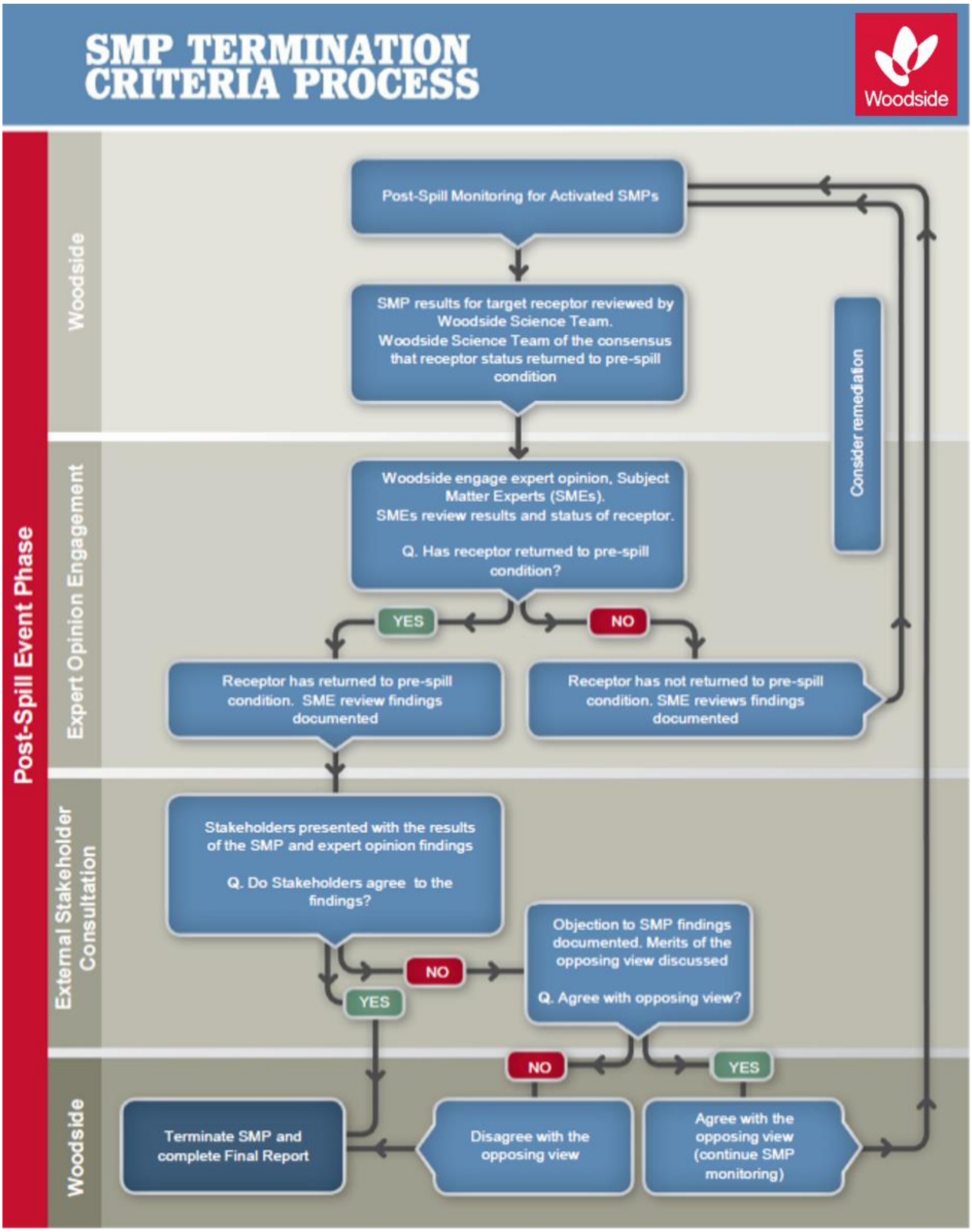


**Figure C-3: Termination Criteria Decision-tree for Oil Spill Environmental Monitoring**

### Receptors at Risk and Baseline Knowledge

In order to assess the baseline studies available and suitability for oil spill scientific monitoring, Woodside maintains knowledge of environmental baseline studies through the upkeep and use of its Environmental Knowledge Management System.

Woodside's Environmental Knowledge Management System is a centralised platform for scientific information on the existing environment, marine biodiversity, Woodside environmental studies, key environmental impact topics, key literature and web-based resources. The system comprises a number of data directories and an environmental baseline database, as well as folders within the 'Corporate Environment' server space. The environmental baseline database was set up to support Woodside's SMP preparedness and as a SMP resource in the event of an unplanned hydrocarbon spill. The environmental baseline database is subject to updates including annual reviews completed as part of the contracted SMP standby, SMP standby contract. This database is accessed pre-PAP to identify Pre-emptive Baseline Areas (PBAs) where hydrocarbon contact is predicted to occur <10 days.

In addition to Woodside's Environmental Knowledge Management System, it is acknowledged that many relevant baseline datasets are held by other organisations (e.g. other oil and gas operators, government agencies, state and federal research institutions and non-governmental organisations). In order to understand the present status of environmental baseline studies a spatial environmental metadata database for Western Australia (Industry-Government Environmental Metadata, I-GEM) was established.  IGEM is a collaboration comprising oil and gas operators (including Woodside), government and research agencies and other organisations. The key objective of IGEM is for participating organisations to have the ability to identify quantitative marine baseline datasets available for species and habitats via a geo-spatially referenced metadata database. It provides members the ability to enter, view and filter metadata records on baseline studies as well as customise and generate report outputs. IGEM aims to provide a foundational baseline framework so industry and government can access the same knowledge base to understand baseline data in the event of an unplanned hydrocarbon release.

In the event of an unplanned hydrocarbon release, Woodside intends to interrogate the information on baseline studies status as held by the various databases (e.g. Woodside Environmental Knowledge Management System, IGEM and other sources of existing baseline data) to identify Pre-emptive Baseline Areas (PBAs), i.e., receptors at risk where hydrocarbon contact is predicted to be >10 days, and baseline data can be collected before hydrocarbon contact.

### Reporting

For the scientific monitoring program relevant regulators will be provided with:

- Annual reports summarising the SMPs deployed and active, data collection activities and available findings; and
- Final reports for each SMP summarising the quantitative assessment of environmental impacts and recovery of the receptor once returned to pre-spill condition and termination of the monitoring program.

The reporting requirements of the scientific monitoring program will be specific to the individual SMPs deployed and terms of responsibilities, report templates, schedule, QA/QC and peer-review will be agreed with the contractors engaged to conduct the SMPs. Compliance and auditing mechanisms will be incorporated into the reporting terms

# ANNEX D: SCIENTIFIC MONITORING PROGRAM AND BASELINE STUDIES FOR THE PETROLEUM ACTIVITIES PROGRAM

**Table D-1: Oil Spill Environmental Monitoring – scientific monitoring program scope for the Petroleum Activities Program based on Spill EMBA for MEE-01 and 05 (Table 2-1)**

| Receptors to be Monitored | Applicable SMP | Kimberley AMP | Agro-Rowley Terrace AMP | Montebello AMP | Dampier AMP | Carnarvon Canyon AMP | Ningaloo AMP | Gascoyne AMP | Shark Bay Open Ocean (including AMP) | Abrolhos AMP | Jurien AMP | Two Rocks AMP | Perth Canyon AMP | Geographe AMP | South-west Corner AMP | Ashmore Reef and AMP | Seringapatam Reef | Scott Reef (North and South) | Mermaid Reef and AMP | Clerke Reef and State Marine Park | Imperieuse Reef and State Marine Park | Rankin Bank | Glomar Shoals | Rowley Shoals (including Sate Maine Park) | Fantome Shoal | Adele Island | Lacepede Islands | Montebello Islands (including State Marine Park) | Lowendal Islands (including State Nature Reserves) | Barrow Island (including State Nature Reserves, State Marine Park and Marine Management Area) | Muiron Islands (WHA, Marine Management Area) | Pilbara Islands - Southern Island Group (Serrurier, Thevenard and Bessieres Islands - State Nature Reserves) | Pilbara Islands - Northern Island Group (Sandy Island Passage Islands - State nature reserves) | Abrolhos Islands | Kimberley Coast | Dampier Peninsula | Northern Pilbara Shoreline | Ningaloo Coast (North/North West Cape, Middle and South) (WHA, and State Marine Park) | Shark Bay - Open Ocean Coast | Shark Bay (WHA, State Marine Park) | Ngari Capes State Marine Park |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Receptor Areas - Potential Impact and Reference Scientific Monitoring Sites (marked X) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Habitat | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water Quality | SM01 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Marine Sediment Quality | SM02 | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Coral Reef | SM03 | X | | X | | | | | | | | | | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | X | X | X | X | X | X | X | |
| Seagrass / Macro-Algae | SM03 | X | | | | | | | | | X | | | | | X | X | X | | | | | | | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Deeper Water Filter Feeders | SM03 | X | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | | | X | | | | | | | X | | | |
| Mangroves and Saltmarsh | SM04 | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | | | | X | X | X | X | X | | X | |
| Species | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sea Birds and Migratory Shorebirds (significant colonies / staging sites / coastal wetlands) | SM05 | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Marine Turtles (significant nesting beaches) | SM06 | X | X | X | X | | X | X | X | | | | | | | X | X | X | X | X | X | | | | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | |
| Pinnipeds (significant colonies / haul-out sites) | SM07 | | | | | | | | | X | X | X | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | X |
| Cetaceans - Migratory Whales | SM08 | X | X | X | X | | X | X | X | X | X | X | X | X | X | | | X | | | | | | | | | X | X | X | X | X | | | X | X | X | | X | | X | X |
| Oceanic and Coastal Cetaceans | SM08 | X | X | X | X | | X | X | X | X | | | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Dugongs | SM08 | X | | | | | | | X | | | | | | | X | | | | | | | | | | | | X | X | X | X | X | X | | X | X | X | X | X | X | |
| Sea Snakes | SM08 | X | | X | X | | | X | X | X | | | | | | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | |
| Whale Sharks | SM08 | | | X | | | X | X | | | | | | | | | | X | | | | | | | | | | X | X | X | X | | | | | | | X | | | |
| Other Shark and Ray Populations | SM08, SM09 | X | X | X | X | | X | X | X | X | X | | | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Fish Assemblages | SM09 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Socio-economic | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fisheries - Commercial | SM10 | | X | X | X | X | X | X | X | X | X | X | | | | | | | | | | X | X | X | X | | | X | X | X | | X | X | X | X | X | X | X | X | X | X |
| Fisheries - Traditional | SM10 | | | | | | | | | | | | | | | X | X | X | | | | | | | | | X | | | | | | | | | | | | | X | |
| Tourism (incl. recreational fishing) | SM10 | X | | X | | | X | X | X | | X | | | X | X | X | X | X | X | X | X | X | X | X | | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X |

| | |
|---|---|
| (dark red) | Receptor areas identified as Pre-emptive Baseline Areas (based on criteria of surface contact and/or entrained hydrocarbon contact ≤10 days (Offshore Australian Marine Parks contacted by hydrocarbons in this timeframe also noted) |
| (light red) | Receptor areas identified as Pre-Emptive Basline Areas in the response phase >10 days (based on criteria of surface contact and/or entrained hydrocarbon contact >10 days) |
| (white) | Receptor areas that may be identified as impact or reference sites in the event of major hydrocarbon release and would be identified as part of the SMP planning process |

**Table D-2: Baseline Studies for the SMPs applicable to identified Pre-emptive Baseline Areas for the Petroleum Activities Program**

| Major Baseline | Proposed Scientific monitoring operational plan and Methodology | Montebello Islands | Barrow Island | Lowendal Islands | Rankin Bank & Glomar Shoals | **Montebello AMP** |
|---|---|---|---|---|---|---|
| Benthic Habitat (Coral Reef) | SM03<br>Quantitative assessment using image capture using either diver held camera or towed video. Post analysis into broad groups based on taxonomy and morphology. | Studies: | | | | |
| | | 1. Broad benthic habitat classifications and habitat maps for the Montebello islands by DBCA.<br>2. Coral monitoring at sites across Barrow Island, Lowendal and the Montebello islands. Most recent survey 2012.<br>3. Benthic community monitoring as part of DBCA Western Australian Marine Monitoring Program (2015-ongoing.<br>4. Pilbara Marine Conservation Partnership Seabed biodiversity survey (2013). | 1. Chevron LTM of corals for the Gorgon Gas Development. Marine Baseline Program (2008), Marine Monitoring Program (2010) Post Development Surveys (2011 – 2013).<br><br>2.Coral monitoring at sites around Barrow Island, Lowendal and the Montebello islands. Most recent survey 2012.<br><br>3.Benthic community (coral, seagrass and macroalgae) monitoring as part of DBCA's Western Australian Marine Monitoring Program (2015-ongoing).<br><br>4.Pilbara Marine Conservation Partnership Seabed biodiversity survey (2013). | 1. Benthic habitats surrounding the Lowendal Islands for the Gorgon Gas Development. Coral assemblages on the eastern side of Double Island, and coral bommies on the south-western edge of the Lowendal Shelf.<br><br>2. Coral monitoring at sites across Barrow Island, Lowendal and the Montebello islands. Most recent survey 2012.<br><br>3. Pilbara Marine Conservation Partnership Seabed biodiversity survey (2013). | 1. Glomar Shoals and Rankin Bank Environmental Survey Report, 2013, quantitatively surveyed benthic habitats and communities. AIMS report to Woodside. Scientific Publication - Biodiversity and spatial patterns of benthic habitat and associated demersal fish communities at two tropical submerged reef ecosystems, 2018.<br><br>2. Rankin Bank Environmental Survey Extension, 2014, Habitat assessment of an area southeast of Rankin Bank.<br><br>3. Glomar Shoals and Rankin Bank surveys, 2017. GWF-2 Monitoring Programme. Quantitatively surveyed benthic habitats and communities.<br><br>4. Temporal Studies survey of Rankin Bank and Glomar Shoals, 2018. | Coral Reefs & Filter Feeders<br><br>1. Montebello Marine Park, 2019, Identification and qualitative descriptions of benthic habitat.<br>2. Montebello Australian Marine Parks – 2019 – Baseline survey on benthic habitats.<br>3. Pluto Trunkline within Montebello Marine Park – Monitoring marine communities. |
| | | Methods: | | | | |
| | | 1. Habitat mapping.<br><br>2. Quantitative assessment details not available.<br><br>3. Drop camera.<br><br>4. Fixed long-term monitoring sites. Diver video transect.<br><br>5. Towed video, benthic trawl and sled. | 1. Belt transect, size class frequency, video transects, photo quadrat, tagged colonies and terracotta tiles for coral recruitment.<br><br>2. Quantitative assessment<br><br>3. Fixed long-term monitoring sites. Diver video transects.<br><br>4. Towed camera, benthic trawl and sled. | Benthic habitat mapping, diver swum transects, tagged colonies. Quantitative assessment<br>Towed video, benthic trawl and sled. | 1. Towed video transects, photo quadrats using towed video system.<br><br>2. Towed video transects, photo quadrats using towed video system.<br><br>3. Towed video transects, photo quadrats using towed video system.<br><br>4. Towed video transects, photo quadrats using towed video system. | 1.ROV Transects.<br>2. Benthic habitat mapping, multibeam acoustic swathing.<br>3. ROV video. |
| | | References and Data: | | | | |
| | | 1. DBCA 2007.<br>DATAHOLDER: DBCA.<br><br>2. RPS, 2012.<br>DATAHOLDER: Santos.<br><br>3. DATAHOLDER: DBCA.<br><br>4. Pitcher et al. (2016).<br>DATAHOLDER: CSIRO. | 1. Baseline: Chevron Australia 2010.<br>Marine Monitoring Program: Chevron Australia 2011<br>Post Dredge: Chevron Australia 2013<br>DATAHOLDER: Chevron Australia.<br><br>2. RPS, 2012.<br>DATAHOLDER: Santos.<br><br>3. Bancroft 2009.<br>DATAHOLDER: DoEE.<br><br>4. Pitcher et al. (2016).<br>DATAHOLDER: CSIRO. | 1. RPS-Bowman Bishaw Gorham 2005.<br>DATAHOLDER: Chevron.<br><br>2. RPS, 2012.<br>DATAHOLDER: Santos.<br><br>3. Pitcher et al. (2016).<br>DATAHOLDER: CSIRO. | 1. AIMS 2014a and Abdul Wahab et al., 2018.<br>DATAHOLDER: AIMS.<br><br>2. AIMS 2014b.<br>DATAHOLDER: AIMS.<br><br>3. Currey-Randall et al. 2019.<br>DATAHOLDER: AIMS<br><br>4. Currey-Randall et al. 2019.<br>DATAHOLDER: AIMS | 1. Advisian 2019<br>2. Keesing 2019<br>3. McLean et al. 2019 |
| | | Studies: | | | | |

| Major Baseline | Proposed Scientific monitoring operational plan and Methodology | Montebello Islands | Barrow Island | Lowendal Islands | Rankin Bank & Glomar Shoals | **Montebello AMP** |
|---|---|---|---|---|---|---|
| Benthic Habitat (Seagrass and Macro-algae) | SM03<br>Quantitative assessment using image capture using either diver held camera or towed video. Post analysis into broad groups based on taxonomy and morphology. | 1. Santos, macroalgae monitoring at sites across Lowendal and the Montebello islands in 2012.<br><br>2. Pilbara Marine Conservation Partnership Seabed biodiversity survey (2013). | 1. Chevron LTM of Seagrass and Macro algae habitats for the Gorgon Gas Development project. Marine baseline Program (2008, 2009), Marine Monitoring Program (2010), Post Dredge Survey one (2011)<br><br>2. Chevron study by RPS in 2004 on Barrow Island intertidal zone.<br><br>3. Pilbara Marine Conservation Partnership Seabed biodiversity survey (2013). | 1. Benthic habitats including seagrass and macroalgae for the (Lowendal Islands, Chevron Janz Feed Gas Pipeline Project.) Gorgon Gas Development Project.<br><br>2. Santos macroalgae monitoring at sites across Lowendal and the Montebello islands in 2012.<br><br>3. Pilbara Marine Conservation Partnership Seabed biodiversity survey (2013). | 1. Glomar Shoals and Rankin Bank Environmental Survey Report, 2013, quantitatively surveyed benthic habitats and communities. AIMS report to Woodside. Scientific Publication - Biodiversity and spatial patterns of benthic habitat and associated demersal fish communities at two tropical submerged reef ecosystems, 2018.<br><br>2. Rankin Bank Environmental Survey Extension, 2014, Habitat assessment of an area southeast of Rankin Bank.<br><br>3. Glomar Shoals and Rankin Bank surveys, 2017. GWF-2 Monitoring Programme. Quantitatively surveyed benthic habitats and communities.<br><br>4. Temporal Studies survey of Rankin Bank and Glomar Shoals, 2018. | N/A – see table D – 1 |
| | | Methods: | | | | |
| | | 1. Quantitative assessment details not available.<br><br>2. Towed video, benthic trawl and sled. | 1. Diver transects, photo quadrats, biomass.<br><br>2. Physical observational survey of intertidal habitats on Barrow Island.<br><br>3. Towed video, benthic trawl and sled. | 1. Diver Transects, Photo Quadrats.<br><br>2. Quantitative assessment details not available.<br><br>3. Towed video, benthic trawl and sled. | 1. Towed video transects, photo quadrats using towed video system.<br><br>2. Towed video transects, photo quadrats using towed video system.<br><br>3. Towed video transects, photo quadrats using towed video system.<br><br>4. Towed video transects, photo quadrats using towed video system | N/A – see table D – 1 |
| | | References and Data: | | | | |
| | | 1. RPS 2012.<br>DATAHOLDER: Santos.<br><br>2. Pitcher et al. (2016).<br>DATAHOLDER: CSIRO. | 1. Baseline: Chevron Australia 2010.<br>Marine Monitoring Program: Chevron Australia 2011<br>Post Dredge: Chevron Australia 2013<br>DATAHOLDER: Chevron Australia.<br><br>2. RPS-Bowman Bishaw Gorham 2005. DATAHOLDER: Chevron Australia.<br><br>3. Pitcher et al. (2016).<br>DATAHOLDER: CSIRO. | 1. RPS-Bowman Bishaw Gorham 2005. DATAHOLDER: Chevron.<br><br>2. RPS 2012.<br>DATAHOLDER: Santos.<br><br>3. Pitcher et al. (2016).<br>DATAHOLDER: CSIRO. | 1. AIMS 2014a and Abdul Wahab et al., 2018.<br>DATAHOLDER: AIMS.<br><br>2. AIMS 2014b.<br>DATAHOLDER: AIMS.<br><br>3. Currey-Randall et al. 2019.<br>DATAHOLDER: AIMS<br><br>4. Currey-Randall et al. 2019.<br>DATAHOLDER: AIMS | N/A – see table D – 1 |
| | SM03 | Studies: | | | | |

| Major Baseline | Proposed Scientific monitoring operational plan and Methodology | Montebello Islands | Barrow Island | Lowendal Islands | Rankin Bank & Glomar Shoals | **Montebello AMP** |
|---|---|---|---|---|---|---|
| Benthic Habitat (Deeper Water Filter Feeders) | Quantitative assessment using image capture using towed video. Post analysis into broad groups based on taxonomy and morphology. | N/A – See Table D-1 | N/A – See Table D-1 | N/A – See Table D-1 | 1. Glomar Shoals and Rankin Bank Environmental Survey Report, 2013, quantitatively surveyed benthic habitats and communities. AIMS report to Woodside. Scientific Publication - Biodiversity and spatial patterns of benthic habitat and associated demersal fish communities at two tropical submerged reef ecosystems, 2018.<br><br>2. Rankin Bank Environmental Survey Extension, 2014, Habitat assessment of an area southeast of Rankin Bank.<br><br>3. Glomar Shoals and Rankin Bank surveys, 2017. GWF-2 Monitoring Programme. Quantitatively surveyed benthic habitats and communities.<br><br>4. Temporal Studies survey of Rankin Bank and Glomar Shoals, 2018. | N/A – see table D – 1 |
| | | Methods: | | | | |
| | | N/A – See Table D-1 | N/A – See Table D-1 | N/A – See Table D-1 | 1. Towed video transects, photo quadrats using towed video system.<br><br>2. Towed video transects, photo quadrats using towed video system.<br><br>3. Towed video transects, photo quadrats using towed video system.<br><br>4. Towed video transects, photo quadrats using towed video system | N/A – see table D – 1 |
| | | References and Data: | | | | |
| | | N/A – See Table D-1 | N/A – See Table D-1 | N/A – See Table D-1 | 1. AIMS 2014a and Abdul Wahab et al., 2018.<br>DATAHOLDER: AIMS.<br><br>2. AIMS 2014b.<br>DATAHOLDER: AIMS.<br><br>3. Currey-Randall et al. 2019.<br>DATAHOLDER: AIMS<br><br>4. Currey-Randall et al. 2019.<br>DATAHOLDER: AIMS | N/A – see table D – 1 |
| Mangroves and Saltmarsh | SM04 | Studies: | | | | |

| Major Baseline | Proposed Scientific monitoring operational plan and Methodology | Montebello Islands | Barrow Island | Lowendal Islands | Rankin Bank & Glomar Shoals | **Montebello AMP** |
|---|---|---|---|---|---|---|
| | Aerial photography and satellite imagery will be used in conjunction with field surveys to map the range and distribution of mangrove communities. | 1. Atmospheric correct and land cover classification, NW Cape.<br><br>2. Advanced Land Observing Satellite (ALOS) images taken in 2006, 2008, and 2010 by DBCA. Digital Aerial Photos were taken in 2009, and the area ground-truthed in 2006.<br><br>3. Ground truthing aerial photography to map the spatial extent of mangroves on the Montebello Islands.<br><br>4. Mangrove monitoring as part of DBCA Western Australian Marine Monitoring Program (ongoing). | Chevron LTM of Mangroves for the Gorgon Gas Development project. Marine Baseline Program (2009), Post Dredge Survey 1 (2011), Post Dredge Survey 2 (2013).<br><br>Baseline state of the mangroves 2008. | 1. Atmospheric correct and land cover classification, NW Cape.<br><br>2. Santos Mangrove baseline (2010).<br><br>3. Santos - Long-term mangrove monitoring (1999-2011). | N/A – See Table D-1 | N/A – see table D – 1 |
| | | Methods: | | | | |
| | | 1. Modular Inversion Program. May 2017<br><br>2. ALOS and Digital aerial photos, ground truthing, for Mangrove extent and mangrove relative canopy density.<br><br>3. Species Composition, LUX, canopy density.<br><br>4. Methods unknown. | 1.Health scoring system, percentage cover, mean canopy density, qualitative health assessment.<br><br>2. Annual Mangrove composition, canopy density, pneumatophore density, leaf pathology, qualitative health. | 1. Modular Inversion Program. May 2017<br><br>2.Aerial imagery (resolution of 0.2 m2 captured in 2010).<br><br>3. Qualitative data includes the presence of new growth, reproductive state, extent of defoliation and pneumatophore condition. Quantitative data, collected at the tree level, includes seedling density, stem diameter, number of defoliated branches and a number of canopy condition parameters. | N/A – See Table D-1 | N/A – see table D – 1 |
| | | References and Data: | | | | |
| | | 1. EOMAP, 2017<br>DATAHOLDER: Woodside.<br><br>2.DBCA unpublished data.<br>DATAHOLDER: DBCA.<br><br>2. Voga unpublish data<br>DATAHOLDER: Voga Contact: voga.envrironment@vermilionenergy.com<br><br>3. DBCA. DATAHOLDER DBCA. | Baseline: Chevron Australia 2010.<br>Marine Monitoring Program: Chevron Australia 2011<br>Post Dredge: Chevron Australia 2013<br>DATAHOLDER: Chevron Australia.<br><br>Chevron 2014.<br>DATAHOLDER: Chevron. | 1. EOMAP, 2017<br>DATAHOLDER: Woodside.<br><br>2.Santos 2014.<br>DATAHOLDER: Santos.<br><br>3. Santos 2011.<br>DATAHOLDER: Santos. | N/A – See Table D-1 | N/A – see table D – 1 |
| Seabirds | SM05 | Studies: | | | | |

| Major Baseline | Proposed Scientific monitoring operational plan and Methodology | Montebello Islands | Barrow Island | Lowendal Islands | Rankin Bank & Glomar Shoals | **Montebello AMP** |
|---|---|---|---|---|---|---|
| | Visual counts of breeding seabirds, nest counts, intertidal bird counts at high tide. | No recent studies. A DBCA/WAM study of terrestrial fauna of the islands was published in 2000 (Burbidge et al 2000). The most recent bird survey referenced in this review was 1998 by DBCA (DPaW, CALM). | 1. Barrow Island migratory behaviour, nesting and foraging behaviour.<br><br>2. Migratory waders at Barrow Island.<br><br>3. LTM on Barrow island (island wide) Study September 2003 – 2006.<br><br>4. Chevron - Gorgon Gas Development. Terrestrial and subterranean environment monitoring program (2008-2015). Monitoring of Wedge-tailed Shearwaters, Bridled Terns, Silver Gulls. | 1. Ongoing study of Bridled Terns from 2009.<br><br>2. Quadrant Energy seabird nesting on Lowendal Island, study 2013.<br><br>3. Lowendal Islands, common breeding bird species, structure, feeding and disturbances to the population.<br><br>4. Quadrant Energy/Santos – Integrated Shearwater Monitoring Program (1994-2016). | N/A – See Table D-1 | Present, in open water, no breeding habitat. |
| | | Methods: | | | | |
| | | Bird observations and counts. | Species, total numbers, Distribution, Roosting locations and foraging numbers. Migratory behaviour.<br><br>High tide roost counts, abundance counts.<br><br>Nest burrow density (number of burrows per m2); presence/absence of eggs or chicks in burrows; collapsed burrows and predation and mortality records.<br><br>Barrow Island: Variation in abundance and spatial/temporal distribution on beaches. Middle Island: Abundance; nest density; Presence and absence of eggs/chicks in nest. | 1. Nest Density, presence and absence of chicks, predation and mortality counts.<br><br>2. Nest burrow density (number of burrows per m2); presence/absence of eggs or chicks in burrows.<br><br>3. Burrowscopes, Ultrasonic monitors to monitor burrows.<br><br>4. The distribution and abundance of other nesting seabirds within the Lowendal Island group, including up to 45 islands and islets, also occurred from 2004 onwards. | N/A – See Table D-1 | N/A |
| | | References and Data: | | | | |
| | | DBCA/WAM – Burbidge et al 2000. | Bamford M.J. & A.R 2004. DATAHOLDER: Chevron.<br><br>Bamford M.J & A.R 2011. DATAHOLDER: Chevron.<br><br>Chevron, 2013. DATAHOLDER: Chevron.<br><br>Chevron 2013. DATAHOLDER: Chevron. | 1. Bamford M.J. & A.R 2004. DATAHOLDER: Chevron.<br><br>2. Surman 2012. DATAHOLDER: Santos.<br><br>3. Bamford M.J & A.R 2011. DATAHOLDER: Chevron.<br><br>4. DATAHOLDER: Santos. | N/A – See Table D-1 | N/A |
| Turtles | SM06 | Studies: | | | | |

