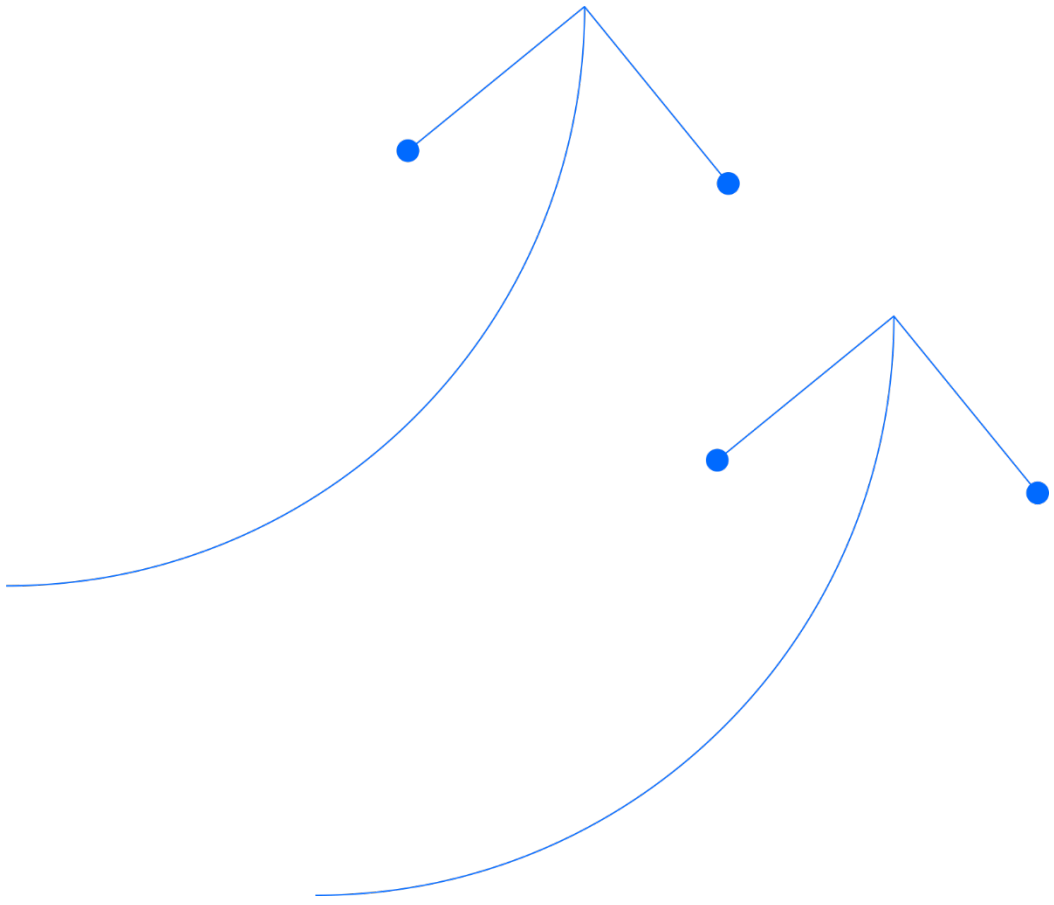
Santos

Operational and Scientific Monitoring

Bridging Implementation Plan: North West Shelf

24 November 2025



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Bridging Implementation Plan: North West Shelf

Document No.: 7715-650-ERP-0002

Project / Facility	North West Shelf
Review interval (months)	12 Months
Safety critical document	No

Rev	Owner	Reviewer(s) *Managerial/Technical/Site*	Approver
	Lead Oil Spill Risk and Planning Coordinator	**Senior Oil Spill Risk & Planning Advisor** **Principal Oil Spill and Emergency Response Coordinator**	**Manager Environmental Approvals – WA, NA & TL**
4			

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Rev	Rev Date	Author / Editor	Amendment
1	21 August 2024	BlueSands Environmental / Santos	Issued for use
2	7 March 2025	Santos	- Revised information regarding Scientific Monitoring Planning area in section 2.1, and related edits throughout. - Revised Figure 2-1 (Consolidated Scientific Monitoring Planning Area); Figure 4-1 (Process for identifying 1st strike monitoring priorities), to align with above changes. - Revised Appendix A to align with above changes, - New Call-off Order Form added to Appendix E.
	9 April 2025	Santos	- Updated references to Santos Incident Management Plan – WANATL (7700-650-PLA-0016) and Santos Incident Response Telephone Directory (7700-650-PLA-0016.20)
3	01 September 2025	BlueSands Environmental / Santos	- Updated Section 8 (Resourcing Requirements) to reflect a change in Santos activities (end of one activity [Ningaloo Vision Ops.] used to determine the previous worst-case for OSM resourcing; and addition of new activities that now determine worst-case for OSM resourcing); - Updated Section 2.2 to reflect the terminology used in the Joint Industry Framework OSM-BIP Template; - Updated Table 4-3 to include new receptors from new activities; - Updated Table 4-3 and Appendix C to meet EPS-OSM-004 'Regular review of existing baseline data'; - Minor updates to reflect OM and SM nomenclature used by OSM Services Provider; - Updated Section 9.1 (Personnel Competencies) to better demonstrate the requirements to the Joint Industry OSM Framework; - Inclusion of Appendix A (Demonstration of Meeting OSM Framework Regulatory Requirements) to assist regulatory assessment; - Updated Appendix B (Process for assessing new activities against OSM-BIP capability) to align with the changes made in Section 2 and Section 8.
4	24 November 2025	BlueSands Environmental / Santos	- Modifications to Table 2-1 to highlight different hydrocarbon phases - Updates throughout to align to recent edits made in the Northern Australia OSM-BIP to ensure consistency within Santos

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Terms

Term	Definition
AEP	Australian Energy Producers (formerly Australian Petroleum Production and Exploration Association [APPEA]; from 13 September 2023)
ALA	Atlas of Living Australia
AMOSC	Australian Marine Oil Spill Centre
AMP	Australian Marine Park
AMSA	Australian Marine Safety Authority
AODN	Australian Ocean Data Network
BACI	Before-After Control-Impact
BIP	Bridging Implementation Plan
BRUVS	Baited Remote Underwater Video Stations
BTEXN	Benzene, Toluene, Ethylbenzene and Xylenes And Naphthalene
CoC	Chain of Custody
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DBCA	Western Australian Department of Biodiversity Conservation and Attractions
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DWER	Western Australian Department of Water and Environmental Regulation
DPIRD	Western Australian Department of Primary Industries and Regional Development
DPLH	Western Australian Department of Planning, Lands and Heritage
EMBA	Environment that may be Affected
EP	Environment Plan
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Cth)
EPS	Environmental Performance Standard
ESC	Environmental Scientific Coordinator
FOB	Forward Operating Base
FPSO	Floating Production, Storage and Offloading
GIS	Geographic Information System
GPS	Geographic Positioning System
HFO	Heavy Fuel Oil
IAP	Incident Action Plan
ICS	Incident Command System
IMOS	Integrated Marine Observing System
IMSA	Index of Marine Surveys for Assessments
IMT	Incident Management Team
IMTAG	Industry Member Technical Advisory Group
KEF	Key Ecological Feature
LEL	Lower Explosive Limits
LOWC	Loss Of Well Control
MDO	Marine Diesel Oil
MoC	Management of Change
Monitoring Service Providers	The subcontracted specialist monitoring service providers subcontracted by OSRL to perform certain operational and scientific monitoring services

Term	Definition
NATA	National Association of Testing Authorities
NEBA	Net Environmental Benefit Analysis
OM	Operational Monitoring
OMP	Operational Monitoring Plan
OPEP	Oil Pollution Emergency Plan
OPGGS (E)	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 Regulations
OSCP	Oil Spill Contingency Plan
OSM	Operational and Scientific Monitoring
OSM-BIP	Operational and Scientific Monitoring-Bridging Implementation Plan
OSM Services Provider	The operational and scientific monitoring services to be provided by OSRL via the OSM Supplementary Service Agreement
OSRA	Oil Spill Response Atlas
OSRL	Oil Spill Response Limited
OSTM	Oil Spill Trajectory Modelling
PAH	Polycyclic aromatic hydrocarbons
PPE	Personal Protective Equipment
QA/QC	Quality Assurance and Quality Control
ROV	Remotely Operated Vehicle
SBRUVS	Stereo Baited Remote Underwater Video Stations
SCAT	Shoreline Clean-up Assessment Technique
SM	Scientific Monitoring
SMP	Scientific Monitoring Plan
SSDI	Subsea Dispersant Injection
TRH	Total Recoverable Hydrocarbons
TPH	Total Petroleum Hydrocarbons
VOC	Volatile Organic Compound
VOO	Vessel of Opportunity
WA	Western Australia
WA DTMI	Western Australian Department of Transport and Infrastructure
WANATL	Western Australia, Northern Australia and Timor Leste
WAMSI	Western Australian Marine Science Institution

Part A – Preparedness

This Plan is presented in two parts:

- **Part A** outlines the relationship between Santos' environmental management document framework and the Joint Industry Operational and Scientific Monitoring (OSM) Framework (APPEA, 2021);
- **Part B** provides operationally focussed guidance for Santos personnel, OSM Services Provider and sub-contracted Monitoring Service Providers to coordinate the implementation of monitoring plans.

1. Introduction

Operational and Scientific Monitoring (OSM) is a key component of the environmental management document framework for offshore petroleum activities, which also include an Environment Plan (EP) and Oil Pollution Emergency Plan (OPEP). Operational Monitoring (OM) is instrumental in providing situational awareness of a hydrocarbon spill, enabling Incident Management Teams (IMT) to mount a timely and effective spill response and continually monitor the effectiveness of the response. Scientific Monitoring (SM) is also the principle tool for determining the extent, severity and persistence of environmental impacts from a hydrocarbon spill and for informing resultant remediation activities.

Santos has elected to use the Joint Industry OSM Framework and supporting operational monitoring plans (OMPs) and scientific monitoring plans (SMPs) as the foundation of its OSM approach. The Joint Industry OSM Framework is available on the AEP Environment Publications Webpage.

As outlined in NOPSEMA's Regulatory Advice Statement (RAS) regarding APPEAs Joint Industry OSM Framework, each Titleholder is required to develop a Bridging Implementation Plan (this document) that explains how the Framework aligns with their activities, oil spill risks and internal management systems. This plan and the Appendix titled 'Operational and Scientific Monitoring Assessment' in each activity OPEP, fulfils that requirement.

Appendix A provides guidance on the RAS requirements and reference to the relevant section of this document (or the broader suite of environmental management framework documents) which addresses that requirement.

Table 1-1 describes key documents that form Santos' environmental management document framework. Note that this is not an exhaustive list and additional documents are listed in the activity specific Santos OPEPs.

Mobilisation of OSM should follow the process listed in Part B: Section 12: Mobilisation and activation process.

Table 1-1: Key documents in Santos' environmental management framework

Document	Description
Activity specific Environment Plan (EP)	Each activity specific 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 BIP, it identifies sensitive receptors, potential impacts from hydrocarbon spills, and the environment that may be affected (EMBA).
Activity specific Oil Pollution Emergency Plan (OPEP) / Oil Spill Contingency Plan (OSCP)	Each activity specific OPEP / OSCP provides the activation and response process for the credible spill scenarios, including incident management, the net environmental benefit analysis (NEBA) process and detailed implementation guidance for individual response strategies. Of particular relevance to this BIP, it identifies the credible spill scenarios and protection priorities, presents the Scientific Monitoring Planning Area for the activity, and conducts a capability assessment to ensure that the OSM requirements of the activity are adequately covered by the existing information described within this OSM-BIP.
Incident Management Plan – WANATL (7700-650-PLA-0016)	The incident management plan establishes Santos incident management arrangements to: • Guide Western Australia, Northern Australia and Timor Leste (WANATL) Incident Management in emergency preparedness, emergency response and operational recovery; • Support site/facility Emergency Response Teams during emergencies; • Undertake incident action planning to manage the consequences of an emergency event, and; • Ensure WANATL incident management preparedness.
Santos Incident Management Handbook	The incident management handbook is a quick reference job aid to assist a response team member in filling specific Incident Command System (ICS) positions, understanding their position responsibilities, and how that position fits within the ICS structure

Document	Description
Incident Response Telephone Directory (7700-650-PLA-0016.20)	Contains all relevant contact and communications information to enable effective communication amongst the response personnel and external stakeholders, including relevant OSM contacts

1.1 Scope

This Operational and Scientific Monitoring - Bridging Implementation Plan (OSM-BIP) addresses the requirements of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 for all Santos activities within the North West Shelf zone of Western Australia (Figure 1-1), and was first submitted on 1st August 2024 with the now accepted Ningaloo Vision Cessation of Production and Floating Asset Removal EP (7750-650-EIS-0007) and OPEP (7750-650-EIS-0008). This BIP applies to all Santos activities which have an EP accepted by Commonwealth and State regulators in the North West Shelf. This Plan supersedes Santos' Oil Spill Scientific Monitoring Standby and Response Manual (EA-00-RI-10162).

For all new activities, there are three main steps for assessing whether this OSM-BIP adequately covers the OSM requirements for each new activity, these include the following, and are summarised in Appendix B:

1. Determine if the new activity Environment that May be Affected (EMBA) and Scientific Monitoring Planning Area fits within the North West Shelf OSM-BIP Consolidated Scientific Monitoring Planning Area, as outlined in Section 2.1.
2. Using stochastic modelling, determine the monitoring priorities for the activity, by identifying receptors predicted to be contacted ≥5 % probability within 7 days, determining whether these receptors are currently included in Table 2-1, and have been assessed for baseline data adequacy in Table 4-3.
3. Determine whether the capability requirements and monitoring arrangements of the new activity exceed or are met by the capability requirements outlined in Section 8 and capability arrangements described in Sections 9 and 10.

Prior to submission for regulatory approval, each new/revised OPEP shall assess whether the OSM-BIP adequately covers the OSM requirements as per the three elements described above. If additional operational and/or scientific monitoring capability is required for a new activity above the OSM capability described in Sections 9 and 10, prior to submission the Environment/Project Team will follow Santos' EP MOC process, and the OSM-BIP will be updated with the new capability requirements before the activity commences.

Santos activities within the Northern Australia zone are addressed by the Santos Northern Australia OSM-BIP (7715-650-ERP-0003).

Santos will implement OSM, as applicable, for oil spills across both State and Commonwealth waters. In the event that control of scientific monitoring in WA State waters is taken over by the Western Australian Department of Transport and Major Infrastructure (WA DTMI) under advice from the State Environmental Scientific Coordinator (ESC), Santos will follow the direction of WA DTMI as Control Agency and provide all necessary resources (monitoring personnel, equipment and planning) to assist as a supporting agency.

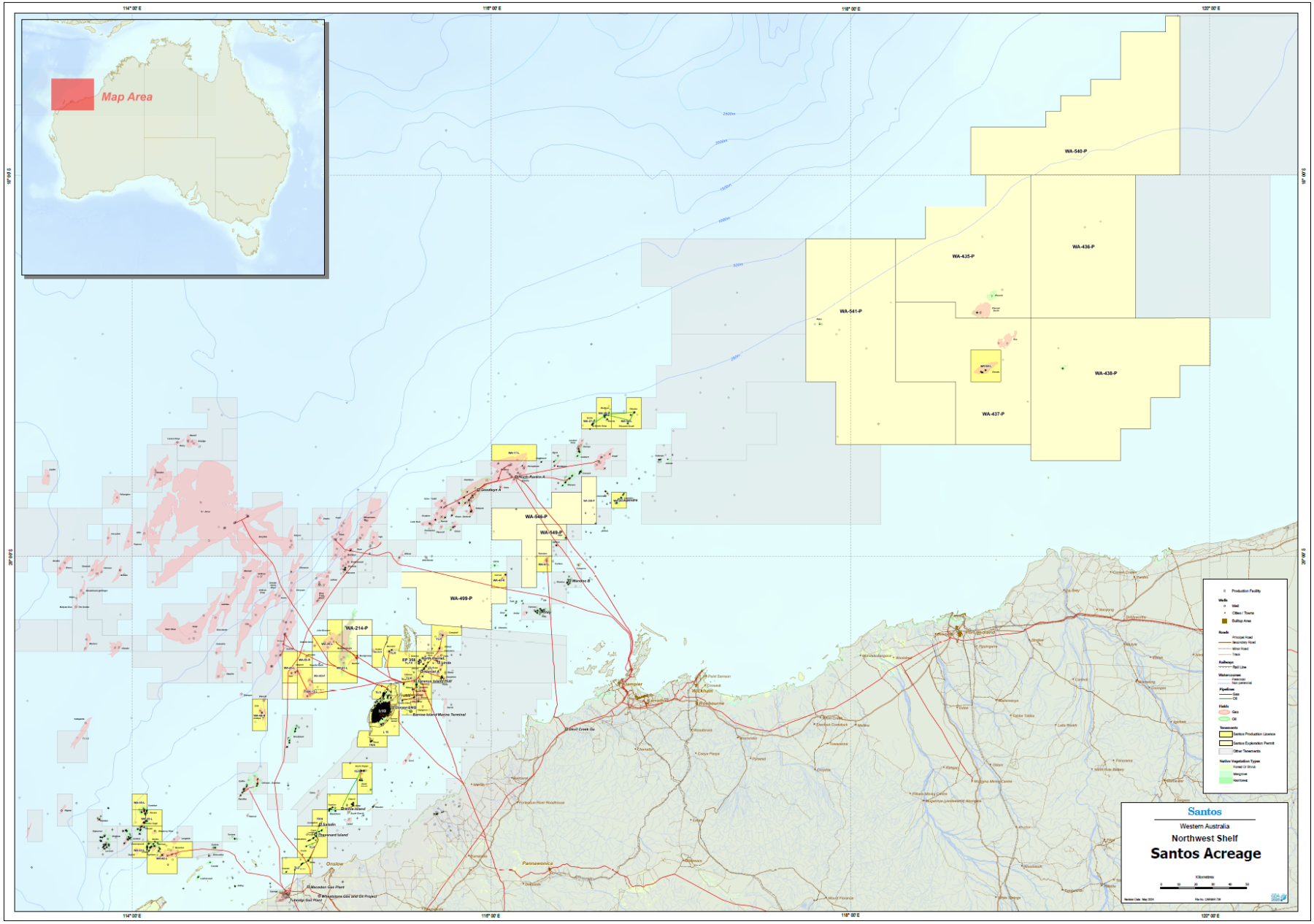


Figure 1-1: Santos acreage Western Australia – North West Shelf (April 2025)

2. Scientific Monitoring Planning Area and Monitoring Priorities

2.1 Consolidated Scientific Monitoring Planning Area

This OSM-BIP provides monitoring guidance and arrangements for all Santos activities referred to in the North West Shelf Region. Therefore, a single Consolidated Scientific Monitoring Planning Area has been prepared to represent all of these activities and the resultant geographical extent of this OSM-BIP (Figure 2-1). The Consolidated Scientific Monitoring Planning Area corresponds to the low exposure values 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, which 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.

The Consolidated Scientific Monitoring Planning Area is based on the above low thresholds as outlined in the NOPSEMA Oil Spill Modelling Environment Bulletin, April 2019 (NOPSEMA, 2019). However, the EMBA for each of the activities covered by this OSM-BIP may be defined by other thresholds, as presented in each relevant EP. Some EPs may use different thresholds for the EMBA, which typically indicates the area where both ecological and socio-economic receptors may be affected. The Scientific Monitoring Planning Area (all based on the low thresholds) can be considered as the absolute outer limit of OSM efforts.

The Consolidated Scientific Monitoring Planning Area has been determined based on the modelling results for the activities and worst-case credible spill scenarios outlined in Table 2-1. These spill scenarios are considered representative of Santos' worst-case credible scenarios given the extent of their Scientific Monitoring Planning Areas, hydrocarbon types, proximity to receptors, minimum time to contact and their representation of Santos' activity locations within the North West Shelf of Western Australia.

For a description of the environment within each Scientific Monitoring Planning Area and respective EMBA, refer to the activity-specific EPs and the Environmental Values and Sensitivities section. This section includes the following pertinent information: protected matters and any associated recovery plans/conservation advice, key ecological features (KEFs), protected areas, significant socio-economic industries, and culturally significant places.

2.2 Monitoring priorities

Monitoring prioritisation during a spill should focus on sensitive receptors with the highest risk of adverse consequences and where oil spill modelling predicts high probability of rapid contact. Santos identifies sensitivities and receptors with high conservation value as part of its Oil Spill Risk Assessment and Response Planning Procedure (SO-91-II-20003). An accumulated sensitivity score is attributed to protected and biologically important areas and receptors, with an overall ranking providing the overall environmental value (EV) of each receptor.

Oil spill modelling provides a useful tool in assessing monitoring priorities, as it predicts the probability and minimum time at which individual receptors may be contacted by a spill. High EV receptors with a higher probability of rapid contact from an oil spill should be the priority of a monitoring program, compared to similar sensitive receptors with a lower probability and longer time to contact following a spill, where time may permit the collection of reactive (post-spill but pre-contact) baseline data.

Santos has reviewed the oil spill modelling results for the scenarios listed in Table 2-1 (as provided in the activity-specific EPs and OPEPs) and have identified receptors contacted at a higher probability of rapid contact; Table 2-1 presents the receptors contacted by hydrocarbons at the low threshold for entrained (≥10 ppb), dissolved (≥10 ppb), floating (≥1 g/m^2), and shoreline contact (≥10 g/m^2), within 7.0 days (7.0 days was used to delineate the initial monitoring response) at a probability >5%. Appendix C lists the background information on key sensitivities associated with each of these receptors.

The inclusion of entrained hydrocarbons at concentrations greater than 10 ppb is used to denote exposure to hydrocarbons, but does not necessarily imply toxicity. For entrained whole-oil droplets, the toxic fraction is small, as many hydrocarbon constituents remain sequestered and not bioavailable (French-McCay 2024). During the initial

monitoring response, emphasis will be placed on receptors contacted by floating, shoreline, and dissolved hydrocarbon phases. If a receptor is only contacted by low concentrations of entrained hydrocarbons and not by any other hydrocarbon phase, it will be considered a lower priority during the initial monitoring response.

The availability of baseline data further influences monitoring priorities. Where receptors have little or no existing baseline, they are given higher scientific monitoring priority to facilitate effective post-impact comparisons. Section 4 outlines Santos' baseline review and evaluation process, and Table 4-3 summarises the baseline data assessment for the sensitive receptors identified in Table 2-1.

Monitoring priorities are subsequently identified as those receptors predicted to be contacted within 7.0 days at a probability >5%, and where baseline data is either not available or not sufficient (as depicted in Table 4-3 and outlined in Section 4).

In addition to these receptors, there are receptors that are transient (i.e. cetaceans, seabirds, whale sharks) and others that are broad-scale, such as managed fisheries with large spatial extents, Key Ecological Features (KEFs) and Biologically Important Areas (BIAs).

As per the Santos Oil Spill Risk Assessment and Response Planning Procedure, Santos applies a sensitivity scoring approach to prioritise spill impact, where protected and biologically important area datasets intersecting the receptor contribute to the receptor's accumulated sensitivity score. The Santos receptors database includes a number of metadata fields for each receptor, which capture broad-scale features where these intersect with the receptor polygons, including:

- DBCA Legislated Lands and Waters features;
- Australian Marine Park (AMP) features;
- Biologically Important Areas (BIAs) behavioural and migratory features;
- Key Ecological Features (KEFs);
- World Heritage Area features;
- Commonwealth Heritage Areas features;
- National Heritage Areas features; and
- RAMSAR Convention wetland features of international importance.

Santos' EV ranking essentially takes account of all these metadata to drive the EV sensitivity score for each receptor. Therefore, broad-scale features are already accounted for within the Santos receptors database, and therefore are included by default within OSM planning for priority receptors.

KEFs are also described in detail in Section 3 of the activity-specific EPs. KEFs relevant to Santos activities in the North West Shelf Region include subsea receptors (benthic and pelagic habitats; demersal fish communities) that may be at risk from subsea releases. Therefore, OSM planning and resourcing for this activity has included relevant monitoring requirements, such as water quality, sediment quality, benthic habitats and fish for these features (refer to Section 8).

The Consolidated Scientific Monitoring Planning Area overlaps a number of BIAs and protected species potentially occurring in the area, as described in Section 3 of the activity-specific EPs. A number of the BIAs and protected species are located within or adjacent to monitoring priorities, for example, marine turtles within the Montebello AMP, and are features that influence the receptor EV sensitivity scores, so would automatically be included in the relevant SMPs for any particular monitoring priority receptor (refer to Table 8-2). Where BIAs and protected species are situated away from the monitoring priorities, they will be captured in the Offshore Environs monitoring unit described in Table 8-2.

Another important consideration for monitoring prioritisation is a receptor's vulnerability to different forms of hydrocarbon exposure as well as its inherent sensitivity. For example, coral is highly sensitive to hydrocarbons, but its vulnerability depends on the form of exposure. If the hydrocarbon is floating on the sea surface during calm conditions, it may pass over the coral without interaction. However, if the hydrocarbon is dissolved in the water column with sufficient exposure duration, the coral may become directly vulnerable to its toxic effects.

At the time of a spill, Santos will work with its OSM Services Provider, sub-contracted Monitoring Service Providers and key stakeholders in the initial stages of the spill to identify priority monitoring receptors and to assist in the finalisation of the monitoring design, ensuring that resources are allocated appropriately and according to the greatest risk of impact. This process is outlined in Section 13.

Table 2-1: Santos worst-case spill scenarios used to determine the Consolidated Scientific Monitoring Planning Area for the North West Shelf Region and key receptors

Environment Plan / OPEP	Hydrocarbon Type	Scenario	Release Duration	Volume (m^3)	Receptors predicted by stochastic modelling to be contacted ≥5 % probability within 7 days				
					Location	Floating	Shoreline	Entrained	Dissolved
Mutineer, Exeter, Fletcher, Finucane Cessation of Production and Decommissioning OPEP (9885-650-PLN-0002)	Mutineer-Exeter Crude (Group 2)	Surface loss of well control (LOWC)	126 days	1,350	Nil	NA	NA	NA	NA
	MDO (Group 2)	Surface diesel release	30 minutes	604	Nil	NA	NA	NA	NA
Varanus Island Hub Operations (Cth) OPEP (EA-60-RI-00186.02)	John Brookes Condensate (Group 1)	Loss of well control (LOWC) / damage to infrastructure causing condensate with gas release from John Brookes wellheads at surface	100 days	39,011	Montebello Islands	√	√	√	NP
					Barrow Island	X	√	X	NP
					Barrow-Montebello surrounds	√	√	√	NP
					Montebello AMP*	√	NA	√	NP
					Offshore Ningaloo*	√	NA	X	NP
					Ningaloo Coast North	X	√	√	NP
					Southern Islands Coast	X	√	X	NP
					Outer Ningaloo North Coast*	X	X	√	NP
					Outer NW Ningaloo*	X	NA	√	NP
	MDO (Group 2)	Vessel spill – release from support/ supply vessel fuel tank (due to vessel collision or lifting operations) at the Wonnich Platform	1 hour	329	Montebello AMP*	√	NA	√	NP
					Offshore Ningaloo*	√	NA	√	NP
	Varanus Island Crude Blend (Group 1)	Vessel spill – release from offtake tanker due to vessel collision / vessel grounding	1 hour	8,629	Montebello Islands	√	√	√	NP
					Lowendal Islands	√	√	√	NP
					Barrow Island	√	√	√	NP
					Barrow-Montebello surrounds	√	√	√	NP
					Montebello AMP*	√	NA	√	NP
					Offshore Ningaloo*	X	NA	√	NP

Environment Plan / OPEP	Hydrocarbon Type	Scenario	Release Duration	Volume (m^3)	Receptors predicted by stochastic modelling to be contacted ≥5 % probability within 7 days				
	John Brookes Condensate (Group 1)	Loss of integrity / Impact damage causing condensate with gas release from the John Brookes 18" Pipeline	5.4 hours	210	Montebello Islands	√	√	X	NP
					Barrow Island	√	√	X	NP
					Barrow-Montebello surrounds	√	X	√	NP
					Montebello AMP*	√	NA	√	NP
					Lowendal Islands	√	√	X	NP
Devil Creek Pipeline and Reindeer Well Head Platform OPEP (EA-14-RI-10001.02)	Reindeer Condensate (Group 1)	Complete loss of well control at surface at the Reindeer wellhead platform (100% full bore flow rate release)	70 days	4,029	Barrow-Montebello surrounds	X	X	X	√
					Glomar Shoals*	X	NA	X	√
					Montebello AMP*	X	NA	X	√
	Reindeer Condensate (Group 1)	Condensate spill from a subsea pipeline leak near the Commonwealth/State Boundary	3.71 hours	121.4	Nil	NA	NA	NA	NA
	Reindeer Condensate (Group 1)	Subsea pipeline leak near the horizontal directional drilling (HDD) break through location (or shoreline crossing)	3.75 hours	121.4	Northern Islands Coast	X	√	X	X
					Dampier Archipelago	X	X	√	X
	MDO (Group 2)	Surface release of MDO following a vessel collision at the wellhead platform	1 hour	325	Barrow-Montebello Surrounds	X	X	√	X
					Glomar Shoals*	X	NA	√	X
					Montebello AMP*	X	NA	√	√
					Montebello Islands	X	X	√	X
					Muiron Islands	X	X	√	X
					Ningaloo-Offshore*	X	NA	√	X
					Penguin Bank*	X	NA	√	X
					Southern Islands Coast	X	X	√	X
	MDO (Group 2)	Surface release of MDO following a vessel collision at the	1 hour	325	Lowendal Islands	X	√	√	
					Montebello Islands	X	√	√	

Environment Plan / OPEP	Hydrocarbon Type	Scenario	Release Duration	Volume (m^3)	Receptors predicted by stochastic modelling to be contacted ≥5 % probability within 7 days				
		Commonwealth/ State Boundary			Dampier AMP	X	X	√	X
					Dampier Archipelago	X	X	√	X
					Barrow Island	X	X	√	X
					Barrow-Montebello Surrounds*	X	X	√	X
					Madeleine Shoals*	X	NA	√	X
					Montebello AMP*	X	NA	√	X
					Ningaloo Offshore	X	X	√	X
	MDO (Group 2)	Surface release of MDO over 1 hour following a vessel collision at the HDD Crossing	1 hour	325	Northern Islands Coast	X	√	X	X
					Cod Bank	X	N/A	√	X
					Dampier Archipelago	X	√	√	X
Ningaloo Vision Cessation of Production and Floating Asset Removal OPEP (7750-650-EIS-0008)	Van Gogh Crude (Group 4)	Subsea crude oil; spill from a LOWC	100 days	1,255	Nil	NA	NA	NA	NA
	MDO (Group 2)	Surface diesel release involving the FPSO	1 hour	1,519	Muiron Islands	X	√	X	X
					Ningaloo Coast North	X	√	√	√
					Outer Ningaloo Coast North*	√	NA	√	√
					Outer NW Ningaloo*	√	NA	√	√
					Offshore Ningaloo*	√	NA	√	√
Varanus Island Hub Operations (State) OSCP (7900-650-ERP-0013)	MDO (Group 2)	Surface release following vessel collision at Wonnich Platform	1 hour	69	Barrow-Montebello Surrounds	√	X	√	√
					Barrow Island	X	X	√	X
					Montebello AMP*	√	NA	√	√
					Montebello Islands	√	√	√	√
					Muiron Islands	X	X	√	X
					Ningaloo-Offshore*	X	NA	√	X
					Penguin Bank*	X	NA	√	X
					Poivre Reef*	X	NA	√	X
					Rosily Shoals*	X	NA	√	X

Environment Plan / OPEP	Hydrocarbon Type	Scenario	Release Duration	Volume (m^3)	Receptors predicted by stochastic modelling to be contacted ≥5 % probability within 7 days				
					Southern Islands Coast	X	X	√	X
	HFO (Group 4)	Surface release from the offtake tanker following vessel collision at Varanus Island Marine Terminal	1 hour	640	Barrow-Montebello Surrounds	√	X	√	X
					Barrow Island	√	√	√	X
					Dampier Archipelago	X	√	X	X
					Glomar Shoals*	√	NA	X	X
					Lowendal Islands	√	√	√	X
					Montebello AMP*	√	NA	X	X
					Montebello Islands	√	√	√	X
					Muiron Islands	√	√	X	X
					Ningaloo-Offshore*	√	NA	X	X
					Rankin Bank*	√	NA	X	X
					Southern Islands Coast	X	√	X	X
	VI Crude Blend (Group 1)	Surface release from the offtake tanker following vessel collision at Varanus Island Marine Terminal	1 hour	5,330	Barrow-Montebello Surrounds	√	X	√	√
					Barrow Island	X	X	√	√
					Brewis Reef*	X	NA	√	X
					Lowendal Islands	√	√	√	√
					Montebello AMP*	X	NA	√	√
					Montebello Islands	X	X	√	√
					Muiron Islands	X	X	√	√
					Ningaloo-Offshore*	X	NA	√	√
					Penguin Bank*	X	NA	√	√
					Poivre Reef*	X	NA	√	√
					Ripple Shoals*	X	NA	√	X
					Rosily Shoals*	X	NA	√	√
					Southern Islands Coast	X	X	√	√
					Thevenard Island	X	X	√	√

