Skua-11 ST1 Well Drilling Operational and Scientific Monitoring: Bridging Implementation Plan

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Please refer to the Jadestone Energy MIS for the latest revision.

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Revision History

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DEFINITIONS

Term	Definition
AIIMS	Australasian Inter-Service Incident Management System
ALA	Atlas of Living Australia
AMOSC	Australian Marine Oil Spill Centre
AMSA	Australian Maritime Safety Authority
AODN	Australian Data Network
BACI	Before-After Control-Impact
BIA	Biologically Important Areas
CoA	Commonwealth of Australia
CoC	Chain of Custody
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DBCA	Western Australian Department of Biodiversity Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Cwth)
DITT	NT Department of Industry, Tourism and Trade
DoT	Western Australian Department of Transport
DPIRD	Department of Primary Industries and Regional Development
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environmental Regulation
EMBA	Environment that may be Affected
EMT	Emergency Management Team
EP	Environment Plan
EUL	Environment Unit Lead
GIS	Geographic Information System
GPS	Geographic Positioning System
IAP	Incident Action Plan
ICS	Incident Command System
IMOS	Integrated Marine Observing System
IMSA	Index of Marine Surveys for Assessment
IMT	Incident Management Team
IMT Leader	Incident Management Team Leader. Equivalent to an Incident Controller or Incident Commander.
KEF	Key Ecological Feature
MSA	Master Service Agreement
OMP	Operational Monitoring Plan
OPEP	Oil Pollution Emergency Plan
OPGGS (E)	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 Regulations

Term	Definition
OSM	Operational and Scientific Monitoring
OSRA	Oil Spill Response Atlas
OSRL	Oil Spill Response Limited
OSTM	Oil Spill Trajectory Modelling
PPE	Personal Protective Equipment
QA/QC	Quality Assurance and Quality Control
SIMA	Spill Impact Mitigation Assessment
SMP	Scientific Monitoring Plan
WAMSI	Western Australian Marine Science Institution

PART A – PREPAREDNESS

This Plan is presented in two parts. Part A outlines the relationship between Jadestone Energy (Australia) Pty Ltd ('Jadestone') environmental management document framework and the Joint Industry Operational and Scientific Monitoring (OSM) Framework (APPEA, 2021). Part B provides operationally focussed guidance for Jadestone personnel and OSM Service Providers to coordinate the implementation of monitoring plans.

1. INTRODUCTION

Jadestone has elected to use the Joint Industry OSM Framework and supporting OMPs and SMPs as the foundation of its operational and scientific monitoring approach. The Joint Industry OSM Framework is available on the Australian Energy Producers Publications Webpage. Use of the Joint Industry OSM Framework requires each Titleholder to develop a Bridging Implementation Plan (this plan) which fully describes how the Framework interfaces with Titleholders own activities, spill risks and internal management systems.

Table 1-1 describes key documents that form Jadestone's environmental management document framework.

Activation of OSM should follow the process listed in Part B: Section 12.

Table 1-1: Key documents in Jadestone's environmental management framework

Document	Description
Montara Operations EP (JS-90-TPL-Q-00009)	The EP describes the activity and the location, the environment, the risks to the environment as a result of the activity and the associated management controls. Of particular relevance to this plan, it identifies sensitive receptors, potential impacts from hydrocarbon spills and the environment that may be affected (EMBA).
Montara Oil Pollution Emergency Plan (OPEP) (GF-70-PLN-I-00001)	This plan provides the activation and response process for the credible spill scenarios, including incident management, spill impact mitigation analysis (SIMA) process and detailed implementation guidance for individual response options. Of particular relevance to this plan, it identifies the credible spill scenarios and protection priorities
Incident Management Contact List	Contains all internal contact and communications information to enable effective communication amongst response personnel. It also contains details of external Support Agencies, Service Providers and Government Agencies to be contacted as per the reporting requirements in Table 9-1 of the OPEP. It is regularly updated and accessed via the Jadestone IMT Portal.
Incident Management Team Response Plan (JS-70-PLN-F-00008)	Details procedures for responding to an emergency incident, including a hydrocarbon spill event. This plan contains details of the incident management structure, procedures for the activation of the IMT and the roles and responsibilities of the IMT.

2. EMBA AND LOCATIONS FOR BASELINE REVIEW

2.1 EMBA

The EMBA is defined in the Montara Operations EP (Section 5.1) as the area potentially impacted by hydrocarbons from a spill event above impact concentrations. The EMBA was determined using stochastic modelling results applying the following thresholds:

- ≥1 g/m^2 floating oil thickness, which is considered to be below levels which would cause environmental harm and is more indicative of the areas perceived to be affected due to its visibility on the sea-surface
- ≥10 g/m^2 for accumulated (shoreline) oil, which represents the area visibly contacted by the spill
- ≥10 ppb for dissolved hydrocarbons corresponds generally with potential for exceedance of water quality triggers
- ≥10 ppb entrained hydrocarbons represents the low exposure zone and corresponds generally with potential for exceedance of water quality triggers.

Of the credible spill scenarios identified in the Montara Operations EP (Section 8.6), scenarios 2 (11,570 m^3 surface release of Montara crude over 5 hours from a cargo vessel tank rupture) and scenario 3 (1,700 m^3 subsea release of Montara crude over 24 hours from a subsea flowline rupture) have been selected to represent worst-case spills from a response perspective, including operational and scientific monitoring, and have been used to inform the resourcing requirements for this operational and scientific monitoring bridging implementation plan.

2.2 Locations Requiring a Baseline Review

Baseline monitoring provides information on the condition of ecological receptors prior to, or spatially independent (e.g. if used in control chart analyses) of, a spill event and is used for comparison with post-impact scientific monitoring, where required. This is particularly important for scientific monitoring where the ability to detect changes between pre-impact and post-impact conditions and evaluate impact from the spill (compared to natural variation and/or impacts unrelated to the spill) is necessary. Therefore, an enhanced understanding of the extent, quality and suitability of any existing baseline data is required to prioritise the monitoring response.

Locations requiring a review of the baseline data available have been determined from the stochastic modelling results of scenario 2 and scenario 3 (RPS, 2023). Locations and associated receptors requiring a baseline review were identified as those sensitive receptors contacted by hydrocarbons at the low threshold for entrained (≤10 ppb), dissolved (≤10 ppb), floating (≤1 g/m2), and shoreline contact (≤10 g/m2), within 7.0 days at a probability >5%, as listed in Table 2-1 and Table 2-2. Table 2-3 lists the key sensitivities associated with these locations.

In addition to these locations, there are receptors that are transient (i.e. cetaceans, seabirds) and others that are broadscale, such as managed fisheries with large spatial extents, Key Ecological Features (KEFs) and Biologically Important Areas (BIAs). These receptors are described in detail in the Montara Operations EP and summarised in Table 2-3 and Appendix A.

Table 2-1: Spill modelling results – scenario 1: surface release of 11,570 m³ Montara crude over 5 hours from a cargo vessel tank rupture with a probability of contact >5% and <7 days (RPS, 2023)

Locations requiring a baseline review	Probability (%) of ≥1 g/m² floating	Min. arrival time ≥1 g/m² floating (days)	Probability (%) of ≥10 g/m² shoreline contact	Min. arrival time ≥10 g/m² shoreline contact (days)	Peak volume on shoreline (m³)	Probability (%) of contact of ≥10 ppb entrained	Min. arrival time ≥10 ppb entrained (days)	Probability (%) of contact of ≥10 ppb dissolved	Min. arrival time ≥10 ppb dissolved (days)
Cartier Island AMP (214 m)	18 (W)	5.83 (W)	NA	NA	NA	50 (W) @ 0-10 m layer	5.3 (W) @ 0-10 m layer	21 (W) @ 0-10 m layer	8.4 (W) @ 0-10 m layer
Cartier Island (0 m)	10 (W)	6.08 (W)	61 (W)	5.38 (W)	554.7 (W)	45 (W) @ 0-10 m layer	5.8 (W) @ 0-10 m layer	20 (W) @ 0-10 m layer	9.5 (W) @ 0-10 m layer
Oceanic Shoals AMP (87 m)	11 (S)	13.33 (S)	NA	NA	NA	42(S) @ 0-10 m layer	7.1 (S) @ 0-10 m layer	9 (S) @ 0-10 m layer	7.7 (S) @ 0-10 m layer
Barracouta Shoal (10.2 m)	20 (W)	2.88 (W)	NA	NA	NA	47 (W) @ 10-20 m layer	2.7 (W) @ 10-20 m layer	27 (W) @ 10-20 m layer	3.7 (W) @ 10-20 m layer
Eugene McDermott Shoal (11.0 m)	15 (S)	6.67 (S)	NA	NA	NA	35 (T) @ 10-20 m layer	2.9 (T) @ 10-20 m layer	22 (T) @ 10-20 m layer	3.4 (T) @ 10-20 m layer
Fantome Shoal (7.6 m)	4 (T)	6.5 (T)	NA	NA	NA	10 (T) @ 0-10 m layer	6.5 (T) @ 0-10 m layer	2 (T) @ 0-10 m layer	7 (T) @ 0-10 m layer
Goeree Shoal (19.0 m)	20 (T)	1.79 (T)	NA	NA	NA	58 (W) @ 10-20 m layer	< 1 (W) @ 10-20 m layer	38 (W) @ 10-20 m layer	< 1 (W) @ 10-20 m layer
Jabiru Shoals (9.9 m)	7 (S)	11.75 (S)	NA	NA	NA	41 (S) @ 0-10 m layer	3.2 (S) @ 0-10 m layer	16 (S) @ 0-10 m layer	3.3 (S) @ 0-10 m layer
Johnson Bank (8.7 m)	10 (W)	6.67 (W)	NA	NA	NA	36 (W) @ 0-10 m layer	7.3 (W) @ 0-10 m layer	13 (W) @ 0-10 m layer	11.8 @ 0-10 m layer
Mangola Shoal (10 m)	3 (S)	25.42 (S)	NA	NA	NA	32 (S) @ 0-10 m layer	5.2 (S) @ 0-10 m layer	13 (S) @ 0-10 m layer	7.6 (S) @ 0-10 m layer

Locations requiring a baseline review	Probability (%) of ≥1 g/m² floating	Min. arrival time ≥1 g/m² floating (days)	Probability (%) of ≥10 g/m² shoreline contact	Min. arrival time ≥10 g/m² shoreline contact (days)	Peak volume on shoreline (m³)	Probability (%) of contact of ≥10 ppb entrained	Min. arrival time ≥10 ppb entrained (days)	Probability (%) of contact of ≥10 ppb dissolved	Min. arrival time ≥10 ppb dissolved (days)
Pee Shoal (7 m)	3 (S)	17.17 (S)	NA	NA	NA	29 (S) @ 0-10 m layer	3.7 (S) @ 0-10 m layer	9 (S) @ 0-10 m layer	3.7 (S) @ 0-10 m layer
Vulcan Shoal (9.5 m)	17 (W)	1.29 (W)	NA	NA	NA	75 (W) @ 0-10 m layer	< 1 (W) @ 0-10 m layer	20 (S) @ 0-10 m layer	2.7 (S) @ 0-10 m layer

S = summer; W = winter, T = transitional season

** The release location resides within the receptor boundaries*

NA = not applicable as receptor is submerged

NC = no contact

Reported values after listed receptor indicates approximate mean depth (m) with the exception of reefs, banks and shoal receptors (incl. nearshore) which indicates minimum depth (m); submerged receptors are denoted by depths >0 m, while reported depths of 0 m denote intertidal receptors.

Table 2-2: Spill modelling results – scenario 3: subsea release of 1,700 m³ Montara crude over 24 hours from a subsea flowline rupture with a probability of contact >5% and <7 days (RPS, 2023)

Locations requiring a baseline review	Probability (%) of ≥1 g/m² floating	Min. arrival time ≥1 g/m² floating (days)	Probability (%) of ≥10 g/m² shoreline contact	Min. arrival time ≥10 g/m² shoreline contact (days)	Peak volume on shoreline (m³)	Probability (%) of contact of ≥10 ppb entrained	Min. arrival time ≥10 ppb entrained (days)	Probability (%) of contact of ≥10 ppb dissolved	Min. arrival time ≥10 ppb dissolved (days)
Cartier Island AMP (214 m)	3 (W)	5.92 (W)	NA	NA	NA	21 (W) @ 0-10 m layer	6.8 (W) @ 0-10 m layer	4 (W) @ 0-10 m layer	8.8 (W) @ 0-10 m layer
Cartier Islands (0 m)	1 (W)	6.08 (W)	58 (W)	5.33 (W)	98 (T)	19 (W) @ 0-10 m layer	7.2 (W) @ 0-10 m layer	2 (W) @ 0-10 m layer	9.3 (W) @ 0-10 m layer
Barracouta Shoal (10.2 m)	7 (W)	3.33 (W)	NA	NA	NA	24 (W) @ 10-20 m layer	2.8 (W) @ 10-20 m layer	7 (W) @ 10-20 m layer	4.4 (W) @ 10-20 m layer

Locations requiring a baseline review	Probability (%) of ≥1 g/m² floating	Min. arrival time ≥1 g/m² floating (days)	Probability (%) of ≥10 g/m² shoreline contact	Min. arrival time ≥10 g/m² shoreline contact (days)	Peak volume on shoreline (m³)	Probability (%) of contact of ≥10 ppb entrained	Min. arrival time ≥10 ppb entrained (days)	Probability (%) of contact of ≥10 ppb dissolved	Min. arrival time ≥10 ppb dissolved (days)
Eugene McDermott Shoal (11 m)	3 (T)	4.63 (T)	NA	NA	NA	20 (T) @ 10-20 m layer	3 (T) @ 10-20 m layer	9 (T) @ 10-20 m layer	3.8 (T) @ 10-20 m layer
Goeree Shoal (19 m)	8 (S)	2.54 (S)	NA	NA	NA	42 (W) @ 10-20 m layer	1 (W) @ 10-20 m layer	25 (W) @ 10-20 m layer	1 (W) @ 10-20 m layer
Heywood Shoal (13 m)	1 (W)	12.71 (W)	NA	NA	NA	12 (W) @ 10-20 m layer	5.6 (W) @ 10-20 m layer	5 (W) @ 10-20 m layer	6.1 (W) @ 10-20 m layer
Jabiru Shoals (9.9 m)	NC	NC	NA	NA	NA	13 (S) @ 0-10 m layer	3.6 (S) @ 0-10 m layer	3 (S) @ 0-10 m layer	3.7 (S) @ 0-10 m layer
Mangola Shoal (10 m)	NC	NC	NA	NA	NA	13 (S) @ 0-10 m layer	6.5 (S) @ 0-10 m layer	3 (S) @ 0-10 m layer	9.7 (S) @ 0-10 m layer
Pee Shoal (7 m)	NC	NC	NA	NA	NA	9 (S) @ 0-10 m layer	3.8 (S) @ 0-10 m layer	1 (S) @ 0-10 m layer	6.5 (S) @ 0-10 m layer
Vulcan Shoal (9.5 m)	5 (W)	1.33 (W)	NA	NA	NA	55 (W) @ 0-10 m layer	< 1 (W) @ 0-10 m layer	28 (W) @ 0-10 m layer	< 1 @ 0-10 m layer

S = summer; W = winter, T = transitional season

NA = not applicable as receptor is submerged

NC = no contact

Reported values after listed receptor indicates approximate mean depth (m) with the exception of reefs, banks and shoal receptors (incl. nearshore) which indicates minimum depth (m); submerged receptors are denoted by depths >0 m, while reported depths of 0 m denote intertidal receptors.