| Major Baseline | Proposed Scientific monitoring operational plan and Methodology | Montebello Islands | Barrow Island | Lowendal Islands | Rankin Bank & Glomar Shoals | **Montebello AMP** |
|---|---|---|---|---|---|---|
| | Beach surveys (recording species, nests, and false crawls). | 1. LTM Study of Green, Flatback, Hawksbill turtles on beaches within the Barrow, Lowendal and Montebello Island Complex for Chevron.<br><br>2. Marine turtle monitoring as part of DBCA long-term turtle monitoring program (ongoing). | Chevron - Gorgon Gas Development. Long-term Turtle Monitoring Program - Flatback tagging program and marine turtle track census program (2005 – ongoing). | 1. LTM Study of Green, Flatback, Hawksbill turtles on beaches within the Barrow, Lowendal and Montebello Island Complex.<br><br>2. Santos 2013 turtle nesting survey on the Lowendal islands.<br><br>3. Varanus Island Turtle monitoring program (2005 – present). | N/A – See Table D-1 | Present, in open water, no nesting habitats. |
| | | Methods: | | | | |
| | | Nesting demographics (composition, spatial variability, seasonal distribution, post-nesting dispersion). | Island wide (though primary nesting occurs on east coast). Mundabullangana on mainland is the reference location for the Flatback tagging program. | 1. Nesting demographics (composition, spatial variability, seasonal distribution, post-nesting dispersion).<br><br>2. Tagging and nest counts.<br><br>3. Tagging and nest counts. Varanus, Beacon, Bridled, Abutilon and Parakeelya islands. | N/A – See Table D-1 | N/A |
| | | References and Data: | | | | |
| | | 1. AMOSC/DPaW 2014. DATAHOLDER: Chevron.<br><br>2.DBCA. | Pendoley Environmental (2005-ongoing). DATAHOLDER: Chevron. | 1. Pendoley 2005. AMOSC/DBCA (DPaW) 2014. DATAHOLDER: Chevron/ Santos.<br><br>2. Santos, 2014. DATAHOLDER: Santos.<br><br>3. Santos (2005 – present) | N/A – See Table D-1 | N/A |
| Fish | SM09<br>Baited Remote Underwater Video Stations (BRUVS), Visual Underwater Counts (VUC), Diver Operated Video (DOV). | Studies: | | | | |
| | | 1. DBCA diver surveys 2009-2012.<br><br>2. Pilbara Marine Conservation Partnership Stereo BRUVS drops in shallow water (~8-20m) in 2014 and deeper (20-60m) in 2015 inside and outside sanctuary zones at the Montebello Islands and in the area from Cape Preston to the Montebello Islands in 2015.<br><br>3. Finfish monitoring as part of DBCA Western Australian Marine Monitoring Program (2015-ongoing). | 1. Chevron LTM of demersal fish for the Gorgon Gas Development project. Marine Baseline Program (2008, 2009), Post Dredge Survey 1 (2011), Post Dredge Survey 2 (2012).<br><br>2. Pilbara Marine Conservation Partnership Stereo BRUVS drops in shallow water (~10m) from Exmouth to Barrow Islands in 2015.<br><br>3. Finfish monitoring as part of DBCAs Western Australian Marine Monitoring Program (2015-ongoing). | 1. Pilbara Marine Conservation Partnership Stereo BRUVS drops in shallow water (~10m) Montebello Sanctuaries 2015.<br><br>2. WA Museum fish surveys of Dampier Archipelago 1998-2000 (Hutchins 2004). | 1. Glomar Shoals and Rankin Bank Environmental Survey Report, 2013, quantitatively surveyed benthic habitats and communities. AIMS report to Woodside. Scientific Publication - Biodiversity and spatial patterns of benthic habitat and associated demersal fish communities at two tropical submerged reef ecosystems, 2018.<br><br>2. Rankin Bank Environmental Survey Extension, 2014, Habitat assessment of an area southeast of Rankin Bank.<br><br>3. Glomar Shoals and Rankin Bank surveys, 2017. GWF-2 Monitoring Programme. Quantitatively surveyed benthic habitats and communities.<br><br>4. Temporal Studies survey of Rankin Bank and Glomar Shoals, 2018. | 1. CSIRO – Fish Diversity.<br>2. Fish species richness and abundance. |
| | | Methods: | | | | |

| Major Baseline | Proposed Scientific monitoring operational plan and Methodology | Montebello Islands | Barrow Island | Lowendal Islands | Rankin Bank & Glomar Shoals | **Montebello AMP** |
|---|---|---|---|---|---|---|
| | | 1. Diver Operated Video - species richness, community composition, and biomass were recorded from 2009-2012.<br><br>2. Stereo BRUVS.<br><br>3. Diver UVS. | 1. Intertidal and subtidal surveys using BRUVS and Netting.<br><br>2. Stereo BRUVS.<br><br>3. Diver UVS. | 1. Stereo BRUVS<br>2. Diver surveys _ Underwater Visual Census (UVC). | 1. BRUVs.<br>2. BRUVs.<br>3. BRUVs.<br>4. BRUVs. | 1. Semi V Wing trawl net or an epibenthic sled.<br>2. ROV Video. |
| | | References and Data: | | | | |
| | | 1. DBCA data.<br>DATAHOLDER: DBCA<br><br>2. CSIRO Data DATAHOLDER: CSIRO Data centre (data-requests-hf@csiro.au)<br><br>3. DBCA. | 1. Baseline: Chevron Australia 2010.<br><br>Marine Monitoring Program: Chevron Australia 2011.<br><br>Post Dredge: Chevron Australia 2013<br>DATAHOLDER: Chevron Australia.<br><br>2. CSIRO Data DATAHOLDER: CSIRO Data centre (data-requests-hf@csiro.au)<br><br>3. DBCA. | 1. UWA. The UWA Oceans Institute & School of Biological Sciences.<br><br>2. DATAHOLDER: Woodside and WAM. | 1. AIMS 2014a and Abdul Wahab et al., 2018.<br>DATAHOLDER: AIMS.<br><br>2. AIMS 2014b.<br>DATAHOLDER: AIMS.<br><br>3. Currey-Randall et al. 2019.<br>DATAHOLDER: AIMS<br><br>4. Currey-Randall et al. 2019.<br>DATAHOLDER: AIMS | 1. Keesing 2019.<br>2. McLean et al. 2019. |

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# ANNEX E: TACTICAL RESPONSE PLANS

| TACTICAL RESPONSE PLANS |
|---|
| Exmouth |
| Mangrove Bay |
| Turquoise Bay |
| Yardie Creek |
| Muiron Islands |
| Jurabi to Lighthouse Beaches Exmouth |
| Ningaloo Reef - Refer to Mangrove/Turquoise bay and Yardie Creek |
| Exmouth Gulf |
| Shark Bay Area 1: Carnarvon to Wooramel |
| Shark Bay Area 2: Wooramel to Petite Point |
| Shark Bay Area 3: Petite Point to Dubaut Point |
| Shark Bay Area 4: Dubaut Point to Herald Bight |
| Shark Bay Area 5: Herald Bight to Eagle Bluff |
| Shark Bay Area 6: Eagle Bluff to Useless Loop |
| Shark Bay Area 7: Useless Loop to Cape Bellefin |
| Shark Bay Area 8: Cape Bellefin to Steep Point |
| Shark Bay Area 9: Western Shores of Edel Land |
| Shark Bay Area 10: Dirk Hartog Island |
| Shark Bay Area 11: Bernier and Dorre Islands |
| Abrohlos Islands: Pelseart Group |
| Abrohlos Islands: Wallabi Group |
| Abrohlos Islands: Easter Group |
| Dampier |
| Rankin Bank & Glomar Shoals |
| Barrow and Lowendal Islands |
| Pilbara Islands - Southern Island Group |
| Montebello Island - Stephenson Channel Nth TRP |
| Montebello Island Champagne Bay and Chippendale channel TRP |
| Montebello Island - Claret Bay TRP |
| Montebello Island - Hermite/Delta Island Channel TRP |
| Montebello Island - Hock Bay TRP |
| Montebello Island - North and Kelvin Channel TRP |
| Montebello Island - Sherry Lagoon Entrance TRP |
| Withnell Bay |
| Holden Bay |
| King Bay |
| No Name Bay / No Name Beach |

| |
|---|
| Enderby Is -Dampier |
| Rosemary Island - Dampier |
| Legendre Is - Dampier |
| Karratha Gas Plant |
| KGP to Whitnell Creek |
| KGP to Northern Shore |
| KGP Fire Pond & Estuary |
| KGP to No Name Creek |
| Broome |
| Sahul Shelf Submerged Banks and Shoals |
| Clerke Reef (Rowley Shoals) |
| Imperieuse Island (Rowley Shoals) |
| Mermaid Reef (Rowley Shoals) |
| Scott Reef |
| Oiled Wildlife Response |
| Exmouth |
| Dampier region |
| Shark Bay |

# APPENDIX E NOPSEMA REPORTING FORMS

# Recordable Environmental Incident Monthly Report

**Due Date:** By the 15th day of the following month.

**Send completed form to:** submissions@nopsema.gov.au via secure file transfer at https://securefile.nopsema.gov.au/filedrop/submissions

**Reference:** Regulation 26B

| Please check the following boxes if applicable to this report | | Nil Incident Report: ☐ | | Final report for this activity: ☐ | |
|---|---|---|---|---|---|
| **Titleholder name:** | | **Titleholder business address:** | | **Title of environment plan for the activity:** | |
| **Activity type:** (e.g. drilling, seismic, production) | | **Month, Year:** | | **Facility name and type** : (e.g. MODU, Seismic Vessel, FPSO) | |
| **Contact person:** | | **Email:** | | **Phone:** | |
| **Incident date** | **All material facts and circumstances** (including release volumes to environment if applicable) | **Performance outcome(s) and/or standard(s) breached** | **Action taken to avoid or mitigate any adverse environmental impacts of the incident** | **Corrective action taken, or proposed, to stop, control or remedy this incident** | **Action taken, or proposed, to prevent a similar incident occurring in future** |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Note 1: As at 28 February 2014, amendments to the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations changed from environmental performance objective to environmental performance outcome. If you are reporting against an EP accepted under the old Regulations please report against the environmental performance objective for that activity.

Note 2: This form may be submitted in conjunction with the 'Injuries and Fatalities – Monthly Summary Report' Form available at www.nopsema.gov.au

## Privacy Notice

NOPSEMA collects your contact details for the purpose of administering the OPGGSA and associated regulations. NOPSEMA will not use or disclose your personal information for any other purpose without your consent, unless it is required or authorised by law, or relates to NOPSEMA's enforcement activities. Your personal information may be disclosed to the following organisations, entities or individuals:

- individuals who make a request under the *Freedom of Information Act 1982*
- the Australian National Audit Office and other privately-appointed auditors
- NOPSEMA's legal advisors.

NOPSEMA may occasionally be required to disclose information to overseas recipients in order to discharge its functions or exercise its powers, or to perform its necessary business activities. Information about how you can access, or seek correction to, your personal information is contained in NOPSEMA's APP Privacy Policy at www.nopsema.gov.au/privacy. If you have an enquiry or a complaint about your privacy, please contact NOPSEMA's Privacy Contact Officer on 08 6188 8700 or by email at privacy@nopsema.gov.au.

# Report of an accident, dangerous occurrence or environmental incident

**For instructions and general guidance in the use of this form, please see the last page.**

Part 1 is required within 3 days of a notified incident.
Part 2 is required within 30 days of notified incident.

| **What was the date and time of the initial verbal incident notification to NOPSEMA?** | | | |
|---|---|---|---|
| **Date** | | **Time** | |

*NOTE: It is a requirement to request permission to interfere with the site of an accident or dangerous occurrence. Refer OPGGS(S)R, Reg. 2.49.*

| **What is the date and time of this written incident report?** | | | |
|---|---|---|---|
| **Date** | | **Time** | |

| **What type of incident is being reported?** | ***Please tick appropriate incident type*** | |
|---|---|---|
| **Accident or dangerous occurrence** | | Complete parts 1A, 1B & part 2 |
| **Environmental Incident** | | Complete parts 1A, 1C |
| **BOTH (Accident or dangerous occurrence AND environmental incident)** | | Complete ALL parts (1A, 1B, 1C, 2) |

*Please tick all applicable (one or more categories)* *To use electronically: MS Word 2007-10 – click in check box*

| | | | |
|---|---|---|---|
| **Categories**<br>*Please select one or more* | Accidents | Death or Serious injury<br>Lost time injury ≥3 days | ☐<br>☐ |
| | Dangerous occurrences | Hydrocarbon release >1 kg or ≥80 L (gas or liquid)<br>Fire or explosion<br>Collision marine vessel and facility<br>Could have caused death, serious injury or LTI<br>Damage to safety-critical equipment<br>Unplanned event - implement ERP<br>Pipeline incident<br>Well kick >50 barrels<br>Other ______ | ☐<br>☐<br>☐<br>☐<br>☐<br>☐<br>☐<br>☐<br>☐ |
| | Environmental incidents | Hydrocarbon release<br>Chemical release<br>Drilling fluid/mud release<br>Fauna Incident<br>Other ______ | ☐<br>☐<br>☐<br>☐<br>☐ |

## Part 1A – Information required within 3 days of an accident, dangerous occurrence or environmental incident

### General information – all incidents

| | | | | |
|---|---|---|---|---|
| 1. | **Where did the incident occur?** | Facility / field / title name | | |
| | | Site name and location *Latitude/longitude* | | |
| 2. | **Who is the registered operator/titleholder or other person that controls the works site or activity?** | Name | | |
| | | Business address | | |
| | | Business phone no. | | |
| 3. | **When did the incident occur?** | Time and time zone | | |
| | | Date | | |
| 4. | **Did anyone witness the incident?** | Yes or no *If yes, provide details below* | | |
| | **Witness details** | Witness no 1 | Witness no 2 | Witness no 3 |
| | Full name | | | |
| | Phone no. (Business hours) | | | |
| | Phone no. (Home) (Mobile) | | | |
| | Email (Business) (Private) | | | |
| | Postal address | | | |
| | *NB: If more witnesses, copy and insert this section (4) here , and add extra witness numbers appropriately* | | | |
| 5. | **Details of person submitting this information** | Name | | |
| | | Position | | |
| | | Email | | |
| | | Telephone no. | | |
| 6. | **Brief description of incident** | | | |
| 7. | **Work or activity being undertaken at time of incident** | | | |

## Part 1A – Information required within 3 days of an accident, dangerous occurrence or environmental incident

### General information – all incidents

| | | | |
|---|---|---|---|
| 8. | **What are the internal investigation arrangements?** | | |
| 9. | **Was there any loss of containment of any fluid (liquid or gas)?** | Yes or no<br>*If Yes, provide details below* | |
| | | Type of fluid (liquid or gas)<br>*If hydrocarbon release please complete item no.15 as well* | Hydrocarbon ☐<br>*Please specify*______________________________<br>Non-hydrocarbon ☐<br>*Please specify*______________________________ |
| | | Estimated quantity<br>*Liquid (L), Gas (kg)* | |
| | | Estimation details | Calculation ☐ Measurement ☐<br>*Please specify*____________________________________ |
| | | Composition<br>*Percentage and description* | |
| | | Known toxicity to people and/or environment | Toxicity to people<br>Toxicity to environment |
| | | How was the leak/spill detected? | F&G detection ☐ Visual ☐<br>CCTV ☐ Other ☐ |
| | | Did ignition occur? | No ☐ Immediate ☐<br>Yes ☐ Delayed ☐<br>If yes, what was the likely ignition source: Hotwork ☐ Spark electrical source ☐ Spark metallic contact ☐ Hot surface ☐ Other ☐ |
| 10. | **Has the release been stopped and/or contained?** | Yes or no | |
| | | Duration of the release<br>*hh:mm:ss* | |
| | | Estimated rate of release<br>*Litres or kg per hour* | |
| 11. | **Location of release** | What or where is the location of the release? | |
| | | What equipment was involved in the release? | |
| | | Is this functional location listed as safety-critical equipment? | |

## Part 1A – Information required within 3 days of an accident, dangerous occurrence or environmental incident

### General information – all incidents

| | | | | | | |
|---|---|---|---|---|---|---|
| 12. | **Weather conditions** *Please complete as appropriate* | Ambient temperature C° | | | | |
| | | Relative humidity % | | | | |
| | | Wind speed m/s *NB: for enclosed areas use* Air change per hour | | | | |
| | | Wind direction e.g. from SW | | | | |
| | | Significant wave height m | | | | |
| | | Swell m | | | | |
| | | Current speed m/s | | | | |
| | | Current direction e.g. from SW | | | | |
| 13. | **Hydrocarbon release details** *If hydrocarbon fluid (liquid or gas) was released, please complete this section as well* | System of hydrocarbon release | Process<br>Drilling<br>Subsea / Pipeline | ☐<br>☐<br>☐ | Utilities<br>Well related<br>Marine | ☐<br>☐<br>☐ |
| | | Estimated inventory in the isolatable system *Litres or kg* | | | | |
| | | System pressure and size of piping or vessel *diameter (d in mm) length (l in m) or volume (V in L)* | Pressure MPag | | | |
| | | | Size Piping (d) and Piping (l) or Vessel (V) | | | |
| | | Estimated equivalent hole diameter *d in mm* | | | | |

## Part 1B - Complete for accidents or dangerous occurrences

### Accidents and dangerous occurrences information

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Was NOPSEMA notified through the dedicated notification phone line?** *Phone No. 08 6461 7090* | | Yes | ☐ | No | ☐ |
| 15. | **Action taken to make the work-site safe** | Was permission given by a NOPSEMA inspector to interfere with the site? OPGGS(S)R 2.49. | Yes | ☐ | No | ☐ |
| | | Action taken | | | | |
| | | Details of any disturbance of the work site | | | | |

## Part 1B - Complete for accidents or dangerous occurrences

### Accidents and dangerous occurrences information

| | | | | | | |
|---|---|---|---|---|---|---|
| 16. | **Was an emergency response initiated?** | | Yes | ☐ | No | ☐ |
| | | Type of response | Manual<br>Automatic alarm | ☐<br>☐ | Muster<br>Evacuation | ☐<br>☐ |
| | | How effective was the emergency response? | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 17. | **Was anyone killed or injured?** *Provide details below* | | Yes | ☐ | | No | ☐ | |
| | **Injured persons (IP)** | **Casualty No 1** | | | | | | |
| | *If different from item 2.*<br>Employer name | | Employer address | | | | | |
| | Employer phone no. | | Employer email | | | | | |
| | IP full name | | | | | | | |
| | IP date of birth | | Sex | M | ☐ | F | ☐ | |
| | IP residential address | | | | | | | |
| | IP phone no. (Work) | | IP phone no. (Home)<br>(Mobile) | | | | | |
| | IP occupation/job title | | Contractor or core crew | | | | | |
| | Details of injury | | | | | | | |
| | ***Based on TOOCS (refer last page)***<br>Nature of injury | a. Intracranial injury<br>b. Fractures<br>c. Wounds, lacerations, amputations, internal organ damage | ☐<br>☐<br>☐ | d. Burn<br>e. Nerve or spinal cord injury<br>f. Joint, ligament, muscle or tendon injury<br>g. Other ____________ | ☐<br>☐<br>☐<br>☐ | | | |
| | Part of body | G1. Head or face<br>G2. Neck<br>G3. Trunk<br>G4. Shoulder or arm | ☐<br>☐<br>☐<br>☐ | G5. Hip or leg<br>G6. Multiple locations<br>G7. Internal systems<br>G8. Other ____________ | ☐<br>☐<br>☐<br>☐ | | | |
| | Mechanism of injury | G0. Falls, stepping, kneeling, sitting on object<br>G1. Hitting object<br>G2. Being hit or trapped | ☐<br>☐<br>☐ | G3. Exposure to sound or pressure<br>G4. Muscular stress<br>G5. Heat, cold or radiation<br>G6/7 Chemical, biological substance<br>G8. Other ____________ | ☐<br>☐<br>☐<br>☐<br>☐ | | | |
| | Agency of injury | 1. Machinery or fixed plant<br>2. Mobile plant or transport<br>3. Powered equipment<br>4. Non-power equipment | ☐<br>☐<br>☐<br>☐ | 5/6. Chemicals, materials, substances<br>7. Environmental agencies<br>8. Human or animal agencies<br>9. Other ____________ | ☐<br>☐<br>☐<br>☐ | | | |

## Part 1B - Complete for accidents or dangerous occurrences

| Accidents and dangerous occurrences information | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Details of job being undertaken** | | | | | | |
| | **Day and hour of shift** | Day<br>*e.g. 5th day of 7 (5 / 7)* | | Hour<br>*e.g. 3rd hour of 12 (3 / 12)* | | | |
| | *NB: If more casualties, please copy/paste this section (19) for each additional casualty and insert here* | | | | | | |
| 18. | **Was there any serious damage?** *Provide details below* | | Yes | ☐ | No | ☐ | |
| | **Details** | **Item 1** | **Item 2** | | **Item 3** | | |
| | Equipment damaged | | | | | | |
| | Extent of damage | | | | | | |
| 19. | **Will the equipment be shut down?** *Yes or No* | | | | | | |
| | If Yes, for how long? | | | | | | |
| | *NB: If more equipment seriously damaged, please copy/paste this section as required* | | | | | | |
| 20. | **Will the facility be shut down?** | Yes or no<br>*If yes provide details below* | | | | | |
| | Facility shutdown | Date | | | dd/mm/yyyy | | |
| | | Time | | | 24 hour clock | | |
| | | Duration | | | days / hours / minutes | | |
| 21. | **Immediate action taken/intended, if any, to prevent recurrence of incident.** | **Action** | **Responsible party** | | **Completion date**<br>*Actual or intended* | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 22. | **What were the immediate causes of the incident?** | | | | | | |

## Attachments

| **Are you attaching any documents?** | | | Yes or no<br>*If yes provide details below* | |
|---|---|---|---|---|
| **No.** | **ID** | **Revision** | **Date** | **Title/description** |
| | | | | |

## Attachments

| | | | | |
|---|---|---|---|---|
| **Are you attaching any documents?** | | | Yes or no<br>*If yes provide details below* | |
| | | | | |
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| | | | | |
| | | | | |

*Insert or delete rows as required*

## Part 1C – Complete for environmental incidents

### Environmental Impacts

| | | | | |
|---|---|---|---|---|
| 23. | **What is the current environment plan for this incident?** | Environment plan | | |
| 24. | **Has the incident resulted in an impact to the environment?** | Yes or no<br>*If yes provide details below* | | |
| | | Incident details<br>*e.g. estimated area of impact, nature/significance of impact* | | |
| | | **ENVIRONMENTAL RECEPTORS** | | |
| | | Open ocean ☐<br>Shoreline ☐<br>Population centre ☐<br>Stakeholders ☐<br>Other sensitivity ☐<br>*e.g. conservation area, nesting beach* | Macroalgae ☐<br>Coral Reef ☐<br>Benthic invertebrates ☐<br>Seagrass ☐<br>Mangrove ☐ | |
| | | Further details | | |
| | **Details** | **Environment 1** | **Environment 2** | **Environment 3** |
| | Location of receiving environments *Lat/Long* | | | |
| | Date & time of impact | | | |
| | Action taken to minimise exposure | | | |
| | Specify each matter protected under Part 3 of the EPBC Act impacted | | | |
| | *NB: If more environments were damaged, please copy/paste this section (Item E3) and add extra data* | | | |
| 25. | **Are any environments at risk?**<br>***Including as a result of spill response measures*** | Yes or no<br>*If yes, provide details* | | |
| | | Details<br>*e.g. zone of potential impact* | | |
| | | **AT RISK ENVIRONMENTS** | | |

## Part 1C – Complete for environmental incidents

### Environmental Impacts

| | | | | | |
|---|---|---|---|---|---|
| | | Open ocean ☐<br>Shoreline ☐<br>Population Centre ☐<br>Stakeholders ☐<br>Other sensitivity ☐<br>*e.g. conservation area, nesting beach* | | Macroalgae ☐<br>Coral Reef ☐<br>Benthic Invertebrates ☐<br>Seagrass ☐<br>Mangrove ☐ | |
| | **Details** | **Environment 1** | **Environment 2** | **Environment 3** | |
| | Estimated location of 'at-risk' environments | | | | |
| | Estimated impact date & time | | | | |
| | Action required to minimise exposure | | | | |
| | Specify each matter protected under Part 3 of the EPBC Act at risk | | | | |
| | *NB: If more environments at risk of damage, please copy/paste this section (Item E2) and add extra data* | | | | |
| 26. | **Was an oil pollution emergency plan activated?** | Yes or no | | | |
| | | If yes, what action has been implemented /planned? | | | |
| | | If yes, how effective is/was the spill response? | | | |
| 27. | **Was an environmental monitoring program initiated?** | Yes or no | | | |
| | | If yes, what actions have been implemented and/or planned? | | | |
| 28. | **Did the incident result in the death or injury of any fauna?** | Yes or no (If yes provide details of species in the table below) | | | |
| | **Injured fauna** | **Species 1** | **Species 2** | **Species 3** | |
| | Species name (common or scientific name) | | | | |
| | Number of individuals killed or injured | Killed:<br>Injured: | Killed:<br>Injured: | Killed:<br>Injured: | |
| | *NB: If more species were injured or killed, please copy/paste this section (Item E4) and add extra data* | | | | |
| 29. | **Actions taken to avoid or mitigate any adverse environmental impacts of the incident.** | **Action** | **Responsible party** | **Completion date**<br>*Actual or intended* | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | *NB: If more actions, please add extra rows as required* | | | | |

## Part 1C – Complete for environmental incidents

### Environmental Impacts

| | | | | |
|---|---|---|---|---|
| 30. | **Corrective actions taken, or proposed, to stop, control or remedy the incident.** | **Action** | **Responsible party** | **Completion date** *Actual or intended* |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | *NB: If more actions, please add extra rows as required* | | | |
| 31. | **Actions taken, or proposed, to prevent a similar incident occurring in the future.** | **Action** | **Responsible party** | **Completion date** *Actual or intended* |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | *NB: If more actions, please add extra rows as required* | | | |

## Attachments

| | |
|---|---|
| **Are you attaching any documents?** | Yes or no *If yes provide details below* |

| No. | ID | Revision | Date | Title/Description |
|---|---|---|---|---|
| | | | | |
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*Insert or delete rows as required*

## Part 2 – Information required within 30 days of accident or dangerous occurrence

**NOPSEMA acknowledges that in many circumstances an operator may not have completed an investigation within 3 days of an accident or first detection of a dangerous occurrence and agrees that these items must be provided within 30 days unless otherwise agreed, in writing with NOPSEMA. In circumstances where an investigation has been completed within 3 days, and these items are available (supplemented, as required by any attachments) this part should also be completed at that time.**

| | | | | |
|---|---|---|---|---|
| 32. | **Has the investigation been completed?** | Yes or no | | |
| | **Root cause analysis**<br>*What were the root causes?* | Root cause 1 | | |
| | | Root cause 2 | | |
| | | Root cause 3 | | |
| | | Other root causes | | |
| | **Full report**<br>*Describe investigation in detail, including who conducted the investigation and in accordance with what standard/procedure with reference to attachments listed in the 'attachments table' (following) as applicable* | | | |
| 33. | **Actions to prevent recurrence of same or similar incident** | **Action** | **Responsible party** | **Completion date**<br>*Actual or intended* |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | *NB: Add or delete rows as appropriate* | | | |

## Attachments (Insert/delete rows as required)

| | | | | |
|---|---|---|---|---|
| **Are you attaching any documents?** | | Yes or no<br>*If yes provide details below* | | |
| **No.** | **ID** | **Revision** | **Date** | **Title/description** |
| | | | | |
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## Instructions and general guidance for use:

1. The use of this form is voluntary and is provided to assist operators and titleholders to comply with their obligations to give notice and provide reports of incidents to NOPSEMA under the applicable legislation.
2. Accidents, dangerous occurrences or environmental incidents can all be reported using this same form.
3. The applicable legislation for incident reporting is:
    a. Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009 [OPGGS(S)R]; and
    b. Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 [OPGGS(E)R], for facilities located in Commonwealth waters; or
    c. for facilities located in designated coastal waters, the relevant State or Territory Act and associated Regulations where there is a current conferral of powers to NOPSEMA.
4. In the context of this form an incident is a reportable incident as defined under:
    a. OPGGSA, Schedule 3, Clause 82.
    b. OPGGS(E)R, regulation 4.
5. This form should be used in conjunction with NOPSEMA Guidance Notes available on the NOPSEMA website:
    a. N-03000-GN0099 Notification and Reporting of Accidents and Dangerous Occurrences
    b. N-03000-GN0926 Notification and Reporting of Environmental Incidents
6. Part 1 requires completion for all incidents; then ALSO complete part 2 if the incident is an accident or dangerous occurrence.
7. NOPSEMA considers that a full report will contain copies of documentary material referenced and/or relied on in the course of completing this form, which may include (but not be limited to) as appropriate: witness statements, management system documents, drawings, diagrams and photographs, third party reports (audit, inspection, material analysis etc.), internal records and correspondence.
8. This form is intended to be completed electronically using Microsoft Word by completing the unshaded cells which will expand as required to accept the information required and the check boxes where relevant (NB: check boxes may appear shaded and have reduced functionality in MS Word versions prior to 2010).
9. The completed version of this form (and any attachments, where applicable) should be emailed to: submissions@nopsema.gov.au or submitted via secure file transfer at: https://securefile.nopsema.gov.au/filedrop/submissions as soon as practicable, but in any case within three days of the incident.

## References

NOPSEMA website: www.nopsema.gov.au

TOOCS – Type of Occurrence Classification System.

The *Type of Occurrence Classifications System, Version 3.0* (TOOCS3.0) was developed to improve the quality and consistency of data. This system aligns with the International Classification of Diseases –Australian Modification (ICD10-AM).

http://www.safeworkaustralia.gov.au/sites/SWA/AboutSafeWorkAustralia/WhatWeDo/Publications/Documents/207/TypeOfOccurrenceClassificationSystem(TOOCS)3rdEditionRevision1.pdf

OPGGS(S)R. Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009. Select Legislative Instrument 2009 No. 382 as amended and made under the *Offshore Petroleum and Greenhouse Gas Storage Act 2006.*Commonwealth of Australia.