Environment Plan / OPEP	Hydrocarbon Type	Scenario	Release Duration	Volume (m^3)	Receptors predicted by stochastic modelling to be contacted ≥5 % probability within 7 days				
					Trap Reef*	X	X	√	X
	Halyard-2 condensate (Group 1)	Pipeline release following major rupture at Commonwealth-State waters boundary	9 hours	327	Barrow-Montebello Surrounds	√	X	√	√
					Barrow Island	√	√	√	√
					Lowendal Islands	X	X	√	√
					Montebello AMP*	√	NA	√	√
					Montebello Islands	X	X	√	√
					Muiron Islands	X	X	X	√
					Ningaloo-Offshore*	X	NA	√	√
					Ningaloo - Outer Coast North*	X	NA	X	√
					Penguin Bank*	X	NA	√	√
					Poivre Reef*	X	NA	√	√
					Rosily Shoals*	X	NA	X	√
					Southern Islands Coast	X	X	X	√
	Halyard-2 condensate (Group 1)	Pipeline release following major rupture at Varanus Port Limits	9 hours	327	Barrow-Montebello Surrounds	√	X	√	√
					Barrow Island	√	√	√	√
					Lowendal Islands	√	√	√	√
					Montebello AMP*	√	NA	√	√
					Montebello Islands	X	X	√	√
					Ningaloo-Offshore*	X	NA	√	X
					Penguin Bank*	X	NA	√	X
					Poivre Reef*	X	NA	√	√
	Harriet Crude (Group 2)	Surface LOWC from the Harriet Bravo Platform	91 days	4,413	Barrow-Montebello Surrounds	√	X	√	√
					Barrow Island	√	√	√	√
					Lowendal Islands	√	√	√	√
					Montebello AMP*	√	NA	√	√
					Montebello Islands	√	√	√	√

Environment Plan / OPEP	Hydrocarbon Type	Scenario	Release Duration	Volume (m^3)	Receptors predicted by stochastic modelling to be contacted ≥5 % probability within 7 days				
					Muiron Islands	X	X	√	X
					Ningaloo-Offshore*	X	NA	√	X
					Penguin Bank*	X	NA	√	X
					Poivre Reef*	X	NA	√	X
					Rosily Shoals*	X	NA	√	X
					Southern Islands Coast	X	√	√	X
					Thevenard Island	X	X	√	X
					Trap Reef*	X	X	√	X
	Wonnich condensate (Group 1)	Surface LOWC from the Wonnich Platform	91 days	8,970	Barrow-Montebello Surrounds	√	X	√	√
					Barrow Island	X	X	√	√
					Lowendal Islands	X	√	√	√
					Montebello AMP*	√	NA	√	√
					Montebello Islands	X	√	√	√
					Muiron Islands	X	X	√	√
					Ningaloo-Offshore*	X	NA	√	√
					Ningaloo - Outer Coast North*	X	NA	√	X
					Ningaloo Coast North	X	X	√	X
					Penguin Bank*	X	NA	√	√
					Poivre Reef*	X	NA	√	√
					Rosily Shoals*	X	NA	√	√
					Southern Islands Coast	X	X	√	√
					Thevenard Island	X	X	√	X
	Agincourt crude (Group 1)	Surface LOWC from the Agincourt Platform	91 days	12,746	Barrow-Montebello Surrounds	√	X	√	√
					Barrow Island	√	√	√	√
					Lowendal Islands	√	√	√	√
					Montebello AMP*	√	NA	√	√

Environment Plan / OPEP	Hydrocarbon Type	Scenario	Release Duration	Volume (m^3)	Receptors predicted by stochastic modelling to be contacted ≥5 % probability within 7 days				
					Montebello Islands	X	√	√	√
					Muiron Islands	X	X	√	X
					Ningaloo-Offshore*	X	NA	√	X
					Penguin Bank*	X	NA	√	X
					Poivre Reef*	X	NA	√	√
					Rosily Shoals*	X	NA	√	X
					Southern Islands Coast	X	X	√	√
					Thevenard Island	X	X	√	X
					Trap Reef*	X	NA	√	X
	Harriet crude (Group 2)	Surface LOWC from the Double Island Platform	91 days	3,183	Barrow-Montebello Surrounds	√	X	√	√
					Barrow Island	√	√	√	√
					Lowendal Islands	√	√	√	√
					Montebello AMP*	√	NA	√	√
					Montebello Islands	X	√	√	X
					Ningaloo-Offshore*	X	NA	√	X
					Penguin Bank*	X	NA	√	X
					Poivre Reef*	X	NA	√	X
					Ripple Shoals*	X	NA	√	X
					Rosily Shoals*	X	NA	√	X
					Southern Islands Coast	X	√	√	X
Keraudren Extension Phase 3 OPEP (7710-650-ERP-0004)	MDO (Group 2)	Surface release following a vessel fuel spill at Location 1	1 hour	553	Nil	NA	NA	NA	NA
	MDO (Group 2)	Surface release following a vessel fuel spill at Location 2	1 hour	553	Bedout Island	X	X	√	X
					Eighty Mile Beach AMP*	X	NA	√	X
Bedout Multi Well Exploration and Appraisal Drilling	Caley Crude (Group 2)	Loss of well control causing a crude release at surface	77 days	1,017,519	Clerke Reef MP	√	√	√	√
					Imperieuse Reef MP	√	√	√	√

Environment Plan / OPEP	Hydrocarbon Type	Scenario	Release Duration	Volume (m^3)	Receptors predicted by stochastic modelling to be contacted ≥5 % probability within 7 days				
EP1 OPEP (7720-650-EMP-0006)		(drilling riser in place) for a subsea well in the Ara operational area.			Mermaid Reef AMP*	√	NA	√	√
					Outer Argo-Rowley Terrace AMP*	√	NA	√	√
					Rowley Shoals surrounds*	√	NA	√	√
	Caley Crude (Group 2)	Loss of well control causing a crude release from a surface wellhead in the Mestrel / Bancroft operational area	77 days	1,367,291	Glomar Shoals*	√	NA	√	√
	Caley Crude (Group 2)	Loss of well control causing a crude release from a subsea wellhead in the Curie operational area	77 days	413,367	Imperieuse Reef MP	√	√	√	√
					Outer Argo-Rowley Terrace AMP*	√	NA	√	√
					Rowley Shoals surrounds*	√	NA	√	√
					Dampier AMP*	X	NA	√	X
					Dampier Archipelago	X	X	√	X
					Glomar Shoals*	X	NA	√	√
					Madeleine Shoals*	X	NA	√	X
					Montebello AMP*	X	NA	√	√
					Montebello Islands	X	X	√	X
					Rankin Bank*	X	NA	√	√
					Barrow-Montebello surrounds	X	X	√	X
	MDO (Group 2)	Surface spill from vessel collision	1 hour	325	Rowley Shoals surrounds*	X	NA	√	X
					Imperieuse Reef MP	X	X	√	X
Bedout Multi Well Exploration and Appraisal Drilling EP2 (Bedout East) OPEP	Caley Crude (Group 2)	Loss of well control causing a crude release from a subsea wellhead in the Pavo operational area.	77 days	1,144,709	Bedout Island	√	√	√	√
					Eighty Mile Beach AMP*	√	NA	√	√
					Port Hedland- Eighty Mile Beach	X	X	√	√
	Caley Crude (Group 2)	Loss of well control causing a crude release at surface	77 days	1,335,493	Bedout Island	X	X	√	√
					Eighty Mile Beach AMP*	√	NA	√	√

Environment Plan / OPEP	Hydrocarbon Type	Scenario	Release Duration	Volume (m^3)	Receptors predicted by stochastic modelling to be contacted ≥5 % probability within 7 days				
		(drilling riser in place) for a subsea well in the Starbuck operational area.			Rowley Shoals surrounds*	X	NA	√	X
Van Gogh Coniston Novara VGA-4H GI ST1 Well Intervention / Plug and Abandonment OPEP	Van Gogh Crude (Group 4)	Surface loss of well control (LOWC)	77 days	8,073	Ningaloo Offshore*	X	NA	√	X
	MDO (Group 2)	Surface spill from vessel collision	1 hour	325	Gascoyne AMP*	X	NA	√	X
					Ningaloo Offshore*	X	NA	√	X
					Ningaloo Outer NW*	√	NA	√	√
					Ningaloo-Outer Coast North*	X	NA	√	X
Varanus Island State Waters Wells Decommissioning OSCP	MDO (Group 2)	Surface spill from vessel collision at Double Island	1 hour	325	Barrow-Montebello Surrounds	√	√	√	√
					Barrow Island	√	√	√	√
					Lowendal Islands	√	√	√	√
					Montebello Islands	X	√	√	X
					Montebello AMP*	X	NA	√	√
					Muiron Islands	X	X	√	X
					Ningaloo – Offshore*	X	NA	√	X
					Ningaloo - Outer Coast North*	X	NA	√	X
					Ningaloo Coast North	X	X	√	X
					Penguin Bank*	X	NA	√	X
					Poivre Reef*	X	NA	√	X
					Rosily Shoals*	X	NA	√	X
					Southern Islands Coast	X	X	√	X
	MDO (Group 2)	Surface spill from vessel collision at Lee	1 hour	325	Barrow-Montebello Surrounds	√	X	√	√
					Barrow Island	X	X	√	X
					Lowendal Islands	X	√	√	√
					Montebello Islands	X	√	√	√
					Montebello AMP*	X	NA	√	X

Environment Plan / OPEP	Hydrocarbon Type	Scenario	Release Duration	Volume (m^3)	Receptors predicted by stochastic modelling to be contacted ≥5 % probability within 7 days				
					Muiron Islands	X	X	√	X
					Ningaloo – Offshore*	X	NA	√	X
					Penguin Bank*	X	NA	√	X
					Poivre Reef*	X	NA	√	X
					Rosily Shoals*	X	NA	√	X
					Southern Islands Coast	X	X	√	X
					Thevenard Islands	X	X	√	X
	MDO (Group 2)	Surface spill from vessel collision at Wonnich	1 hour	325	Barrow-Montebello Surrounds	√	X	√	√
					Barrow Island	X	X	√	√
					Brewis Reef*	X	NA	√	X
					Lowendal Islands	X	X	√	X
					Montebello Islands	√	√	√	√
					Montebello AMP*	√	NA	√	√
					Muiron Islands	X	X	√	X
					Ningaloo – Offshore*	X	NA	√	X
					Ningaloo - Outer Coast North*	X	NA	√	X
					Ningaloo - Outer NW *	X	NA	√	X
					Ningaloo Coast North	X	X	√	X
					Penguin Bank*	X	NA	√	X
					Poivre Reef*	X	NA	√	X
					Rosily Shoals*	X	NA	√	X
					Southern Islands Coast	X	X	√	X
					Thevenard Islands	X	X	√	X
					Trap Reef*	X	NA	√	X
Key									
NP	Not provided								

Environment Plan / OPEP	Hydrocarbon Type	Scenario	Release Duration	Volume (m^3)	Receptors predicted by stochastic modelling to be contacted ≥5 % probability within 7 days
NA	Not applicable				
*	Submerged receptor				
	Receptor only contacted by entrained hydrocarbons				

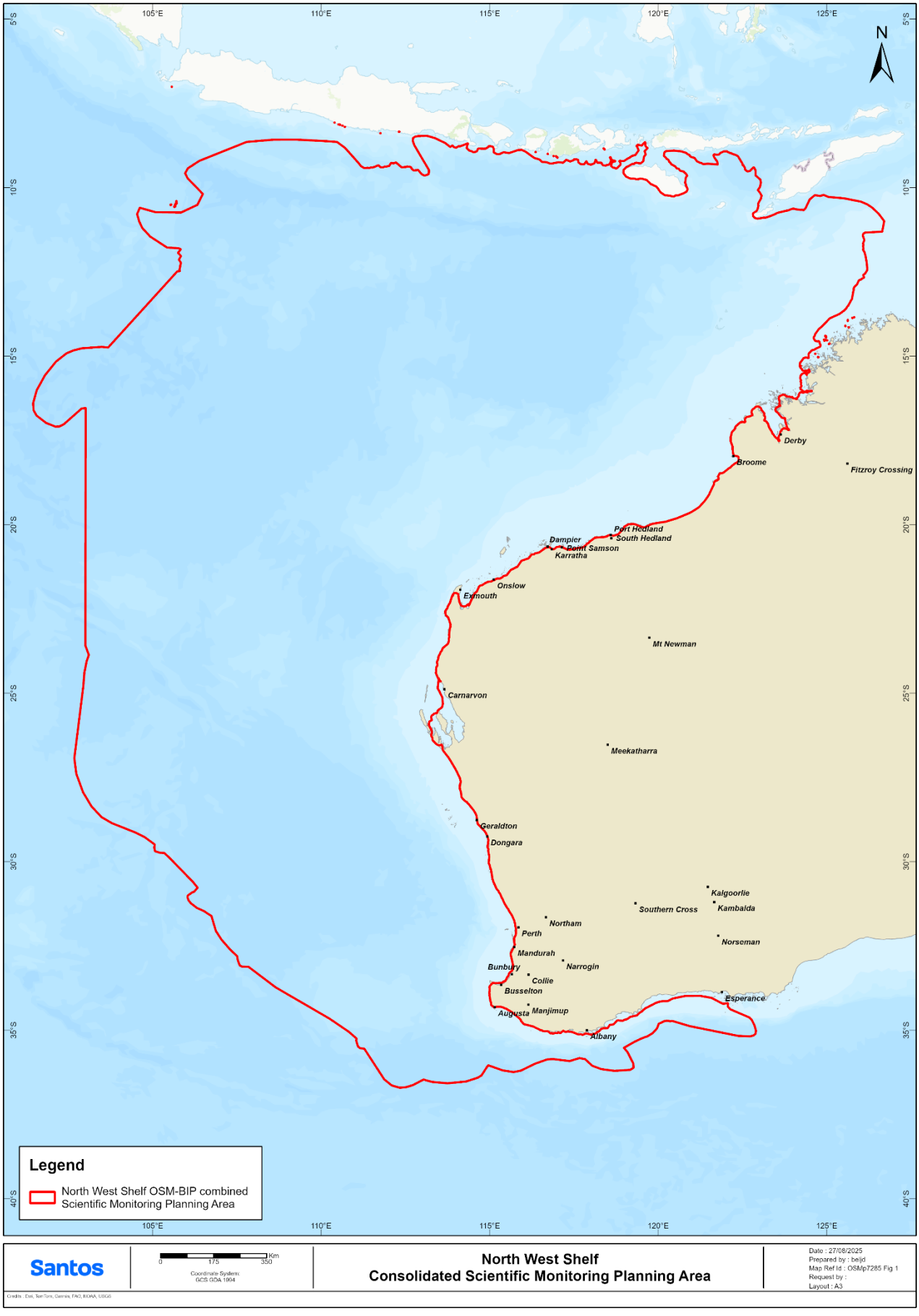


Figure 2-1: Consolidated Scientific Monitoring Planning Area for Santos North West Shelf OSM-BIP

3. Relevant existing baseline information sources

Santos has access to a number of different baseline data sources that are relevant to the high-value receptors in the North West Shelf OSM-BIP Consolidated Scientific Monitoring Planning Area. These include the Santos Geographic Information System (GIS) (including habitat/fauna distribution layers and satellite imagery) and the following external data sources:

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).

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 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 WA DTMI Marine Safety and is part funded through the National Plan for Maritime Environmental Emergencies and the Australian Maritime Safety Authority (AMSA). Santos IMT members can log in to the OSRA on the Santos SharePoint site.

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 Scientific Monitoring Planning Area. 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).

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.

3.6 Other Sources

Other sources include:

- the WA Department of Biodiversity and Attractions (DBCA) Biodiversity and Conservation Science Annual Reports;
- Australian Institute for Marine Science (AIMS) Research Data Platform;
- WA State of Fisheries Report;

- eAtlas.org.au;
- North West Atlas;
- Western Australian Marine Science Institution;
- Geosciences Australia data and publications;
- Australian Marine Parks Science Atlas; and
- Birdlife Data Zone.

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

Understanding the presence or absence, suitability and quality of baseline data for receptors predicted to be contacted within 7 days is an important preparatory measure for prioritising monitoring. During a spill event, prioritisation of capability may be given to those receptors with insufficient baseline data where it is possible to collect baseline data post-spill pre-impact. Where post-spill pre-impact monitoring is not feasible due to short contact times, understanding which receptors have insufficient baseline data will help quickly guide the finalisation of each SMP design and the need to include alternative designs (e.g. the Gradient Approach versus Before-After Control-Impact (BACI) design).

Santos is part of a Joint Industry Collaborative Group who are working together to determine the extent, quality and suitability of existing baseline data for the marine environments in the North West Shelf, Browse and Timor Sea Regions of Australia. The Marine Environment Baseline Database includes available data for all receptors relevant to the Joint Industry OSM Framework and has assessed the spatial and temporal relevance of this data and comparison of methods and parameters to those outlined in the Joint Industry SMPs.

Using the Marine Environment Baseline Database, Santos has reviewed the baseline data for all of the receptors listed in Table 2-1 to help determine which receptors have insufficient or no baseline data available and should be given a higher monitoring priority.

The baseline data assessment includes the following steps:

1) **Identification of receptors requiring a baseline review:** Receptors predicted to be contacted within 7 days, at a probability greater than 5%, are identified and aligned with OMPs and SMPs
2) **Collection of baseline data:** Environmental baseline monitoring data relevant to the receptors is located (as per sources outlined in Section 3) and included (if it is not already included) in the Marine Environment Baseline Database. Appendix D provides a high-level summary of selected data sources included in the Marine Environment Baseline Database.
3) **Assessment of baseline data**: The relevance of each data source is assessed:

   For each data source obtained, a meta-analysis is performed to determine if the parameters and methods align with the key parameters and methods outlined in the Joint Industry SMPs (Table 4-1), the spatial extent of the data, the sampling effort/duration, and the temporal relevance is also noted. Table 4-2 outlines the overall assessment criteria used for each data source.
4) **Assessment of baseline data:** A qualitative annual evaluation of the adequacy (in terms of the likely ability to detect changes between pre-impact and post-impact conditions) of the collective baseline data for each receptor is undertaken. This evaluation takes into consideration the following:
   a) Background historical information on the presence, distribution, seasonality, and if applicable, the reproductive state of the receptor (as outlined in Appendix C) is compared with the data available from monitoring within the last 5 years. Depending on the receptor and associated Joint Industry SMP, the following is considered:
      i) Does the data collectively cover the required spatial extent of the receptor within a location (taking into consideration any background historical information on the distribution of the receptor)?
      ii) Does the data collectively cover all the species/biological communities required for the relevant Joint Industry SMP and that may be present at the receptor/location?
5) **Assessment outcome:** Each location and associated receptor is then categorised as follows and summarised in Table 4-3:
   a) **Priority Survey:** Current baseline data is not in place, not suitable or not sufficient; and post-spill pre-impact baseline data collection should be prioritised; or

b) **Survey:** Collectively there is substantial baseline data or on-going monitoring from within the last 5 years. This data aligns with the key parameters and methodologies of the relevant Joint Industry SMP, encompasses the required species/biological communities, and covers the required spatial extent of the location. The current baseline data is therefore considered sufficient and could likely be used to detect a level of change in the event of a significant impact. Hence this receptor is considered a lower priority for post-spill, pre-impact data collection.

It is 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.

Table 4-1: Key parameters and key methodology from the Joint Industry SMPs

SMP	Key parameter	Key methodology
SM1: Water quality impact assessment	At least one key parameter: • Total recoverable hydrocarbons (TRH); • Total petroleum hydrocarbons (TPH); • Benzene, toluene, ethylbenzene and xylenes and naphthalene (BTEXN); or • Polycyclic aromatic hydrocarbons (PAH)	In situ UV fluorometer and/or samples analysed at National Association of Testing Authorities (NATA) accredited lab using NATA accredited method
SM2: Sediment quality impact assessment	At least one key parameter: TRH, TPH, BTEXN, PAH, heavy metals	Sediment collected by corer/grab and samples analysed at NATA accredited lab using NATA accredited method
SM3: Intertidal and coastal habitat assessment	At least one key parameter: presence, diversity, distribution	Any of the following, as appropriate to the parameters: • Ground and vessel-based intertidal surveys (e.g. quadrats, transects, including video and still photography) • Remote sensing • Infauna sampling
SM4: Seabirds and shorebirds	At least one key parameter: species present, abundance / counts, behaviour (resting, roosting, foraging, nesting)	Ground surveys and standardised methodology for counting birds
SM5a: Marine megafauna - reptile	At least one key parameter: species identification, abundance / counts, key behaviour (foraging, mating, nesting, internesting)	As appropriate to the species and behaviour / life stage: • Nesting turtles: ground surveys • In water turtles: vessel and aerial surveys • Sea snakes: manta board and snorkel surveys • Estuarine crocodiles: vessel-based spotlight surveys at night
SM5b: Marine megafauna- whale sharks, dugong and cetaceans	At least one key parameter: species identification, abundance / counts, key behaviour	Aerial or vessel surveys, acoustic monitoring
SM6: Benthic habitat assessment	At least one key parameter: presence, diversity, distribution	Any of the following, as appropriate to the parameters: • Transects • Towed camera • Drop camera

SMP	Key parameter	Key methodology
		• Remotely Operated Vehicle (ROV) camera • Diver-based camera surveys • Remote sensing (coral & seagrass broad scale survey) • Sediment grab for infauna
SM7: Marine fish and elasmobranch assemblages assessment	At least one key parameter: species identification, abundance, habitat type	Any of the following, as appropriate to the parameters: • Baited remote underwater video stations (BRUVS) • Stereo Baited Remote Underwater Video Stations (SBRUVS) • ROV • Towed video survey
SM8: Fisheries impact assessment	At least one key parameter: Abundance, catch-rate, stock structure, size structure	Catch and effort for stock assessment

Table 4-2: 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 = less than 5 years old	High = > 4 years	High = 4+ sampling trips per year	High	High
Medium = between 5-10 years old	Medium = 2–4 years	Medium = 2–3 sampling trips per year	-	-
Low = greater than 10 years old	Low = <2 years	Low = one-off sampling trip	Low	Low

Table 4-3: Baseline data assessment versus SMPs for the worst-case spill scenarios in the North West Shelf OSM-BIP Consolidated Scientific Monitoring Planning Area

Receptor	SMP									
	SM1: Water quality impact	SM2: Sediment quality impact	SM3: Intertidal and coastal habitat	SM4: Seabirds and shorebirds	SM5a: Marine mega-fauna assessment – reptiles	SM5b: Marine mega-fauna assessment – whale sharks, dugong and cetaceans	SM6: Benthic habitat	SM7: Marine fish and elasmobranch assemblages	SM8: Fisheries impact[+]	SM9 & 10: Heritage and social impact[^]
Gascoyne AMP*			N/A							
Dampier AMP*			N/A							
Eighty Mile Beach AMP*			N/A							
Montebello AMP*			N/A							
Outer Argo-Rowley Terrace AMP*			N/A							
Rowley Shoals MP* (Clerk Reef and Imperieuse Reef)										
Dampier Archipelago					Turtles: Rosemary Island					
Eighty Mile Beach				Shorebirds	Flatback turtle					
Ningaloo Coast North (includes Ningaloo World Heritage Area and Ningaloo Offshore Areas*)					Turtle	Whale shark				
Port Hedland- Eighty Mile Beach	Port Hedland Port	Port Hedland Port		Shorebirds at Port Hedland	Flatback turtles					
Southern Islands Coast	Ashburton Port	Ashburton Port		Onslow, Urala	Turtles: Onslow,			Sawfish		

Receptor	SMP									
	SM1: Water quality impact	SM2: Sediment quality impact	SM3: Intertidal and coastal habitat	SM4: Seabirds and shorebirds	SM5a: Marine mega-fauna assessment – reptiles	SM5b: Marine mega-fauna assessment – whale sharks, dugong and cetaceans	SM6: Benthic habitat	SM7: Marine fish and elasmobranch assemblages	SM8: Fisheries impact+	SM9 & 10: Heritage and social impact^
				Station, Airlie, Serrurier & Thevenard Islands	Thevenard & Airlie Islands					
Northern Islands Coast					Turtle			Sawfish		
Barrow Island and Barrow Montebello surrounds*	Barrow Island Port	Barrow Island Port			Flatback turtle					
Bedout Island										
Lowendal Islands			Mangroves: Varanus & Bridled Is	Seabirds: Varanus, Abutilon, Beacon, Bridled, Parakeelya Is	Turtles: Varanus Is					
Montebello Islands				Wedge-tailed shearwater Ah Chong Island						
Muiron Islands										
Thevenard Island					Flatback turtle					
Reefs, Shoals, Banks*										

Receptor	SMP									
	SM1: Water quality impact	SM2: Sediment quality impact	SM3: Intertidal and coastal habitat	SM4: Seabirds and shorebirds	SM5a: Marine mega-fauna assessment – reptiles	SM5b: Marine mega-fauna assessment – whale sharks, dugong and cetaceans	SM6: Benthic habitat	SM7: Marine fish and elasmobranch assemblages	SM8: Fisheries impact+	SM9 & 10: Heritage and social impact^
Key										
	Priority survey: Current baseline data is not in place, not suitable or not sufficient; and post-spill pre-impact baseline data collection should be prioritised									
	Survey: Collectively there is substantial baseline data or on-going monitoring from within the last 5 years, therefore current monitoring/knowledge is considered adequate (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									
	N/A: not applicable									

** Submerged EVA*

+ Locations to be determined in consultation with key stakeholders to reflect current fishing zones/effort

^ Locations to be determined in consultation with key stakeholders

5. OSM organisational structure

Santos uses the ICS to respond to incidents and therefore adopts the key roles and responsibilities used in this system, as described in the activity EPs and/or OPEPs. The IMT will be responsible for coordinating OSM activities, which will be implemented by the Planning Section within the IMT, with support from each Section, in particular the Operations Section.

The full Santos IMT structure is shown in the activity specific OPEPs. Where the WA DTMI is the Control Agency, the IMT will be managed through coordinated command and Santos will still be expected to continue monitoring activities in State waters, with oversight from the WA DTMI.

Figure 5-1 illustrates the structure of the IMT, including key OSM roles during the response phase. The IMT Incident Commander 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.

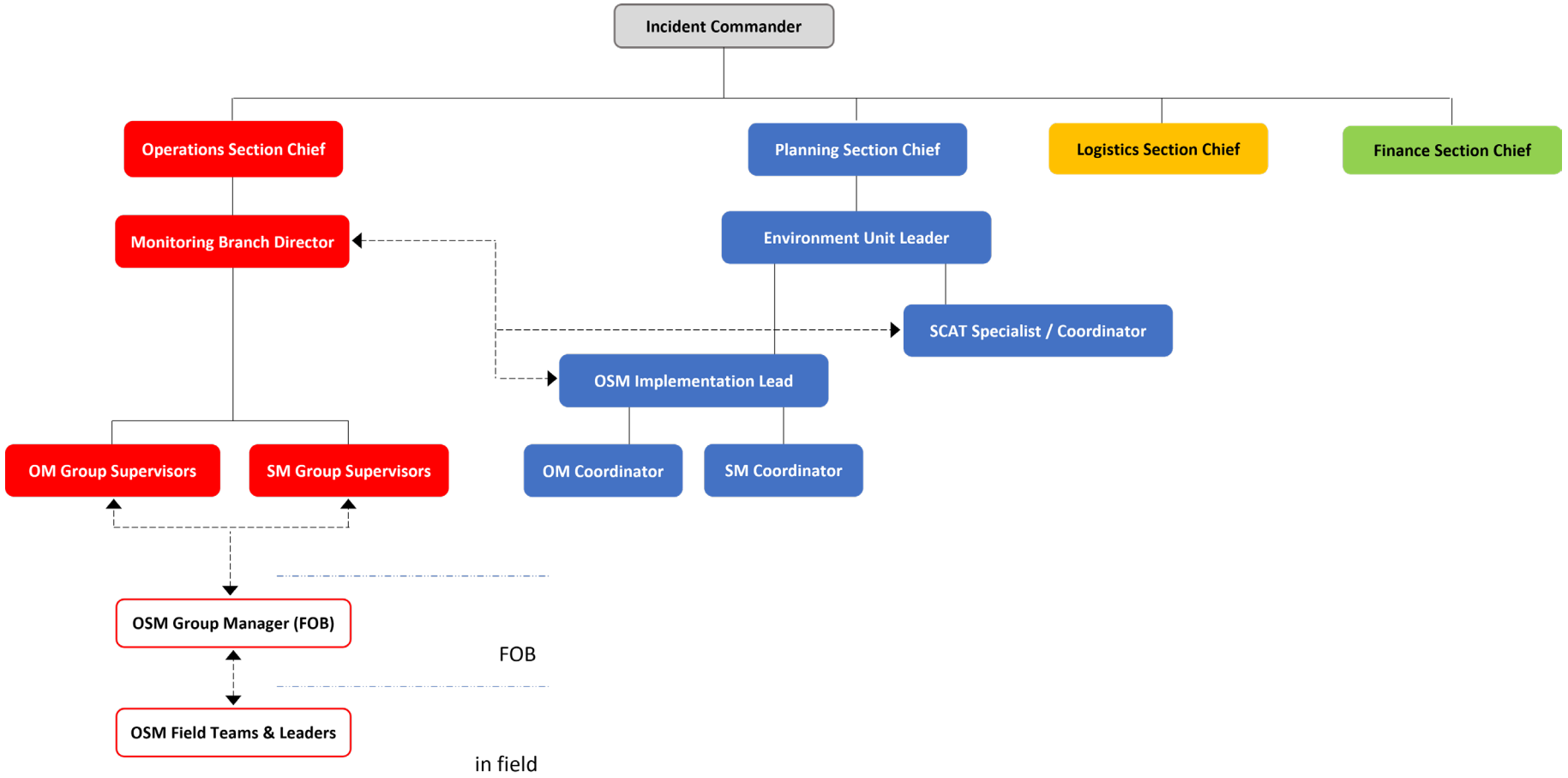


Figure 5-1: Santos IMT structure with key OSM roles

6. OSM roles and responsibilities

OSM roles and responsibilities are listed in Section 10.13.2 of the Joint Industry OSM Framework, which will be adopted by Santos and its OSM Services Provider. Table 6-1 outlines the roles held by Santos and the OSM Services Provider.

During the post-response phase the Santos Environment Unit Lead and the Santos OSM Implementation Lead and/or 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	Santos (IMT)
OSM Implementation Lead	Santos to hold this position initially, followed by OSM Services Provider, if required[1]
Operational Monitoring Coordinator and/or Scientific Monitoring Coordinator	OSM Services Provider
OM and/or SM Group Supervisors and Managers	Santos / OSM Services Provider
OSM Field Teams	OSM Services Provider

7. Mobilisation and timing of OMP and SMP implementation

Table 7-1 provides an indicative implementation schedule for OMPs and SMPs in the North West Shelf OSM-BIP Consolidated Scientific Monitoring Planning Area and adjacent waters. 'Implementation' of an OMP/SMP is defined as being ready, at the point of staging or departure, to mobilise for monitoring. If the monitoring plan is desktop-based, implementation is defined as commencing the work (e.g. computer model inputs). Refer to activity specific OPEPs for an indication of worst-case minimum contact times based on stochastic modelling (stochastic modelling represents all possible outcomes that could potentially occur, in reality, only a subset of receptors will likely be contacted during a spill event).

Through Santos' membership in the OSRL OSM Supplementary Agreement, OSM services are available for preparedness, activation, and monitoring (Section 9). This agreement ensures operational monitoring personnel can deploy within 72 hours of notification, and scientific monitoring personnel within 5-7 days, which is reflective of the implementation schedule provided in Table 7-1. In addition to these OSM services, Santos has personnel trained in Shoreline Clean-up Assessment Technique (SCAT) and aerial surveillance who are available within 24-48 hours of spill notification, as noted in the activity OPEP (Monitor and Evaluate Section, and Appendix titled 'Resourcing Requirements for OM6: Shoreline Clean-up Assessment') and deployed in a timeframe relevant to assisting the relevant response operations for that OPEP.

Santos also has an initial oil sampling and analysis capability as per Appendix E, which can include the collection of initial water samples to support OM1: Hydrocarbon Characterisation, when safe to do so.

Due to short contact times, there may be instances where post-spill pre-impact monitoring is not feasible. For these receptors, and where baseline data does not exist, or may not be recent and applicable, the application of a BACI design may not be possible. The finalisation of each SMP design will consider this and may need to include alternative designs (e.g. data from an expected BACI design may need to be analysed as a Gradient Approach).