Table 2-3: Key sensitivities for locations predicted to be contacted within 7 days at the low thresholds, at a probability greater than 5%, and requiring a baseline review

Key sensitivities of Cartier Island AMP: The Marine Park includes an unvegetated sand island (Cartier Island), mature reef flat, a small, submerged pinnacle (Wave Governor Bank), and two shallow pools to the north-east of the island. Covers an area of 172 km^2.
Turtles: Significant feeding, breeding, and nesting population of green sea turtles (*Chelonia mydas*). Cartier Island and surrounding water are considered critical habitats for nesting and interesting for the genetically distinct population of green turtles (Commonwealth of Australia, 2017): Nesting occurs year-round (peak: Dec – Jan) Loggerhead (*Caretta caretta*) and hawksbill (*Eretmochelys imbricata*) turtle are also known to forage around Cartier Island (Limpus, 2008).
Sea snakes: High abundance and diversity (Guinea, 2013).
Whale shark: the Cartier Island Marine Park lies within the foraging BIA for whale sharks (Commonwealth of Australia 2023)
Birds: Several species, including the Pacific reef heron (*Egretta sacra*), brown booby (*Sula leucogaster*), ruddy turnstone (*Arenaria interpres*) and crested tern (*Thalasseus bergii*), are regular visitors to Cartier Island and Cartier Reef (Clarke et al. 2017). The crested tern is known to breed on the island in small numbers (Clarke et al. 2017). During high tides, the Island provides the only available land within this reef for roosting birds. At lower tides, reef-flats provide additional resting and foraging substrates for species such as egrets and shorebirds (Clarke et al. 2017). The waters of the Cartier AMP are considered important foraging grounds for the internationally significant numbers of seabird species that breed on Ashmore Reef (Clarke et al. 2017). A total of 34 species of birds have been recorded from the Cartier Island AMP for a list of these species refer to Appendix A of Clarke et al. 2017. Breeding: May – June/Oct; Migrating: Feb-Apr/Sept-Oct
Marine mammals: Dugong (*Dugong dugon*): The Ashmore Reef National Nature Reserve supports a small population of dugong and their range possibly extends to Cartier Island (Whiting, 1999). Cartier Island lies in the vicinity of the pygmy blue whale (*Balaenoptera musculus brevicauda*) distribution and migration BIA (Commonwealth of Australia, 2023). Pygmy Blue whale migration north: May-Aug; Pygmy Blue whale migration south – Sept-Dec.
Benthic community: High diversity and abundance of hard and soft corals, gorgonians (sea fans), sponges and a range of encrusting organisms. The overall dominant composition of the shallow reef benthos is hard coral and turf algae (Heyward et al. 2010a). Coral bleaching events have been noted within the Cartier Island AMP historically and notably in 2016-2017(AIMS, 2023). In 2021-22, sea surface temperatures in Western Australia remained in the highest 10% of observations since 1900 (AIMS, 2023).
Traditional owner values: Sea country is valued for Indigenous cultural identity, health and wellbeing. Across Australia, Indigenous people have been sustainably using and managing their sea country for tens of thousands of years. At the commencement of the management plan (Director of National Parks, 2018), there is limited information about the cultural significance of this Marine Park.
Indonesia: Subject to the Memorandum of Understanding between Australia and Indonesia (Current resting and staging area from MoU Box). Indonesian artefacts and graves.
Shipwreck: Ann Millicent (1888)
Socio-economic: Commercial tourism – recreation and scientific research

Safety Alert: Cartier Island and the surrounding marine area within a 10-kilometre radius was a gazetted Defence Practice Area up to 20 July 2011 and has been used in the past as an air weapons range. Although the site is no longer an active weapons range there is a SUBSTANTIAL RISK that unexploded ordnances remain in the area.
Barracouta, Vulcan and Goeree Shoals
Prior to the Montara hydrocarbon release, there were no baseline data for benthic habitats and associated fish communities on these shoals. Following the Montara spill three repeat surveys were conducted at Barracouta, Vulcan and Goeree Shoals in 2011, 2013 and 2016 (there was also extensive sampling undertaken across Barracouta and Vulcan shoals in 2010). A variety of algae were the most abundant benthic group encountered on all shoals. Overall mean coral cover differed between individual shoals, within a range of 5-15%, but varied from survey to survey. Both declines and increases in major benthic categories, such as hard corals, other primary producers and filter feeders were recorded between successive surveys at all three shoals. Physical disturbance associated with storms may be an important driver of shoal communities (Heyward et al. 2017).
Oceanic Shoal AMP: covers an area of 72,000 km^2.
Turtles: Includes biologically important foraging areas for flatback turtle (*Natator depressus*), loggerhead turtle (*Caretta caretta*) and olive ridley turtle (*Lepidochelys olivacea*), and interesting areas for flatback. Flatback turtle prefer foraging in waters 60 to 90 m deep in association with complex, benthic geomorphology (banks, shoals, terraces, deep holes and valleys) thought to support a high abundance of sessile invertebrates (Thums et al. 2017).
Benthic community: the banks in the Oceanic Shoals are biodiversity hotspots for sponges, with more species and different communities than the surrounding seafloor (species richness and endemism of sponges in the western sector may not be as high as those in the eastern sector). A wide variety of high-order pelagic fish species occur in these waters (Nichol et al. 2013).

3. RELEVANT EXISTING BASELINE INFORMATION SOURCES

Jadestone has access to a number of different baseline data sources that are relevant to the high value receptors of the EMBA. These include:

3.1 Data.gov.au

Data.gov.au is the central source of Australian open government data published by federal, state and local government agencies. In addition, it includes publicly-funded research data and datasets from private institutions that are in the public interest.

3.2 Australian Ocean Data Network

The Australian Ocean Data Network (AODN) is the primary access point for search, discovery, access and download of data collected by the Australian marine community. Data is presented as a regional view of all the data available from the AODN. Primary datasets are contributed to by Commonwealth Government agencies, State Government agencies, Universities, the Integrated Marine Observing System (IMOS – an Australian Government Research Infrastructure project), and the Western Australian Marine Science Institution (WAMSI).

Access is via the following link https://portal.aodn.org.au/search

3.3 Western Australian Oil Spill Response Atlas

The Western Australian Oil Spill Response Atlas (OSRA) is a spatial database of environmental, logistical and oil spill response data. Using a geographical information system (GIS) platform, OSRA displays datasets collated from a range of custodians allowing decision makers to visualise environmental sensitivities and response considerations in a selected location. Oil spill trajectory modelling (OSTM) can be overlaid to assist in determining protection priorities, establishing suitable response strategies and identifying available resources for both contingency and incident planning. OSRA is managed by the Oil Spill Response Coordination unit within Department of Transport (DoT) Marine Safety and is part funded through the National Plan for Maritime Environmental Emergencies and the Australian Maritime Safety Authority (AMSA).

Access is via the following link https://www.transport.wa.gov.au/imarine/preparedness-response-resources.asp#:~:text=The%20Western%20Australian%20Oil%20Spill,and%20oil%20spill%20response%20data.

3.4 The Atlas of Living Australia

The Atlas of Living Australia (ALA) is a collaborative, online, open resource that contains information on all the known species in Australia aggregated from a wide range of data providers. It provides a searchable database when considering species within the EMBA. The ALA receives support from the Australian Government through the National Collaborative Research Infrastructure Strategy and is hosted by the Commonwealth Scientific and Industrial Research Organisation (CSIRO).

Access is via the following link https://www.ala.org.au

3.5 Index of Marine Surveys Assessment

The Index of Marine Surveys for Assessments (IMSA) is an online portal to information about marine-based environmental surveys in Western Australia. IMSA is a project of the WA Department of Water and Environmental Regulation (DWER) for the systematic capture and sharing of marine data created as part of an environmental impact assessment.

Access via the following link https://catalogue.data.wa.gov.au/app/index-of-marine-surveys-for-assessments-imsa

3.6 Other Sources

Reports and peer reviewed journal articles were also accessed via research and journal databases such as PubMed and Google Scholar, as well as unpublished monitoring reports.

4. BASELINE DATA REVIEW AND IDENTIFICATION OF FIRST-STRIKE MONITORING PRIORITIES

Jadestone has compiled a list of available baseline data relevant to the locations identified in Section 2.2 (those locations contacted by hydrocarbons at the low thresholds (Section 2.1) within 7 days at ≥ 5% probability for the worst-case spill scenarios). Refer to Appendix B for the list of baseline data sources assessed. The assessment of each data source included examining the spatial and temporal relevance of the data and a comparison of the methods and parameters to those outlined in the Joint Industry SMPs.

The criteria used during the baseline data review is outlined in Table 4-1.

Table 4-1: Assessment criteria for baseline data review

Year of most recent data capture	Duration of monitoring program	Frequency of data capture	Similarity of methods to Joint Industry SMP	Similarity of parameters to Joint Industry SMP
High = 2018–2023	High = >4 years	High = 4+ sampling trips per year	High	High
Medium = 2012–2017	Medium = 2–4 years	Medium = 2–3 sampling trips per year	Medium	Medium
Low = <2012	Low = <2 years	Low = one-off sampling trip	Low	Low

This assessment was then used to determine if the available baseline data could be used to detect change in receptors at priority monitoring locations in the event of a significant impact. Table 4-2 compares priority monitoring locations and receptors, and provides guidance on where post-spill, pre-impact monitoring should be prioritised.

The different categories listed in Table 4-2 include:

- Not applicable (N/A) – this receptor and relevant SMP is not applicable to the priority monitoring location (i.e. shoreline habitat not present at submerged shoals)
- Lower priority for first-strike monitoring – current monitoring/knowledge is considered sufficient (i.e. could be used to detect level of change in the event of a significant impact) and is considered a lower priority for post-spill, pre-impact data collection
- First-strike monitoring priority – current monitoring/knowledge is not in place, not suitable or not practicable; and post-spill pre-impact baseline data collection should be prioritised.

It is noted that although baseline data exists for some of the priority monitoring areas (Appendix B) most of the studies are now outdated and post-spill pre-impact baseline data should be prioritised. Where baseline data is current, given the location of the priority monitoring areas, physical disturbance associated with cyclone events may be an important driver for communities (Heyward et al. 2017), and thus may also warrant the need for post-spill pre-impact baseline data. Further, coral bleaching events have been recorded historically and notably in 2016-2017 (AIMS, 2023). In 2021-22, sea surface temperatures in Western Australia remained in the highest 10% of observations since 1900 (AIMS, 2023).

It is also noted that it is difficult to obtain absolute statistical proof of oil spill impacts, due to the variability (spatially and temporally) of the natural environment, the lack of experimental control due to the nature of spills and because suitable baseline data may not be available (Kirby *et al*. 2018). Alternative approaches exist for detecting impacts where post-spill, pre-impact monitoring may not be feasible. These include impact versus control design approaches and/or a gradient approach. The Joint Industry OSM Framework provides guidance and considerations for survey designs to enable the acquisition of sufficiently powerful data during SMP implementation.

Once SMP monitoring reports are drafted (post-spill) they should be peer reviewed by an expert panel (Refer to Section 10.10 of the Joint Industry OSM Framework).

Table 4-2: Recommended priority monitoring locations versus SMPs

Location	SMP									
	Water quality impact assessment	**Sediment quality impact assessment**	**Intertidal and coastal habitat assessment**	**Seabirds and shorebirds**	**Marine megafauna assessment – reptiles**	**Marine megafauna assessment – whale sharks, dugong and cetaceans**	**Benthic habitat assessment**	**Marine fish and elasmobranch assemblages assessment**	**Fisheries impact assessment**	**Heritage and social impact assessment**
Cartier Island Marine Park	First-strike monitoring priority	First-strike monitoring priority	First-strike monitoring priority	First-strike monitoring priority	First-strike monitoring priority	First-strike monitoring priority	First-strike monitoring priority	First-strike monitoring priority	Lower priority to first-strike monitoring (Locations to be determined in consultation with key stakeholders to reflect current fishing zones/effort)	First-strike monitoring priority (Locations to be determined in consultation with key stakeholders)
Barracouta Shoal			N/A							
Eugene McDermott Shoal										
Fantome Shoal										
Goeree Shoal										
Jabiru Shoals										
Johnson Bank										
Mangola Shoal										
Pee Shoal										
Vulcan Shoal										
Heyward Shoal										

Location	SMP									
	Water quality impact assessment	**Sediment quality impact assessment**	**Intertidal and coastal habitat assessment**	**Seabirds and shorebirds**	**Marine megafauna assessment – reptiles**	**Marine megafauna assessment – whale sharks, dugong and cetaceans**	**Benthic habitat assessment**	**Marine fish and elasmobranch assemblages assessment**	**Fisheries impact assessment**	**Heritage and social impact assessment**
Oceanic Shoal AMP										

5. OSM ORGANISATIONAL STRUCTURE

The Jadestone incident response structure is based on the Australasian Inter-Service Incident Management System (AIIMS), which consists of a standard management hierarchy and procedures for managing incidents of any size. This system aligns with the international Incident Command System (ICS). The Incident Management Team (IMT) will be responsible for coordinating OSM activities, which will be led by the Planning Section within the IMT, with support from each Section, in particular the Operations Section.

Jadestone IMT structure is shown in Figure 5-1.

Figure 5-2 illustrates the structure of the OSM Management Team during the response phase. The IMT Leader is ultimately accountable for managing the response operation, which includes this plan. Depending on the scale of the event, individual people may perform multiple roles; similarly, multiple people may share the same role.

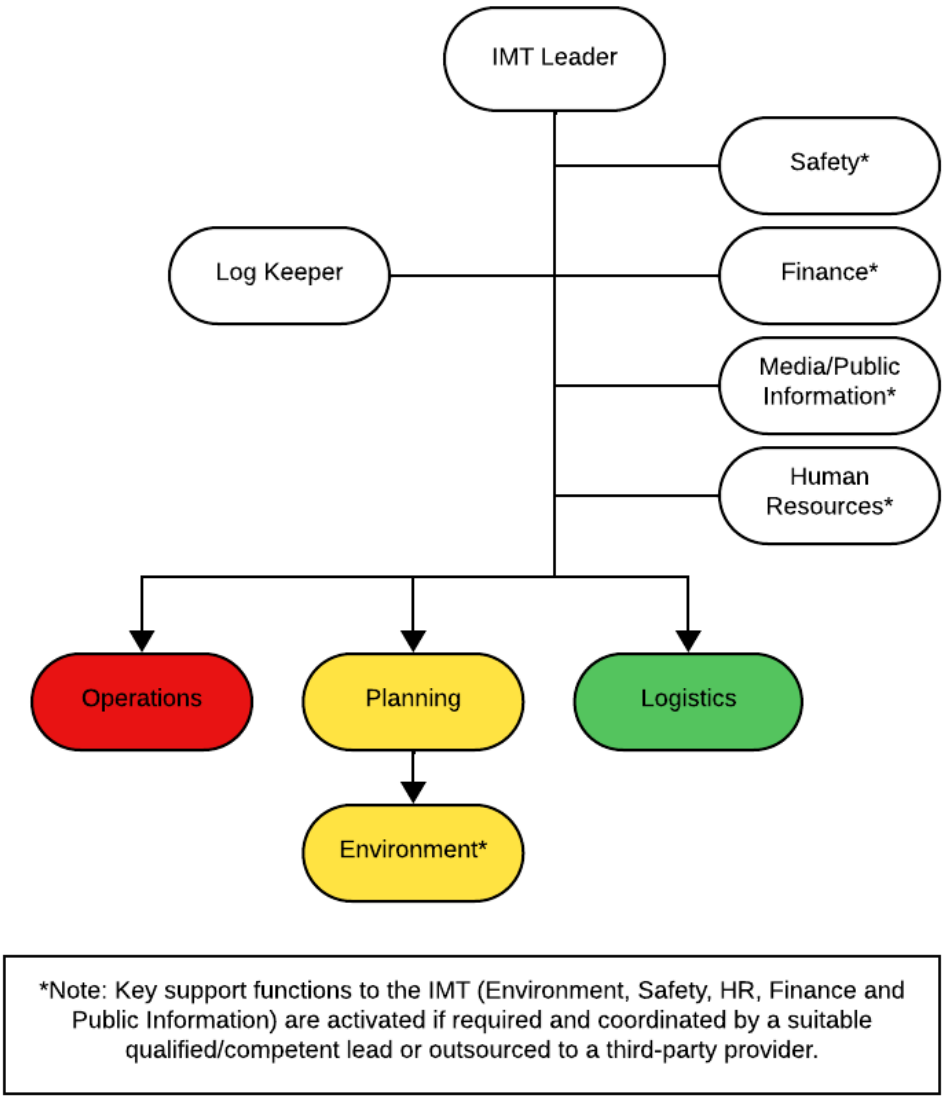

Figure 5-1: Jadestone IMT structure

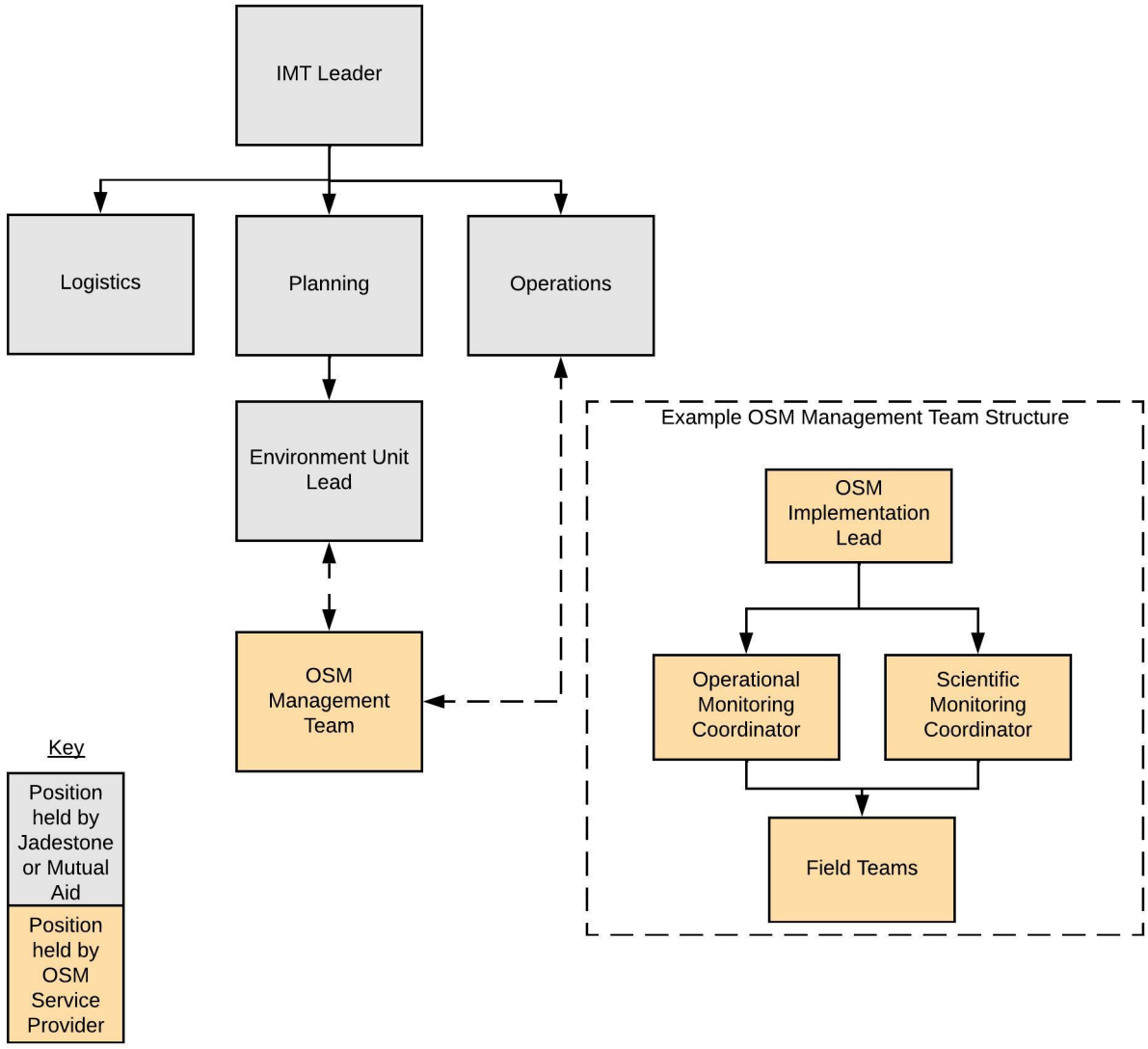

Figure 5-2: Jadestone IMT structure with OSM Team

6. OSM ROLES AND RESPONSIBILITIES

OSM roles and responsibilities are listed in Section 10.13.2 of the Joint Industry OSM Framework. Table 6-1 outlines the roles held by Jadestone and the OSM Services Provider.