OPGGS(E)R. Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009. Statutory Rules 1999 No. 228 as amended and made under the *Offshore Petroleum and Greenhouse Gas Storage Act 2006.* Commonwealth of Australia.

# Privacy Notice

NOPSEMA collects your personal information for the purpose of investigating accidents, dangerous occurrences and environmental incidents under the Offshore Petroleum and Greenhouse Gas Storage Act 2006.

NOPSEMA will not use or disclose your personal information for any other purpose without your consent, unless it is required or authorised by law, or relates to NOPSEMA's enforcement activities. Your personal information may be disclosed to the following organisations, entities or individuals:

- individuals who make a request under the *Freedom of Information Act 1982*
- the Australian National Audit Office and other privately-appointed auditors
- other law enforcement bodies (for example, the police or the Coroner)
- NOPSEMA's legal advisors.

NOPSEMA may occasionally be required to disclose information to overseas recipients in order to discharge its functions or exercise its powers, or to perform its necessary business activities.

Information about how you can access, or seek correction to, your personal information is contained in NOPSEMA's APP Privacy Policy at www.nopsema.gov.au/privacy. If you have an enquiry or a complaint about your privacy, please contact NOPSEMA's Privacy Contact Officer on (08) 6188 8700 or by email at: privacy@nopsema.gov.au.

# APPENDIX F STAKEHOLDER CONSULTATION PHASE I

# Woodside Consultation Material

## Consultation with all relevant stakeholders – 8 July 2019

*Woodside sent the email below and consultation Information Sheet to all relevant stakeholders.*

Dear Stakeholder

Woodside is planning to submit a revised Operations Environment Plan for the Okha floating production storage and offloading (FPSO) facility in Production Licence WA-11-L in Commonwealth waters.

It is a requirement of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth) (the regulations) that Environment Plans for operating facilities be revised at least every five years. The Environment Plan for this facility was last revised in November 2014.

A Consultation Information Sheet is attached, which provides background on the proposed activity, including a summary of potential key risk and associated management measures. The Information Sheet is also available on our website.

**Activity overview**

| | |
|---|---|
| **Activity purpose:** | • Support ongoing production from the Okha FPSO. |
| **Activity:** | • The Okha FPSO will continue to produce oil for export from the facility via offloading tankers and gas for export to shore via a pipeline to the North Rankin Complex and then via two trunklines to the Karratha Gas Plant. |
| **Activity location:** | • 115 km North West of Dampier, Western Australia. |
| **Facility location:** | • Latitude: 19° 35’ 13” S<br>• Longitude: 116° 26’ 29” E |
| **Approximate water depth:** | • 80 m |
| **Exclusion zones:** | • A 500 m radius petroleum safety zone around the Okha FPSO.<br>• A 1500 m radius Operational Area around the Okha FPSO, subsea infrastructure, including wells and flowlines and the gas export line<br>• A 500 m radius Operational Area around four suspended exploration wells |

**Your feedback**

Your feedback on the proposed activity and our response will be included in an Environment Plan for consideration by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), as is required under the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please note under new public transparency arrangements being implemented by NOPSEMA, the Environment Plan for this activity will be published in full following acceptance by the Authority. Please advise Woodside if you do not wish any part of your feedback to be published and we will ensure it is included in the sensitive information part of the Environment Plan. The information received will form part of the EP assessment however it will not be released publicly and will remain confidential to NOPSEMA throughout.

Please provide your views by close of business **7 August 2019** to allow us sufficient time to inform our planning for the proposed activity. Comments can be made by email, letter or by phone.

Regards

[redacted]
Corporate Affairs Adviser | Corporate Affairs
Woodside Energy Ltd

Woodside

STAKEHOLDER CONSULTATION
INFORMATION
SHEET

July 2019

# OKHA OPERATIONS

## CARNARVON BASIN, NORTH-WEST AUSTRALIA

Woodside is submitting a revised Environment Plan for the Okha Floating Production, Storage and Offloading (FPSO) facility in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth) (the regulations).

The regulations require that Environment Plans for operating facilities be revised at least every five years.

The Okha facility is operated by Woodside on behalf of the North West Shelf Project participants. The participants are Woodside Energy Ltd., BHP Billiton Petroleum (North West Shelf) Pty Ltd, BP Developments Australia Pty Ltd, Chevron Australia Pty Ltd, Japan Australia LNG (MIMI) Pty Ltd and Shell Australia Pty Ltd.

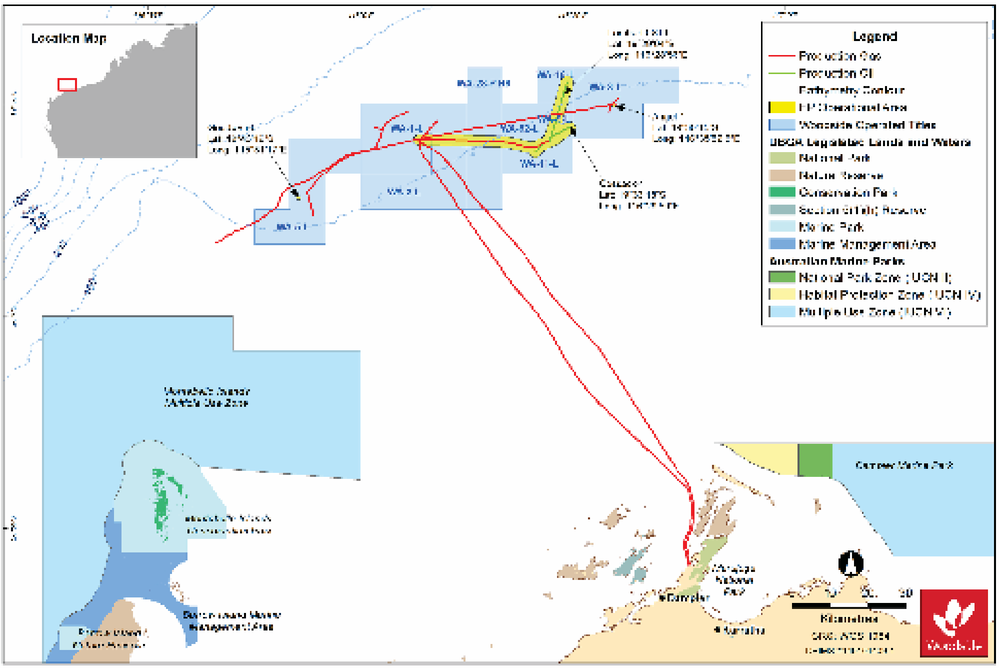


*Table 1. Activity summary*

| Okha FPSO facility | |
|---|---|
| **Facility type** | + Oil and gas production facility<br>+ Subsea wells and infrastructure, a riser turret production and mooring system, the Okha FPSO and a gas export line |
| **Distance from facility to nearest port** | + 115 km north west of Dampier, Western Australia |
| **Water depth at facility** | + Approximately 80 m |
| **Facility coordinates** | + Latitude: 19° 35' 13"S<br>+ Longitude: 116° 26' 29"E |
| **Number of wells** | There are 13 subsea production wells tied back to the Okha FPSO, of which 10 are capable of producing hydrocarbons<br>+ One well tied back from the Cossack field<br>+ Eight wells tied back from the Wanaea field<br>+ Two wells tied back from the Lambert field<br>+ Two wells tied back from the Hermes field<br>Four suspended exploration wells will also be included in the Environment Plan, these being Goodwyn-6, Angel-1, Cossack-1 and Lambert 5ST1. |
| **Commissioned** | + The Okha FPSO commenced production in September 2011. Prior to this, the oil and gas from the fields were produced through the Cossack Pioneer FPSO, which commenced production in 1995 |
| **Distance to nearest marine park** | + Approximately 120 km north west of the Montebello Islands Marine Park (WA)<br>+ Approximately 72 km north west of Montebello Marine Park - Multiple Use Zone (Cwlth) |

## Operations

The Okha FPSO extracts, processes, stores and offloads oil and export gas from the Cossack, Wanaea, Lambert and Hermes fields.

Oil is dispatched from the FPSO to trading tankers whilst export gas is transported via a 32 km gas export line to North Rankin Complex (NRC). Gas is subsequently transported from the NRC to the Karratha Gas Plant via two 130 km trunklines.

The offshore production system consists of subsea wells and infrastructure (e.g. wellheads, Xmas trees, manifolds, umbilicals, flowlines and risers), a riser turret production and mooring system, the FPSO and the gas export line.

## Activity Location

The Okha FPSO is located about 115 km north west of Dampier, Western Australia with petroleum activities undertaken in production licence areas WA-11-L, WA-9-L, WA-16-L.

The Operational Area for this Environment Plan includes:

+ The Okha FPSO and the area around the facility extending out to 1500 m to allow for offtake activities (including the 500 m petroleum safety zone)
+ The Okha FPSO subsea infrastructure, including wells and flowlines, and an area 1500 m from the infrastructure
+ The gas export line to a pipeline end manifold adjacent to NRC which is located in WA-4-PL and an area within 1500 m around the infrastructure
+ The four suspended exploration wells and an area within 500 m around the infrastructure

## Activity Details

The Okha FPSO normally operates 24 hours per day, 365 days per year. Activities undertaken include:

***Production and maintenance***

Production and maintenance involve receiving hydrocarbons from the reservoirs, processing, storing oil for offloading to export tankers, exporting gas to the NRC and supporting operations.

Routine inspection, maintenance and repair of the Okha FPSO may be undertaken. Inspection and maintenance are carried out to ensure the integrity of the facility and identify any risks if they pose a risk.

***Production and major projects***

Major projects involves refurbishment, modification or major maintenance on the facility. An assessment will be undertaken whether an Environment Plan revision is required if a project scope has the potential to result in significant change to the facility.

***FPSO marine (disconnected) mode***

The FPSO can operate as a self-propelled vessel to avoid adverse weather conditions or for maintenance or modification works at a shipyard. The FPSO must comply with all applicable maritime regulations once disconnected from the riser turret mooring.

## Activity Vessels

Support vessels are used to transfer materials and equipment to and from the facility. While in the field, vessels also backload materials and segregates waste for transportation back to the King Bay Supply Facility in Dampier, as well as carrying out standby duties during helicopter operations and working over the side activities. The current schedule is for a support vessel to visit the facility about every two weeks.

Support vessels are also required for inspection, monitoring, maintenance and repair activities, and may vary depending on operational requirements, vessel schedules and capability. Activities will be conducted intermittently and over short durations in the immediate vicinity of subsea infrastructure and no additional exclusion zones will be in place during these activities.

## Implications for Stakeholders

Woodside will consult relevant stakeholders whose interests, functions, and activities may be affected by the proposed activities. We will also keep other stakeholders who have identified an interest in the activities informed about our planned activities.

Woodside has undertaken an assessment to identify potential risks to the marine environment and relevant stakeholders, considering timing, duration, location and potential impacts arising from petroleum activities.

A number of mitigation and management measures will be implemented and are summarised in the Table 2. Further details will be provided in the Environment Plan.

*Table 2. Summary of key risks and/or impacts and management measures*

| Potential Risk and/or Impact | Mitigation and/or Management Measure |
|---|---|
| **Planned** | |
| **Chemical use** | + Chemical use will be managed in accordance with Woodside and contractor chemical selection and approval procedures. |
| **Emissions from fuel combustion** | + Procedures to keep emissions from combustion of fuel (e.g. power generation) in line with design specifications will be followed.<br>+ Fuel gas is the preferred source of fuel. Emissions will be reported in accordance with regulatory requirements. |
| **Flaring** | + Gas flaring will be managed to a level required for safe and reliable production.<br>+ Unplanned flaring will be minimised where possible and managed in accordance with annual performance targets. |
| **Interests of relevant stakeholders including:**<br>+ **Defence activities**<br>+ **Petroleum activities**<br>+ **Commercial fishing activities**<br>+ **Shipping activities** | + Consultation with relevant petroleum titleholders, commercial fishers and their representative organisations, and government departments and agencies to inform decision making for the proposed activity and revision of the Environment Plan. |
| **Marine discharges** | + All routine marine discharges will be managed according to legislative and regulatory requirements and Woodside's Environmental Performance Standards where applicable. |
| **Seabed disturbance** | + Lifting and lifted equipment will be in a safe and serviceable condition to prevent dropped objects.<br>+ Lifting operations will be safely performed to minimise potential for dropped objects overboard. |
| **Vessel interaction** | + Use of navigational aids and practices as required by Maritime Regulations to minimise impact on other marine users.<br>+ A 500 m radius petroleum safety zone around the Okha FPSO.<br>+ A 1500 m radius Operational Area around the Okha FPSO, subsea infrastructure, including wells and flowlines, and the gas export line.<br>+ Commercial fishers and other marine users are permitted to use but should take care when entering the Operational Area. |
| **Waste generation** | + Waste generated on the vessels will be managed in accordance with legislative requirements and a Waste Management Plan.<br>+ Wastes will be managed and disposed of in a safe and environmentally responsible manner that aims to prevents accidental loss to the environment.<br>+ Waste transported onshore will be sent to appropriate recycling or disposal facilities by a licensed waste contractor. |
| **Unplanned** | |
| **Hydrocarbon release** | + Appropriate spill response plans, equipment and materials will be in place and maintained.<br>+ Appropriate refuelling procedures and equipment will be used to prevent spills to the marine environment. |
| **Introduction of invasive marine species** | + All vessels will be assessed and managed as appropriate to prevent the introduction of invasive marine species.<br>+ Compliance with Australian biosecurity requirements and guidance. |

## Providing feedback

Our intent is to minimise environmental and social impacts associated with the proposed activities, and we are seeking any interest or comments you may have to inform our decision making.

If you would like to comment on the proposed activities outlined in this information sheet, or would like additional information, please contact Woodside before **Wednesday, 7 August 2019.**

Please note that your feedback and our response will be included in our Environment Plan for the proposed activity, which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Andrew Winter, *Corporate Affairs Adviser*
Woodside Energy Ltd
**E:** Feedback@woodside.com.au | **Toll free:** 1800 442 977

*Please note that stakeholder feedback will be communicated to NOPSEMA as required under legislation. Woodside will communicate any material changes to the proposed activity to affected stakeholders as they arise*

**www.woodside.com.au**

Woodside

## Consultation with specific stakeholders

*Woodside sent the following emails, consultation Information Sheet, activity maps and other information relevant to specific stakeholder interests.*

## Email to WAFIC and DPIRD – 8 July 2019

Dear [redacted]

Woodside is planning to submit a revised Operations Environment Plan for the Okha floating production storage and offloading (FPSO) facility in Production Licence WA-11-L in Commonwealth waters.

It is a requirement of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth) (the regulations) that Environment Plans for operating facilities be revised at least every five years. The Environment Plan for this facility was last revised in November 2014.

We have identified and assessed potential risks and impacts to active commercial fishers and the marine environment in the development of the proposed Environment Plan for this activity. These risks are summarised below.

Woodside has endeavoured to reduce these risks to as low as reasonably practical (ALARP) level. Please contact me if you believe we have overlooked any potential impacts to the commercial fishing industry or missed any points of importance.

An information sheet (also available on our website) and maps of State Fisheries relevant to the proposed activities are also attached.

**Activity overview**

| | |
|---|---|
| **Activity purpose:** | • Support ongoing production from the Okha FPSO. |
| **Activity:** | • The Okha FPSO will continue to produce oil for export from the facility via offloading tankers and gas for export to shore via a pipeline to the North Rankin Complex and then via two trunklines to the Karratha Gas Plant. |
| **Activity location:** | • 115 km North West of Dampier, Western Australia. |
| **Facility location:** | • Latitude: 19° 35’ 13” S<br>• Longitude: 116° 26’ 29” E |
| **Approximate water depth:** | • 80 m |
| **State fisheries consulted for this activity*:** | • Pilbara Trawl Fishery<br>• Pilbara Trap Fishery<br>• Pilbara Line Fishery<br>• Mackerel Fishery |
| **Exclusion zones:** | • A 500 m radius petroleum safety zone around the Okha FPSO.<br>• A 1500 m radius Operational Area around the Okha FPSO, subsea infrastructure, including wells and flowlines and the gas export line<br>• A 500 m radius Operational Area around four suspended exploration wells |

* Fisheries have been identified as being relevant on the basis of fishing licence overlap with the proposed activity area, as well as consideration of fishing effort data, fishing methods and water depth. Individual licence holders or representative fishing organisations who have requested ongoing advice on Woodside's planned activities will also be advised.

**Potential risks to commercial fishing**

| Potential risk | Risk description | Mitigation and/or management measures |
|---|---|---|
| **Planned Activities** | | |
| **Physical presence** | • The presence of the Okha FPSO and subsea infrastructure may result in exclusion of other users, or interactions between vessels and the facility. | • Woodside will implement a 500 m petroleum safety zone around the Okha FPSO to reduce the likelihood of interactions with the NRC.<br>• Notification and updates to marine charts.<br>• Woodside will routinely consult with marine users to ensure they are informed and aware thereby reducing the likelihood of interactions. |
| **Seabed disturbance** | • Disturbance to the seabed may occur due to the physical presence of the Okha FPSO and subsea infrastructure and subsea maintenance, inspection and repair (IMR) activities. | • Woodside will seek to minimise seabed disturbance during Okha FPSO operations through:<br>- The use of vessels with dynamic positioning for IMR<br>- Monitoring and maintenance of subsea infrastructure to manage scour and flowline movement within integrity envelope.<br>- |
| **Underwater noise** | • Noise will be generated by the Okha FPSO, vessels, helicopters and IMR activities. | • Due to the low acoustic source levels associated with Okha FPSO and vessel operations there is not likely to be any interaction or potential impact to fish hearing, feeding or spawning. |
| **Marine discharges** | • Operational discharges including produced water, sewage, putrescible water, grey water, bilge water, drain water cooling water and brine.<br>• Routine discharges of approved chemicals and residual hydrocarbons as a result of IMR activities.<br>• Both these discharges may result in a localised short-term reduction in water quality however they will | • Discharges are compliant with industry best practice standards.<br>• Implementation of chemical assessment and approval process.<br>• Flushing of subsea infrastructure where practical to reduce volume of residual hydrocarbon discharged.<br>• The produced water discharge is monitored and managed to achieve 99% species protection. |

| | | |
|---|---|---|
| | be rapidly diluted and dispersed in the water column. | |
| **Unplanned Risks** | | |
| **Hydrocarbon release** | • Loss of hydrocarbons to the marine environment via loss of well control or from a vessel collision resulting in a tank rupture. | • Compliance with industry best practice standards and procedures.<br>• Bunkering procedures<br>• Well design and barriers to prevent a loss of well integrity.<br>• Blow out Preventer (BOP)<br>• In the unlikely event of an oil spill or unplanned discharge into the environment, relevant agencies and organisations will be notified as appropriate to the nature and scale of the event, as soon as practicable following the occurrence.<br>• Oil spill response strategies will be implemented based on potential impact to identified key receptor locations and sensitivities, which includes fish spawning and nursery areas. |
| **Invasive Marine Species** | • Introduction or translocation and establishment of invasive marine species to the area via vessels ballast water or biofouling. | • All vessels will be assessed and managed as appropriate to prevent the introduction of invasive marine species.<br>• Compliance with Australian biosecurity requirements and guidance. |

**Your feedback**
Your feedback on the proposed activity and our response will be included in an Environment Plan for consideration by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), as is required under the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please note under new public transparency arrangements being implemented by NOPSEMA, the Environment Plan for this activity will be published in full following acceptance by the Authority. Please advise Woodside if you do not wish any part of your feedback to be published and we will ensure it is included in the sensitive information part of the Environment Plan. The information received will form part of the EP assessment however it will not be released publicly and will remain confidential to NOPSEMA throughout.

Please provide your views by close of business **7 August 2019** to allow us sufficient time to inform our planning for the proposed activity. Comments can be made by email, letter or by phone.

Regards

[redacted]
Corporate Affairs Adviser | Corporate Affairs

Woodside Energy Ltd

**Email to DPIRD – 8 July 2019**

Hi [redacted] – I received an auto response from [redacted] providing your contact details as [redacted] is on secondment.

Please find below consultation information for the Okha Operations Environment Plan.

Would be great to meet if you now have carriage of this work?

Regards

[redacted]
Corporate Affairs Adviser | Corporate Affairs
Woodside Energy Ltd

**Email to DPIRD – 15 August 2019**

Hi [redacted] – I'm following up on my email of 8 July to [redacted] and yourself regarding Woodside's consultation information for the Okha Operations Environment Plan.

Should you have any queries or comments please let me know.

I'd be happy to meet you now Carli has moved into a different role.

Regards

[redacted]
Corporate Affairs Adviser | Corporate Affairs
Woodside Energy Ltd

**Email to State fishery licence holders – 8 July 2019**

Dear Fishery Licence Holder

Woodside is planning to submit a revised Operations Environment Plan for the Okha Floating Production Storage and Offloading (FPSO) facility in Production Licence WA-11-L in Commonwealth waters.

It is a requirement of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth) (the regulations) that Environment Plans for operating facilities be revised at least every five years. The Environment Plan for this facility was last revised in November 2014.

We have identified and assessed potential risks and impacts to active commercial fishers and the marine environment in the development of the proposed Environment Plan for this activity. These risks are summarised below.

Woodside has endeavoured to reduce these risks to as low as reasonably practical (ALARP) level. Please contact me if you believe we have overlooked any potential impacts to the commercial fishing industry or missed any points of importance.

An information sheet (also available on our website) and maps of State Fisheries relevant to the proposed activities are also attached.

**Activity overview**

| | |
|---|---|
| **Activity purpose:** | • Support ongoing production from the Okha FPSO. |
| **Activity:** | • The Okha FPSO will continue to produce oil for export from the facility via offloading tankers and gas for export to shore via a pipeline to the North Rankin Complex and then via two trunklines to the Karratha Gas Plant. |
| **Activity location:** | • 115 km North West of Dampier, Western Australia. |
| **Facility location:** | • Latitude: 19° 35' 13" S<br>• Longitude: 116° 26' 29" E |
| **Approximate water depth:** | • 80 m |
| **State fisheries consulted for this activity*:** | • Pilbara Trawl Fishery<br>• Pilbara Trap Fishery<br>• Pilbara Line Fishery<br>• Mackerel Fishery |
| **Exclusion zones:** | • A 500 m radius petroleum safety zone around the Okha FPSO.<br>• A 1500 m radius Operational Area around the Okha FPSO, subsea infrastructure, including wells and flowlines and the gas export line.<br>• A 500 m radius Operational Area around four suspended exploration wells. |

* Fisheries have been identified as being relevant on the basis of fishing licence overlap with the proposed activity area, as well as consideration of fishing effort data, fishing methods and water depth. Individual licence holders or representative fishing organisations who have requested ongoing advice on Woodside's planned activities will also be advised.

**Potential risks to commercial fishing**

| Potential risk | Risk description | Mitigation and/or management measures |
|---|---|---|
| **Planned Activities** | | |
| **Physical presence** | • The presence of the Okha FPSO and subsea infrastructure may result in exclusion of other users, or interactions between vessels and the facility. | • Woodside will implement a 500 m petroleum safety zone around the Okha FPSO to reduce the likelihood of interactions.<br>• Notification and updates to marine charts.<br>• Woodside will routinely consult with marine users to ensure they are informed and aware thereby reducing the likelihood of interactions. |

| | | |
|---|---|---|
| **Seabed disturbance** | • Disturbance to the seabed may occur due to the physical presence of the Okha FPSO and subsea infrastructure and subsea inspection, maintenance and repair (IMR) activities. | • Woodside will seek to minimise seabed disturbance during Okha FPSO operations through:<br>○ The use of vessels with dynamic positioning for IMR.<br>○ Monitoring and maintenance of subsea infrastructure to manage scour and flowline movement within integrity envelope. |
| **Underwater noise** | • Noise will be generated by the Okha FPSO, vessels, helicopters and IMR activities. | • Due to the low acoustic source levels associated with Okha FPSO and vessel operations there is not likely to be any interaction or potential impact to fish hearing, feeding or spawning. |
| **Marine discharges** | • Operational discharges including produced water, sewage, putrescible water, grey water, bilge water, drain water cooling water and brine.<br>• Routine discharges of approved chemicals and residual hydrocarbons as a result of IMR activities.<br>• Both these discharges may result in a localised short-term reduction in water quality however they will be rapidly diluted and dispersed in the water column. | • Discharges are compliant with industry best practice standards.<br>• Implementation of chemical assessment and approval process.<br>• Flushing of subsea infrastructure where practical to reduce volume of residual hydrocarbon discharged.<br>• The produced water discharge is monitored and managed to achieve 99% species protection. |
| **Unplanned Risks** | | |
| **Hydrocarbon release** | • Loss of hydrocarbons to the marine environment via loss of well control or from a vessel collision resulting in a tank rupture. | • Procedures for the supply and transfer of fuel.<br>• Design of the wells and barriers within the wells to prevent loss of hydrocarbons.<br>• Well blow-out-preventers, which are large valves or similar mechanical devices used to seal, control and monitor oil and gas wells.<br>• Relevant agencies and organisations will be notified as appropriate to the nature and scale of the event, as soon as practicable following the occurrence.<br>• Oil spill response strategies will be implemented based on potential |

| | | |
|---|---|---|
| | | impact to identified key receptor locations and sensitivities, which includes fish spawning and nursery areas. |
| **Invasive Marine Species** | • Introduction or translocation and establishment of invasive marine species to the area via vessels ballast water or biofouling. | • All vessels will be assessed and managed as appropriate to prevent the introduction of invasive marine species.<br>• Compliance with Australian biosecurity requirements and guidance. |

**Your feedback**

Your feedback on the proposed activity and our response will be included in an Environment Plan for consideration by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), as is required under the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please note under public transparency arrangements being implemented by NOPSEMA, the Environment Plan for this activity will be published in full following acceptance by the Authority. Please advise Woodside if you do not wish any part of your feedback to be published and we will ensure it is included in the sensitive information part of the Environment Plan. The information received will form part of the EP assessment however it will not be released publicly and will remain confidential to NOPSEMA throughout.

Please provide your views by close of business **7 August 2019** to allow us sufficient time to inform our planning for the proposed activity. Comments can be made by email, letter or by phone.

Regards

[redacted]
Corporate Affairs Adviser | Corporate Affairs

Woodside

Please direct all responses/queries to:
**Andrew Winter**
T: +61 8 9348 6115
E: andrew.winter@woodside.com.au

Our reference: 1401177784

**Woodside Energy Ltd.**
ACN 005 482 986
Mia Yellagonga
11 Mount Street
Perth WA 6000
Australia
T +61 8 9348 4000
F +61 8 9214 2777
www.woodside.com.au

8 July 2019

Dear Licence Holder

**CONSULTATION INFORMATION – OKHA OPERATIONS ENVIRONMENT PLAN**

Woodside is planning to submit a revised Operations Environment Plan for the Okha floating production storage and offloading (FPSO) facility in Production Licence WA-11-L in Commonwealth waters.

It is a requirement of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth) (the regulations) that Environment Plans for operating facilities be revised at least every five years. The Environment Plan for this facility was last revised in November 2014.

We have identified and assessed potential risks and impacts to active commercial fishers and the marine environment in the development of the proposed Environment Plan for this activity. These risks are at Appendix A. Woodside has endeavoured to reduce these risks to as low as reasonably practical (ALARP) level. Please contact me if you believe we have overlooked any potential impacts to the commercial fishing industry or missed any points of importance.

An information sheet (also available on our website) and maps of State Fisheries relevant to the proposed activities are also enclosed.

| | |
|---|---|
| **Activity purpose:** | Support ongoing production from the Okha FPSO. |
| **Activity:** | The Okha FPSO will continue to produce oil for export from the facility via offloading tankers and gas for export to shore via a pipeline to the North Rankin Complex and then via two trunklines to the Karratha Gas Plant. |
| **Activity location:** | 15 km North West of Dampier, Western Australia. |
| **Facility location:** | Latitude: 19° 35' 13" S<br>Longitude: 116° 26' 29" E |
| **Approximate water depth:** | 80 m |
| **Exclusion zones:** | A 500 m radius petroleum safety zone around the Okha FPSO.<br>A 1500 m radius Operational Area around the Okha FPSO, subsea infrastructure, including wells and flowlines and the gas export line<br>A 500 m radius Operational Area around the four suspended exploration wells |

**Your feedback**

Your feedback on the proposed activity and our response will be included in an Environment Plan for consideration by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), as is required under the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please note under public transparency arrangements implemented by NOPSEMA, the Environment Plan for this activity will be published in full following acceptance by the Authority. Please advise Woodside if you do not wish any part of your feedback to be published and we will ensure it is included in the sensitive information part of the Environment Plan. The information received will form part of the Environment Plan assessment however it will not be released publicly and will remain confidential to NOPSEMA throughout.

Please provide your views by close of business **7 August 2019** to allow us sufficient time to inform our planning for the proposed activity. Comments can be made by email, letter or by phone.