[1] *Santos may fill the OSM Implementation Lead role throughout the monitoring effort, if it chooses to. This will depend upon the individual circumstances of the spill.*

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	~5-7 days from OSM activation	1-2 weeks from OSM activation	Ongoing
Spill site and surrounding waters	OM	• Activation of OMP Team Leads. • Finalise OMPs. • Aerial surveillance – which will also document fauna observations. • Commence activation and mobilisation of OM personnel.	• OM1: Hydrocarbon Characterisation, where resources are available (e.g. Supply Vessel with onboard sampling equipment). • OM2: Hydrocarbons in Water Assessment • OM3: Hydrocarbons in Sediment Assessment • OM4: Surface Chemical Dispersant Effectiveness (commencing with Tier 1 SMART Protocol) • OM5: Rapid Marine Fauna Surveillance • OM7: Air Quality Modelling • Continue to finalise OMPs. • Continue to activate and mobilise OM personnel.	Continued (as per on-going arrangements)	Continued (as per on-going arrangements)	As results from implemented OMPs are available, data are provided to relevant personnel in IMT (e.g. Situation/Intelligence Unit) 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.	• SM1: Water Quality Impact Assessment • SM2: Sediment Quality Impact Assessment • SM6: Benthic Habitat Assessment • SM7: Marine fish and elasmobranch assemblages assessment	Continued	Continue SMP monitoring until termination criteria are met
Sensitive receptors (including shorelines, reefs,	OM	• Activation of OMP Team Leads.	• OM1: Hydrocarbon Characterisation	Continued (as per on-going arrangements)	Continued (as per on-going arrangements)	As results from implemented OMPs are available, data are provided to relevant

Proximity to spill source	Monitoring type	0–48 hours from OSM activation	Within 72 hours of OSM activation	~5-7 days from OSM activation	1-2 weeks from OSM activation	Ongoing
banks and shoals) predicted to be contacted within 7 days		• OM6: Shoreline Clean-up Assessment • Finalise OMPs. • Commence activation and mobilisation of OM personnel.	• OM2: Hydrocarbons in Water Assessment • OM3: Hydrocarbons in Sediment Assessment • OM5: Rapid Marine Fauna Surveillance • Continue to finalise OMPs. • Continue to activate and mobilise OM personnel.			personnel in IMT (Situation Unit 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	• Continue to activate and mobilise personnel. • Work on finalising SMPs.	• SM1: Water Quality Impact Assessment • SM2: Sediment Quality Impact Assessment • SM3: Intertidal and Coastal Habitat Assessment • SM4: Seabirds and Shorebirds • SM5: Marine Mega-fauna Assessment-Reptiles • SM5: Marine Mega-fauna Assessment-Cetaceans, Whale Sharks, Dugong • SM6: Benthic Habitat Assessment • SM7: Marine Fish and Elasmobranch Assemblages assessment • SM8: Fisheries impact assessment • SM9: Heritage Features Assessment • SM10: Social Impact Assessment	Continued	Continue SMP implementation until termination criteria are met.

Proximity to spill source	Monitoring type	0–48 hours from OSM activation	Within 72 hours of OSM activation	~5-7 days from OSM activation	1-2 weeks from OSM activation	Ongoing
Sensitive receptors (including shorelines, reefs, banks and shoals) predicted to be contacted week 1-2	OM	-	-	• Additional Activation of OMP Team Leads. • Commence activation and mobilisation of additional OM personnel.	• Continue to finalise OMPs. • Continue to activate and mobilise OM personnel. • OM1: Hydrocarbon Characterisation • OM2: Hydrocarbons in Water Assessment • OM3: Hydrocarbons in Sediment Assessment • OM5: Rapid Marine Fauna Surveillance • OM6: Shoreline Clean-up Assessment	As results from implemented OMPs are available, data are provided to relevant personnel in IMT (Situation Unit 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	-	-	• Additional Activation of SMP Team Leads. • Commence activation and mobilisation of additional SM personnel.	• SM1: Water Quality Impact Assessment • SM2: Sediment Quality Impact Assessment • SM3: Intertidal and Coastal Habitat Assessment • SM4: Seabirds and Shorebirds • SM5: Marine Mega-fauna Assessment-Reptiles • SM5: Marine Mega-fauna Assessment-Cetaceans, Whale Sharks, Dugong • SM6: Benthic Habitat Assessment • SM7: Marine Fish and Elasmobranch Assemblages assessment • SM8: 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	~5-7 days from OSM activation	1-2 weeks from OSM activation	Ongoing
					• SM9: Heritage Features Assessment • SM10: Social Impact Assessment	

8. Resourcing requirements

To guide OSM resourcing requirements, the spill scenarios most likely to require the greatest initial and on-going capability were selected from those informing the North West Shelf OSM-BIP Consolidated Scientific Monitoring Planning Area. Selection was based on stochastic modelling results (refer to Table 2-1), focussing on the scenarios with the greatest predicted number of receptors contacted at the low thresholds (Section 2.1) within 7 days; followed by the greatest number of receptors contacted within 7-14 days; and, at the highest contact probabilities. If a receptor is only contacted by low concentrations of entrained hydrocarbons and not by any other hydrocarbon phase, it will be considered a lower priority during the initial monitoring response as outlined in Section 2.2.

Other factors influencing the selection of the scenario with the highest capability requirements were location of the spill, proximity to receptors, and hydrocarbon properties. The chosen scenarios and reasons for their selection are presented in Table 8-1.

Table 8-1: Scenarios selected for OSM capability analysis

Scenario	Rationale for selection
Varanus Island Hub (State) Operations: Surface HFO release of 640 m^3 (1 hour) from the offtake tanker following vessel collision at Varanus Island Marine Terminal	• Highest number of floating and shoreline receptors contacted within 7 days • Represents a heavy, persistent hydrocarbon (Group 4)[2] • Located close to a number of sensitive emergent receptors
Varanus Island Hub (State) Operations: Subsea release of 327 m^3 Halyard condensate (9 hours) from a pipeline following major rupture at Commonwealth-State waters boundary	• Highest number of dissolved receptors contacted within 7 days • Represents a light, non-persistent hydrocarbon (Group 1)[3] • Located close to a number of sensitive submerged receptors
Bedout Multi Well Exploration and Appraisal Drilling EP1: Loss of well control causing a crude release (Caley Crude) of 1,017,519 m^3 over 77 days at surface (drilling riser in place) for a subsea well in the Ara operational area	• High number of floating, shoreline and dissolved receptors contacted within 7 days • Represents a very light crude (Group 2)[4] • Located at the northern-most extent of Santos' operational areas in the North West Shelf

8.1 Monitoring units

Using stochastic modelling results, Santos has grouped its monitoring priorities into monitoring 'units' (Table 8-2). These units incorporate all of the possible receptors that may be contacted by the scenarios shown in Table 2-1. These unit groupings are based on consultation with experienced monitoring personnel and planners, who often group these receptors together for time-bound monitoring projects. The grouping of units is based on factors such as access and distance to ports, SIMOPS of multiple vessels and teams working in a close area, travel time between individual locations/receptors and time taken to collect samples for each SMP.

The monitoring units presented in Table 8-2 also include KEFs, BIAs and transient species. Additional information on the seasonality of the receptors can be found in Appendix C and in Section 3 of the relevant EPs. Each monitoring unit will require 1-2 teams during the initial response (1-2 weeks). The number of teams allocated to each unit will depend on the extent of the spill, the outcome of the monitoring prioritisation finalised at the time of the spill (Section 13), the Operational Net Environmental Benefit Analysis and SIMOPs.

It should be noted that not all monitoring units will be contacted by a single spill and that the list below has been generated from stochastic modelling results from all receptors identified in Table 2-1.

Table 8-2: Monitoring units relevant to stochastic modelling results

Monitoring Unit	Receptors within Monitoring Unit
Dampier	Dampier Archipelago and Islands
	Dampier AMP*

[2] *HFO Properties – API = 12.3; residual components = 82.8%*

[3] *Halyard Condensate properties – API = 52.1; residual components = 0.1%*

[4] *Caley Crude properties – API = 51.4; residual components = 15%*

Monitoring Unit	Receptors within Monitoring Unit
	Madeleine Shoals*
	Marine turtle BIAs
	Pygmy blue whale (distribution) BIA
	Seabird and shorebird BIAs
	Humpback whale (migration) BIA
Northern Pilbara	Northern Islands Coast
	Marine turtle BIAs
	Pygmy blue whale (distribution) BIA
	Humpback whale (migration) BIA
	Seabird and shorebird BIAs
Middle Pilbara	Middle Islands Coast
	Penguin Bank*
	Ripple Shoals*
	Trap Reef*
	Marine turtle BIAs
	Pygmy blue whale (distribution) BIA
	Humpback whale (migration) BIA
	Seabird and shorebird BIAs
Southern Pilbara	Southern Islands Coast
	Thevenard Island
	Muiron Islands
	Brewis Reef*
	Rosily Shoals*
	Marine turtle BIAs
	Pygmy blue whale (distribution) BIA
	Humpback whale (migration) BIA
	Seabird and shorebird BIAs
	Dugong (breeding) BIA
Barrow	Barrow Island
	Lowendal Islands
	Barrow-Montebello surrounds*
	Seabird and shorebird BIAs
	Marine turtle BIAs
	Poivre Reef*
	Humpback whale (migration) BIA
	Pygmy blue whale (distribution) BIA
	Whale shark (foraging) BIA
Montebello	Montebello Islands
	Montebello AMP*
	Barrow-Montebello surrounds*
	Montebello Islands MP*
	Seabird and shorebird BIAs
	Marine turtle BIAs

Monitoring Unit	Receptors within Monitoring Unit
	Humpback whale (migration) BIA
	Pygmy blue whale (distribution) BIA
Ningaloo	Offshore Ningaloo*
	Ningaloo Coast North
	Outer Ningaloo North Coast*
	Outer NW Ningaloo*
	Gascoyne AMP*
	North West Reef*
	Whale shark (foraging) BIA
	Seabird and shorebird BIAs
	Marine turtle BIAs
	Dugong (breeding) BIA
	Pygmy blue whale (foraging and migration) BIAs
Eighty Mile	Eighty Mile Beach AMP
	Bedout Island
	Marine turtle BIAs
	Humpback whale (migration) BIA
	Pygmy blue whale (distribution) BIA
	Seabird and shorebird BIAs
Rowley Shoals	Rowley Shoals surrounds*
	Imperieuse Reef MP
	Clerke Reef MP
	Mermaid Reef AMP*
	Outer Argo-Rowley Terrace AMP*
	Pygmy blue whale (distribution) BIA
	Seabird and shorebird BIAs
Offshore Environs	Rankin Bank*
	Glomar Shoals*
	Ancient Coastline at 125 m depth contour*
	Continental Slope Demersal Fish Communities*
	Pygmy blue whale (migration) BIAs
	Humpback whale (migration) BIA
	Whale shark (foraging) BIA
	Marine turtle BIAs
	Seabird and shorebird BIAs
Control	Control sites

Key
Stochastic modelling predicts contact by only entrained hydrocarbons for all scenarios listed in Table 2-1
*Submerged receptor that has no features above the sea surface

8.2 Deterministic modelling

To better understand worst-case capability OSM requirements, deterministic modelling was undertaken for the scenarios listed in Table 8-1. The deterministic run with the most receptors contacted by either floating, shoreline or dissolved hydrocarbons at the low thresholds and within 7 days was selected for further analysis. Deterministic modelling enables oil spill planners to assess the results of a single run from the stochastic oil spill modelling results, helping to assess the possible worst-case capability requirements. The results of this deterministic assessment are presented in Table 8-3, Table 8-4 and Table 8-5.

The resources required to support the IMT in the coordination and management of OSM are outlined in Table 8-6. The resources required to commence OM and SM components during weeks 1-2 are presented in Table 8-7 and Table 8-8 respectively, which are based on the monitoring priorities for those scenarios, the implementation schedule outlined in Table 7-1, and the worst-case deterministic trajectories outlined in Table 8-3, Table 8-4 and Table 8-5. If additional resources are required to be scaled in to support the monitoring effort, this will be identified as soon as practicable following the spill and mobilised via the OSM Services Provider contract, which includes provision of scale-up resources.

Each new activity will be assessed, as outlined in Section 1.1 and Appendix B, to determine whether their spill scenario(s) exceed the worst-case resourcing requirements presented below. This may not require the use of deterministic modelling if it is a lower nature and scale spill, and the stochastic modelling results show limited receptors are contacted (as per the criteria in Appendix B).

Table 8-3: VI Hub (State) EP/OPEP - Deterministic modelling results (Run 32 - winter) - Surface HFO release of 640 m^3 (1 hour) from the offtake tanker following vessel collision at Varanus Island Marine Terminal (RPS, 2025)

Receptor	Arrival time (days:hours) for deterministic run No. 32			
	Floating oil ≥1 g/m^2	Shoreline Accumulation ≥10 g/m^2	Total Entrained Oil ≥10 ppb	Dissolved Hydrocarbons ≥ 10 ppb
Lowendal Islands	0 days: 1 hr	0 days: 4 hrs	0 days: 1 hr	NC
Barrow-Montebello surrounds	0 days: 6 hrs	NA	0 days: 9 hrs	NC
Barrow Island	0 days: 8 hrs	0 days: 14 hrs	0 days: 9 hrs	NC
Montebello AMP*	0 days: 11 hrs	NA	0 days: 12 hrs	NC
Southern Islands Coast	3 days: 4 hrs	3 days: 8 hrs	NC	NC
Muiron Islands	4 days: 2 hrs	4 days: 13 hrs	NC	NC
Ningaloo Offshore*	5 days: 21 hrs	NA	NC	NC
Gascoyne AMP*	10 days: 9 hrs	NA	NC	NC
Thevenard Island	NC	3 days: 20 hrs	NC	NC
Key				
Receptor contacted within 7 days				
Receptor contacted within 7-14 days				

**Submerged receptor that has no features above the sea surface. Modelling indicates floating contact with these receptors when the hydrocarbons pass over the receptor on the sea surface.*

NC: No contact to receptor predicted for specified threshold

Table 8-4: VI Hub (State) EP/OPEP - Deterministic modelling results (Run 27 - winter) – Subsea release of 327 m^3 Halyard condensate (9 hours) from a pipeline following major rupture at Commonwealth-State waters boundary (RPS, 2025)

Receptor	Arrival time (days:hours) for deterministic run No. 27			
	Floating oil ≥1 g/m^2	Shoreline Accumulation ≥10 g/m^2	Total Entrained Oil ≥10 ppb	Dissolved Hydrocarbons ≥ 10 ppb
Barrow-Montebello surrounds	1 hr	NA	1 hr	1 hr
Barrow Island	NC	NC	1 day: 2 hrs	1 day: 2 hrs
Montebello AMP*	1 hr	NA	1 hr	2 hrs

Receptor	Arrival time (days:hours) for deterministic run No. 27			
	Floating oil ≥1 g/m²	Shoreline Accumulation ≥10 g/m²	Total Entrained Oil ≥10 ppb	Dissolved Hydrocarbons ≥ 10 ppb
Muiron Islands	NC	NC	5 days: 2 hrs	5 days: 1 hr
Ningaloo Offshore*	NC	NA	4 days: 6 hrs	4 days: 13 hrs
Ningaloo - Outer Coast North*	NC	NA	6 days: 1 hr	5 days: 22 hrs
Ningaloo – Outer NW*	NC	NA	6 days: 11 hrs	6 days: 15 hrs
Rosily Shoals*	NC	NA	NC	3 days: 17 hrs
Southern Islands Coast	NC	NC	NC	4 days: 10 hrs
Thevenard Island	NC	NC	NC	4 days: 5 hrs
Key				
Receptor contacted within 7 days				
Receptor contacted within 7-14 days				

**Submerged receptor that has no features above the sea surface. Modelling indicates floating contact with these receptors when the hydrocarbons pass over the receptor on the sea surface.*

NC: No contact to receptor predicted for specified threshold

Table 8-5: Bedout Multi-well Drilling EP 1 EP/OPEP - Deterministic modelling results (Run 14 – transitional) – Bedout LOWC causing a crude release [Caley Crude] of 1,017,519 m³ over 77 days at surface [drilling riser in place] for a subsea well in the Ara operational area (RPS, 2025)

Receptor	Arrival time (hours) for deterministic run No. 14			
	Floating oil ≥1 g/m²	Shoreline Accumulation ≥10 g/m²	Total Entrained Oil ≥10 ppb	Dissolved Hydrocarbons ≥ 10 ppb
Rowley Shoals surrounds*	2 days: 4 hrs	NA	1 day: 6 hrs	1 day: 15 hrs
Clerke Reef MP	4 days: 6 hrs	9 days: 13 hrs	4 days: 0 hrs	4 days: 8 hrs
Outer Argo-Rowley Terrace AMP*	7 days: 18 hrs	NA	7 days: 8 hrs	8 days: 23 hrs
Imperieuse Reef MP	9 days: 7 hrs	9 days: 19 hrs	9 days: 7 hrs	9 days: 12 hrs
Key				
Receptor contacted within 7 days				
Receptor contacted within 7-14 days				

**Submerged receptor that has no features above the sea surface. Modelling indicates floating contact with these receptors when the hydrocarbons pass over the receptor on the sea surface.*

NC: No contact to receptor predicted for specified threshold

8.3 Co-Mobilisation of Monitoring Teams

Where monitoring programs share compatible objectives, spatial footprints, sampling methods or logistical dependencies, co-mobilisation of OMP and/or SMP teams may be undertaken to maximise efficiency and minimise vessel movements, provided that safety, data integrity and analytical objectives are not compromised. Table 8-7 and Table 8-8 outline when co-mobilisation of OMP and/or SMP teams may be undertaken. Co-mobilisation is particularly applicable where monitoring programs:

- target the same or adjacent environmental compartments (e.g. water column and sediment);
- use comparable sampling and analytical techniques (e.g. grab or water sampling, fluorometry, or visual transects);
- operate within the same geographic area or under the same environmental conditions (e.g. similar tidal or meteorological windows); and
- are required within a comparable timeframe following the spill (e.g. within 0–14 days post-activation).

Compatibility of OMPs and SMPs arises because many operational and scientific monitoring elements are designed to be complementary rather than sequential. For example, data collected under OM1–OM3 (hydrocarbon characterisation, water and sediment assessments) provide the initial exposure information required to inform SMPs such as SM1 and SM2 (water and sediment impact assessments). These programs use consistent sample media, laboratory protocols and QA/QC chains, enabling co-deployment without compromising scientific rigour. Similarly, concurrent vessel-based aerial or visual surveys for OM5 (Rapid Marine Fauna Surveillance) can support the early stages of SM4 and SM5 (Seabird, Shorebird and Marine Megafauna Assessments) through shared platforms and observation windows.

This approach reduces duplication of mobilisation logistics, minimises transit times between sites and sample transport while maintaining representative spatial and temporal coverage. It also supports ALARP principles by limiting the number of concurrent field assets, thereby reducing SIMOPs, vessel congestion, and overall operational risk. Where subsequent SMP phases require extended sampling or increased replication, these will be implemented independently once initial monitoring is underway.

Co-mobilisation decisions will be confirmed post-spill through the Incident Action Planning process, in consultation with the OSM Services Provider, monitoring specialists and relevant stakeholders, taking into account safety, receptor access, timing and data-quality considerations.

Table 8-6: Resources required for key OSM coordination roles

Role	Resources required	Arrangement
OSM Implementation Lead (Santos / OSM Services Provider)	1 x OSM Implementation Lead	Oil Spill Response Limited (OSRL) OSM Supplementary Service Agreement
Operational Monitoring Coordinator and Scientific Monitoring Coordinator (OSM Services Provider)	1 x Operational Monitoring Coordinator 1 x Scientific Monitoring Coordinator	
OM and/or SM Group Supervisors and Managers (Santos / OSM Services Provider)	1 x OM Group Supervisor 1 x SM Group Supervisor 1 x OM Group Manager 1 x SM Group Manager	

Table 8-7: Resources required for implementing operational monitoring plans for the identified worst-case scenarios from the North West Shelf OSM-BIP Consolidated Scientific Monitoring Planning Area

OMP	Week 1 (total)[#]	Week 2 (total) [#]	Arrangement
OM1: Hydrocarbon characterisation*^	**Vl Hub - Surface HFO release** 1 team (spill site and surrounds) 1 team - Barrow Unit 1 team - Montebello Unit 1 team - Southern Pilbara Unit 1 team - Ningaloo Unit **Total 5 teams**	**Vl Hub - Surface HFO release** 1 team - (spill site and surrounds) 1 team - Barrow Unit 1 team - Montebello Unit 1 team - Southern Pilbara Unit 1 team - Ningaloo Unit **Total 5 teams**	• OSRL OSM Supplementary Service Agreement • Santos Contracted Vessel Providers • Laboratory arrangements
	Vl Hub - Subsea pipeline release 1 team - (spill site and surrounds) 1 team - Barrow Unit 1 team - Montebello Unit 1 team - Southern Pilbara Unit 1 team - Ningaloo Unit **Total 5 teams**	**Vl Hub - Subsea pipeline release** 1 team - (spill site and surrounds) 1 team - Barrow Unit 1 team - Montebello Unit 1 team - Southern Pilbara Unit 1 team - Ningaloo Unit **Total 5 teams**	
	Bedout EP1 - LOWC 1 team - (spill site and surrounds) 2 teams - Rowley Shoals Unit **Total 3 teams**	**Bedout EP1 - LOWC** 1 team - (spill site and surrounds) 3 teams - Rowley Shoals Unit **Total 4 teams**	

OMP	Week 1 (total)[#]	Week 2 (total) [#]	Arrangement
OM2: Hydrocarbon in water assessment*	Refer to OM1: Hydrocarbon characterisation* (all sites)		• OSRL OSM Supplementary Service Agreement • Santos Contracted Vessel Providers • Laboratory arrangements
OM3: Hydrocarbon in sediment assessment*	Refer to OM1: Hydrocarbon characterisation* (all sites)		• OSRL OSM Supplementary Service Agreement • Santos Contracted Vessel Providers • Laboratory arrangements
OM4a: Surface dispersant effectiveness monitoring	**Any scenario** 1 team 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 OM2: Hydrocarbon in water assessment		• OSRL OSM Supplementary Service Agreement • AMOSC Participant Member Agreement • Santos Contracted Vessel Providers
OM4b: Subsea dispersant injection effectiveness monitoring	**Bedout EP1 - LOWC** No subsea dispersant injection until week 2 due to mobilisation requirements	**Bedout EP1 - LOWC** 1 team	• OSRL OSM Supplementary Service Agreement • AMOSC Participant Member Agreement • Santos Contracted Vessel Providers
OM5: Rapid marine fauna surveillance^	**Any scenario** 1 team to conduct initial aerial surveys for all sites (2 observers per aircraft)		• OSRL OSM Supplementary Service Agreement • Santos Contracted Vessel Providers • Aviation contractors
OM6: Shoreline clean-up assessment	Detail on resources required for SCAT are presented in the activity-specific OPEP		• AMOSC Participant Member Agreement and/or OSRL OSM Supplementary Service Agreement • Santos Contracted Vessel Providers • State/Territory Response Teams and AMSA National Response Team
OM7: Air quality modelling (responder health and safety)	**Any scenario** 1 model	**Any scenario** 1 model	• RPS via Santos contract

** Initial co-mobilisation between OM1: Hydrocarbon characterisation, OM4a: Surface dispersant effectiveness monitoring, OM2: Hydrocarbon in water assessment and OM3: Hydrocarbon in sediment assessment.*

[#] Specific units are mentioned for planning and guidance purposes based on a worst case planning approach. In the event of an actual spill, other locations and/or receptors may be contacted. This would be identified and managed as part of implementation as per the guidance in Section 13.

^ These resources may not be required if relevant scientific monitoring components initiation criteria have been triggered.

Table 8-8: Resources required for implementing scientific monitoring plans for the identified worst-case scenarios from the North West Shelf OSM-BIP Consolidated Scientific Monitoring Planning Area

SMP	Week 1 (total) #	Week 2 (total) #	Arrangement
SM1: Water quality impact assessment^	**Vl Hub - Surface HFO release** 1 team - (spill site and surrounds) 1 team - Barrow Unit 1 team - Montebello Unit 1 team - Southern Pilbara Unit 1 team - Ningaloo Unit 1 team - control site(s) **Total 6 teams** Note: can initially be performed by the same team as OM2: Hydrocarbon in water assessment	**Vl Hub - Surface HFO release** 1 team - (spill site and surrounds) 1 team - Barrow Unit 1 team - Montebello Unit 1 team - Southern Pilbara Unit 1 team - Ningaloo Unit 1 team - control site(s) **Total 6 teams** Note: can initially be performed by the same team as OM2: Hydrocarbon in water assessment	• OSRL OSM Supplementary Service Agreement • Santos Contracted Vessel Providers • Laboratory arrangement
	Vl Hub - Subsea pipeline release 1 team - (spill site and surrounds) 1 team - Barrow Unit 1 team - Montebello Unit 1 team - Southern Pilbara Unit 1 team - Ningaloo Unit **Total 5 teams**	**Vl Hub - Subsea pipeline release** 1 team - (spill site and surrounds) 1 team - Barrow Unit 1 team - Montebello Unit 1 team - Southern Pilbara Unit 1 team - Ningaloo Unit **Total 5 teams**	
	Bedout EP1 - LOWC 1 team - (spill site and surrounds) 2 teams - Rowley Shoals Unit 1 team - control site(s) **Total 4 teams**	**Bedout EP1 - LOWC** 1 team - (spill site and surrounds) 3 teams - Rowley Shoals Unit 1 team - control site(s) **Total 5 teams**	
SM2: Sediment quality impact assessment	Refer to SM1: Water quality impact assessment* (all sites)		• OSRL OSM Supplementary Service Agreement • Santos Contracted Vessel Providers • Laboratory arrangement
SM3: Intertidal and coastal habitat assessment	**Vl Hub - Surface HFO release** 1 team - Barrow Unit 1 team - Southern Pilbara Unit 1 team - control site(s)	**Vl Hub - Surface HFO release** 1 team - Barrow Unit 1 team - Southern Pilbara Unit 1 team - control site(s)	• OSRL OSM Supplementary Service Agreement • Santos Contracted Vessel Providers • Laboratory arrangement

SMP	Week 1 (total)[#]	Week 2 (total)[#]	Arrangement
	Total 3 teams	**Total 3 teams**	
	Vl Hub - Subsea pipeline release No intertidal or emergent features predicted to be contacted	**Vl Hub - Subsea pipeline release** No intertidal or emergent features predicted to be contacted	
	Bedout EP1 - LOWC 1 team - Rowley Shoals Unit 1 team - control site(s) **Total 2 teams**	**Bedout EP1 - LOWC** 2 teams - Rowley Shoals Unit 1 team - control site(s) **Total 3 teams**	
SM4: Seabirds and shorebirds[^]	**Vl Hub - Surface HFO release** 1 team to conduct initial aerial surveys for Barrow Unit and Montebello Unit (2 observers per aircraft) 1 team to conduct initial aerial surveys for Southern Pilbara Unit and Ningaloo Unit (2 observers per aircraft) **Total 2 aerial teams** 1 team to conduct vessel-based surveys for Barrow Unit and Montebello Unit 1 team Southern Pilbara Unit and Ningaloo Unit 1 team control site(s) (surveys would include all fauna [birds, reptiles, cetaceans, dugong and whale shark]) **Total 3 vessel-based teams** 1 team to conduct ground-based surveys for Barrow Unit and Southern Pilbara Unit 1 team control site(s) (1 experienced ornithologists per team) **Total 2 ground-based teams** Note: can initially be performed by the same team as OM5: Rapid marine fauna surveillance	**Vl Hub - Surface HFO release** 1 team to conduct initial aerial surveys for Barrow Unit and Montebello Unit (2 observers per aircraft) 1 team to conduct initial aerial surveys for Southern Pilbara Unit and Ningaloo Unit (2 observers per aircraft) **Total 2 aerial teams** 1 team to conduct vessel-based surveys for Barrow Unit and Montebello Unit 1 team Southern Pilbara Unit and Ningaloo Unit 1 team control site(s) (surveys would include all fauna [birds, reptiles, cetaceans, dugong and whale shark]) **Total 3 vessel-based teams** 1 team to conduct ground-based surveys for Barrow Unit and Southern Pilbara Unit 1 team control site(s) (1 experienced ornithologists per team) **Total 2 ground-based teams** Note: can initially be performed by the same team as OM5: Rapid marine fauna surveillance	• OSRL OSM Supplementary Service Agreement • Santos Contracted Vessel Providers • Laboratory arrangement
	Vl Hub - Subsea pipeline release	**Vl Hub - Subsea pipeline release**	

SMP	Week 1 (total)[#]	Week 2 (total)[#]	Arrangement
	1 team to conduct initial aerial surveys for Barrow Unit and Montebello Unit (2 observers per aircraft) 1 team to conduct initial aerial surveys for Southern Pilbara Unit and Ningaloo Unit (2 observers per aircraft) **Total 2 aerial teams** 1 team to conduct vessel-based surveys for Barrow Unit and Montebello Unit 1 team Southern Pilbara Unit and Ningaloo Unit 1 team control site(s) (surveys would include all fauna [birds, reptiles, cetaceans, dugong and whale shark]) **Total 3 vessel-based teams** Note: can initially be performed by the same team as OM5: Rapid marine fauna surveillance	1 team to conduct initial aerial surveys for Barrow Unit and Montebello Unit (2 observers per aircraft) 1 team to conduct initial aerial surveys for Southern Pilbara Unit and Ningaloo Unit (2 observers per aircraft) **Total 2 aerial teams** 1 team to conduct vessel-based surveys for Barrow Unit and Montebello Unit 1 team Southern Pilbara Unit and Ningaloo Unit 1 team control site(s) (surveys would include all fauna [birds, reptiles, cetaceans, dugong and whale shark]) **Total 3 vessel-based teams** Note: can initially be performed by the same team as OM5: Rapid marine fauna surveillance	
	Bedout EP1 - LOWC 1 team to conduct initial aerial surveys for Rowley Shoals Unit (2 observers per aircraft) **Total 1 team** 1 team to conduct vessel-based surveys for Rowley Shoals Unit 1 team control site(s) (surveys would include all fauna [birds, reptiles, cetaceans, dugong and whale shark]) **Total 2 vessel-based teams** 1 team to conduct ground-based surveys for Rowley Shoals Unit 1 team control site(s) (1 experienced ornithologists per team)	**Bedout EP1 - LOWC** 1 team to conduct initial aerial surveys for Rowley Shoals Unit (2 observers per aircraft) **Total 1 team** 1 team to conduct vessel-based surveys for Rowley Shoals Unit 1 team control site(s) (surveys would include all fauna [birds, reptiles, cetaceans, dugong and whale shark]) **Total 2 vessel-based teams** 1 team to conduct ground-based surveys for Rowley Shoals Unit 1 team control site(s) (1 experienced ornithologists per team)	

SMP	Week 1 (total)[#]	Week 2 (total)[#]	Arrangement
	Total 2 ground-based teams	**Total 2 ground-based teams**	
SM5: Marine mega-fauna assessment (whale shark, dugong and cetaceans)[^]	Aerial surveys refer to SMP: Seabirds and shorebirds Vessel surveys refer to SMP: Seabird and shorebirds	Aerial surveys refer to SMP: Seabirds and shorebirds Vessel surveys refer to SMP: Seabird and shorebirds	• OSRL OSM Supplementary Service Agreement • Santos Contracted Vessel Providers • Laboratory arrangement
SM5: Marine mega-fauna assessment (reptiles)[^]	Aerial surveys refer to SMP: Seabirds and shorebirds Vessel surveys refer to SMP: Seabird and shorebirds Ground based survey refer to SMP: Seabird and shorebirds (including 1 member experienced with ground turtle surveys)	Aerial surveys refer to SMP: Seabirds and shorebirds Vessel surveys refer to SMP: Seabird and shorebirds Ground based survey refer to SMP: Seabird and shorebirds (including 1 member experienced with ground turtle surveys)	• OSRL OSM Supplementary Service Agreement • Santos Contracted Vessel Providers • Laboratory arrangement
SM6: Benthic habitat assessment	**Vl Hub - Surface HFO release** 1 team - (spill site and surrounds) 1 team - Barrow Unit 1 team - Montebello Unit 1 team - Southern Pilbara Unit 1 team - Ningaloo Unit 1 team - control site(s) **Total 6 teams**	**Vl Hub - Surface HFO release** 1 team - (spill site and surrounds) 1 team - Barrow Unit 1 team - Montebello Unit 1 team - Southern Pilbara Unit 1 team - Ningaloo Unit 1 team - control site(s) **Total 6 teams**	• OSRL OSM Supplementary Service Agreement • Santos Contracted Vessel Providers • Laboratory arrangement
	Vl Hub - Subsea pipeline release 1 team - (spill site and surrounds) 1 team - Barrow Unit 1 team - Montebello Unit 1 team - Southern Pilbara Unit 1 team - Ningaloo Unit 1 team - control site(s) **Total 6 teams**	**Vl Hub - Subsea pipeline release** 1 team - (spill site and surrounds) 1 team - Barrow Unit 1 team - Montebello Unit 1 team - Southern Pilbara Unit 1 team - Ningaloo Unit 1 team - control site(s) **Total 6 teams**	
	Bedout EP1 - LOWC 1 team - (spill site and surrounds) 2 teams - Rowley Shoals Unit 1 team - control site(s)	**Bedout EP1 - LOWC** 1 team - (spill site and surrounds) 3 teams - Rowley Shoals Unit 1 team - control site(s)	

SMP	Week 1 (total)[#]	Week 2 (total)[#]	Arrangement
	Total 4 teams	**Total 5 teams**	
SM7: Marine fish and elasmobranch assemblages assessment	**Vl Hub - Surface HFO release** 1 team - (spill site and surrounds) 1 team - Barrow Unit 1 team - Montebello Unit 1 team - Southern Pilbara Unit 1 team - Ningaloo Unit 1 team - control site(s) **Total 6 teams**	**Vl Hub - Surface HFO release** 1 team - (spill site and surrounds) 1 team - Barrow Unit 1 team - Montebello Unit 1 team - Southern Pilbara Unit 1 team - Ningaloo Unit 1 team - control site(s) **Total 6 teams**	• OSRL OSM Supplementary Service Agreement • Santos Contracted Vessel Providers • Laboratory arrangement
	Vl Hub - Subsea pipeline release 1 team - (spill site and surrounds) 1 team - Barrow Unit 1 team - Montebello Unit 1 team - Southern Pilbara Unit 1 team - Ningaloo Unit 1 team - control site(s) **Total 6 teams**	**Vl Hub - Subsea pipeline release** 1 team - (spill site and surrounds) 1 team - Barrow Unit 1 team - Montebello Unit 1 team - Southern Pilbara Unit 1 team - Ningaloo Unit 1 team - control site(s) **Total 6 teams**	
	Bedout EP1 - LOWC 1 team - (spill site and surrounds) 2 teams - Rowley Shoals Unit 1 team - control site(s) **Total 4 teams**	**Bedout EP1 - LOWC** 1 team - (spill site and surrounds) 3 teams - Rowley Shoals Unit 1 team - control site(s) **Total 5 teams**	
SM8: Fisheries impact assessment	**Any scenario** Total 2 teams to cover all relevant Commonwealth and State fisheries.		• OSRL OSM Supplementary Service Agreement • Santos Contracted Vessel Providers • Laboratory arrangement
SM9: Heritage features assessment	**Any scenario** 1 team	**Any scenario** 1 team	• OSRL OSM Supplementary Service Agreement • Santos Contracted Vessel Providers • Laboratory arrangement
SM10: Social impact assessment	**Any scenario** 1 team	**Any scenario** 1 team	• OSRL OSM Supplementary Service Agreement

[#] *Specific units are mentioned for planning and guidance purposes based on a worst case planning approach. In the event of an actual spill, other locations and/or receptors may be contacted. This would be identified and managed as part of implementation as per the guidance in Section 13.*

** Initial co-mobilisation between SM1: Water quality impact assessment and SM2: Sediment quality impact assessment.*

^ This SMP may replace the relevant OMP if the OMPs termination criteria are triggered .