During the post-response phase the Environment Unit Leader and the OSM Services Provider OSM Implementation Lead will continue to be responsible for the coordination and delivery of monitoring plans.

Table 6-1: Roles and responsibilities for OSM

Role	Held by
Environment Unit Lead (EUL)	Jadestone
OSM Implementation Lead	OSM Service Provider
Operational Monitoring Coordinator and Scientific Monitoring Coordinator	OSM Service Provider
OSM Field Operations Manager	OSM Service Provider
OSM Field Teams	OSM Service Provider

7. MOBILISATION AND TIMING OF OMP AND SMP IMPLEMENTATION

Table 7-1 provides an indicative implementation schedule for OMP and SMPs in the EMBA and adjacent waters. 'Implementation' of an OMP/SMP is defined as being ready, at the point of staging or departure, to mobilise for monitoring. The locations listed are aligned to the initial monitoring priorities described in Section 2.

Where baseline data does not exist, or may not be recent and applicable, and post spill pre-impact monitoring is not feasible, the application of a BACI (Before-After Control-Impact) design may not be possible. The finalisation of each SMP design will take this into consideration and may need to include alternative designs (e.g. data from an expected BACI design may need to be analysed as a Gradient Approach).

Table 7-1: Indicative OMP and SMP implementation schedule for OSM activities if initiation criteria are met

Proximity to spill source	Monitoring type	0–48 hours from OSM activation	Within 72 hours of OSM activation	~3–5 days from OSM activation	>2 weeks from OSM activation
Spill site and surrounding waters	OM	• Activation of OMP Team Leads. • Finalise OMPs. • Commence activation and mobilisation of OM personnel.	Implement: • OMP: Hydrocarbon Properties And Weathering Behaviour, where resources are available (e.g. Stored at Montara Venture floating production storage and offtake facility). • OMP: Surface Chemical Dispersant Effectiveness and Fate Assessment • OMP: Water Quality Assessment • OMP: Sediment Quality Assessment • Marine Fauna Assessment	-	As results from implemented OMPs are available, data are provided to relevant personnel in IMT (e.g. Planning Section) and used in the Incident Action Planning process for the next operational period. OMP is redesigned or reallocated according to the specifics of the actual spill.
	SM	• Commence activation and mobilisation process. • Activation of SMP Team Leads.	• Continue to activate and mobilise personnel. • Work on finalising SMPs.	Implement: • SMP: Water Quality Impact Assessment • SMP: Sediment Quality Impact Assessment • SMP: Marine Fish and Elasmobranch Assemblages assessment • SMP: Marine Mega-fauna Assessment	Continue SMP monitoring until termination criteria are met

Proximity to spill source	Monitoring type	0–48 hours from OSM activation	Within 72 hours of OSM activation	~3–5 days from OSM activation	>2 weeks from OSM activation
				• SMP: Commercial and recreational fisheries impact assessment	
Sensitive receptors where stochastic modelling shows contact within 72 hours (3 days) * (Note: the same receptors were contacted for both scenarios 2 and scenario 3): • Barracouta Shoal • Eugene McDermott Shoal • Goeree Shoal • Vulcan Shoal	OM	• Activation of OMP Team Leads. • Finalise OMPs. • Commence activation and mobilisation of OM personnel.	Implement: • OMP: Hydrocarbon Properties And Weathering Behaviour • OMP: Water Quality Assessment • OMP: Sediment Quality Assessment • Marine Fauna Assessment	-	As results from implemented OMPs are available, data are provided to relevant personnel in IMT (Planning Lead) and used in the Incident Action Planning process for the next operational period. OMP is redesigned or reallocated according to the specifics of the actual spill until termination criteria are met
	SM	• Activation of SMP Team Leads and finalisation of SMPs.	• Finalisation of the remaining SMPs (where individual SMP initiation criteria are met).	Implement: • SMP: Water Quality Impact Assessment • SMP: Sediment Quality Impact Assessment • SMP: Benthic habitat assessment • SMP: Marine Mega-fauna Assessment- cetaceans • SMP: Marine Fish and Elasmobranch Assemblages assessment • SMP: Commercial and recreational fisheries impact assessment	Continue SMP monitoring until termination criteria are met

Proximity to spill source	Monitoring type	0–48 hours from OSM activation	Within 72 hours of OSM activation	~3–5 days from OSM activation	>2 weeks from OSM activation
Sensitive receptors (including shorelines) where stochastic modelling shows contact >3 days* Scenario 2: • Cartier Island • Cartier Island AMP • Oceanic Shoals AMP • Fantome Shoal • Jabiru Shoals • Johnson Bank • Mangola Shoal • Pee Shoal Scenario 3: • Cartier Island • Cartier Island AMP • Heywood Shoal • Jabiru Shoals • Mangola Shoal • Pee Shoal	OM	-	• Activation of OMP Team Leads. • Finalise OMPs. • Commence activation and mobilisation of OM personnel.	Implement: • OMP: Hydrocarbon Properties And Weathering Behaviour • OMP: Water Quality Assessment • OMP: Sediment Quality Assessment • OMP: Shoreline clean-up assessment • Marine Fauna Assessment	As results from implemented OMPs are available, data are provided to relevant personnel in IMT (Planning Lead) and used in the Incident Action Planning process for the next operational period. OMP is redesigned or reallocated according to the specifics of the actual spill until termination criteria are met
	SM	-	• Activation of SMP Team Leads and finalisation of SMPs. • Finalise OSMPs. • Commence activation and mobilisation of SM personnel.	Implement: • SMP: Water Quality Impact Assessment • SMP: Sediment Quality Impact Assessment • SMP: Intertidal and Coastal Habitat Assessment • SMP: Seabirds and Shorebirds • SMP: Marine Mega-fauna Assessment- Reptiles • SMP: Marine Mega-fauna Assessment- cetaceans • SMP: Marine Fish and Elasmobranch Assemblages assessment	Continue SMP monitoring until termination criteria are met

Proximity to spill source	Monitoring type	0–48 hours from OSM activation	Within 72 hours of OSM activation	~3–5 days from OSM activation	>2 weeks from OSM activation
				• SMP: Commercial and recreational fisheries impact assessment • SMP: Heritage and social impact assessment	

**The receptors listed are based on stochastic modelling. Deterministic modelling was undertaken for both scenarios 2 and 3 and the run with the most receptors contacted within 7 days for entrained hydrocarbons at 10 ppb was determined. For scenario 2 the maximum number of receptors that could be contacted in 7 days was three (Barracouta Shoal [5.5 days], Goeree Shoal [5.8 days], and Vulcan Shoal [5.3 days]) (RPS, 2023). For Scenario 3 the maximum number of receptors that could be contacted in 7 days was three (Pee Shoal [3.8 days], Jabiru Shoal [6 days], and Mangola Shoal [6.5 days])(RPS, 2023).*

8. RESOURCE REQUIREMENTS

To inform the resourcing requirements for operational and scientific monitoring, deterministic modelling was undertaken for the worst-case scenario (scenario 2: 11,570 m^3 surface release of Montara crude over 5 hours from a cargo vessel tank rupture). Table 8-1 outlines the results of the deterministic trajectory that resulted in the most receptors receiving shoreline accumulation ≥ 10 g/m^2 within 7 days of the spill commencing (RPS, 2023). Table 8-2 outlines the results of the deterministic trajectory that resulted in the most receptors exposed to entrained hydrocarbon concentrations ≥ 10 ppb within 7 days of the spill commencing (RPS, 2023), noting that there was no shoreline contact for this run.

Table 8-1: Scenario 2 (run 83): (11,570 m^3 surface release of Montara crude over 5 hours from a cargo vessel tank rupture) deterministic summary for the trajectory that resulted in the most receptors receiving shoreline accumulation ≥10 g/m2 within 7 days of the spill commencing (RPS, 2023)

Priority Monitoring Areas	Arrival time ≥10 g/m^2 shoreline contact (days)	Arrival time ≥10 ppb entrained (days)	Arrival time ≥10 ppb dissolved (days)
Cartier Island	6	6.9	20.4
Barracouta Shoal	NA	2.9	5.6

NA- Not applicable

Table 8-2: : Scenario 2 (run 93): (11,570 m^3 surface release of Montara crude over 5 hours from a cargo vessel tank rupture) deterministic summary for the trajectory that resulted in the most receptors exposed to entrained hydrocarbon concentrations ≥10 ppb within 7 days of the spill commencing (RPS, 2023)

Priority Monitoring Areas	Arrival time ≥10 ppb entrained (days)	Arrival time ≥10 ppb dissolved (days)
Barracouta Shoal	5.5	NC
Goeree Shoal	5.8	5.7
Vulcan Shoal	5.3	5.9

NC- No contact

The resources required to assist the IMT in the coordination and management of OSM are outlined in Table 8-3. The resources required to implement operational and scientific monitoring components are presented in Table 8-4 and Table 8-5 respectively, which are based on the monitoring priorities in Section 2, the implementation schedule outlined in Table 7-1, and the worst-case deterministic trajectories outlined in Table 8-1 and Table 8-2.

Table 8-3: Resources required for key OSM coordination roles

Role	Resources required	Arrangement
OSM Implementation Lead (OSM Monitoring Provider/s)	1 x Principal Scientist	OSM contractor
Operational Monitoring Coordinator and Scientific Monitoring Coordinator (OSM Service Provider/s)		
OSM Field Operations Manager (OSM Service Provider/s)	1 x Senior Scientist	

Table 8-4: Resources required for implementing OMPs

OMP	Resources Required	Arrangement
Hydrocarbon properties and weathering behaviour at sea*	1 team (spill site and surrounds including shoals in vicinity) 1 team (Cartier Island and surrounding shoals) Total 2 team leaders and 4 team members (3 per team)	OSM contractor Marine contractors Laboratory arrangements
Shoreline clean-up assessment	1 team (Cartier Island) Total 1 team leaders and 2 team members (3 per team)	AMOSC Master Services Agreement (MSA) and/or OSRL Service Level Agreement (SLA) Marine contractors
Surface chemical dispersant effectiveness and fate	1 team leader 1 team member (for visual observations, which may be performed by trained aerial observers used during monitor and evaluate if trained in observation and verification of chemical dispersant effectiveness) For water quality observations, refer to OMP: Water quality assessment	OSM contractor AMOSC MSA Marine contractors
Water quality assessment*	Refer to OMP: Hydrocarbon properties and weathering behaviour at sea resourcing* (all sites)	OSM contractor Marine contractors
Sediment quality assessment*	Refer to OMP: Hydrocarbon properties and weathering behaviour at sea resourcing* (all sites)	OSM contractor Marine contractors
Marine fauna assessment	1 team to conduct initial aerial surveys for all sites (2 observers per aircraft) Note: Fauna related SMPs are likely to be initiated simultaneously or following aerial assessment with vessel and ground based fauna surveys carried out as part of the relevant fauna SMP.	OSM contractor Marine contractors Aviation contractors

** Initial co-mobilisation between OMP: Hydrocarbon properties and weathering behaviour at sea, OMP: Surface chemical dispersant effectiveness and fate, OMP: Water quality assessment and OMP: Sediment quality assessment*

Table 8-5: Resources required for implementing SMPs

SMP	Resources Required	Arrangement
Water quality impact assessment	1 team (spill site and surrounds) 1 team (Cartier Island and surrounding shoals) Total 2 team leaders and 4 team members (3 per team) Note: can initially be performed by the same team as OMP: Water quality assessment. This SMP may replace OMP: Water quality assessment if the OMPs termination criteria are triggered	OSM contractor Marine contractors Laboratory arrangement
Sediment quality impact assessment	Refer to SMP: Water quality impact assessment* (all sites)	OSM contractor Marine contractors Laboratory arrangement
Intertidal and coastal habitat assessment	1 team (Cartier Island) Total 1 team leader and 1 team member (2 per team)	OSM contractor Marine contractors Laboratory arrangement
Seabirds and shorebirds	1 team to conduct aerial surveys for all sites for all fauna (Can initially be performed by the same aerial team as OMP: Marine fauna assessment) 1 team to conduct vessel-based surveys for all sites (surveys would include all fauna [birds, reptiles, cetaceans, dugong and whale shark]) 1 team to conduct ground-based surveys at Cartier Island (2 experienced ornithologists) This SMP may replace the relevant OMP: Marine fauna assessment if the OMPs termination criteria are triggered	OSM contractor Marine contractors Laboratory arrangement
Marine mega-fauna assessment -whale shark, dugong and cetaceans	1 team to conduct aerial surveys for all sites for all fauna (Can initially be performed by the same aerial team as OMP: Marine fauna assessment) 1 team to conduct vessel-based surveys for all sites (surveys would include all fauna [birds, reptiles, cetaceans, dugong and whale shark]) This SMP may replace the relevant OMP: Marine fauna assessment if the OMPs termination criteria are triggered	OSM contractor Marine contractors Laboratory arrangement
Marine mega-fauna assessment – reptile	1 team to conduct aerial surveys for all sites for all fauna (Can initially be performed by the same aerial team as OMP: Marine fauna assessment)	OSM contractor Marine contractors Laboratory arrangement

SMP	Resources Required	Arrangement
	1 team to conduct vessel-based surveys for all sites (surveys would include all fauna [birds, reptiles, cetaceans, dugong and whale shark]) 1 team to conduct ground-based surveys at Cartier Island (including 2 members experience with ground turtle surveys) This SMP may replace the relevant OMP: Marine fauna assessment if the OMPs termination criteria are triggered	
Benthic habitat assessment	1 team (all sites) Total 1 team leader and 2 team members (3 per team)	OSM contractor Marine contractors Laboratory arrangement
Marine fish and elasmobranch assemblages assessment	1 team (all sites) Total 1 team leader and 2 team members (3 per team)	OSM contractor Marine contractors Laboratory arrangement
Fisheries impact assessment	1 team Total 1 team leader and 2 team members (3 per team)	OSM contractor Marine contractors Laboratory arrangement
Heritage features assessment	1 team Total 1 team leader and 2 team members (3 per team)	OSM contractor Marine contractors Laboratory arrangement
Social impact assessment	1 team Total 1 team leader and 2 team members (3 per team)	OSM contractor

9. CAPABILITY ARRANGEMENTS

Jadestone is a Member to the OSRL OSM Supplementary Agreement, which provides OSM preparedness, activation and monitoring services. This Membership also includes access to OSRL's sub-contracted Monitoring Service Providers in Australia and internationally (who will report through OSRL). OSRL will provide direct monitoring capability and support to Members for OMP: Shoreline Clean-up Assessment.

Details of OSM services are provided in Table 9-1. Jadestone will maintain responsibility for implementing OMP: Air Quality Modelling (responder health and safety).

OSRL (referred to as the OSM Services Provider in this BIP), via the OSM Supplementary Agreement is contracted to provide Members with a monthly Standby Capability and Competency Report, which details personnel requirements for OMPs/SMPs, numbers of available personnel and competencies for service provider and sub-contracted personnel.

Personnel listed on the monthly update will be contactable via mobile phone during this period and accessible to a nominated airport or port within 72 hours of a Member's initial activation of OSM Services.

Table 9-1: OSM services provider preparedness and activation/monitoring services

Standby	Implementation
24/7 Duty Manager accessed through 24 hr. call out number	Provision of an OSM Services Lead and OSM Implementation Lead to the Jadestone IMT within 12 hours of notification
Provision of suitably trained operational monitoring personnel	Provision of a first-strike monitoring team within 72 hours of notification, ready to deploy from a nominated port(s) or staging location
Monthly reports on personnel and equipment availability	Finalisation of monitoring plans
Access to OSM Service Provider's sub-contracted Monitoring Service Providers	Provision of scientific monitoring personnel within 5-7 days of notification
Access to OSM Service Provider's network of laboratories and equipment providers	Access to OSM Services Provider personnel and equipment

9.1 Personnel Competencies

The OSRL OSM Supplementary Agreement specifies the competency requirements for key OSM personnel.

In addition and where practicable, Jadestone will engage its consultants in the initial stages of the monitoring program to help activate and mobilise monitoring teams, and finalise monitoring designs.

9.2 Equipment

Equipment requirements are listed in the individual OMPs and SMPs. A generalised breakdown of equipment types and the source is listed in Table 9-2.

In accordance with the OSM services contract, the OSM Services Provider will provide all specialised field monitoring equipment to implement individual OMPs and SMPs. Jadestone will remain responsible for support and field logistics, including monitoring platforms (e.g. vessels, vehicles and aircraft), flights and accommodation for personnel and transportation / couriers for samples to be sent back to laboratories.

Availability of field equipment will be listed in the OSM Services Provider's Standby Capability and Competency Report.

Table 9-2: OSM equipment

Equipment type	Source
Desktop equipment (e.g. Oil Spill Response Atlas, GIS)	Coordinated through OSM Service Provider.
In-field specialised monitoring equipment (e.g. fluorometers, sample bottles, ROVs)	Coordinated through the OSM Services Provider's standby OSM response and implementation services.
Logistical equipment (e.g. in-field accommodation, vessels, aircraft)	Marine contracts, aviation contracts.