Kind Regards

Andrew Winter
**Corporate Affairs Adviser**

**APPENDIX A**

**Potential risks to commercial fishing**

| Potential risk | Risk description | Mitigation and/or management measures |
|---|---|---|
| **Planned Activities** | | |
| **Physical presence** | - The presence of the Okha FPSO and subsea infrastructure may result in exclusion of other users, or interactions between vessels and the facility. | - Woodside will implement a 500 m petroleum safety zone around the Okha FPSO to reduce the likelihood of interactions with the NRC.<br>- Notification and updates to marine charts.<br>- Woodside will routinely consult with marine users to ensure they are informed and aware thereby reducing the likelihood of interactions. |
| **Seabed disturbance** | - Disturbance to the seabed may occur due to the physical presence of the Okha FPSO and subsea infrastructure and subsea maintenance, inspection and repair (IMR) activities. | - Woodside will seek to minimise seabed disturbance during Okha FPSO operations through:<br>  - The use of vessels with dynamic positioning for IMR<br>  - Monitoring and maintenance of subsea infrastructure to manage scour and flowline movement within integrity envelope.<br>  - |
| **Underwater noise** | - Noise will be generated by the Okha FPSO, vessels, helicopters and IMR activities. | - Due to the low acoustic source levels associated with Okha FPSO and vessel operations there is not likely to be any interaction or potential impact to fish hearing, feeding or spawning. |
| **Marine discharges** | - Operational discharges including produced water, sewage, putrescible water, grey water, bilge water, drain water cooling water and brine.<br>- Routine discharges of approved chemicals and residual hydrocarbons as a result of IMR activities.<br>- Both these discharges may result in a localised short-term reduction in water quality however they will be rapidly diluted and dispersed in the water column. | - Discharges are compliant with industry best practice standards.<br>- Implementation of chemical assessment and approval process.<br>- Flushing of subsea infrastructure where practical to reduce volume of residual hydrocarbon discharged.<br>- The produced water discharge is monitored and managed to achieve 99% species protection. |
| **Unplanned Risks** | | |
| **Hydrocarbon release** | - Loss of hydrocarbons to the marine environment via loss of well control or from a vessel collision resulting in a tank rupture. | - Procedures for the supply and transfer of fuel.<br>- Design of the wells and barriers within the wells to prevent loss of hydrocarbons.<br>- Well blow-out-preventers, which are large valves or similar mechanical devices used to seal, control and monitor oil and gas wells.<br>- Relevant agencies and organisations will be notified as appropriate to the nature and scale of the event, as soon as practicable following the occurrence.<br>- Oil spill response strategies will be implemented based on potential impact to identified key receptor locations and sensitivities, which includes fish spawning and nursery areas. |
| **Invasive Marine Species** | - Introduction or translocation and establishment of invasive marine species to the area via vessels ballast water or biofouling. | - All vessels will be assessed and managed as appropriate to prevent the introduction of invasive marine species.<br>- Compliance with Australian biosecurity requirements and guidance. |

**Email sent to PPA – 16 July 2019**

Dear [redacted] – thank you for the chat.

As discussed Woodside is planning to submit a revised Operations Environment Plan for the Okha Floating Production Storage and Offloading (FPSO) facility in Production Licence WA-11-L in Commonwealth waters.

It is a requirement of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth) (the regulations) that Environment Plans for operating facilities be revised at least every five years. The Environment Plan for this facility was last revised in November 2014.

We have identified and assessed potential risks and impacts to active commercial fishers and the marine environment in the development of the proposed Environment Plan for this activity. These risks are summarised below.

Woodside has endeavoured to reduce these risks to as low as reasonably practical (ALARP) level. Please contact me if you believe we have overlooked any potential impacts to the commercial fishing industry or missed any points of importance.

An information sheet (also available on our website) and maps of State Fisheries (you'll note we haven't included Pearl Producers but please let me know if you consider them relevant given water depth and proximity to the Dampier Peninsula) relevant to the proposed activities are also attached.

**Activity overview**

| | |
|---|---|
| **Activity purpose:** | • Support ongoing production from the Okha FPSO. |
| **Activity:** | • The Okha FPSO will continue to produce oil for export from the facility via offloading tankers and gas for export to shore via a pipeline to the North Rankin Complex and then via two trunklines to the Karratha Gas Plant. |
| **Activity location:** | • 115 km North West of Dampier, Western Australia. |
| **Facility location:** | • Latitude: 19° 35' 13" S<br>• Longitude: 116° 26' 29" E |
| **Approximate water depth:** | • 80 m |
| **State fisheries consulted for this activity*:** | • Pilbara Trawl Fishery<br>• Pilbara Trap Fishery<br>• Pilbara Line Fishery<br>• Mackerel Fishery<br>• Pearl Producers Association |
| **Exclusion zones:** | • A 500 m radius petroleum safety zone around the Okha FPSO.<br>• A 1500 m radius Operational Area around the Okha FPSO, subsea infrastructure, including wells and flowlines and the gas export line. |

| | |
|---|---|
| | • A 500 m radius Operational Area around four suspended exploration wells. |

* Fisheries have been identified as being relevant on the basis of fishing licence overlap with the proposed activity area, as well as consideration of fishing effort data, fishing methods and water depth. Individual licence holders or representative fishing organisations who have requested ongoing advice on Woodside's planned activities will also be advised.

**Potential risks to commercial fishing**

| Potential risk | Risk description | Mitigation and/or management measures |
|---|---|---|
| **Planned Activities** | | |
| **Physical presence** | • The presence of the Okha FPSO and subsea infrastructure may result in exclusion of other users, or interactions between vessels and the facility. | • Woodside will implement a 500 m petroleum safety zone around the Okha FPSO to reduce the likelihood of interactions.<br>• Notification and updates to marine charts.<br>• Woodside will routinely consult with marine users to ensure they are informed and aware thereby reducing the likelihood of interactions. |
| **Seabed disturbance** | • Disturbance to the seabed may occur due to the physical presence of the Okha FPSO and subsea infrastructure and subsea inspection, maintenance and repair (IMR) activities. | • Woodside will seek to minimise seabed disturbance during Okha FPSO operations through:<br>• The use of vessels with dynamic positioning for IMR.<br>• Monitoring and maintenance of subsea infrastructure to manage scour and flowline movement within integrity envelope. |
| **Underwater noise** | • Noise will be generated by the Okha FPSO, vessels, helicopters and IMR activities. | • Due to the low acoustic source levels associated with Okha FPSO and vessel operations there is not likely to be any interaction or potential impact to fish hearing, feeding or spawning. |

| | | |
|---|---|---|
| **Marine discharges** | • Operational discharges including produced water, sewage, putrescible water, grey water, bilge water, drain water cooling water and brine.<br>• Routine discharges of approved chemicals and residual hydrocarbons as a result of IMR activities.<br>• Both these discharges may result in a localised short-term reduction in water quality however they will be rapidly diluted and dispersed in the water column. | • Discharges are compliant with industry best practice standards.<br>• Implementation of chemical assessment and approval process.<br>• Flushing of subsea infrastructure where practical to reduce volume of residual hydrocarbon discharged.<br>• The produced water discharge is monitored and managed to achieve 99% species protection. |
| **Unplanned Risks** | | |
| **Hydrocarbon release** | • Loss of hydrocarbons to the marine environment via loss of well control or from a vessel collision resulting in a tank rupture. | • Procedures for the supply and transfer of fuel.<br>• Design of the wells and barriers within the wells to prevent loss of hydrocarbons.<br>• Well blow-out-preventers, which are large valves or similar mechanical devices used to seal, control and monitor oil and gas wells.<br>• Relevant agencies and organisations will be notified as appropriate to the nature and scale of the event, as soon as practicable following the occurrence.<br>• Oil spill response strategies will be |

| | | |
|---|---|---|
| | | implemented based on potential impact to identified key receptor locations and sensitivities, which includes fish spawning and nursery areas. |
| **Invasive Marine Species** | • Introduction or translocation and establishment of invasive marine species to the area via vessels ballast water or biofouling. | • All vessels will be assessed and managed as appropriate to prevent the introduction of invasive marine species.<br>• Compliance with Australian biosecurity requirements and guidance. |

**Your feedback**

Your feedback on the proposed activity and our response will be included in an Environment Plan for consideration by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), as is required under the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

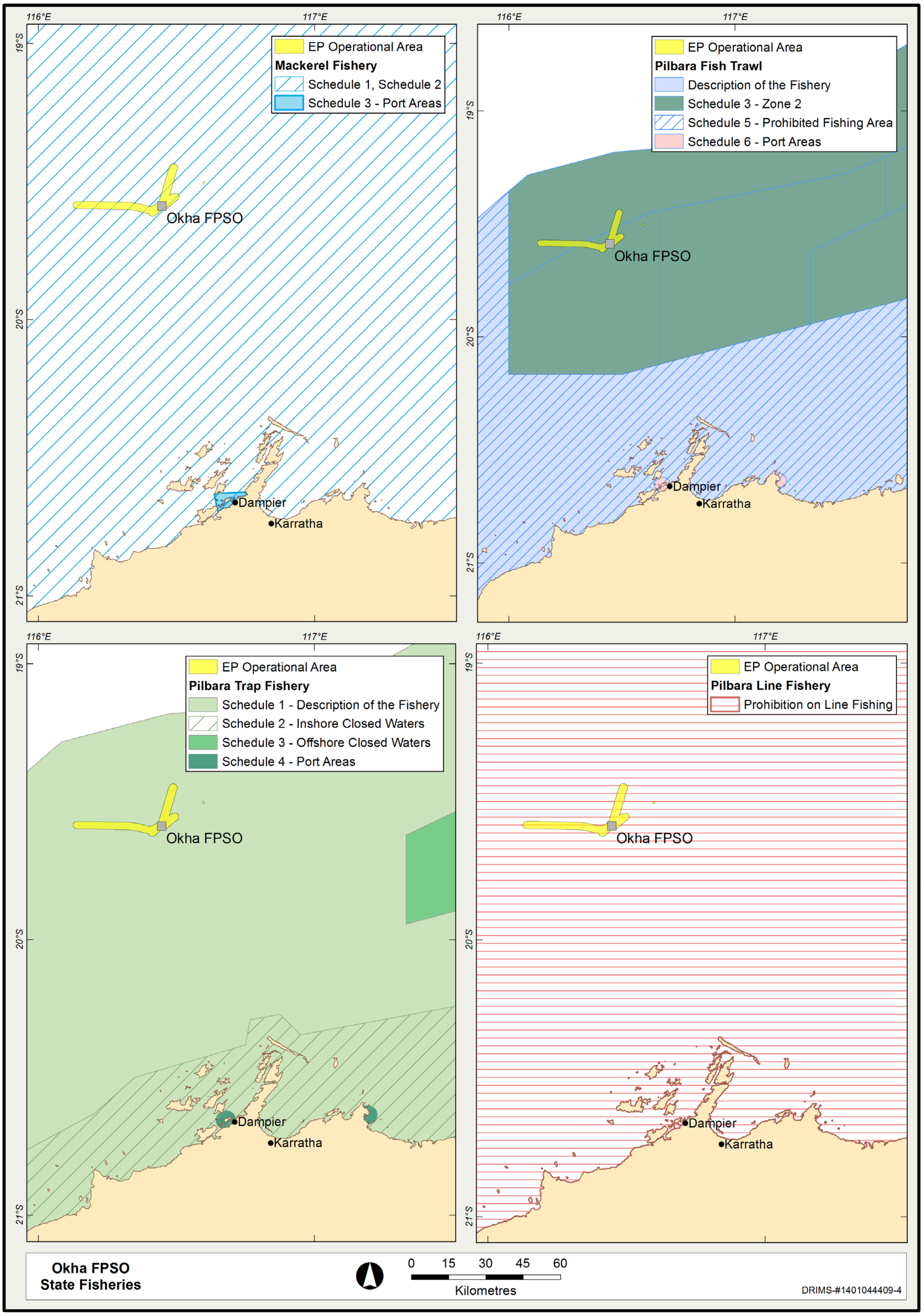
Please note under public transparency arrangements being implemented by NOPSEMA, the Environment Plan for this activity will be published in full following acceptance by the Authority. Please advise Woodside if you do not wish any part of your feedback to be published and we will ensure it is included in the sensitive information part of the Environment Plan. The information received will form part of the EP assessment however it will not be released publicly and will remain confidential to NOPSEMA throughout.

Please provide your views by close of business **7 August 2019** to allow us sufficient time to inform our planning for the proposed activity. Comments can be made by email, letter or by phone.

Regards

[redacted]
Corporate Affairs Adviser | Corporate Affairs
Woodside Energy Ltd

**State Fishery map provided to DPIRD, WAFIC and fishing licence holders – 8 July 2019**
**State Fishery map provided to PPA – 16 July 2019**



## Email to AMSA – 8 July 2019

Dear AMSA

Woodside is planning to submit a revised Operations Environment Plan for the Okha Floating Production Storage and Offloading (FPSO) facility in Production Licence WA-11-L in Commonwealth waters.

It is a requirement of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth) (the regulations) that Environment Plans for operating facilities be revised at least every five years. The Environment Plan for this facility was last revised in November 2014.

A Consultation Information Sheet is attached, which provides background on the proposed activity, including a summary of potential key risk and associated management measures. The Information Sheet is also available on our website.

A shipping densities map is also attached for your reference.

**Activity overview**

| | |
|---|---|
| **Activity purpose:** | • Support ongoing production from the Okha FPSO. |
| **Activity:** | • The Okha FPSO will continue to produce oil for export from the facility via offloading tankers and gas for export to shore via a pipeline to the North Rankin Complex and then via two trunklines to the Karratha Gas Plant. |
| **Activity location:** | • 115 km North West of Dampier, Western Australia. |
| **Facility location:** | • Latitude: 19° 35' 13" S<br>• Longitude: 116° 26' 29" E |
| **Approximate water depth:** | • 80 m |
| **Exclusion zones:** | • A 500 m radius petroleum safety zone around the Okha FPSO.<br>• A 1500 m radius Operational Area around the Okha FPSO, subsea infrastructure, including wells and flowlines and the gas export line.<br>• A 500 m radius Operational Area around four suspended exploration wells. |

**Your feedback**

Your feedback on the proposed activity and our response will be included in an Environment Plan for consideration by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), as is required under the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please note under public transparency arrangements implemented by NOPSEMA, the Environment Plan for this activity will be published in full following acceptance by the Authority. Please advise Woodside if you do not wish any part of your feedback to be published and we will ensure it is included in the sensitive information part of the Environment Plan. The information received will form part of the EP assessment however it will not be released publicly and will remain confidential to NOPSEMA throughout.

Please provide your views by close of business **7 August 2019** to allow us sufficient time to inform our planning for the proposed activity. Comments can be made by email, letter or by phone.

Regards

[redacted]
Corporate Affairs Adviser | Corporate Affairs
Woodside Energy Ltd

**Email to AHO – 8 July 2019**

Dear AHO

Woodside is planning to submit a revised Operations Environment Plan for the Okha Floating Production Storage and Offloading (FPSO) facility in Production Licence WA-11-L in Commonwealth waters.

It is a requirement of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth) (the regulations) that Environment Plans for operating facilities be revised at least every five years. The Environment Plan for this facility was last revised in November 2014.

A Consultation Information Sheet is attached, which provides background on the proposed activity, including a summary of potential key risk and associated management measures. The Information Sheet is also available on our website.

A shipping densities map is also attached for your reference.

**Activity overview**

| | |
|---|---|
| **Activity purpose:** | • Support ongoing production from the Okha FPSO. |
| **Activity:** | • The Okha FPSO will continue to produce oil for export from the facility via offloading tankers and gas for export to shore via a pipeline to the North Rankin Complex and then via two trunklines to the Karratha Gas Plant. |
| **Activity location:** | • 115 km North West of Dampier, Western Australia. |
| **Facility location:** | • Latitude: 19° 35’ 13” S<br>• Longitude: 116° 26’ 29” E |
| **Approximate water depth:** | • 80 m |
| **Exclusion zones:** | • A 500 m radius petroleum safety zone around the Okha FPSO.<br>• A 1500 m radius Operational Area around the Okha FPSO, subsea infrastructure, including wells and flowlines and the gas export line.<br>• A 500 m radius Operational Area around four suspended exploration wells. |

**Your feedback**

Your feedback on the proposed activity and our response will be included in an Environment Plan for consideration by the National Offshore Petroleum Safety and Environmental Management

Authority (NOPSEMA), as is required under the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please note under public transparency arrangements implemented by NOPSEMA, the Environment Plan for this activity will be published in full following acceptance by the Authority. Please advise Woodside if you do not wish any part of your feedback to be published and we will ensure it is included in the sensitive information part of the Environment Plan. The information received will form part of the EP assessment however it will not be released publicly and will remain confidential to NOPSEMA throughout.

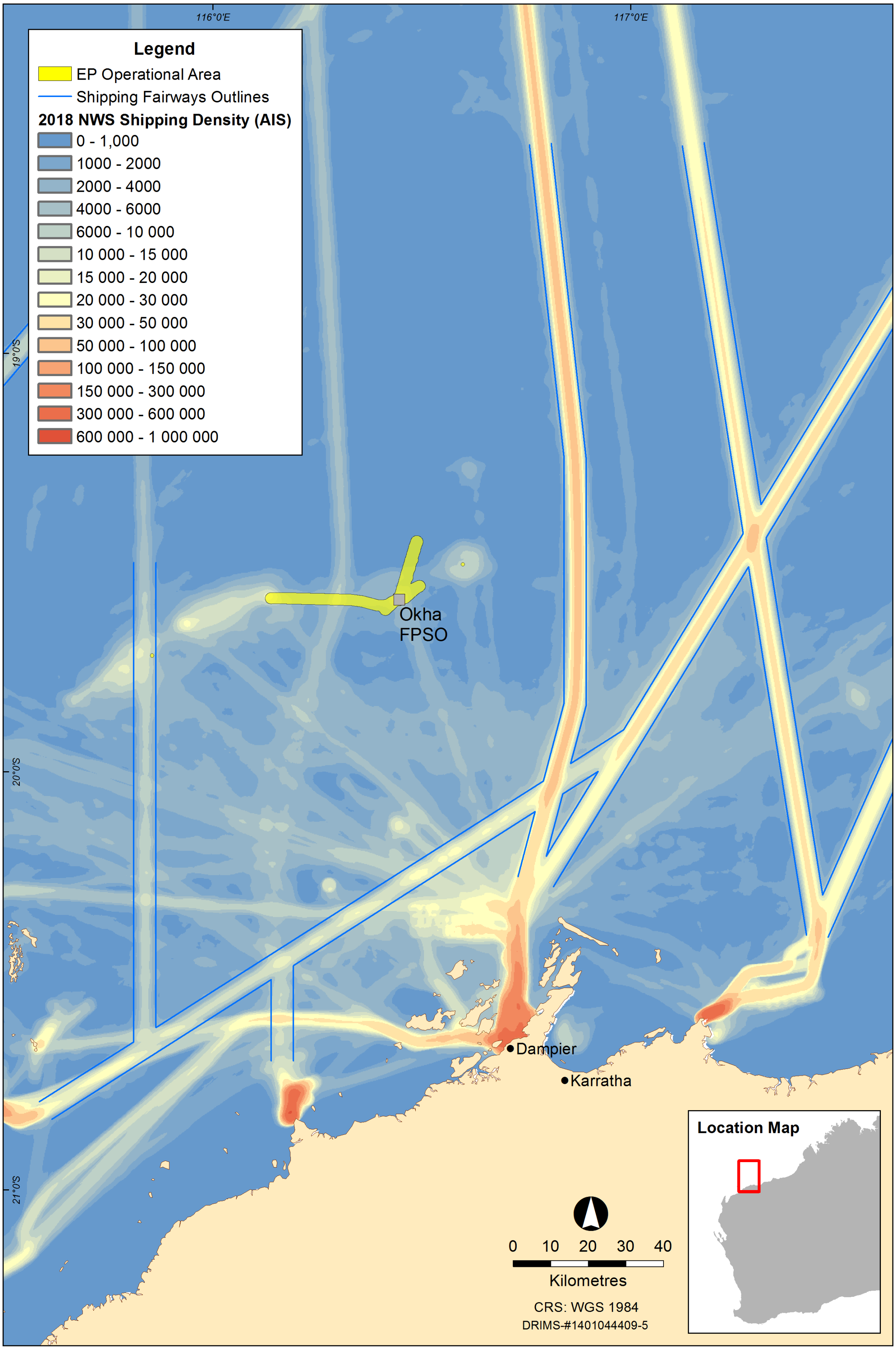
Please provide your views by close of business **7 August 2019** to allow us sufficient time to inform our planning for the proposed activity. Comments can be made by email, letter or by phone.

Regards

[redacted]
Corporate Affairs Adviser | Corporate Affairs
Woodside Energy Ltd

[redacted]

## Shipping lane map provided to AMSA and AHO – 8 July 2019



## Email to adjacent titleholders – 8 July 2019

Dear Stakeholder

Woodside is planning to submit a revised Operations Environment Plan for the Okha Floating Production Storage and Offloading (FPSO) facility in Production Licence WA-11-L in Commonwealth waters.

It is a requirement of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth) (the regulations) that Environment Plans for operating facilities be revised at least every five years. The Environment Plan for this facility was last revised in November 2014.

A Consultation Information Sheet is attached, which provides background on the proposed activity, including a summary of potential key risk and associated management measures. The Information Sheet is also available on our website.

A neighbouring Titleholders map is also attached.

**Activity overview**

| | |
|---|---|
| **Activity purpose:** | • Support ongoing production from the Okha FPSO. |
| **Activity:** | • The Okha FPSO will continue to produce oil for export from the facility via offloading tankers and gas for export to shore via a pipeline to the North Rankin Complex and then via two trunklines to the Karratha Gas Plant. |
| **Activity location:** | • 115 km North West of Dampier, Western Australia. |
| **Facility location:** | • Latitude: 19° 35' 13" S<br>• Longitude: 116° 26' 29" E |
| **Approximate water depth:** | • 80 m |
| **Exclusion zones:** | • A 500 m radius petroleum safety zone around the Okha FPSO.<br>• A 1500 m radius Operational Area around the Okha FPSO, subsea infrastructure, including wells and flowlines and the gas export line.<br>• A 500 m radius Operational Area around four suspended exploration wells. |

**Your feedback**

Your feedback on the proposed activity and our response will be included in an Environment Plan for consideration by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), as is required under the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

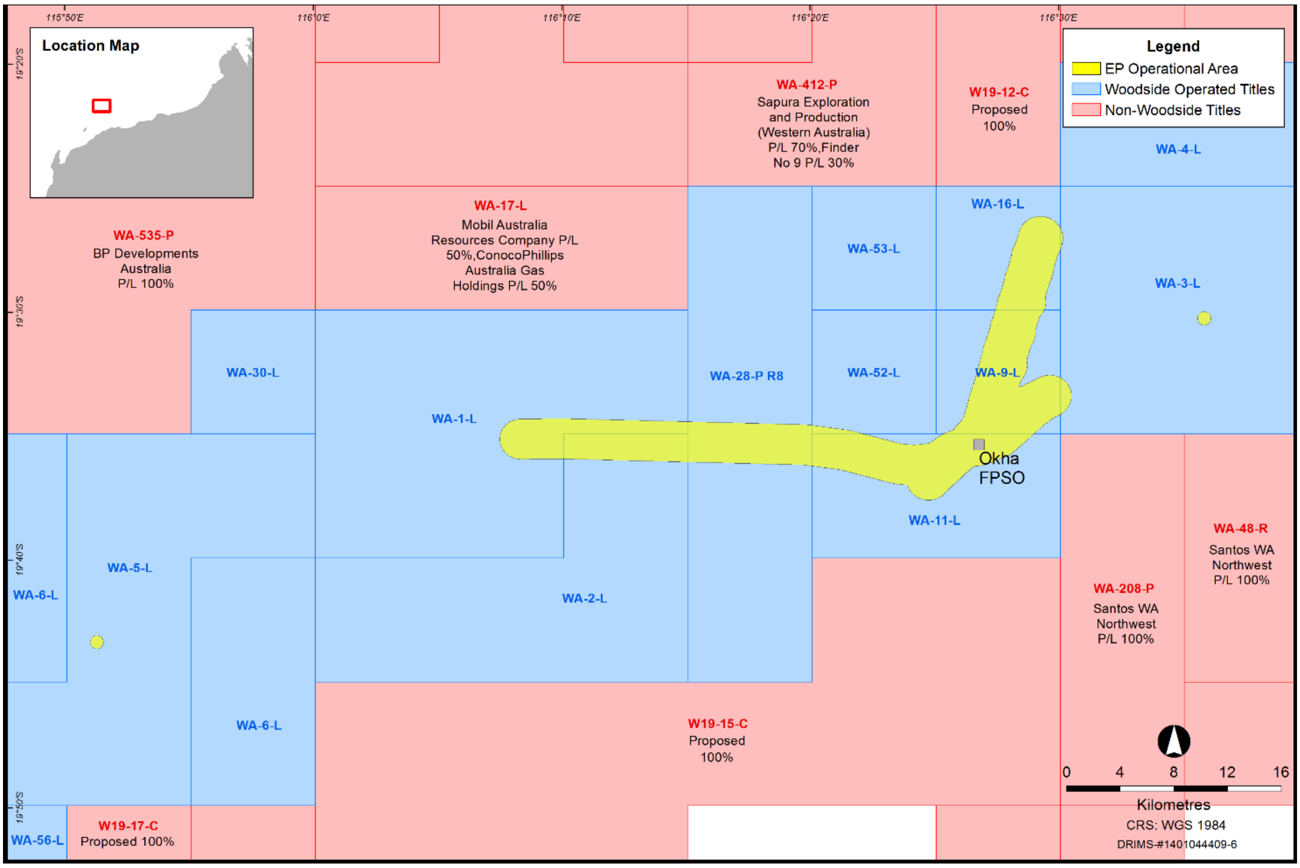
Please note under public transparency arrangements implemented by NOPSEMA, the Environment Plan for this activity will be published in full following acceptance by the Authority. Please advise Woodside if you do not wish any part of your feedback to be published and we will ensure it is included in the sensitive information part of the Environment Plan. The information received will form part of the EP assessment however it will not be released publicly and will remain confidential to NOPSEMA throughout.

Please provide your views by close of business **7 August 2019** to allow us sufficient time to inform our planning for the proposed activity. Comments can be made by email, letter or by phone.

Regards

[redacted]
Corporate Affairs Adviser | Corporate Affairs
Woodside Energy Ltd

## Titleholders map provided to BP Developments, Mobil Australia, Santos and Sapura Exploration and Petroleum – 8 July 2019



## Email to DAWR – 2 August 2019

Dear Department of Agriculture and Water Resources (DAWR)

Woodside is planning to submit a revised Operations Environment Plan for the Okha Floating Production Storage and Offloading (FPSO) facility in Production Licence WA-11-L in Commonwealth waters.

It is a requirement of the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth) (the regulations) that Environment Plans for operating facilities be revised at least every five years. The Environment Plan for this facility was last accepted by NOPSEMA on 10 December 2014.

With respect to DAWR's guidance for consultation on Environment Plans and Offshore Project Proposals - please note the following points below. An Information Sheet is attached and is also available on our website.

**Activity overview**

| | |
|---|---|
| **Activity purpose:** | • Support ongoing production from the Okha FPSO. |
| **Activity:** | • The Okha FPSO will continue to produce oil for export from the facility via offloading tankers and gas for export to shore via a pipeline to the North Rankin Complex and then via two trunklines to the Karratha Gas Plant. |
| **Activity location:** | • 115 km North West of Dampier, Western Australia. |
| **Facility location:** | • Latitude: 19° 35' 13" S<br>• Longitude: 116° 26' 29" E |
| **Approximate water depth:** | • 80 m |
| **Operational Area:** | • A 1500 m radius Operational Area around the Okha FPSO, subsea infrastructure, including wells and flowlines and the gas export line<br>• A 500 m radius Operational Area around four suspended exploration wells |

**Commercial fishing**
Whilst three Commonwealth Fisheries overlap the proposed Operational Area (see attached map), it is our assessment that interaction with licence holders in Commonwealth Fisheries is unlikely, as fishing effort has historically taken place well beyond the operational area.

**Biosecurity**
With respect to the biosecurity matters, please note the following information below.

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| **Vessels:** | • Two types of vessels service the offshore facility including:<br>  o Platform support vessels<br>  o Subsea support vessels<br>• All support vessels are required to undergo a Woodside Marine Assurance Inspection to review compliance with marine laws and Woodside safety and environmental requirements.<br>• Support vessels may be sourced from the local area (Dampier, Karratha, etc) or from further afield, depending on the type of vessel required and availability |

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| **Environment description:** | • The seabed around Okha facility is flat and featureless with no areas of hard substrate or outcrops. The seabed composition is characterised by deep (>5 m) soft silty sediment.<br>• The closest distance to the Marine Parks are;<br>  ○ Approximately 120 km north west of the Montebello Islands Marine Park (WA)<br>  ○ Approximately 72 km north west of Montebello Marine Park - Multiple Use Zone (Cwlth) |
| **Ballast and biofouling management:** | • Compliance with National Ballast Water and Biofouling Management Requirements (as defined under the Biosecurity Act 2015).<br>• Requirements are aligned with the International Convention for the Control and Management of Ships' Ballast Water and Sediments and the National Biofouling Management Guidance for the Petroleum Production and Exploration Industry.<br>• As a minimum, all vessels mobilised from outside of Australia will undertake ballast water exchange > 12 nm from land and > 50 m water depth.<br>• The operator of a vessel must provide a ballast water report if it is intended that the vessel discharge, or the vessel discharges, ballast water in Australian seas. |
| **IMS risk:** | • Introduction or translocation and establishment of invasive marine species to the area via vessels or biofouling.<br>• Introducing invasive marine species into the local marine environment will alter the ecosystem, as invasive species have characteristics that make them superior (in a survival and/or reproductive sense) to the indigenous species.<br>• Invasive marine species have also proven economically damaging to areas where they have been introduced and established. |
| **IMS mitigation:** | • Vessels will be assessed and managed to prevent the introduction of invasive marine species in accordance with Woodside's Invasive Marine Species Management Plan.<br>• Woodside's Invasive Marine Species Management Plan includes a risk assessment process that is applied to vessels undertaking Activities. Based on the outcomes of each IMS risk assessment, Management measures commensurate with the risk (such as the treatment of internal systems, IMS inspections or cleaning) will be implemented to minimise the likelihood of IMS being introduced.<br>• Vessels are required to comply with the Australian Biosecurity Act 2015. |

**Your feedback**
Your feedback is appreciated by **1 September 2019** to assist with planning for this activity, noting that your feedback and our response will be included in an Environment Plan for consideration by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), as is required under the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth). Comments can be made by email, letter or by phone.