9. Capability arrangements

Santos is a Member of the OSRL OSM Supplementary Service Agreement, which provides shared OSM Annual Services and Response Services to members who have subscribed this supplementary service. This OSM Supplementary Service Agreement includes access to OSRL's sub-contracted Monitoring Service Providers in Australia (who will report through OSRL) to deliver monitoring capability. The OSM Supplementary Service Agreement includes provision of scale-up capability in the event of response activation, allowing for scalability and adaptability of OSM resourcing.

Details of OSM services are provided in Table 9-1. Santos will maintain responsibility for implementing OM7: Air Quality Modelling (responder health and safety).

OSRL (referred to as the OSM Services Provider in this BIP), via the OSM Supplementary Service Agreement is contracted to provide Members with a monthly Capability Register, 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 are accessible following a Member's initial activation of OSM Services.

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

OSM Services Provided During Preparedness and Activation / Monitoring Phases
Preparedness[5]
24/7 Duty Manager accessed through 24 hr. hotline
Provision of suitably trained operational monitoring personnel
Monthly reports on personnel and equipment availability
Access to OSM Services Provider's sub-contracted Monitoring Service Providers
Access to OSM Services Provider's network of laboratories and equipment providers
Activation / Monitoring[6]
Provision of an OSM Services Lead and OSM Implementation Lead to the Santos IMT within 12 hours of notification
Provision of an initial monitoring team within 72 hours of notification, ready to deploy from a nominated port(s) or staging location (e.g. Forward Operating Base [FOB])
Assisting Santos in the finalisation of monitoring plans
Provision of scientific monitoring personnel within 5-7 days of notification
Access to OSM Services Provider laboratories and equipment

9.1 Personnel competencies

The OSRL OSM Supplementary Service Agreement specifies the training and competency requirements for key OSM personnel consistent with the specified training and competencies stated in Table 11-1 of the Joint Industry OSM Framework. In addition, competencies of SMP Field Teams are consistent with Appendix D of the Joint Industry OSM Framework.

The OSM Supplementary Service Agreement commits to nominated monitoring personnel providing copies of their CVs/Resumes, along with certificates or evidence meeting the competency requirements. This information is stored in the OSRL Operational and Scientific Monitoring Document Management System for capability tracking and assurance purposes. The Monthly Capability Register is updated so that it reflects changes to personnel availability or gaps in competency and training. The role of the OSM Implementation Lead aligns with the responsibilities listed in the Joint Industry OSM Framework.

Where the key OSM role is held by the Member, this is outlined in the Santos Crisis, Incident Management & Emergency Response Procedure (SMS-HSS-OS05-PD01) and Santos Incident Management Plan - WANATL (7700-650-PLA-0016).

[5] *Defined as Annual OSM Services in OSM Supplementary Service Agreement.*

[6] *Defined as Response Services in OSM Supplementary Service Agreement.*

In addition and where practicable, Santos will engage its most qualified local environmental advisors in the initial stages of the monitoring program to help activate and mobilise monitoring teams and support the OSM Services Provider in the finalisation of 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 OSRL OSM Supplementary Service Agreement, the OSM Services Provider will provide specialised field monitoring equipment to implement individual OMPs and SMPs. Santos 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.

Santos also maintains its own initial sampling kits, as shown in Table 9-2.

Availability of key equipment will be listed in the OSM Services Provider's Equipment Register.

Table 9-2: OSM equipment

Equipment type	Source
Santos and third-party equipment	
Desktop equipment (e.g. Oil Spill Response Atlas, GIS)	Coordinated through IMT GIS Team
Logistical equipment (e.g. in-field accommodation, vessels, aircraft)	Refer to list of external support agencies and contracts held by Santos as listed in the activity specific OPEPs
Dispersant shake test kits (initial shake jar test only)	Santos (2 x test kits in Exmouth), AMSA (2 x test kits in Fremantle; 2 x test kits in Karratha)
Oil sampling kits (full kit) – 1 located on Varanus Island, 1 located in Exmouth	Santos
Oil sampling kits (rapid kit) – 2 located on Varanus Island, 1 located in Exmouth	Santos
Bulk oil sampling bottles	Intertek and/or Leeder Analytical (via Santos managed contract)
OSM Services Provider equipment	
In-field specialised monitoring equipment (e.g. fluorometers, sample bottles, ROVs)	Coordinated through the OSM Services Provider's OSM response and implementation services

9.3 Exercises

The OSM Services Provider, via the OSM Supplementary Service Agreement, is contracted to maintain an OSM Services Annual Assurance Program. As part of this program, the OSM Services Provider conducts a number of different exercise types, which are outlined in Table 9-3. The purpose of this testing is to confirm that the response arrangements and capability in place are available when needed and function as intended. Following the Notification and Tabletop excises listed in Table 9-3, the OSM Services Provider will prepare exercise reports and track any action items to complete.

In addition, Santos will conduct an annual notification test of the OSM Services Provider, outlined in Santos Offshore Oil Spill Response Readiness Guideline (7710-650-GDE-0001).

Table 9-3: Exercise types

Exercise Type	Responsibility	Description	Frequency
Assurance Program Workshop	OSRL, Industry Member Technical Advisory Group (IMTAG) and Monitoring Service Providers	The outputs from the annual OSM Services and Assurance Program Workshop will form the basis of the OSM Annual Services and Assurance Program for the coming Contract Year.	Annually
Notification exercise	Santos with OSRL	Test procedures to notify and activate the OSM Services, including subcontracted Monitoring Service Providers.	Annually

Exercise Type	Responsibility	Description	Frequency
Tabletop exercise	IMTAG and OSRL to agree a lead Titleholder for each Calendar Year	A discussion-based exercise that involves no physical deployment of personnel or equipment. The exercise will simulate all actions to validate the enactment of plans, procedures, protocols, roles and tasks during a simulated incident.	Annually
Desktop review	Monitoring Service Providers & OSRL	A desktop review of capability for any OMP and/or SMP not tested during the annual table-top exercise. The review can also be based on the outcomes/findings of the OMPs and/or SMPs that were tested.	Annually

10. Capability assessment

Table 10-1 provides a comparison of Santos' worst-case OSM capability requirements (as outlined in Table 8-7 and Table 8-8) with the OSRL OSM Supplementary Service Agreement capability to implement each OMP and SMP. Where there are synergies between OMPs and SMPs, the same personnel may implement multiple OMPs/SMPs simultaneously, as identified in Table 10-1. For example, personnel assigned to OM1: Hydrocarbon Characterisation can also carry out OM2: Hydrocarbon in water assessment and OM3: Hydrocarbon in sediment assessment concurrently.

Table 10-1: OSM capability

Component	Maximum No. personnel or teams required (Weeks 1–2) [7]	Personnel / teams available via OSM Services Provider	Personnel available via OSROs	Personnel available within Santos	Total personnel available
OSM Personnel embedded in IMT	1 OSM Implementation Lead 1 OM Coordinator 1 SM Coordinator 2 Group Supervisors 2 Group Managers	1 OSM Implementation Lead 1 OM Coordinator 1 SM Coordinator 1 OM/SM Group Manager	-	1 OSM Implementation Lead 3 x Group Supervisors and/or Group Managers	2 OSM Implementation Leads 1 OM Coordinator 1 SM Coordinator 2 Group Supervisors 2 Group Managers
OMPs					
OM1: Hydrocarbon characterisation*	5 teams	6 teams#	-	Initial sampling kits and procedures for untrained personnel to obtain samples[8]	6 teams
OM2: Hydrocarbon in water assessment*	Refer to OM1: Hydrocarbon characterisation				
OM3: Hydrocarbon in sediment assessment*	Refer to OM1: Hydrocarbon characterisation				
OM4a: Surface dispersant effectiveness monitoring	Visual observations: 1 team Water quality assessment – refer to OM2: Hydrocarbon in water assessment*	1 visual observation team# Refer to OM2: Hydrocarbon in water assessment	4 AMOSC Staff 2 AMOSC Core Group trained personnel	7 Santos trained aerial observers	Visual observations: 1 team (OSM Services Provider) 4 AMOSC Staff 2 AMOSC Core Group trained personnel 7 Santos trained aerial observers
OM4b: Subsea dispersant injection effectiveness monitoring	1 team (week 2 onwards)	1 team#	-	-	1 team
OM5: Rapid marine fauna surveillance^	1 aerial team	2 teams#	N/A	7 Santos trained aerial observers	2 teams

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

[8] *For OM1: Hydrocarbon characterisation only*

Component	Maximum No. personnel or teams required (Weeks 1–2) [7]	Personnel / teams available via OSM Services Provider	Personnel available via OSROs	Personnel available within Santos	Total personnel available
					7 Santos trained aerial observers
OM6: Shoreline clean-up assessment	As per activity specific OPEP				
OM7: Air quality modelling (responder health and safety)	1 model	-	-	RPS Contract for Air Quality Modelling held by Santos	RPS Contract for Air Quality Modelling held by Santos
SMPs					
SM1: Water quality impact assessment^	6 teams	6 teams[#]	-	-	6 teams
SM2: Sediment quality impact assessment	Refer to SM1: Water quality impact assessment* (all sites)				
SM3: Intertidal and coastal habitat assessment	3 teams	6 teams[#]	-	-	6 teams
SM4: Seabirds and shorebirds^	2 aerial teams 3 vessel teams (surveys would include all fauna [birds, reptiles, cetaceans, dugong and whale shark]) 2 ground-based teams	2 aerial teams[#] 5 vessel teams[#] 5 ground based teams (plus 1 team member per team experienced with ground turtle surveys – see Marine mega-fauna assessment [reptiles])[#]	-	-	2 aerial teams 5 vessel teams 5 ground based teams (plus 1 team member per team experienced with ground turtle surveys – see Marine mega-fauna assessment [reptiles])
SM5: Marine mega-fauna assessment (whale shark, dugong and cetaceans)^	Refer to SM4: seabirds and shorebirds				
SM5: Marine mega-fauna assessment (reptiles)^	Aerial and vessel - Refer to SM4: seabirds and shorebirds Ground surveys - Refer to SM4: seabirds and shorebirds (plus 1 team member per team experienced with ground turtle surveys)				

Component	Maximum No. personnel or teams required (Weeks 1–2) [7]	Personnel / teams available via OSM Services Provider	Personnel available via OSROs	Personnel available within Santos	Total personnel available
SM6: Benthic habitat assessment	6 teams	6 teams#	-	-	6 teams
SM7: Marine fish and elasmobranch assemblages assessment	6 teams	6 teams#	-	-	6 teams
SM8: Fisheries impact assessment	2 teams	2 teams#	-	-	2 teams
SM9: Heritage features assessment	1 team	1 team#	-	-	1 team
SM10: Social impact assessment	1 team	1 team#	-	-	1 team

** Initial co-mobilisation between OM1: Hydrocarbon characterisation, OM4a: Surface dispersant effectiveness monitoring, OM2: Hydrocarbon in water assessment and OM3: Hydrocarbon in sediment assessment*

 # During capability assessment, available personnel were allocated to one monitoring team only.

^ Can initially be performed by the same team as the relevant OMP. This SMP may replace the relevant OMP, if the relevant OMP's termination criteria are triggered.

11. Document review

As part of the Environment Plan review cycle, this document will be reviewed annually and revised, if required, in accordance with the Santos Offshore Division Environment Management of Change Procedure (EA-91-IQ-10001). 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 services provider);
- 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. *Environment Protection and Biodiversity Conservation Act 1999* [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 Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 Regulations (OPGGS (E) Regulations).

Part B – Implementation

Control Agencies and Jurisdictional Authorities

Section 4 of Santos OPEPs provide detailed information on Control Agency responsibilities, and should be referred to when planning operational and scientific monitoring activities, particularly in WA State Waters and along WA shorelines. Where the WA DTMI is the Control Agency, OM6: Shoreline Clean-up Assessment will be implemented under their direction, with resources provided by Santos.

In addition, Section 7 of Santos OPEPs provide regulatory and stakeholder notification and reporting requirements. Whilst all notification and reporting will be performed by Santos IMT personnel, monitoring personnel should be aware of these requirements, and confirm all relevant notifications and reporting have been completed prior to undertaking monitoring activities.

Note: for oil spills in Commonwealth waters, NOPSEMA are the jurisdictional authority. However, the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) oversee scientific monitoring activities within Ashmore Reef AMP and Cartier Island AMP[9]; therefore the Santos IMT (as Control Agency for Commonwealth waters) will liaise with DCCEEW to direct resources for the purposes of shoreline assessment and scientific monitoring activities.

12. Mobilisation and activation process

The Santos IMT Environment Unit Lead is responsible for activating OSM components, subject to approval from the Incident Commander. Table 12-1 outlines Santos' OSM activation process.

Table 12-1: OSM mobilisation and activation process

Responsibility	Task	Timeframe[10]	Complete
Santos Environment Unit Lead	Review initiation criteria of OMPs and SMPs (provided in Table 9-1 (OMPs) and Table 9-2 (SMPs) of the Joint Industry Operational and Scientific Monitoring Framework) 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 Incident Commander to activate OSM Services Provider	Within 4 hours of spill notification	☐
	Initiate initial oil and water sampling, if safe and possible, using the procedures in Appendix E	Within 24 hours of spill notification	☐
	Contact OSM Services Provider and verbally notify their Duty Manager of the incident, requesting provision of OSM Implementation Lead (if required by Santos) to the IMT. Complete Call Off Order Form (Appendix F) and submit to OSM Services Provider[11] 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 with Santos' Logistics Section Chief 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	☐

[9] Oil spill modelling did not predict contact with Ashmore or Cartier Island for any scenario listed in Table 2-1. However, the information on monitoring arrangements is included on a precautionary basis.

[10] All timeframes stated in Part B are based on best endeavours as per the OSRL OSM Supplementary Service Agreement.

[11] A copy of the Call Off Order Form is provided in Appendix F, however a copy of the Call-off Order Form will also be available via OSRL Duty Manager upon request.

Responsibility	Task	Timeframe[10]	Complete
Safety Officer (Santos)	Develop and maintain ICS 201-5 – Site Safety and Control Analysis (refer Santos Oil Spill Response HSE Management Manual [SO-91-RF-10016])	Within 6 hours of spill notification	☐
Logistics Section Chief (Santos)	Commence arrangements for vessels, accommodation and transport to mobilise monitoring teams	Within 24 hours of spill notification	☐
OSM Services Provider	Duty Manager to activate relevant Monitoring Service Providers	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 Titleholder (via Call Off Order Form) to be sent to Titleholder's IMT	Within 12 hours of notification being made to OSM Services Provider	☐
	Liaise directly with Environment Unit Lead 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 and Section 4, the available stochastic spill modelling has been analysed to understand the likely monitoring priorities. Table 4-3 provides a summary 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 4-3 are to be used for guidance when confirming monitoring priorities in consultation with key stakeholders and sub-contracted 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
Santos Environment Unit Lead	Evaluate monitoring priorities in consultation with key stakeholders, including the appointed State / Territory Environmental Scientific Coordinator	Within 12 hours of monitor and evaluate data being received from IMT	☐
Santos Environment Unit Lead with input from OSM Services Provider	Confirm monitoring receptors/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); • EV ranking of receptors (Section 2.2); • Analysis of the Joint Industry Marine Environment Baseline Database for relevant receptors; • Nature of hydrocarbon spill (i.e. subsea blow out, 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); and • Monitoring priorities identified in Section 2.	Within 12 hours of monitor and evaluate data being received from IMT	☐
	Using the results of the Santos EV rankings (Section 2.2), baseline data analysis in Table 4-3 and the information above, determine receptors for initial 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 suitable locations, noting that suitable control or reference sites may be outside of the Scientific Monitoring Planning Area	Within 12 hours of monitor and evaluate data being received from IMT	☐
	Continually re-evaluate monitoring priorities in consultation with Environment Unit Lead and relevant key stakeholders throughout spill response	Ongoing	☐

14. Protected Matters requirements

Table 14-1 provides a checklist to ensure monitoring personnel consider protected matters requirements in the finalisation of OMPs and SMPs.

Santos' Values and Sensitivities of the Marine and Coastal Environment (EA-00-RI-10062) outlines the management plans, recovery plans and conservation advice statements relevant for the protected matters within the relevant EP's EMBA that are likely to be relevant to the final design of the OMPs and SMPs. The Santos Values and Sensitivities of the Marine and Coastal Environment (EA-00-RI-10062) and Appendix C also includes relevant locations where these receptors are known to occur in order to expedite consideration of relevant information into finalised monitoring designs.

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

Responsibility	Task	Complete
Santos Environment Unit Lead with input from OSM Services Provider	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 Santos Values and Sensitivities of the Marine and Coastal Environment (EA-00-RI-10062) and online protected matters search tool 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 the OSM Services Provider and their sub-contracted Monitoring Service 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.

Santos' 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.

Whilst instantaneous low thresholds, used to define the planning area for scientific monitoring, shows a greater geographical extent, the hydrocarbons in areas defined by low threshold limits may not be detectable. Therefore, final monitoring design may also consider time-weighted average predictions from the incident oil spill modelling to optimise the monitoring efforts.

Table 15-1: Checklist for finalising monitoring design

Responsibility	Task	Timeframe	Complete
Santos Environment Unit Lead with input from 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	☐
	Review Table 10-4 of the Joint Industry OSM Framework to ensure potential impacts from response activities are considered and incorporated into relevant OMP/SMP designs	Before finalising monitoring designs	☐

Responsibility	Task	Timeframe	Complete
	Liaise with the Santos Environment Unit Lead to review the Environmental Performance Standards listed in the activity-specific OPEP and integrate checks into the monitoring design that will help determine if relevant Environmental Performance Standards are being met	Before finalising monitoring designs	☐
	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 of monitoring teams

When the monitoring design has been finalised for each OMP and SMP, the OSM Services Provider shall work in conjunction with Santos 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, with the exception of OM7: Air Quality Modelling, which will be coordinated by Santos. Santos is responsible for flights, accommodation and victualing for field personnel. Santos 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.

Note: OM7: Air quality modelling is a desk top assessment and should be mobilised as soon as practicable as it is not reliant on any mobilisation of field personnel.

Table 16-1: Checklist for mobilisation of monitoring teams

Responsibility	Task	Complete
OSM Services Provider with input from Santos Environment Unit Lead	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	☐
	If additional resources are likely to be required to implement monitoring from week 2 onwards, this should be raised by the OSM Implementation Lead with the Environment Unit Leader and arranged via the OSM Services Provider	
	As part of the Incident Action Planning Process, liaise with IMT regarding co-mobilisation of monitoring teams, giving due consideration to safety, access to sensitive receptors, timing, and data quality 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 is 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 Santos Logistics Section have arranged flights, accommodation, and car hire arrangements are in place	☐
	Develop field survey schedules, detailing staff rotation	☐
	Equipment	
	Confirm Santos Logistics Section have arranged survey platforms (vessel, vehicle, aircraft) as required to survey or access survey sites and ensure they are equipped	☐

Responsibility	Task	Complete
	with appropriate fridge and freezer space for transportation of samples (and carcasses if collecting)	
	Confirm Santos Logistics Section have arranged vessels with correct fit-out specifications (e.g. winches, Geographic Positioning System [GPS], satellite, deck crane, 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 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 Quality Assurance and Quality Control (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, as listed in Table 17-1. For a list of all relevant locations and fisheries refer to the Santos Values and Sensitivities of the Marine and Coastal Environment (EA-00-RI-10062).

The OSM Services Provider will work with Santos to request access and permit applications to all relevant Jurisdictional Authorities to conduct monitoring for OMPs and SMPs.

Safety Note: Due to the risk posed by unexploded ordnances, landing on Cartier Island or anchoring anywhere within the Cartier Island Marine Park[12] 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.

[12] *Oil spill modelling did not predict contact with Ashmore or Cartier Island for any scenario listed in Table 2 1. However, the information on monitoring arrangements is included on a precautionary basis.*

Table 17-1: Permits required in Scientific Monitoring Planning Area

Receptor	Jurisdictional Authority	Relevant information on permits
Permits for monitoring fauna	DCCEEW DBCA	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
State Marine Protected Area	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	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	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
State Managed Fisheries	Department of Primary Industries and Regional Development (DPIRD)	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
Commonwealth Managed Fisheries	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	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 Aboriginal heritage sites in WA: https://www.wa.gov.au/service/aboriginal-affairs/aboriginal-cultural-heritage/search-aboriginal-sites-or-heritage-places
Defence/ restricted military area	Department of Defence	Unexploded Ordnance (mapping information): https://www.defence.gov.au/UXO/default.asp Maritime military firing practice and exercise areas: https://www.hydro.gov.au/n2m/2010/annual/n2m/9.pdf
Industry (e.g. operational zone of offshore oil or gas platform)	Operating company	Safety zones (up to 500 m from outer edge of well or equipment) – https://www.nopsema.gov.au/safety/safety-zones/
Shipwrecks	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). Table 18-1 provides a checklist to assist in utilising OM data to inform decision making.

The Field Team Lead will be responsible for communicating data back to the Monitoring Branch via field reporting forms, debriefs and reports. Laboratory analysis reports should also be directed to the Monitoring Branch.

The OSM Implementation Lead 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 Implementation Lead.

Once OM data is analysed and checked by the Field Team Lead, it will be provided to the Monitoring Branch and OSM Implementation Lead , who will then distribute the data from each monitoring component to the relevant IMT Section. Table 18-2 provides guidance on the type of data generated from each OMP, which IMT Section / Unit requires the data and how the data may be used during a response. All SMP data received during a response will be received by the Planning Section via the Monitoring Branch.

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

As ultimately responsible for the IAPs, the Planning Section Chief will be required to utilise the OMP data to aid in decision making and determine if the response strategies 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: Checklist for utilising OMP data to inform IMT decision making

Responsibility	Task	Timeframe	Complete
OSM Services Provider - Field Team Lead	Data collected whilst implementing OMPs and SMPs is checked that it aligns with the requirements listed in the finalised OMPs and SMPs (where applicable)	Ongoing	☐
	OMP data provided to the IMT Situation Unit Lead	Daily and ongoing	☐
Shoreline Response Program Manager	Reports from OM6: Shoreline Clean-up Assessment will be provided to the IMT daily, detailing the assessed areas to maximise effective utilisation of resources.	Daily reporting	☐
Santos Situation Unit Lead	Incorporate OMP data into Common Operating Picture	Daily and ongoing	☐
Santos Environment Unit Lead	Incorporate OMP data into operational NEBA and IAP for the next operating period	Each operational period	☐

Table 18-2: Data generated from each OMP and how this may be used by IMT in decision-making

OMP	Data generated[13]	IMT Section requiring data	How data may be used by IMT
OM1: Hydrocarbon characterisation	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
OM2: Hydrocarbon in water assessment	Distribution of oil in water column and change in hydrocarbon concentrations (e.g. total recoverable hydrocarbons, BTEXN, PAH), physio-chemical parameters and dispersant detection	Situation Unit 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 NEBA.
OM3: Hydrocarbon in sediment assessment	Distribution of oil in sediment and change in hydrocarbon concentrations (e.g. Total recoverable hydrocarbons, BTEXN, PAH)	Situation Unit 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
OM4a: Surface dispersant effectiveness monitoring	Visual observations of dispersant efficacy; Fluorometric readings in water column (see also water quality assessment);	Environment Unit for use in operational NEBA; 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 NEBA to help decide if dispersants are being effective at minimising oil reaching sensitive receptors (NEBA to evaluate any trade-offs between receptors)
OM4b: Subsea dispersant injection effectiveness monitoring	Visual observations of dispersant efficacy; Fluorometric readings in water column (see also water quality assessment)	Source Control Branch to aid decision-making for other source control operations; Environment Unit for use in operational NEBA; Planning Section to aid in IAP development.	Determine efficacy of subsea dispersant in treating oil to help understand if injection should continue or be modified; understand the nature and extent of the subsea plume; and provide an initial assessment of potential ecological effects. This information can be used in NEBA to help decide if dispersants are being effective at minimising oil reaching sensitive receptors (NEBA to evaluate any trade-offs between receptors) and also if subsea dispersants are effectively reducing volatile organic compound (VOC) levels so that operations are within lower explosive limits (LEL)
OM5: Rapid marine fauna surveillance	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 Unit/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

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

OMP	Data generated[13]	IMT Section requiring data	How data may be used by IMT
			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)
OM6: 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).
OM7: Air quality modelling (responder health and safety)	Modelled outputs of VOCs	Operations Section to help determine safe zones in close vicinity of spill; Planning Section for use in IAP	Determine safe distances from spill source for response personnel; determine the presence and persistence of volatile organic compounds to know if response areas are safe for personnel

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 and the relevant activity EP to ensure potential impacts from response activities are considered and incorporated into relevant OMP/SMP designs.

18.3 Operational monitoring of effectiveness of control measures and to ensure EPS are met

As stated in Table 15-1, when finalising monitoring designs, the OSM Implementation Lead and Santos Environment Unit Lead (or delegate) shall review the Environmental Performance Standards (EPSs) listed in the activity specific OPEP and integrate checks into the monitoring design that will help determine if relevant EPSs are being met.

Table 18-3 provides relevant EPSs listed in Santos' activity-specific OPEPs and how operational monitoring may be able to confirm it is being met.

Table 18-3: Relevant OPEP Environmental Performance Standards related to operational monitoring

Environmental Performance Standard	Confirmation that EPS is being met
[EPS-SCU-018] Access plans for shoreline operations will be developed. Unless directed otherwise by the Control Agency, Access plans will prioritise use of existing roads and tracks, establish demarcation zones to protect sensitive areas and select vehicles appropriate to conditions	Implementation of OM6: Shoreline Clean-up Assessment will involve assessment teams determining suitable access routes, including utilisation of existing roads and tracks and establishing demarcation zones to protect sensitive areas
[EPS-SCU-020] Unless directed otherwise by the designated Control Agency, a soil profile assessment is conducted prior to earthworks	Implementation of OM6: Shoreline Clean-up Assessment and OM3: Hydrocarbon in Sediment Assessment will involve a soil profile assessment being conducted prior to earthworks taking place
[EPS-SCU-024] Unless directed otherwise by the designated Control Agency, demarcation zones are mapped out in sensitive habitat areas for vehicle and personnel movement, considering sensitive vegetation, bird nesting/ roosting areas and turtle nesting habitat.	Implementation of OM6: Shoreline Clean-up Assessment will involve assessment teams mapping any demarcation zones in sensitive habitat areas
[EPS-SCU-019] Unless directed otherwise by the designated Control Agency, operational restrictions on movement of personnel and vehicles, including vehicle types and traffic volumes, are established to minimise impacts from erosion and compaction	Implementation of OM6: Shoreline Clean-up Assessment will involve assessment teams determining any operational restrictions for vehicle and personnel movement

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 Santos and the OSM Services 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 Santos and the OSM Services Provider.

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

21. Communication protocols

21.1 OSM Services Provider

Communication protocols between Santos 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 Santos 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 Provider.
- Communication between Santos and its OSM Services Provider during activation (prior to deployment) will be between the Environment Unit Lead (or delegate) and the OSM Services Provider representative.
- During implementation (post deployment), primary communication occurs via two pathways:
  - Environment Unit Lead and the OSM Services Provider Duty Manager for contractual, management, scientific and general direction matters; and
  - Santos Division Commander / On-Scene Commander and the OSM Services Provider's Group Manager/s / Field Team Leaders for on-site matters.
- All key OSM decisions should be logged in an ICS 214 Log maintained by the OSM Implementation Lead.
- All key OSM tasks, actions and requirements should be documented in an IAP during the response phase of the spill.
- The Santos Environment Unit Lead will keep the Operations Section Chief, Logistics Section Chief and Planning Section Chief briefed of the OSM status as required.
- All correspondence (copies of emails and records of phone calls) between Santos 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 Environment Unit Lead 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 Santos Environment Unit Lead or On-Scene Commander prior to implementation.

During the post-response phase all communications shall be between the Santos Environment Advisor and the OSM Services Provider.

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.

The Santos IMT Public Information Officer will be the focal point for external engagement during the response operation.

Stakeholder communications post-response will be managed by the Santos Government and Public Affairs 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, Santos is responsible for coordinating a lessons-learnt meeting between the OSM Services Provider, sub-contracted

Monitoring Service Providers and other relevant stakeholders. It is the responsibility of Santos 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. Table 22-1 provides a checklist to assist in terminating the OMPs and SMPs and the monitoring effort.

Table 22-1: Checklist for terminating monitoring components

Responsibility	Task	Complete
Santos Environment Unit Lead / Environment Advisor with input from OSM Services Provider	Review termination criteria of OMPs and SMPs (provided in Table 9-1 (OMPs) and Table 9-2 (SMPs) of the Joint Industry Operational and Scientific Monitoring Framework) to ensure OMPs and SMPs are terminated in accordance with these criteria	☐
	Ensure all drafted SMP monitoring reports are peer reviewed by an expert panel (refer to Section 10.10 of the Joint Industry OSM Framework)	☐
	Conduct lessons-learnt meeting	☐

23. References

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.

French-McCay D (2024) Considerations for Development of Entrained Oil Thresholds for Oil Spill Risk Assessments. RPS Ocean Science. Australian Energy Producers. Available at: https://energyproducers.au/wp-content/uploads/2024/09/Oil-in-Water-Threshold-Review_French-McCay_2024Feb19-002.pdf

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.