9.3 Exercises

Jadestone maintains the Incident Management Exercise and Testing Program (JS-70-PR-F-00001) to ensure its competency in responding to and managing major incidents, including oil spills. The Incident Management Exercise and Testing Program is reviewed and revised (if required) annually.

Additional information is provided in Section 3.4 of the OPEP.

10. CAPABILITY ASSESSMENT

Table 10-1 demonstrates Jadestone's OSM contractor capability to implement each OMP and SMP, including an assessment of each monitoring plan, identification of likely monitoring platforms, major supporting infrastructure (e.g. offshore accommodation), reactive baseline monitoring requirements (Section 4), initial survey arrangements (e.g. aerial followed up with ground reconnaissance) and ability to combine with other monitoring plans.

Table 10-1: OSM capability

Component	Total Personnel Required (Weeks 1–2) [1]	Personnel available via OSM Service Provider Contract	Personnel available via OSROs	Jadestone	Total Personnel Available
OSM Personnel embedded in IMT	1 OSM Implementation Lead (given nature/scale this person can also fill the role of OM and SM Coordinator) 1 Field Operations Manager	9 OSM Implementation Lead / Monitoring Coordinators / Field Operations Manager	N/A	N/A	9 OSM Implementation Lead / Monitoring Coordinators / Field Operations Manager
OMPs					
Hydrocarbon properties and weathering behaviour at sea*	2 team leaders 4 team members	11 team leaders 11 team members	N/A	N/A	11 team leaders 11 team members
Shoreline clean-up assessment	1 team leader 2 team members	18 OSRL	60 + AMOSC Core Group 12 AMOSC staff	N/A	60 + AMOSC Core Group 12 AMOSC staff 18 OSRL
Surface chemical dispersant effectiveness and fate (relevant only to a spill involving Montara crude)	Visual observations: 1 team leader 1 team member Water quality assessment – refer to SMP: Water quality assessment	7 team leaders 7 team members	Visual observations: 3 team leaders 4 team members	N/A	10 team leaders 11 team members
Water quality assessment*	Refer to OMP: Hydrocarbon properties	17 team leaders 17 team members	N/A	N/A	17 team leaders 17 team members

[1] If additional resources are required for week 3 onwards then this will be identified early in the monitoring process and Jadestone will activate additional contracted resources through its OSM Services Provider to increase capacity

Component	Total Personnel Required (Weeks 1–2) [1]	Personnel available via OSM Service Provider Contract	Personnel available via OSROs	Jadestone	Total Personnel Available
	and weathering behaviour at sea				
Sediment quality assessment*	Refer to OMP: Hydrocarbon properties and weathering behaviour at sea	17 team leaders 17 team members	N/A	N/A	17 team leaders 17 team members
Marine fauna assessment (reptiles, cetaceans, dugongs, seabirds and shorebirds, fish)	1 aerial team (including 1 Marine Mammal Observer (MMO) and 1 Aerial survey observer)	8 team leaders 8 team members	N/A	N/A	8 team leaders 8 team members
SMPs					
Water quality impact assessment	2 team leaders 4 team members Note: can initially be performed by the same team as OMP: Water quality assessment. This SMP may replace OMP: Water quality assessment if the OMPs termination criteria are triggered	27 team leaders 27 team members	N/A	N/A	27 team leaders 27 team members
Sediment quality impact assessment	Refer to SMP: Water quality impact assessment* (all sites)	27 team leaders 27 team members	N/A	N/A	27 team leaders 27 team members
Intertidal and coastal habitat assessment	1 team leader 2 team members	1 team leader 2 team members	N/A	N/A	1 team leader 2 team members

Component	Total Personnel Required (Weeks 1–2) [1]	Personnel available via OSM Service Provider Contract	Personnel available via OSROs	Jadestone	Total Personnel Available
Seabirds and shorebirds	1 aerial team (Can initially be performed by the same aerial team as OMP: Marine fauna assessment)	6 team leaders 6 team members	N/A	N/A	6 team leaders 6 team members
	1 vessel team (surveys would include all fauna [birds, reptiles, cetaceans, dugong and whale shark])				
	1 ground team (including 2 experienced ornithologists)				
Marine mega-fauna assessment – whale shark, dugong and cetaceans	1 aerial team (Can initially be performed by the same aerial team as OMP: Marine fauna assessment)	6 team leaders 12 team members	N/A	N/A	6 team leaders 12 team members
	1 vessel team (surveys would include all fauna [birds, reptiles, cetaceans, dugong and whale shark])				
Marine mega-fauna assessment – reptiles	1 aerial team (Can initially be performed by the same aerial team as OMP: Marine fauna assessment)				
	1 vessel team (surveys would include all fauna				

Component	Total Personnel Required (Weeks 1–2) [1]	Personnel available via OSM Service Provider Contract	Personnel available via OSROs	Jadestone	Total Personnel Available
	[birds, reptiles, cetaceans, dugong and whale shark]) 1 ground team (including 2 members experience with ground turtle surveys)				
Benthic habitat assessment	1 team leader 2 team members	12 team leaders 12 team members	N/A	N/A	12 team leaders 12 team members
Marine fish and elasmobranch assemblages assessment	1 team leaders 2 team members	6 team leaders 6 team members	N/A	N/A	6 team leaders 6 team members
Fisheries impact assessment	1 team leaders 2 team member	6 team leaders 6 team members	N/A	N/A	6 team leaders 6 team members
Heritage features assessment	1 team leader 2 team members (including either ROV operator or marine diver/s)	7 team leaders 7 team members	N/A	N/A	7 team leaders 7 team members
Social impact assessment	1 team leader 1 team member	2 team leaders 2 team members	N/A	N/A	2 team leaders 2 team members

** Initial co-mobilisation between OMP: Hydrocarbon properties and weathering behaviour at sea, OMP: Surface chemical dispersant effectiveness and fate, OMP: Water quality assessment and OMP: Sediment quality assessment*

11. REVIEW OF PLAN

As part of the Environment Plan review cycle, this document will be reviewed annually and revised, if required, in accordance with Jadestone's Management of Change Procedure (JS-90-PR-G-00017). This could include changes required in response to one or more of the following:

- When major changes have occurred which affect Operational and/or Scientific Monitoring coordination or capabilities (e.g. change of service provider/s)
- Changes to the activity that affect Operational and/or Scientific Monitoring coordination or capabilities (e.g. a significant increase in spill risk)
- Changes to legislative context related to Operational and/or Scientific Monitoring (e.g. EPBC Act protected maters requirements)
- Following routine testing of the OSM if improvements or corrections are identified; or
- After a Level 2/3 spill incident.

The extent of changes made to this OSM Bridging Implementation Plan and resultant requirements for regulatory resubmission will be informed by the relevant Commonwealth regulations, i.e. the OPGGS (E) Regulations.

PART B – IMPLEMENTATION

12. NOTIFICATION AND ACTIVATION PROCESS

Jadestone's IMT Planning Lead is responsible for activating OSM components, subject to approval from the IMT Leader. Table 12-1 outlines the Jadestone OSM activation process.

Table 12-1: OSM activation process

Responsibility	Task	Timeframe	Complete
Environment Unit Lead (Jadestone)	Review initiation criteria of OMPs and SMPs during the preparation of the initial Incident Action Plan (IAPs) and subsequent IAPs; and if any criteria are met, activate relevant OMPs and SMPs	Within 4 hours of spill notification	☐
	Obtain approval from IMT Leader to initiate OSM	Within 4 hours of spill notification	☐
	Contact OSM Services Provider and verbally notify their Duty Manager of the incident, requesting provision of OSM Implementation Lead to the IMT. Duty Manager will send Call Off Order Form to Jadestone to complete and return to OSM Services Provider to confirm activation of OSM Services	Within 4 hours of spill notification	☐
	Provide monitor and evaluate data (e.g. aerial surveillance, fate and weathering modelling, tracking buoy data, current IAPs) to OSM Services Provider	Within 1 hour of data being received by IMT	☐
	Liaise directly with Jadestone's Logistics Lead to identify potential staging and departure location/s for monitoring activities. Provide this information to OSM Services Provider	Within 4-6 hours of spill notification	☐
	Record tasks in Personal Log	At time of completion of task	☐
OSM Services Provider	Duty Manager to activate relevant MSPs	Within 30 minutes of Call Off Order Form being received by OSM Services Provider	☐
	OSM personnel (OSM Implementation Lead and OM/SM Coordinators) requested by Jadestone (via Call Off Order Form) to be sent to Jadestone's IMT	Within 12 hours of notification being made to OSM Services Provider	☐
	Liaise directly with EUL to confirm which OMPs and SMPs are to be fully activated	Within 4 hours of monitor and evaluate data being received from IMT	☐
	Confirm availability of initial personnel and equipment resources	Within 5 hours of monitor and evaluate data being received from IMT	☐

13. MONITORING PRIORITIES

As described in Section 2, the available spill trajectory modelling has been analysed to understand the likely initial monitoring priorities for its activities in the EMBA. In addition, Table 4-2 lists comparability of available baseline data for receptors, to assist in identifying where post-spill, pre-impact monitoring should be prioritised.

The monitoring priorities provided in Section 2 and Table 4-2 are to be used for guidance when confirming monitoring priorities in consultation with key stakeholders and monitoring service providers (including subject matter experts, where available) at the time of the spill. Table 13-1 provides a checklist to assist in the confirmation of monitoring priorities for individual spills.

Table 13-1: Checklist for determining monitoring priorities

Responsibility	Task	Timeframe	Complete
Environment Unit Leader (Jadestone)	Evaluate monitoring priorities in consultation with key stakeholders, including the appointed State/Territory Environment and Science Coordinator	Within 12 hours of monitor and evaluate data being received from IMT	☐
OSM Services Provider with input from Environment Unit Leader	Confirm monitoring locations for activated OMPs and SMPs based on: • Current monitor and evaluate data (i.e. situational awareness data, including predicted time to receptor impact, aerial/vessel surveillance observations, tracking buoy data, satellite data) • Monitoring locations identified in Section 4 • Nature of hydrocarbon spill (i.e. subsea release, surface release, hydrocarbon characteristics, volume, expected duration of release) • Seasonality and presence of receptors impacted or at risk of being impacted • Current information on transient and broadscale receptors (surface and subsea) • Current operational considerations (e.g. weather, logistics) • Nature of hydrocarbon spill (i.e. Source of the spill, surface release, hydrocarbon characteristics, volume, expected duration of release) • Monitoring priorities identified in Section 2 • Existing literature, baseline data, and monitoring programs.	Within 12 hours of monitor and evaluate data being received from IMT	☐
	Using the results of the baseline data analysis in Table 4-2 and the information above, determine priority locations for post-spill, pre-impact monitoring	Within 12 hours of monitor and evaluate data being received from IMT	☐
	Confirm the need for any additional reactive baseline monitoring data for SMPs and determine	Within 12 hours of monitor and evaluate data	☐

Responsibility	Task	Timeframe	Complete
	suitable locations, noting that suitable control or reference sites may be outside of the EMBA	being received from IMT	
	Continually re-evaluate monitoring priorities in consultation with EUL and relevant key stakeholders throughout spill response and relevant key stakeholders throughout spill response	Ongoing	☐

14. PROTECTED MATTERS REQUIREMENTS

Table 14-1 provides a checklist to ensure monitoring personnel consider EPBC Act Protected Matters (Matters of Environmental Significance) and other protected matters requirements in the finalisation of OMPs and SMPs.

Appendix C outlines the management plans, recovery plans and conservation advice statements relevant for the Protected Matters within the EMBA that are likely to be relevant to the final design of the OMPs and SMPs.

Table 14-1: Checklist for including protected matters into monitoring designs

Responsibility	Task	Complete
OSM Services Provider with input from Environment Unit Lead	Review Monitoring, Evaluation and Surveillance data and available OMP data to determine likely presence and encounter of protected species in predicted trajectory of the spill	☐
	Review the relevant recovery plan/conservation advice/management plan in Appendix C and determine if there have been any updates to the relevant conservation threats/actions. Integrate relevant considerations into the final monitoring design for affected OMPs and SMPs	☐
	Review restrictions on marine mammal buffer distances in SMP: Marine mega-fauna and ensure this is included in all relevant response and monitoring IAPs (e.g. Shoreline Protection Plan, Shoreline Clean-up Plan, OSM Plan), so that response and monitoring field teams maintain required buffer distances from fauna during operations	☐

15. FINALISING MONITORING DESIGN

The methods presented in the Joint Industry OMPs and SMPs are designed to allow Monitoring Providers with the flexibility to modify the standard operating procedures, so that the latest research, technologies, equipment, sampling methods and variables may be used. Monitoring designs may also be varied in-situ, according to the factors presented in Section 10.6 of the Joint Industry OSM Framework.

Jadestone's checklist for finalising monitoring designs post-spill is provided in Table 15-1. The OSM Implementation Lead will be responsible for approving the finalised monitoring design used in the OMPs and SMPs.

Table 15-1: Checklist for finalising monitoring design

Responsibility	Task	Timeframe	Complete
OSM Services Provider	Confirm survey objectives, sampling technique, for each initiated OMP and SMP	Within 48 hours of initial monitoring priorities being confirmed by IMT	☐
	Determine suitable sampling frequency	Within 48 hours of initial monitoring priorities being confirmed by IMT	☐
	Finalise standard operating procedures	Within 48 hours of initial monitoring priorities being confirmed by IMT	☐
	Scientific monitoring: • Establish benchmarks and guidelines to be used • Confirm indicator species • Confirm parameters and metrics	Within 96 hours of initial monitoring priorities being confirmed by IMT	☐

16. MOBILISATION

When the monitoring design has been finalised for each OMP and SMP, the OSM Services Provider shall work in conjunction with Jadestone to develop and execute a monitoring mobilisation plan, which will be incorporated into the Incident Action Planning process.

The OSM Services Provider will be required to coordinate the availability of personnel and equipment for all monitoring programs. Jadestone is responsible for flights, accommodation and victualing for field personnel. Jadestone will also be required to procure all vessels, aerial platforms and vehicles for OMP and SMP implementation.

A checklist for mobilising monitoring teams is provided in Table 16-1.

Table 16-1: Checklist for mobilisation of monitoring teams

Responsibility	Task	Complete
OSM Services Provider with input from Environment Unit Leader	Confirm availability of all monitoring personnel (noting required competencies in Section 9.1 and individual OMPs/SMPs)	☐
	Allocate number of teams, personnel, equipment and supporting resource requirements	☐
	Undertake HAZIDs as required and consolidate/review field documentation including safety plans, emergency response plans, and daily field reports	☐
	Develop site-specific health and safety plans which are compliant with health safety and environment systems (including call in timing and procedures)	☐
	Conduct pre-mobilisation meeting with monitoring team/s on survey objectives, logistics, safety issues, reporting requirements and data management collection requirements	☐
	Determine data management delivery needs of the IMT and process requirements, including data transfer approach and frequency/timing	☐
	Confirm data formats and metadata requirements with personnel receiving data	☐
	Logistics	
	Confirm flights, accommodation, and car hire arrangements are in place	☐
	Develop field survey schedules, detailing staff rotation	☐
	Equipment	
	Confirm survey platform (vessel, vehicle, aircraft) has been secured to survey or access survey sites and ensure it is equipped with appropriate fridge and freezer space for transportation of samples (and carcasses if collecting)	☐
	Ensure vessels have correct fit-out specifications (e.g. winches, GPS, satellite, hiab, sufficient deck space, water supplies [fresh and/or salt], accommodation)	☐
	Confirm consumables (including personal protective equipment) have been purchased and will be delivered to required location	☐
	Liaise with NATA-accredited laboratories to confirm availability, limits of detection, sampling holding times, transportation, obtain sample analysis quotes and arrange provision of appropriate sample containers, Chain of	☐

Responsibility	Task	Complete
	Custody (CoC) forms and suitable storage options for all samples. Make arrangements for couriers (if necessary)	
	Confirm specialist equipment requirements and availability (including redundancy)	☐
	Check GPS units and digital cameras are working and that sufficient spare batteries and memory cards are available	☐
	Confirm sufficient equipment to allow integration of survey software and navigational systems (e.g. GPS, additional equipment and adaptors), and additional GPS units prepared	☐
	Confirm GPS survey positions (where available) have been QA/QC checked and pre-loaded into navigation software/positioning system	☐
	Check field laptops, ensuring they have batteries (including spares), power cable, and are functional	☐
	Check if a first aid kit or specialist Personal Protective Equipment (PPE) is required	☐
	Confirm arrangements for freight to mobilisation port is in place	☐

17. PERMITS AND ACCESS REQUIREMENTS

Permit and access requirements apply to Marine Parks, Marine Protected Areas, restricted heritage areas, operational areas of industrial sites, defence locations, certain fauna and managed fisheries. Table 17-1 lists relevant protected areas within the EMBA and the jurisdictional authority to be contacted to obtain the necessary permit or access permission.

The OSM Services Provider is responsible for submitting access and permit applications to all relevant Jurisdictional Authorities to conduct monitoring for OMPs and SMPs.