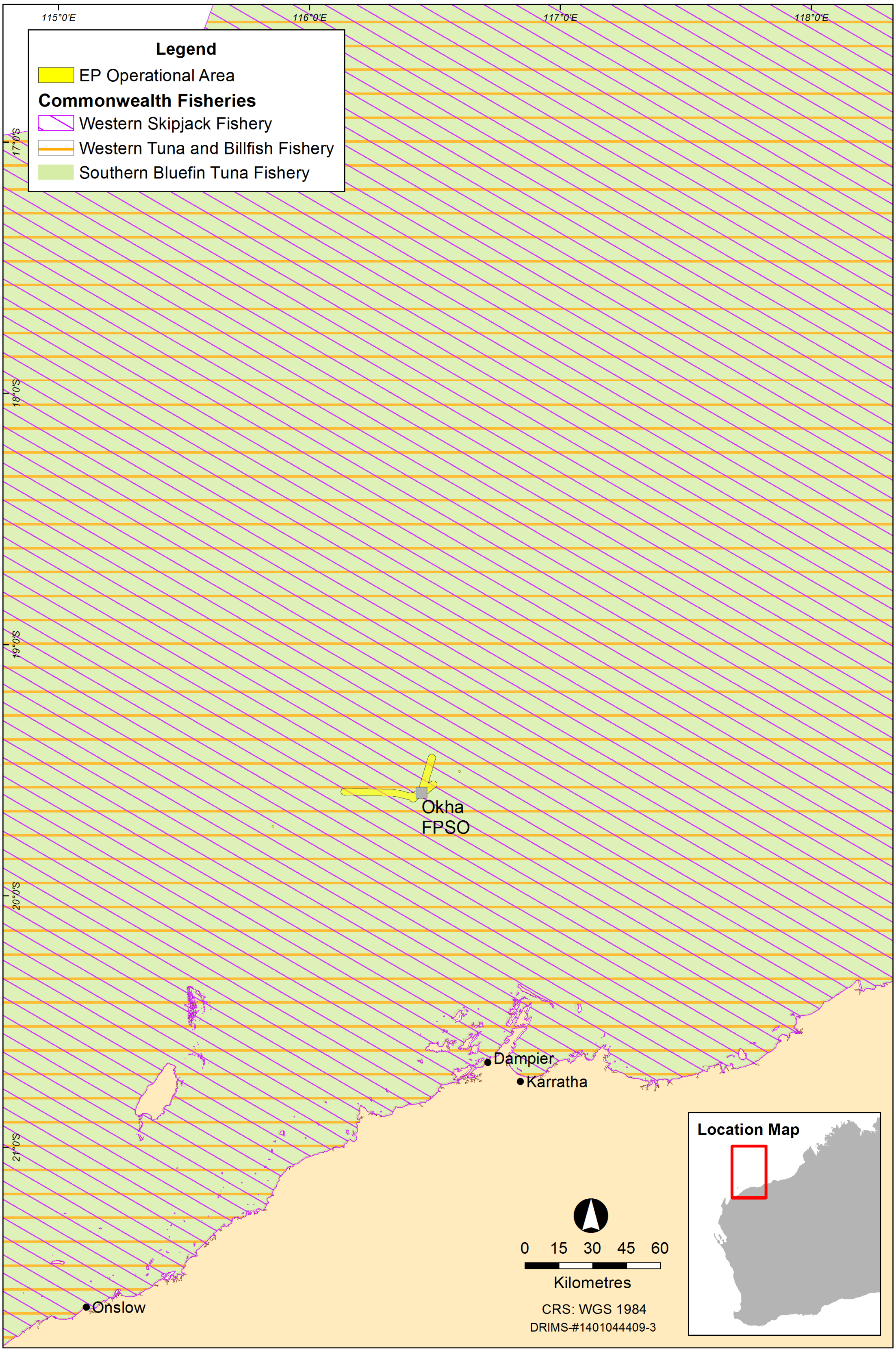
In line with Australian Government guidance on consultation with government agencies, can you also please advise within 10 business days if you require any additional information on the proposed activity.

Please note under public transparency arrangements implemented by NOPSEMA, the Environment Plan for this activity will be published in full following acceptance by the Authority. Please advise Woodside if you do not wish any part of your feedback to be published and we will ensure it is included in the sensitive information part of the Environment Plan. The information received will form part of the EP assessment however it will not be released publicly and will remain confidential to NOPSEMA throughout.

Regards

[redacted]
Corporate Affairs Adviser | Corporate Affairs
Woodside Energy Ltd

## Commonwealth Fishery map provided to DAWR – 2 August 2019



**Email sent to DNP – 20 September 2019**

Dear Director of National Parks

Woodside is submitting a revised Environment Plan for the Okha Floating Production, Storage and Offloading (FPSO) facility in accordance with Commonwealth environmental regulations, which require Environment Plans for operating facilities to be revised at least every five years.

The Okha FPSO is located in Commonwealth waters about 115 km north west of Dampier Western Australia and extracts, processes, stores and offloads oil and export gas from the Cossack, Wanaea, Lambert and Hermes fields.

We note Australian Government Guidance on consultation activities with respect to the proposed activities and confirm that:

- The proposed activities are outside the boundaries of a proclaimed Australian Marine Parks the nearest being Montebello Marine Park, 35 km to the south west of the Operational Area.
- We have assessed potential risks to Australian Marine Parks in the development of the proposed Environment Plan for this activity and believe that there are no credible risks as part of planned activities that have potential to impact the values of the Marine Parks.
- The worst case credible spill scenario assessed in this EP is the remote likelihood event of a subsea well blow-out. For this consequence to occur, the Xmas Tree on top of the well must be completely removed along with the failure of multiple barriers within the well. Given the controls in place to prevent and control loss of containment events and mitigate their consequences, it is considered that the risk associated with a subsea well blow out is managed to as low as reasonably practical.
- In the unlikely event of a loss of well control there is a risk of light crude entering the following Marine Parks:
    - Montebello Marine Park
    - Argo-Rowley Terrace Marine Park
    - Gascoyne Marine Park
    - Ningaloo Marine Park
    - Shark Bay Marine Park

A Commonwealth Government-approved oil spill response plan will be in place for the duration of the activities, which includes notification to relevant agencies and organisations as to the nature and scale of the event, as soon as practicable following an occurrence. The Director of National Parks will be advised if an environmental incident occurs that may impact on the values of the Marine Park.

For information, a Consultation Information Sheet about the planned activity is attached, which provides background on the activity, including a summary of potential key risk and associated management measures. The Information Sheet is also available on our website.

Please contact me if you have any feedback on the proposed activity by close of business 21 October 2019, noting that and our response will be included in an Environment Plan for consideration by the National Offshore Petroleum Safety and Environmental Management Authority, as is required under the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).
Regards

[redacted]
Corporate Affairs Adviser | Corporate Affairs
Woodside Energy Ltd

## Oil Pollution Consultation

*Woodside sent the emails below to stakeholders with responsibilities for oil pollution response in Commonwealth and State waters.*

### Email sent to DoT – 8 July 2019

Dear Stakeholder

Woodside is planning to submit a revised Operations Environment Plan for the Okha Floating Production Storage and Offloading (FPSO) facility in Production Licence WA-11-L in Commonwealth waters.

It is a requirement of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth) (the regulations) that Environment Plans for operating facilities be revised at least every five years. The Environment Plan for this facility was last revised in November 2014.

A Consultation Information Sheet is attached, which provides background on the proposed activity, including a summary of potential key risk and associated management measures. The Information Sheet is also available on our website.

**Activity overview**

| | |
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| **Activity purpose:** | • Support ongoing production from the Okha FPSO. |
| **Activity:** | • The Okha FPSO will continue to produce oil for export from the facility via offloading tankers and gas for export to shore via a pipeline to the North Rankin Complex and then via two trunklines to the Karratha Gas Plant. |
| **Activity location:** | • 115 km North West of Dampier, Western Australia. |
| **Facility location:** | • Latitude: 19° 35' 13" S<br>• Longitude: 116° 26' 29" E |
| **Approximate water depth:** | • 80 m |
| **Exclusion zones:** | • A 500 m radius petroleum safety zone around the Okha FPSO.<br>• A 1500 m radius Operational Area around the Okha FPSO, subsea infrastructure, including wells and flowlines and the gas export line.<br>• A 500 m radius Operational Area around four suspended exploration wells. |

**Your feedback**

Your feedback on the proposed activity and our response will be included in an Environment Plan for consideration by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), as is required under the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please note under public transparency arrangements implemented by NOPSEMA, the Environment Plan for this activity will be published in full following acceptance by the Authority. Please advise Woodside if you do not wish any part of your feedback to be published and we will ensure it is included in the sensitive information part of the Environment Plan. The information received will form part of the EP assessment however it will not be released publicly and will remain confidential to NOPSEMA throughout.

Please provide your views by close of business **7 August 2019** to allow us sufficient time to inform our planning for the proposed activity. Comments can be made by email, letter or by phone.

Regards

[redacted]
Corporate Affairs Adviser | Corporate Affairs
Woodside Energy Ltd

**Email sent to DoT – 27 August 2019**

Good Afternoon [redacted]

As part of Woodside's ongoing consultation for its current and planned activities, I would like to advise WA Department of Transport (DoT) that Woodside are preparing the *Okha FPSO Facility Operations Environment Plan* and would like to offer DoT the opportunity to review or provide comment on the activity.

Information is presented as follows:

- A Consultation Information Sheet is available on our website here, providing information on the proposed petroleum activities program, located about 115 km north-west of Dampier. The FPSO activities form part of the ongoing production from 13 subsea production wells tied back to the Okha FPS0, 10 of which are capable of producing hydrocarbons.

- The *Okha FPSO Facility Operations Oil Pollution Emergency Plan* is attached. This will form part of the approval submission in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

- In the table below, as requested in the *Offshore Petroleum Industry Guidance Note* (September 2018) and from recent engagement activities between DoT-Woodside, responses to the information requirements in a succinct summary and source of information.

Woodside propose to submit an EP 18 October 2019 to support these activities.

Should you require additional information or have a comment to make about the proposed activity, please contact myself by close of business 9 October 2019 to allow us sufficient time to inform our activity planning and EP development.

Comments can be made by email, letter or by phone.

Please be aware that your feedback will be communicated to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), as is required under legislation.

We look forward to hearing from you.

[redacted]

| Information Requested in the Offshore Petroleum Industry Guidance Note (September 2018) | Information Provided & Reference |
|---|---|
| Description of activity, including the intended schedule, location (including coordinates), distance to nearest landfall and map. | Included in the consultation information sheet |
| Worst case spill volumes. | Included in Appendix A of the First Strike Plan |
| Known or indicative oil type/properties. | Included in Appendix A of the First Strike Plan |
| Amenability of oil to dispersants and window of opportunity for dispersant efficacy. | Dispersant testing on Cossack Light Crude indicates that average dispersant efficiency (%) for oil age will be;<br>• ~45% (0 hours)<br>• ~84% (<12 hrs)<br>• ~16% (48-96 hrs)<br>This data is based on a range of weathering results and five National Plan OSCA approved and/or transitional dispersants that will be the most likely dispersants used by Woodside. |
| Description of existing environment and protection priorities. | Included in section 4 of the First Strike Plan |
| Details of the environmental risk assessment related to marine oil pollution - describe the process and key outcomes around risk identification, risk analysis, risk evaluation and risk treatment. For further information see the Oil Pollution Risk Management Information Paper (NOPSEMA 2017). | Unplanned loss of containment events from the Petroleum Activities Program have been identified during the risk assessment process (presented in Section 5 of the EP). Further descriptions of risk, impacts and mitigation measures (which are not related to hydrocarbon preparedness and response) are provided in Section 5 of the EP. Five unplanned events or credible spill scenarios for the Petroleum Activities Program have been selected as representative across types, sources and incident/response levels, up to and including the WCCS.<br>Table 2-1 of the EP presents the credible scenarios for the Petroleum Activities Program. Two WCCS for the activity are then used for response planning purposes as all other scenarios are of a lesser scale and extent. By demonstrating capability to meet and manage an event of this size, Woodside assumes relevant |

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| | scenarios that are smaller in nature and scale can also be managed by the same capability.<br>Response performance outcomes have been defined based on a response to the WCCS. | |
| Outcomes of oil spill trajectory modelling, including predicted times to enter State waters and contact shorelines. | Minimum time to shoreline accumulation (above 100 g/m2) at any individual shoreline receptor (loss of well containment – MEE-01) | 14.2 days (Barrow Island – 2 $m^3$) |
| | Minimum time to shoreline accumulation (above 100 g/m2) where largest shoreline accumulation (above 100g/m2) across all shoreline receptors (loss of well containment – MEE-01) | 42 days (Pilbara Islands – Southern Islands Group – 65.8 $m^3$) |
| | Minimum time to shoreline accumulation (above 100 g/m2) at any individual shoreline receptor (cargo tank rupture – MEE-05) | 7 days (Barrow Island, 42 $m^3$) |
| | Minimum time to shoreline accumulation (above 100 g/m2) where largest shoreline accumulation (above 100g/m2) across all shoreline receptors (cargo tank rupture – MEE-05) | 11 days (Montebello Islands and Montebello Islands State Marine Park – 110 $m^3$) |
| Details on initial response actions and key activation timeframes. | Included in Section 2 and 3 of the First Strike Plan | |
| Potential Incident Control Centre arrangements. | Included in Appendix E and F of the First Strike Plan | |
| Potential staging areas / Forward Operating Base. | A Forward Operating Base can be established at Exmouth and/ or Dampier. | |
| Details on response strategies. | Included in Section 2 and 3 of the First Strike Plan | |
| Details and diagrams on proposed IMT structure including integration of DoT arrangements as per this IGN. | Included in Appendix E and F of the First Strike Plan | |
| Details on testing of arrangements of OPEP/OSCP. | • 1 x Level 1 oil spill response drill to be conducted per year. This drill should test elements of the recommended response identified in the NRC Oil Pollution First Strike Plan in relation to the level of the incident.<br>• 1x Crisis oil spill response focused exercise annually.<br>**of Oil Spill Response Arrangements** | |

| | |
|---|---|
| | There are a number of arrangements which in the event of a spill will underpin Woodside's ability to implement a response across its petroleum activities. In order to ensure each of these arrangements is adequately tested, the Hydrocarbon Spill Preparedness Capability and Competency Coordinator ensures tests are conducted in alignment with the Hydrocarbon Spill Arrangements Testing Schedule (Woodside Doc No. 10058092).<br>Woodside's Hydrocarbon Spill Preparedness & Response Testing Schedule aligns with international good practice for spill preparedness & response management; the testing is compatible with the IPIECA Good Practice Guide and the Australian Emergency Management Institute Handbook.<br>The Hydrocarbon Spill Arrangements Testing Schedule (Woodside Doc No. 10058092) identifies the type of test which will be conducted annually for each arrangement, and how this type will vary over a five year rolling schedule. Testing methods may include (but are not limited to): audits, drills, field exercises, functional workshops, assurance reporting, assurance monitoring and reviews of key external dependencies.<br>Activity specific Oil Spill Pollution First Strike Plans are developed to meet the response needs of that particular activity's Worst Credible Spill Scenario (WCCS). The ability to implement these plans may rely on specific arrangements or those common to other Woodside activities. Regardless of their commonality each arrangement will be tested in at least one of the methods annually. This ensures that personnel are familiar with spill response procedures, reporting requirements, and roles/ responsibilities.<br>At the completion of testing a report is produced to demonstrate the outcomes achieved against the tested objectives. The report will include the lessons learned, any improvement actions and a list of the participants. Alternatively, an assurance report, assurance records, or audit report may be produced. These reports record findings and include any recommendations for improvement. Improvement actions and their close-out are actively recorded and managed.<br>This is over and above the emergency management exercises conducted. |
| Additional comments | Please be advised maps showing surface oil concentrations from Loss of well containment and loss of cargo tank containment (Section 4) and Dispersant Application (Section 5) are still being finalised. |

[redacted]
Hydrocarbon Spill Adviser | Security & Emergency Management

**Email sent to DoT – 16 September August 2019**

Good Afternoon [redacted],

For your records please find attached the updated First Strike Plan with maps showing surface oil concentrations from Loss of well containment and loss of cargo tank containment (Section 4) and Dispersant Application (Section 5) included.

If you have any questions please don't hesitate to get in touch.

Kind Regards

[redacted]

**Email sent to AMSA (marine pollution) – 27 August 2019**

Good Evening [redacted]

As part of Woodside's ongoing consultation for its current and planned activities, I would like to advise WA Department of Transport (DoT) that Woodside are preparing the *Okha FPSO Facility Operations Environment Plan* and would like to offer DoT the opportunity to review or provide comment on the activity.

Information is presented as follows:

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- The *Okha FPSO Facility Operations Oil Pollution Emergency Plan* is attached. This will form part of the approval submission in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth). Please be advised maps showing surface oil concentrations from Loss of well containment and loss of cargo tank containment (Section 4) and Dispersant Application (Section 5) are still being finalised.

Woodside propose to submit an EP 18 October 2019 to support these activities.

Should you require additional information or have a comment to make about the proposed activity, please contact myself by close of business 9 October 2019 to allow us sufficient time to inform our activity planning and EP development.

Comments can be made by email, letter or by phone.

Please be aware that your feedback will be communicated to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), as is required under legislation.

We look forward to hearing from you.

Regards,

[redacted]

[redacted]
Hydrocarbon Spill Adviser | Security & Emergency Management
Woodside Energy Ltd

# APPENDIX G DEPARTMENT OF PLANNING LAND, HERITAGE AND ABORIGINAL ENQUIRY SYSTEM RESULTS

# Aboriginal Heritage Inquiry System

## List of Registered Aboriginal Sites



### Search Criteria

30 Registered Aboriginal Sites in Coordinates - Area (OKHA EMBA Coordinates.xlsx) - 118.448767301°E, 15.5004033702°S (GDA94) : 118.553058665°E, 15.9319365834°S (GDA94) : 118.607820635°E, 16.3426866669°S (GDA94) : 118.493338657°E, 16.6292993925°S (GDA94) : 118.654330929°E, 16.9236376144°S (GDA94) : 118.840008832°E, 17.2275563355°S (GDA94) : 119.095967663°E, 17.6178082135°S (GDA94) : 119.321132727°E, 17.6300061935°S (GDA94) : 119.66936142°E, 17.5647021742°S (GDA94) : 120.010600524°E, 17.5008209562°S (GDA94) : 120.095294477°E, 17.1625169072°S (GDA94) : 120.067986618°E, 16.8066521475°S (GDA94) : 119.997667574°E, 16.4569983671°S (GDA94) : 119.954762224°E, 16.1028820033°S (GDA94) : 119.949971169°E, 15.7450803551°S (GDA94) : 119.973184724°E, 15.3888595903°S (GDA94) : 120.127141047°E, 15.1231771145°S (GDA94) : 120.052175845°E, 15.4994767872°S (GDA94) : 120.064916022°E, 15.8280794815°S (GDA94) : 120.1676823°E, 16.1506167562°S (GDA94) : 120.317638883°E, 16.4732228966°S (GDA94) : 120.457061847°E, 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(GDA94) : 118.723559802°E, 15.023817774°S (GDA94)

15.023817774°S (GDA94)

### Disclaimer

The *Aboriginal Heritage Act 1972* preserves all Aboriginal sites in Western Australia whether or not they are registered. Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist.

The information provided is made available in good faith and is predominately based on the information provided to the Department of Planning, Lands and Heritage by third parties. The information is provided solely on the basis that readers will be responsible for making their own assessment as to the accuracy of the information. If you find any errors or omissions in our records, including our maps, it would be appreciated if you email the details to the Department at heritageenquiries@dplh.wa.gov.au and we will make every effort to rectify it as soon as possible.



### Coordinate Accuracy

Coordinates (Easting/Northing metres) are based on the GDA 94 Datum. Accuracy is shown as a code in brackets following the coordinates.

### Terminology (NB that some terminology has varied over the life of the legislation)

**Place ID/Site ID:** This a unique ID assigned by the Department of Planning, Lands and Heritage to the place.
**Status:**

- **Registered Site**: The place has been assessed as meeting Section 5 of the *Aboriginal Heritage Act 1972.*
- **Other Heritage Place which includes:**
  - **Stored Data / Not a Site:** The place has been assessed as not meeting Section 5 of the *Aboriginal Heritage Act 1972.*
  - **Lodged:** Information has been received in relation to the place, but an assessment has not been completed at this *stage* to determine if it meets Section 5 of the *Aboriginal Heritage Act 1972.*

**Access and Restrictions:**

- **File Restricted = No:** Availability of information that the Department of Planning, Lands and Heritage holds in relation to the place is not restricted in any way.
- **File Restricted = Yes:** Some of the information that the Department of Planning, Lands and Heritage holds in relation to the place is restricted if it is considered culturally sensitive. This information will only be made available if the Department of Planning, Lands and Heritage receives written approval from the informants who provided the information. To request access please contact heritageenquiries@dplh.wa.gov.au.
- **Boundary Restricted = No:** Place location is shown as accurately as the information lodged with the Registrar allows.
- **Boundary Restricted = Yes:** To preserve confidentiality the exact location and extent of the place is not displayed on the map. However, the shaded region (generally with an area of at least 4km²) provides a general indication of where the place is located. If you are a landowner and wish to find out more about the exact location of the place, please contact the Department of Planning, Lands and Heritage.
- **Restrictions:**
  - **No Restrictions:** *Anyone* can view the information.
  - **Male Access Only:** Only *males* can view restricted information.
  - **Female Access Only:** *Only* females can view restricted information.

**Legacy ID:** This is the former unique number that the former Department of Aboriginal Sites assigned to the place. This has been replaced by the Place ID / Site ID.

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| ID | Name | File Restricted | Boundary Restricted | Restrictions | Status | Type | Knowledge Holders | Coordinate | Legacy ID |
|---|---|---|---|---|---|---|---|---|---|
| 508 | POINT MURAT 03 | No | No | No Gender Restrictions | Registered Site | Artefacts / Scatter, Midden / Scatter | *Registered Knowledge Holder names available from DAA | 209042mE 7584688mN Zone 50 [Reliable] | P07503 |
| 509 | POINT MURAT 04 | No | No | No Gender Restrictions | Registered Site | Artefacts / Scatter | *Registered Knowledge Holder names available from DAA | 208690mE 7584604mN Zone 50 [Reliable] | P07504 |
| 563 | POINT MURAT 01 | No | No | No Gender Restrictions | Registered Site | Artefacts / Scatter, Midden / Scatter | *Registered Knowledge Holder names available from DAA | 208716mE 7585665mN Zone 50 [Reliable] | P07501 |
| 564 | POINT MURAT 02 | No | No | No Gender Restrictions | Registered Site | Artefacts / Scatter, Midden / Scatter | *Registered Knowledge Holder names available from DAA | 209079mE 7585539mN Zone 50 [Reliable] | P07502 |
| 628 | CAMP THIRTEEN BURIAL | No | No | No Gender Restrictions | Registered Site | Skeletal Material / Burial | *Registered Knowledge Holder names available from DAA | 800392mE 7559449mN Zone 49 [Reliable] | P07434 |
| 873 | MONTEBELLO IS: NOALA CAVE. | No | No | No Gender Restrictions | Registered Site | Artefacts / Scatter, Midden / Scatter, Rockshelter, BP Dating: 27,220 +/- 640 | *Registered Knowledge Holder names available from DAA | 348188mE 7741053mN Zone 50 [Reliable] | P07287 |
| 926 | MONTEBELLO IS: HAYNES CAVE. | No | No | No Gender Restrictions | Registered Site | Artefacts / Scatter, Midden / Scatter, Rockshelter, Arch Deposit | *Registered Knowledge Holder names available from DAA | 348289mE 7741005mN Zone 50 [Reliable] | P07286 |
| 6017 | YARDIE CREEK CARAVAN BURIAL | No | No | No Gender Restrictions | Registered Site | Skeletal Material / Burial | *Registered Knowledge Holder names available from DAA | 191538mE 7576555mN Zone 50 [Unreliable] | P07115 |
| 6311 | POINT MURAT. | No | No | No Gender Restrictions | Registered Site | Artefacts / Scatter, Midden / Scatter, Skeletal Material / Burial, Camp, Other: ? | *Registered Knowledge Holder names available from DAA | 208538mE 7584405mN Zone 50 [Reliable] | P06628 |
| 6761 | LOW POINT MIDDEN | No | No | No Gender Restrictions | Registered Site | Artefacts / Scatter, Midden / Scatter | *Registered Knowledge Holder names available from DAA | 802992mE 7566299mN Zone 49 [Reliable] | P06172 |
| 6762 | MILYERING MIDDEN | No | No | No Gender Restrictions | Registered Site | Artefacts / Scatter, Midden / Scatter | *Registered Knowledge Holder names available from DAA | 801342mE 7561449mN Zone 49 [Reliable] | P06173 |
| 6764 | CAMP 17 SOUTH MIDDENS | No | No | No Gender Restrictions | Registered Site | Artefacts / Scatter, Midden / Scatter | *Registered Knowledge Holder names available from DAA | 799042mE 7555649mN Zone 49 [Unreliable] | P06175 |

| ID | Name | File Restricted | Boundary Restricted | Restrictions | Status | Type | Knowledge Holders | Coordinate | Legacy ID |
|---|---|---|---|---|---|---|---|---|---|
| 6765 | CAMP 17 NORTH MIDDENS | No | No | No Gender Restrictions | Registered Site | Artefacts / Scatter, Midden / Scatter | *Registered Knowledge Holder names available from DAA | 799042mE 7555849mN Zone 49 [Unreliable] | P06176 |
| 6784 | MANDU MANDU CREEK SOUTH | No | No | No Gender Restrictions | Registered Site | Artefacts / Scatter, Midden / Scatter | *Registered Knowledge Holder names available from DAA | 796642mE 7548649mN Zone 49 [Unreliable] | P06142 |
| 6785 | MANDU MANDU CREEK NORTH | No | No | No Gender Restrictions | Registered Site | Artefacts / Scatter, Midden / Scatter | *Registered Knowledge Holder names available from DAA | 796642mE 7548649mN Zone 49 [Unreliable] | P06143 |
| 6801 | NORTH T-BONE BAY | No | No | No Gender Restrictions | Registered Site | Artefacts / Scatter, Midden / Scatter | *Registered Knowledge Holder names available from DAA | 801666mE 7562059mN Zone 49 [Reliable] | P06159 |
| 6827 | CORAL BAY SKELETON | No | No | No Gender Restrictions | Registered Site | Skeletal Material / Burial | *Registered Knowledge Holder names available from DAA | 785143mE 7445149mN Zone 49 [Unreliable] | P06132 |
| 7126 | MESA CAMP | No | No | No Gender Restrictions | Registered Site | Artefacts / Scatter, Midden / Scatter | *Registered Knowledge Holder names available from DAA | 798442mE 7554749mN Zone 49 [Unreliable] | P05792 |
| 7206 | WEALJUGOO MIDDEN. | No | No | No Gender Restrictions | Registered Site | Artefacts / Scatter, Midden / Scatter, Camp, Hunting Place | *Registered Knowledge Holder names available from DAA | 776584mE 7504740mN Zone 49 [Reliable] | P05710 |
| 7265 | LAKE SIDE VIEW | No | No | No Gender Restrictions | Registered Site | Artefacts / Scatter, Midden / Scatter | *Registered Knowledge Holder names available from DAA | 800942mE 7560549mN Zone 49 [Reliable] | P05664 |
| 7303 | TULKI WELL MIDDEN | No | No | No Gender Restrictions | Registered Site | Artefacts / Scatter, Midden / Scatter | *Registered Knowledge Holder names available from DAA | 798642mE 7554249mN Zone 49 [Reliable] | P05649 |
| 7305 | MANGROVE BAY. | No | No | No Gender Restrictions | Registered Site | Artefacts / Scatter, Midden / Scatter, Skeletal Material / Burial, Hunting Place | *Registered Knowledge Holder names available from DAA | 804142mE 7568149mN Zone 49 [Reliable] | P05651 |
| 10381 | VLAMING HEAD | Yes | Yes | No Gender Restrictions | Registered Site | Ceremonial, Mythological | *Registered Knowledge Holder names available from DAA | Not available when location is restricted | P01799 |
| 11400 | YARDIE CREEK STATION | No | No | No Gender Restrictions | Registered Site | Engraving | *Registered Knowledge Holder names available from DAA | 191638mE 7576655mN Zone 50 [Unreliable] | P00750 |