Appendix A Demonstration of Meeting OSM Framework Regulatory Requirements

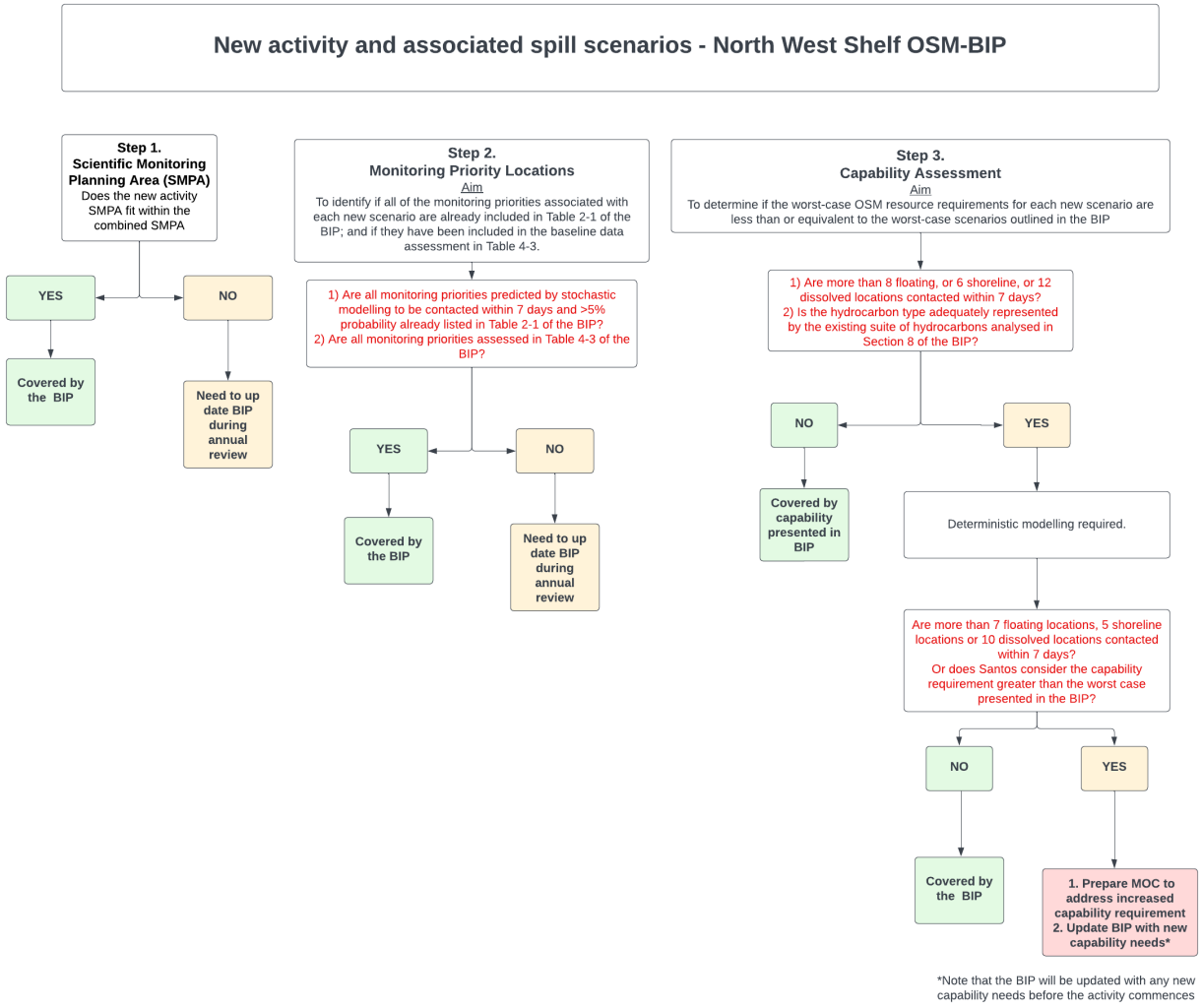
RAS Requirement	Relevant Section of Documentation that Addresses the Requirement
Conducted an appropriate risk assessment of worst-case oil pollution scenario(s) supported by spill modelling.	Santos has analysed all of its worst-case oil pollution scenario(s), including volumes, hydrocarbon types and spill locations in its OSM Baseline and Monitoring Assessment Matrix (7715-650-DAS-0002) which is updated to include each new activity. As part of this assessment, Santos reviews the stochastic spill modelling results for each activity to determine spill risk relevant to OSM planning (Appendix - Operational and scientific monitoring assessment). A comprehensive assessment of worst-case oil pollution scenario(s) for each activity is also included in the activity EP and OPEP.
Evaluated and adopted all reasonably practicable measures to reduce oil pollution risks by preventing incidents and preparing for a timely and effective response to pollution events.	The control measures for reducing oil pollution risks are included in the activity EP in the unplanned activities risk assessment section. Information pertaining to response preparedness is provided in the activity OPEP.
Identified monitoring arrangements and resource requirements based on the worst-case oil pollution scenario(s).	Section 8 Resourcing requirements outlines the process for determining the greatest OSM resource requirements based on the worst-case scenarios for Santos activities, including the use of deterministic modelling. Monitoring arrangements, including contracted and internal capability are presented in Sections 9 Capability arrangements and 10 Capability assessment.
Presented monitoring arrangements and capability that are scalable and adaptable and will provide timely information.	Section 9 Capability arrangements outlines Santos' monitoring arrangements via OSRL's OSM Supplementary Service Agreement, including scalable resourcing, if it is required.
Identified suitably qualified personnel who will be in decision making roles and implementing the monitoring and who are prepared for their responsibilities in advance of the incident occurring.	Section 6 OSM roles and responsibilities outlines personnel who will fill key OSM decision making roles. Roles filled by the OSM Services Provider are managed via the OSRL OSM Supplementary Services Agreement which specifies responsibilities for OSM response.
Established operational monitoring requirements based on the response needs and capacity reasoning applied to demonstrate ALARP for the response control measures detailed in the OPEP	Santos has assessed its OSM control measures and required capability in preparing this OSM-BIP. In addition, Santos has undertaken an activity-specific OSM ALARP assessment in Appendix B (Oil spill response ALARP framework & assessment) of each OPEP to determine if any improvements could be made to the existing suite of control measures.
Demonstrated all feasible preparatory actions to improve reliability, effectiveness and timeliness of response arrangements and capability (including operational monitoring), have been implemented where costs are not grossly disproportionate to the environmental benefit gained	Appendix B of the activity OPEP (Operational and Scientific Monitoring – ALARP Assessment) demonstrates a detailed control measure options analysis was undertaken and all feasible control measures for OSM have been implemented.
Set environmental performance standards that reflect the level of performance required of the response control measures (including monitoring) to achieve the defined environmental performance outcomes.	The activity OPEPs include a section 'Environmental performance – operational and scientific monitoring', which details all OSM control measures and performance standards, many of which relate directly to the RAS Requirements. Section 18.3 Operational monitoring of effectiveness of control measures and to ensure EPS are met outlines tasks for the OSM Implementation Lead and Environment Unit Leader to ensure environmental performance standards are met via operational monitoring activities.

RAS Requirement	Relevant Section of Documentation that Addresses the Requirement
The EP clearly commits to initiate all OMPs as listed in Table 5-1 as per initiation criteria listed in Table 9-1.	Table 12-1: OSM mobilisation and activation process provides guidance during mobilisation, and in the activity OPEPs, the Section 'Environmental performance – operational and scientific monitoring' commits to OM activation in accordance with the initiation criteria in the Framework.
The EP clearly commits to initiate all SMPs as listed in Table 6-1 as per initiation criteria listed in Table 9-2.	Table 12-1: OSM mobilisation and activation process provides guidance during mobilisation, and in the activity OPEPs, the Section 'Environmental performance – operational and scientific monitoring' commits to SM activation in accordance with the initiation criteria in the Framework.
The EP clearly commits to the Termination Criteria listed in Table 9-1 for operational monitoring and Table 9-2 for scientific monitoring.	Table 22-1: Checklist for terminating monitoring components provides guidance during termination of monitoring, and in the activity OPEPs, the Section 'Environmental performance – operational and scientific monitoring' commits to termination in accordance with the termination criteria in the Framework.
The EP clearly commits to the quality assurance and quality control items listed in Section 10.11 of the framework.	Section 20 Quality assurance and quality control commits that Santos and the OSM Services Provider will use Section 10.11 of the Joint Industry OSM Framework for QA/QC minimum standards.
The EP includes a clear commitment to use the same description of the roles and responsibilities for key emergency response personnel presented in the framework in Table 10-6.	Section 6 OSM roles and responsibilities commits that Santos and the OSM Services Provider will use the key roles and responsibilities provided in Section 10.13.2 of the Framework.
The EP clearly commits to emergency response personnel having the competencies outlined in Table 11-1. However, Titleholders need to ensure that regardless of the university qualifications that personnel may have, ultimately the monitoring undertaken must be of suitable experimental design, and with personnel who are trained and competent in experimental design and in situ monitoring implementation, irrespective of their qualifications, this may not be achieved.	Section 9.1 Personnel competencies commits that Santos and the OSM Services Provider will use the competencies outlined in Table 11-1 of the Framework.
The EP clearly commits to the minimum standards identified in Appendix A, with the addition of replacing language in the form of "should" and "where possible" with "will". EP's that commit to the standards identified in this appendix without replacing the text described above with more definitive language will likely to be subject to a more comprehensive assessment of the arrangements in accordance with the risk factors particular to the EP and receive requests for clarification from NOPSEMA during the assessment process.	In the activity OPEPs, the Section 'Environmental performance – operational and scientific monitoring' commits that Santos will comply with the minimum standards listed in Appendix A of the Joint Industry OSM Framework. In addition, all of the minimum standards have been reviewed and integrated into this OSM-BIP and/or activity OPEPs.
The EP clearly commits to meet the competencies identified for teams in Appendix D Table D1.	Section 9.1 Personnel competencies commits that Santos and the OSM Services Provider will use the competencies for SMP Field Teams as outlined in Appendix D of the Framework.
The EP clearly commits to an annual review and reviews where all the suggested triggers apply as advised in the template.	Section 11 Document review and in the OPEPs, the Section 'Environmental performance – operational and scientific monitoring' commit to conducting an annual review of the OSM-BIP, providing the criteria for the review.
The EP uses the process described in Sections 2 and 13 of the template to identify the environment that may be affected and the protection and monitoring priorities, including the application of oil concentration thresholds consistent with the exposure values for oil spill modelling presented in NOPSEMA's oil spill modelling bulletin, and fully justifies the outcome.	Section 2 Scientific Monitoring Planning Area and Monitoring Priorities demonstrates that Santos has applied the NOPSEMA oil spill modelling bulletin thresholds for determining the Consolidated Scientific Monitoring Planning Area. This section also outlines Santos' process for identifying monitoring priorities, as required by Section 2 of the BIP Template (step 3). This process incorporates the key elements listed in the BIP Template, including analysis of spill modelling results with receptors of high conservation value (especially receptors predicted to be contacted at higher

RAS Requirement	Relevant Section of Documentation that Addresses the Requirement
	probabilities and a rapid timeframe) and availability of baseline data. This process is then applied in each OPEP (Appendix - Operational and scientific monitoring assessment) to confirm activity-specific monitoring priorities. As noted in Section 2 of the BIP template, the monitoring priorities listed are for planning purposes only and Santos and its OSM Services Provider will follow the process outlined in Section 13 Monitoring priorities when confirming monitoring priorities in the event of a spill.
The EP adheres to the process described in Sections 3 and 4 of the template to undertake baseline data analysis and fully justifies the outcome.	Sections 3 Relevant existing baseline information sources and 4 Baseline data review follow the guidance provided in the BIP Template, with the addition of more information to support continuous improvement in this area. In addition, the OPEP (Appendix - Operational and scientific monitoring assessment) provides a baseline assessment for identified monitoring priorities for that activity. Noting this, Santos is part of a Joint Industry Collaborative Group who are working together to determine the extent, quality and suitability of existing baseline data for the marine environments in the North West Shelf, Browse and Timor Sea Regions of Australia. The Marine Environment Baseline Database includes available data for all receptors relevant to the Joint Industry OSM Framework and has assessed the spatial and temporal relevance of this data and comparison of methods and parameters to those outlined in the Joint Industry SMPs, as recommended in Section 7 and Appendix A of the Framework and Section 4 of the BIP Template.
The EP makes clear, unambiguous commitment that scientific monitoring reports “will be” peer reviewed by an expert panel (Section 4, p10).	In the OPEPs, the Section ‘Environmental performance – operational and scientific monitoring’ commits that draft OSM data reports will be peer reviewed by an expert panel for data integrity. This is also stated in Section 20 Quality assurance and quality control.
The EP includes clear, unambiguous activation, mobilisation, and implementation timeframes, which are relevant to the predicted time to contact of the pollution with sensitive receptors, baseline data available, sensitivities affected, practicability of implementation and/or other factors. Indicative mobilisation timeframes for OSM activities presented as worked examples in the template, for example, activation timeframes in Table 7-1 and Section 12 and implementation timeframes in Sections 13 and 15, should be revised to reflect each activity’s oil pollution scenario(s) and specific response requirements.	Section 12 Mobilisation and activation process provides the mobilisation and activation process and timeframes for the OSRL OSM Supplementary Services Agreement. Section 7 Mobilisation and timing of OMP and SMP implementation provides timeframes for mobilisation and activation that are relevant to Santos’ activities, including predicted time to contact to sensitive receptors (from spill modelling), availability of baseline data and practicability of implementation (i.e. remote environments, timeframes for mobilising specialised equipment and personnel). Where receptors may be contacted more rapidly that the quickest deployment timeframes (i.e. aerial surveillance within 24 hours; SCAT within 48 hours), Santos has undertaken an ALARP assessment in Appendix B of each OPEP to determine if any improvements could be made to control measures to address this gap.
Monitoring implementation timeframes consider any time requirements to finalise SMPs prior to implementation being required or take actions to reduce timeframes during the pre-spill (preparedness) phase.	The timeframes for finalising SMPs have been accounted for in the timeframes provided in Part B of the OSM-BIP, in particular, Section 15 Finalising monitoring design.
The EP includes OMPs that are sufficiently developed and/or finalised to ensure that they are ready to implement in the identified timeframes for operational monitoring to provide information to support initial and ongoing response decision-making.	The Joint Industry Framework includes well developed OMPs that have been socialised with the OSM Services Provider and will be finalised in the event of a spill. The timeframe for finalising the OMPs is factored into the implementation timeframes provided in Section 7 Mobilisation and timing of OMP and SMP implementation.
The EP identifies that operational monitoring detailed in the OMPs will be initiated, monitoring teams deployed, and information provided to the incident management team (IMT) in timeframes that match those identified and applied to the oil pollution emergency response planning in the development of the OPEP.	As described in Section 7 Mobilisation and timing of OMP and SMP implementation, the activity OPEPs describe additional operational monitoring and monitor and evaluate activities that may be required to support the implementation of response strategies. This includes SCAT teams to support

RAS Requirement	Relevant Section of Documentation that Addresses the Requirement
	shoreline protection and clean-up; aerial surveillance to support oiled wildlife activities and marine fauna monitoring; and tier 1 SMART monitoring for surface dispersant application.
The EP identifies monitoring resources in the BIP that match the monitoring and response needs in terms of numbers of personnel, teams, equipment, sites etc. Tables 8-2, 8-3 and 10-1 in the template provide a suitable method of presenting the number of personnel and teams required to resource a monitoring program, however, the content of these tables will be assessed by NOPSEMA in the context of the oil pollution scenario(s), response needs analysis and capacity reasoning presented in the EP.	Section 8 Resourcing requirements presents the spill scenarios most likely to require the greatest initial and on-going capability for Santos on the North West Shelf, which have been used in the capability assessment. As per Section 8 of the BIP Template, Santos has based its resourcing requirements on spill modelling, implementation timeframes and its monitoring priorities. However, in keeping with continuous improvement in this area and alignment to how capability is determined for oil spill response strategies (i.e. shoreline clean-up), Santos has utilised deterministic modelling to help define its capability requirements. In addition, Santos has included the use of 'Monitoring Units' for the reasons stated in Section 8.1 Monitoring units, and also to enable demonstration of how BIAs, KEFs and broadscale features are included in the capability assessment.
The EP adheres to the exercise and testing process described in Section 9.3. Additionally, the BIP should identify the specific objectives of the testing of monitoring arrangements, ensure the frequency of the schedule of testing is consistent with the regulatory requirements and provide information on any aspects of the testing of monitoring that differ to the OPEP testing arrangements described elsewhere in the EP.	Section 9.3 Exercises is aligned to the BIP Template, outlining the types of exercises that shall be conducted by the OSM Services Provider, as per the OSRL OSM Supplementary Services Agreement; and also by Santos.
The EP confirms that the aims and objectives of the OMPs and SMPs are appropriate for a Titleholder's monitoring requirements and address the potential impacts and risks and response activities.	In the OPEPs, the Section 'Operational and Scientific Monitoring' confirms which OMPs and SMPs are relevant to the activity and that the aims and objectives of these monitoring plans are appropriate to the needs of the spill, its risks and response activities.
The EP uses the method provided in the template for Titleholders to ensure special requirements for Matters Protected Under Part 3 of the EPBC Act are met through the proposed monitoring (Section 14). However, the method indicates that this would be done prior to finalisation of OMPs and SMPs, which may not be completed in a Titleholder's EP. Titleholders should ensure that relevant requirements are at least identified in the EP. This process would also be repeated during finalisation of OMPs and SMPs in the event of an oil pollution emergency to ensure any changes to requirements since submission of the EP or the latest review are included.	Santos lists special requirements for Matters Protected Under Part 3 of the EPBC Act in Section 3 of the activity EPs. The process for ensuring all relevant Protected Matters are integrated into the final monitoring design is outlined in Section 14 Protected Matters requirements.
The EP sets environmental performance outcomes, standards and measurement criteria that relate to the environmental impacts and risks and required level of performance of the proposed monitoring arrangements (preparedness and implementation) defined in the BIP.	In the OPEPs, the Section 'Environmental performance – operational and scientific monitoring' outlines a number of environmental performance outcomes, standards and measurement criteria committing Santos to OSM preparedness and implementation performance relevant to this OSM-BIP.

Appendix B Process for assessing new activities against OSM-BIP



Appendix C Background information for key sensitivities

Table B-1: Background information for key sensitivities and receptors predicted to be contacted within 7 days, at a probability >5%, and requiring a baseline review

Receptor	Receptor	Background	Key locations	Seasonality
Argo-Rowley Terrace AMP	Benthic habitat	The marine park contains ecosystems typical of two provincial settings: the Northwest Transition, with shelf break, continental slope, and much of the Argo Abyssal Plain, where Mermaid, Clerke, and Imperieuse Reefs form a biodiversity hotspot; and the Timor Province, dominated by warm, nutrient-poor waters in which submarine canyons are key drivers of productivity and marine life aggregations (Parks Australia n.d.)..	-	-
	Birds	Biologically important resting and breeding habitat for seabirds.	-	-
	Marine mammals	Migratory pathway for pygmy blue whales (*Balaenoptera musculus brevicauda*). The marine park contains submarine canyons that link the deep Argo Abyssal Plain with the shallower Rowley Terrace and Scott Plateau. These canyons transport sediments downslope and modify currents, creating periodic upwelling that increases surface-water productivity and provides important habitat for the pygmy blue whale.	-	April to December
Barrow Island	Birds	Barrow Island is recognised as a nationally significant site for migratory shorebirds, serving both as a key staging area during migration and as a non-breeding destination. It qualifies as an Important Bird Area (IBA) under the East Asian–Australasian Flyway for supporting more than 1% of the flyway populations of Grey-tailed Tattler (*Tringa brevipes*) and Ruddy Turnstone (*Arenaria interpres*) (Weller et al. 2020). The island also meets national significance thresholds for several other species, including the Red-necked Stint (*Calidris ruficollis*), Greater Sand Plover (*Charadrius leschenaultii*), Lesser Sand Plover (*Charadrius mongolus*), and Sanderling (*Calidris alba*) (Weller et al. 2020). High shorebird counts recorded outside peak migration periods suggest the island also provides important overwintering habitat for non-breeding individuals (Bamford et al. 2011). Foraging area for seabirds.	Extensive intertidal mudflats occur along the southern and south-eastern shores of Barrow Island, where sheltered coastal areas allow sand or mud to accumulate over rocky platforms. These largely unvegetated flats offer important foraging habitat for migratory shorebirds (Weller et al. 2020). Beyond the shoreline, offshore intertidal reefs also contribute valuable habitat. Notably, Bandicoot Bay in the island's south contains a large intertidal reef that provides important shorebird habitat (Weller et al. 2020).	Migratory shorebird abundances increase on the island as the birds arrive from the north during September to December. The abundances of some migratory shorebirds continue to increase in January and February, suggesting local movements of birds from the mainland to Barrow Island. Abundances decrease as the migratory species leave the region to return north at the end of summer. Summer Seabird foraging (Terns and Shearwaters)

Receptor	Receptor	Background	Key locations	Seasonality
	Turtles	The reproductive population of green turtles (*Chelonia mydas*) on Barrow Island is estimated at around 20,000 females, with nesting concentrated on high-energy beaches along the west and northeast coasts. In contrast, the flatback turtle (*Natator depressus*) nests predominantly on the east coast, where deep, low-energy sandy beaches with wide intertidal zones provide suitable habitat. Track-count data indicate a population of approximately 3,600 adult female flatbacks, of which 1,800–1,900 are estimated to nest in any given year (Chevron, n.d.). Only a small proportion of green turtles nest on the south and east coast beaches (Pendoley Environmental, 2018). Green turtle nesting abundance is also known to fluctuate cyclically in response to El Niño–Southern Oscillation (ENSO) events (Limpus and Nicholls, 2000). Hawksbill turtle (*Eretmochelys imbricata*) nesting populations were estimated at approximately 100 individuals on Barrow Island, with a further 1,000 in the Lowendal Islands and 1,300 in the Montebello Islands, based on track count surveys from 1998 to 2005 (Pendoley 2005). Hawksbill nesting on Barrow Island is more temporally and spatially diffuse than flatback or green turtle nesting.	Flatback: nesting activity is concentrated on the east coast of the island on sandy, low-sloped, low-energy beaches with wide, shallow intertidal zones (Pendoley 2005; Pendoley et al. 2014). Limited nesting activity has also been recorded on the south-west, south-east, north, and north-east beaches of Barrow Island (Pendoley Environmental 2010). The approximate internesting interval (duration between a successful nest and subsequent nest or nesting attempt) of Flatback Turtles on Barrow Island is similar to other Flatback Turtle rookeries in the Pilbara region with a mean of approximately 14 days, and varying year to year (Pendoley et al. 2014). Satellite tracking of 33 Flatback Turtles from Barrow Island identified four patterns of inter-nesting movement, including interesting periods where turtles travelled east, south-east, or to the mainland from Barrow Island. The slight majority of movements stayed in the nearshore area surrounding Barrow Island, within 10 km (Whittock et al. 2014). Green Turtle nesting usually occurs on the west and north-east coasts of Barrow Island. The west coast nesting beaches are high-energy, steeply sloped, sandy, and with an unobstructed foreshore approach (Chevron Australia 2005), in contrast to the low-energy beaches preferred by nesting Flatback Turtles (Pendoley 2005). Annually, only a very small percentage of these Green Turtles nest on the south and east coast beaches of Barrow Island (Pendoley Environmental 2018). Shallow foraging habitat used by adult and juvenile Green Turtles typically comprises seagrass beds or algae mats, and both juvenile and adult Green Turtles have been observed feeding year-round on algae-covered, rocky intertidal and	Flatback: nesting on Barrow Island occurs between October and March, with peak nesting activity occurring between December and January (Chevron Australia 2015; Chevron Australia 2016) Substantial aggregations of mating Green Turtles can occur in waters and on beaches along the west, north, and north-east coasts of Barrow Island between September and December (Chevron Australia 2005). Green Turtle nesting usually occurs between October and March each year, with a remigration interval of approximately five years (Bjorndal 1997) and peak nesting activity occurring between December and February (Chevron Australia 2005; Pendoley 2005). Hawksbill Turtle nesting in WA occurs from September/October to January, peaking in October, but the entire breeding season remains undefined (DCCEEW 2024; Pendoley 2005). Hawksbill Turtles typically have an internesting interval of approximately 14 days and a remigration interval of approximately three years (Chevron Australia 2005; DoE 2015b).

Receptor	Receptor	Background	Key locations	Seasonality
			subtidal platforms, off the west and east coasts of Barrow Island (DoE 2015a; Chevron Australia 2005). Analysis of satellite tracking data for Barrow Island Green Turtles suggests interesting habitat occurs throughout the rocky intertidal and subtidal platforms common on the west coast, around to the north-eastern beaches and waters (Chevron Australia 2005; Pendoley 2005) Surveillance of Barrow Island Hawksbill Turtle nesting has found that nesting activity is more temporally and spatially diffuse than Flatback and Green Turtle nesting activity and occurs predominantly on small, rocky, north-east coast beaches, extending down to Mushroom Beach. Very low numbers of Hawksbill Turtles nest further south along the east coast (Chevron 2015).	
	Marine Mammals	Humpback whales (*Megaptera novaeangliae*) are regularly observed in the waters around Barrow Island during both their northward and southward migrations. Other whale species that may occasionally visit the area include the short-finned pilot whale (*Globicephala macrorhynchus*), false killer whale (*Pseudorca crassidens*), killer whale (*Orcinus orca*), minke whale (*Balaenoptera acutorostrata*), Bryde's whale (*Balaenoptera edeni*), sei whale (*Balaenoptera borealis*), pygmy blue whale (*Balaenoptera musculus brevicauda*), fin whale (*Balaenoptera physalus*), melon-headed whale (*Peponocephala electra*), sperm whale (*Physeter macrocephalus*), and blue whale (*Balaenoptera musculus musculus*) (DEC 2007).	-	Humpback whale migration: June to end of October
		Resident populations of bottlenose dolphins (*Tursiops truncatus*) and Australian humpback dolphins (*Sousa sahulensis*) are present in the shallow coastal waters of the inner Rowley Shelf, including the Barrow Island region (DEC 2007). Spinner dolphins (*Stenella longirostris*), common dolphins (*Delphinus delphis*), and striped dolphins (*Stenella coeruleoalba*) are also considered abundant in surrounding waters (DEC 2007).	Spinner dolphins, common dolphins, and striped dolphins are generally oceanic species and are likely to be most abundant on the west coast of the island (DEC 2007).	
		Significant sightings of dugongs (*Dugong dugon*) have been recorded near Barrow Island (Bancroft et al. 2000).	-	-

Receptor	Receptor	Background	Key locations	Seasonality
	Fish	The Montebello/Barrow Islands region hosts exceptionally diverse fish communities, with over 450 species recorded, most of which occur widely across the Indo–West Pacific (Allen 2000; DEC 2007). The region's fauna is closely linked to that of the Dampier Archipelago, benefiting from larval recruitment via the Leeuwin Current, and potentially acting as a recruitment source for areas further south (Hutchins 2004; DEC 2007). Surveys around Barrow Island have documented strong habitat associations: coral reefs support the greatest diversity, dominated by damselfish, parrotfish, snappers, and groupers; macroalgae habitats serve as important nurseries; sand habitats host large transient predators such as mackerel and trevally alongside smaller benthic species; and areas rich in sessile invertebrates are frequented by emperors, threadfin bream, and trevally (Chevron Australia 2012).	-	-
	Mangroves	Restricted areas of stunted *Avicennia marina* occurring in narrow fringing strips in embayments (DEC 2007).	*Avicennia marina* grows in sparse stands only on the east coast of Barrow Island. It is distributed in a narrow band along soft sediment and rock substrates in the upper-littoral and supra-littoral zones of the intertidal area. Mangroves are recorded at Little Bandicoot Bay and Pelican Island, as well as further east at Bandicoot Bay, where a small number of trees extend further down the intertidal zone to the mid-littoral zone. Sparse stands of trees are recorded on the rocky intertidal shoreline from Stokes Point along the coast up to Shark Point. Stands of mangroves are also recorded further north at Mattress Bay, Ant Point, and Square Bay. No mangrove stands are recorded on the west coast of Barrow Island (Chevron Australia 2015)	*Avicennia marina* flowering often occurs between December and January while propagules mature mostly in March (Duke 2006).
	Coral	Surveys around Barrow Island have identified 96 species of hard coral in 48 genera from the order Scleractinia and seven soft coral genera from the suborder Alcyoniina (Chevron 2015).	The most significant coral reefs around Barrow Island are Biggada Reef on the west coast, Dugong Reef and Batman Reef off the south-east coast and along the edge of the Lowendal Shelf on the east side of Barrow Island (DEC 2007).	There are two distinct coral recruitment periods: autumn and spring (Chevron 2015).
	Non-coral benthic macro-invertebrates	The habitats on the east and west coasts of Barrow Island support different benthic macro-invertebrate assemblages. Of the 316 species of molluscs recorded from Barrow Island,	-	-

Receptor	Receptor	Background	Key locations	Seasonality
		less than one third occur on both coasts (Chevron Australia 2005). The muddier habitats on the east coast support a greater proportion of bivalve species, whilst the west coast supports a greater proportion of coral reef gastropod species (Chevron Australia 2005). The gastropod *Amoria macandrewi*, is endemic to sandbars within the Montebello/Barrow Islands region (Chevron Australia 2005).		
	Macroalgae	Macroalgal-dominated limestone reef and subtidal reef platform/sand mosaic are the most extensive habitat types in the Montebello/Barrow Islands region (DEC 2007). The extensive subtidal macroalgae communities are major benthic primary producers, significantly contributing to the productivity of the region, as well as providing refuge areas for fish and invertebrates (DEC2007). The macroalgal assemblages are typically dominated by species of brown algae, particularly of the genera *Sargassum*, *Turbinaria* and *Padina* (Chevron Australia 2005; DEC 2007). Other common taxa include *Halimeda*, *Dictyopteris*, *Dictyota*, *Cystoseira*, *Codium* and *Laurencia*.	These communities are most commonly found on shallow limestone pavement in depths of 5 to 10 m (DEC 2007). Green algae from the genera *Caulerpa* and *Cladophora* and red algae from the genera *Centroceras*, *Ceramium*, *Champia*, *Chondria*, *Gelidiopsis*, and *Hypnea* are dominant or widespread off the east coast of Barrow Island (Chevron Australia 2005; DEC 2007; RPS Bowman Bishaw Gorham 2007). Some species, such as *Avrainvillea* sp. and *Halimeda macroloba*, appear to be restricted to the east coast of Barrow Island (Chevron Australia 2005).	Macroalgal habitats in the Montebello/Barrow Islands region vary seasonally in response to water temperature, day length, reproductive cycles, physical disturbance and regrowth (DEC 2007).
	Seagrass	Seven species have been recorded to date from the Montebello/Barrow Islands region: *Cymodocea angustata*, *Halophila ovalis*, *H. spinulosa*, *Halodule uninervis*, *Thalassia hemprichii*, *Thalassodendron ciliatum* and *Syringodium isoetifolium* (DEC 2007). Of these, *Halophila spp.* Are the most common on shallow soft substrates and sand veneers throughout the region (DEC 2007).	Seagrass do not appear to form extensive beds in the area, but rather are sparsely interspersed between macroalgae, extending from the intertidal zone to approximately 15 m water depth (DEC 2007). Ephemeral seagrass are widespread on the east coast of Barrow Island (Chevron Australia 2005). Seagrass, most often *Halophila spp*., are patchily distributed on sandy subtidal habitats, and areas of bare sand devoid of seagrass are also common along the east coast of Barrow Island.	-
Bedout Island	Turtle	Flatback nesting (Fossette et al. 2021)	-	-
	Birds	Listed as an Important Bird and Biodiversity Area (Birdlife International, 2019). Seabird breading including Lesser Frigatebird (*Fregata ariel*), Masked Booby (*Sula dactylatra*) and Brown Boobies (*Sula leucogaster*) (Lavers et al. 2020).	-	-

Receptor	Receptor	Background	Key locations	Seasonality
Dampier AMP	Benthic habitat	The Dampier AMP is a hotspot for sponge biodiversity. The marine park includes several coral reefs and shoals (Parks Australia n.d.).	Delambre Reef and Tessa Shoals	
	Birds	Foraging habitat for seabirds (Parks Australia n.d.).		
	Turtles	Important inter-nesting habitat for flatback (*Natator depressus*), hawksbill (*Eretmochelys imbricata*), loggerhead (*Caretta caretta*), and green (*Chelonia mydas*) turtles (Parks Australia n.d.).		October to March
	Marine mammals	Migratory pathway for Humpback whales (*Megaptera novaeangliae*) (Parks Australia n.d.).		June to October
Dampier Region (Northern Pilbara to Karratha) and Dampier Archipelago)	Marine Mammal	Humpback whales (*Megaptera novaeangliae*): Biologically Important Area Migration for humpback whales. Females occasionally give birth in the waters of the Dampier Archipelago, although the main calving area is further north (CALM 2005)	Adult humpback whales and their young frequent the Archipelago on their southern migrations in early spring, and the Mermaid Sound (area of water between the western coastline of the Burrup Peninsula to the east of the Dampier Port, and Dampier Archipelago to the west) is a significant resting area for females with calves (MMPATF 2021; CALM 2005; CALM 1990).	Humpback whale northern migration past Pilbara occurs June and July while southern migration occurs in early spring.
		Humpback dolphins (*Sousa sahulensis*): The Australian humpback dolphin exhibit relatively small home ranges (<300 km^2) and high site fidelity (Hanf et al. 2016).	Humpback dolphins inhabit shallow, coastal waters; typically, within 20 km of land and in water depths of less than 20 m (Parra and Jedensjö 2013; Hanf et al. 2015; Hanf et al. 2021; Hunt et al. 2017). In the Pilbara, they have been recorded up to 50 km from the mainland, but possibly associated with offshore islands (Hanf et al. 2015; Hanf et al. 2021).	Humpback dolphins may be present throughout the year.
		Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) have been recorded throughout nearshore waters of the region (Hanf et al 2016; Allen et al. 2012; Hanf et al. 2021).	-	Indo-Pacific bottlenose dolphins may be present throughout the year.
		Current knowledge on the size of the population of the Dampier Archipelago/ Cape Preston area for dugongs (*Dugong dugon*) is limited (MMPATF 2021).	Small numbers of dugongs have been sighted in shallow, warm waters in bays and between islands, including at East Lewis Island, Cape Preston, Regnard Bay, Nickol Bay and west of Keast Island (MMPATF 2021; CALM 2005). Dugongs have a strong association with seagrass habitat. Seagrass beds are found	May be present throughout the year.