Table 17-1: Permits required in EMBA

Receptor	Location	Jurisdictional Authority	Relevant information on permits
Permits for monitoring fauna	N/A	Department of Climate Change, Energy, the Environment and Water (DCCEEW) WA Department of Biodiversity, Conservation and Attractions (DBCA) NT Parks and Wildlife	Any interactions involving nationally listed threatened fauna may require approval from DCCEEW (http://www.environment.gov.au/biodiversity/threatened/permits) WA- appropriate permits can be found at: https://www.dbca.wa.gov.au/licences-and-permits/fauna NT- permits can be found at: https://nt.gov.au/environment/animals/wildlife-permits/permits-take-interfere-with-wildlife
State Marine Protected Areas	• North Kimberley • Rowley Shoals	DBCA	No specific permitting requirements exist for monitoring in WA marine protected areas, but additional information is available at: https://www.dbca.wa.gov.au/management/marine-planning
Ramsar wetland	• Ashmore Reef Nature Reserve • Hosnies Spring (Christmas Island) • The Dales (Christmas Island)	DCCEEW	Additional information on Ramsar wetlands and how they are protected as a matter of national environmental significance under the EPBC Act is available at: https://www.environment.gov.au/epbc/what-is-protected/wetlands
Australian (Commonwealth) Marine Parks	• Cartier Island • Argo-Rowley Terrace • Ashmore Reef • Christmas Island • Joseph Bonaparte Gulf • Kimberley • Oceanic Shoals	Director of National Parks Parks Australia	Permit and licence application information for Marine Protected Areas (including monitoring) can be found at: https://onlineservices.environment.gov.au/parks/australian-marine-parks and https://onlineservices.environment.gov.au/parks/australian-marine-parks/permits Additional information on permitting requirements in Australian Marine Parks can be obtained through Parks Australia via email marineparks@environment.gov.au or phone 1800 069 352 Information on permits to access biological resources in Commonwealth areas can be found at: http://www.environment.gov.au/topics/science-and-research/australias-biological-resources/access-biological-resources-commonwealth

Receptor	Location	Jurisdictional Authority	Relevant information on permits
			Due to the risk posed by unexploded ordnances, landing on Cartier Island or anchoring anywhere within the Cartier Island Marine Park is strictly prohibited without express prior written approval. If anchoring is unavoidable due to emergency (e.g. extreme weather conditions), great care should be taken to ensure anchoring is on sand, and anchors do not drag. Any metal objects or suspicious objects found in the reserve should not be touched or disturbed and reported immediately to the police and the Parks Australia Work Health and Safety Advisor on 02 6274 2369 or ParksHealthAndSafety@dcceew.gov.au.
State/Territory Managed Fisheries	• Mackerel Managed Fishery (WA) • Norther Demersal Scalesfish Managed Fishery (WA) • Northern Shark Fishery (WA) • Joint Managed Fishery Area (WA) • Pearl Oyster (WA) • Kimberley Prawn (WA) • Specimen Shell (WA) • Abalone (WA) • Beche de Mer (WA) • Broome Prawn Managed Fishery (WA) • Marine Aquarium Fish Managed Fishery (WA) • Pilbara Line (WA) • Pilbara Trap (WA)	WA Department of Primary Industries and Reginal Development (DPIRD) NT Department of Industry, Tourism and Trade (DITT)	No specific permitting requirements exist for WA Fisheries, but additional information is available at – https://www.fish.wa.gov.au/Fishing-and-Aquaculture/Pages/default.aspx No specific permitting requirements exist for NT Fisheries, but additional information is available at - https://industry.nt.gov.au/industries/fisheries

Receptor	Location	Jurisdictional Authority	Relevant information on permits
	• Pilbara Trawl (WA) • Trochus (WA) • West Coast Deep Sea Crustacean (WA) • Aquarium Fishery (NT) • Coastal Line Fishery (NT) • Demersal Fishery (NT) • Off-shore Net and Lines Fisheries (NT) • Spanish Mackerel Fishery (NT) • Timor Reef Fishery (NT)		
Commonwealth Managed Fisheries	• Western Tuna and Billfish Fishery • Southern Bluefin Tuna • Western Skipjack Tuna Fishery • Northern Prawn Fishery • North-West Slope Trawl Fishery	Australian Fishing Management Authority	Commonwealth Managed Fisheries (scientific permit for research/monitoring in an Australian Fishing Zone) https://www.afma.gov.au/fisheries-services/fishing-rights-permits
Indigenous Cultural Heritage	A search of the DPLH database indicates there are 12 Registered Aboriginal Sites and 1	Department of Planning, Lands and Heritage (DPLH)	Entry access permits to Aboriginal Lands in WA: https://www.wa.gov.au/service/aboriginal-affairs/aboriginal-heritage-conservation/apply-permit-access-or-travel-through-aboriginal-land

Receptor	Location	Jurisdictional Authority	Relevant information on permits
	Heritage Survey within the EMBA.	Aboriginal Areas Protection Authority (AAPA)	Aboriginal heritage sites in WA: https://www.wa.gov.au/service/aboriginal-affairs/aboriginal-cultural-heritage/search-aboriginal-sites-or-heritage-places Indigenous heritage information in NT: https://nt.gov.au/leisure/arts-culture-heritage/visit-a-cultural-or-heritage-site/indigenous-heritage-information
Defence/restricted military area	North Australian Exercise Area (NAXA) offshore training area	Department of Defence	Unexploded Ordanances (mapping information): https://www.defence.gov.au/UXO/default.asp Maritime military firing practice and exercise areas: https://www.hydro.gov.au/factsheets/FS_Navigation-Firing_Practice_and_Exercise_Areas.pdf
Industry (e.g. operational zone of offshore oil or gas platform)	• Northern Endeavour Facility (Australian Government) • Bayu-Undan Field (Santos)	Operating company	Safety zones (up to 500 m from outer edge of well or equipment) – https://www.nopsema.gov.au/safety/safety-zones/
Shipwrecks	A number of unnamed Indonesian fishing vessels, the Sinar Bonerate (1999) and the Ann Millicent (1888) are known to be in the vicinity of Ashmore Reef and Cartier Island	DCCEEW	Refer to the *Underwater Cultural Heritage Act* 2018 (Commonwealth): https://www.dcceew.gov.au/parks-heritage/heritage/underwater-heritage/underwater-cultural-heritage-act

18. USE OF DATA IN RESPONSE DECISION-MAKING

18.1 Operational Monitoring to Inform Response Activities

The OSM Services Provider is responsible for the collection of data by field teams, which shall be QA/QC checked by the Field Team Lead in accordance with the requirements listed in the finalised OMPs and SMPs (where applicable). The Team Lead will be responsible for communicating data back to the OSM Management Team (led by the OSM Services Provider) via field reporting forms, debriefs and reports. Laboratory analysis reports should also be directed to the OSM Management Team.

The OSM Management Team is responsible for the interpretation and analysis of data. OMP data should be analysed rapidly so that it may be used to inform response planning and decisions in the current and/or next operating period. SMP data is designed to be more scientifically robust and long-term in nature and is not relied upon by the IMT for decision-making. Therefore, SMP data will be analysed more thoroughly by the OSM Management Team.

Once data is analysed and checked by the Field Team Lead, it will be provided to the Planning Section who will then distribute the data from each monitoring component to the relevant IMT Section. Table 18-1 provides guidance on the type of data generated from each OMP, which IMT Section requires the data and how the data may be used during a response.

Analysed data will then be incorporated into the Common Operating Picture (managed by the Planning Lead) and used by the Environment Unit Lead during development of the operational Spill Impact Mitigation Assessment (SIMA), which would be included in the IAP for the current or next operating period.

As ultimately responsible for the IAPs, the Planning Lead will be required to determine if the response options can be commenced, continued, escalated, terminated, or if controls need to be put in place to manage impacts of the response activities. These decisions will be communicated to the broader IMT during regular situation debriefs.

Table 18-1: Data generated from each OMP and how this may be used by IMT in decision-making

Operational Monitoring Plan	Data generated[2]	IMT Section requiring data	How data may be used by IMT
Hydrocarbon properties and weathering behaviour at sea	Hydrocarbon physical characteristics (e.g. viscosity, asphaltene content, fingerprinting, weathering ratios of hydrocarbon chains)	Planning Section to aid in response option selection / modification	Changes to the hydrocarbon properties will affect the window of opportunity for particular responses and the associated logistical requirements of these responses, such as use of chemical dispersants, recovery and pumping equipment suitability, hydrocarbon storage and hydrocarbon disposal requirements
Shoreline clean-up assessment	Assessment of shoreline character; assessment of shoreline oiling; recommendations for response activities; post-treatment surveys	Planning Section to aid in IAP development and response option selection / modification	Confirmation of shoreline character, habitats and fauna present which may influence selection of response tactics (e.g. no mechanical recovery if turtles are known to be nesting); Oil deposition and/or removal rate for a shoreline sector will help determine effectiveness of relevant tactics (e.g. shoreline protection and/or clean-up operations); Assessment teams provide ground truthing of sites that are not possible via satellite imagery, therefore the IMT can rely on the recommendations of Assessment Teams (e.g. flagging access issues, suitable tactics, likely resourcing needs)
Surface chemical dispersant effectiveness and fate	Visual observations of dispersant efficacy; concentration of hydrocarbons in water column (see also water quality assessment);	Environment Unit for use in operational SIMA; Planning Section to aid in IAP development; Operations Section to confirm dispersant effectiveness for decision-making purposes in current operations period.	Determine the effectiveness of dispersant in removing oil from sea surface and how dispersed oil is being distributed through the water column. This information can be used in SIMA to help decide if dispersants are being effective at treating high value receptors (SIMA to evaluate any trade-offs between receptors)
Water quality assessment	Distribution of oil in water column and change in hydrocarbon concentrations (e.g. total recoverable hydrocarbons, BETEXN, PAH), physio-chemical parameters and dispersant detection	Planning Lead to validate surveillance and modelling data; Planning Section for use in IAP	Confirm spatial extent of spill within the water column and verify spill modelling and surveillance data; extent of spill can in turn influence location of other OMP and SMP monitoring components and sites. Data can also influence ongoing use of dispersant through ongoing operational SIMA.

[2] Summary only. For additional detail, please refer to individual OMPs. Also note data outputs will be reliant on finalised monitoring design.

Operational Monitoring Plan	Data generated[2]	IMT Section requiring data	How data may be used by IMT
Sediment quality assessment	Distribution of oil in sediment and change in hydrocarbon concentrations (e.g. Total recoverable hydrocarbons, BETEXN, PAH)	Planning Lead to validate surveillance and modelling data; Planning Section for use in IAP	Confirm spatial extent of spill; extent of spill can in turn influence location of other OMP and SMP monitoring components and sites
Marine fauna assessment • Reptiles • Cetaceans (observational only) • Dugongs • Seabirds and shorebirds • Fish	Rapid assessment of presence and distribution of marine fauna; evaluate impact of spill and response activities on fauna	Planning Section for use in IAP; Oiled Wildlife Section/Division to help in developing Wildlife Response Sub-plan	Understanding of species, populations and geographical locations at greatest risk from spill impacts. IMT can use this information to help qualify locations with highest level of protection priority (e.g. dugong nursery area is at risk of high contact therefore dispersant use closest to spill source may be a preferred option); understanding the impacts of spill response activities can help IMT to modify or terminate activities if they are assessed as creating more harm than the oil alone (e.g. large shoreline clean-up teams and staging areas may disturb shorebird nesting resulting in adults abandoning chicks)

18.2 Impacts from Response Activities

Table 10-4 of the Joint Industry OSM Framework outlines the potential impacts from response activities and the relevant OMP/SMP for monitoring impacts. For example, if shoreline clean-up was being considered as a response option, then possible impacts resulting from that activity could include physical presence, ground disturbance, water/sediment quality decline and lighting/noise impacts to fauna.

When finalising monitoring designs, the OSM Implementation Lead shall review Table 10-4 of the Joint Industry OSM Framework to ensure potential impacts from response activities are considered and any suitable mitigation actions are incorporated into relevant OMP/SMP designs.

18.3 Operational Monitoring of Effectiveness of Control Measures and to Ensure EPS are Met

The Environmental Performance Standards (EPS) relevant to spill response and the OSM are included in the Montara Operations OPEP (GF-70-PLN-I-00001) When finalising monitoring designs, the OSM Implementation Lead and Environment Unit Lead (or delegate) shall review the Environmental Performance Standards listed in the Montara Operations OPEP and integrate checks into the monitoring design that will help determine if relevant EPS are being met.

19. DATA MANAGEMENT

Minimum standards for data management are provided in Section 10.11 of the Joint Industry OSM Framework and will be adopted by Jadestone and the OSM Service Provider.

20. QUALITY ASSURANCE AND QUALITY CONTROL

Refer to Section 10.11 of the Joint Industry OSM Framework for QA/QC minimum standards, which will be adopted by Jadestone and the OSM Service Provider.

21. COMMUNICATION PROTOCOLS

21.1 OSM Services Provider/s

Communication protocols between Jadestone and its OSM Services Provider with respect to delivery of the OMPs and SMPs (during both preparedness and implementation) are intentionally defined to ensure clear and consistent information is provided in both directions.

The following communication protocols must be observed:

- Communication between Jadestone and its OSM Services Provider during the preparedness phase (pre-spill) will be between the nominated Industry Member Technical Advisory Group representative and the OSM Services Lead.
- Communication between Jadestone and its OSM Services Provider during activation (prior to deployment) will be between the Environment Unit Lead (EUL) (or delegate) and the OSM Services Provider Lead.
- During implementation (post deployment), primary communication will occur via two pathways:
    - Jadestone Representative and the OSM Services Provider Lead for contractual, management, scientific and general direction matters
    - Jadestone's IMT Planning Lead and the OSM Services Provider's Field Operations Manager for on-site matters.
- All OSM operational decisions should be logged in an OSM decision log by key personnel, including but not limited to the OSM Services Provider Implementation Lead, OSM Field Operations Manager, Operational Monitoring Coordinator, Scientific Monitoring Coordinator and Field Team Leads.
- All OSM tasks, actions and requirements should be documented in an IAP during the response phase of the spill.
- The Jadestone EUL will keep the Operations Lead, Logistics Lead and Planning Lead briefed of the OSM status as required.
- All correspondence (copies of emails and records of phone calls) between Jadestone and the OSM Services Provider during a response should be recorded and kept on file.
- All communication received by OSM Services Provider not in line with these protocols should be reported to the EUL who will seek guidance on the accuracy of the information received.
- Unless related to safety (e.g. evacuation), any direction or instruction received by the OSM Services Provider outside of these protocols should be confirmed via the Jadestone EUL or On-Scene Commander prior to implementation.

During the post-response phase all communications shall be between a nominated Jadestone representative and the OSM Services Provider OSM Implementation Lead and/or OSM Services Lead.

21.2 External Stakeholders

Results of OMPs and SMPs will be discussed with relevant stakeholders. Information will be shared with regulatory agencies/authorities as required and inputs received from stakeholders will be evaluated and where practicable, will be used to refine the ongoing spill response and/or ongoing operational and/or scientific monitoring.

Jadestone IMT Media/Public Information Officer will be the focal point for external engagement during the response operation.

Stakeholder communications post-response will be managed by Jadestone HSE Team.

22. STAND-DOWN PROCESS

Monitoring for each component will continue until termination criteria for individual components are reached. Typically, OMPs will terminate when agreement has been reached with the Jurisdictional Authorities relevant to the spill to terminate the response or a relevant SMP has been activated. SMPs will continue after the spill response has been terminated and until such time as their termination criteria are also reached. A list of criteria is provided in the OSM Framework.

After OMPs are terminated, the OMP monitoring teams will be advised to stand down. Following this stage, the OSM Services Provider will run a lessons-learnt meeting between Jadestone, all monitoring providers and other relevant stakeholders. It is the responsibility of Jadestone to ensure that lessons learnt are communicated to the relevant stakeholder groups. The lessons discussed should include both positive actions to be reinforced and lessons for actions that could be improved in future standby or response campaigns.

23. REFERENCES

Allen GR. (1993). Part 7 - Fishes of Ashmore Reef and Cartier Island. Pages 67-91 in P. F. Berry, editor. Marine faunal surveys of Ashmore Reef and Cartier Islands, north-western Australia. Records of the Western Australian Museum, Perth.

Australian Institute of Marine Science (AIMS). (2017). Towed Video deployments in Timor Sea Banks and Shoals (Montara 2). https://apps.aims.gov.au/metadata/view/cd084dc6-12f8-4d50-83ba-ec0512313544, accessed 19-Nov-2023.

Australian Institute of Marine Science (AIMS). (2023). Coral bleaching events. Retrieved from https://www.aims.gov.au/research-topics/environmental-issues/coral-bleaching/coral-bleaching-events

APPEA (2021) Joint Industry Operational and Scientific Monitoring Plan Framework. Rev D. Report prepared by BlueSands Environmental for APPEA Marine and Environmental Science Working Group.

Bouchet PJ, Letessier TB, Caley MJ, Nichol SL, Hemmi JM, Meeuwig JJ. (2020) Submerged Carbonate Banks Aggregate Pelagic Megafauna in Offshore Tropical Australia. Front. Mar. Sci. 7:530. doi: 10.3389/fmars.2020.00530

Clark RH, Herrod A. (2016). The status of seabirds and shorebirds at Ashmore, Cartier Island and Browse Island. Final impact assessment of the Montara Oil Spill. Prepared on behalf of PTTEP Australasia and the Department of the Environment. Monash University, Melbourne, Australia

Clarke RH, Swann G, Carter MJ, Mott RM, Herrod A. (2017), The avifauna of Cartier Island Commonwealth Marine Reserve, north-western Australia. Australian Field Ornithology, 34: 18-25.

Commonwealth of Australia (CoA) (2015). *Wildlife Conservation Plan for Migratory Shorebirds.* Canberra, ACT: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/publications/wildlife-conservation-plan-migratory-shorebirds-2016

Commonwealth of Australia (CoA) (2017). Recovery Plan for Marine Turtles in Australia. 2017–2027. Australian Government, Canberra. Available from: http://www.environment.gov.au/marine/publications/recovery-plan-marine-turtles-australia-2017. In effect under the EPBC Act from 03-Jun-2017.

Commonwealth of Australia (CoA) (2020a). *Wildlife Conservation Plan for Seabirds.* Canberra, ACT: Department of the Environment. Available from: https://www.dcceew.gov.au/sites/default/files/documents/wildlife-conservation-plan-for-seabirds.pdf

Commonwealth of Australia (CoA) (2015). Sawfish and River Sharks Multispecies Recovery Plan. Canberra, ACT: Commonwealth of Australia. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/recovery/sawfish-river-sharks-multispecies-recovery-plan

Commonwealth of Australia (CoA) (2023). National Conservation Values Atlas. Available from: https://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022). National Recovery Plan for the Australian Painted Snipe (Rostratula australis). Department of Climate Change, Energy, the Environment and Water, Canberra. Available from: http://www.dcceew.gov.au/environment/biodiversity/threatened/publications/recovery/australian-painted-snipe-2022.