# Aboriginal Heritage Inquiry System

## List of Registered Aboriginal Sites



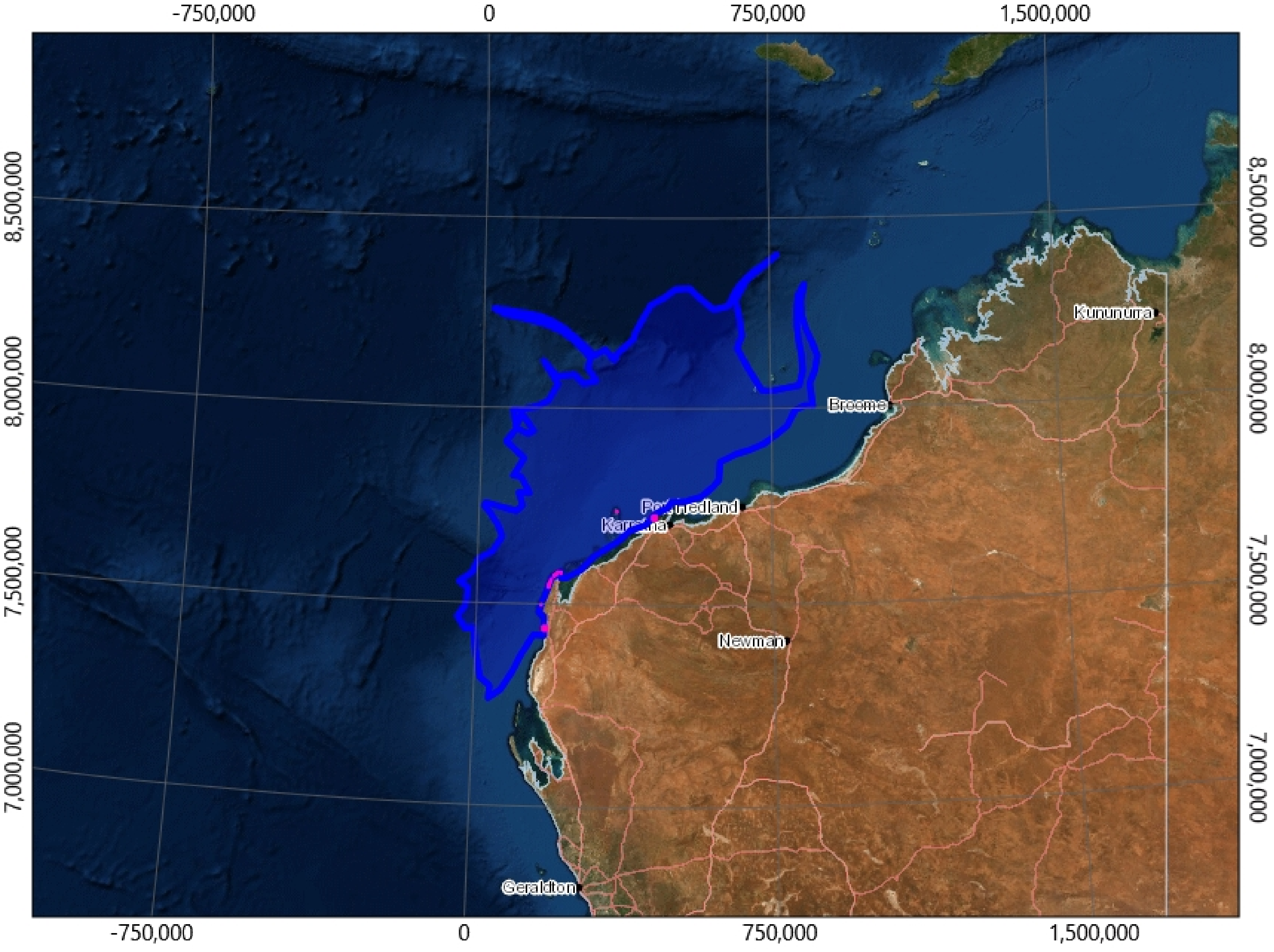
| ID | Name | File Restricted | Boundary Restricted | Restrictions | Status | Type | Knowledge Holders | Coordinate | Legacy ID |
|---|---|---|---|---|---|---|---|---|---|
| 11401 | 5 Mile Well (Cape Range) | No | No | No Gender Restrictions | Registered Site | Artefacts / Scatter, Engraving, Painting, Quarry, Arch Deposit | *Registered Knowledge Holder names available from DAA | 198638mE 7583655mN Zone 50 [Unreliable] | P00751 |
| 11820 | ENDERBY ISLAND 01 | No | No | No Gender Restrictions | Registered Site | Engraving | *Registered Knowledge Holder names available from DAA | 445137mE 7725156mN Zone 50 [Unreliable] | P00364 |
| 11885 | PADJARI MANU CAVE (Formerly Bunbury Cave) | Yes | Yes | No Gender Restrictions | Registered Site | Artefacts / Scatter, Ceremonial, Engraving, Painting, Arch Deposit, Water Source | *Registered Knowledge Holder names available from DAA | Not available when location is restricted | P00267 |
| 15322 | POINT MURAT/WHITE OPAL | No | No | No Gender Restrictions | Registered Site | Artefacts / Scatter, Midden / Scatter | *Registered Knowledge Holder names available from DAA | 209012mE 7585213mN Zone 50 [Reliable] | P07916 |
| 17447 | PAP HILL OCHRE | No | No | No Gender Restrictions | Registered Site | Ceremonial, Grinding Patches / Grooves, Rockshelter, Ochre | *Registered Knowledge Holder names available from DAA | 198327mE 7581741mN Zone 50 [Reliable] | |
| 17448 | CHUGORI ROCKHOLE | No | No | No Gender Restrictions | Registered Site | Ceremonial, Grinding Patches / Grooves, Man-Made Structure, Mythological, Water Source | *Registered Knowledge Holder names available from DAA | 193492mE 7579323mN Zone 50 [Reliable] | |

Department of Planning, Lands and Heritage
GOVERNMENT OF WESTERN AUSTRALIA

# Aboriginal Heritage Inquiry System

## Map of Registered Aboriginal Sites






Legend

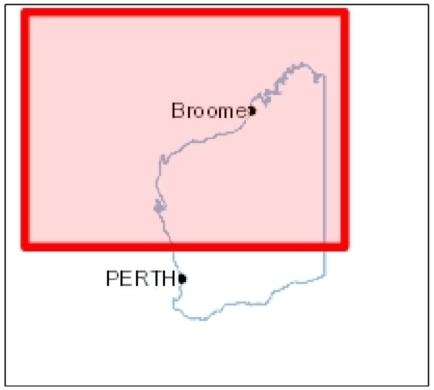
- Registered Aboriginal Site
- Search Area
- Town
- Road
- River
- Local Government Authority

525.96 kilometres

Map Scale 1 : 15,940,000

MGA Zone 50 (GDA94)





# APPENDIX H OIL POLLUTION FIRST STRIKE PLAN

# Okha Floating Production Storage and Offloading Facility Operations – Oil Pollution First Strike Plan

Security & Emergency Management
Hydrocarbon Spill Preparedness Unit

October 2019

Revision: C; Final Submission

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# OKHA FPSO FACILITY OPERATIONS

# OIL POLLUTION FIRST STRIKE PLAN

**SPILL FROM FACILITY INCLUDING SUBSEA INFRASTRUCTURE**

*(Note: Pipe laying and accommodation vessels are considered a "FACILITY" under Australian Regs).*

**LEVEL 1**
**CONTROL AGENCY:** WOODSIDE
**INCIDENT CONTROLLER:** Person In Charge (PIC) with support from Onshore Team Leader (OTL)

**LEVEL 2 & 3**
**CONTROL AGENCY:** WOODSIDE
**INCIDENT CONTROLLER:** CICC DUTY MANAGER

**SPILL FROM FACILITY INCLUDING SUBSEA INFRASTRUCTURE ENTERING STATE WATERS**

**LEVEL 1**
**CONTROL AGENCY:** WOODSIDE
**INCIDENT CONTROLLER:** CICC DUTY MANAGER

**LEVEL 2 & 3**
**CONTROL AGENCY:** WA Department of Transport (DoT)
**INCIDENT CONTROLLER:** DoT IC

**SPILL FROM VESSEL**

*(Note: SOPEP should be implemented in conjunction with this document)*

**LEVEL 1**
**CONTROL AGENCY:** AMSA
**INCIDENT CONTROLLER:** VESSEL MASTER (with response assistance from Woodside)

**LEVEL 2 & 3**
**CONTROL AGENCY:** AMSA
**INCIDENT CONTROLLER:** AMSA (with response assistance from Woodside)

# Oil Spill Incident Levels

The most significant characteristic of the below table is considered when determining oil spill incident level or escalation potential.

| Characteristic | Level 1 Indicators | Level 2 Indicators | Level 3 Indicators |
|---|---|---|---|
| General Description | Generally able to be resolved within 24-48 hours. | Generally response required beyond 48 hours. | Response may extend beyond weeks. |
| Woodside Emergency Management (EM)/ Crisis Management Team (CMT) Activation | Onsite Incident Controller (IC) activated. Use of ICC support may be required. | Additional support required from Corporate Incident Coordination Centre (CICC) Duty Manager (DM). | Includes Perth based CMT activation. |
| Number of Agencies | First-response agency and Incident Management Team (IMT) | Multi-agency response, | Agencies from across government and industry. |
| Environment | Isolated impacts or with natural recovery expected within weeks. | Significant impacts and recovery may take months. | Significant area and recovery may take months. Remediation required. |
| Economy | Business level disruption (i.e. Woodside). | Business failure or 'Channel' impacts. | Disruption to a sector. |
| Public Affairs | Local and regional media coverage (Western Australia). | National media coverage. | International media coverage. |
| Volumes | 0-10 $m^3$. | 10-1,000 $m^3$. | >1,000 $m^3$. |

**For guidance on credible spill scenarios and hydrocarbon characteristics refer to APPENDIX A – credible spill scenarios and Hydrocarbon Information**

## For Spills Entering State Waters

In the event of a spill where Woodside is the responsible party and the spill may impact State waters/shorelines, Woodside will notify Western Australia Department of Transport (DoT).

If the spill impacts State waters/shorelines and is a Level 1, Woodside will remain the Controlling Agency. If the spill is a Level 2/3 then WA DoT will become the Control Agency for the response in State waters/shorelines only. WA DoT will appoint an Incident Controller (IC) and form a separate IMT to manage the State waters/shorelines response only. The coordination structure for a concurrent hydrocarbon spill in both Commonwealth and State waters/shorelines is shown in APPENDIX E – Coordination Structure for a Concurrent Hydrocarbon Spill in Both Commonwealth & State Waters/Shorelines.

Initially Woodside will be required to make available an appropriate number of suitably qualified persons to work in the DoT IMT (see APPENDIX G – Woodside liaison officer resources to WA DoT). DoT's role as the Controlling Agency for Level 2 and 3 spills in State waters/shorelines does not negate the requirement for Woodside to have appropriate plans and resources in place to adequately respond or to commence the initial response actions to a spill prior to DoT establishing incident control in line with DoT Offshore Petroleum Industry Guidance Note, Marine Oil Pollution: Response and Consultation Arrangements;

http://www.transport.wa.gov.au/mediaFiles/marine/MAC_P_Westplan_MOP_OffshorePetroleumIndGuidance.pdf

Woodside's Incident Management Structure for a Hydrocarbon Spill, including Woodside Liaison Officer's command structure within DoT, can be seen at APPENDIX F – Woodside incident management structure.

# Response Process Overview

<table>
<tr><th colspan="3">Use the below to determine actions required and which parts of this plan are relevant to the incident.</th></tr>
<tr><th colspan="3">For guidance on credible scenarios and hydrocarbon characteristics, refer to APPENDIX A – credible spill scenarios and Hydrocarbon Information</th></tr>
<tr><td rowspan="2">ALL INCIDENTS</td><td colspan="2">Notify the Woodside Communication Centre (WCC) on:<br>[redacted]<br>or sat phone: [redacted]</td></tr>
<tr><td colspan="2">Incident Controller or delegate to make relevant notifications in Table 1-1 of this document.</td></tr>
<tr><td rowspan="3">LEVEL 1</td><th>FACILITY INCIDENT</th><th>VESSEL INCIDENT</th></tr>
<tr><td>Coordinate pre-identified tactics in Table 2-1: Level 1 Response Summary of this document.<br>Remember to download each Operational Plan.</td><td>Upon agreement with AMSA:<br>Coordinate pre-identified tactics in Table 2-1: Level 1 Response Summary of this document.<br>Remember to download each Operational Plan.</td></tr>
<tr><td colspan="2">If the spill escalates such that the site cannot manage the incident, inform the WCC on: [redacted] or sat phone [redacted] and escalate to a Level 2/3 incident.</td></tr>
<tr><td rowspan="4">LEVEL 2/3</td><th>FACILITY INCIDENT</th><th>VESSEL INCIDENT</th></tr>
<tr><td>Handover control to CICC for facility spill including from subsea infrastructure.<br>OR<br>Handover control to DoT for facility spill which has entered State waters.</td><td>Stand up CICC to assist AMSA.</td></tr>
<tr><td>Undertake quick revalidation of the recommended strategies on Table 3-1: Level 2/3 Response Summary taking into consideration seasonal sensitivities and current situational awareness.<br><br>Undertake validated strategies.</td><td>If requested by AMSA:<br>Undertake quick revalidation of the recommended strategies on Table 3-1: Level 2/3 Response Summary taking into consideration seasonal sensitivities and current situational awareness.<br><br>Undertake validated strategies.</td></tr>
<tr><td>Create an Incident Action Plan (IAP) for all ongoing operational periods.<br><br><u>The content of the IAP should reflect the selected response strategies based on current situational awareness.</u><br><br>For the full detailed pre-operational Net Environmental Benefit Analysis (NEBA) see Okha FPSO Facility Operations Pre-operational NEBA.</td><td>If requested by AMSA:<br>Create an IAP for all ongoing operational periods.<br><br><u>The content of the IAP should reflect the selected response strategies based on current situational awareness.</u><br><br>For the full detailed pre-operational Net Environmental Benefit Analysis (NEBA) see Okha FPSO Facility Operations Pre-operational NEBA.</td></tr>
</table>

# 1. NOTIFICATIONS (ALL LEVELS)

The Incident Controller or delegate must ensure the below notifications (Table 1-1) are completed within the designated timeframes.

For other environmental notifications required refer to the *Okha FPSO Facility Operations Environment Plan*.

**Table 1-1: Immediate Notifications**

| Notification timing | Responsibility | Authority/ Company | Name | Contact Number | Instruction | Form/ Template | Mark Complete (✓) |
|---|---|---|---|---|---|---|---|
| Notifications to be made for ALL LEVELS of spill<br>*(For spills from a vessel the following notifications must be undertaken by a WEL representative).* | | | | | | | |
| Immediately | Offshore Installation Manager (OIM) or Vessel Master | Woodside Communication Centre (WCC) | Duty Manager | [redacted]<br>or<br>[redacted]<br>or<br>Sat phone:<br>[redacted] | Verbally notify WCC of event and estimated volume and hydrocarbon type. | Verbal | |
| Within 2 hours | OIM or Woodside Site Rep (WSR) | National Offshore Petroleum Safety Environmental Management Authority (NOPSEMA[1]) | Incident notification office | [redacted] | Verbally notify NOPSEMA for spills >80L.<br>Record notification using Initial Verbal Notification Form or equivalent and send to NOPSEMA as soon as practicable (cc to NOPTA and DMIRS). | APPENDIX B – Forms<br>FORM 1 | |
| Within 3 days | OIM or WSR | | | | Provide a written NOPSEMA Incident Report Form as soon as practicable (no later than 3 days after notification) (cc to NOPTA and DMIRS).<br>NOPSEMA: submissions@nopsema.gov.au<br>NOPTA: resources@nopta.gov.au<br>DMIRS: petreps@dmirs.wa.gov.au | APPENDIX B – Forms<br>FORM 2 | |
| As soon as practicable | OIM or WSR | Woodside | Hydrocarbon Spill Preparedness (HSP) Manager | [redacted] | Verbally notify HSP Manager of event and estimated volume and hydrocarbon type. | Verbal | |

[1] Notification to NOPSEMA must be from a Woodside Representative.

| Notification timing | Responsibility | Authority/ Company | Name | Contact Number | Instruction | Form/ Template | Mark Complete (✓) |
|---|---|---|---|---|---|---|---|
| As soon as practicable | CICC DM or Delegate | Woodside | Duty Environment | As per roster | Verbally notify Duty Environment of event and seek advice on relevant performance standards from EP. | Verbal | |
| As soon as practicable | CICC DM or Delegate | Department of Environment and Energy | Director of National Parks (Director) | [redacted] | The Director is notified in the event of oil pollution within a marine park, or where an oil spill response action must be taken within a marine park, so far as reasonably practicable, prior to response action being taken. | Verbal | |
| Additional notifications to be made ONLY if spill is from a vessel | | | | | | | |
| Without delay as per protection of the Sea Act, part II, section 11(1) | Vessel Master | Australian Maritime Safety Authority (AMSA) | Response Coordination Centre (RCC) | [redacted] or [redacted] | Verbally notify AMSA RCC of the hydrocarbon spill.<br>Follow up with a written Marine Pollution Report (POLREP) as soon as practicable following verbal notification. | APPENDIX B – Forms<br>FORM 3 | |
| Additional Level 2/3 Notifications | | | | | | | |
| As soon as practicable | CICC DM or Delegate | Australian Marine Oil Spill Centre (AMOSC) | AMOSC Duty Manager | [redacted] | Notify AMOSC that a spill has occurred and follow-up with an email from the IC/CICC DM, CMT Leader or Oil Spill Preparedness Manager to formally activate AMOSC.<br>Determine what resources are required consistent with the AMOSPlan and detail in a Service Contract that will be sent to Woodside from AMOSC upon activation. | APPENDIX B – Forms<br>FORM 4 | |
| As soon as practicable | CICC DM or Delegate | Oil Spill Response Limited (OSRL) | OSRL Duty Manager | Singapore Office [redacted] | Contact OSRL Duty Manager and request assistance from technical advisor in Perth.<br>Send the notification form to OSRL as soon as practicable.<br>For mobilisation of resources, send the Mobilisation Form to OSRL as soon as practicable. | APPENDIX B – Forms<br>Notification: FORM 6a<br>Mobilisation: FORM 6b | |
| As soon as practicable or if spill is likely to extend into WA State waters | CICC DM or Delegate | WA Department of Transport (DoT) | DOT Duty Manager | [redacted] | Marine Duty Manager to verbally notify DoT that a spill has occurred and request use of equipment stored in the Exmouth supply shed at Harold E Holt if required. N.B. This would be additional to Woodside's own equipment | APPENDIX B – Forms<br>FORM 5 | |

| Notification timing | Responsibility | Authority/ Company | Name | Contact Number | Instruction | Form/ Template | Mark Complete (✓) |
|---|---|---|---|---|---|---|---|
| | | | | | stockpiles and those of its primary response contractors.<br>Follow up with a written POLREP as soon as practicable following verbal notification.<br>Additionally, DoT to be notified if spill is likely to extend into WA State waters. Request DoT to provide Liaison to WEL IMT. | | |
| As soon as practicable if there is potential for oiled wildlife or the spill is expected to contact land or waters managed by WA Department of Biodiversity, Conservation and Attractions | CICC DM or Delegate | WA Department of Biodiversity, Conservation and Attractions (DBCA) | Duty Officer | [redacted] | Phone call notification | Verbal | |
| As soon as practicable | CICC DM or Delegate | Marine Spill Response Corporation (MSRC) | MSRC Response Manager | [redacted] or [redacted] | Activate the contract with MSRC (in full) for the provision of up to 30 personnel depending on what skills are required. Please note that provision of these personnel from MSRC are on a best endeavours basis and are not guaranteed. | Verbal | |

# 2. LEVEL 1 RESPONSE

## 2.1 Mobilisation of Response Strategies

For the relevant hydrocarbon type, undertake quick revalidation of the recommended strategies and pre-identified tactics indicated with a 'Yes' in Table 2-1. Undertake all validated pre-identified tactics immediately. These tactics should be carried out using the associated plan identified under Table 2-1 Operational Plan column.

All response strategies and pre-identified tactics have been identified from the pre-operational NEBA presented in the Okha FPSO Facility Operations Environment Plan Appendix D: Oil Spill Preparedness and Response Mitigation Assessment.

**Table 2-1: Level 1 Response Summary**

| Response Strategies | Hydrocarbon Type | | Pre- Identified Tactics | Responsible | ALARP Commitment Summary | Complete ✓ | Link to Operational Plans for notification numbers and actions |
|---|---|---|---|---|---|---|---|
| | Marine Diesel | Cossack Light Crude | | | | | |
| **Monitor and Evaluate (Operational Monitoring)** | Yes | Yes | If a vessel is on location consider the need to deploy the oil spill tracking buoy. If no vessel is on location consider the need to mobilise oil spill tracking buoys from the King Bay Supply Base (KBSB) Stockpile.<br><br>If a surface sheen is visible from the facility deploy the satellite tracking buoy within 2 hours. | Operations | Tracking buoy deployed within 2 hours | | Surveillance and Reconnaissance to Detect Hydrocarbons and Resources at Risk (OM02) of The Operational Monitoring Operational Plan.<br><br>Deploy tracking buoy in accordance with APPENDIX D – Drifter Buoy Deployment Instructions. |
| | **Please consider instructing the CICC DM to activate or implement any of the following Pre-Identified tactics. The following tactics will assist in answering the '7 Questions of Spill Assessment' identified in Appendix C to increase situational awareness.** | | | | | | |
| | Yes | Yes | Undertake initial modelling using the Rapid Assessment Oil Spill tool Woodside Maps (Emergency Response) and weathering fate analysis using ADIOS (refer to the hydrocarbon information in APPENDIX A – credible spill scenarios and Hydrocarbon Information | Intelligence or Environment | Initial modelling within 6 hours using the Rapid Assessment Tool. Detailed modelling within 4 hours of APASA receiving information from Woodside. | | Predictive Modelling of Hydrocarbons to Assess Resources at Risk (OM01) of The Operational Monitoring Operational Plan. *Planning to download immediately and follow steps* |
| | Yes | Yes | Send Oil Spill Trajectory Modelling (OSTM) form (APPENDIX B – Forms, FORM 7) to RPS APASA response team (email [redacted]) and call [redacted] | Intelligence | | | |
| | Yes | Yes | Instruct Aviation Duty Manager to commence aerial observations in daylight hours. Aerial surveillance observer to complete log in APPENDIX B – Forms, FORM 8. | Logistics – Aviation | 2 trained aerial observers deployed by day 1.<br>1 aircraft available for 2 sorties per day from day 1.<br>Observer to compile report during flight and made available to the IMT within 2 hours of each sortie landing | | Surveillance and Reconnaissance to Detect Hydrocarbons and Resources at Risk (OM02) of The Operational Monitoring Operational Plan. *Planning to download immediately and follow steps* |

| Response Strategies | Hydrocarbon Type | | Pre- Identified Tactics | Responsible | ALARP Commitment Summary | Complete ✓ | Link to Operational Plans for notification numbers and actions |
|---|---|---|---|---|---|---|---|
| | Marine Diesel | Cossack Light Crude | | | | | |
| | Yes | Yes | The Intelligence Duty Manager should be instructed to stand up KSAT to provide satellite imagery of the spill (email [redacted] and call [redacted] | Intelligence | Service provider will confirm availability of an initial acquisition within 2 hours.<br>First image received within 24 hours of acceptance of the proposed acquisition plan. | | |
| | Yes | Yes | Consider the need to mobilise resources to undertake water quality monitoring (OM03). | Planning or Environment | Service provider deploy resources within 3 days:<br>- 3 specialists in water quality monitoring<br>- 2 monitoring systems and ancillaries<br>- 1 vessel for deploying the monitoring systems with a dedicated winch, A-frame or Hiab and ancillaries to deploy the equipment. | | Detecting and Monitoring for the Presence and Properties of Hydrocarbons in the Marine Environment (OM03) of The Operational Monitoring Operational Plan. |
| | Yes | Yes | Consider the need to mobilise resources to undertake pre-emptive assessment of sensitive receptors at risk (OM04). | Planning or Environment | Within 2 days, deployment of 2 specialists from resource pool in establishing the status of sensitive receptors. | | Pre-emptive Assessment of Sensitive Receptors (OM04) of The Operational Monitoring Operational Plan. |
| | Yes | Yes | Consider the need to mobilise resources to undertake shoreline assessment surveys (OM05). | Planning or Environment | Within 2 days deployment of 1 specialist(s) in Shoreline Clean-up Assessment Technique (SCAT) for each of the Response Protection Areas (RPAs) with predicted impacts. | | Shoreline Assessment (OM05) of The Operational Monitoring Operational Plan, |

# 3. LEVEL 2/3 RESPONSE

## 3.1 Mobilisation of Response Strategies

For the relevant hydrocarbon type, undertake quick revalidation of the recommended strategies and pre-identified tactics indicated with a 'Yes' in Table 3-1. Undertake all validated pre-identified tactics immediately. These tactics should be carried out using the associated plan identified under Table 3-1 Operational Plan column.

All response strategies and pre-identified tactics have been identified from the pre-operational NEBA presented in the Okha FPSO Facility Operations Environment Plan Appendix D: Oil Spill Preparedness and Response Mitigation Assessment.

**Table 3-1: Level 2/3 Response Summary**

| Response Strategies | Hydrocarbon Type | | Pre- Identified Tactics | Responsible | ALARP Commitment Summary | Complete ✓ | Link to Operational Plans for notification numbers and actions |
|---|---|---|---|---|---|---|---|
| | Marine Diesel | Cossack Light Crude | | | | | |
| **Monitor and Evaluate (Operational Monitoring)** | Yes | Yes | If a vessel is on location consider the need to deploy the oil spill tracking buoy. If no vessel is on location consider the need to mobilise oil spill tracking buoys from the King Bay Supply Base (KBSB) Stockpile.<br>If a surface sheen is visible from the facility deploy the satellite tracking buoy within 2 hours. | Operations | Tracking buoy deployed within 2 hours. | | Surveillance and Reconnaissance to Detect Hydrocarbons and Resources at Risk (OM02) of The Operational Monitoring Operational Plan.<br>Deploy tracking buoy in accordance with APPENDIX D – Drifter Buoy Deployment Instructions. |
| | Yes | Yes | Undertake initial modelling using the Rapid assessment oil spill tool Woodside Maps (Emergency Response) and weathering fate analysis using ADIOS (or refer to the hydrocarbon information in **Error! Not a valid result for table.**). | Intelligence or Environment | Initial modelling within 6 hours using the Rapid Assessment Tool.<br>Detailed modelling within 4 hours of APASA receiving information from Woodside. | | Predictive Modelling of Hydrocarbons to Assess Resources at Risk (OM01) of The Operational Monitoring Operational Plan. |
| | Yes | Yes | Send Oil Spill Trajectory Modelling (OSTM) form (APPENDIX B – Forms, FORM 7) to RPS APASA. | Intelligence | | | |
| | Yes | Yes | Instruct Aviation Duty Manager to commence aerial observations in daylight hours. Aerial surveillance observer to complete log in APPENDIX B – Forms, FORM 8. | Logistics – Aviation | 2 trained aerial observers' available by day 1.<br>1 aircraft available for 2 sorties per day from day 1.<br>Observer to compile report during flight and made available to the IMT within 2 hours of landing after each sortie. | | |

| Response Strategies | Hydrocarbon Type | | Pre- Identified Tactics | Responsible | ALARP Commitment Summary | Complete ✓ | Link to Operational Plans for notification numbers and actions |
|---|---|---|---|---|---|---|---|
| | Marine Diesel | Cossack Light Crude | | | | | |
| | | | | | Unmanned Aerial Vehicles/ Systems (UAV/UASs) to support tactics and as contingency if required. | | |
| | Yes | Yes | The Intelligence Duty Manager should be instructed to stand up KSAT to provide satellite imagery of the spill (email [redacted] and call [redacted]). | Intelligence | Service provider will confirm availability of an initial acquisition within 2 hours.<br>First image received with 24 hours of Woodside confirming its acceptance of the proposed acquisition plan.<br>Service provider to submit report to Woodside per image with polygon of any possible or identified slick(s) with metadata.<br>Data received to be uploaded into Woodside Common Operating Picture (COP daily) | | |
| | Yes | Yes | Consider the need to mobilise resources to undertake water quality monitoring (OM03). | Planning or Environment | Service provider to deploy resources within 3 days:<br>- 3 specialists in water quality monitoring<br>- 2 monitoring systems and ancillaries<br>- 1 vessel for deploying the monitoring systems with a dedicated winch, A-frame or Hiab and ancillaries to deploy the equipment.<br>Daily fluorometry reports will be provided to IMT.<br>Use of Autonomous Underwater Vehicles (AUVs) for hydrocarbon presence and detection may be used as a contingency. | | Detecting and Monitoring for the Presence and Properties of Hydrocarbons in the Marine Environment (OM03) of The Operational Monitoring Operational Plan. |

| Response Strategies | Hydrocarbon Type | | Pre- Identified Tactics | Responsible | ALARP Commitment Summary | Complete ✓ | Link to Operational Plans for notification numbers and actions |
|---|---|---|---|---|---|---|---|
| | Marine Diesel | Cossack Light Crude | | | | | |
| | Yes | Yes | Consider the need to mobilise resources to undertake pre-emptive assessment of sensitive receptors at risk (OM04). | Planning or Environment | Within 2 days, in agreement with WA DoT, deployment of 2 specialists | | Pre-emptive Assessment of Sensitive Receptors (OM04) of The Operational Monitoring Operational Plan. |
| | Yes | Yes | Consider the need to mobilise resources to undertake shoreline assessment surveys (OM05). | Planning or Environment | Within 2 days, in agreement with WA DoT, deployment of 1 specialist in SCAT for each of the Response Protection Areas (RPA) with predicted impacts. | | Shoreline Assessment (OM05) of The Operational Monitoring Operational Plan. |
| **Surface Dispersant** | No | Yes | Mobilise Karratha and Exmouth stockpiles.<br>Consider need to mobilise vessels for surface dispersant application, including:<br>• Woodside drilling support and offtake<br>• support vessels on / off location<br>• Woodside Exmouth pilot vessel<br>• Regional mutual aid vessel<br>Consider need to mobilise fixed wing aerial dispersant platforms<br>Consider need to mobilise OSRL Hercules C130 | Logistics, Marine and Planning | 1 aircraft with minimum payload of 1,850 litre mobilised to site within 4 hours of activation.<br>1 additional aircraft mobilised to site within another 20 hours of activation.<br>4 additional aircraft mobilised to site within 48 hours of activation.<br>1 high capacity aircraft with minimum payload of 10 $m^3$ available to spray on day 2.<br>2 offtake support vessels from integrated fleet will undertake dispersant trials within 48 hours of the release as per first strike plan.<br>Up to 4 vessels spraying per day by day 5.<br>Access to 5,000 $m^3$ of dispersant on activation of GDS membership within 24-48 hours. | | Surface Dispersants Operational Plan |
| **Mechanical Dispersion** | No | No | This strategy is not recommended. | | | | |