Receptor	Receptor	Background	Key locations	Seasonality
			throughout Nickol Bay and around many of the islands (Worley Parsons 2009).	
	Birds	Many of the islands are important seabird nesting sites. The Dampier Archipelago has been recognised to have BIAs based on breeding for the wedge-tailed shearwater (*Ardenna pacifica*), roseate tern (*Sterna dougallii*) and Australian fairy tern (*Sternula nereis*). Important feeding and resting area for migratory shorebirds, utilising many beaches and mud flats (CALM 1990).	Angel Island: shorebird sightings: Bar-tailed godwit (*Limosa lapponica*), Ruddy turnstone (*Arenaria interpres*), Whimbrel (*Numenius phaeopus*). Brigadier Island: Shorebird sightings: Whimbrel (*Numenius phaeopus*). Cohen Island: Shorebird sightings: Ruddy turnstone (*Arenaria interpres*), Grey-tailed tattler (*Tringa brevipes*). Seabird nesting: Wedge-tailed shearwater (*Ardenna pacifica*), Caspian tern .(*Hydroprogne caspia*) Collier Rocks: Seabird nesting: Wedge-tailed shearwater (*Ardenna pacifica*). Conzinc Island: shorebird sightings: Grey-tailed tattler (*Tringa brevipes*) Seabird nesting: Wedge-tailed shearwater (*Ardenna pacifica*), Caspian tern (*Hydroprogne caspia*) Delambre Island: Seabird nesting: Wedge-tailed shearwater (*Ardenna pacifica*) Dolphin Island: shorebird sightings: Red-necked stint (*Calidris ruficollis*), Grey plover (*Pluvialis squatarola*), Grey-tailed tattler (*Tringa brevipes*) Elphick Nob: Seabird nesting: Australian fairy tern (*Sternula nereis*), Wedge-tailed shearwater (*Ardenna pacifica*). Egret Island: Seabird nesting: Caspian tern (*Hydroprogne caspia*) Enderby Island: shorebird sightings: Sharp-tailed sandpiper (*Calidris acuminata*), Oriental plover (*Charadrius veredus*), Whimbrel (*Numenius phaeopus*), Grey-tailed tattler (*Tringa brevipes*). Seabird nesting: Caspian tern. (*Hydroprogne caspia*)	Australian fairy tern breeding: August-November (CALM 1990) Wedge-tailed shearwater breeding: October – April (CALM 1990; Nicholson 2002) Caspian tern .(breeding: July – October (CALM 1990) Roseate tern breeding: August – December (Higgins and Davies 1996

Receptor	Receptor	Background	Key locations	Seasonality
			Gidley Island: Shorebird sightings: Whimbrel (*Numenius phaeopus*). Goodwyn Island: Shorebird sightings: Grey-tailed tattler (*Tringa brevipes*) Seabird nesting: Australian fairy tern (*Sternula nereis*), Wedge-tailed shearwater (*Ardenna pacifica*), Roseate tern (*Sterna dougallii*). Hauy Island: Seabird nesting: Wedge-tailed shearwater (*Ardenna pacifica*) Keast Island: Seabird nesting: Caspian tern .(*Hydroprogne caspia*), Australian Peican (*Pelecanus conspicillatus*) Kendrew Island: Seabird nesting: Australian fairy tern (*Sternula nereis*), Wedge-tailed shearwater (*Ardenna pacifica*) Lady Nora Island: Shorebird sightings: Oriental plover (*Charadrius veredus*), Whimbrel (*Numenius phaeopus*) Seabird nesting: Wedge-tailed shearwater (*Ardenna pacifica*), Caspian tern (*Hydroprogne caspia*) Legendre Island: Whimbrel (*Numenius phaeopus*), Grey-tailed tattler (*Tringa brevipes*) Seabird nesting: Wedge-tailed shearwater (*Ardenna pacifica*) Malus Island: Shorebird sightings: Grey-tailed tattler (*Tringa brevipes*) Seabird nesting: Wedge-tailed shearwater (*Ardenna pacifica*) Nelson Rocks: Shorebird sightings: Whimbrel (*Numenius phaeopus*) Roly Rocks: Seabird nesting: Wedge-tailed shearwater (*Ardenna pacifica*) Rosemary Island: Shorebird sightings: Red necked stint (*Calidris ruficollis*) Seabird nesting: Caspian tern (*Hydroprogne caspia*) (CALM 2005; Higgins and Davies 1996)	

Receptor	Receptor	Background	Key locations	Seasonality
	Turtles	The waters of the Dampier Archipelago are used for breeding while the sandy beaches are regularly used for nesting by green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*) and flatback turtles (*Natator depressus*), and occasionally by loggerhead turtles (*Caretta caretta*) (CALM 2005). Leather back turtles have been recorded in waters of the Dampier Archipelago, however, do not nest in this area.	Flatback turtle: There are significant rookeries centred on Dampier Archipelago (DoEE 2017; Limpus 2007). Delambre Island, Enderby Island, Hauy Island, Keast Island and Legendre Island have records of moderate nesting (Pendoley 2019). Delmbre Island has been recognised as the largest flatback turtle rookery in Australia with an estimated 3500 nesting females per year (Pendoley 2019). Green turtle: some the nesting sites have been identified as principal near-coastal rookeries for the species (DoEE 2017; Waayers et al. 2014). Angel Island, Cohen Island, Delambre Island, Dolphin Island, Eaglehawk Island, Enderby Island, Goodwyn Island, Hauy Island, Keast Island, Lady Nora Island, Legendre Island, Malus Island, Rosemary Island, and West Lewis Island have records nesting for this species (Pendoley 2019). Hawksbill nesting in WA is centred on the Pilbara (Dampier Archipelago) (Whiting et al. 2018; Waayers et al. 2014; Limpus 2002). Rosemary Island is considered a significant breeding area, supporting the most significant hawksbill turtle rookery in the Western Australian region and one of the largest in the Indian Ocean; tens to hundreds of animals nest on the island annually, more than any other Western Australian rookery, with approximately 1000 nesting females nesting per year (Pendoley Environmental 2019; DoEE 2017; DSWEPC 2012d). Angel Island, Delambre Island, Dolphin Island, Eaglehawk Island, Enderby Island, Goodwyn Island, Malus Island and Rosemary Island have records of moderate nesting (Pendoley 2019).	The flatback turtle nesting during the summer months (October to March) with peak nesting in November to January (DoEE 2017; CALM 2005; CALM 1990). The green turtle nesting during the summer months (November – March) with peak nesting between December to February (DoEE 2017; CALM 2005; CALM 1990). The hawksbill turtle nesting during the summer months (October – February) with peak nesting in October to January, however, are known to nest all year round in the region (DoEE 2017; DSEWPC 2012b; CALM 2005; Prince 1993; CALM 1990).
	Coral	Live coral cover can vary greatly from reef to reef, as indicated by contrasting covers of 10 to 60% on Sailfish Reef and Hamersley Shoal, respectively (CALM 2005).	High coral diversity is found on the seaward slopes of Delambre Island, Hamersley Shoal, Sailfish Reef, Kendrew	-

Receptor	Receptor	Background	Key locations	Seasonality
			Island and north-west Enderby Island (CALM 2005).	
	Mangroves	Six species of mangrove are found within the Dampier Archipelago/Cape Preston region: the white mangrove (*Avicennia marina*), red mangrove (Rhizophora stylosa), club mangrove (*Aegialitis annulata*), ribbed-fruit orange mangrove (*Brugiera exaristrata*), yellow- leaf spurred mangrove (*Ceriops tagal*) and river mangrove (*Aegiceras cornculatum*) (CALM 2005).	Most mangals occur along the mainland coast on the tidal flats at Regnard Bay, the Maitland River mouth, King Bay and Nickol Bay. Well-developed communities also occur in some of the sheltered bays on the islands, for example at West Intercourse Island, in Searipple Passage and the southern shores of West Lewis and East Lewis islands (CALM 2005). The mangrove communities at the Fortescue River delta, Cape Preston area, West Intercourse Island, Enderby Island, Searipple Passage/Conzinc Bay and Dixon Island have been assessed by Semeniuk (1997) as having international significance from a biodiversity and ecological basis (CALM 2005).	-
	Seagrass	Seagrasses occur sparsely, in low diversity and low abundance, on shallow, unconsolidated sediments of sand and muddy sand (Jones 2004).	The most significant areas of seagrass are found between Keast and Legendre islands and between West Intercourse Island and Cape Preston (CALM 2005).	-
Eighty Mile Beach	Mangroves	The Eighty Mile Beach is almost devoid of mangroves. The exceptions are two small tidal creeks on Mandora Station (Johnstone et al. 2013).	Two small tidal creeks on Mandora Station (Johnstone et al. 2013).	-
	Intertidal flats	60,000 ha of sand/mud flats support rich invertebrate communities (notably molluscs and microphytobenthos) that fuel shorebird feeding; a 1999 survey along 80 km recorded 112 taxa, 40 of which weren't found in nearby Roebuck Bay, highlighting distinctiveness (DPaW 2014).	-	-
	Birds	The extensive tidal flats and beaches of Eighty Mile Beach and Roebuck Bay), are of great importance to migratory shorebirds. No other region in Australia, or indeed anywhere else in the East Asian Flyway, supports such large and diverse nonbreeding populations (Bamford et al. 2008, Hansen et al. 2016). Between them Eighty Mile Beach and Roebuck Bay support 21 shorebird species in internationally significant numbers (i.e. >1% of the entire population of the East Asian Australasian Flyway), that almost 3.5 million shorebirds in	Shorebird roosting distribution in north-western Australia is limited by their intolerance of hot microclimates; by day most species need to roost on wet substrates to avoid heat stress (Roger et al. 2020). Shorebirds prefer open roost settings and avoid sites where the tide pushes them close to tall features (e.g. mangroves, sand dunes) that can be used as cover by hunting birds of prey (Roger et al. 2020).	Around September the first migratory shorebirds arrive and by October many disperse further across Australia, using Eighty Mile Beach as an important staging area (Commonwealth of Australia, 2016).

Receptor	Receptor	Background	Key locations	Seasonality
		total occur on these sites, and they include ~580,000 shorebirds that forage on tidal flats (Rogers et al. 2011).	At Eighty Mile Beach density of shorebirds on tidal flats at low tide is strongly correlated with high tide counts on the adjacent beaches, suggesting shorebirds there typically roost on beaches close to their preferred foraging sites (Roger et al. 2020).	
	Turtle	Flatback turtle (*Natator depressus*) is the only species known to nest on Eighty Mile Beach. Green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*) and other species may occur in adjacent waters (DPaW 2014).	-	Peak nesting Nov-Dec, peak hatching Jan-Mar (DPaW 2014).
Eighty Mile Beach AMP	Birds	Biologically important area for breeding, foraging and resting habitat for seabirds.	-	-
	Turtles	Biologically important area for interesting habitat for marine turtles.	-	-
	Fish	Biologically important area for foraging, nursing and pupping habitat for sawfish	-	-
	Marine mammals	Migratory pathway for humpback whales (*Megaptera novaeangliae*)	-	June to October
Gascoyne AMP	Birds	Biologically important breeding habitat for seabirds (Parks Australia n.d.).		
	Turtle	Biologically important internesting habitat for turtles (Parks Australia n.d.).		
	Marine mammals	A migratory pathway for humpback whales (*Megaptera novaeangliae*) (Parks Australia n.d.).		June to October
		Biologically important foraging habitat and migratory pathway for pygmy blue whales (*Balaenoptera musculus brevicauda*) (Parks Australia n.d.).		April to December
Lowendal Islands	Birds	Nesting and foraging area for seabirds.	Abutilon, Beacon, Bridled, Parakeelya, and Varanus islands	Seabird nesting all year, peak Oct – Jan. Pied cormorant (*Phalacrocorax varius*) nests in winter (Nicholson 2002). Wedge-tailed shearwater (*Ardenna pacifica*) and Bridled tern (*Onychoprion anaethetus*) nest in Summer (Nicholson 2002).

Receptor	Receptor	Background	Key locations	Seasonality
				Silver gull (*Larus novaehollandiae*) nests in summer and Autumn (Nicholson 2002). Crested tern (*Thalasseus bergii*), Lesser crested tern (*Thalasseus bengalensis*) and Roseate tern (*Sterna dougallii*) nest in Autumn (Nicholson 2002).
	Turtles	Green (*Chelonia mydas*), flatback (*Natator depressus*) and hawksbill (*Eretmochelys imbricata* (DEC 2007).	All beaches on Beacon, Bridled, Varanus, Abutilon, Parakeelya Islands Significant hawksbill nesting on Varanus Island (DSEWPC 2012a). Hawksbill foraging around the Lowendal Island group (DSEWPC 2012a).	Hawksbill nesting in spring and early summer (peak October) with a 20 km inter-nesting buffer. Flatback nesting peak late December – early January with a 20 km inter-nesting buffer (DSEWPC 2012a).
	Marine mammals	Whale species that may occasionally visit include the humpback whale (*Megaptera novaeangliae*), short-finned pilot whale (*Globicephala macrorhynchus*), false killer whale (*Pseudorca crassidens*), killer whale (*Orcinus orca*), minke whale (*Balaenoptera acutorostrata*), Bryde's whale (Balaenoptera edeni), sei whale (*Balaenoptera borealis*), pygmy blue whale (*Balaenoptera musculus brevicauda*), fin whale (*Balaenoptera physalus*), melon-headed whale (*Peponocephala electra*), sperm whale (*Physeter macrocephalus*) and the blue whale (*Balaenoptera musculus musculus*). Of these, only the humpback whale is a regular visitor to the area (DEC 2007).	-	-
		The seagrass beds around the Lowendal Islands are thought to provide a valuable food source for dugong (*Dugong dugon*) (DEC 2007).	-	-
	Mangroves	Mangroves occupy less than 0.1% of the coastline (DEC 2007).	-	-
Montebello Islands	Birds	According to Datazone by Birdlife the Montebello Islands were last surveyed and assessed in 2008 and 2009 by Birldife Australia, respectively, with three species meeting IBA/KBA criteria: sooty oystercatcher (*Haematopus*	-	Wedge-tailed shearwater and bridled tern nest in summer (Nicholson 2002). Silver gull nest in summer and Autumn (Nicholson 2002).

Receptor	Receptor	Background	Key locations	Seasonality
		fuliginosus), roseate tern (*Sterna dougallii*) and fairy tern (*Sternula nereis*). Historical surveys undertaken in the late 1980s and 1990s documented that the Montebello Islands support a diverse range of breeding seabirds (Burbidge & Fuller 1998), although the size, distribution, and breeding activity of these populations may have changed considerably since that time. Wedge-tailed Shearwaters (*Puffinus pacificus*) were recorded breeding extensively across many islands, including Ah Chong, Alpha, 'Beaufortia', Brooke, Gardenia, 'Gossypium', Kingcup, Flag, Pansy, and South East, with colonies ranging from small groups to very large aggregations. Pied Cormorants (*Phalacrocorax varius*) maintained small nesting colonies on islands such as the 'Karri Islands', while Eastern Reef Egrets (Egretta sacra) nested sporadically on 'Bloodwood' and Buttercup. The Beach Stone-curlew (*Esacus neglectus*) appeared resident on several islands, including the 'Marri Islands', with occasional nesting observed. Both Pied (*Haematopus longirostris*) and Sooty Oystercatchers (*H. fuliginosus*) bred on multiple islands, including Alpha, 'Renewal', Hollyhock, Bluebell, and Flag. Silver Gulls (*Larus novaehollandiae*) formed large colonies on Brooke, 'Birthday', Gardenia, 'Renewal', and South East. Terns were well-represented, with Caspian Terns (*Sterna caspia)* breeding on numerous islands, including Ah Chong, Alpha, Bluebell, Dandelion, Flag, Foxglove, Gardenia, an islet south of Hermite, Ivy, 'Kunzea', Marri Islands, Primrose, 'Renewal', and Trimouille. Crested Terns (*S. bergii*) formed very large colonies in some years on Daisy, Epsilon, 'Birthday', and Bluebell Islet, while Roseate Terns (*S. dougallii*) bred on Dahlia, Dandelion, 'Pimelia', 'Myoporum', Gannet, an islet north of Gannet, 'Fig Islands', and 'Bloodwood'. Fairy Terns (*S. nereis*) were common breeders on 'Fairy Tern Island' and 'Hibbertia', and Bridled Terns (*S. anaethetus*) were presumed summer breeders based on evidence from Dahlia, 'Gossypium', and South East. Lesser Crested Terns (*S. bengalensis*) may also have bred among Crested Tern colonies on Daisy and Epsilon, although this was not confirmed (Burbidge & Fuller 1998).		Caspian tern nest in autumn and winter (Nicholson 2002). Crested tern, lesser crested tern, roseate tern and sooty tern nest in Autumn (Nicholson 2002). Fairy tern nest in winter and spring (Nicholson 2002).
	Turtle	The Montebello Islands support nesting by green (*Chelonia mydas*), flatback (*Natator depressus*), and hawksbill (*Eretmochelys imbricata*) turtles. The islands are recognised as critical habitat for flatback turtles and for hawksbill turtles, with key sites for the latter including Ah Chong Island, South East Island, and Trimouille Island. Within the recovery plan's	Hawksbill- Ah Chong Island, South East Island, Trimouille and elsewhere.	Green turtle- major nesting Nov – Mar (peak: Dec-May) on locations with sandy beaches (recovery plan)

Receptor	Receptor	Background	Key locations	Seasonality
		classification framework, the Montebello Islands are identified as a major important nesting area for green turtles, a minor important nesting area for flatback turtles, and a major important nesting area for hawksbill turtles (Commonwealth of Australia 2017).		Flatback- minor nesting occurs Oct-Mar (peak: Nov-Jan) Hawksbill- major nesting occurs all year (peak Oct-Jan)
	Marine mammals	Humpback whales (Megaptera novaeangliae) are regular visitors to the region during their annual migration. Several whale species are known to occasionally visit the Montebello/Barrow Islands region, including the short-finned pilot whale (Globicephala macrorhynchus), false killer whale (Pseudorca crassidens), killer whale (Orcinus orca), minke whale (Balaenoptera acutorostrata), Bryde's whale (Balaenoptera edeni), sei whale (Balaenoptera borealis), pygmy blue whale (Balaenoptera musculus brevicauda), fin whale (Balaenoptera physalus), melon-headed whale (Peponocephala electra), sperm whale (Physeter macrocephalus), and the blue whale (Balaenoptera musculus musculus) (DEC, 2007).	Anecdotal reports suggest that sheltered waters to the west of Trimouille Island in the Montebello group may be used as a resting area for female humpbacks with calves, although the importance of this site remains uncertain (DEC, 2007).	Humpback whale migration: June to end of October
		Australian humpback dolphins (*Sousa sahulensis*) were first recorded in the Montebello Islands Marine Protected Area (MPA) in June 2015 and were subsequently sighted in summer, autumn, and winter of 2017, with repeated observations in nearshore waters suggesting a year-round presence. In 2017, a five-day vessel-based photo-identification survey of fringing coral reefs and shallow, sheltered sandy lagoons (generally <10 m deep, maximum <20 m) identified 28 individuals, including six calves (one a neonate). Despite the limited survey effort, this represents a relatively high number of individuals compared with other Pilbara sites where more intensive monitoring has occurred. No matches were found between Montebello dolphins and those from mainland Pilbara waters (Exmouth, Onslow, Dampier) or nearshore islands in the Western Australian Humpback Dolphin Catalogue, suggesting possible population separation. While nearshore habitat is clearly important to the species, it is unknown whether the open waters between the Montebello Islands and the mainland act as a barrier to movement. The authors note that increased survey effort in favourable conditions would likely identify more individuals and improve understanding of abundance, range, and connectivity (Raudino et al. 2018).		

Receptor	Receptor	Background	Key locations	Seasonality
	Dugong	Dugong (*Dugong dugon*) are frequently recorded in the shallow, warm waters around the Montebello Islands, Lowendal Islands, and Barrow Shoals (DEC, 2007).	-	-
	Fish	Historic surveys of the Montebello Islands have recorded 456 fish species across 75 families, a composition representative of reef communities on the mid-continental shelf of north-western Australia (Allen 2000). Most species are associated with coral reef habitats, with the ten most species-rich families: Gobiidae, Labridae, Pomacentridae, Blenniidae, Apogonidae, Serranidae, Chaetodontidae, Carangidae, Lutjanidae, and Acanthuridae comprising 54 % of the total assemblage. These families are widely distributed and typically abundant throughout the tropical Indo-Pacific. The Montebello Islands support a slightly higher species richness than the more inshore Dampier Archipelago.		
	Mangroves	Six species of mangroves occur in the Montebello Islands: white mangrove (*Avicennia marina*), ribbed-fruit orange mangrove (*Bruguiera exaristata*), yellow-leaf spurred mangrove (*Ceriops tagal*), red mangrove (*Rhizophora stylosa*), club mangrove (*Aegialitis annulata*), and river mangrove (*Aegiceras corniculatum*). The occurrence of lagoonal mangrove assemblages in an oceanic island setting is unusual and of high scientific value, with the Montebello Islands' mangrove communities regarded as globally unique (Semeniuk 1997). The largest stand, covering approximately 15 ha, is located in Stephenson Channel on Hermite Island, where individual trees reach heights of up to 5 m (DEC 2007).	Stephenson Channel on Hermite Island.	-
	Coral	There is a high diversity of hard coral present and they are generally in an undisturbed condition (DEC 2007).	The best developed coral reef communities are in the relatively clear water and high energy conditions of the fringing reefs to the west and south-west of the Montebello Islands, and bommies and patch reefs in the more turbid and lower energy waters along the eastern edge of the Montebello Islands (DEC 2007).	
	Macroalgae	Macroalgal-dominated limestone reef and subtidal reef platform/sand mosaic are the most extensive habitat types in the Montebello/Barrow Islands region (DEC 2007). The macroalgal assemblage is typically dominated by species of brown algae, particularly of the genera *Sargassum*, *Turbinaria* and *Pandina.* Green algae from the	These communities are most commonly found on shallow limestone pavement in depths of 5 to 10 m (DEC 2007).	Macroalgal habitats in the Montebello/Barrow Islands region vary seasonally in response to water temperature, day length, reproductive cycles,

Receptor	Receptor	Background	Key locations	Seasonality
		genera *Caulerpa*, *Cladophora and Rhodophyta* are also quite common.		physical disturbance and regrowth (DEC 2007).
	Seagrass	Seven species have been recorded to date from the Montebello/Barrow Islands region: *Cymodocea angustata*, *Halophila ovalis*, *H. spinulosa*, *Halodule uninervis*, *Thalassia hemprichii*, *Thalassodendron ciliatum* and *Syringodium isoetifolium* (DEC 2007). Of these, *Halophila spp*. Are the most common on shallow soft substrates and sand veneers throughout the region (DEC 2007).	Seagrass do not appear to form extensive beds in the area, but rather are sparsely interspersed between macroalgae, extending from the intertidal zone to approximately 15 m water depth (DEC 2007).	
Muiron Islands	Birds	Nesting area for seabirds Wedge-tailed shearwater (*Ardenna pacifica*) nesting colony, birds forage at sea in large aggregations. Crested tern (*Thalasseus bergii*) nesting colony (Department of Parks and Wildlife, 2014) Identified as an internationally important shorebird area (Weller et al. 2020).	-	Wedge-tailed shearwater are believed to stay in the area year-round, but undertake significant flights away from the islands around May. Returning around June, they nest in burrows on both islands spending several months preparing and re-excavating the burrows. At about 1m long and not very deep, the burrows are subject to collapse by foot traffic. A single egg is laid around October and the chicks hatch in January (DPaW 2015).
	Turtle	Major loggerhead turtle (*Caretta caretta*) nesting site, significant green turtle (*Chelonia mydas*) nesting site, low density hawksbill turtle (*Eretmochelys imbricata*) nesting site, occasional flatback turtle (*Natator depressus*) presence	-	Loggerhead turtle peak nesting: November to January (Waayers 2010). Green turtle peak nesting December to January (Waayers 2010).
Ningaloo Coast World Heritage Area	Mangroves	Mangroves are not extensive.	On the east side of the Cape Range peninsula, a fringing mangal of Avicennia marina occurs to the south of Cape Murat, between Bundegi Reef and Exmouth. On the west side of the Peninsula, mangals occur at Mangrove Bay (*A. marina, Rhizophora stylosa and Bruguiera exaristata*), Low Point (*Avicennia marina*) and Yardie Creek (*A. marina and R. stylosa*)	-
	Manta rays	-	-	Ningaloo Reef is considered an important area for Manta Rays

Receptor	Receptor	Background	Key locations	Seasonality
				in autumn and winter (Preen et al. 1997).
	Whale sharks	Whale Sharks aggregate in the waters of the Ningaloo Marine Park, frequently close to the Ningaloo Reef front. The aggregations coincides with the period when the Leeuwin Current is strongest. (Sleeman et al. 2010). The whale sharks that visit Ningaloo are mostly immature males (Sequerira et al. 2016).	-	Peak visibility April to July (noting that whale sharks may be present throughout the year)
	Turtle	Four species of turtle nest in Ningaloo: Green turtle (*Chelonia mydas*), Flatback turtle (*Natator depressus*), Hawksbill turtle (*Eretmochelys imbricata*), Loggerhead turtle (*Caretta caretta*)	The most concentrated area of green turtle nesting is along the northern beaches and Muiron Islands, while loggerhead nesting is concentrated along beaches further south (Bungelup, Jane's Bay, Gnaraloo) and on South Muiron Island (Whiting 2016)	Main nesting: Hawksbill July-Mar Green Sept-Mar Flatback Sept-Mar Loggerhead Sept-Mar
	Marine mammals	Two species of dolphins are resident at Ningaloo, the Indo-Pacific bottlenose dolphin (*Tursiops aduncus*) and the Australian humpback dolphin (*Sousa sahulensis*) (Allen et al. 2012, Jefferson & Rosenbaum 2014). Humpback whales (*Megaptera novaeangliae*) and pygmy blue whales (*Balaenoptera musculus brevicauda*) migrate past Ningaloo each year on their way to breeding grounds further north, and back again (Jenner et al. 2001; Double et al. 2014). (Note: an increasing number of humpback calves are being born at or near Ningaloo each year (Irvine et al. 2018). The waters off Ningaloo are a possible foraging BIA for pygmy blue whales (Thums et al. 2022). Killer whales (*Orcinus orca*) prey on humpback whale calves and are regularly present during the southern migration of humpback whales each year (Pitman et al. 2014).	Indo-Pacific bottlenose dolphins have been found to be primarily associated with the 20m contour and the Muiron Islands (Hanf, 2015). A relatively dense population of have been observed around the North West Cape, suggesting that this region is of high importance to this species (Haughey et al. 2020) Humpback dolphins tend to be associated with intertidal and shallow coastal waters, as well as offshore islands (Hanf, 2015). Dugong mostly inhabit the shallow waters fringing the coast and offshore islands, occurring in close conjunction with the seagrass and algae beds on which they feed.	Humpback whales: June through to the end of October Pygmy blue whales: April to June
	Birds	Identified as an internationally important shorebird area (Weller et al. 2020). Approximately 30 bird species listed under (JAMBA), China–Australia Migratory Bird Agreement (CAMBA) and/or Republic of Korea- Australia Migratory Bird Agreement (ROKAMBA) have been recorded in the Cape Range National Park (DEC 2010). Habitats including the shallow sandy intertidal beaches and rocky shorelines of the Ningaloo coast are important for	Significant seabird rookeries include Cape Farquhar, Pelican Point, Point Maud and Winderabandi Point (Shore of Exmouth et al. 1999).	Juvenile shorebirds can be found year-round. Adults shorebirds usually between August and April.

Receptor	Receptor	Background	Key locations	Seasonality
		seabirds and waders to breed, rest and feed (Shire of Exmouth et al. 1999).		
Rowley Shoals (Clerk Reef and Imperieuse Reef)	Benthic habitat	The Rowley Shoals are three oceanic atolls, Mermaid, Clerke and Imperieuse, with a classic sequence of reef flat, reef crest and steep outer slope surrounding shallow lagoons that contain coral bommies on sand and rubble substrates.		
	Turtle	Hawksbill turtles (*Eretmochelys imbricata*) are known to nest and feed at the Rowley Shoals; both hawksbill and green turtles (*Chelonia mydas*) are frequent visitors seen by divers (DPIRD, n.d.).	Bedwell Island	Unknown
	Sea snakes	Sea snakes are common in the Rowley Shoals Marine Park, alongside other North-West WA reef systems. (DBCA general fauna note for marine parks, including Rowley Shoals).	-	-
	Marine Mammals	Humpback whales (*Megaptera novaeangliae*) transit the Rowley Shoals during their annual migration to and from calving grounds off the Kimberley coast. Localised upwelling of cooler, nutrient-rich water along the outer shelf can enhance productivity and provide foraging opportunities for small and large species. The deep waters surrounding the atolls also regularly support cetaceans, with sightings of Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) and spinner dolphins (*Stenella longirostris*) common (DBCA 2024).	-	Humpback whales: June to October
	Birds	Seabirds forage in offshore waters, while many species breed on the islands. Bedwell Island (Clerke Reef) supports Western Australia's only breeding colony of red-tailed tropicbirds (*Phaethon rubricauda*), which nest among limestone rubble and driftwood. They are occasionally joined by wedge-tailed shearwaters (*Ardenna pacifica*), white-bellied sea eagles (*Haliaeetus leucogaster*), ruddy turnstones (*Arenaria interpres*), sand plovers (*Charadrius spp.*), eastern reef egrets (*Egretta sacra*), several tern species (family Laridae), and, more rarely, white-tailed tropicbirds (*Phaethon lepturus*). Both Bedwell Island and Cunningham Island (Imperieuse Reef) also provide important resting sites for migratory birds (DBCA 2024).	Bedwell Island- seabird nesting Cunningham Islet- used by migratory shorebirds as a resting site	-
Southern Islands Coast (Southern Pilbara shoreline, Onslow area coastline)	Sediment	The Department of Environment and Conservation (DEC) investigated background contaminants in Sediments of the Pilbara in 2005 (DEC 2007). Sediment samples were collected from coastal waters at Port Hedland, Dampier Archipelago, Onslow, Ashburton River Mouth and Exmouth	-	-

Receptor	Receptor	Background	Key locations	Seasonality
		Gulf. Samples were analysed for TBT, PAHs, TPH, BTEXN, organochlorin pesticides, PCBs, total metals and metalloids. Background sediment quality was found to be high. Total arsenic were found in high concentrations in one site off Onslow (considered natural and likely to be related to geology of the region.		
	Mangroves	Mangroves in the area form small but sometimes complex communities in embayments and on the sheltered shores of many offshore islands.	Juvenile green turtles are known to forage on mangroves and have been recorded in both Urala Creek North and Urala Creek South (AECOM 2022).	-
	Turtle	Recovery Plan for Marine Turtles in Australia 2017-2027 (Commonwealth of Australia 2017) has listed critical nesting habitat in this area for Green turtle (*Chelonia mydas*), Flatback turtle (*Natator depressus*), Hawksbill turtle (*Eretmochelys imbricata*) and Loggerhead turtle (*Caretta caretta*). Flatback BIA for nesting and inter-nesting (DCCEEW 2023). Inter-nesting BIA for green and loggerhead turtle (DCCEEW 2023).	Thevenard Island is an important nesting area (Commonwealth of Australia 2017).	Nesting and hatching takes place between October and April. Flatback turtle nesting in the Ashburton area occurs between October and February, with peak nesting activity in December (Imbricata 2013).
	Marine mammals	Key species (O2 Marine, 2021) : humpback whale (*Megaptera novaeangliae*), dugong (*Dugong dugon*), Australian humpback dolphin (*Sousa sahulensis*), Indo-Pacific bottlenose dolphin (*Tursiops aduncus*). Dugongs are resident in coastal waters of the Pilbara coast and are sighted year-round, having a strong association with seagrass habitat. BIAs (DCCEEW 2023): Humpback whale: migration and resting. Pygmy blue whale: distribution.	-	-
	Birds	Key species (O2 Marine, 2021): Australian fairy tern (*Sternula nereis*), bar-tailed godwit- critically endangered (*Limosa lapponica menzbieri*), curlew sandpiper - critically endangered (*Calidris ferruginea*), eastern curlew- critically endangered (*Numenius madagascariensis*) Breeding and foraging BIA of Wedge-tailed shearwater (DCCEEW 2023).	-	Juvenile shorebirds can be found year-round. Adults shorebirds usually between August and April.