Department of Climate Change, Energy, the Environment and Water (2023). Conservation Advice for *Erythrotriorchis radiatus* (red goshawk). Canberra: Department of Climate Change, Energy, the Environment and Water. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/942-conservation-advice-31032023.pdf.

Department of Environment and Conservation (DEC) (2007). Rowley Shoals Marine Park Management Plan 2007–2017: Management Plan No. 56. Department of Environment and Conservation, Perth, Western Australia.

Department of Environment and Resource Management (DERM) (2012). National recovery plan for the red goshawk *Erythrotriorchis radiatus*. Report to the Department of Sustainability, Environment, Water, Population and Communities, Canberra. Queensland Department of Environment and Resource Management, Brisbane. Available from: http://www.environment.gov.au/biodiversity/threatened/recovery-plans/national-recovery-plan-red-goshawk-erythrotriorchis-radiatus.

Department of Environment, Water, Heritage and the Arts (DEWHA) (2008). The North-West Marine Bioregional Plan. Bioregional Profile. A Description of the Ecosystems, Conservation Values and Uses of the North-West Marine Region. Department of the Environment, Water, Heritage and the Arts, Canberra, ACT.

Department of Parks and Wildlife (2016). North Kimberley Marine Park Joint Management Plan 2016 Uunguu, Balanggarra, Miriuwung Gajerrong, and Wilinggin management area, Number plan 89. Department of Parks and Wildlife, Perth. Available from: https://www.dbca.wa.gov.au/management/plans/north-kimberley-marine-park

Department of Primary Industries and Regional Development (DPIRD) (2022) State of the Fisheries Report (Western Australia)

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2011a). Approved Conservation Advice for *Aipysurus apraefrontalis* (Short-nosed Sea Snake). Canberra, ACT. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1115-conservation-advice.pdf.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2011b). Approved Conservation Advice for *Aipysurus foliosquama* (Leaf-scaled Sea Snake). Canberra, ACT. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1118-conservation-advice.pdf

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2012) Marine bioregional plan for the North-west Marine Region. Commonwealth of Australia

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2013a). Recovery Plan for the White Shark (*Carcharodon carcharias*). Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/recovery-plans/recovery-plan-white-shark-carcharodon-carcharias

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2013b). Approved Conservation Advice for *Rostratula australis* (Australian painted snipe). Canberra: Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/77037-conservation-advice.pdf

Department of Environment (DoE) (2014a) Conservation Advice – *Pristis clavata* -Dwarf Sawfish. Canberra: Department of the Environment.

Department of the Environment (DoE) (2014b). Approved Conservation Advice for *Pristis pristis* (largetooth sawfish). Canberra: Department of the Environment. Available from:http://www.environment.gov.au/biodiversity/threatened/species/pubs/60756-conservation-advice.pdf. In effect under the EPBC Act from 11-Apr-2014.

Department of the Environment (2014c). Approved Conservation Advice for *Glyphis garricki* (northern river shark). Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/82454-conservation-advice.pdf.

Department of Environment (DoE) (2014d) Conservation Advice – *Glyphis glyphis*- Speartooth shark. http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=66181

Department of the Environment (2014e). Approved Conservation Advice for *Chalcophaps indica natali*s (Christmas Island emerald dove). Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/67030-conservation-advice.pdf.

Department of the Environment (DoE) (2014f). Conservation Advice *Phaethon lepturus fulvus* white-tailed tropicbird (Christmas Island). Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/26021-conservation-advice.pdf.

Department of the Environment(DoE) (2014g). Approved Conservation Advice for *Turdus poliocephalus erythropleurus* (Christmas Island thrush). Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/67122-conservation-advice.pdf.

Department of the Environment (DoE) (2015a) *Conservation Management Plan for the Blue Whale—A Recovery Plan under the Environment Protection and Biodiversity Conservation Act 1999*, Canberra, ACT: Commonwealth of Australia. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/recovery/blue-whale-conservation-management-plan. In effect under the EPBC Act from 03-Oct-2015.

Department of the Environment (DoE) (2015c). *Conservation Advice* Calidris ferruginea *curlew sandpiper*. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/856-conservation-advice.pdf.

Department of the Environment (DoE) (2015d). Conservation Advice *Numenius madagascariensis* eastern curlew. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/847-conservation-advice.pdf.

Department of the Environment and Energy (DoEE) (2018). Threat Abatement Plan for the impact of marine debris on the vertebrate wildlife of Australia's coasts and oceans. Australian Government [accessed 24 September 2023].

Department of the Environment and Energy (DoEE) (2020). National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds. Commonwealth of Australia 2020 [accessed 24 September 2023].

Department of Environment, Water, Heritage and the Arts (DEWHA) (2008a). The North-West Marine Bioregional Plan. Bioregional Profile. A Description of the Ecosystems, Conservation Values and Uses of the North-West Marine Region. Department of the Environment, Water, Heritage and the Arts, Canberra, ACT.

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008b). Approved Conservation Advice for Green Sawfish. Canberra. Available: http://www.environment.gov.au/biodiversity/threatened/species/pubs/68442-conservation-advice.pdf.

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008c). *Approved Conservation Advice for* Dermochelys coriacea *(Leatherback Turtle)*. Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1768-conservation-advice.pdf. In effect under the EPBC Act from 08-Jan-2009.

Director of National Parks (2018) *North-west Marine Parks Network Management Plan 2018*, Director of National Parks, Canberra. Available from: https://parksaustralia.gov.au/marine/pub/plans/north-west-management-plan-2018.pdf

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2012). Marine Bioregional Plan for the North-west Marine Region. Department of Sustainability, Environment, Water, Populations and Community, Canberra.

Done TJ, Williams D McB, Speare, PJ, Davidson, J, DeVantier, LM, Newman, SJ & Hutchins, JB, (1994). Surveys of coral and fish communities at Scott Reef and Rowley Shoals., Australian Institute of Marine Science, Townsville.

Edgar G, Stuart-Smith R. (2018). Reef Life Survey (RLS): Global Reef Fish Dataset. Battery Point, TAS: Institute for Marine and Antarctic Studies (IMAS).

Gilmour J, Cheal A, Smith L, Underwood J, Meekan M, Fitzgibbon B, Rees M, (2007). Data compilation and analysis for Rowley Shoals: Mermaid, Imperieuse and Clerke reefs., Report to the Department of Environment and Water Resources, Australian Institute of Marine Science, Perth.

Gilmour JP, Travers MJ, Underwood JN, McKinney DW, Meekan MG, Gates EN, Fitzgerald KL (2009). Long-term Monitoring of Shallow-water Coral and Fish Communities at Scott Reef. AIMS SRRP Annual Report September 2009, Project 1. Report produced for Woodside Energy Ltd. Australian Institute of Marine Science, Townsville, Australia. 224pp.

Guinea ML (2006). Sea turtles, Sea Snakes and Dugongs of Scott Reef, Seringapatam Reef and Browse Island with notes on West Lacepede Island. Report to URS. Charles Darwin University, Australia.

Guinea ML. (2008). Sea snakes of Ashmore Reef and Cartier Island: Final Report Survey 2008 to DEWHA Canberra. Darwin, NT: Charles Darwin University.

Guinea ML. (2013). Surveys of the sea snakes and sea turtles on reefs of the Sahul Shelf, monitoring program for the Montara well release Timor Sea (Darwin, NT: Charles Darwin University).

Heyward A, Radford B, Burns K, Colquhoun J, Moore C. (2010a). Final report on Benthic Surveys at Ashmore, Cartier and Seringapatam Reefs.

Heyward A, Moore C, Radford B, Colquhoun J (2010b). Monitoring program for the Montara well release Timor Sea: final report on the Nature of Barracouta and Vulcan Shoals. Report prepared by AIMS for PTTEP Australia (Ashmore Cartier) Pty Ltd.

Heyward A, (2011) Monitoring study S% banks and shoals, Montara 2011 offshore banks assessment survey. Report prepared by AIMS for Report prepared by AIMS for PTTEP Australia (Ashmore Cartier) Pty Ltd.

Heyward A, Case M, Cappo M, Colquhoun J, Curry L, Fisher R, Radford B, Stowar M, Wakeford M, Wyatt M (2017) The Barracouta, Goeree and Vulcan Shoals Survey 2016. Report prepared by AIMS for PTTEP Australia (Ashmore Cartier) Pty Ltd.

Heyward A., Radford B. (2019). Northwest Australia. In: Loya Y., Puglise, K., Bridge T. (eds) Mesophotic Coral Ecosystems. Coral Reefs of the World, vol 12. Springer, Cham. https://doi.org/10.1007/978-3-319-92735-0_19

Hill R. (2004a). National Recovery Plan for the Christmas Island Goshawk *Accipiter fasciatus natalis*. Commonwealth of Australia, Canberra.

Hill R. (2004b). National recovery plan for the Christmas Island Hawk-Owl Ninox natalis. Commonwealth of Australia, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/recovery-plans/national-recovery-plan-christmas-island-hawk-owl-ninox-natalis.

Hill R and Dunn A (2004). National Recovery Plan for the Christmas Island Frigatebird *Fregata andrewsi*. Commonwealth of Australia, Canberra.

Kirby MF, Brant J, Moore J, Lincoln S (eds) (2018) PREMIAM – Pollution Response in Emergencies – Marine Impact Assessment and Monitoring: Post-incident monitoring guidelines. Second Edition. Science Series Technical Report. Cefas, Lowestoft.

Kospartov MC, Beger, M, Ceccarelli DM and Richards ZT. (2006). An assessment of the distribution and abundance of sea cucumbers, trochus, giant clams, coral, fish and invasive marine species at Ashmore Reef National Nature Reserve and Cartier Island Marine Reserve: 2005. Report prepared by UniQuest Pty Ltd, University of Queensland, Brisbane, Queensland, for the Department of the Environment and Heritage, Canberra, ACT.

Lavers JL., Miller MGR, Carter MJ, Swann G, Clarke RH. (2014). Predicting the Spatial Distribution of a Seabird Community to Identify Priority Conservation Areas in the Timor Sea. Conservation Biology, 28(6), 1699–1709. http://www.jstor.org/stable/24482133

Last P, Lyne V, Yearsley G, Gledhill D, Gomon M, Rees T and White W (2005) Validation of national demersal fish datasets for the regionalisation of the Australian continental slope and outer shelf (>40 metres depth), Department of the Environment and Heritage and CSIRO Marine and Atmospheric Research, Hobart.

Limpus CJ (2008). A biological review of Australian marine turtles, 2. Green turtle *Chelonis mydas* (Linnaeus). Environment Protection Agency, Queensland.

Moore C, Cappo M, Radford B, Heyward A. (2017) Submerged oceanic shoals of north Western Australia are a major reservoir of marine biodiversity. Coral Reefs 36: 719-734.

National Environmental Research Program Marine Biodiversity Hub (NERP MBH) (2014). Exploring the Oceanic Shoals Commonwealth Marine Reserve, NERP MBH, Hobart.

O'Malley C. (2006). National Recovery Plan for the Gouldian Finch (*Erythrura gouldiae*). WWF-Australia, Sydney and Parks and Wildlife NT, Department of Natural Resources, Environment and the Arts, NT Government, Palmerston. Available from: http://www.environment.gov.au/biodiversity/threatened/recovery-plans/national-recovery-plan-gouldian-finch-erythrura-gouldiae.

National Environmental Research Program Marine Biodiversity Hub (NERP MBH) (2014). Exploring the Oceanic Shoals Commonwealth Marine Reserve, NERP MBH, Hobart.

Nichol SL, Howard FJF, Kool J, Stowar M, Bouchet P, Radke L, Siwabessy J, Przeslawski, R, Picard K., Alvarez de Glasby B, Colquhoun J, Letessier T, Heyward A. (2013). Oceanic Shoals Commonwealth Marine Reserve (Timor Sea) Biodiversity Survey:GA0339/SOL5650 – Post Survey Report. Record 2013/38. Geoscience Australia: Canberra.

Parks Australia (2022). Satellite mapping of bathymetry and habitats of Ashmore Reef and Cartier Island Marine Parks. Accessed via Australian Ocean Data Network (AODN)

Przeslawski R, Alvarez B, Kool J, Bridge T, Caley MJ, Nichol S (2015) Implications of Sponge Biodiversity Patterns for the Management of a Marine Reserve in Northern Australia. PLoS ONE 10(11): e0141813. doi:10.1371/journal.pone.0141813

Rees MM, Colquhoun JJ, Smith LL, Heyward AA. (2003).Survey of Trochus, Holothuria, Giant Clams and the Coral Communities at Ashmore, Cartier Reef and Mermaid Reef, Northwestern Australia. Darwin, NT: Environment Australia, 64.

Richards Z, Beger M, Hobbs JP, Bowling T, Chong-Seng K, Pratchett M. (2009). Ashmore reef National Nature Reserve and Cartier Island Marine Reserve Marine Survey 2009. ARC Centre of Excellence for Coral Reef Studies. Sydney, NSW: Department of the Environment, Water, Heritage and the Arts.

RPS. (2023). Montara Production Oil Spill Modelling. MAQ1275J v1, 12 July 2023.

Skewes TD, Dennis DM, Jacobs DR, Gordon SR, Taranto TJ, Haywood M, Pitcher CR, Smith GP, Milton D, Poiner IR. (1999). Survey and stock size estimates of the shallow reef (0–15 m deep) and shoal area (15–50 m deep) marine resources and habitat mapping within the Timor Sea MOU74 Box. Vol. 1. Stock estimates and stock status. CSIRO Division of Marine Research, Hobart, Tasmania.

Ryan KL, Lai EKM, Smallwood CB (2022). Boat-based recreational fishing in Western Australia 2020/21. Fisheries Research Report No. 327 Department of Primary Industries and Regional Development, Western Australia. 221pp.

Threatened Species Scientific Committee (TSSC) (2015a). Approved Conservation Advice for *Rhincodon typus* (whale shark). Canberra: Department of the Environment. Available: http://www.environment.gov.au/biodiversity/threatened/species/pubs/66680-conservation-advice-01102015.pdf .

Threatened Species Scientific Committee (TSSC) (2015b). Approved Conservation Advice for *Balaenoptera borealis* (sei whale). Canberra: Department of the Environment. Available: http://www.environment.gov.au/biodiversity/threatened/species/pubs/34-conservation-advice-01102015.pdf

Threatened Species Scientific Committee (TSSC) (2015c). Approved Conservation Advice for *Balaenoptera physalus* (fin whale). Canberra: Department of the Environment. Available: http://www.environment.gov.au/biodiversity/threatened/species/pubs/37-conservation-advice-01102015.pdf .

Threatened Species Scientific Committee (TSSC) (2015d). Approved Conservation Advice for *Tyto novaehollandiae Kimberli* masked owl (northern). Canberra: Department of the Environment. Available: https://www.environment.gov.au/biodiversity/threatened/species/pubs/26048-conservation-advice-01102015.pdf

Threatened Species Scientific Committee (TSSC) (2015e). Conservation Advice *Anous tenuirostris melanops* Australian lesser noddy. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/26000-conservation-advice-01102015.pdf

Threatened Species Scientific Committee (TSSC) (2016a). Approved Conservation Advice for *Calidris canutus* (Red knot). Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/855-conservation-advice-05052016.pdf

Threatened Species Scientific Committee (TSSC) (2016b). Approved Conservation Advice for *Accipiter hiogaster natalis* Christmas Island Goshawk. Canberra: Department of the Environment. Available from: https://www.environment.gov.au/biodiversity/threatened/species/pubs/82408-conservation-advice-15072016.pdf

Threatened Species Scientific Committee (TSSC) (2016c). Conservation Advice *Charadrius leschenaultii* Greater sand plover. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/877-conservation-advice-05052016.pdf.

Threatened Species Scientific Committee (2016d). Conservation Advice Erythrura gouldiae Gouldian finch. Canberra: Department of the Environment and Energy. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/413-conservation-advice-07122016.pdf.

Threatened Species Scientific Committee (2016e). Conservation Advice Falcunculus frontatus whitei Crested shrike-tit (northern) Canberra: Department of the Environment. Available from: https://www.environment.gov.au/biodiversity/threatened/species/pubs/26013-conservation-advice-05052016.pdf

Threatened Species Scientific Committee (2016f). Conservation Advice Limosa lapponica baueri Bar-tailed godwit (western Alaskan). Canberra: Department of the Environment. Available from:

http://www.environment.gov.au/biodiversity/threatened/species/pubs/86380-conservation-advice-05052016.pdf.

Threatened Species Scientific Committee (TSSC) (2016g). *Conservation Advice* Limosa lapponica menzbieri *Bar-tailed godwit (northern Siberian)*. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/86432-conservation-advice-05052016.pdf.

Threatened Species Scientific Committee (2016h). Conservation Advice Ninox natalis Christmas Island hawk-owl. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/66671-conservation-advice-15072016.pdf.

Threatened Species Scientific Committee (TSSC) (2020a). Conservation Advice the Abbott's booby *Papasula abbotti*. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/59297-conservation-advice-19102020.pdf.

Threatened Species Scientific Committee (2020b). Conservation Advice Falco hypoleucos Grey Falcon. Canberra: Department of Agriculture, Water and the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/929-conservation-advice-09072020.pdf.