| Response Strategies | Hydrocarbon Type | | Pre- Identified Tactics | Responsible | ALARP Commitment Summary | Complete ✓ | Link to Operational Plans for notification numbers and actions |
|---|---|---|---|---|---|---|---|
| | Marine Diesel | Cossack Light Crude | | | | | |
| | | | It is of limited benefit in an open ocean environment where wind and wave action are likely to deliver similar advantages. | | | | |
| **Containment and Recovery** | No | Yes | Equipment from Woodside, AMOSC, DoT and AMSA Western Australian Stockpiles and relevant personnel mobilised. Mobilisation of rapid sweep systems (NOFI Buster Series, Desmi speed Sweep etc should be prioritised to increase encounter rates)<br><br>Consideration of mobilisation of interstate/international containment and recovery equipment and relevant personnel (i.e. OSRL). Mobilisation of rapid sweep systems (NOFI Buster Series, Desmi speed Sweep etc should be prioritised to increase encounter rates) | Logistics and Planning | 2 vessel-based containment and recovery operations would be deployed by day 2.<br><br>4 additional vessel-based containment and recovery operations using 3rd party provider resources would be deployed by day 10.<br><br>Deployment of 2 containment and recovery teams would be available by day 2, and 4 containment and recovery teams available by day 5.<br><br>Each operation will have internal or added 100 $m^3$ of liquid waste storage onboard. | | Containment and Recovery Operational Plan |
| **In Situ Burning** | No | No | This strategy is not recommended.<br><br>It requires calm sea state conditions which limits its feasibility in the region.<br><br>There are health and safety risks for response personnel associated with the containment and subsequent burning of hydrocarbons and the residue from attempts to burn would sink, posing a risk to the environment. | | | | |
| **Shoreline Protection and Deflection** | No | Yes | Woodside will mobilise and begin the shoreline protection and deflection response to reduce the volume of oil at shorelines by deploying protection and deflection equipment at selected RPA shorelines 5 days prior to impact (first | Operations and Planning | In agreement with WA DoT, activate relevant Tactical Response Plans (TRPs) within 24 hours of the release.<br><br>In agreement with WA DoT, mobilise teams (2 supervisors plus 10 additional personnel) to RPAs within | | Protection and Deflection Operational Plan<br>*Logistics to download immediately and follow steps*<br>Tactical Response Plans available from: |

| Response Strategies | Hydrocarbon Type | | Pre- Identified Tactics | Responsible | ALARP Commitment Summary | Complete ✓ | Link to Operational Plans for notification numbers and actions |
|---|---|---|---|---|---|---|---|
| | Marine Diesel | Cossack Light Crude | | | | | |
| | | | impact predicted to be in 7 days at Barrow Island).<br><br>Equipment from Woodside, AMOSC and AMSA Western Australian Stockpiles mobilised. Consideration of mobilisation of interstate/international shoreline protection equipment (i.e. OSRL). | | 48 hours of operational monitoring predicting impacts.<br><br>In agreement with WA DoT, equipment mobilised from closest stockpile within 48 hours.<br><br>Supplementary equipment mobilised from State, AMOSC, AMSA stockpiles within 48 hours. | | *Oil Spill Portal – Tactical Response Plans*<br>Relevant TRPs:<br>Mangrove Bay<br>Turquoise Bay<br>Yardie Creek<br>Ningaloo Reef - Refer to Mangrove/Turquoise bay and Yardie Creek<br>Barrow and Lowendal Islands<br>Montebello Island - Stephenson Channel Nth TRP<br>Montebello Island Champagne Bay and Chippendale channel TRP<br>Montebello Island - Claret Bay TRP<br>Montebello Island - Hermite/Delta Island Channel TRP<br>Montebello Island - Hock Bay TRP<br>Montebello Island - North and Kelvin Channel TRP<br>Montebello Island - Sherry Lagoon Entrance TRP<br>Barrow and Lowendal Islands TRP<br>Pilbara Islands - Southern Island Group TRP<br>Shark Bay Areas 1-11 TRPs<br>Exmouth Gulf TRP<br>Muiron Islands TRP |

| Response Strategies | Hydrocarbon Type | | Pre- Identified Tactics | Responsible | ALARP Commitment Summary | Complete ✓ | Link to Operational Plans for notification numbers and actions |
|---|---|---|---|---|---|---|---|
| | Marine Diesel | Cossack Light Crude | | | | | |
| | | | Mobilise security provider as per security support plan. | | | | Land Based Security Support Plan |
| **Shoreline Clean Up** | No | Yes | Equipment from Woodside, AMOSC and AMSA Western Australian Stockpiles and relevant personnel mobilised.<br>Consideration of mobilisation of interstate/international shoreline cleanup equipment and relevant personnel (i.e. OSRL). | Logistics and Planning | In agreement with WA DoT, deployment of 1 shoreline clean-up team to each contaminated RPA within 48 hours of operational monitoring predicting impacts.<br>Relevant Tactical Response Plans (TRPs) available for shoreline contacted by accumulation >100 g/m$^2$ within 48 hours of operational monitoring predicting impacts.<br>Access to at least 675 m$^3$ of solid and liquid waste storage available within 5 days upon activation of 3rd party contract. | | Shoreline Clean-up Operational Plan *Logistics to download immediately and follow steps* |
| | | | Mobilise security provider as per security support plan. | | | | Land Based Security Support Plan |
| **Oiled Wildlife Response** | Yes | Yes | If oiled wildlife is a potential impact, request AMOSC to mobilise containerised oiled wildlife first strike kits and relevant personnel. Refer to relevant Tactical Response Plan for potential wildlife at risk.<br>Mobilise AMOSC Oiled Wildlife Containers.<br>Consider whether additional equipment is required from local suppliers. | Logistics and Planning | Facilities for oiled wildlife rehabilitation are operational 24/7 | | Oiled Wildlife Response Operational Plan |
| **Scientific Monitoring (Type II)** | Yes | Yes | Notify Woodside science team of spill event. | Environment | | | Oil Spill Scientific Monitoring Programme – Operational Plan |

| Response Strategies | Hydrocarbon Type | | Pre- Identified Tactics | Responsible | ALARP Commitment Summary | Complete ✓ | Link to Operational Plans for notification numbers and actions |
|---|---|---|---|---|---|---|---|
| | Marine Diesel | Cossack Light Crude | | | | | |
| **For well integrity event the following strategies apply:** | | | | | | | |
| **Well Intervention – SFRT** | No | Yes | Debris clearance equipment to be mobilised prior to deployment of SSDI equipment. | Operations, Logistics and Drilling & Completions (source control) | Remotely Operated Vehicle (ROV) on Mobile Offshore Drilling Unit (MODU) ready for deployment within 48 hours, subject to risk assessment and approvals, to undertake inspection and/or well intervention.<br>Intervention vessel with minimum requirement of a working class ROV and operator – mobilised to site for deployment within 11 days.<br>ROV equipment deployed within 7 days. | | Source Control and Well Intervention Operational Plan |
| **Subsea Dispersant** | No | Yes | Consider the need to mobilise suitable support vessel and reeled injection unit. | Operations (Source Control Unit) | Equipment to be mobilised within 24 hours if required. SSDI operations to be deployed to the field within 12 days if required.<br>Access to 5,000 $m^3$ of dispersant on activation of GDS membership within 24-48 hours. | | Subsea First Response Toolkit (SFRT) and Capping Stack Operational Plan |
| **Capping Stack** | No | No | This strategy is not feasible as the Okha LH3 well has a vertical Xmas tree upon which a capping stack cannot be utilised. In the event of a complete loss of the Xmas tree, capping stack is still not considered viable as there will be no infrastructure upon which to land the cap and secure it for well control operations. | | | | |
| **Relief Well** | No | Yes | As per Okha FPSO Facility Operations – Blowout Contingency Plan. | Operations, Logistics and Drilling & Completions (source control) | ROV on MODU ready for deployment within 48 hours, subject to risk assessment and approvals, to undertake inspection and/or well intervention. | | Source Control and Well Intervention Operational Plan |

| Response Strategies | Hydrocarbon Type | | Pre- Identified Tactics | Responsible | ALARP Commitment Summary | Complete ✓ | Link to Operational Plans for notification numbers and actions |
|---|---|---|---|---|---|---|---|
| | Marine Diesel | Cossack Light Crude | | | | | |
| | | | | | Identify source control vessel availability within 24 hours. Vessel mobilised to site for deployment within 12 days.<br><br>Mobile Offshore Drilling Unit MODU mobilised to location within 21 days | | |

# 4. PRIORITY RECEPTORS

Note: DoT are the Control Agency to respond to all sites in a Level 2/3 spill into State waters/ shorelines. Woodside develops plans for incidents in State Waters/ shorelines and maintains capability in terms of resources for responding to incidents in state waters.

Action: Provide DoT with all relevant Tactical Response Plans for any locations predicted to be contacted.

Based on hydrocarbon spill risk modelling results there are no sensitive receptors identified as Response Protection Area (RPA), as they do not have the potential to be contacted by any hydrocarbon at or above threshold levels within 48 hours of a spill.

Oil Spill Trajectory Modelling (as per OM02) specific to the spill event will be required to determine the regional sensitive receptors to be contacted beyond 48 hours of a spill.

Preliminary hydrocarbon spill modelling results indicate the sensitive receptors listed in Table 4-1 have the potential to be contacted by hydrocarbons above threshold concentrations beyond 48 hours of a spill:

**Table 4-1: Receptors for Priority Protection**

| Receptor | Distance and Direction from Operational Area (km) | Minimum time to shoreline contact (above 100g/m$^2$) in days | Maximum shoreline accumulation (above 100g/m$^2$) in m$^3$ | Minimum time to shoreline contact (above 100g/m$^2$) in days | Maximum shoreline accumulation (above 100g/m$^2$) in m$^3$ | Tactical Response Plans/ Oiled Wildlife Response Plans (also available within the Data Directory) |
|---|---|---|---|---|---|---|
| | | Scenario 1 (MEE-01) | | Scenario 5 (MEE-05) | | |
| Ningaloo Coast North and World Heritage Area | 259 km south-west | 75 days (20 m$^3$) | 30 m$^3$ (day 77) | 40 days (0.3 m$^3$) | 1.1 m$^3$ (day 44) | • Mangrove Bay TRP<br>• Turquoise Bay TRP<br>• Yardie Creek TRP<br>• Exmouth OWRP |
| Montebello Islands and State Marine Park | 105 km south-west[2] | No contact | No contact | 11 days (71 m$^3$) | 113 m$^3$ (day 14) | • Montebello Island - Stephenson Channel Nth TRP<br>• Montebello Island Champagne Bay and Chippendale channel TRP<br>• Montebello Island - Claret Bay TRP<br>• Montebello Island - Hermite/Delta Island Channel TRP<br>• Montebello Island - Hock Bay TRP<br>• Montebello Island - North and Kelvin Channel TRP<br>• Montebello Island - Sherry Lagoon Entrance TRP<br>• Dampier Region OWRP |

[2] *Approximate distance to nearest landfall*

| | | | | | | |
|---|---|---|---|---|---|---|
| Barrow Island | 114 km south-westError! Bookmark not defined. | No contact | No contact | 12 days (4 $m^3$) | 63 $m^3$ (day 15) | • Barrow and Lowendal Islands TRP<br>• Dampier Region OWRP |
| Lowendal Islands | 103 km south-west[4] | No contact | No contact | 12 days (1 $m^3$) | 3 $m^3$ (day 16) | • Barrow and Lowendal Islands TRP Dampier Region OWRP |
| Pilbara Islands – Southern Islands Group | 233 km south-west | 76 days (1.4 $m^3$) | 66 $m^3$ (day 84) | 19 days (0.7 $m^3$) | 36 $m^3$ (day 40) | • Pilbara Islands - Southern Island Group TRP<br>• Dampier Region OWRP |
| Shark Bay World Heritage Area | 610 km south-west | 99 days (0.2 $m^3$) | 0.2 $m^3$ (99 days) | No contact | No contact | • Shark Bay Areas 1-11 TRPs<br>• Shark Bay OWRP |
| Exmouth Gulf West | 272 km south-west | 83 days (0.08 $m^3$) | 0.2 $m^3$ (87 days) | No contact | No contact | • Exmouth Gulf TRP<br>• Exmouth OWRP |
| Muiron Islands Marine Management Area and World Heritage Area | 259 km south-west | 75 days (0.3 $m^3$) | 41 $m^3$ (99 days) | 40 days (3 $m^3$) | 4 $m^3$ (day 45) | • Muiron Islands TRP<br>• Exmouth OWRP |

Tactical Response Plans for a number of these locations can be accessed via the Oil Spill Portal – Tactical Response Plans and are also listed in Table 3-1 and Table 4-1 of this document.

Please note that impact thresholds used to determine the Environment That May Be Affected (EMBA) identified in the Environment Plan are lower than response thresholds (Table 4-2).

**Table 4-2 Response Thresholds**

| Surface Hydrocarbon ($g/m^2$) | Description |
|---|---|
| >10[3] | Predicted minimum threshold for commencing operational monitoring |
| 50 | Predicted minimum floating oil threshold for effective containment and recovery and surface dispersant application [4] |
| 100 | Predicted optimum floating oil threshold for effective containment and recovery and surface dispersant application |
| | |
| 250 | Predicted minimum threshold for effective shoreline clean-up operations |

[3] Operational monitoring will be undertaken from the outset of a spill whether or not this threshold has been reached. Monitoring is needed throughout the response to assess the nature of the spill, track its location and inform the need for any additional monitoring and/or response techniques. It also informs when the spill has entered State Waters and/or control of the incident passes to statutory authorities e.g. WA DoT or AMSA.

[4] At 50g/$m^2$ containment and recovery and surface dispersant application operations are not expected to be particularly effective. This threshold represents a conservative approach to planning response capability and displaying the spread of surface oil.

Figure 4-1 illustrates the location of regional sensitive receptors in relation to the Okha FPSO Facility operational area and identifies priority protection areas. Figure 4-2 and Figure 4-3 illustrate the deterministic modelling results for scenario 1 (MEE-01) and scenario 5 (MEE-05). A total of 100 replicate simulations were completed for MEE-01 over an annual period to test for trends and variations in the trajectory and weathering of the spilled oil, with an even number of replicates completed using samples of metocean data that commenced within each calendar quarter (25 simulations per quarter). For MEE-05 a total of 200 replicate simulations were run over an annual period (50 simulations per quarter).

Consideration should be given to other stakeholders (including mariners) in the vicinity of the spill location. Table 4-3 indicates the assets within the vicinity of the Okha FPSO Facility operational area.

**Table 4-3: Assets in the vicinity of the Okha FPSO Facility operational area.**

| Asset | Distance and Direction from Okha FPSO Facility | Operator |
|---|---|---|
| Angel | 20 km east | Woodside |
| Goodwyn Alpha | 54 km south-west | Woodside |
| NRC | 32 km west | Woodside |
| Reindeer | 51 km south | Santos |
| Stag | 81 km south | Santos |
| Pluto | 122 km south-west | Woodside |

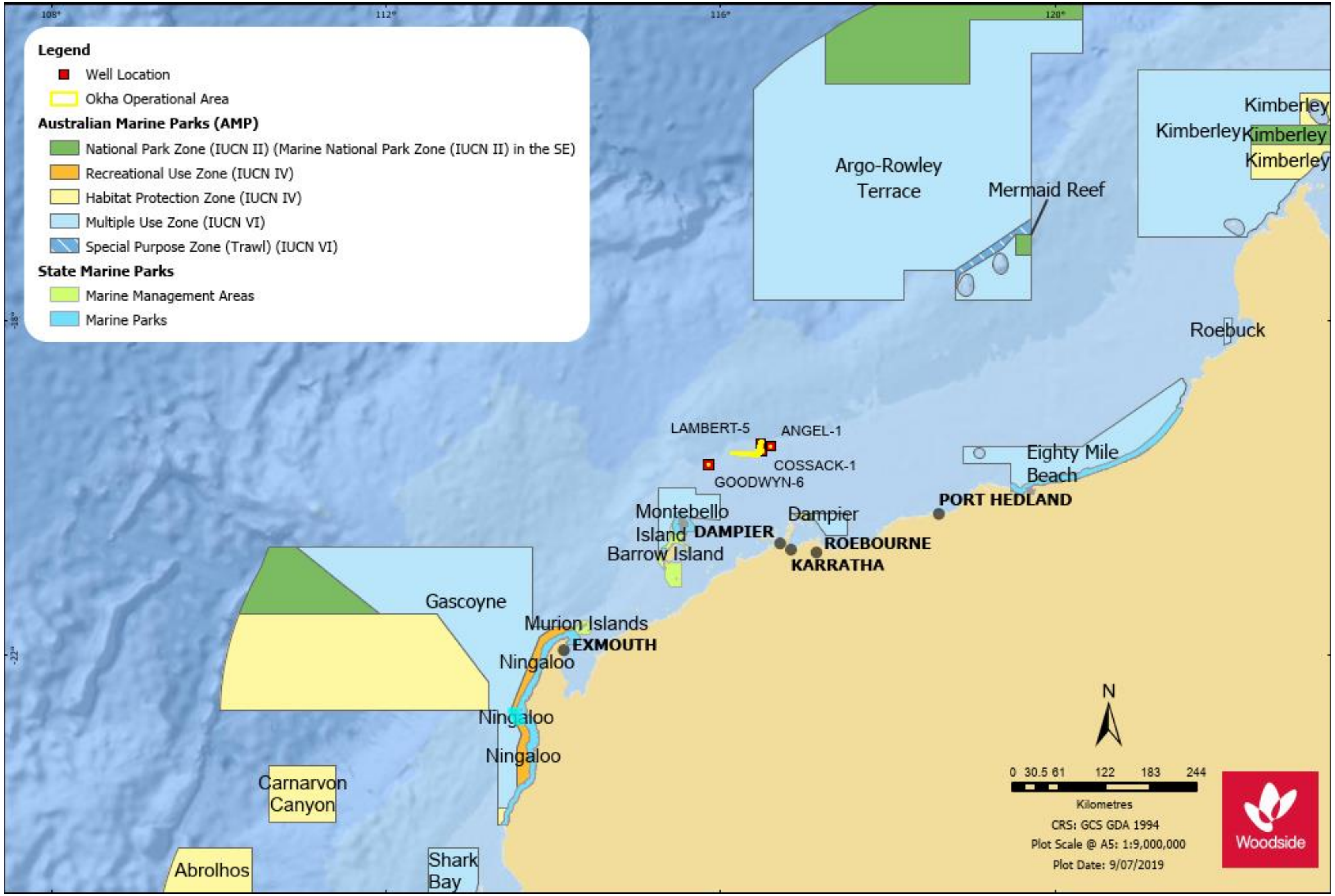



**Figure 4-1: Commonwealth and State Marine Protected Areas in relation to Okha FPSO Facility, Lat: 19° 26' 58.47" S Lon: 116° 29' 16.23" E**

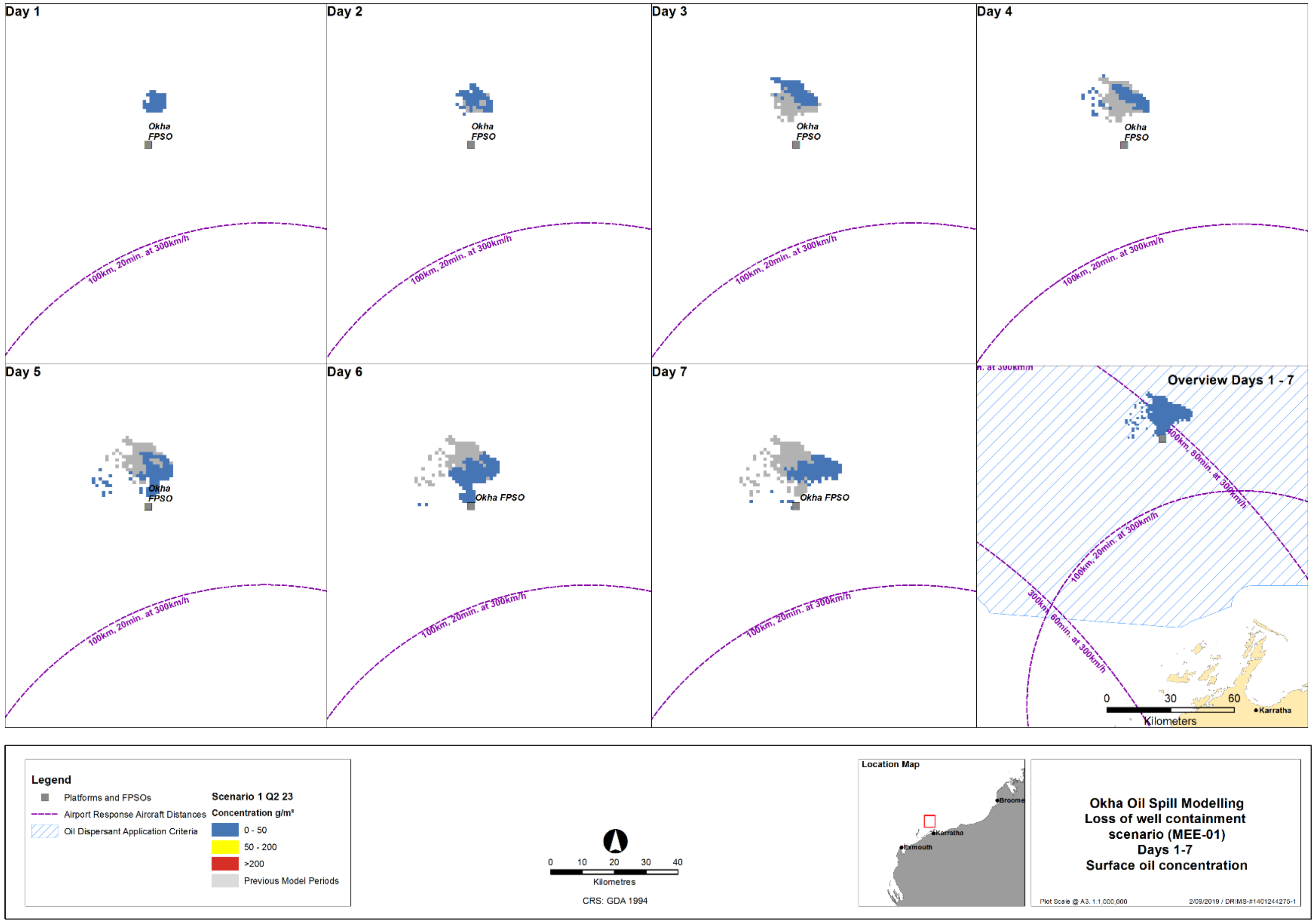



**Figure 4-2: Okha FPSO Facility loss of well containment (MEE-01) – Day 1-7 – Surface oil concentration**

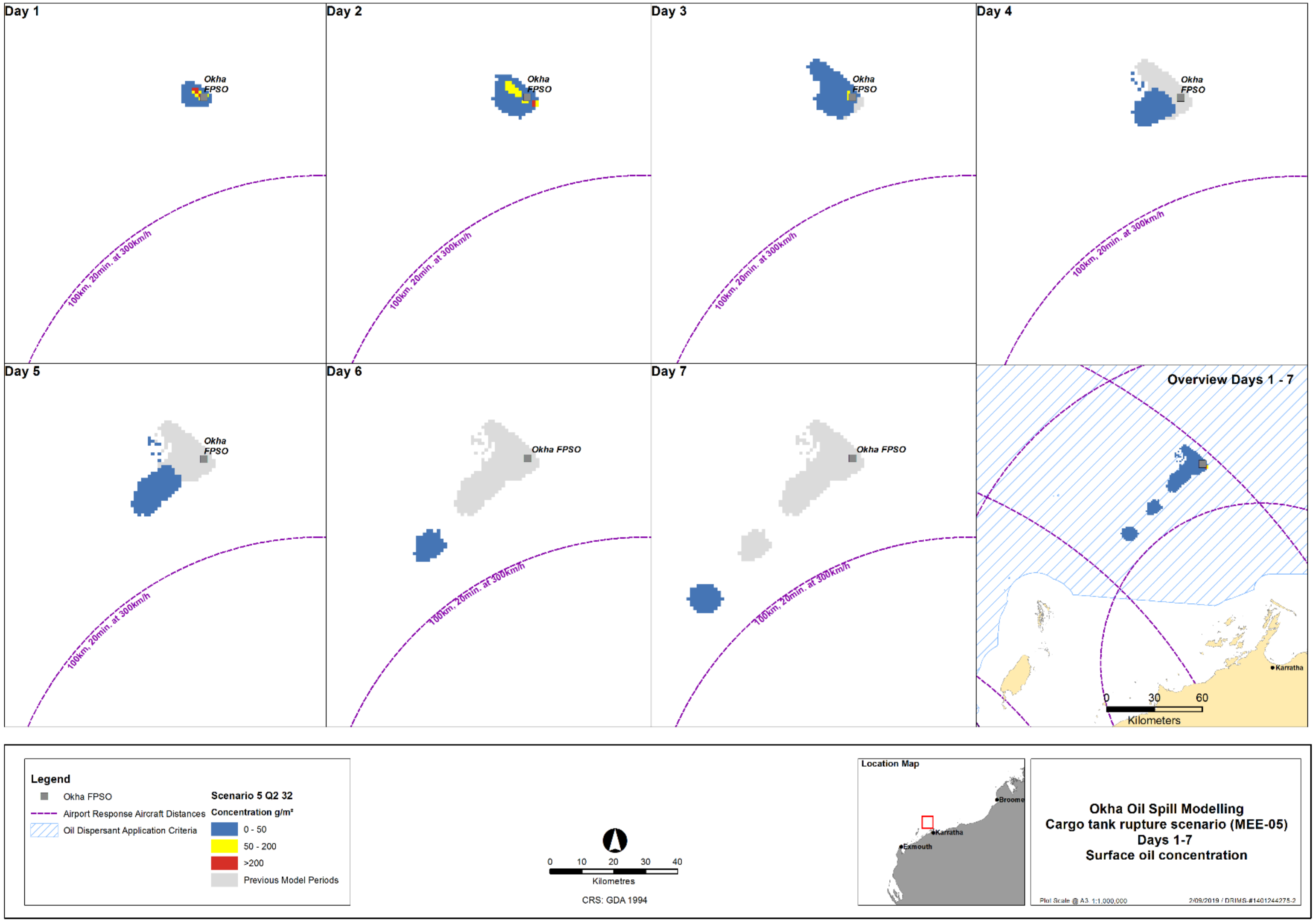



**Figure 4-3: Okha FPSO Facility loss of cargo tank containment (MEE-05) – Day 1-7 – Surface oil concentration**

# 5. DISPERSANT APPLICATION

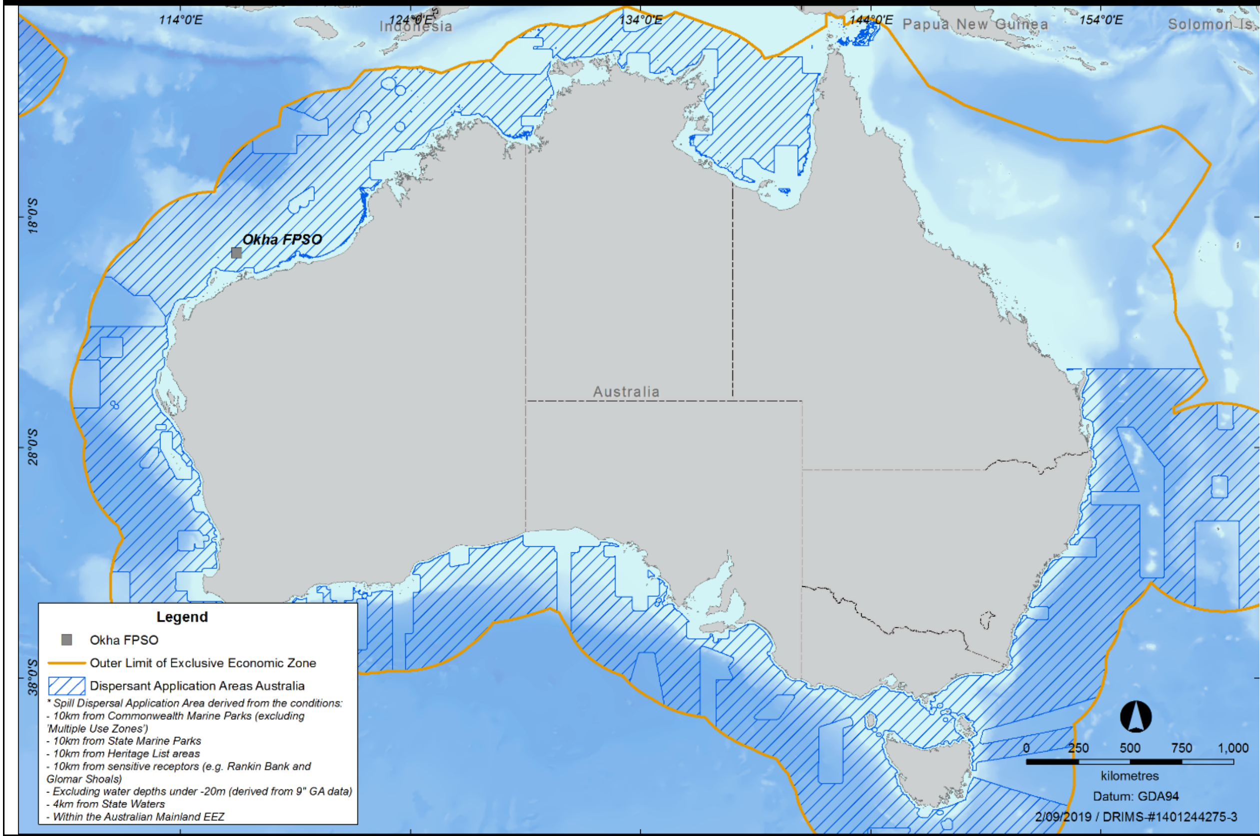
**INSTRUCTIONS**

**DISPERSANTS ARE PRE-APPROVED FOR USE IN THE BLUE STRIPED ZONE ONLY. OSCA APPROVED OR TRANSISTIONAL DISPERSANTS ARE PRE-APPROVED FOR USE.**

The shape file for the approved dispersant zone is saved in Woodside's Corporate Geodatabase by GTO.