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Appendix D OSM baseline data sources

Table C-1: Baseline data sources

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
Water quality	Chevron (2019) Wheatstone Effluent Quality Validation Report, Rev 0- 20200909 (ABU200900381)	Chevron	Onslow area
	Chevron (2022) MEQMP Compliance report and data (ABU221200858)	Chevron	Barrow Island
	Chevron (2022) Wheatstone Platform Environmental Monitoring Program – draft report. 60672341 Wheatstone 5 Yearly Monitoring Technical Report- Rev A	Chevron	Wheatstone Platform
	Chevron (2018) Wheatstone Platform Waste Water Discharges Model Verification Report (ABU190601699)	Chevron	Wheatstone Platform
	Chevron (2022) Gorgon Backfill Fields Benthic Survey 2022 (ABU230100068)	Chevron	Gorgon Backfill Fields
	Pilbara Ports Authority (2019) Marine Environmental Quality Program	Pilbara Ports Authority	Dampier Dampier Archipelago Port Hedland
	O2 Marine (2020) Mardie Project- Marine Water Quality. Prepared for Mardie Minerals Pty Ltd. Report Number R190056	O2 Marine	Mardie
	Port of Broome- Ongoing Marine Monitoring Program. By O2 Marine for Kimberley Ports Authority	Kimberley Ports Authority	Broome Kimberley
	Proposed Browse to North West Shelf Project, Appendix D.1: Browse to NWS Project Trunkline Route Surveys (2019) Environmental Survey Report. Neptune Document J11200-1-RR-006	Advisian/Neptune	Kimberley Marine Park Continental Slope Demersal Fish KEF Agro-Rowley Terrace Marine Park Ancient Coastline at 125 m Depth Contour KEF
Sediment quality	Chevron (2019) Wheatstone LNG Project Mangrove Monitoring Program 2019 (ABU200800053)	Chevron	Onslow
	Chevron (2022) MEQMP 2022 Compliance report and data (ABU221200858)	Chevron	Barrow Island
	Chevron (2022) Wheatstone Platform Environmental Monitoring Program - DRAFT REPORT 60672341, Wheatstone Platform 5 Yearly Monitoring Technical Report-Rev A	Chevron	Wheatstone Platform
	Chevron (2022) Gorgon Backfill Fields Benthic Survey 2022 (ABU230100068)	Chevron	Gorgon Backfill Fields
	Pilbara Ports Authority (2019) Marine Environmental Quality Program	Pilbara Ports Authority	Dampier

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
			Dampier Archipelago Port Hedland
	O2 Marine (2019). Mardie project- Sediment Sampling and Analysis Plan Results. Prepared for Mardie Minerals Pty Ltd. Report Number R190033	O2 Marine	Mardie
	O2 Marine and Teal Solutions (2019). Port Hedland Spoilbank Marina Sediment Sampling and Analysis Plan Implementation Report. Prepared for the Department of Transport. Report Number R190209	O2 Marine	Port Hedland
	Jones R, Wakeford M, Currey-Randall L, Miller K, Tonin H (2021) Drill cuttings and drilling fluids (muds) transport, fate and effects near a coral reef mesophotic zone. Marine Pollution Bulletin 172, 112717	AIMS	Glomar Shoal Rankin Bank
	O2 Marine (2021) Ashburton Infrastructure Project Sediment Sampling and Analysis Plan, Fremantle, WA. Prepared for Mineral Resource Limited	O2 Marine	Ashburton Onslow area
	Advisian (2019) Scarborough Sediment Sampling and Analysis Plan Implementation Report. Prepared for Woodside	Woodside	Dampier
	Woodside (ongoing unpublished data) Chemical and Ecological Monitoring of Mermaid Sound	Woodside	Burrup Peninsula Dampier
	Port of Broome- Ongoing Marine Monitoring Program. By O2 Marine for Kimberley Ports Authority	Kimberley Ports Authority	Broome Kimberley
	Proposed Browse to North West Shelf Project, Appendix D.1: Browse to NWS Project Trunkline Route Surveys (2019) Environmental Survey Report. Neptune Document J11200-1-RR-006	Advisian/Neptune	Kimberley Marine Park Continental Slope Demersal Fish KEF Agro-Rowley Terrace Marine Park Ancient Coastline at 125 m Depth Contour KEF
Intertidal and coastal habitats	Chevron (2019) Wheatstone LNG Project Mangrove Monitoring Program 2019 (ABU200800053)	Chevron	Onslow
	DBCA (long term-monitoring) Ningaloo Reef Program	DBCA	Ningaloo
	360 Environmental (2017) Learmonth Habitat Surveys. Prepared for Subsea 7	Subsea 7	Exmouth Gulf
	Woodside (ongoing unpublished data) Chemical and Ecological Monitoring of Mermaid Sound	Woodside	Burrup Peninsula Dampier
	AECOM (2022) Assessment of Benthic Communities and Habitats Ashburton Salt Project. Prepared for K + S Australian Pty Ltd. Doc No. 60692048_4.	K + S Australian Pty Ltd	Ashburton Onslow area

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Reef R and Lovelock C (2019). Characteristics of landward expansion of mangrove forests with sea level rise. Geophysical Research Abstracts 21(1), 1.	Monash University	Exmouth Gulf
	DBCA (2019) Ecological monitoring in the Shark Bay marine reserves, DBCA, Perth.	DBCA	Shark Bay
	Sutton AL and Shaw LL (2020) A snapshot of Marine Research in Shark Bay (Gathaagudu): Literature Review and Metadata Collection (1949-2020). West Australian Marine Science Institution, 180.	WAMSI	Shark Bay
	Sutton AL and Shaw JL (2021) Cumulative Pressures on the Distinctive Values of Exmouth Gulf. First draft report to the Department of Water and Environmental Regulation by the Western Australian Marine Science Institution, Perth, Western Australia. 272 pages.	WAMSI	Exmouth Gulf
	DBCA (2023) DBCA Annual Report 2022–23, Department of Biodiversity, Conservation and Attractions, Perth. Primary productivity and energy transfer between marine ecosystems (SP 2020-002)	DBCA	Dampier Archipelago
	Lincoln G, Mathews D, Oades D with the Balanggarra, Bardi Jawi, Dambimangari, Karajarri, Mayala, Nyangumarta, Nyul Nyul, Wunambal Gaambera & Yawuru ISWAG members (2021) The Kimberley Indigenous Turtle & Dugong Initiative 2021-2031. Prepared by Mosaic Environmental for the Kimberley Indigenous Saltwater Advisory Group (ISWAG) Broome 2021	Coordinated by the Kimberley Indigenous Saltwater Advisory Group, implemented by Kimberley Saltwater Communities, supported by Western Science Partners	Kimberley
	Astron Environmental Services (2021) Varanus and Bridled Islands Mangrove Monitoring – Annual Report 2020, unpublished report to Santos WA Energy Limited	Santos	Varanus Island Bridled Island
	Ground-truthing satellite imagery that is utilised to monitor mangrove extent/density at Montebello Islands	DBCA	Montebello Islands
	Port of Broome- Ongoing Marine Monitoring Program. By O2 Marine for Kimberley Ports Authority	Kimberley Ports Authority	Broome Kimberley
	WAMSI- Mardie Off Set Plan	WAMSI	Pilbara Coast Gnoorea Yammadery Onslow Giralia Bay
Benthic habitat	Chevron (2019) Jansz-Io Subsea Compression Benthic Video Footage Review (G7-NT-REPX0000239)	Chevron	Jansz-Io Field
	Chevron (2022) WHS Platform Environmental Monitoring Program - DRAFT REPORT 60672341, Wheatstone Platform 5 Yearly Monitoring Technical Report-Rev A	Chevron	Wheatstone Platform
	Chevron (2022) Gorgon Backfill Fields Benthic Survey (ABU230100068)	Chevron	Gorgon Backfill Fields
	Chevron (2023) Thevenard Island Retirement Project Heavy Lift Vessel Anchor Spread Benthic Habitat Mapping- Survey Report	Chevron	Thevenard Island

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	DBCA (long term-monitoring) Ningaloo Reef Program	DBCA	Ningaloo
	Wahab MA, Radford B, Cappo M, Colquhoun J, Stowar M, Depczynski M, Miller K, Heyward A (2018) Biodiversity and spatial patterns of benthic habitat and associated demersal fish communities at two tropical submerged reef ecosystems. Coral Reefs, 37, 327-343, 10.1007/s00338-017-1655-9	AIMS	Glomar Shoal Rankin Bank
	O2 Marine (2019). Mardie project- Sediment Sampling and Analysis Plan Results. Prepared for Mardie Minerals Pty Ltd. Report Number R190033	O_2 Marine	Mardie
	O2 Marine (2019). Mardie Project - Subtidal Benthic Communities and Habitat Baseline Assessment. Prepared for Mardie Minerals Pty Ltd. Report Number R190045.	O_2 Marine	Mardie
	Jones R, Wakeford M, Currey-Randall L, Miller K, Tonin H (2021) Drill cuttings and drilling fluids (muds) transport, fate and effects near a coral reef mesophotic zone. Marine Pollution Bulletin 172, 112717	AIMS	Glomar Shoal Rankin Bank
	O2 Marine (2021) Benthic Communities and Habitat Ashburton Infrastructure Project, Fremantle, WA. Prepared for Mineral Resources Limited	O_2 Marine	Ashburton Onslow area
	O2 Marine (2021). Onslow Seawater Desalination Plant. Benthic Communities and Habitat. Report No. R200065. Prepared for the Water Corporation.	O_2 Marine	Onslow area
	360 Environmental (2017) Learmonth Habitat Surveys. Prepared for Subsea 7	Subsea 7	Exmouth Gulf
	Advisian (2019) Dampier Archipelago Commonwealth Waters Marine Benthic Habitat Survey. Prepared for Woodside Energy Ltd	Woodside	Dampier Archipelago
	MScience (2019) Scarborough Trunkline Marine Environmental Studies- Pre-dredging Coral Habitat Assessment. Report to Advisian	Advisian	Dampier Archipelago Dampier Angle Island Burrup Peninsula Conzinc Island Gidley Island Intercourse Island Malus Island Middle Island
	Woodside (ongoing unpublished data) Chemical and Ecological Monitoring of Mermaid Sound	Woodside	Burrup Peninsula Dampier
	AECOM (2022) Assessment of Benthic Communities and Habitats Ashburton Salt Project. Prepared for K + S Australian Pty Ltd. Doc No. 60692048_4.	K + S Australian Pty Ltd	Ashburton Onslow area
	O2 Marine and Teal Solutions (2019) Port Hedland Spoilbank Marina Sediment Sampling and Analysis Plan Implementation Report. Prepared for the Department of Transport. Report Number R190209	O_2 Marine	Port Hedland

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	BMT (2020) Technical Note. Learmonth Benthic Habitat Survey. Prepared for MBS Environmental	BMT	Exmouth Gulf
	Advisian (2019) Scarborough Offshore Benthic Marine Habitat Assessment. Prepared for Woodside	Woodside	Scarborough permit area WA-1-R
	Advisian (2019) Montebello Marine Park Benthic Habitat Survey ROV Analysis of the Scarborough Pipeline Route. Prepared for Woodside	Woodside	Montebello Australian Marine Park
	Moustaka M, Mohring M, Holmes T, Evans R , Thomson D, Nutt C, Stoddart J, Wilson S (2019) Cross-shelf Heterogeneity of Coral Assemblages in Northwest Australia, Diversity, vol. 11, 15pp.	DBCA Marine Science	Dampier Archipelago Regnard Island Eaglehawk Island Dockrell Reef Enderby Island Goodwyn Island Malus Island Conzinc Island Gidley Island Hammersley Shoal Legendre Island Delambre Island
	Thompson DP, Babcock RC, Evans RD, Feng M, Moustaka M, Orr M, Slawinski D, Wilson S, Hoey A (2021) Coral larval recruitment in north-western Australia predicted by regional and local conditions. Marine Environmental Research 168: 105318	CSIRO	Dampier Archipelago Regnard Island Eaglehawk Island Dockrell Reef Enderby Island Goodwyn Island Malus Island Conzinc Island Gidley Island Hammersley Shoal Legendre Island Delambre Island
	Adam A., Thomas L, Underwood J, Gilmour J, Richards Z (2022) Population connectivity and genetic offset in the spawning coral *Acropora digitifera* in Western Australia. Molecular Ecology.	Curtin University	Ashmore Reef Lalang-garram Marine Park Reefs Beagle Reef Adele Island

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
			Clerke Reef Mermaid Reef Imperieuse Reef Ningaloo Station Gnaraloo Quobba
	Doropoulos C, Gomez-Lemos LA, Salee K, McLaughlin MJ, Tebben J, Van Koningsveld M, Feng M, Babock R (2021). Limitations to coral recovery along an environmental stress gradient. Ecological Applications. 2022;32:e2558.	CSIRO	Exmouth Gulf Exmouth Ningaloo Coral Bay
	Edgeloe JM, Severn-Ellis AA, Bayer PE, Mehravi S, Breed MF, Krauss SL, Batley J, Kendrick GA, Sinclair EA. 2022. Extensive polyploid clonality was a successful strategy for seagrass to expand into a newly submerged environment. Proc. R. Soc. B20220538.https://doi.org/10.1098/rspb.2022.0538	UWA	Shark Bay
	McLean D and Birt M. (2021) Enhanced ROV survey of tropical fish and benthic communities associated with shallow oil and gas platforms. Research Square	AIMS	Varanus Island
	Sutton AL and Shaw LL (2020) A snapshot of Marine Research in Shark Bay (Gathaagudu): Literature Review and Metadata Collection (1949-2020). West Australian Marine Science Institution, 180.	WAMSI	Shark Bay
	Sutton AL and Shaw JL (2021) Cumulative Pressures on the Distinctive Values of Exmouth Gulf. First draft report to the Department of Water and Environmental Regulation by the Western Australian Marine Science Institution, Perth, Western Australia. 272 pages.	WAMSI	Exmouth Gulf
	DBCA (2023), Biodiversity and Conservation Science Annual Report 2022–23, DBCA, Perth. Primary productivity and energy transfer between marine ecosystems (SP 2020-002)	DBCA	Dampier Archipelago
	DBCA (2023), Biodiversity and Conservation Science Annual Report 2022–23, DBCA, Perth. Understanding the key ecosystem services provided by the seagrass meadows of Western Australia (SP 2018-136)	DBCA	Shark Bay
	National Reef Monitoring Network	The IMOS National Reef Monitoring Network sub-Facility	Houtman Abrolhos Islands Ningaloo Coast World Heritage Area Exmouth Gulf Dampier Archipelago Island Group Barrow Island Montebello Islands Group Ashmore Reef

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
			Cartier Island Darwin Harbour Arafura Arnhem Marmion Rottnest Island Geographe Bay
	Ningaloo Outlook	CSIRO	Ningaloo Coast World Heritage Area
	Gilmour JP, Cook KL, Ryan NM, Puotinen ML, Green, RH, Shedrawi G, Hobbs J-P A, Thompson, DP, Badcock, R, Buckee J, Foster T, Richards ZT, Wilson SK, Barnes PB, Coutts TB, Radford BT, Piggott CH, Depczynski M, Evans SN, Schoepf V, Evans RD, Halford AR, Nutt CD, Bancroft KP, Heyward AJ, Oades D (2019) The state of Western Australia's coral reefs. Coral Reefs https://doi.org/10.1007/s00338-019-01795-8	AIMS	Western Australia Cocos Keeling Islands Ashmore Reef Scott Reef Rowley Shoals Montebello Islands Group Barrow Island Ningaloo Reef Shark Bay
	Lincoln G, Mathews D, Oades D with the Balanggarra, Bardi Jawi, Dambimangari, Karajarri, Mayala, Nyangumarta, Nyul Nyul, Wunambal Gaambera & Yawuru ISWAG members (2021) The Kimberley Indigenous Turtle & Dugong Initiative 2021-2031. Prepared by Mosaic Environmental for the Kimberley Indigenous Saltwater Advisory Group (ISWAG) Broome 2021	Coordinated by the Kimberley Indigenous Saltwater Advisory Group, implemented by Kimberley Saltwater Communities, supported by Western Science Partners	Kimberley
	Heyward A, Miller K, Fromont J, Keesing J, Parnum I (EDS.) (2018). Kimberley Benthic Biodiversity Synthesis Report of Project 1.1.1 prepared for the Kimberley Marine Research Program, Western Australian Marine Science Institution, Perth, Western Australia, 57pp.	WAMSI AIMS	Kimberley Camden Sound Bonaparte Archipelago Eclipse Archipelago Lalang-garram Marine Park Reefs
	Port of Broome- Ongoing Marine Monitoring Program. By O2 Marine for Kimberley Ports Authority	Kimberley Ports Authority	Broome Kimberley

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Biota Environmental Sciences (2019) Asian Renewable Energy Hub Environmental Review Document, Assessment Number 2140, Appendix 2 Benthic Communities and Habitat Survey. Prepared by BMT	BMT for Asian Renewable Hub (NW Interconnected Power)	Eighty Mile Beach
	Proposed Browse to North West Shelf Project, Appendix D.1: Browse to NWS Project Trunkline Route Surveys (2019) Environmental Survey Report. Neptune Document J11200-1-RR-006	Advisian/Neptune	Kimberley Marine Park Continental Slope Demersal Fish KEF Agro-Rowley Terrace Marine Park Ancient Coastline at 125 m Depth Contour KEF
	O2 Marine (2020). Kimberley Marine Offloading Facility - Benthic Infauna Survey. O2 Marine Report Number T200073. Perth, Western Australia	O2 Marine	Broome Roebuck Bay
	Evans RD, Wilson SK, Fisher R, Ryan NM, Babcock R, Blakeway D, Bond T, Dorji P, Dufois F, Fearns P, Lowe RJ, Stoddart J, Thomson DP (2020) Early recovery dynamics of turbid coral reefs after recurring bleeching events. Journal of Environmental Management 268 110666	DBCA	West pilbara
	Helmholz P, Bassett T, Boyle L, Browne N, Parnum I, Moustaka M, Evans R (2024) Evaluating Linear Coral Growth Estimation Using Photogrammetry and Alternative Point Cloud Comparison Method. The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, Volume XLVIII-2-2024 ISPRS TC II Mid-term Symposium “The Role of Photogrammetry for a Sustainable World”, 11–14 June 2024, Las Vegas, Nevada, USA	Curtin University	Enderby Island, Dampier Archipelago
	Moustaka M, Evans RD, Kendrick GA, Hyndes GA, Cuttler MVW, Bassett TJ, O’Leary MJ, Wilson SK (2024) Local habitat composition and complexity outweigh seascape effects on fish distribution across a tropical seascape. Landsc Ecol 39:28 https://doi.org/10.1007/s10980-024-01814-2	DBCA	Dampier Archipelago
	Travaglione N, Evans R, Moustaka M, Cuttler M, Thompson DP, Tweedy J, Wilson (2023) Scleractininan corals rely on heterotrophy in highly turbid environments. Coral Reefs https://doi.org/10.1007/s00338-023-02407-2	AIMS	Dampier Archipelago
Marine fish and elasmobranchs	Chevron (2019) Jansz-Io Subsea Compression Benthic Video Footage Review (G7-NT-REPX0000239)	Chevron	Jansz-Io field
	Chevron (2021) Wheatstone Sawfish Progress Report	Chevron	Onslow area
	Chevron (2022) Gorgon Backfill Fields Benthic Survey 2022 (ABU230100068)	Chevron	Gorgon Backfill Fields
	DBCA (long term-monitoring) Ningaloo Reef Program	DBCA	Ningaloo
	Wahab MAA, Radford B, Cappo M, Colquhoun J, Stowar M, Depczynski M, Miller K, Heyward A (2018) Biodiversity and spatial patterns of benthic habitat and associated demersal fish communities at two tropical submerged reef ecosystems Coral Reefs, 37, 327-343, 10.1007/s00338-017-1655-9	AIMS	Glomar Shoal Rankin Bank

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Jones R, Wakeford M, Currey-Randall L, Miller K, Tonin H (2021) Drill cuttings and drilling fluids (muds) transport, fate and effects near a coral reef mesophotic zone. Marine Pollution Bulletin 172, 112717	AIMS	Glomar Shoal Rankin Bank
	Morgan D, Lear K, Norman B (2020) Sawfish surveys Urala Creek, Exmouth Gulf, February 2019. Report to AECOM. Centre for Sustainable Aquatic Ecosystems, Harry Butler Institute, Murdoch University, Perth, Western Australia	Murdoch University	Ashburton Exmouth Gulf
	Schramm KD, Marnane MJ, Elsdon TS, Jones CM, Saunders BJ, Newman SJ, Harvey ES (2021) Fish associations with shallow water subsea pipelines compared to surrounding reef and soft sediment habitats. Sci Rep 11, 6238 . https://doi.org/10.1038/s41598-021-85396-y	Curtin University	Thevenard Island
	Galaiduk R, Radford B, Case M, Bond T, Taylor M, Cooper T, Smith L and McLean D (2022) Regional patterns in demersal fish assemblages among subsea pipelines and natural habitats across north-west Australia. Front. Mar. Sci. 9:979987. doi: 10.3389/fmars.2022.979987	AIMS	Rankin Bank Glomar Shoal Thevenard Island
	Currey-Randall LM, Galaiduk R, Stowar M, Vaughan BI, Miller KJ (2021) Mesophotic fish communities of the ancient coastline in Western Australia. PLoS ONE 16(4): e0250427. https://doi. org/10.1371/journal.pone.0250427	AIMS	Locations associated with the ancient coastline KEF at depths greater than 125 m
	McLean D and Birt M. (2021) Enhanced ROV survey of tropical fish and benthic communities associated with shallow oil and gas platforms. Research Square	AIMS	Varanus Island
	McLean DL, Vaughan BI, Malseed BE, Taylor MD (2020) Fish-habitat associations on a subsea pipeline within an Australian Marine Park, Marine Environmental Research 123, 104813	AIMS	Montebello Australian Marine Park
	Sutton AL and Shaw LL (2020) A snapshot of Marine Research in Shark Bay (Gathaagudu): Literature Review and Metadata Collection (1949-2020). West Australian Marine Science Institution, 180.	WAMSI	Shark Bay
	Sutton AL and Shaw JL (2021) Cumulative Pressures on the Distinctive Values of Exmouth Gulf. First draft report to the Department of Water and Environmental Regulation by the Western Australian Marine Science Institution, Perth, Western Australia. 272 pages.	WAMSI	Exmouth Gulf
	DBCA (2023), Biodiversity and Conservation Science Annual Report 2022–23, Department of Biodiversity, Conservation and Attractions, Perth. Benefits of marine parks for marine fishes in a changing climate (SP 2021-040)	DBCA	WA State Marine Parks
	DBCA (2023), Biodiversity and Conservation Science Annual Report 2022–23, Department of Biodiversity, Conservation and Attractions, Perth. Do marine reserves adequately represent high diversity cryptobenthic fish assemblages in a changing climate? (SP 2019-031)	DBCA	Ningaloo
	National Reef Monitoring Network	The IMOS National Reef Monitoring Network sub-Facility	Houtman Abrolhos Islands Ningaloo Coast World Heritage Area Exmouth Gulf

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
			Dampier Archipelago Island Group Barrow Island Montebello Islands Group Ashmore Reef Cartier Island Darwin Harbour Arafura Arnhem Marmion Rottnest Island Geographe Bay
	Lear KO, Ebner BC, Fazeldean T, Bateman RL, Morgan DL (2024) Effects of coastal development on sawfish movements and the need for marine animal crossing solutions. Conservation Biology, e14263. https://doi.org/10.1111/cobi.14263	Murdoch University	Onslow area
	Feutry P, Laird A, Davies CL, Devloo-Delva F, Fry G, Johnson G, Gunasekara RM, Marthick J, Kyne PM (2021) Population structure of Narrow Sawfish *Anoxypristis cuspidata* across northern Australia. Report to the National Environmental Science Program Marine Biodiversity Hub. CSIRO, Charles Darwin University, and NPF Industry Pty Ltd.	CSIRO	Kimberley Northern Territory coastline
	Heupel M, Simpfendorfer C, Chin A, Appleyard S, Barton D, Green M, Johnson G, McAuley R and White W (2020) Examination of connectivity of hammerhead sharks in northern Australia. Report to the National Environmental Science Program, Marine Biodiversity Hub. Australian Institute of Marine Science.	AIMS	Exmouth Gulf Broome
	Morgan DL, Lear KO, Dobinson E, Gleiss AC, Fazeldean T, Pillans RD, Beatty SJ and Whitty JM (2021) Seasonal use of a macrotidal estuary by the endangered dwarf sawfish, *Pristis clavata*. Aquatic Conservation Marine and Freshwater Ecosystems 31(8):2164–2177. doi: 10.1002/aqc.3578	CSIRO	Kimberley Fitzroy River King Sound
	Port of Broome- Ongoing Marine Monitoring Program. By O2 Marine for Kimberley Ports Authority	Kimberley Ports Authority	Broome Kimberley
	West K, Travers MJ, Stat M, Harvey ES, Richards ZT, DiBattista JD, Newman SJ, Harry A, Skepper CL, Heydenrych M, Bunce M (2021) Large-scale eDNA metabarcoding survey reveals marine biogeographic break and transitions over tropical north-western Australia. Divers Distrib. 27: 1942–1957. https://doi.org/10.1111/ddi.13228	Trace and Environmental DNA (TrDNA) Laboratory, Curtin University	Kimberley
	Moustaka M, Evans RD, Kendrick GA, Hyndes GA, Cuttler MVW, Bassett TJ, O'Leary MJ, Wilson SK (2024) Local habitat composition and complexity outweigh seascape effects on fish distribution across a tropical seascape. Landsc Ecol 39:28 https://doi.org/10.1007/s10980-024-01814-2	DBCA	Dampier Archipelago

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Tebbett SB, Bellwood DR, Bassett T, Cuttler MVW, Moustaka M, Wilson SK, Yan HF, Evans RD (2023) The limited role of herbivorous fishes and turf-based trophic pathways in the functioning of turbid coral reefs. Rev Fish Biol Fisheries https://doi.org/10.1007/s11160-023-09823-1	Curtin University	Dampier Archipelago
Fisheries	Sutton AL and Shaw JL (2021) Cumulative Pressures on the Distinctive Values of Exmouth Gulf. First draft report to the Department of Water and Environmental Regulation by the Western Australian Marine Science Institution, Perth, Western Australia. 272 pages.	WAMSI	Exmouth Gulf
	DBCA (2023), Biodiversity and Conservation Science Annual Report 2022–23, Department of Biodiversity, Conservation and Attractions, Perth. Benefits of marine parks for marine fishes in a changing climate (SP 2021-040)	DBCA	WA State Marine Parks
	DBCA (2023), Biodiversity and Conservation Science Annual Report 2022–23, Department of Biodiversity, Conservation and Attractions, Perth. Do marine reserves adequately represent high diversity cryptobenthic fish assemblages in a changing climate? (SP 2019-031)	DBCA	Ningaloo
	National Reef Monitoring Network	The IMOS National Reef Monitoring Network sub-Facility	Houtman Abrolhos Islands Ningaloo Coast World Heritage Area Exmouth Gulf Dampier Archipelago Island Group Barrow Island Montebello Islands Group Ashmore Reef Cartier Island Darwin Harbour Arafura Arnhem Marmion Rottnest Island Geographe Bay
	State of the Fisheries Report (Western Australia)	DPIRD	WA's major commercial and recreational fisheries
	DPIRD (2020). Western Australian Marine Stewardship Council Report Series No. 16: Ecological Risk Assessment of the Shark Bay Invertebrate Fisheries. DPIRD, Western Australia.	DPIRD	Shark Bay

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Bartes S and Braccini JM (2021) Potential expansion in the spatial distribution of subtropical and temperate west Australian sharks. Journal of Fish Biology. doi:10.1111/jfb.14822	DPIRD	Fisheries included: Bigeye sixgill (*Hexanchus nakamurai*) Tiger shark (*Galeocerdo cuvier*) Spinner shark (*Carcarhinus brevipinna*) Scalloped hammerhead (*Sphyrna lewini*) Broadnose sevengill sharks (*Notorhyncus cepedianus*) Southern sawsharks (*Pristiophorus nudipinnis*)
	Langlois TJ, Wakefield CB, Harvey ES, Boddington DK and Newman SJ (2021). Does the benthic biota or fish assemblage within a large targeted fisheries closure differ to surrounding areas after 12 years of protection in tropical north-western Australia? Marine Environmental Research 170: 105403.	DPIRD	Fishery: Pilbara demersal scalefish fisheries
	Yeoh D, Johnston D and Harris D (2021) Squid and cuttlefish resources of Western Australia. Fisheries Research Report No. 314 Department of Primary Industries and Regional Development, Western Australia. 101pp	DPIRD	Squid and cuttlefish
	DPIRD (2020) Western Australian Marine Stewardship Council Report Series No. 17: Ecological Risk Assessment of the Exmouth Gulf Prawn Managed Fishery. DPIRD, Western Australia.	DPIRD	Exmouth Gulf
	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	
	Sutton AL and Shaw LL (2020) A snapshot of Marine Research in Shark Bay (Gathaagudu): Literature Review and Metadata Collection (1949-2020). West Australian Marine Science Institution, 180.	WAMSI	Shark Bay
	Meteyard, B (2024) Northern Prawn Fishery Data Summary 2023. NPF Industry Pty Ltd, Australia	Northern Prawn Fishery PTY Ltd	Kimberley Northern Territory
	Lynch TP, Smallwood CB, Ochwada-Doyle FA, Lyle J, Williams J, Ryan KL, Devine C, Gibson B, Jordan A (2020) A cross continental scale comparison of Australian offshore recreational fisheries research and its applications to Marine Park and fisheries management. – ICES Journal of Marine Science, 77 (3): 1190–1205.	CSIRO	Australia wide
Reptiles	Chevron (2022) Gorgon Gas Development - Marine Turtle Monitoring Program 2021/22: Barrow Island and Mundabullangana ABU220800133	Chevron	Barrow Island Mundabullangana

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Wilson P, Thums M, Pattiaratchi C, Whiting S, Pendoley K, Ferreira L, Meekan M (2019) High predation of marine turtle hatchlings near a coastal jetty. Biological Conservation, 236	UWA/DBCA	Thevenard Island
	Rob D, Barnes P, Whiting S, Fossette S, Tucker T and Mongan T (2019) Turtle activity and nesting on the Muiron Islands and Ningaloo Coast: Final Report 2018, Ningaloo Turtle Program. Report prepared for Woodside Energy Limited. Department of Biodiversity, Conservation and Attractions, Exmouth, pp.51.	DBCA	Cape Range National Park North West Cape Muiron Islands North Muiron Island South Muiron Island Sunday Island Bungelup
	Tucker T, Whiting S, Fossette S, Rob D, Barnes P (2020). Inter-nesting and migrations by marine turtles of the Muiron Islands and Ningaloo Coast. Final Report. Prepared for Woodside Energy Limited. Department of Biodiversity, Conservation and Attractions, Perth. pp. 1-93	DBCA	Muiron Islands North Muiron Island South Muiron Island North West Cape Cape Range National Park Bungelup
	Ferreira LC, Thums M, Fossette S, Wilson P, Shimada T, Tucker A, Pendoley K, Waayers D. Guinea ML, Loewenthal G, King J, Speirs M, Rob D, Whiting SD (2020) Multiple satellite tracking datasets inform green turtle conservation at a regional scale. Diversity and Distribution 27: 249-266	AIMS	Rosemary Island Legendre Island Middle Passage Island Barrow Island Muiron Islands Ningaloo Coast World Heritage Area Montebello Islands Group Lacepede Islands Maret Island Scott Reef
	Fossette S, Loewenthal G, Peel LR, Vitenbergs A, Hamel MA, Douglas C, Tucker AD, Mayer F, Whiting SD (2021) Using Aerial Photogrammetry to Assess Stock-Wide Marine Turtle Nesting Distribution, Abundance and Cumulative Exposure to Industrial Activity. Remote Sens, 13, 1116.	DBCA	Y Island Locker Island Onslow Area Mainland Coast Ashburton Island Thevenard Island