Threatened Species Scientific Committee (2020b). Conservation Advice the Christmas Island Frigatebird – *Fregata andrewsi.* Canberra: Department of Agriculture, Water and the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1011-conservation-advice-19102020.pdf

Thums M, Waayers D, Huang Z, Pattiaratchi C, Bernus J, Meekan M. (2017). Environmental predictors of foraging and transit behaviour in flatback turtles *Natator depressus*. Endangered Species Research, 32(1), 333-349. https://doi.org/10.3354/esr00818

Whiting SD (1999). Use of the remote Sahul Banks, Northwestern Australia, by dugongs, including breeding females. Marine Mammal Science 15 (2): 609-615.

Willan RC. (2005). The molluscan fauna from the emergent reefs of the northernmost Sahul Shelf, Timor Sea: Ashmore, Cartier and Hibernia reefs— biodiversity and zoogeography. The Beagle, Records of the Museums and Art Galleries of the Northern Territory, Supplement 1: 51–81.

APPENDIX A KEY ECOLOGICAL FEATURES

Table A-1: Key Ecological Features in the EMBA

Key Ecological Feature	Description and Values
Carbonate Bank and Terrace System of the Sahul Shelf	• Regionally important because of its likely ecological role in enhancing biodiversity and local productivity relative to its surrounds • Forms a unique seafloor feature, with banks that rise to at least 45 m, and to within 30 m water depth, allow light dependent organisms to thrive and support more biodiversity (Nichol et al. 2013; NERP 2014) • Supports a high diversity of organisms including reef fish, sponges, soft and hard corals, gorgonians, bryozoans, ascidians and other sessile filter feeders • The banks are known to be foraging areas for loggerhead, olive ridley and flatback turtles • Cetaceans and green and largetooth sawfish are likely to occur in the area
Ancient Coastline at 125 m Depth Contour	• A unique seafloor feature with ecological properties of regional significance • Migratory pelagic species (e.g. humpback whales and whale sharks) may use this escarpment as a guide • The topographic complexity of escarpments associated with this feature may facilitate vertical mixing of the water column, providing nutrient-rich and enhanced productivity.
Continental Slope Demersal Fish Communities	• Valued for its high degree of endemism as the diversity of demersal fish assemblages is high compared to elsewhere along the continental slope
Ashmore Reef and Cartier Island and Surrounding Commonwealth Waters	• Regionally important for feeding and breeding aggregations of birds and other marine life • Areas of enhanced primary productivity in an otherwise low-nutrient environment • Ashmore Reef supports the highest number of coral species of any reef off the WA coast
Seringapatam Reef and Commonwealth Waters in the Scott Reef Complex	• Coral communities occur across shallow (<30 m) and deep (>30 m) habitats • 306 hard coral species from 60 genera and 14 families having been identified; all were predominantly widespread Indo–Pacific species (Gilmour et al. 2009) • Coral species diversity comparable to other reefs in the region, such as Ashmore, Seringapatam and Mermaid Reef/Rowley Shoals • Green turtle nesting at Sandy Islet (Guinea 2006) • Shallow atoll reef forms an intertidal platform at low tide • High primary productivity relative to other parts of the region and coral communities are largely self-seeded and rely on the reproductive output of resident corals

Key Ecological Feature	Description and Values
	• Relatively pristine and has a high species richness, which apply to both the benthic and pelagic habitats, attracting aggregations of marine life including whale and dolphin species
Pinnacles of the Bonaparte Basin (North and North West)	• The Pinnacles rise steeply from depths of ~80 m to within 30 m of the water surface. Supported communities include sessile benthic invertebrates, including hard and soft corals, sponges, whips, fans, bryozoans and aggregations of demersal fish species such as snappers, emperors and groupers • Recognised as a unique seafloor feature and a biodiversity hotspot for sponges
Carbonate Bank and Terrace System of the Van Diemen Rise	• Unique seafloor feature with ecological properties of regional significance • While reef-forming corals are sparse throughout the region, some locally dense hard corals can be found on the banks of the Van Diemen Rise. These include near threatened, vulnerable and endangered species on the IUCN Red List. Coral communities on the Van Diemen rise are believed to be genetically distinct from those elsewhere in northern Australia. • Pelagic fish such as mackerel, red snapper and a distinct gene pool of gold band snapper are also found on the Van Diemen rise
Canyons Linking the Argo Abyssal Plain with the Scott Plateau	• Scott Plateau connects with the Argo Abyssal Plain via a series of canyons, the largest of which are the Bowers and Oates canyons (DSEWPaC 2012) • High productivity of the region is believed to be led by topographically induced water movements through the canyons and the action of internal waves in these canyons as well as around islands and reefs • The canyons are thought to be linked to small and periodic upwellings that enhance this biological productivity (DEWHA 2008a) • The canyons are likely to be important features due to their historical association with sperm whale aggregations (DSEWPaC 2012). Historical records indicate that the number of sperm whales was high. Although current numbers are unknown, it is possible that they congregate around the canyon heads, encouraged by the high biological productivity, supporting stocks of their prey (DEWHA 2008a) • Anecdotal evidence that the Scott Plateau may be a breeding ground for sperm and beaked whales • Likely that important demersal communities occur in the canyons, as they do in the Scott Plateau supported by the nutrient upwelling (DEWHA 2008a)
Mermaid Reef and Commonwealth Waters Surrounding Rowley Shoals NOTE: This is just outside EMBA but included for close proximity.	• The Rowley Shoals are a group of three atoll reefs—Clerke, Imperieuse and Mermaid reefs—located ~300 km north-west of Broome • Mermaid Reef lies 29 km north of Clerke and Imperieuse reefs and is totally submerged at high tide • Regionally important in supporting high species richness, higher productivity and aggregations of marine life associated with the adjoining reefs themselves (Done et al. 1994) • Contains 214 coral species and approximately 530 species of fishes (Gilmour et al. 2007), 264 species of molluscs and 82 species of echinoderms (Done et al. 1994; Gilmour et al. 2007)

Key Ecological Feature	Description and Values
	• Both coral communities and fish assemblages differ from similar habitats in eastern Australia (Done et al. 1994)

APPENDIX B BASELINE DATA SOURCES

Table B-1: Baseline data sources Cartier Island Marine Park

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
Benthic communities and fish assemblages	Kospartov MC, Beger, M, Ceccarelli DM and Richards ZT. (2006). An assessment of the distribution and abundance of sea cucumbers, trochus, giant clams, coral, fish and invasive marine species at Ashmore Reef National Nature Reserve and Cartier Island Marine Reserve: 2005. Report prepared by UniQuest Pty Ltd, University of Queensland, Brisbane, Queensland, for the Department of the Environment and Heritage, Canberra, ACT.	University of Queensland (Link to report)	Ashmore Reef Marine Park Cartier Island Marine Park
	Willan RC. (2005). The molluscan fauna from the emergent reefs of the northernmost Sahul Shelf, Timor Sea: Ashmore, Cartier and Hibernia reefs—biodiversity and zoogeography. The Beagle, Records of the Museums and Art Galleries of the Northern Territory, Supplement 1: 51–81.	Western Australian Museum (Link to article)	Ashmore reef Cartier reef Hibernia reef
	Rees MM, Colquhoun JJ, Smith LL, Heyward AA. (2003). Survey of Trochus, Holothuria, Giant Clams and the Coral Communities at Ashmore, Cartier Reef and Mermaid Reef, Northwestern Australia. Darwin, NT: Environment Australia, 64.	Australian Institute of Marine Science (AIMS) (Link to report)	Ashmore reef Cartier reef Mermaid reef
	Richards Z, Beger M, Hobbs JP, Bowling T, Chong-Seng K, Pratchett M. (2009). Ashmore reef National Nature Reserve and Cartier Island Marine Reserve Marine Survey 2009. ARC Centre of Excellence for Coral Reef Studies. Sydney, NSW: Department of the Environment, Water, Heritage and the Arts.	Commonwealth of Australia (Link to the report)	Ashmore reef Cartier Island Marine Park
	Parks Australia (2022). Satellite mapping of bathymetry and habitats of Ashmore Reef and Cartier Island Marine Parks. Accessed via Australian Ocean Data Network (AODN)	Parks Australia (Link to metadata)	Ashmore reef Cartier Island Marine Park
	Heyward A., Radford B. (2019). Northwest Australia. In: Loya Y., Puglise, K., Bridge T. (eds) Mesophotic Coral Ecosystems. Coral Reefs of the World, vol 12. Springer, Cham. https://doi.org/10.1007/978-3-319-92735-0_19	AIMS (Link to article)	Northwest Australia

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Skewes TD, Dennis DM, Jacobs DR, Gordon SR, Taranto TJ, Haywood M, Pitcher CR, Smith GP, Milton D, Poiner IR. (1999). Survey and stock size estimates of the shallow reef (0–15 m deep) and shoal area (15–50 m deep) marine resources and habitat mapping within the Timor Sea MOU74 Box. Vol. 1. Stock estimates and stock status. CSIRO Division of Marine Research, Hobart, Tasmania.	Commonwealth Scientific and Industrial Research Organisation (CSIRO) (Link to report)	Ashmore Reef Browse Island Cartier Island Hibernia Reef Scott North Reef Scott South Reef Seringapatam Reef Johnson Bank Woodbine Bank
	Edgar G, Stuart-Smith R. (2018). Reef Life Survey (RLS): Global Reef Fish Dataset. Battery Point, TAS: Institute for Marine and Antarctic Studies (IMAS).	Institute for Marine and Antarctic Studies (Link to Reef Life Survey)	Ashmore reef Cartier reef Scott reef Seringapatam Hibernia
	Allen GR. (1993). Part 7 - Fishes of Ashmore Reef and Cartier Island. Pages 67-91 in P. F. Berry, editor. Marine faunal surveys of Ashmore Reef and Cartier Islands, north-western Australia. Records of the Western Australian Museum, Perth.	Western Australian Museum (Link to article)	Ashmore reef Cartier Island
	Heyward A, Moore C, Radford B, Colquhoun J (2010). Monitoring program for the Montara well release Timor Sea: final report on the Nature of Barracouta and Vulcan Shoals. Report prepared by AIMS for PTTEP Australia (Ashmore Cartier) Pty Ltd.	AIMS (Link to report)	Barracouta Shoal Vulcan Shoal
	Heyward A, (2011) Monitoring study S% banks and shoals, Montara 2011 offshore banks assessment survey. Report prepared by AIMS for Report prepared by AIMS for PTTEP Australia (Ashmore Cartier) Pty Ltd.	AIMS (Link to report)	Eugene McDermott Goeree Shoal Vulcan Shoal Shoal 25 Barracouta Shoal Echuca Shoal Heyward Shoal

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Heyward A, Case M, Cappo M, Colquhoun J, Curry L, Fisher R, Radford B, Stowar M, Wakeford M, Wyatt M (2017) The Barracouta, Goeree and Vulcan Shoals Survey 2016. Report prepared by AIMS for PTTEP Australia (Ashmore Cartier) Pty Ltd.	AIMS (Link to report)	Barracouta Shoal Vulcan Shoal Goeree Shoal
	Moore C, Cappo M, Radford B, Heyward A. (2017) Submerged oceanic shoals of north Western Australia are a major reservoir of marine biodiversity. Coral Reefs 36: 719-734.	AIMS (Link to article)	Barracouta Shoal Wave Governor Bank Shoal 25 Vulcan Shoal Goree Shoal Eugene McDermott Shoal Heywood Shoal Echuca Shoal
	Nichol SL, Howard FJF, Kool J, Stowar M, Bouchet P, Radke L, Siwabessy J, Przeslawski, R, Picard K., Alvarez de Glasby B, Colquhoun J, Letessier T, Heyward A. (2013). Oceanic Shoals Commonwealth Marine Reserve (Timor Sea) Biodiversity Survey:GA0339/SOL5650 – Post Survey Report. Record 2013/38. Geoscience Australia: Canberra.	Geoscience Australia (Link to report)	Oceanic Shoals AMP
	Przeslawski R, Alvarez B, Kool J, Bridge T, Caley MJ, Nichol S (2015) Implications of Sponge Biodiversity Patterns for the Management of a Marine Reserve in Northern Australia. PLoS ONE 10(11): e0141813. doi:10.1371/journal.pone.0141813	Geoscience Australia (Link to article)	Oceanic Shoals AMP
	Bouchet PJ, Letessier TB, Caley MJ, Nichol SL, Hemmi JM, Meeuwig JJ. (2020) Submerged Carbonate Banks Aggregate Pelagic Megafauna in Offshore Tropical Australia. Front. Mar. Sci. 7:530. doi: 10.3389/fmars.2020.00530	The University of Western Australia (Link to article)	Oceanic Shoals AMP
	Australian Institute of Marine Science (AIMS). (2017). Towed Video deployments in Timor Sea Banks and Shoals (Montara 2). https://apps.aims.gov.au/metadata/view/cd084dc6-12f8-4d50-83ba-ec0512313544, accessed 19-Nov-2023.	AIMS (Link to the data)	Baracuda East and West Shoals Sheldon Shoal Wave Governor Bank Heywood Shoal Echuca Shoal

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
			Goeree Shoal Eugene McDermott Shoal Vulcan Shoal
Marine reptiles	Guinea ML. (2013). Surveys of the sea snakes and sea turtles on reefs of the Sahul Shelf, monitoring program for the Montara well release Timor Sea (Darwin, NT: Charles Darwin University).	Charles Darwin University (Link to report)	Ashmore reef Scott reef Cartier Island Hibernia reef Seringapatam reef Browse Island Montgomery reef
	Guinea ML. (2006). Final Report Survey 2005: Sea Snakes of Ashmore Reef, Hibernia Reef and Cartier island. Darwin, NT: Charles Darwin University.	Charles Darwin University	Ashmore reef Cartier reef Hibernia reef
	Guinea ML. (2008). Sea snakes of Ashmore Reef and Cartier Island: Final Report Survey 2008 to DEWHA Canberra. Darwin, NT: Charles Darwin University.	Charles Darwin University	Ashmore reef Cartier reef
	Edgar G, Stuart-Smith R. (2018). Reef Life Survey (RLS): Global Reef Fish Dataset. Battery Point, TAS: Institute for Marine and Antarctic Studies (IMAS). (Survey included sea snake observations)	Institute for Marine and Antarctic Studies (Link to Reef Life Survey)	Ashmore reef Cartier reef Scott reef Seringapatam Hibernia
	Limpus CJ (2008). A biological review of Australian marine turtles, 2. Green turtle *Chelonis mydas* (Linnaeus). Environment Protection Agency, Queensland.	Queensland Government (Link to article)	Ashmore and Cartier Islands
	Commonwealth of Australia (2017) Recovery Plan for Marine Turtles in Australia 2017–2027.	Commonwealth of Australia (Link to management plan)	Australia wide
	Thums M, Waayers D, Huang Z, Pattiaratchi C, Bernus J, Meekan M. (2017). Environmental predictors of foraging and transit behaviour in flatback	AIMS (Link to article)	Oceanic Shoals AMP

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	turtles *Natator depressus*. Endangered Species Research, 32(1), 333-349. https://doi.org/10.3354/esr00818		
Seabirds and shorebirds	Clark RH, Herrod A. (2016). The status of seabirds and shorebirds at Ashmore, Cartier Island and Browse Island. Final impact assessment of the Montara Oil Spill. Prepared on behalf of PTTEP Australasia and the Department of the Environment. Monash University, Melbourne, Australia	Commonwealth of Australia (Link to report)	Cartier Island Ashmore Reef Browse Island
	Clarke RH, Swann G, Carter MJ, Mott RM, Herrod A. (2017), The avifauna of Cartier Island Commonwealth Marine Reserve, north-western Australia. Australian Field Ornithology, 34: 18-25.	Monash University (Link to article)	Cartier Island
	Lavers JL., Miller MGR, Carter MJ, Swann G, Clarke RH. (2014). Predicting the Spatial Distribution of a Seabird Community to Identify Priority Conservation Areas in the Timor Sea. Conservation Biology, 28(6), 1699–1709. http://www.jstor.org/stable/24482133	Monash University (Link to article)	Ashmore Reef Cartier Island Browse Island Scott Reef Adele Island Lacepede Islands Broome Timor Sea
Marine mammals	Whiting SD (1999). Use of the remote Sahul Banks, Northwestern Australia, by dugongs, including breeding females. Marine Mammal Science 15 (2): 609-615.	Scott Whiting (Department of Biodiversity, Conservation and Attractions) (Link to article)	Ashmore reef Cartier reef
Commercial fisheries	State of the Fisheries Report (Western Australia) DPIRD (2022)	DPIRD (Link to report)	Western Australia
	Ryan KL, Lai EKM, Smallwood CB (2022). Boat-based recreational fishing in Western Australia 2020/21. Fisheries Research Report No. 327 Department of Primary Industries and Regional Development, Western Australia. 221pp.	DPIRD (Link to report)	Western Australia

APPENDIX C PROTECTED MATTERS IN THE EMBA

Table C-1: Protected matters in the EMBA, relevant monitoring plans and priority sites

Species or group	Relevant Plan/ Conservation Advice	Relevant threats and conservation actions	Relevant OMPs and SMPs
Fish, sharks and rays			
Great White Shark (*Carcharodon carcharias*)	Recovery plan for the White Shark (*Carcharodon carcharias*) (DSEWPaC 2013a)	Ecosystem effects as a result of habitat modification	• OMP: Marine fauna assessment – Fish • SMP: Marine mega-fauna assessment • SMP: Marine fish and elasmobranch assemblages assessment
Dwarf sawfish (*Pristis clavata*)	Approved Conservation Advice on *Pristis lavate* (sawfish) (DoE 2014a) Sawfish and River Sharks Multispecies Recovery Plan (CoA 2015)	Habitat degradation and modification	
Freshwater/ Largetooth Sawfish (*Pristis pristis*)	Approved Conservation Advice for *Pristis pristis* (largetooth sawfish) (DoE 2014b) Sawfish and River Sharks Multispecies Recovery Plan (CoA 2015)	Habitat degradation and modification	
Green Sawfish (*Pristis zijsron*)	Approved Conservation Advice for *Pristis zijsron* (green sawfish) (DEWHA 2008b) Sawfish and River Sharks Multispecies Recovery Plan (CoA 2015)	Habitat degradation and modification	
Whale Shark (*Rhincodon typus*)	Approved Conservation Advice for *Rhincodon typus* (whale shark) (TSSC 2015a)	Boat strike from large vessels	
		Habitat disruption from mineral exploration, production and transportation	
Northern River Shark (*Glyphis garricki*)	Approved Conservation Advice for *Glyphis garricki* (northern river shark) (DoE 2014c)		
Scalloped Hammerhead (*Sphyrna lewini*)	-	-	
Southern Bluefin Tuna (*Thunnus maccoyii*)	-	-	