The **SURFACE DISPERSANT OPERATIONAL PLAN** should be used to mobilise dispersant operations immediately – [Surface Dispersants Operational Plan]

**PRE-APPROVED DISPERSANT ZONE**




**DISPERSANT VOLUMES**

Current dispersant volumes available should be checked in the following document:
Oil Spill Preparedness – Dispersant Stockpiles Datasheet

# APPENDIX A – CREDIBLE SPILL SCENARIOS AND HYDROCARBON INFORMATION

***For more detailed hydrocarbon information see the***
Hydrocarbon Data Directory

## Credible Spill Scenarios

| Scenario | Product | Maximum Volumes | Suggested ADIOS2 Analogue* |
|---|---|---|---|
| MEE-01<br>Uncontrolled subsea hydrocarbon release caused by loss of well containment after a loss of well control | Cossack Light Crude | 185,915 $m^3$ | Cossack Light Crude API 48.1 |
| MEE-02<br>An instantaneous subsea release due to a flowline or riser rupture at the midpoint of the WC Production Line flowline | Cossack Light Crude | 773 $m^3$ | Cossack Light Crude API 48.1 |
| MEE-03<br>Instantaneous surface hydrocarbon release due to a support vessel tank rupture | Marine diesel | 105 $m^3$ | Diesel Fuel Oil (Southern USA 1) API of 37.2 |
| MEE-04<br>Instantaneous surface release due to an offtake system failure or incident | Cossack Light Crude | 724 $m^3$ | Cossack Light Crude API 48.1 |
| MEE-05<br>Uncontrolled hydrocarbon release representing a loss of containment after a vessel cargo tank rupture | Cossack Light Crude | 30,302 $m^3$ | Cossack Light Crude API 48.1 |

### Cossack Light Crude

Cossack Light Crude (API 48.1) contains a moderate proportion (15.3% by mass) of hydrocarbon compounds that will not evaporate at atmospheric temperatures. These compounds will persist in the marine environment.

The unweathered mixture has a dynamic viscosity of 1.40 cP. The pour point of the whole oil (-24 °C) ensures that it will remain in a liquid state over the annual temperature range observed on the North West Shelf.

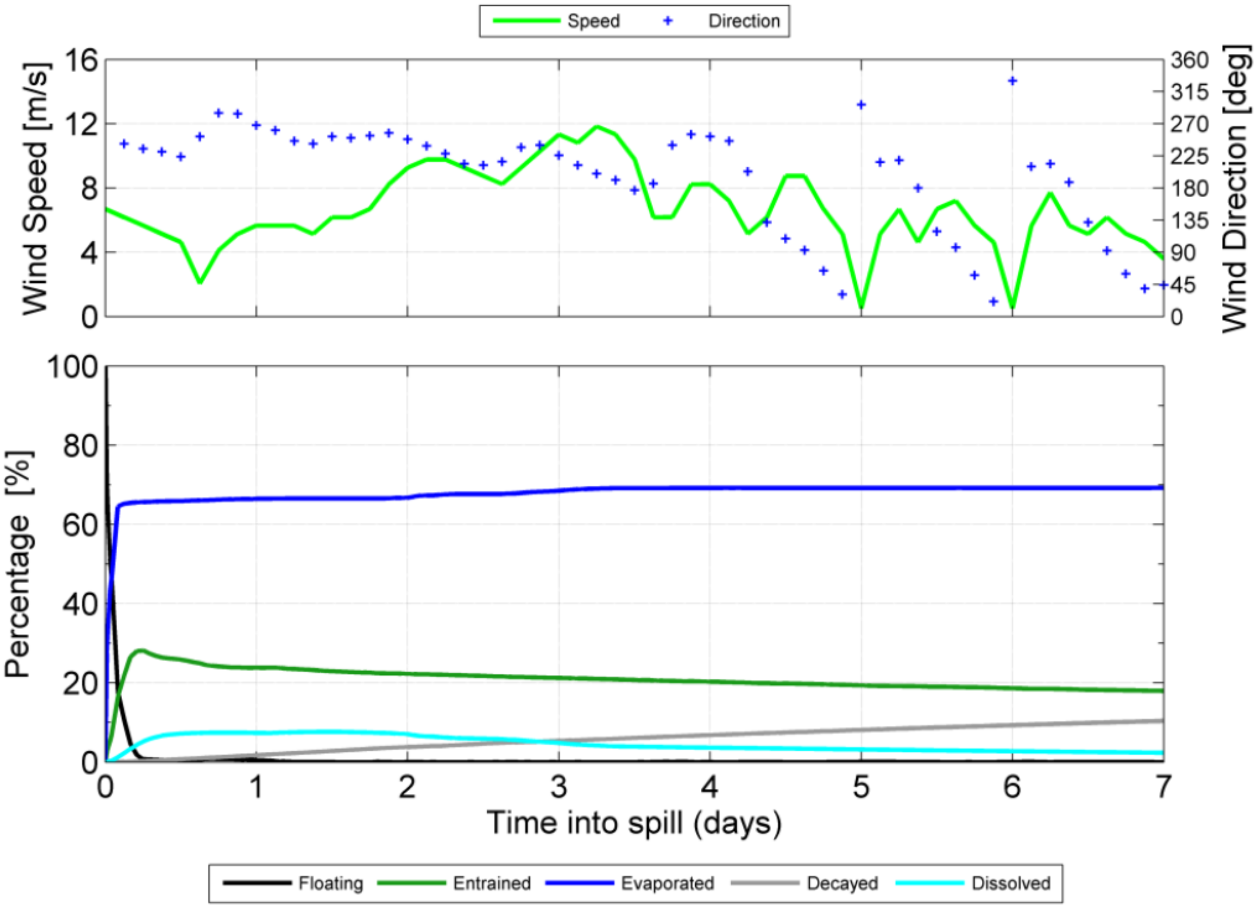



**Figure A-0-1: Proportional mass balance plot representing the weathering of Cossack Light Crude spilled onto the water surface as a one-off release (50 m$^3$ over 1 hour) and subject to variable wind at 27 °C water temperature and 25 °C air temperature.**

The increased level of entrainment in the variable-wind case will result in higher levels of biological and photochemical degradation, with an approximate rate of 1.5% per day and an accumulated total of 10% after 7 days in comparison to a rate of ~0.5% per day and an accumulated total of 3.6% after 7 days in the constant-wind case. The slow degradation of the weathered crude will extend the area of potential effect, requiring the break-up and dispersion of the slicks to reduce concentrations below the thresholds considered in this study.

The results of the OILMAP simulation predict that the discharge will generate a cone of rising gas that will entrain the oil droplets and ambient sea water up to the water surface. The mixed plume is initially forecast to jet towards the water surface with a vertical velocity of around 3 m/s, gradually slowing and increasing in plume diameter as more ambient water is entrained. The diameter of the central cone of rising water and oil at the point of surfacing is predicted to be approximately 16 m.

The ongoing nature of the release combined with the potential for the plume to breach the water surface may present other hazards, including conditions that may lead to high local concentrations of atmospheric volatiles. These issues should be considered when evaluating the practicality of response operations at or near the blowout site. The results suggest that beyond the immediate vicinity of the blowout the majority of the released hydrocarbons will be present in the upper layers of the ocean, with the potential for oil to form floating slicks under sufficiently calm local wind conditions.

## Marine diesel

Marine diesel is a mixture of volatile and persistent hydrocarbons with low proportions of highly volatile and residual components. In general, about 6% of the oil mass should evaporate within the first 12 hours (BP < 180 °C); a further 35% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and a further 54% should evaporate over several days (265 °C < BP < 380 °C). Approximately 5% of the oil is shown to be persistent. The aromatic content of the oil is approximately 3%.

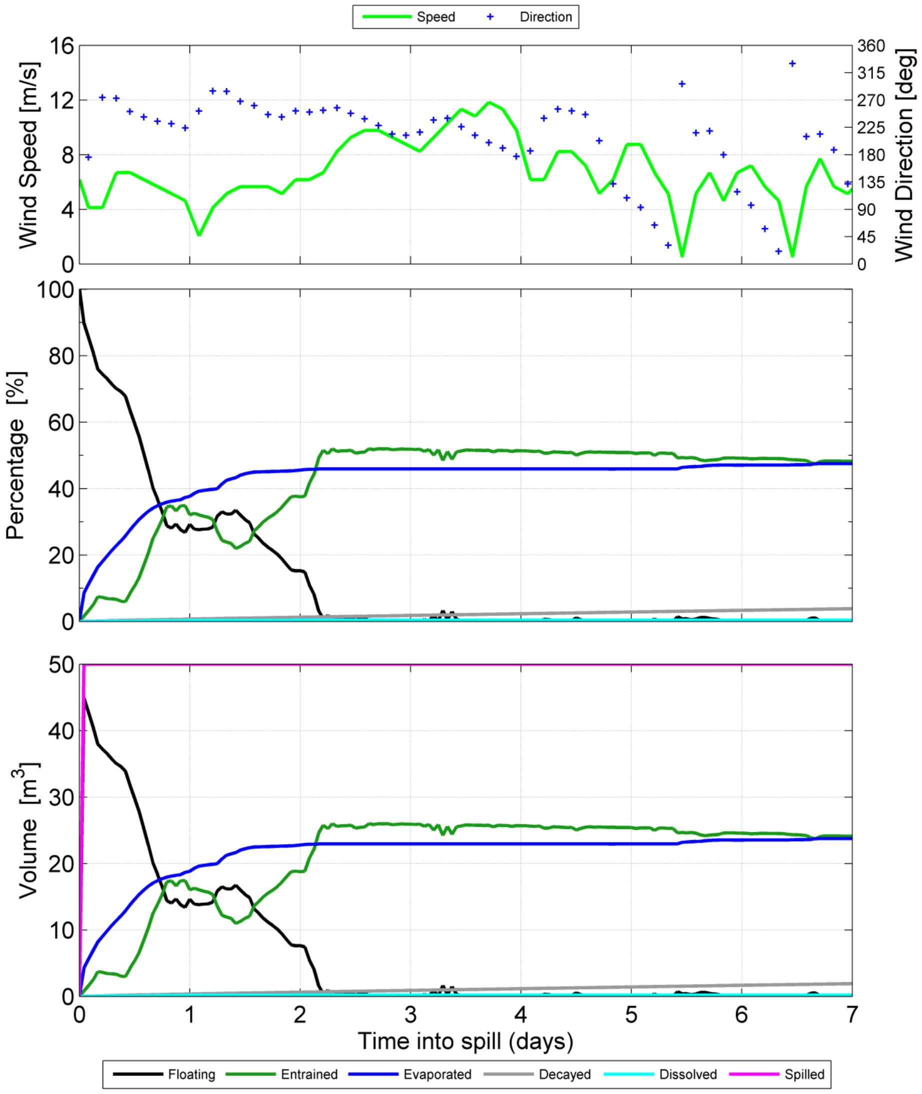



**Figure A-0-2: Proportional mass balance plot representing, as proportion (middle panel) and volume (bottom panel), the weathering of marine diesel spilled onto the water surface as a one-off release (50 m$^3$ over 1 hour) and subject to variable winds (top panel) at 27 C water temperature**

# APPENDIX B – FORMS

| Form No. | Form Name | Link (if available) |
|---|---|---|
| 1 | Record of Initial Verbal Notification to NOPSEMA Template | Link |
| 2 | NOPSEMA Incident Report Form | Link |
| 3 | Marine Pollution Report (POLREP – AMSA) | Link |
| 4 | AMOSC Service Contract | Link |
| 5 | Marine Pollution Report (POLREP – DoT) | Link |
| 6a | OSRL Initial Notification Form | Link |
| 6b | OSRL Mobilisation Activation Form | Link |
| 7 | APASA Oil Spill Trajectory Modelling Request | Link |
| 8 | Aerial Surveillance Observer Log | Link |

**FORM 1**

# Record of initial verbal notification to NOPSEMA

Woodside

## (NOPSEMA ph: (08) 6461 7090)

| | |
|---|---|
| **Date of call** | |
| **Time of call** | |
| **Call made by** | |
| **Call made to** | |

## Information to be provided to NOPSEMA:

| | |
|---|---|
| **Date and Time of incident/time caller became aware of incident** | |
| **Details of incident** | 1. **Location** ________________<br>2. **Title**________________<br>3. **Hydrocarbon source**<br>□ **Platform**________________<br>□ **Pipeline**________________<br>□ **FPSO**________________<br>□ **Exploration drilling**________________<br>□ **Well**________________<br>□ **Other (please specify)** ________________<br>4. **Hydrocarbon type**________________<br>5. **Estimated volume of hydrocarbon** ________________<br>6. **Has the discharge ceased?** ________________<br>7. **Fire, explosion or collision?** ________________<br>8. **Environment Plan(s)** ________________<br>9. **Other Details**________________ |
| **Actions taken to avoid or** | |

| | |
|---|---|
| **mitigate environmental impacts** | |
| **Corrective actions taken or proposed to stop, control or remedy the incident** | |

**After the initial call is made to NOPSEMA, please send this record as soon as practicable to:**

1. **NOPSEMA** **submissions@nopsema.gov.au**
2. **NOPTA** **resources@nopta.gov.au**
3. **DMIRS** **petreps@dmirs.wa.gov.au**

# FORM 2

**[insert NOPSEMA Incident Report Form when printing]**
**Link**

# FORM 3

## [insert Marine Pollution Report (POLREP – AMSA) when printing]

**Link**

# FORM 4

**[insert AMOSC Service Contract when printing]**
**Link**

# FORM 5

**[insert Marine Pollution Report (POLREP – DoT) when printing]**
**Link**

# FORM 6a

**[insert OSRL Initial Notification Form when printing]**
**Link**

# FORM 6b

**[insert OSRL Mobilisation Activation Form when printing]**
**Link**

# FORM 7

**[insert APASA Oil Spill Trajectory Modelling Request when printing]**
**Link**

# FORM 8

**[insert Aerial Surveillance Observer Log when printing]**
**Link**

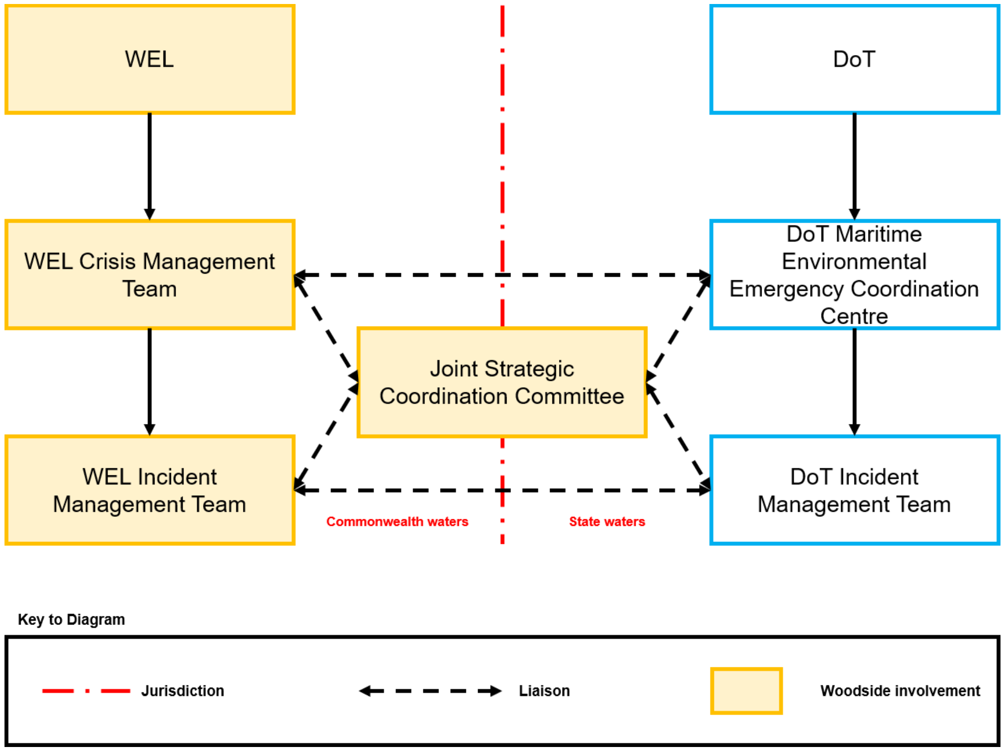
# APPENDIX C – 7 QUESTIONS OF SPILL ASSESSMENT

| | |
|---|---|
| **WHAT IS IT?**<br>Oil Type/name<br>Oil properties<br>Specific gravity / viscosity / pour point / asphaltenes / wax content / boiling point | |
| **WHERE IS IT?**<br>Lat/Long<br>Distance and bearing | |
| **HOW BIG IS IT?**<br>Area<br>Volume | |
| **WHERE IT IS GOING?**<br>Weather conditions<br>Currents and tides | |
| **WHAT IS IN THE WAY?**<br>Resources at risk | |
| **WHEN WILL IT GET THERE?**<br>Weather conditions<br>Currents and tides | |
| **WHAT'S HAPPENING TO IT?**<br>Weathering processes | |

# APPENDIX D – DRIFTER BUOY DEPLOYMENT INSTRUCTIONS

**(Insert instructions when printing)**

# APPENDIX E – COORDINATION STRUCTURE FOR A CONCURRENT HYDROCARBON SPILL IN BOTH COMMONWEALTH & STATE WATERS/SHORELINES[5]

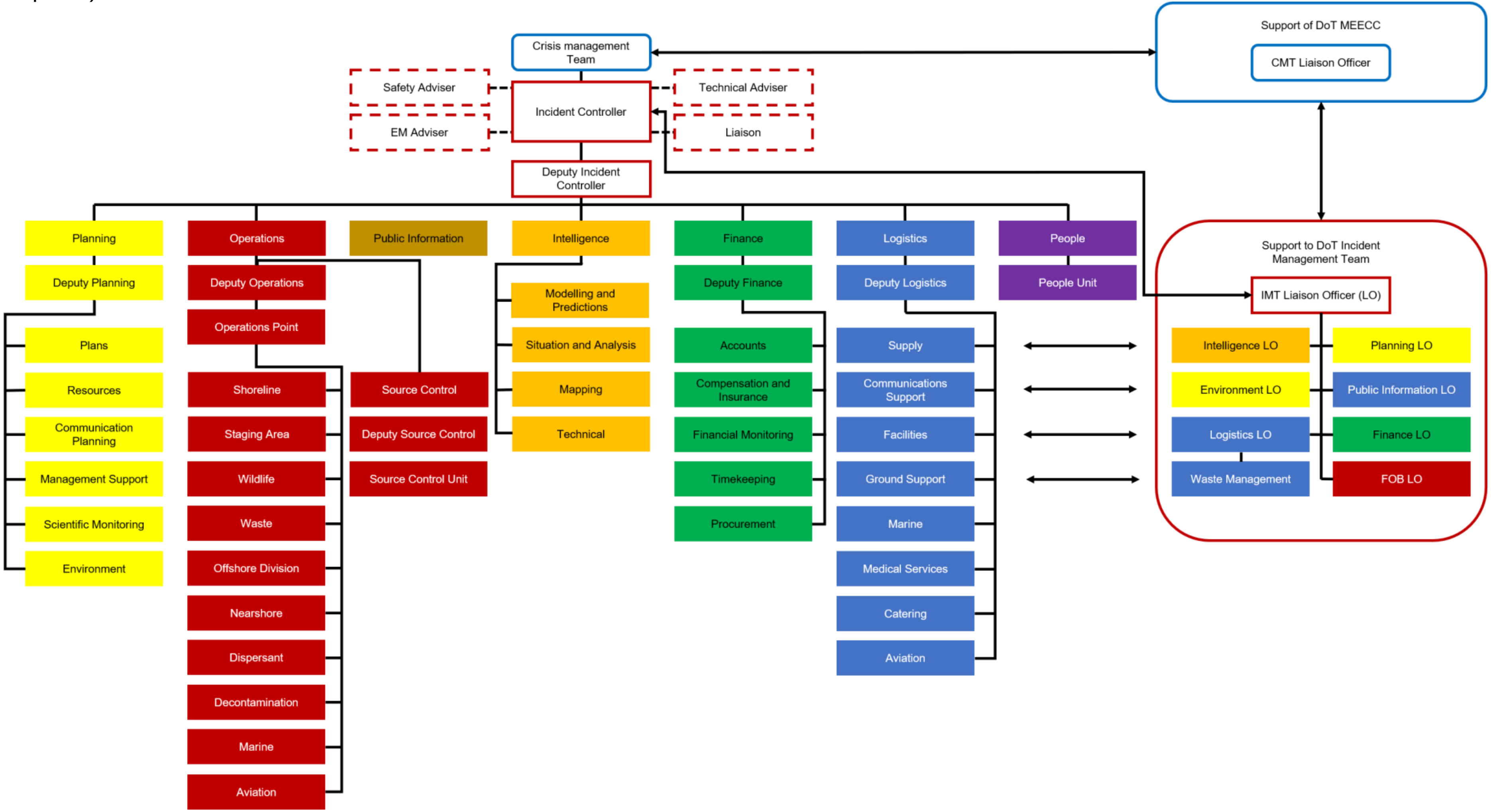



The Control Agency for a hydrocarbon spill in Commonwealth waters/shorelines resulting from an offshore petroleum activity is Woodside (the Petroleum Titleholder). The Control Agency for a hydrocarbon spill in State waters/shorelines resulting from an offshore petroleum activity is DoT. DoT will appoint an Incident Controller and form a separate IMT to only manage the spill within State waters/shorelines.

[5] Adapted from DoT Offshore Petroleum Industry Guidance Note, Marine Oil Pollution: Response and Consultation Arrangements September 2018. Note: For full structure up to Commonwealth Cabinet/Minister refer to Marine Oil Pollution: Response and Consultation Arrangements Section 6.5, Figure 4.

# APPENDIX F – WOODSIDE INCIDENT MANAGEMENT STRUCTURE

Woodside Incident Management Structure for Hydrocarbon Spill (including Woodside Liaison Officers Command Structure within WA DoT IMT if required).



# APPENDIX G – WOODSIDE LIAISON OFFICER RESOURCES TO WA DOT

Once WA DoT activates a State waters/shorelines IMT, Woodside will make available the following roles to WA DoT.

| Area | WEL Liaison Role | Personnel Sourced from[6]: | Key Duties | # |
|---|---|---|---|---|
| DoT MEECC | CMT Liaison Officer | CMT Duty Managers Roster | • Provide a direct liaison between the CMT and the MEECC.<br>• Facilitate effective communications and coordination between the CMT and State Maritime Environment Emergency Coordinator (SMEEC).<br>• Offer advice to SMEEC on matters pertaining to PT crisis management policies and procedures. | 1 |
| DoT IMT Incident Control | WEL IMT Liaison Officer | CICC Duty Managers Reserve List Roster | • Provide a direct liaison between the PT IMT and DoT IMT.<br>• Facilitate effective communications and coordination between the PT IC and the DoT IC.<br>• Offer advice to the DoT IC on matters pertaining to PT incident response policies and procedures.<br>• Offer advice to the Safety Coordinator on matters pertaining to PT safety policies and procedures, particularly as they relate to PT employees or contractors operating under the control of the DoT IMT. | 1 |
| DoT IMT Planning-Intelligence/ Mapping | Intelligence Liaison Officer | AMOSC Staff Member or AMOSC Core Group | • Facilitate the provision of relevant modelling and predications from the PT IMT.<br>• Assist in the interpretation of modelling and predictions originating from the PT IMT.<br>• Facilitate the provision of relevant situation and awareness information originating from the DoT IMT to the PT IMT.<br>• Facilitate the provision of relevant mapping from the PT IMT.<br>• Assist in the interpretation of mapping originating from the PT IMT.<br>• Facilitate the provision of relevant mapping originating from the DoT IMT to the PT IMT. | 1 |
| DoT IMT Planning-Plans/ Resources | Planning Liaison Officer | AMOSC Core Group/CICC Planning Coordinator Reserve List and Planning Group 3 | • Facilitate the provision of relevant IAP and sub plans from the PT IMT.<br>• Assist in the interpretation of the PT OPEP from the PT.<br>• Assist in the interpretation of the PT IAP and sub plans from the PT IMT.<br>• Facilitate the provision of relevant IAP and sub plans originating from the DoT IMT to the PT IMT.<br>• Assist in the interpretation of the PT existing resource plans.<br>• Facilitate the provision of relevant components of the resource sub plan originating from the DoT IMT to the PT IMT. | 1 |
| DoT IMT<br>Planning-Environment | Environmental Liaison Officer | CMT Environmental FST Duty Managers Roster | • Assist in the interpretation of the PT OPEP and relevant TRP plans.<br>• Facilitate in requesting, obtaining and interpreting environmental monitoring data originating from the PT IMT.<br>• Facilitate the provision of relevant environmental information and advice originating from the DoT IMT to the PT IMT. | 1 |

[6] See Combined CICC, KICC, CMT roster & Preparedness Schedule / AMOSC Service Contract

| | | | | |
|---|---|---|---|---|
| DoT IMT<br><br>Public Information-Media/ Community Engagement | Public Information & Media Liaison Officer | CMT Reputation {Media} FST Duty Manager Roster | • Facilitate effective communications and coordination between the PT and DoT media teams.<br>• Assist in the release of joint media statements and conduct of joint media briefings.<br>• Assist in the release of joint information and warnings through the DoT Information & Warnings team.<br>• Offer advice to the DoT Media Coordinator on matters pertaining to PT media policies and procedures.<br>• Facilitate effective communications and coordination between the PT and DoT Community Liaison teams.<br>• Assist in the conduct of joint community briefings and events.<br>• Offer advice to the DoT Community Liaison Coordinator on matters pertaining to the PT community liaison policies and procedures.<br>• Facilitate the effective transfer of relevant information obtained from through the Contact Centre to the PT IMT. | 1 |
| DoT IMT<br><br>Logistics-Supply | Logistic Liaison Officer | CMT Services FST Logistics Team 2 Roster | • Facilitate the acquisition of appropriate supplies through the PTs existing OSRL, AMOSC and private contract arrangements.<br>• Collects Request Forms from DoT to action via PT IMT. | 1 |
| DoT IMT<br><br>Logistics-Waste | Waste Management Liaison Officer | CMT Services FST Logistics Team 2 and WEL Waste Contractor Roster | • Facilitate the acquisition of appropriate services and supplies through the PTs existing private contract arrangements related to waste management.<br>• Collects Request Forms from DoT to action via PT IMT. | 1 |
| DoT IMT<br><br>Finance-Accounts/ Financial Monitoring | Finance Liaison Officer | CICC Finance Coordinator Roster | • Assist the DoT Finance Officer in time keeping and the setting up and payment of accounts for those services acquired through the PTs existing OSRL, AMOSC and private contract arrangements.<br>• Facilitate the communication of financial monitoring information to the PT to allow them to track the overall cost of the response. | 1 |
| DoT FOB<br><br>Operations Command | FOB Liaison Officer | AMOSC Core Group | • Provide a direct liaison between the PT FOB and DoT FOB.<br>• Facilitate effective communications and coordination between the PT FOB Operations Commander and the DoT FOB Operations Commander.<br>• Offer advice to the DoT FOB Operations Commander on matters pertaining to PT incident response policies and procedures.<br>• Assist the Senior Safety Officer deployed in the FOB in the performance of their duties, particularly as they relate to PT employees or contractors.<br>• Offer advice to the Senior Safety Officer deployed in the FOB on matters pertaining to PT safety policies and procedures. | 1 |
| Total Woodside Personnel Initial Requirement to DoT IMT | | | | 10 |

# WA DOT LIAISON OFFICER RESOURCES TO WOODSIDE

Once WA DoT activates a State waters/shorelines IMT, WA DoT will make available the following roles to Woodside.

| Area | DoT Liaison Role | Personnel Sourced from: | Key Duties | # |
|---|---|---|---|---|
| WEL CMT | DoT Liaison Officer | DoT | • Provide a direct liaison via CICC HSP Advisor between the CMT and the MEECC.<br>• Facilitate effective communications and coordination between the CMT Leader and SMEEC.<br>• Offer advice to CMT Leader on matters pertaining to DoT and wider government emergency management policies and procedures.<br>• Provide a direct liaison between the PT IMT and DoT IMT.<br>• Facilitate effective communications and coordination between the PT IC and the DoT IC.<br>• Offer advice to the PT IC on matters pertaining to DoT and wider government incident response policies and procedures.<br>• Facilitate requests for specific tasks from PT IMT related to Aviation and Waste Management. | 1 |
| WEL Reputation FST (Media Room) | DoT Media Liaison Officer | DoT | • Provide a direct liaison via Reputation FST Media Team between the PT Media team and DoT IMT Media team.<br>• Facilitate effective communications and coordination between the PT and DoT media teams.<br>• Assist in the release of joint media statements and conduct of joint media briefings.<br>• Assist in the release of joint information and warnings through the DoT Information & Warnings team.<br>• Offer advice to the PT Media Coordinator on matters pertaining to DoT and wider Government media policies and procedures. | 1 |
| | | | Total WA DoT Personnel Initial Requirement to Woodside | 2 |