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
			Barrow Island Long Island Dampier Mainland Coast Rosemary Island West Mid Intercourse Island East Lewis Island Legendre Island Hauy Island Delambre Island Karratha Downes Island Bedout Island Port Hedland Mainland Coast Mundabullangana Cape Lambert Exmouth Gulf
	Pendoley Environmental (2018). Marine turtle survey of Mardie Salt Project Area - December 2017. January 2018. Prepared for Phoenix Environmental	Pendoley Environmental	Mardie
	Pendoley Environmental (2019). Mardie Salt Project: Marine turtle monitoring program 2018/2019. April 2019. Prepared for BCI Minerals Ltd.	Pendoley Environmental	Mardie Angle Island Long Island Middle Island Round Island Sholl Island
	Ningaloo Turtle Program	DBCA	North West Cape Cape Range National Park Bungelup
	Rosemary Island Turtle Monitoring Program	DBCA	Rosemary Island
	West Pilbara Turtle Program	DBCA	Karratha Cleaverville

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
			Wickham
	North West Shelf Flatback Turtle Monitoring Program	DBCA	Thevenard Island Delambre Island Karratha Port Hedland Mainland Coast Eighty Mile Beach Echo Beach Cable Beach Cape Domett
	Care for Headland Turtle Program	Care for Hedland	Port Hedland area
	Dirk Hartog Island Loggerhead Monitoring	DBCA	Dirk Hartog Island
	AECOM (2022) Marine Fauna Impact Assessment Ashburton Salt Project. Doc No. 60597242_3	AECOM	Ashburton Locker Island
	Keesing, J.K. (Ed.) (2019). Benthic habitats and biodiversity of the Dampier and Montebello Australian Marine Parks. Report for the Director of National Parks. CSIRO, Australia	CSIRO	Dampier Marine Park Montebello Australian Marine Park
	Gammon M, Whiting S, Fossette S (2023) Vulnerability of sea turtle nesting sites to erosion and inundation: A decision support framework to maximize conservation. Ecosphere, 14(6), e4529. https://doi.org/10.1002/ecs2.4529	UWA/DBCA	Y Island Locker Island Onslow Area Mainland Coast Ashburton Island Thevenard Island Barrow Island Long Island Dampier Mainland Coast Rosemary Island West Mid Intercourse Island East Lewis Island Legendre Island Hauy Island Delambre Island

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
			Karratha Downes Island Bedout Island Port Hedland Mainland Coast Mundabullangana Cape Lambert
	FitzSimmons N N, Pittard SD, McIntyre N, Jensen MP, Guinea M, Hamann M, Kennett R, et al. (2020). Phylogeography, Genetic Stocks, and Conservation Implications for an Australian Endemic Marine Turtle. Aquatic Conservation 30 (3): 440–60. https://doi.org/10.1002/aqc.3270.	Griffith University/DBCA	Barrow Island Delambre Island Mundabullangana Port Hedland Mainland Coast Eighty Mile Beach Echo Beach Cape Domett
	Thums M, Udyawer V, Galaiduk R, Ferreira L, Streten C, Radford B (2021) Using Marine Turtles to Identify Habitat and Assess Connectivity of the North and North-West Marine Park Networks and Sea Country: Exploration Study of Data and Partnerships. Report prepared for Parks Australia. Australian Institute of Marine Science, Perth. 48pp.	AIMS	Miaboolya Beach Quobba Shark Bay Ningaloo Coast World Heritage Area Muiron Islands Barrow Island Great Sandy Island Eighty Mile Beach Scott Reef Kimberley Roebuck Bay Joseph Bonaparte Gulf Lalang-garram Marine Park Reefs Oceanic Shoals Thevenard Island Echo Beach Montebello Islands Group

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
			Camden Sound Horizontal Falls
	Sutton AL and Shaw LL (2020) A snapshot of Marine Research in Shark Bay (Gathaagudu): Literature Review and Metadata Collection (1949-2020). West Australian Marine Science Institution, 180.	WAMSI	Shark Bay
	Sutton AL and Shaw JL (2021) Cumulative Pressures on the Distinctive Values of Exmouth Gulf. First draft report to the Department of Water and Environmental Regulation by the Western Australian Marine Science Institution, Perth, Western Australia. 272 pages.	WAMSI	Exmouth Gulf
	Fossette S, Ferreira L C, Whiting SD, King J, Pendoley K, Shimada T, Speirs M, Tucker A D, Wilson P, Thums M (2021) Movements and distribution of hawksbill turtles in the Eastern Indian Ocean. Global Ecology and Conservation, 29, e01713. https://doi.org/10.1016/j.gecco.2021.e01713	DBCA	Beacon Island Delambre Island Rosemary Island Varanus Island Montebello Islands Group
	Pillans RD, Whiting S, Tucker T, Vanderklift MA (2022) Fine-scale movement and habitat use of juvenile, subadult, and adult green turtles (*Chelonia mydas*) in a foraging ground at Ningaloo Reef, Australia. Aquatic Conservation: Marine and Freshwater Ecosystems 32 1323-1340	CSIRO	Ningaloo
	Gammon M, Whiting S, Fossette S (2023) Vulnerability of sea turtle nesting sites to erosion and inundation: a decision support framework to maximize conservation. Ecosphere 14: e4529	UWA/DBCA	Pilbara southern islands Pilbara northern islands Onslow area Thevenard Island Barrow Island Montebello Islands Dampier Archipelago Karratha Mundabullangana Cemetery Beach
	Ferreira LC, Thums M, Whiting S, Meekan M, Andrews-Goff V, Attard CRM, Bilgmann K, Davenport A, Double M, Falchi F, Guinea M, Hickey SM, Jenner C, Jenner M, Loewenthal G, McFarlane G, Möller LM, Norman B, Peel L, Pendoley K, Radford B, Reynolds S, Rossendell J, Tucker A, Waayers D, Whittock P, Wilson P and Fossette S (2023) Exposure of marine megafauna to cumulative anthropogenic threats in north-west Australia. Front. Ecol. Evol. 11:1229803. doi: 10.3389/fevo.2023.1229803	AIMS	Pilbara coast Kimberley Northern Territory coastline
	Ningaloo Outlook	CSIRO	Ningaloo Coast World Heritage Area

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Lambourne RN (2019) Classifying the diving behaviour of flatback turtles (*Natator depressus*) from multi-sensor tags. Honours thesis, Murdoch University	Murdoch University	Thevenard Island
	Udyawer V, D'Anastasi B, McAuley R, Heupel M (2016) Exploring the status of Western Australia's sea snakes. National Environmental Science Programme	AIMS	Shark Bay Ningaloo Coast World Heritage Area Port Hedland Rowley Shoals Oceanic Shoals
	Lincoln G, Mathews D, Oades D with the Balanggarra, Bardi Jawi, Dambimangari, Karajarri, Mayala, Nyangumarta, Nyul Nyul, Wunambal Gaambera & Yawuru ISWAG members (2021) The Kimberley Indigenous Turtle & Dugong Initiative 2021-2031. Prepared by Mosaic Environmental for the Kimberley Indigenous Saltwater Advisory Group (ISWAG) Broome 2021	Coordinated by the Kimberley Indigenous Saltwater Advisory Group, implemented by Kimberley Saltwater Communities, supported by Western Science Partners	Kimberley
	Tucker AD, Pendoley KL, Murray K, Loewenthal G, Barber C, Denda J, Lincoln G, Mathews D, Oades D, Whiting SD, et al. (2021) Regional Ranking of Marine Turtle Nesting in Remote Western Australia by Integrating Traditional Ecological Knowledge and Remote Sensing. Remote Sensing. 13(22):4696. https://doi.org/10.3390/rs13224696	DBCA WAMSI	Kimberley
	Santos Varanus Island Turtle Monitoring Program	Santos	Varanus Island
	Bayliss P, Raudino H, Hutton M, Murray K, Waples K and Strydom S (2019) Modelling the spatial relationship between dugon (Dugong dugon) and their seagrass habitat in Shark Bay Marine Park before and after the marine heatwave of 2010/11. Department of Agriculture, Water and the Environment Final Report 2.	CSIRO DBCA	Shark Bay Ningaloo Reef Exmouth Gulf
	Hounslow JL, Fossette S, Chong W, Bali R, Tucker AD, Whiting SD and Gleiss AC (2023) Behaviour-specific spatiotemporal patterns of habitat use by sea turtles revealed using biologging and supervised machine learning, Journal of Applied Ecology, 60(9):1828-1840. doi: 10.1111/1365-2664.14438	Murdoch University	Roebuck Bay
	West KM, Heydenrych M, Lines R, Tucker T, Fossette S, Whiting S and Bunce M (2023) Development of a 16S metabarcoding assay for the environmental DNA (eDNA) detection of aquatic reptiles across northern Australia, Marine and Freshwater Research 74(5):432-440. doi: 10.1071/MF20288	Curtin University	Roebuck Bay
	Whiting S, Tucker T, Pendoley K, Mitchell N, Bentley B, Berry O and FitzSimmons N (2018) Final Report of Proposal 1.2.2 prepared for the Kimberley Marine Research Program, Western Australian Marine Science Institution, Perth, Western Australia, 146 pp	DBCA WAMSI	Kimberley
	Thums Michele, Rossendell Jason, Fisher Rebecca, Guinea Michael L. (2020) Nesting ecology of flatback sea turtles *Natator depressus* from Delambre Island, Western Australia. Marine and Freshwater Research 71, 443-451.	AIMS	Delambre Island

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Schneider L, Tucker AD, Vincent K, Fossette S, Young EJ and Whiting SD (2022) First Assessment of Mercury (Hg) Concentrations in Skin and Carapace of Flatback Turtles (*Natator depressus*) (Garman) From Western Australia. Front. Environ. Sci. 10:843855. doi: 10.3389/fenvs.2022.843855	DBCA	Thevenard Island Eighty Mile Beach
	Gammon M, Whiting S, Fossette S (2023) Vulnerability of sea turtle nesting sites to erosion and inundation: a decision support framework to maximize conservation. Ecosphere 14: e4529	UWA DBCA	Pilbara southern islands Pilbara northern islands Onslow area Thevenard Island Barrow Island Montebello Islands Dampier Archipelago Karratha Mundabullangana Cemetery Beach
Marine megafauna (whale shark, dugong and cetaceans)	Chevron (2019) Soundscape monitoring at JIC site (G1-NT-REPX0000361)	Chevron	Barrow Island
	Chevron (2023) Soundscape Monitoring at the JIC Site 2021-2023	Chevron	Barrow Island
	Raudino HC, Hunt TN, Waples KA (2018) Records of Australian humpback dolphins (*Sousa sahulensis*) from an offshore island group in Western Australia. Marine Biodiversity Records 11:14	DBCA	Montebello Islands
	Raudino HC, Douglas CR, Waples KA (2018) How many dolphins live near a coastal development? Regional Studies in Marine Science 19: 25-32	DBCA	Onslow Area Thevenard Island
	Sprogis K and Parra G (2022) Coastal dolphin and marine megafauna in Exmouth Gulf, Western Australia: informing conservation management actions in an area under increasing human pressure. Wildlife Research, 50(6): 435-450	UWA	Exmouth Gulf
	Wild S, Krutzen M, Rankin M, Hoppitt W, Gerber L, Allen S (2019) Long-term decline in survival and reproduction of dolphins following a marine heatwave. Current Biology 29, R225-R240	University of Leeds	Shark Bay
	Thums M, Ferreira LC, Jenner C, Jenner M, Harris D, Davenport A, Andrews-Goff V, Double M, Moller L, Attard CRM, Bilgmann K, Thomson PG, McCauley R (2022) Pygmy blue whale movement, distribution and important areas in the Eastern Indian Ocean. Global Ecology and Conservation 35 e02054	AIMS	Western Australia
	ECOCEAN Whale Shark Photo-Identification Library	Ecocean	Ningaloo
	AIMS (2021) Individual haplotyping of whale sharks from seawater environmental DNA.	AIMS	Ningaloo

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Lester E, Meekan MG, Barnes P, Raudino H, Rob D, Waples K, Speed CW (2020) Multi-year patterns in scarring, survival and residency of whale sharks in Ningaloo Marine Park, Western Australia. Mar Ecol Prog Ser 634:115-125.	UWA	Ningaloo
	Irvine L and Salgado Kent C (2018) The distribution and relative abundance of marine mega-fauna, with a focus on humpback whales (*Megaptera novaeangliae*), in Exmouth Gulf, Western Australia.	Oceans Blueprint	Exmouth Gulf
	NESP MaC Project 3.10 - A partnership approach to filling key knowledge gaps on dugongs in northern Australia using novel technologies, 2023 -2026 (JCU, CDU, DBCA)	AIMS	Exmouth Gulf Ningaloo Shark Bay
	AIMS research on whale sharks	AIMS	Ningaloo
	Sprogis KR, Sutton AL, Jenner MN, McCauley RD, Jenner KCS (2022) Occurrence of cetaceans and seabirds along the Indian Ocean 110 E meridian from temperate to tropical waters. Deep-Sea Research II 205. 105184	Centre for Whale Research/UWA	Indian Ocean 110 E meridian from temperate to tropcial waters
	Haughey R, Hunt TN, Hanf D, Passadore C, Baring R and Parra GJ (2021) Distribution and Habitat Preferences of Indo-Pacific Bottlenose Dolphins (*Tursiops aduncus*) Inhabiting Coastal Waters With Mixed Levels of Protection. Front. Mar. Sci. 8:617518. doi: 10.3389/fmars.2021.617518	Flinders University	North West Cape Exmouth Gulf Ningaloo
	Cleguer C, Kelly N, Tyne J, Wieser M, Peel D and Hodgson A (2021) A Novel Method for Using Small Unoccupied Aerial Vehicles to Survey Wildlife Species and Model Their Density Distribution. Front. Mar. Sci. 8:640338. doi: 10.3389/fmars.2021.640338	Murdoch University	Exmouth Gulf
	Sutton AL and Shaw LL (2020) A snapshot of Marine Research in Shark Bay (Gathaagudu): Literature Review and Metadata Collection (1949-2020). West Australian Marine Science Institution, 180.	WAMSI	Shark Bay
	Sutton AL and Shaw JL (2021) Cumulative Pressures on the Distinctive Values of Exmouth Gulf. First draft report to the Department of Water and Environmental Regulation by the Western Australian Marine Science Institution, Perth, Western Australia. 272 pages.	WAMSI	Exmouth Gulf
	Raudino HC, Bouchet PJ, Douglas C, Douglas R, Waples K (2023) Aerial abundance estimates for two sympatric dolphin species at a regional scale using distance sampling and density surface modelling. Front. Ecol. Evol. 10:1086686. doi: 10.3389/fevo.2022.1086686	DBCA	Exmouth Gulf Onslow Area Ashburton Dampier Area Dampier Archipelago Karratha Porth Hedland Area Eighty Mile Beach Southern Pilbara Islands

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
			Northern Pilbara Islands Great Sandy Island
	D'Cruz A, Salgado Kent C, Waples K, Brown AM, Marley SA, Thiele D, Yawuru PBC and Raudino HC (2022) Ranging Patterns and Site Fidelity of Snubfin Dolphins in Yawuru Nagulagun/Roebuck Bay, Western Australia. Front. Mar. Sci. 8:758435. doi: 10.3389/fmars.2021.758435	Edith Cowan University	Broome Roebuck Bay
	DBCA (2023), Biodiversity and Conservation Science Annual Report 2022–23, Department of Biodiversity, Conservation and Attractions, Perth.	DBCA	Roebuck Bay
	Lester E, Canon T, Arujo G (2023) Whale sharks (*Rhincodon typus*) feed on baitfish with other predators at Ningaloo Reef. Pacific Conservation Biology 29 86-87	DBCA	Coral Bay Ningaloo
	Palmer C, Martien KK, Raudino H, Robertson KM, Withers A, Withers E, Risk R, Cooper D, D'Cruz E, Jungine E, Barrow D, Cuff N, Lane A, Keynes D, Waples K, Malpartida A and Banks S (2023) Evidence of resident coastal population(s) of false killer whales (*Pseudorca crassidens*) in northern Australian waters. Front. Mar. Sci. 9:1067660. doi: 10.3389/fmars.2022.1067660	Charles Darwin University	Exmouth Gulf Pilbara Coast Islands Southern Pilbara Islands and Coast Eighty Mile Beach Broome Lalang-garram Marine Park Reefs Darwin Harbour Tiwi Islands Groote Archipelago
	Ferreira LC, Thums M, Whiting S, Meekan M, Andrews-Goff V, Attard CRM, Bilgmann K, Davenport A, Double M, Falchi F, Guinea M, Hickey SM, Jenner C, Jenner M, Loewenthal G, McFarlane G, Möller LM, Norman B, Peel L, Pendoley K, Radford B, Reynolds S, Rossendell J, Tucker A, Waayers D, Whittock P, Wilson P and Fossette S (2023) Exposure of marine megafauna to cumulative anthropogenic threats in north-west Australia. Front. Ecol. Evol. 11:1229803. doi: 10.3389/fevo.2023.1229803	AIMS	Shark Bay Ningaloo Coast World Heritage Area Kimberley
	Ningaloo Outlook	CSIRO	Ningaloo Coast World Heritage Area
	Bouchet PJ, Thiele D, Marley SA, Waples K, Weisenberger F, Balanggarra Rangers, Bardi Jawi Rangers, Dambimangari Rangers, Nyamba Buru Yawuru Rangers, Nyul Nyul Rangers, Uunguu rangers, Raudino H (2021) Regional Assessment of the Conservation Status of Snubfin Dolphins (*Orcaella heinsohni*) in the Kimberley Region , Western Australia, Frontiers in Marine Science, 7(January), pp. 1–20.	Universtiy of St Andrews DBCA	Kimberley Roebuck Bay Cygnet Bay Prince Regent River Cambridge Gulf
	Brown AM, Bejder L, Pollock KH, Allen SJ (2016) Site-specific assessments of the abundance of three inshore dolphin species to inform conservation and management, Frontiers in Marine Science, 3(FEB), pp. 1–18.	Murdoch University	Kimberley Roebuck Bay

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
			Beagle Bay Cygnet Bay Cone Bay Cambridge Gulf Buccaneer Archipelago
	Brown AM, Smith J, Salgado Kent C, Marley S, Allen SJ, Thiele D, Bejder L, Erbe C, Chabanne D (2017) Relative abundance, population genetic structure and acoustic monitoring of Australian snubfin and humpback dolphins in regions within the Kimberley, Report of Project 1.2.4 for the Kimberley Marine Research Program. Western Australian Marine Science Institute, Perth.	Murdoch University	Kimberley Roebuck Bay Cygnet Bay Yampi Sound Prince Regent River Cambridge Gulf Buccaneer Archipelago
	Jarolimek CV, King J J, Apte SC., Hall J, Gautam A, Gillmore M, Doyle C (2023) A review of inorganic contaminants in Australian marine mammals, birds and turtles. Environmental Chemistry 20, 147-170. https://doi.org/10.1071/EN23057	CSIRO	Australia wide
	Lincoln G, Mathews D, Oades D with the Balanggarra, Bardi Jawi, Dambimangari, Karajarri, Mayala, Nyangumarta, Nyul Nyul, Wunambal Gaambera & Yawuru ISWAG members (2021) The Kimberley Indigenous Turtle & Dugong Initiative 2021-2031. Prepared by Mosaic Environmental for the Kimberley Indigenous Saltwater Advisory Group (ISWAG) Broome 2021	Coordinated by the Kimberley Indigenous Saltwater Advisory Group, implemented by Kimberley Saltwater Communities, supported by Western Science Partners	Kimberley
	Bayliss P, Hutton M (2017). Integrating Indigenous knowledge and survey techniques to develop a baseline for dugong (*Dugong dugon*) management in the Kimberley: Final Report of project 1.2.5 of the Kimberley Marine Research Program Node of the Western Australian Marine Science Institution, WAMSI, Perth, Western Australia, 98 pp.	CSIRO	Kimberley
	Bayliss P, Raudino H, Hutton M, Murray K, Waples K and Strydom S (2019) Modelling the spatial relationship between dugong (*Dugong dugon*) and their seagrass habitat in Shark Bay Marine Park before and after the marine heatwave of 2010/11. Department of Agriculture, Water and the Environment Final Report 2.	CSIRO DBCA	Shark Bay Ningaloo Reef Exmouth Gulf
	Raudino H, D'Cruz E, Waples K, Menzies J, Murdoch J, Quartermaine T and Mathews D (2020) Dry season dreaming Snubfin census on Yawuru sea country. Landscope 36, 41-44	DBCA	Roebuck Bay
	Thums M, Jenner C, Waples K, Salgado Kent C and Meekan M (2018) Humpback whale use of the Kimberley; understanding and monitoring spatial distribution. Report of Proposal 1.2.1 prepared for the Kimberley Marine Research Program, Western Australian Marine Science Institution, Perth, Western Australia, 78pp. Tourism WA. Shire of Broome visitor factsheet. Three-year average 2015/2016/2017. Produced by Tourism WA – Strategy and Research.	AIMS WAMSI	Kimberley

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Brown AM, Allen SJ, Kelly N, Hodgson A (2022) Using Unoccupied Aerial Vehicles to estimate availability and group size error for aerial surveys of coastal dolphins. Remote Sensing in Ecology and Conservation. doi: 10.1002/rse2.313	Murdoch University	Ningaloo Reef Exmouth Gulf
Seabirds and shorebirds	Chevron Env-Gor-Seabird Monitoring Report 2021/22 J01209 (ABU220500068)	Chevron	Ah Chong Island (Montebello group) Double Island North Double Island South Parakeelya Island Barrow Island Group
	Dunlop JN. and Greenwell C (2021) Seasonal movements and metapopulation structure of the Australian fairy tern in Western Australia. Pacific Conservation Biology, 27, 47-60	Conservation Council of Western Australia	Stewart Island Fortescue Island Mardie Island Regnard Island Scholl Island Shark Bay Exmouth Gulf Somerville Island Tent Island Hope Point Houtman Abrolhos Islands Ningaloo Coast
	Weller D, Kidd L, Lee C, Klose S, Jaensch R, Driessen J (2020) Directory of Important Habitat for Migratory Shorebirds in Australia. Prepared for Australian Government Department of Agriculture, Water and the Environment by BirdLife Australia, Melbourne	Birdlife Australia	Barrow Island Carnarvon Coral Bay Exmouth Gulf Houtman Abrolhos Islands Karratha Ningaloo Onslow Area Port Hedland Adele Island Lacepede Islands Dampier Peninsula

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Australia's National Shorebird Monitoring Program https://awsg.org.au/about-us/shorebirds-2020/	Birdlife Australia	Dampier Port Hedland Shark Bay Eighty Mile Beach Barrow Island Exmouth Gulf Ningaloo Reef Ningaloo Roebuck Bay
	Birdata: https://birdata.birdlife.org.au/	Birdlife Australia	Western Australia
	eBird: https://ebird.org/hotspots?hs=L5713406&yr=all&m=	eBird	Western Australia
	Astron (2020) Thevenard Island Retirement Project Terrestrial Ecological Monitoring Report June 2020. Prepared for Chevron	Chevron	Thevenard Island
	Biota (2022) Ashburton Salt Project Migratory Shorebird Assessment. Prepared for K + S Salt Australia	for K + S Salt Australia	Ashburton Exmouth Gulf
	Cannell B, Hamilton S, Driessen J (2019) Wedge- tailed shearwater foraging behaviour in the Exmouth region. Report for Woodside Energy Ltd. University of Western Australia and Birdlife Australia.	UWA	Muiron Islands
	Sutton AL and Shaw LL (2020) A snapshot of Marine Research in Shark Bay (Gathaagudu): Literature Review and Metadata Collection (1949-2020). West Australian Marine Science Institution, 180.	WAMSI	Shark Bay
	Sutton AL and Shaw JL (2021) Cumulative Pressures on the Distinctive Values of Exmouth Gulf. First draft report to the Department of Water and Environmental Regulation by the Western Australian Marine Science Institution, Perth, Western Australia. 272 pages.	WAMSI	Exmouth Gulf
	Woodside Case Study: Ningaloo Region Migratory Shorebirds of Exmouth Gulf (Birdlife)	Woodside Birdlife Australia	Exmouth Gulf Giralia Station
	DBCA shorebird surveys of Montebello Islands and Bedout Island in 2017 and 2018 mentioned in: Australian National Report to the 19th JAMBA, 13th CAMBA and 6th ROKAMBA Consultative Meetings, Commonwealth of Australia 2018	DBCA	Bedout Island Montebello Islands
	Roger DI, Scroggie MP, Hassell CJ (2020) Review of long-term shorebird monitoring in north Western Australia. Arthur Rylah Institute for Environmental Research. Technical Report Series No. 313. Prepared for DBCA	Arthur Rylah Institute DBCA	Roebuck Bay Eighty Mile Beach Bush Point
	Pendoley Environmental (2021) Varanus and Airlie Islands Shearwater Monitoring Annual Report 2020	Santos	Lowendal Islands Group Airlie Island

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
			Serrurier Island
	Bancroft W and Bamford M (2018) ANSIA Stage 2 Fauna Assessment	MJ and AR Bamford Consulting Ecologists	Pilbara
	Phoenix Environmental Sciences (2023) Long-term migratory shorebird monitoring program for the Optimised Mardie Project. Prepared for Mardie Minerals Pty Ltd	Phoenix Consultants	Mardie
	Lavers JL, Humphreys-Williams E, Crameri NJ, Bond AL (2020) Trace element concentrations feathers from three seabird species breeding in the Timor Sea. Marine Pollution Bulletin 151. 110876	University of Tasmania	Bedout Island
	Biota Environmental Sciences (2019) Asian Renewable Energy Hub Environmental Review Document, Assessment Number 2140, Appendix 8, Asian Renewable Energy Hub Migratory Shorebirds and Waterbirds Survey. Prepared by Biotat Environmental Sciences, Nov 2018	Biota Environmental Sciences for Asian Renewable Hub (NW Interconnected Power)	Eighty Mile Beach
	Chan YC, Chan DTC, Tibbitts TL, Hassell CJ, Piersma T (2023) Site fidelity of migratory shorebirds facing habitat deterioration: insights from satellite tracking and mark-resighting. Mov Ecol 11, 79 https://doi.org/10.1186/s40462-023-00443-9	Department of Coastal Systems, NIOZ Royal Netherlands Institute for Sea Research Global Flyway Network Australasian Wader Studies Group	Roebuck Bay Eighty Mile Beach
	Lavers JL, Humphreys-Williams E, Crameri NJ, Bond AL (2020) Trace ekement concentrations feathers from three seabird species breeding in the Timor Sea. Marine Pollution Bulletin 151. 110876	University of Tasmania	Bedout Island

Appendix E Initial oil characterisation sampling

Oil sampling and analysis

Oil sampling kits are held by Santos for the purposes of taking initial spilled oil/ oily water samples. Santos also maintains procedures to guide untrained personnel in the collection of these initial samples, which may be taken by vessel crew. Trained personnel may be deployed to the field via the OSM Services Provider to continue sampling as required as part of ongoing operational monitoring.

Sampling kits are positioned at Santos strategic locations (refer to Table 9-2) and will be mobilised to the required locations when needed. The kits contain all necessary equipment and sampling containers for shipping to a laboratory for analysis.

The Santos Oil and Water Sampling Procedures (7710-650-PRO-0008) defines the sampling protocol and procedures, and broad implementation guidance is provided in Table E-1.

Using on-site Vessel of Opportunity (VOOs), oil samples are to be taken daily where possible from fresh oil, and from the weathered oil locations.

Laboratory analysis

Laboratory analysis of the chemical and physical properties of the recovered oil, including gas chromatography/mass spectrometry for the purpose of fingerprinting the oil constituents, is to be undertaken. Fingerprinting of the released hydrocarbon potentially allows contamination to be traced back to the source where this is otherwise unclear or in dispute. The Santos Oil and Water Sampling Procedures (7710-650-PRO-0008) outlines the suite of available oil testing and fingerprinting analyses that can be performed by the preferred laboratories. Details of the testing laboratories can also be found within the document.

Ecotoxicology assessment of the oil is to be conducted at an ecotoxicology capable laboratory following the revised Australian and New Zealand Water Quality Guidelines, if the hydrocarbon is from Santos fields/reservoirs and ecotoxicology testing has not already been done (i.e. pre-spill). The quantity of sample required for analysis will be confirmed by the laboratory but is expected to be in the order of 6 to 10 L. Testing results will provide the concentrations at which toxicity endpoints consistent with revised Australian and New Zealand Water Quality Guidelines are met for each test. Overall species protection concentrations, including 90%, 95% and 99% species protection trigger levels are then to be generated using a species sensitivity distribution fitted to the data (e.g. by using the Burrlioz software program).

Table E-1: Implementation guidance – initial oil characterisation

Action		Consideration	Responsibility	Complete
Initial actions	Source available vessels (on hire or VOO) for oil sampling.	Can be multi-tasked – e.g. for vessel surveillance or tracking buoy deployment.	Operations Section Chief Logistics Section Chief	☐
	Source sampling equipment. Confirm sampling methodology. Confirm laboratory for sample analysis. Develop health and safety requirements/controls.	Refer Table 9-2 for resource availability. The Santos Oil and Water Sampling Procedures (7110-650-PRO-0008) provide the procedures for sampling.	Environment Unit Lead Safety Officer	☐
	Vessel directed to sampling location.	Sampling of oil at thickest part of slick – typically leading edge.	Operations Section Chief	☐
	Vessel crew to undertake sampling and delivery of samples to nearest Port for dispatch to laboratory. Environment Unit Lead to confirm analysis of oil with lab.	Darwin Logistics personnel to assist with logistics of sending oil samples to laboratory for analysis.	Operations Section Chief Environment Unit Lead Logistics Section Chief	☐
Ongoing actions	Continue sample collection post release where oil is available.	Initial monitoring by crew of available vessels – Once mobilised to site OSM Services Provider to continue sampling of oil in conjunction with operational water quality monitoring.	Operations Section Chief Environment Unit Lead Logistics Section Chief	☐

Appendix F OSM Services Provider Call Off Order Form

Operational and Scientific Monitoring (OSM) Services Call-Off Order Form

Please do not hesitate in contacting the Duty Manager at the earliest opportunity in the event of an incident or potential incident. Please ensure you telephone the Duty Manager before e-mailing or faxing this completed form

Oil Spill Response Limited's safety policy requires us to work closely with the mobilising party to ensure all aspects of safety and security are addressed for our personnel.

To	Duty Manager
OSRL Base	Southampton, UK Loyang, Singapore Fort Lauderdale, USA
Telephone	+65 6266 1566
Emergency Fax	+65 6266 2312
Email	dutymanagers@oilspillresponse.com, osm@oilspillresponse.com

Details of Authorised Contact				
Mobilising Company				
Name of Person Authorising OSRL				
Position of Authorising Representative				
Direct Phone Number	Country Code	+	Number	
Email Address				

Operational Monitoring service to be activated (X)		**Scientific Monitoring service to be activated (X)**	
OM1 Hydrocarbon Properties and Weathering Behaviour at Sea		**SM1** Water Quality Impact Assessment	
OM2 Water Quality Assessment		**SM2** Sediment Quality Impact Assessment	
OM3 Sediment Quality Assessment		**SM3** Intertidal and Coastal Habitat Assessment	
OM4a Surface Chemical Dispersant Effectiveness and Fate Assessment		**SM4** Seabirds and Shorebirds	
OM4b Subsea Dispersant Injection Monitoring		**SM5** Marine Mega-fauna Assessment	
OM5 Marine Fauna Surveillance		**SM6** Benthic Habitat Assessment	
OM6 Shoreline Clean-up Assessment		**SM7** Marine Fish and Elasmobranch Assemblages Assessment	
		SM8 Fisheries Impact Assessment	
		SM9 Heritage Features Assessment	
		SM10 Social Impact Assessment	

Location of Port of Staging/ Departure – Port (X)		Additional Information
Ashburton		
Barrow Island		
Broome		
Cape Preston		
Dampier		
Darwin		
Derby		
Exmouth		
Onslow		
Port Hedland		
Port Walcott		
Varanus Island		
Wyndham		
Yampi Sound		
Others (*To be Agreed)		

Location of Port of Staging/ Departure – Airport (X)		Additional Information
Barrow Island		
Broome		
Cape Preston		
Darwin		
Derby		
Karratha		
Learmonth		
Lombardina		
Onslow		
Pardoo		
Perth		
Port Hedland		
Roebourne		
Wallal Downs		
Others (*To be Agreed)		

Request for OSM position to IMT/EMT (X)		IMT/EMT Address
OSM Implementation Lead		
OSM Field Operations Manager		
SM Coordinator		
OM Coordinator		

Invoice Address if available	
Purchase Order Number	

I, the above-named Authorising Representative for the Mobilising Company, approve activation of Oil Spill Response Limited and its resources for OSM Services under the terms of the SUPPLEMENTARY SERVICE AGREEMENT FOR OPERATIONAL AND SCIENTIFIC MONITORING (OSM) SERVICES Agreement in place between the above stated Company and Oil Spill Response PTY Limited.

Signature:		Date / Time (UTC+8):		

Please telephone the Duty Manager to confirm receipt the completed form after sending this completed form.