Species or group	Relevant Plan/ Conservation Advice	Relevant threats and conservation actions	Relevant OMPs and SMPs
Little Gulper Shark	-	-	
Reef Manta Ray (*Manta alfredi*)	-	-	
Giant Manta Ray (*Manta birostris*)	-	-	
Narrow sawfish (*Anoxypristis cuspidata*)	-	-	
Oceanic Whitetip Shark (*Carcharhinus longimanus*)	-	-	
Shortfin Mako (*Isurus oxyrinchus*)	-	-	
Longfin Mako (*Isurus paucus*)	-	-	
Speartooth Shark (*Glyphis glyphis*)	Approved Conservation Advice for *Glyphis glyphis* (speartooth shark) (DoE 2014d) Sawfish and river shark multispecies recovery plan (Commonwealth of Australia 2015)		
Marine mammals			
Sei Whale (*Balaenoptera borealis*)	Approved Conservation Advice for *Balaenoptera borealis* (sei whale) (TSSC 2015b) Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans (DoEE 2018)	Anthropogenic noise and acoustic disturbance Habitat degradation including pollution (increasing port expansion and coastal development) Pollution (persistent toxic pollutants) Vessel strike	• OMP: Marine fauna assessment – Cetaceans • SMP: Marine mega-fauna assessment – Whale sharks, dugongs and cetaceans

Species or group	Relevant Plan/ Conservation Advice	Relevant threats and conservation actions	Relevant OMPs and SMPs
Blue whale (*Balaenoptera musculus*) Including Pygmy Blue Whale	Blue Whale Conservation Management Plan 2015–2025 (DoE 2015a) Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans (DoEE 2018)	Noise Interference	
		Habitat Modification	
		Vessel Disturbance/ strike	
Fin whale (*Baleenoptera physalus*)	Approved Conservation Advice for *Balaenoptera physalus* (fin whale) (TSSC 2015c) Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans (DoEE 2018)	Anthropogenic noise and acoustic disturbance	
		Habitat degradation including coastal development, port expansion and aquaculture	
		Pollution (persistent toxic pollutants)	
		Vessel strike	
Humpback whale (*Megaptera novaeangliae*)	Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans (DoEE 2018)	Habitat degradation including coastal development and port expansion	
		Entanglement	
		Vessel disturbance and strike	
Bryde's whale (*Balaenoptera edeni*)	Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans (DoEE 2018)	Marine debris	
Orca, Killer whale (*Orcinus orca*)			
Spotted bottlenose dolphin (Arafura/Timor Sea populations) (*Tursiops aduncus*)			
Sperm whale (*Physeter macrocephalus*)			

Species or group	Relevant Plan/ Conservation Advice	Relevant threats and conservation actions	Relevant OMPs and SMPs
Australian Snubfin Dolphin (*Orcaella heinsohni*)			
Australian Humpback Dolphin (also known as *Sousa chinensis*)			
Dugong (*Dugong dugon*)			
Marine reptiles			
Short-nosed seasnake (*Aipysurus apraefrontalis*)	Approved Conservation Advice on *Aipysurus apraefrontalis* (Short-nosed seasnake) (DSEWPaC 2011a)	Habitat degradation	• OMP: Marine fauna assessment – Reptiles • SMP: Marine mega-fauna assessment – Reptiles
Leaf-scaled seasnake (*Aipysurus folipsquama*)	Approved Conservation Advice on *Aipysurus foliosquama* (Leaf-scaled seasnake) (DSEWPaC 2011b)	Degradation of reef habitat	
All marine turtles including: • Loggerhead Turtle • Green Turtle • Leatherback Turtle • Hawksbill Turtle • Flatback Turtle • Olive Ridley	Recovery plan for marine turtles in Australia 2017–2027 (DoEE 2017) National Light Pollution Guidelines for Wildlife including Marine Turtles, Seabirds and Migratory Shorebirds (DoEE 2020) Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans (DoEE 2018)	Light pollution	
		Habitat modification/ loss	
		Chemical and terrestrial discharge/ deteriorating water quality	
		Marine debris	
		Vessel disturbance/ strike	
		Noise interference	
Leatherback Turtle (*Dermochelys coriacea*)	Approved Conservation Advice on *Dermochelys coriacea* (DEWHA 2008c)	Vessel strike	
		Degradation of foraging areas	
Salt-water crocodile (*Crocodylus porosus*)	-	-	

Species or group	Relevant Plan/ Conservation Advice	Relevant threats and conservation actions	Relevant OMPs and SMPs
Birds			
All seabirds and migratory shorebirds	National Light Pollution Guidelines for Wildlife including Marine Turtles, Seabirds and Migratory Shorebirds (DoEE 2020)		• OMP: Shoreline clean-up assessment • OMP: Marine fauna assessment – Seabirds and shorebirds • SMP: Seabirds and shorebirds
All seabirds	Wildlife Conservation Plan for Seabirds (CoA 2020a)		
Migratory species within the combined EMBA	Wildlife Conservation Plan for Migratory Shorebirds (CoA 2015)		
Australian Lesser Noddy (*Anous tenuirostris melanops*)	Conservation advice *Anous tenuirostris melanops* Australian lesser noddy (Threatened Species Scientific Committee 2015e)		
Red Knot (*Calidris canutus*)	Conservation advice *Calidris canutus* red knot (Threatened Species Scientific Committee 2016a)		
Curlew Sandpiper (*Calidris ferruginea*)	Conservation advice *Calidris ferruginea* curlew sandpiper (Department of the Environment 2015c)		
Eastern Curlew (*Numenius madagascariensis*)	Conservation advice *Numenius madagascariensis* eastern curlew (Department of the Environment 2015d)		
Abbott's Booby (*Papasula abbotti*)	Conservation advice *Papasula abbotti* Abbott's booby (Threatened Species Scientific Committee 2015h)		
Common Sandpiper (*Actitis hypoleucos*)	Wildlife Conservation Plan for Seabirds (Commonwealth of Australia 2020)		
Common/brown Noddy (*Anous stolidus*)	Wildlife Conservation Plan for Seabirds (Commonwealth of Australia 2020)		
Sharp-tailed Sandpiper	Wildlife Conservation Plan for Seabirds (Commonwealth of Australia 2020)		

Species or group	Relevant Plan/ Conservation Advice	Relevant threats and conservation actions	Relevant OMPs and SMPs
(*Calidris acuminata*)			
Pectoral Sandpiper (*Calidris melanotos*)	Wildlife Conservation Plan for Seabirds (Commonwealth of Australia 2020)		
Streaked Shearwater (*Calonectris leucomelas*)	Wildlife Conservation Plan for Seabirds (Commonwealth of Australia 2020)		
Lesser Frigatebird (*Fregata ariel*)	Wildlife Conservation Plan for Seabirds (Commonwealth of Australia 2020)		
Great Frigatebird (*Fregata minor*)	Wildlife Conservation Plan for Seabirds (Commonwealth of Australia 2020)		
White- tailed tropicbird (*Phaethon lepturus*)	Wildlife Conservation Plan for Seabirds (Commonwealth of Australia 2020)		
Christmas Island Goshawk (*Accipiter hiogaster natalis*)	Conservation advice *Accipiter hiogaster natalis C*hristmas Island *Goshawk* (Threatened Species Scientific Committee 2016b) *National Recovery Plan for Christmas Island Goshawk* Accipiter fasciatus natali (Hill 2004a)	Reduce the impacts of exotic rodents Predation by feral cats	
Christmas Island Emerald Dove (*Chalcophaps indica natalis*)	Conservation advice *Chalcophaps indica natalis* Christmas Island emerald dove (DoE 2014e)	Reduce the impacts of exotic rodents	
Greater Sand Plover, Large Sand Plover (*Charadrius leschenaultii*)	Conservation Advice *Charadrius leschenaultii* Greater sand plover (Threatened Species Scientific Committee 2016c)		
Red Goshawk (*Erythrotriorchis radiatus*)	Conservation Advice for *Erythrotriorchis radiatus* (red goshawk) (DCCEEW 2023) National recovery plan for the red goshawk *Erythrotriorchis radiatus* (DERM 2012)		

Species or group	Relevant Plan/ Conservation Advice	Relevant threats and conservation actions	Relevant OMPs and SMPs
Gouldian Finch (*Erythrura gouldiae*)	Conservation Advice *Erythrura gouldiae* Gouldian finch (Threatened Species Scientific Committee 2016d) National Recovery Plan for the Gouldian Finch (*Erythrura gouldiae*) (O'Malley 2006)	Reduce the impacts by five listed grasses Predation, habitat degradation, competition and disease transmission by feral pigs	
Grey Falcon (*Falco hypoleucos*)	Conservation Advice *Falco hypoleucos* Grey Falcon (Threatened Species Scientific Committee 2020b)		
Crested Shrike-tit (northern) (*Falcunculus frontatus whitei*)	Conservation Advice *Falcunculus frontatus whitei* Christmas island goshawk-tit (northern) (Threatened Species Scientific Committee 2016e)		
Christmas Island Frigatebird (*Fregata andrewsi*)	Conservation Advice for the Christmas Island Frigatebird – *Fregata andrewsi* (Threatened Species Scientific Committee 2020b) National recovery plan for the Christmas Island Frigatebird (*Fregata andrewsi*) (Hill and Dunn 2004)		
Western Alaskan Bar-tailed Godwit (*Limosa lapponica baueri*)	Conservation Advice *Limosa lapponica baueri* Bar-tailed godwit (western Alaskan) (Threatened Species Scientific Committee 2016f)		
Northern Siberian Bar-tailed Godwit (*Limosa lapponica menzbieri*)	Conservation Advice *Limosa lapponica menzbieri* Bar-tailed godwit (northern Siberian) (Threatened Species Scientific Committee 2016g)		
Christmas Island Hawk-Owl, (*Ninox natalis*)	Conservation Advice *Ninox natalis* Christmas Island hawk-owl (Threatened Species Scientific Committee 2016h) National recovery plan for the Christmas Island Hawk-Owl *Ninox natalis* (Hill 2004b)	Predation by feral cats Reduce impacts of exotic rodents Predation by feral cats	
Christmas Island White-tailed Tropicbird, (*Phaethon lepturus fulvus*)	Conservation Advice *Phaethon lepturus fulvus* white-tailed tropicbird (Christmas Island) (DoE 2014f)	Predation by feral cats	

Species or group	Relevant Plan/ Conservation Advice	Relevant threats and conservation actions	Relevant OMPs and SMPs
Australian Painted Snipe (Rostratula australis)	Conservation Advice for *Rostratula australis* Australian painted snipe (DSEWPaC 2013b) National Recovery Plan for the Australian Painted Snipe (*Rostratula australis*) (DCCEEW 2022)		
Christmas Island Thrush (*Turdus poliocephalus erythropleurus)*	Approved Conservation Advice for *Turdus poliocephalus erythropleurus* (Christmas Island thrush) (DoE 2014g)	Reduce the impacts of exotic rodents	
Masked Owl (northern) (*Tyto novaehollandiae kimberli)*	Conservation Advice *Tyto novaehollandiae kimberli* masked owl (northern) (Threatened Species Scientific Committee 2015d)	Reduce the impacts of five listed grasses	
Oriental Reed-Warbler (*Acrocephalus orientalis*)	-		
Fork-tailed Swift (*Apus pacificus*)	-	Predation by feral cats	
Wedge-tailed Shearwater (*Ardenna pacifica*)	-	Impacts of marine debris Incidental catch (or bycatch) of seabirds	
Red-rumped Swallow (*Cecropis daurica*)	-		
Oriental Plover (*Charadrius veredus*)	-		
Oriental Cuckoo (*Cuculus optatus*)	-		
Oriental Pratincole (*Glareola maldivarum*)	-		
Barn Swallow (*Hirundo rustica*)	-		

Species or group	Relevant Plan/ Conservation Advice	Relevant threats and conservation actions	Relevant OMPs and SMPs
Caspian Tern (*Hydroprogne caspia)*	-		
Asian Dowitcher (*Limnodromus semipalmatus*)	-		
Bar-tailed Godwit (*Limosa lapponica*)	-		
Grey Wagtail (*Motacilla cinerea*)	-		
Yellow Wagtail (Motacilla flava)	-		
Bridled Tern (*Onychoprion anaethetus*)	-		
Osprey (*Pandion haliaetus*)	-		
Red-tailed Tropicbird (*Phaethon rubricauda*)	-	Predation by feral cats	
Roseate Tern (*Sterna dougallii*)	-		
Little Tern (*Sternula albifrons*)	-		
Masked Booby (*Sula dactylatra*)	-		
Brown Booby (*Sula leucogaster*)	-	Impacts of marine debris	
Red-footed Booby (*Sula sula*)	-		

Species or group	Relevant Plan/ Conservation Advice	Relevant threats and conservation actions	Relevant OMPs and SMPs
Greater Crested Tern (*Thalasseus bergii*)	-		
National Heritage Places (refer to Appendix B of EP for additional description of key receptors for each location)			
The West Kimberley	N/A	N/A	
Commonwealth Heritage Places (refer to EP for additional description of key receptors for each location)			
Ashmore Reef National Nature Reserve	N/A	N/A	• OMP: Water quality assessment • OMP: Sediment quality assessment • OMP: Marine fauna assessment – Seabirds and shorebirds • SMP: Water quality impact assessment • SMP: Sediment quality impact assessment • SMP: Seabirds and shorebirds • OMP: Marine fauna assessment – Dugongs • SMP: Marine mega-fauna assessment – Whale sharks, cetaceans and dugongs • SMP: Benthic habitat assessment • SMP: Marine fish and elasmobranch assemblages assessment
Christmas Island Natural Areas	N/A	N/A	
Mermaid Reef – Rowley Shoals	N/A	N/A	
Scott Reef and Surrounds – Commonwealth Area	N/A	N/A	
Wetlands of International Importance (refer to EP for additional description of key receptors for each location)			
Ashmore Reef National Nature Reserve	N/A	N/A	• OMP: Water quality assessment • OMP: Sediment quality assessment • OMP: Shoreline clean-up assessment
Hosnies Spring	N/A	N/A	
The Dales	N/A	N/A	

Species or group	Relevant Plan/ Conservation Advice	Relevant threats and conservation actions	Relevant OMPs and SMPs
			• OMP: Marine fauna assessment – Seabirds and shorebirds • SMP: Water quality impact assessment • SMP: Sediment quality impact assessment • SMP: Intertidal and Coastal Habitat Assessment • SMP: Seabirds and shorebirds • OMP: Marine fauna assessment – Dugongs • SMP: Marine mega-fauna assessment – Whale sharks, cetaceans and dugongs • SMP: Benthic habitat assessment • SMP: Marine fish and elasmobranch assemblages assessment
Australian Marine Parks (refer to EP for additional description of key receptors for each location)			
Agro-Rowley Terrace	North-west Marine Parks Network Management Plan 2018 (Director of National Parks 2018)	Relevant management actions: Park protection and management—timely and appropriate preventative and restorative actions to protect natural, cultural and heritage values from impacts	• OMP: Water quality assessment • OMP: Sediment quality assessment • OMP: Shoreline clean-up assessment • OMP: Marine fauna assessment – Seabirds and shorebirds • SMP: Water quality impact assessment • SMP: Sediment quality impact assessment • SMP: Intertidal and Coastal Habitat Assessment
Ashmore Reef			
Cartier Island			
Christmas Island			
Joseph Bonaparte Gulf			
Kimberley			
Oceanic Shoals			

Species or group	Relevant Plan/ Conservation Advice	Relevant threats and conservation actions	Relevant OMPs and SMPs
			• SMP: Seabirds and shorebirds • OMP: Marine fauna assessment – Dugongs • SMP: Marine mega-fauna assessment – Whale sharks, cetaceans and dugongs • SMP: Benthic habitat assessment • SMP: Marine fish and elasmobranch assemblages assessment
State and Territory Marine Reserves (refer to EP for additional description of key receptors for each location)			
North Kimberley	North Kimberley Marine Park Joint Management Plan 2016. Uunguu, Balanggarra, Miriuwung Gajerrong, and Willinggin management areas (Department of Parks and Wildlife 2016)	• Relevant management issues: oil spills, physical disturbance to reefs, anchoring from vessels, boat strike (turtles/cetaceans), lighting (turtles) • Relevant management actions: ensure the values of the park are fed into predictive models for oil spills, apply appropriate anchoring controls	• OMP: Water quality assessment • OMP: Sediment quality assessment • OMP: Shoreline clean-up assessment • OMP: Marine fauna assessment – Seabirds and shorebirds • SMP: Water quality impact assessment • SMP: Sediment quality impact assessment • SMP: Intertidal and Coastal Habitat Assessment • SMP: Seabirds and shorebirds • OMP: Marine fauna assessment – Dugongs • SMP: Marine mega-fauna assessment – Whale sharks, cetaceans and dugongs • SMP: Benthic habitat assessment
Rowley Shoals	Rowley Shoals Marine Park Management Plan 2007-2017 (Department of Environment and Conservation 2007)		

Species or group	Relevant Plan/ Conservation Advice	Relevant threats and conservation actions	Relevant OMPs and SMPs
			• SMP: Marine fish and elasmobranch assemblages assessment